



MIDLANDS STATE UNIVERSITY

**Developing a process-based model for effective and sustainable work safety
analysis for rural hospitals in Chirumanzu district of Midlands Province,
Zimbabwe**

BY

TAPIWA SHABANI

R163053N

FACULTY OF SOCIAL SCIENCES

**A thesis submitted in fulfilment to the requirements of the Master of
Philosophy Degree in Geography and Environmental Sustainability,
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Building**

SUPERVISOR: PROFESSOR S. JERIE

CO-SUPERVISOR: DOCTOR P. KOWE

Abstract

Work safety analysis is essential for the well-being and productivity of healthcare workers, particularly in less developed countries such as Zimbabwe. Nevertheless, existing work safety analysis models inadequately address work safety challenges affecting rural hospitals, leading to high rates of accidents and injuries. As a result of this, this research develops a process-based model for effective and sustainable work safety analysis for rural hospitals in Chirumanzu district of Midlands Province, Zimbabwe. A descriptive cross-sectional design incorporating both quantitative and qualitative methods was employed during the study. A total of 109 questionnaires and 68 questionnaires were self-administered at Muvonde Hospital and Driefontein Sanatorium Hospital respectively to reduce margin of error. Data collected using the questionnaire included risks affecting healthcare workers, their causes, effects and methods used to manage risks. The Medical Superintendent, Hospital Manager (Matron), Human Resource Manager, Head of Environmental Health Department (Environmental Health Technician), Nurse in Charge at each hospitals and the District Medical Officer were included as key informant interviewees to collect qualitative data, such as, data on aspects which affect work safety analysis in rural hospitals. Observations were done focusing mainly on essential features of the workplace notably the work environment, workers, tasks performed by workers and equipment used which are likely to cause risks at work. An observational checklist was used. Secondary data regarding risks affecting healthcare workers was obtained from weekly, monthly and annual reports within the rural hospitals.

Several risks were identified, including ergonomic, chemical, psychosocial, biological and physical risks at Muvonde Hospital and Driefontein Sanatorium Hospital. At Muvonde Hospital (44%) of the healthcare workers reported ergonomic risks due to the nature of work they performed which involved manual tasks. However, at Driefontein Sanatorium Hospital the majority (30.9%) of the healthcare workers reported biological risks. This is not surprising since the hospital mainly deals with infectious diseases, for example, tuberculosis. Risks which affect healthcare workers within the hospitals expose them to various injuries and diseases. Back injuries were the most common issue reported at both hospitals. The study found that risk challenges were exacerbated by inadequate equipment, shortage of labour, poor training, ineffective management and high workloads as well as negative safety behaviour. Some of the measures used to manage risks include safety training, safety inspection, safety workshops, monitoring worker's safety and provision of personal protective equipment/cloth however, challenges or gaps related in those current safety approaches were identified. Rural hospitals

face significant challenges related to resource scarcity, inadequate infrastructure and limited access to support services and training, all of which negatively affect occupational health and safety. To address these challenges, the study proposes a process-based model for effective and sustainable work safety analysis tailored to the needs of rural hospitals. The model includes factors such as assessment of work safety measures already in place, risk assessment, data collection and analysis, development of control measures, capacity building and continuous monitoring. The model also considers aspects such as stakeholder involvement, management commitment, regular communication, sustainability planning and emergency preparedness. The proposed model's emphasis on sustainability alludes a long-term approach in enhancing work safety procedures at rural hospitals. By integrating continuous monitoring and improvement, the model aims to create lasting changes that adapt to evolving challenges in rural healthcare settings.

Key Words: Healthcare Workers; Risk Assessment; Risk Identification; Risk Management; Rural Hospitals; Work-related Risks; Work Safety Analysis

Declaration

I, Tapiwa Shabani, hereby declare that this study titled ***Developing a process-based model for effective and sustainable work safety analysis for rural hospitals in Chirumanzu district of Midlands Province, Zimbabwe*** is my original work, and has not been submitted in part or in full, to this or any other university for the award of any degree or qualification. I confirm that all sources used in this thesis have been properly acknowledged and cited.

I further declare that the research conducted for this thesis has been carried out under the guidance and supervision of Prof. S. Jerie as the main supervisor and Dr. P. Kowe as the co-supervisor. To the best of my knowledge, the data collected, analysed and presented in this thesis is accurate and reliable.

I declare that this thesis is a culmination of my own efforts, knowledge, and skills acquired during my academic journey. As a result, the reproduction of any part of this research project, without obtaining my consent or the consent of Midlands State University, is strictly prohibited.

Student's Signature  Date 06/08/24

As the candidate's thesis supervisor, I, Prof. S. Jerie, concur with the aforementioned statements and endorse the submission of the research.

Supervisor's Signature  Date 06/08/2024

As the candidate's thesis co-supervisor, I, Dr. P. Kowe, concur with the aforementioned statements and endorse the submission of the research.

Co-supervisor's Signature  Date 06/08/2024

I, Professor M. Matsa, being the chairperson of the Department of Geography, Environmental Sustainability and Resilience Building, agree with the above statements and recommend submission of the research.

Chairperson's Signature  Date 07/08/2024

Note to the Reader

The thesis is structured in seven chapters. The thesis is presented in the form of manuscripts as it adopted a paper based approach. The principal author of the manuscripts was the student, Tapiwa Shabani. The student was responsible for coming up with research ideas and writing-up the research methodology. Data collection was done by the student with the assistance of a Research Assistant, Takunda Shabani, who also became a co-author of the manuscripts. Prof. S. Jerie and Dr. P. Kowe are also part of the authorship since the research was done under their supervision. The guidelines of the journal that published the paper also dictated the referencing styles used in the manuscripts.

Publications and Manuscripts

1. **Shabani, Tapiwa.,** Jerie, Steven. and Shabani, Takunda. (2024). Significant occupational hazards faced by healthcare workers in Zimbabwe. *Life Cycle Reliability and Safety Engineering*, 13. 61-73. <https://doi.org/10.1007/s41872-024-00245-x>. **(Springer) (Published).**
2. **Shabani, Tapiwa.,** Jerie, Steven. and Shabani, Takunda. (2023). Assessment of work-related risks among healthcare workers in rural hospitals of Chirumanzu District, Zimbabwe. *Safety in Extreme Environments*, 5(2), 131-148. <https://doi.org/10.1007/s42797-023-00075-7>. **(Springer) (Published).**
3. **Shabani, Tapiwa.,** Jerie, Steven. and Shabani, Takunda. (2024). Work safety analysis for rural hospitals in Chirumanzu District of Midlands Province, Zimbabwe. *Safety in Extreme Environments*, 6 (2), 107–137. <https://doi.org/10.1007/s42797-023-00096-2>. **(Springer) (Published).**
4. **Shabani, Tapiwa.,** Jerie, Steven. and Shabani, Takunda. (2024). Assessment of work safety analysis performance among rural hospitals of Chirumanzu district of midlands province, Zimbabwe. *BMC Health Services Research*, 24, 938. 1-16. <https://doi.org/10.1186/s12913-024-11425-x>. **(Springer) (Published).**
5. **Shabani, Tapiwa.,** Jerie, Steven., Kowe Pedzisai and Shabani, Takunda. (2024). Developing A Process-Based Model for Effective and Sustainable Work Safety Analysis for Rural Hospitals in Chirumanzu District of Midlands Province, Zimbabwe. *Journal of Risk Research*. 24675761. **(Taylor and Francis) (Under Review).**

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Acronyms

AIDS	Acquired Immunodeficiency Syndrome
ALARP	As Low as Reasonably Possible
BP	Blood Pressure
DMO	District Medical Officer
EHT	Environmental Health Technician
FAO	Food and Agriculture Organisation
HBV	Hepatitis B Virus
HCV	Hepatitis C Virus
HIV	Human Immunodeficiency Virus
HRM	Human Resource Manager
ILO	International Labour Organisation
ISO	International Organisation for Standardization
MDR-TB	Multi-drug resistant Tuberculosis
NSSA	National Social Security Authority
OHS	Occupational Health and Safety
OPD	Outpatient Department
OSHMS	Occupational Safety and Health Management System
PPE/C	Personal Protective Equipment/Cloth
PDCA	Plan Do Check Act
PTSD	Post-Traumatic Stress Disorder
SARS	Severe Acute Respiratory Syndrome
SHAB	Safety Health Accountability Board
TB	Tuberculosis

WBG CCKP	World Bank Group Climate Change Knowledge Portal
WHO	World Health Organisation
WSA	Work Safety Analysis
ZIMSTAT	Zimbabwe National Statistics Agency
ZIOSH	Zimbabwe Occupational Safety and Health
ZOSHC	Zimbabwe Occupational Safety and Health Council

Chapter 1

Introduction

1.1 Background to the Study

Most industries prioritise occupational safety to foster a healthy, prosperous, and comfortable working environment (Madhurima et al., 2018; Widodo and Dwinanda, 2020). Every worker has the legal right to work in an environment free from occupational risks. Globally, healthcare workers represent approximately 12% of the workforce (Mossburg et al., 2019; Che Huei et al., 2020), with over 59 million people employed in healthcare facilities (Hamid et al., 2018; Che Huei et al., 2020). Despite the critical role healthcare facilities play in saving lives, healthcare workers are exposed to numerous risks, including chemical, physical, biological, psychosocial, and ergonomic risks (Abiramalakshmi and Shree, 2018; Nankongnab et al., 2021). Compared to workers in other industries, healthcare workers report higher compensation claims for infectious diseases, mental health disorders, eye conditions, hepatitis B/C, strains, and sprains (O'Neill, 2020; WHO, 2020). As a result of this, accurate identification of occupational risks in hospitals requires the involvement of knowledgeable professionals. Hazard identification is vital for understanding how systems operate and the risks that may arise during their operation (Corvalan et al., 2020; Koppy et al., 2023). Among the various techniques available, work safety analysis (WSA) is considered the most effective method for hazard identification.

Work safety analysis is a systematic way used to identify and evaluate potential risks associated with any job as well as developing suitable control procedures for the identified risks (Li et al., 2019; Ramagnesh et al., 2021). Through work safety analysis, the job is divided into steps, then risks associated with each step are identified and recorded, and at the end control measures are developed (Adamopoulos, 2022). This means that when risk identification is done and control measures are developed based on work safety analysis risks remain at acceptable level. Common metrics, such as injury rates, fatalities, and accident records, are often used to assess effectiveness of work safety analysis in workplaces (Ofori et al., 2023; Koc et al., 2023). For instance, in 2000, injuries caused by sharp objects in African healthcare facilities led to 6,000 cases of HBV, 16,000 cases of HCV, and 1,000 cases of HIV (Mossburg et al., 2019), demonstrating the necessity of comprehensive work safety analysis in hospitals to mitigate risks to healthcare workers. The steps involved in work safety analysis include selecting a job

to be analysed, recording the steps involved in the task, identifying hazards and assessing risks, developing control measures, implementing work safety analysis procedures, and monitoring and maintaining controls (Kumar Mishra and Aithal, 2021). Imran *et al.* (2023) emphasise that steps of work safety analysis are crucial for identifying hazards in healthcare institutions.

Many industry practitioners and stakeholders recognise the need for improved work safety analysis to reduce workplace accidents (Dababneh *et al.*, 2018; Nguyen *et al.*, 2022). Proper implementation of work safety analysis can prevent occupational diseases and injuries. For example, work safety analysis was applied to assess work-related risks during scaffold installation at PT. Jay Konstruktis Jakarta Construction Company in Indonesia (Mulyaning, 2020). Negroho *et al.* (2020) also recommended integrating fuzzy inferences and Bayesian networks with work safety analysis for risk analysis in Shipyard operations, illustrating its application across various industries. Similarly, work safety analysis can enhance safety in healthcare centres by building resilient work safety systems (Buheji and Buhaid, 2020; Aliabadi *et al.*, 2020). This resilience enables healthcare workers to manage unexpected challenges using existing resources (Corvalan *et al.*, 2020), which is crucial for hospitals. Work safety analysis strengthens hospital resilience by focusing on risk identification, assessment, and the implementation of safety measures, including effective workplace design (Sunindijo *et al.*, 2020; Jovanović *et al.*, 2020).

Various models, such as Heinrich's Accident Causation Model of 1931 (Komjenovic *et al.*, 2017; Molan and Molan, 2021) and the Swiss Cheese Model (1990) developed by Reason (Hans *et al.*, 2018; Genserik *et al.*, 2020), have proven effective in reducing workplace injuries, diseases, and fatalities in both developed countries like the United Kingdom and the Netherlands (Kharazishvili *et al.*, 2020) and developing countries like Zimbabwe (Jerie and Jenya, 2017). However, these safety models are more commonly applied in industries such as timber, mining and manufacturing (Na *et al.*, 2021). In contrast, healthcare workers, especially those in marginal areas, remain vulnerable to occupational risks due to the lack of safety models and systems (Abbas *et al.*, 2021). The limited application of safety models in healthcare facilities, particularly in rural areas, highlights the need for improved work safety practices. Many rural hospitals now use generic safety procedures which are adapted from national safety and health guidelines. The guidelines include National Health and Safety Policies. However, these guidelines provide a foundation for occupational safety, but they are not specifically tailored to address particular challenges encountered by hospitals located in rural areas. Therefore, this research aims to develop a process-based model for effective and sustainable

work safety analysis tailored to rural hospitals, with a focus on Chirumanzu district, Zimbabwe.

1.2 Statement of the Problem

Work safety analysis is a key focus for modern healthcare systems, aimed at improving the quality of patient care and ensuring the safety of healthcare workers (Jones *et al.*, 2020). However, in rural healthcare facilities such as Muvonde and Driefontein Sanatorium rural hospitals, safety policies have traditionally prioritised patient safety over the wellbeing of healthcare workers. Policymakers, political leaders and health experts worldwide have acknowledged the advantages of taking an organised and coordinated strategies for safeguarding patients and identifying the prevalent causes of harm and methods for preventing them (WHO, 2021). Administrators in rural hospitals understudy allocated more resources to patient care, under the assumption that healthcare professionals are capable of maintaining their own health without additional support. When health professionals participate in adversity events, they frequently face severe professional and personal consequences. As a result, the safety of healthcare workers is often neglected. Despite the safety measures in place, healthcare workers at Muvonde Hospital and Driefontein Sanatorium Hospital are exposed to a variety of risks, including chemical, physical, biological, ergonomic, and psychosocial risks. These risks persist because the focus in these hospitals remains on disease diagnosis, often at the expense of implementing comprehensive work safety analysis.

The operating conditions of rural hospitals in Chirumanzu district differ significantly from those of other industries in the area. Muvonde Hospital and Driefontein Sanatorium Hospital operate 24 hours a day, including holidays. This continuous operation adds to the complexity of the work environment, making work safety analysis a priority. Despite efforts to improve work safety in these hospitals, insufficient risk assessment and lack of regular safety training as well as lack of resources have exacerbated the risks. Insufficient risk assessment means there is poor work safety analysis within the rural hospitals. Healthcare workers in these rural hospitals are frequently exposed to hazards as a result of needle stick injuries, patient lifting, static postures, work pressure, and exposure to hazardous chemicals. A shortage of funding further hampers the ability of these hospitals to run effective safety programs. The budgets of Muvonde Hospital and Driefontein Sanatorium Hospital are not specifically allocated to safety related issues, such as hiring dedicated Safety Officers who could help in implementing proper work safety analysis.

The lack of adequate safety analysis at these hospitals exposes healthcare workers to a range of hazards, leading to musculoskeletal injuries, allergies, asthma, burnout, stress, and biological infections. These problems are made worse by the absence of a systematic method for work safety analysis which leads to increased workplace accidents and risks. Effective work safety procedures are vital, but there are no models designed to meet the particular needs and difficulties faced by Chirumanzu district rural hospitals. This gap emphasises the necessity of a process-based model that incorporates sustainable methods that are feasible to apply within the rural healthcare settings. The inability to gather thorough information on occupational safety incidents in rural healthcare centers hinders the efforts to create effective interventions. It becomes difficult to develop methods that improve worker's safety in rural hospitals of Chirumanzu district in the absence of precise evaluations and analysis of current safety procedures. Therefore, this study aims to develop a process-based model for effective and sustainable work safety analysis for rural settings such as Muvonde and Driefontein Sanatorium rural hospitals located in Chirumanzu district.

1.3 Objectives

1.3.1 General Objective

- To develop a process-based model for effective and sustainable work safety analysis for rural settings such as Muvonde and Driefontein Sanatorium rural hospitals of Chirumanzu District.

1.3.2 Specific Objectives

- To determine work related risks affecting healthcare workers of Muvonde and Driefontein Sanatorium rural hospitals.
- To examine work safety analysis procedures used at Muvonde and Driefontein Sanatorium rural hospitals of Chirumanzu District.
- To assess the effectiveness of work safety analysis procedures used to manage risks at Muvonde and Driefontein Sanatorium rural hospitals in Chirumanzu District.
- To develop a process-based model for effective and sustainable work safety analysis for rural settings such as Muvonde and Driefontein Sanatorium rural hospitals in Chirumanzu District.

1.4 Justification of the Study

Healthcare workers must implement procedures that positively influence safety behaviour and enhance overall safety performance within the workplace (Kavenga *et al.*, 2021; Chinene *et al.*, 2022). In response to this need, this research proposes the development of a process-based model for effective and sustainable work safety analysis in rural settings, specifically targeting hospitals such as Muvonde and Driefontein Sanatorium rural hospitals. The findings of this research will benefit both private and public healthcare institutions, providing valuable insights into risks associated with each step of tasks performed within the hospital. The outcomes equip healthcare professionals with the knowledge to identify the types, causes, and impacts of risks, as well as to develop appropriate control measures. The research demonstrates the effectiveness of work safety analysis in enhancing safety awareness among healthcare workers, ultimately improving the quality of services delivered to patients.

This study also aligns with Sustainable Development Goal (SDG) 3, which aims to achieve Good Health and Well-Being. Moreover, it contributes to the attainment of SDG 8, target 8.8, which focuses on protecting labour rights and promoting safe and secure working environments by 2030, and SDG 16, target 16.6, which emphasises the development of effective, accountable, and transparent institutions at all levels. The findings will support Zimbabwe's Vision 2030, which aims to transform the country into a middle-income society by the year 2030. A key aspect of Vision 2030 is enhancing employee productivity, which can be achieved through robust occupational health and safety practices (Chitiyo *et al.*, 2019). This research not only benefits healthcare workers in the rural hospitals of Chirumanzu district but also the entire healthcare sector of Zimbabwe. By assessing whether work safety analysis is achieving its intended goals, the study provides a framework that can be adopted by various industries, with guidance from the National Social Security Authority (NSSA) on managing work-related risks. Additionally, the Ministry of Health and Child Care will benefit from this research by using the findings to train healthcare matrons on improving the safety of both workers and patients. The study will increase healthcare workers' understanding of the importance of following the stages of work safety analysis in their day-to-day procedures.

The outcomes of this research can also be utilised by other ministries that work alongside NSSA in promoting occupational safety, such as the Ministry of Labour and Social Welfare, the Zimbabwe Occupational Safety and Health Council (ZOSHC), the Zimbabwe Institute of Occupational Safety and Health (ZIOSH), and the Ministry of Industry in facilitating the

formulation and implementation of safety policies. The study is particularly significant for health department managers within rural districts councils, who are focused on ensuring safety compliance for lower-level workers. The results of this research are crucial for Zimbabwe's National Development Strategy 1, which prioritises health and well-being. Moreover, the findings will contribute to global knowledge by determining whether work safety analysis is an effective method for reducing work-related risks in healthcare centres. The research also broadens the researcher's knowledge in the field of occupational safety and health.

The study serves as a benchmark for future research, as other researchers can reference its findings. This indicates the importance of the study in meeting some of the demands of Education 5.0, particularly in terms of research. The results can be integrated into the educational curriculum for healthcare workers, providing learners with valuable knowledge on ensuring work safety in challenging environments such as rural hospitals. This supports the teaching objectives of Education 5.0, which also promotes innovation. The process-based model developed through this research will not only improve safety practices but also encourage innovation in safety measures implemented in rural hospitals located in remote areas.

1.5 Description of Study Areas

1.5.1 Physical Characteristics

The study was conducted at Muvonde and Driefontein Sanatorium rural hospitals near Driefontein Mission under the Diocese of Gweru in Midlands Province, Zimbabwe. Muvonde Hospital (-19.42222, 30.69800) and Driefontein Sanatorium Hospital (-19.41670, 30.71195) are located in ward 20 of Chirumanzu district as shown in Figure 1. The two hospitals are accessed by a 15km gravel road from Chaka along Masvingo Mvuma road. Driefontein Sanatorium hospital and Muvonde Hospital can be accessed by a 20km road from Fairfields on Masvingo Mvuma road. Driefontein Sanatorium Hospital and Muvonde hospital are separate Mission hospitals, however their operation is closely linked. Driefontein Sanatorium Hospital specializes in treating Tuberculosis (TB) and Multi drug-resistant Tuberculosis (MDR-TB). Muvonde and Driefontein Sanatorium rural hospitals are referrals of clinics and other hospitals in Chirumanzu District.

Since the hospitals act as referrals pressure and high workload increases within the hospitals which expose health workers to various work-related risks. Muvonde and Driefontein Sanatorium rural hospitals serve the Driefontein catchment area and their services are also

extended to Masvingo, Chaka, Mvuma and Gweru. At Muvonde and Driefontein Sanatorium rural hospitals, healthcare workers carry out their activities in different departments such as maternity ward, theatre, X-ray department, dental unit, pediatric ward, male ward, female ward, psychiatric unit, outpatient department (OPD) and optical unit. According to Tichapondwa (2012) Muvonde Hospital was a reformatory school and was turned into a full hospital with 140 bed capacity in 1962 and later a school of nursing was constructed however, expansion of the hospital took place from the 1990s and the bed capacity increased to about 190 beds while the number of departments also increased. Driefontein Sanatorium Hospital which is well known for diagnosis of tuberculosis in Zimbabwe (Tichapondwa, 2012), has a bed capacity of approximately 120 beds.

Chirumanzu district covers 4, 737 km² of Midlands Province, and the southern part consists of communal areas and the northern part consists of resettlement areas (Kori *et al.*, 2020). Muvonde Hospital and Driefontein Sanatorium Hospital are located in the northern part of Chirumanzu District which is high to about 1 470m and the southern part of the district is 1 200m low. The northern border of Chirumanzu district is demarcated by Chivhu in Mashonaland East province, southern part is demarcated by Mashava in Masvingo Province, and Gweru district along Ngezi River demarcates the western side while Gutu demarcates eastern boundaries along Shashe River. Chirumanzu District is between longitude 19° 50'E and 30° 45'E and between 19°30'S and 20°20'S (Zimbabwe Geographical Location and Statistical Data, 2016). In Zimbabwe there are five Agricultural Regions which are grouped based on precipitation and temperature (Zimbabwe National Geo-Spatial and Space Agency, 2020). It is estimated that 80 to 90% of Chirumanzu district is located in Agricultural Region 111, while the remainder is in Region IV (Agritex, 2010; Gwamuri *et al.*, 2012). Ward 20 where Muvonde Hospital and Driefontein Sanatorium Hospital are located lies in agro-ecological region 111 receiving between 650-800mm of rainfall (Marambanyika *et al.*, 2021).

The temperature of the district ranges from 24°C to 31°C (Gumbo, 2006; Mugandani *et al.*, 2012). The district where Muvonde Hospital and Driefontein Sanatorium hospital are located is associated with mid-season dry spells and high temperatures (FAO, 2006). Frequent mid-season dry spells and other unusual variations such as droughts are characteristics of regions 3 and 4 where Chirumanzu district lies (Zvigadza *et al.*, 2010). Chirumanzu District consists of two main seasons which are summer and winter (Fakarayi *et al.*, 2015). Sandy loam soils with high infiltration capacity cover the area where the two hospitals are placed. The soils found in Chirumanzu District mainly come from granite rocks and their fertility is very low (Mupaso *et*

al., 2014). Savanna grasslands and Miombo woodlands characterized ward 20 where the two hospitals are located (Marambanyika *et al.*, 2021). The main types of vegetation found in Chirumanzu District where ward 20 is located are mopane (*Colospermum*), mutondo (*Julbernardia Globiflora*) and musasa tree (*Brachystegia Specieforms*) (Matsa and Dzawanda, 2014). The drainage networks of ward 20 where Muvonde Hospital and Driefontein Sanatorium Hospital are located are mainly influenced by Nyororo River, Deure River, Chivake River and Shashe River (Marambanyika *et al.*, 2021).

1.5.2 Human and Economic Geography

According to the ZIMSTAT (2022) census report Chirumanzu District is estimated to have a population of 95 272 people which is further divided into 45 589 males and 49 683 females. Ward 20 of Chirumanzu District where the two hospitals are located has a total population of 10 004 people with 2.479 households (ZIMSTAT, 2022). In Driefontein population increased due to the 2000 fast track land reform program, coupled by natural upsurge of the population (Musasa and Marambanyika, 2021). The increase of people in the wards close to Muvonde Hospital and Driefontein Sanatorium Hospital also increases pressure on the healthcare workers since more people visit the hospitals looking for health services. The administration of Muvonde Hospital and Driefontein Sanatorium Hospital is done by both the government of Zimbabwe and the Roman Catholic Church. This improves the reputation of the hospitals and attracts people from different places around the country. This situation exposes healthcare workers to high workload and long working hours. People in Ward 20 are poor as shown by the level of poverty which is between 60 and 76% (Zimbabwe National Statistics Agency, 2016), this *status quo* results in financial shortages hence ill people delay to consult health workers, therefore severely ill patients are dealt with at Muvonde Hospital and Driefontein Sanatorium Hospital. This increases work-related risks affecting rural health workers since dealing with patients who are critically ill is highly demanding.

In Driefontein people practice subsistence farming to earn their living. However, their farming activities are affected by climatic variations such as drought and this disturbs the production of maize which is grown for consumption. To combat the effects of drought which affects their livelihoods the Driefontein community people are now cultivating close to the Driefontein wetland to increase their food production (Marambanyika *et al.*, 2021). People in Ward 20 of Chirumanzu District grow crops such as beans, tomatoes, cabbage and maize. They also keep livestock such as goats and cattle. During the rainy season the livestock is herded to avoid crop

destruction but in winter livestock wander everywhere searching for food since no special fodder crops are grown for livestock (cattle and goats). During drought farmers in Chirumanzu district where Ward 20 is located sell their livestock (Matsa, 2014) and traditional fruits such as mashuku (Mangizvo and Mthokozisi, 2017) in Mvuma, Gweru, Masvingo and Kwekwe towns to increase their source of income. Farmers in Chirumanzu district also sell surplus farm produce even if there is no drought to increase their source of income (Kori *et al.*, 2020). The district is generally associated with food shortages and they only get surplus food once per 5 years (Matsa and Dzawanda, 2014). The year-in and year-out of drought in Chirumanzu district has become a custom.

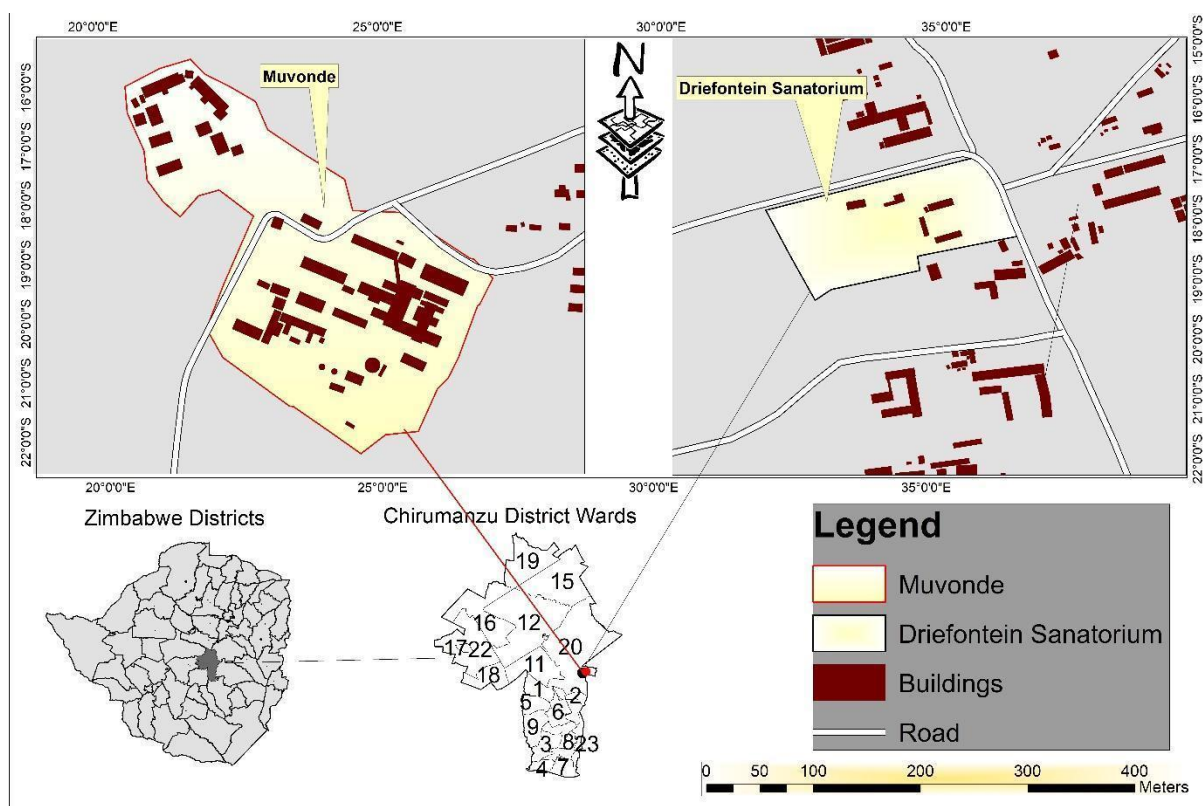


Figure 1: Location of Muvonde Hospital and Driefontein Sanatorium Hospital

Source: Author

1.6 Conceptual Framework

1.6.1. The Health and Safety Management System Process Model of ISO 45 001: 2018

The study is grounded around the ISO 45 001: 2018 Health and Safety Management System Process Model shown in Figure 2. The ISO 45 001: 2018 OHSMS was developed and published in 2018 by a committee of specialists of Occupational Health and Safety which was

set up by the International Organisation for Standardization (Morgado *et al.*, 2019). Occupational Health and Safety Management System has become common because it is considered as the model which enables companies to be competitive, promote elimination of risks, and provide sustainable and effective work safety within companies (Neto *et al.*, 2023; Liu *et al.*, 2023). The OHSMS model of ISO 45 001: 2018 uses the Plan, Do, Check and Act for continuous monitoring of hazards within an organisation. Many companies follow the PDCA cycle for management of risks because they are familiar with it, since it was also used in previous standards, such as ISO 900 1 and ISO 14 001 (Genserik *et al.*, 2020). Alvarez-Santos (2018) stated that all ISO systems which are related to safety management usually use the Plan-Do-Check-Act cycle theory of 1950 developed by Deming, which is well known as the PDCA cycle. This implies that the Health and Safety Management System Process Model of ISO 45 001:2018 adopted the Plan-Do-Check-Act for easier implementation by organisations.

The Health and Safety Management System process model which applies the Deming cycle (Plan, Do, Check and Act cycle) in implementation of worker's safety to meet the objectives of the stakeholders was used to examine the effectiveness of work safety analysis procedures used by the rural hospitals to manage risks. At the stage of planning, an analysis of the current methods used to manage risks within hospitals was done in order to identify the root sources of risks within the rural hospitals. The revision of the statement of the problem and study objectives was done. This was vital since it is considered in the formulation of a process-based model for effective and sustainable work safety analysis for rural settings such as Chirumanzu district rural hospitals. In the Do phase, there was determination of content and tasks in each job to implement solutions to risks encountered in each stage of the task carried out within the rural hospitals.

Step 3 of the PDCA cycle, which is checking there is comparison of results obtained during the study, contrary to the objectives of the study. Check if the safety goals used within the rural hospitals to manage risks produce results related to the Occupational Health and Safety policy. Also, checking the traditional procedures used to manage risks within rural hospitals if they are continually improving occupational safety and health dynamics to meet the demands of ISO 45 001: 2018. The results obtained in the three stages (Plan, Do and Check) were used in the Act stage to develop a process-based model for effective and sustainable work safety analysis for rural settings such as Chirumanzu district rural hospitals. This was done to provide a new mechanism which establishes improvements to meet the standards of the Occupational

Health and Safety Management System process model of ISO 45 001: 2018. In the Act stage, alteration of procedures or formulation of new procedures used for OHS can be done following the results obtained after the whole process has been followed (Genserik *et al.*, 2020). The stages of the PDCA cycle adopted by the Health and Safety Management System Process Model of ISO 45 001: 2018 cause companies to achieve continuous improvement in terms of occupational safety and health. As a result, the study developed a process-based model for effective and sustainable work safety analysis for rural hospitals in Chirumanzu district of Midlands Province, Zimbabwe using aspects of the Plan-Do-Check-Act cycle.

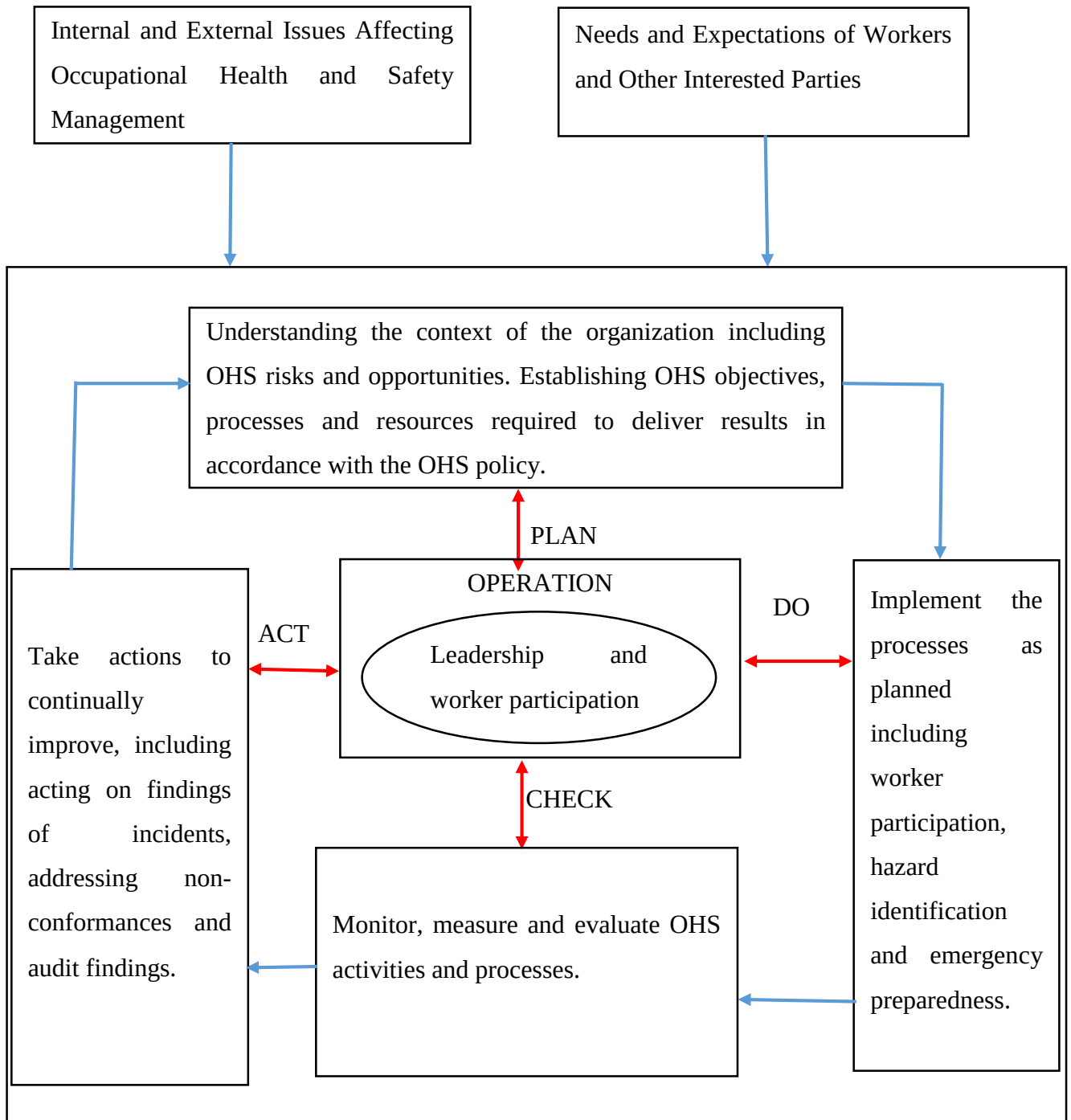


Figure 2: Health and Safety Management System Process Model of ISO 45001: 2018

Source: ISO 45 001: 2018

1.7 Thesis Outline

1.7.1 Overview of the Thesis Structure

The thesis is structured into seven chapters where Chapter 1 is the introductory chapter while, chapter 2 to 6 are presented replicas of the publications or manuscripts since the thesis adopted a paper based approach. The last section of the thesis represents chapter 7 which sums up the primary findings of the study and discussion while presenting research synthesis, conclusion and recommendations for future research.

1.7.2 Chapter 1

This chapter introduces the study and provides background to the study, statement of the problem, objectives of the study and justification of the study as well as study area. The chapter also indicates the conceptual framework. Thesis outline is also shown in this chapter.

1.7.3 Chapter 2

Chapter 2 represents a review paper titled, *Significant Occupational Hazards Faced by Healthcare Workers in Zimbabwe*. The main aim of this review paper was to cover aspects related to workplace hazards affecting healthcare workers. Understanding specific work-related hazards affecting healthcare workers in the country of Zimbabwe was important since it help to develop a work safety analysis model tailored to realities. The review paper was published by the *Journal of Life Cycle Reliability and Safety Engineering* which is on Springer stable as below:

Shabani, Tapiwa., Jerie, Steven. and Shabani, Takunda. (2024). Significant occupational hazards faced by healthcare workers in Zimbabwe. *Life Cycle Reliability and Safety Engineering*, 13. 61-73. <https://doi.org/10.1007/s41872-024-00245-x>. **(Springer)**
(Published).

1.7.5 Chapter 3

Chapter 3 is represented by a paper addressing information related to objective one of the study. The objective is “To determine work related risks affecting healthcare workers of Muvonde and Driefontein Sanatorium rural hospitals”. The title of the paper reads as, *Assessment of work-related risks among healthcare workers in rural hospitals of Chirumanzu District, Zimbabwe*. The paper aims to provide a comprehensive overview of the various work-related risks that healthcare workers face in rural hospitals of Chirumanzu district. The paper was

published by a journal called *Safety in Extreme Environments* (Springer). The reference of the paper is written below:

Shabani, Tapiwa., Jerie, Steven. and Shabani, Takunda. (2023). Assessment of work-related risks among healthcare workers in rural hospitals of Chirumanzu District, Zimbabwe. *Safety in Extreme Environments*, 5(2), 131-148. <https://doi.org/10.1007/s42797-023-00075-7>. **(Springer) (Published).**

1.7.6 Chapter 4

The paper presented in this chapter covers information related to objective 2 of the study. The objective is “To examine work safety analysis procedures used at Muvonde and Driefontein Sanatorium rural hospitals of Chirumanzu District. The title of the paper is *Work Safety Analysis for Rural Hospitals in Chirumanzu District of Midlands Province, Zimbabwe*. The paper focus on gathering information related to work safety analysis procedures currently in use at the rural hospitals located in Chirumanzu district. The manuscript was published by the journal of *Safety in Extreme Environments* (Springer). The reference of the paper is indicated below:

Shabani, Tapiwa., Jerie, Steven. and Shabani, Takunda. (2024). Work safety analysis for rural hospitals in Chirumanzu District of Midlands Province, Zimbabwe. *Safety in Extreme Environments*, 6 (2), 107–137. <https://doi.org/10.1007/s42797-023-00096-2>. **(Springer) (Published).**

1.7.7 Chapter 5

Manuscript related to objective 3 is presented in this chapter, and objective 3 reads: To assess the effectiveness of work safety analysis procedures used to manage risks at Muvonde and Driefontein Sanatorium rural hospitals in Chirumanzu District. The manuscript is titled, *Assessment of Work Safety Analysis Performance Among Rural Hospitals of Chirumanzu District of Midlands Province, Zimbabwe*. It was published by the *Journal of BMC Health Services Research* (Springer). The paper puts much attention on assessing safety measures used to manage risks at Muvonde hospital and Driefontein Sanatorium hospital. Reference details of the paper are shown below:

Shabani, Tapiwa., Jerie, Steven. and Shabani, Takunda. (2024). Assessment of work safety analysis performance among rural hospitals of Chirumanzu district of midlands province,

Zimbabwe. *BMC Health Services Research*, **24**, 938. 1-16. <https://doi.org/10.1186/s12913-024-11425-x>. **(Springer) (Published)**.

1.7.8 Chapter 6

This chapter presents information related to objective 4. The objective is “To develop a process-based model for effective and sustainable work safety analysis for rural settings such as Muvonde and Driefontein Sanatorium rural hospitals in Chirumanzu District.” The title of the manuscript reads *Developing A Process-Based Model for Effective and Sustainable Work Safety Analysis for Rural Hospitals in Chirumanzu District of Midlands Province, Zimbabwe*. The paper focus on developing a model to address safety challenges in rural hospitals. The manuscript was submitted to Journal of Risk Research of Taylor and Francis. The details of the paper are shown below:

Shabani, Tapiwa., Jerie, Steven., Kowe Pedzisai and Shabani, Takunda. (2024). Developing A Process-Based Model for Effective and Sustainable Work Safety Analysis for Rural Hospitals in Chirumanzu District of Midlands Province, Zimbabwe. *Journal of Risk Research*. 24675761. **(Taylor and Francis, Under review)**.

1.7.9 Chapter 7

This chapter sums up the primary findings of the study and discussion while presenting research synthesis. Additionally, it presents the conclusion and recommendations for future research.

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Chapter 2

Significant Occupational Hazards Faced by Healthcare Workers in Zimbabwe

Tapiwa Shabani¹; Jerie Steven¹ and Takunda Shabani¹

¹Midlands State University, Department of Geography, Environmental Sustainability and Resilience Building

Corresponding Author: Tapiwa Shabani, email address: tapiwashaban@gmail.com

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Abstract

Healthcare workers are exposed to a variety of work-related hazards that can negatively impact their health and well-being. This paper examines the various work-related hazards affecting healthcare workers in Zimbabwe, including physical, chemical, biological and psychosocial hazards. Search of books, book chapters, journals, published articles, thesis and abstracts was done using databases such as Google Scholar, Scopus, PubMed, Science Direct, Springer, Sage Publications, Web of Science and African Journals Online without date limit. Articles published in English were gathered to be considered during the compilation of the review. The study found that healthcare workers in Zimbabwe face numerous challenges, including inadequate training, protective equipment and long working hours as well as exposure to infectious diseases. However, implementation of methods to reduce hazards in countries like Zimbabwe is suboptimal. As a result, this paper concludes with a developed framework for managing all types of risks affecting healthcare workers in Zimbabwe. The development of the proposed framework for managing work-related hazards was developed based on Plan, Do, Check and Act model.

Keywords: Biological Hazards; Chemical Hazards; Ergonomic Hazards; Healthcare Workers; Physical Hazards; Psychosocial Hazards; Work-related Hazards; Zimbabwe

2.1 Introduction

All individuals who work to enhance the health of people in any healthcare centre are regarded as healthcare workers (Bielicki et al., 2020; Sovold et al., 2021). Globally, 12% of the working population consists of healthcare workers (Mossburg et al., 2019). This indicates that healthcare workers are vital in every society since they increase the functioning of healthcare systems. According to Cox (2020) there is no society which can operate without healthcare workers. In Zimbabwe, it is perceived that most of the people visit healthcare centres so that they can receive treatment of different diseases affecting them. As a result, workers in healthcare centres attend to patients affected with different diseases which expose them to various hazards such as chemical, biological, physical, psychosocial and ergonomic hazards (Naithani et al., 2021; Emenim and Okafor 2021). This implies that hazards affecting other industries' workers are also affecting healthcare workers for example surgeons, doctors, nurses, dentist and technicians. However, the assumption with other researchers is that healthcare centres are free from hazards since healthy is their main objective (Rai et al., 2021; Mackworth-Young et al., 2020). It is estimated that the medical sector hires over 59 million employees globally to offer different types of services in healthcare centres such as hospitals which are regarded as the most hazardous workplaces (Che Huei et al., 2020; Hamid et al., 2018).

Further, worldwide it is projected that among ten healthcare employees one is affected with a sharp (needle, razor or scissors) injury each year (Mossburg et al., 2019). Zvanaka et al. (2018) also opined that every year 2 million sharp injuries affect healthcare employees worldwide and 90% of the injuries are recorded in Africa. The statistics published by Zvanaka et al. (2018) focus on Africa as a whole however there is no documents focus on countries like Zimbabwe as a whole. This is evidenced by Figure 1 which was developed using Scopus data showing numbers of articles published in other countries including African countries like South Africa on hazards affecting healthcare workers neglecting Zimbabwe. As a result, this study will focus on hazards affecting healthcare workers in Zimbabwe. This implies that the prevalence of HIV, HCV and HBV among healthcare employees who are exposed to piercing injuries highlight uneven distribution of burden between African countries and developed nations. In the year 2000, injuries caused by sharps to healthcare employees resulted to 16, 000 cases of Hepatitis C virus contagions, 66, 000 cases of hepatitis B virus contagions and expose 1000 healthcare workers to Human Immunodeficiency Virus infections (Mossburg et al., 2019). To healthcare workers in Africa the effects of these contagions is significant and health workers in Zimbabwe are not spared with these infections since they also suffer from sharp injuries suffered by other

healthcare workers located in other countries of Africa. However, most statistics of secondary literature on hazards affecting healthcare workers is published in developed countries as indicated by Figure 2 which was prepared using Scopus data. This clearly indicates that there is scanty of secondary data focusing on hazards affecting healthcare workers in developing countries like Zimbabwe. Therefore, this paper is focusing on hazards affecting healthcare workers in one of the developing countries which is Zimbabwe.

In the healthcare centre the use of various chemicals such as cleaning agents, sterilising and disinfecting agents, anesthetic agents, laboratory chemicals, pharmaceutical substances and cytotoxic drugs is prevalent (Health and Safety Authority 2020; Nankongnab et al. 2020). According to Che Huei et al. (2020); Mohanty et al. (2019a, b) and Zhang et al. (2020) physical hazards which are experienced in other industries for example noise, inadequate ventilation, slippery floors, poor lighting, radiation and electrical hazards are also experienced in healthcare facilities. This means that the idea of saying healthcare facilities are different from other work-related industries and are free from hazards is a misconception since they are affected with similar hazards which affect other industries. In addition, patient handling performed by healthcare workers expose them to ergonomic hazards which causes musculoskeletal disorders such as muscular strain, shoulder pain, back pain and neck pain among healthcare workers (Alshahrani, 2020, Mossburg et al., 2019; Nhokovedzo and Nembaware, 2022). In the Zimbabwean context ergonomic hazards which affect healthcare workers at Parirenyatwa Group of Hospitals expose healthcare workers to shoulders discomfort, neck pain, muscular discomfort, upper and lower back pain (Chiwaridzo et al. 2018). Zebron and Mutara (2014) and Makoni and Mutana (2016) opined that Zimbabwean healthcare workers are affected with psychosocial hazards at work which expose them to stress, fatigue, nausea, frequent headaches, loss of sleep and feeling tired. This concurs with Wilcox et al. (2020) and Moyo et al. (2022) who indicated that healthcare workers are affected with well-known psychosocial hazards such as stress and burnout.

This background indicates that hazards are also prevailing in healthcare facilities of Zimbabwe and expose healthcare workers to various injuries and diseases. So, Zimbabwean healthcare workers are similar to other healthcare workers located in other countries, as a result local studies need to be done to identify types, causes and impacts of hazards affecting healthcare workers in Zimbabwe to proffer solutions. Therefore, this study aims to examine work-related hazards affecting healthcare workers in Zimbabwe to come up with an idealised framework suitable for managing hazards affecting healthcare workers Zimbabwe.

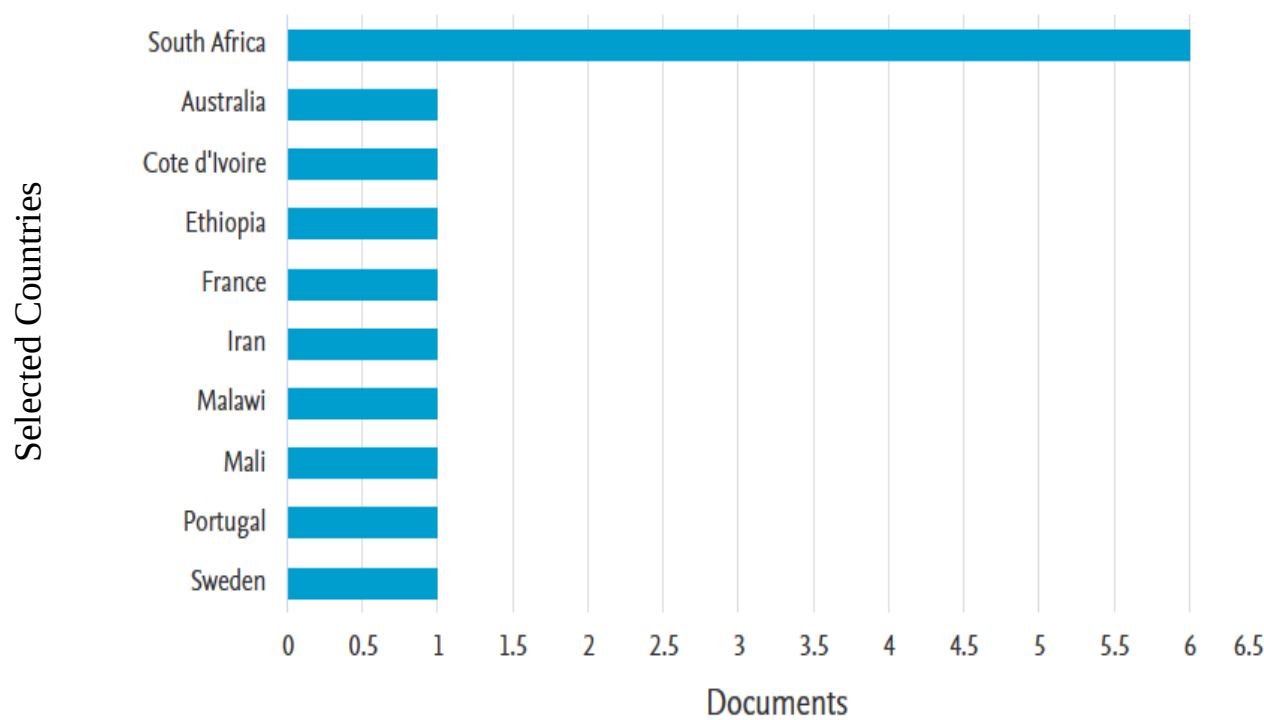


Figure 1: Number of documents published under Scopus in other countries including other Africa countries focusing on hazards affecting healthcare workers

Source: Authors

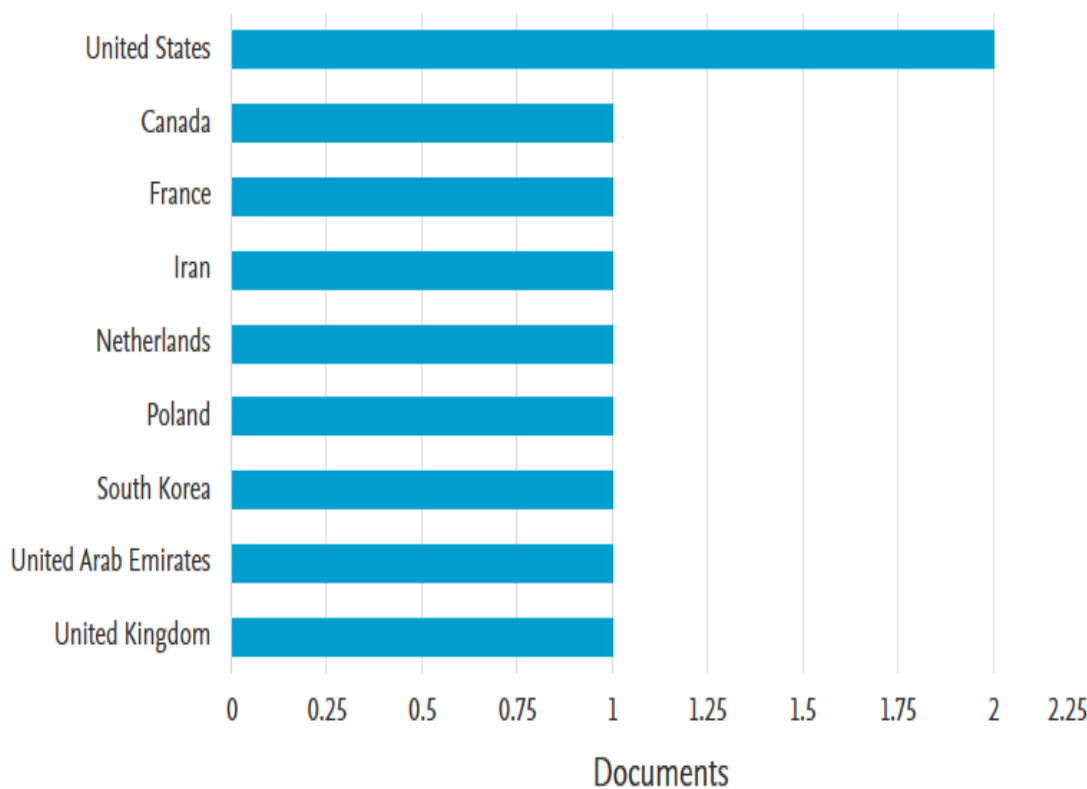


Figure 2: Number of documents published under Scopus at Global Level focusing on hazards affecting healthcare workers

Source: Authors

2.2 Study Area

Zimbabwe is a land locked country in Southern Africa which covers 390, 757 km² (CIA World Fact Book, 2011). Zimbabwe's boundaries are demarcated by its neighbouring countries which are Botswana, South Africa, Mozambique and Zambia (World Bank Open Data, 2021). Zimbabwe is subdivided into ten provinces. In Zimbabwe the high veld's altitude is 1 300 m and low veld is about 300-500m in altitude (FAO, 1990). The climate of Zimbabwe is dominated by two seasons notably summer and winter season (Red Cross Climate Centre, 2021). The average rainfall in the country is 620 mm (Chikodzi et al. 2013). The average temperatures of Zimbabwe ranges between 15 and 25°C (WBG CCKP, 2021). The country has five agro-ecological regions divided from I to V (Mugandani et al. 2012). Citizens of Zimbabwe are also exposed to various types of injuries and diseases notably tuberculosis, HIV/AIDS and hepatitis, Covid-19 as well as other general diseases like any other people in

other African countries (Chirisi et al., 2015; Chigudu 2020). Subsequently, the affected population resort to healthcare facilities for diagnosis. The whole population affected by various diseases in Zimbabwe are served with 214 large healthcare centres excluding small clinics (Banya, 2018a, b), hence pressure, high workload and repetitive tasks which expose health employees to hazards are increased. Work-related hazards expose healthcare workers to different impacts (injuries and diseases). This drives the review to focus on work-related hazards affecting healthcare workers in Zimbabwe to develop a sustainable and effective framework to manage the hazards.

2.3 Methodology

Literature review was done to search literature related to work-related hazards affecting healthcare workers in Zimbabwe. Search of books, book chapters, journals, published articles, thesis and abstracts was done using databases such as Google Scholar, Scopus, PubMed, Science Direct, Springer, Sage Publications, Web of Science and African Journals Online without date limit. World Health Organisation online database was also reviewed. The search primarily focuses on peer-reviewed papers and gray literature. The articles were searched using key words notably Zimbabwe, healthcare workers, work-related hazards, chemical hazards, and physical hazards, biological hazards, psychosocial hazards and ergonomic hazards, and references from studies which are related to review topic. The researcher includes articles published in globally recognised language to achieve the aim of the review. Due to shortage of literature in Zimbabwe, literature search focus on Africa and global level then the interpretation of data was contextualised to Zimbabwe. Collected literature was used to develop an idealised framework for sustainable and effective management of work-related hazards. Even though, the framework was guided by the Plan, Do, Check and Act cycle, published articles which were reviewed were significant since they provide an in depth understanding of types, causes and impacts of hazards affecting healthcare workers. This was vital to the researcher because the information help the researcher to come up with robust recommendations shown in the idealised framework Figure 3.

2.4 Results and Discussion

2.4.1 Nature and Causes of Hazards

Globally, work-related hazards which affect healthcare workers are categorised into chemical, biological, ergonomic, psychosocial and physical risks (Rai et al., 2021; Che Huei et al., 2020). Studies carried in Zimbabwe also indicated that healthcare workers are also affected with different types of hazards (Chinene et al., 2022; Chingono et al., 2022; Chipuru 2017; Chiwaridzo et al., 2018; Chitura and Chitura 2014; Moyo et al. 2022; Wilcox et al. 2020). A study carried by Williamson et al. (1988) at Bindura Provincial Hospital in Zimbabwe on barriers to infection prevention and control practice among nurses indicated that 24% of nurses are exposed to infectious risks due to lack of knowledge. However, the study just focus on one type of healthcare workers (nurses only). As a result, to cover the gap this review focus on different types of healthcare workers and occupational hazards affecting them Zimbabwe.

2.4.1.1 Biological Hazards

Healthcare workers are exposed to biological hazards such as hepatitis B virus, hepatitis C virus, Human Immunodeficiency Virus and Acquired Immune Deficiency Virus (Wilcox et al., 2020; Kavenga et al., 2021). Healthcare workers are exposed to biological hazards because they contact blood of patients or other body fluids and they sustain sharp injuries at work (Mossburg et al., 2019; Manjengwa et al., 2022). The level at which healthcare workers are exposed to biological hazards depends on the duration of exposure to infected materials and patients (Dzinamarira et al., 2021). This implies that the direct contact with infected materials is regarded as the primary route of getting infectious diseases. Zvanaka et al. (2018) also opined that every year million sharp injuries affect healthcare employees worldwide and 90% of the injuries are recorded in Africa. As a result, Zimbabwe is not spared with the burden of viruses such as HIV which affect health workers as a result of sharp injuries since it is among African countries. However, the top management in healthcare facilities of Zimbabwe are focusing much on training workers about diagnosis neglecting safety issues to manage work-related infections. Therefore, this study focus incorporates the management with other factors in managing hazards. The nature and causes of biological hazards are shown in Table 1.

Table 1: Biological hazards

Biological hazards	Causes of biological hazards	Impacts of biological	References
Exposure to air-borne pathogens which are transimitted through ventilation systems and other contaminated materials used by patients.	The hazards are caused by contacting a patient with undiagnosed tuberculosis (TB). Healthcare workers are exposed to biological risks when infected patients are not following precautionary measures to avert the spread of diseases. Health workers are also exposed to biological risks when they get into contact with contaminated air particularly during testing patients since they get closer to them.	Healthcare workers are at risk of contracting tuberculosis, severe acute respiratory syndrome (SARS) for example Covid-19 and Influenza.	Dzinamarira et al., (2021); Ng’etich et al., (2021) and Rusakaniko et al. (2021).
Exposure to blood-borne pathogens which are transmitted through contact with blood and other body fluids.	Healthcare workers are exposed to infections such as hepatitis B virus, hepatitis C virus and HIV/AIDS due to direct contact with blood and body fluids of infected patients and sharp injuries	Healthcare workers are affected with infections for example Hepatitis B/C virus transmission, HIV transmission and AIDS transmission.	

2.4.1.2 Chemical Hazards

The review also examines chemical hazards which are commonly experienced by workers in Table 2. Healthcare workers working in hospitals are susceptible to different chemicals for example mercury, latex, gluteraldehyde, formaldehyde and cleaning detergents which are used for housekeeping (Mohanty et al., 2019a, b; Henretig et al., 2019; Chilcott et al., 2019). Skin exposure, inhalation and vapours of chemicals are regarded as the factors which expose health

workers to chemical agents (Che Huei et al., 2020; Naithani et al., 2021; Emenim and Okafor 2021). This is the reason why chemicals which affect healthcare workers result to eye irritation, respiratory irritation and if the workers are exposed to chemicals for a long time, they experience asthma and pneumonitis. In addition, if the skin directly contacts the chemical it swells, itches, cracks and it turns to redness (Rai et al., 2021; Wilcox et al., 2020). This reveals that handling of various chemicals used in hospitals is hazardous to healthcare workers even in developing countries such as Zimbabwe since they use chemical such as mercury during medication. In developed countries, healthcare facilities are moving towards phasing out the use of mercury apparatus such as thermometers because they regard mercury as hazardous (Mohanty et al., 2019a, b). However, in the Zimbabwean context the use of mercury in hospitals is continuing because there is insufficient resources to replace apparatus which use mercury (Mundagowa et al., 2022; Mossburg et al., 2019).

Table 2: Chemical hazards

Chemical hazards	Causes of chemical hazards	Impacts of chemical hazards	References
At work, healthcare workers are exposed to various types of chemicals which are used to cancers and infections for example antineoplastic, aerosolized drugs, hormonal drugs and antibiotics which are regarded as cytotoxic. Healthcare workers are prone to cancer, allergy, dermatitis, and maternal disorders and poisoning due to harmful chemicals used in hospitals.	Safety culture such as the use of PPE, quantity of chemicals used, time and frequency the healthcare worker is exposed to the chemicals affects the level of exposure. Inhalation, absorption, ingestion and skin contact are regarded as the primary routes of chemical hazards which affects healthcare workers.	Inhalation of chemicals used in hospitals expose healthcare workers to allergic reactions and poisoning. Chemicals such as chlorine used in healthcare facilities causes eye irritation, skin irritation and irritates the respiratory system. Cleaning agents used in hospitals can react to some products used in hospitals and produce vapours which are toxic to health. Hand sanitizers which are commonly used in hospitals due to Covid-19 pandemic are hazardous to the skin. Chemicals used in healthcare facilities are carcinogenic (cancerous), teratogenic (causes birth complications) and they are mutagenic since they promote mutations.	Mossburg et al. (2019); Manjengwa (2022); Mohanty et al. (2019a, b) and Mundagowa et al. (2022).

2.4.1.3 Psychosocial Hazards

Globally, healthcare workers are exposed to various psychosocial hazards which are related to the type of work they perform (Di Tecco et al., 2020; Wagner et al., 2019; Chingono et al., 2022). This clearly depicts that healthcare professionals are found to be exposed to

psychosocial hazards in both developed and developing countries and Zimbabwe is not spared. A study carried by Chinene et al. (2022) on disruptive behaviours involving radiographers at Harare Metropolitan Province Central Hospitals in Zimbabwe revealed that 83% of the radiographers are exposed to psychosocial risks due to pressure and verbal abuse from patients and their relatives. The study has a gap since it focusses on Harare Metropolitan Province Central hospitals neglecting the whole of Zimbabwe. Therefore, there is a gap which need to be covered by this review which put much attention on the whole Zimbabwe. The paper published by Chinene et al. (2022) focus on radiographers only neglecting other types of healthcare workers however this review put attention to all types of healthcare workers. In Zimbabwe, healthcare workers are affected with psychosocial hazards which manifest in various ways (Zebron and Mutara, 2014; Washinyira, 2018; Mossburg et al., 2019). Psychosocial hazards which affect healthcare workers arise from work pressure, high workload, work shifts, poor salaries, prolonged time at work, and exposure to violence, job insecurity and harassment worldwide (Michel et al., 2020; WHO, 2020; Ruotsalaninen et al., 2020; Vento et al. 2020). Factors such as poor wages which are indicated as the roots of stress which affect health workers globally are the most prevailing situations in Zimbabwe which expose healthcare workers to stress. In addition, due to shortage of labour in Zimbabwe health employees are affected by psychosocial risks as a result of pressure at work since they have to save many patients per day (Nyakabau, 2014; Chokunonga et al., 2016; Wushe and Shenje 2019). Franklin and Gkiouleka (2021) opined that healthcare workers who experience psychosocial hazards are exposed to stress.

Healthcare workers are affected by psychosocial risks such as insomnia, anxiety and depression which causes mental challenges hence reduces work performance (WHO, 2018). Consequently, psychological risks increase problems to the public and private sector since it affects their workers' well-being and their contribution to the country. During the Covid-19 pandemic psychosocial hazards affect the performance of front-line healthcare workers and quality of services provided to patients in Zimbabwe (Moyo et al., 2022; Chingono et al., 2022 and Kavenga et al., 2021). Considering effects related to psychosocial hazards various research communities have been attracted to focus on psychosocial hazards (Schuller 2020). However, in Zimbabwe most researches for example Chiwaridzo et al. (2018); Nhokovedzo and Nembaware (2022) Dzinamarira et al. (2021) and Mossburg et al. (2019) focus much on physical, chemical, biological and ergonomic hazards neglecting psychosocial hazards. This concurs with Okeafo et al. (2018) that in the healthcare context there is dearth of research in

terms of psychosocial hazards. Therefore, this review indicates a summary of causes and impacts of psychosocial hazards in Table 3 to use the information to develop an idealised framework to manage the risks posed by hazards including psychosocial hazards.

Table 3: Psychosocial hazards

Psychosocial hazards	Causes of psychosocial hazards	Impacts of psychosocial hazards	References
Psychosocial hazards (stress, anxiety, fatigue and trauma).	Interpersonal relationships, hospital culture, level of satisfaction, nature of the tasks performed within the healthcare centre and balance between home and work issues are factors which triggers psychosocial risks among healthcare employees. Healthcare workers also face verbal abuse from patients and relatives of patients when they are being accused of negligence. Long working time, shift work, pressure and high workload expose healthcare workers to stress and fatigue.	Occupational psychosocial hazards affects the well-being of healthcare workers since it causes mental disorders, cardiovascular disease and chronic degenerative syndrome. Psychosocial hazards expose healthcare workers to depression, heart diseases and physical health challenges. Poor performance and low concentration is also triggered by psychosocial risks. Healthcare workers who are affected with job pressure suffer as a result of burnout. Work-related violence affects quality of sleep and health status of healthcare worker.	Mundagowa et al. (2022); Kanyumba and Msosa (2020); Washinyira (2018); Chibango (2013); Moyo et al. 2022; Chingono et al., (2022) and Kavenga et al., (2021).

2.4.1.4 Physical Hazards

Like any other industries healthcare industries expose employees to physical hazards such as noise, poor ventilation, poor lighting, electrical shocks and falls due to slippery floors (Che Huei et al., 2020; Franklin et al., 2021). According to Harrell et al. (2020) and Abiramalakshmi and Shree (2018) exposure to physical hazards is interrelated to basic facilities for example lighting and ventilation. This indicates that hazards which can affect the body without getting

into contact with it are also prevailing in healthcare centres. In Zimbabwe, health workers such as radiographers are exposed to hazards such as radiation because they use radiation when performing their duties (Chinene et al., 2022). This concurs with Mohanty et al. (2021) and Aljondi et al. (2022) who also indicated that healthcare workers are exposed to radiation when saving patients in the X-ray department. In view of this, X-ray department is the one which mostly expose healthcare workers to radiation in the medical facilities. Leukemia and tumors are some of the stochastic impacts of radiation affecting healthcare workers (United Nations Scientific Committee on the Effects of Atomic Radiation, 2018). In healthcare centres, workers are affected with physical hazards such as noise because they ignore the use of ear plugs at work (Nankongnab et al., 2020). This simply reveals that healthcare workers are sometimes affected with occupational hazards due to ignorance. As a result, there is need for continuous research on the nature of hazards affecting workers to develop measures which improve the knowledge of healthcare workers to manage hazards in Table 4.

Table 4: Physical Hazards

Physical hazards	Causes of physical hazards	Impacts of physical hazards	References
➤ Exposure to ionizing and non-ionizing radiation.	The exposure to radiation increases when using machines which are poorly maintained equipment such as radio-diagnostic. Healthcare workers are exposed to radiation when using X-ray machines and other radiation therapy.	Radiation which affects healthcare workers damages the tissues, expose workers to cancer and radiation also causes mutation of the cells since they are mutagenic.	Maboreke et al. (2019); Chinene et al. (2022) and Mohanty et al. (2019a, b).
➤ Falls, trips, cuts and slipping.	Slippery floors, poor housekeeping, scalpels, needles and razorblades.	Broken bones, muscular strain/injuries and cuts.	
➤ Extreme temperatures for example extreme hot or extreme cold.	Healthcare workers are exposed to cold temperatures during night shifts. They are also exposed to high temperatures from steam generated by autoclaves.	Heatstroke, exhaustion, frostbite, rash, cramps, and pneumonia.	
➤ Exposure to electrical and mechanical hazards.	Noise, equipment which are poorly maintained, electrical faults and overloaded sockets.	Hearing loss, muscular strain due to use of force when using poorly maintained equipment, burns from electrical faults caused by overloaded sockets.	

2.4.1.5 Ergonomic Hazards

Many professions are affected by distinct ergonomic risks for example musculoskeletal disorders as a result of awkward stance, lifting of heavy loads and repetition of work (Jerie, 2012; Boughattas *et al.*, 2017; Tinubu *et al.*, 2010). This means every institution which is associated with awkward postures, repetitive tasks and lifting of objects such as hospitals expose workers to ergonomic risks. Movements done in an ordinary manner are not injurious, they become injurious in work settings because of recurrent replication of same task using force, speed when moving body parts and the time to recover the muscles is not found since the task is done on a daily basis (Useh *et al.*, 2003; Richardson *et al.* 2018). According to Dhlwane *et al.* (2018) and Kahere and Ginindza (2020) healthcare workers are exposed to repetitive movements at work, awkward postures and manual therapy for a long time. This implies that healthcare workers are exposed to activities which result to musculoskeletal disorders and Zimbabwe's healthcare workers are not spared. Duties performed by healthcare workers in Zimbabwe are associated with musculoskeletal injuries (Chiwaridzo *et al.*, 2018; Mossburg *et al.*, 2019). Chiwaridzo *et al.* (2018) carried a study on work-related musculoskeletal disorders among registered general nurses at a large central hospital in Harare, Zimbabwe and the study pointed out that 52.7% of nurses were affected with musculoskeletal disorders in the first 5 years. The study shows a gap since it only focusses on nurses leaving other types of healthcare workers such as doctors. The study also focusses on hospitals in urban areas neglecting rural healthcare workers. However, this review is focusing on all types of healthcare workers in all healthcare facilities whether urban or rural. Furthermore, back injuries and muscular strains affect hospital workers in Zimbabwe as a result of lifting patients and treating patients in awkward postures on non-adjustable beds for a long time (Useh *et al.*, 2003; Nhokovedzo and Nembaware, 2022). This concurs with Chiwaridzo *et al.* (2018) and Kgakge *et al.* (2021) that upper and lower back pains are common among healthcare workers in developing and developed countries. This indicates that healthcare workers are affected with back injuries globally as a result of same duties they play in trying to save the lives of people such as lifting of the patients. However, frequency and features associated with back injuries continue to be unclear in healthcare profession globally (Richardson *et al.*, 2018; Dlungwane *et al.*, 2018). According to Chiwaridzo *et al.* (2018) and Oke and Adeyekun (2013) in Africa few researches have been done pertaining the issue of lower back injuries so the assumption is that the prevalence of back injuries is low in Africa if it is compared to other nations. Zimbabwe as an African country is not spared on the dearth of information pertaining lower back pain

among healthcare workers. Therefore, there is need for further investigation of hazards such as ergonomic risks affecting healthcare workers in Zimbabwe as shown in Table 5 to come up with an idealised framework to manage such hazards.

Table 5: Ergonomic hazards

Ergonomic hazards	Causes of ergonomic hazards	Impacts of ergonomic hazards	References
Ergonomic hazards comprise design of the healthcare workplace, performing duties in an awkward position and performing tasks repetitively	Hospital workers lift elderly and very ill patients which expose them to musculoskeletal disorders. Healthcare workers lift and transfer medical equipment and other instruments which are needed for diagnosis from one department to the other. The level of physical fitness is also related to ergonomic risks which affect healthcare workers. High workload due to high work-related demands and poor team work when performing high demanding tasks expose workers to musculoskeletal disorders. Repetitive actions when treating patients in awkward positions is strongly related to muscular strain. Use of poorly engineered work equipment which force health workers to stretch when trying to overreach patients.	Ergonomic hazards expose healthcare workers to upper and lower back pain, shoulder pain and neck pain. Healthcare workers suffers chronic pain which is detrimental if they are continuously exposed to ergonomic hazards. Ergonomic risks affect the level of performance of workers and this reduces the quality of services provided to patients. Pain caused by ergonomic hazards disturb sleeping of healthcare workers and muscles feels overworked.	Chiwaridzo et al., (2018); Nhokovedzo and Nembaware (2022) and Mossburg et al. (2019).

2.5 Idealised Framework for Managing Work-Related Hazards

The development of the proposed framework in Figure 3 for managing work-related hazards was done based on the Plan, Do, Check and Act model. The proposed framework consist of four factors which affect safety in healthcare centres which include Plan stage where development of Safety Health Accountability Board (SHAB) duties are planned for example carrying TAPIWA (**T**: Training and Education, **A**: Assessment of Risks, **P**: Prevention of Risks, **I**: Identification of Hazards, **W**: Work Safety Analysis and **A**: Assessing Safety Equipment). At the Do stage the hospital management must improve in terms of commitment, communication, rewarding workers, giving workers a voice in decision making, providing a blame free environment, providing better work shifts for workers and providing adequate resources to the health workers. At the Check stage the healthcare authority check the availability and maintenance of resources within the healthcare institution to monitor resources which might trigger hazards. At the Act stage all healthcare workers must check actions suitable for managing hazards effectively for example following safety rules, team work, attending safety meetings and workshops, using safety equipment properly, healthcare workers must have confidence when doing risky tasks and report fatal and non fatal incidents to the Safety Health Accountability Board (SHAB). The SHAB board need to check if the measures applied are effective to improve them.

The SHAB train healthcare workers highlighting the benefits of safety at work, how to execute procedures with high risks as well as how to use new machines brought by the hospital to reduce errors. SHAB carry out home-grown risk assessments which are important in providing necessary evidence which influence the identification of hazards and come up with suitable measures to mitigate losses from hazards identified at the hospital. The board continue to identify departments which are mostly affected by hazards at the hospital with the intention of reducing major hazards. Work Safety Analysis at the healthcare centres carried out by the SHAB reveal the types of procedures performed at the healthcare facilities and identify accidents which arise when the task is performed so that methods to manage hazards are introduced. The board also assess safety equipment within the healthcare facilities to measure their effectiveness and their suitability for risky procedures performed at the healthcare facility. The SHAB board must be in a position to give feedback on all hazards identified within the workplace.

Considering the feedback provided by the SHAB board, the healthcare facility management team show its commitment to safety results by increasing the level of safety communication to produce positive safety outcomes, hence hazards are managed. The healthcare facility communicates with lower healthcare workers since they are in the forefront of providing services to patients which expose them to different hazards. This enhances sympathetic of healthcare workers on hazards affecting them and conformity to safety measures increases. In addition to the Do stage the human resource manager within the healthcare facilities motivate workers with incentives, make sure there is no blame game in terms of hazards occurring within the work environment. This increases the rate of reporting of near miss incidents within the healthcare facility. The healthcare facility authority especially human resource manager must provide adequate safety resources for smooth operation of hospitals and protection of the well-being of healthcare workers.

The management team must check the availability of safety management equipment and check their maintenance. This is done in the Check stage. Compare the performance of the equipment before maintenance and after maintenance. Healthcare facility equipment must be maintained to reduce hazards occurring when performing risky tasks. Availability of safety facilities such as soaps for washing hands after procedures is important to workers of healthcare facilities because it reduces the rate of cross infection. Safety facilities such as changing rooms, sand buckets and fire horse must be available and placed in areas that are easily accessed by every worker at the healthcare facility so that the employee quickly access them in case of emergency. Resources such as PPE/C used in hospitals notably examination gloves must be always available at hospitals to reduce the exposure of employees to blood and sharp injuries. Environment Health Technicians must monitor if the health workers are using the available resources during safety inspection.

In the Act stage healthcare workers must take corrective actions to manage hazards to increase their well-being and protect the patients. This means health workers must follow the safety rules when carrying out procedures to manage hazards. In healthcare facilities health workers must by-in the idea of team work to manage hazards. Healthcare workers' actions of using corrective measures must involve attending safety meetings and workshops to improve their knowledge. The Environmental Health Technician and the safety committee must review methods used to manage hazards and make recommendations related to the results. The healthcare workers must take roles played by the management in the Do stage for example provision of PPE/C and use that PPE/C properly to protect themselves to hazards. The

healthcare workers must review the measures which are effective in protecting them and report to the SHAB board so that they work together to improve them in the Act stage in Figure 3.

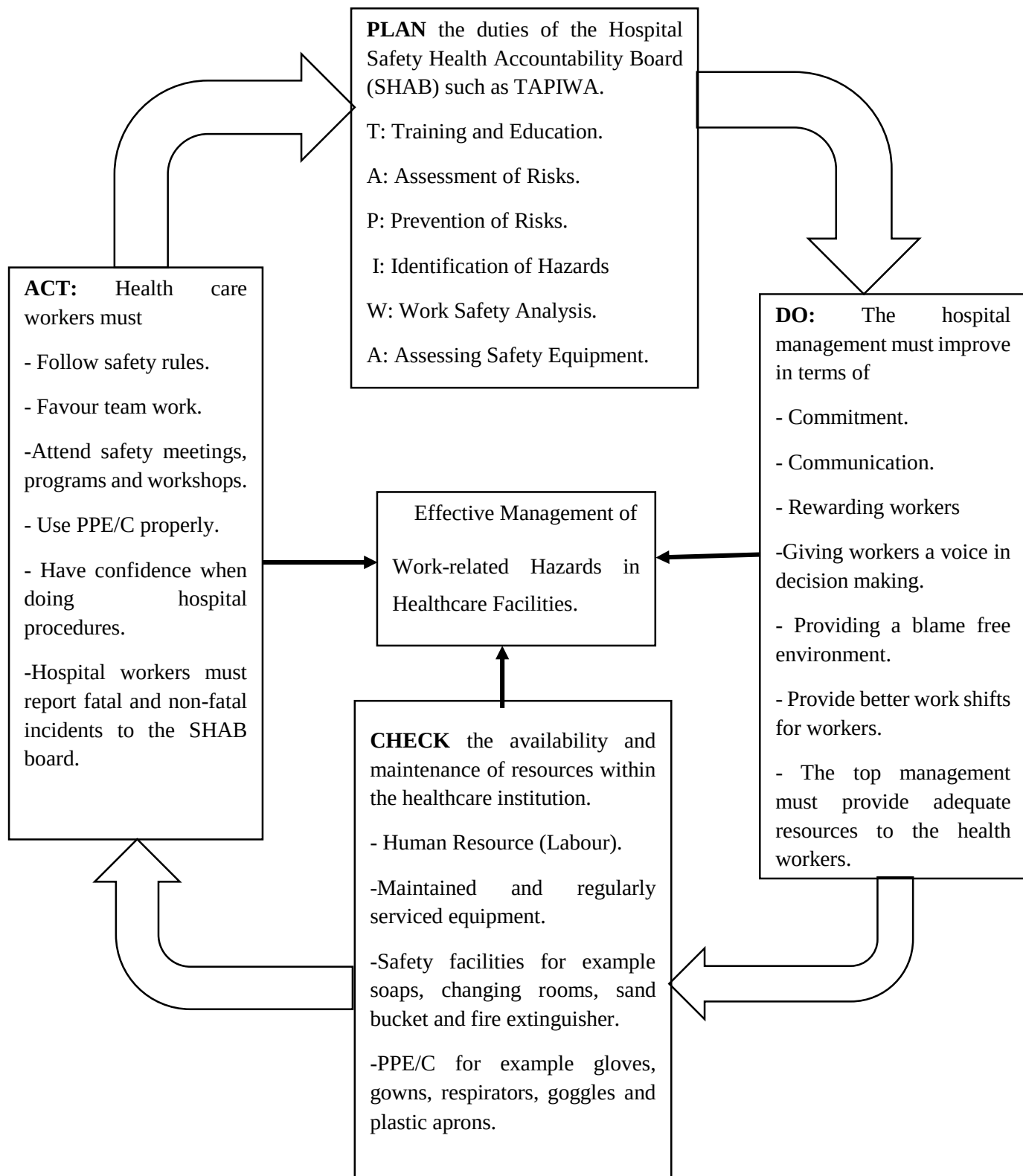


Figure 3: Idealised framework for managing work-related hazards

Source: Authors

2.6 Conclusion

The review indicated that most healthcare workers in Zimbabwe are exposed to various types of work-related hazards. Healthcare workers are mainly affected with five different types of hazards which are physical, chemical, biological, ergonomic and psychosocial hazards. Healthcare workers are exposed to different types of hazards due to different duties they perform, high workload, sharp injuries and pressure. Measures used to manage hazards in Zimbabwe's healthcare institutions are suboptimal due to shortage of resources. There is need to protect healthcare workers from work related hazards because these risks expose them to injuries and diseases and can affect the quality of services provided to the patients. Migration and retention of healthcare workers is also triggered by hazards affecting them within the workplace. Retention and out migration of healthcare workers in Zimbabwe is significant since the country is already facing challenges due to shortage of workers in healthcare facilities. As a result, the government of Zimbabwe must work hand in hand with the Ministry of Health and Child Care towards making safety and health a priority to protect the health of healthcare workers as well as maintaining their well-being. Although studies on work-related hazards affecting healthcare employees in Zimbabwe has been done in the past, most of the studies focus on musculoskeletal hazards. Hence, more researches are needed on other categories of hazards such as physical and psychosocial hazards. Therefore, this review developed a framework for managing all types of hazards affecting healthcare workers.

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Chapter 3

Assessment of Work-Related Risks Among Healthcare Workers in Rural Hospitals of Chirumanzu District, Zimbabwe

Tapiwa Shabani¹; Steven Jerie¹ and Takunda Shabani¹

¹Department of Geography Environmental Sustainability and Resilience Building, Midlands State University, P. Bag 9055 Gweru, Zimbabwe

Corresponding Author: Shabani Tapiwa, Email Address: tapiwashaban@gmail.com

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Abstract

The paper aims to provide a comprehensive overview of the various work-related risks that healthcare workers face in rural hospitals of Chirumanzu District. Descriptive cross-sectional design was used for the study to collect data among 109 healthcare workers at Muvonde hospital and 68 healthcare workers at Driefontein Sanatorium hospital. Data was collected using questionnaires, interviews, observations and secondary data sources. Overall, 100% of questionnaire respondents at Muvonde hospital and Driefontein Sanatorium hospital indicated that they are affected with work-related risks such as ergonomic, chemical, physical, psychosocial and biological risks. Shortage of labour, work-related pressure, shortage of equipment, poor commitment of the management and poor safety training were indicated as the causes of risks within the hospitals. Risks which occur at the hospitals exposes healthcare workers to various injuries and diseases. This causes this paper to discuss measures that are used to manage risks at Driefontein Sanatorium hospital and Muvonde hospital and effectiveness of the measures. Measures raised at the hospitals include safety trainings, recruitment of more healthcare workers and provision of safety equipment are some of the measures raised by healthcare works to manage risks. As a result, interventions must be established in order to alleviate risks. However, established measures should focus mainly on addressing shortage of equipment such as PPE/C, work-related pressure, poor safety trainings and influence the commitment of the management team positively.

Keywords: Healthcare Workers; Risk Assessment; Rural Hospitals; Work-related Risks; Zimbabwe

3.1 Introduction

A hospital is an institution that provide care and treatment to patients affected with different diseases and injuries (Fleming et al. 2021; Struyf et al. 2022; Chen et al. 2020). Despite the critical role that hospitals play in saving lives, they expose healthcare workers to various risks. According to Pascarella *et al.* (2021) risk is the term used to describe the possible harm, danger or unfavorable outcomes that might arise from certain situations, conditions or activities. It is estimated that 12% of the working population is represented by healthcare workers globally (Mossburg et al. 2019; Che Huei et al. 2020). Hamid et al. (2018) and Che Huei et al. (2020) stated that over 59 million employees are employed by the healthcare facilities. Healthcare workers are categorised into different classes, mostly as medical staff (nurses, doctors, dentists, physiotherapist, anesthetist, opticians and radiologist) and paramedical staff such as administrators, clerks, technicians and pharmacists (Negash et al. 2022; Balogun and Balogun 2021; Chingono et al. 2022). This indicates that hospitals consist of different workers who perform different duties in different departments where they encounter various types of risks. Healthcare workers who work in different departments within healthcare facilities such as hospitals are exposed to different risks notably chemical, physical, biological, psychosocial and ergonomic risks (Abiramalakshmi and Shree 2018; Hamid et al. 2018; Gulen et al. 2022). This implies that healthcare institutions are affected with the same risks which affect other working industries which shows that it has some similarities with other work environments. However, the most prevailing situation is that hospitals are riskless since health is their main objective (Mackworth-Young et al. 2020; Rai et al. 2021a, b).

According to Chiwaridzo et al. (2018), ergonomic professional risks such as musculoskeletal injuries for instance injury of the back, shoulders discomfort, muscular discomfort and pain of the neck as a result of repetitive twisting when providing service to patients affect the wellbeing of Parirenyatwa Group of Hospitals' health workers in Zimbabwe. In healthcare centers workplace violence, burnout and stress are well-known psychosocial risks affecting health care workers (Wilcox et al. 2020; Moyo et al. 2022; Nurmine 2022). In the hospital context, workers working in developing countries such as Zimbabwe are divulged to psychosocial risks which include depression, stress and mental fatigue (Makoni and Mutanana 2016; Sibanda et al. 2015) which are linked to bullying at work by patients and other staff, unfavourable work schedules and high level of pressure as a result of shortage of labour (Mhango et al. 2020). Furthermore, due to shortage of labour in Zimbabwe's healthcare centers, health employees are affected by psychosocial risks as a result of pressure at work since they have to save many patients (Wilcox

et al. 2020; Kavenga et al. 2021; Dzinamarira and Musuka 2021). It is recognised that employees in healthcare centres are susceptible to physical risks which are commonly found in other industries for example noise, electrical injuries, temperature, illumination and ionizing and non-ionizing radiation (Mohanty et al. 2019; Che Huei et al. 2020). Previous studies indicated that radiation produced by X-ray machines affect the morphology and density of blood cells of healthcare workers (Albander 2021; Chipuru 2017).

In high-income nations, safety measures and standards to safeguard health care workers have been implemented and have largely succeeded in mitigating these risks (Moss burg et al. 2019). However, occupational safety and health aspects are frequently overlooked in healthcare facilities of developing countries (Muthuri et al. 2020; Gage and Bauhoff 2020). According to Owie and Apanga (2016), occupational safety and health laws serve 10% alone of the less developed countries' population, neglecting several dominant unsafe occupational areas for example healthcare institutions. These deficits of safety in developing nations are attributed to shortage of resources, poor enforcement of safety laws, and lack of commitment from the management and poor methods used to collect data for occupational safety in healthcare systems. As a result, protection of healthcare workers is significant since it also benefits the society members who are attended within the healthcare institution (Albejaidi and Nair 2019; Al-Hanawi et al. 2019).

Continuous examination of work-related risks affecting healthcare workers is vital for improving the healthcare safety system in different countries (Al-Hanawi et al. 2019). However, according to Alenazi et al. (2020) this can be accomplished by identifying occupational safety and health risks affecting healthcare workers. In Zimbabwe studies conducted by scholars such as Chinene et al. 2022; Chingono et al. 2022; Chipuru 2017; Chitura and Chitura 2014; Chiwaridzo et al. 2018; Kavenga et al. 2021; Mathew et al. 2022; Moyo et al. 2022, Sibanda et al. 2015 and Sithole et al. 2018 most of them focused on one type of risk within the hospital, most of them also focused on one group of healthcare workers, the studies also put attention on one unit/department within the hospital, they also put much attention on one healthcare centre/hospital and they focus much on urban healthcare centres. Hence, this research intended to study all types of healthcare workers and risks affecting them in different departments within the two rural hospitals they are located.

Therefore, the main objective of this study is on the assessment of work-related risks among healthcare workers in rural hospitals of Chirumanzu District, Zimbabwe. The study identifies

and evaluate the various types of work-related risks that healthcare workers of Muvonde and Driefontein Sanatorium rural hospitals are exposed to, examine the factors that contribute to these risks and their impact on the health and safety of healthcare workers and identify the existing measures used to manage risks within the hospital. Sustainable Development Goal number 3 which says Good Health and Well-Being might be achieved through applying findings of the research. The study findings would also contribute to the attainment of Sustainable Development Goal number 3 target 9 which focus on reducing the number of deaths and illness from hazardous chemicals, Sustainable Development Goal number 8 target 8 on protecting labour rights and promoting safe and secure working environments by 2030 and Sustainable Development Goal number 16 target 6 which put more attention on developing effective, accountable and transparent institutions at all levels. The findings of the research would help Zimbabwe to achieve its Vision 2030, which is driving the country to be among middle income societies by the year 2030.

3.2 Materials and Methods

3.2.1 Study Design

The study design determines and controls methods used to collect data as well as data analysis techniques applied during the study. Descriptive cross-sectional design was applied for the study design because it combines both qualitative and quantitative approach which is known as triangulation to achieve the aims of the study objectives. A descriptive cross-sectional design was used because it allows to capture a snapshot of existing work safety analysis procedures and risk perceptions at a specific time within the rural hospitals. This is essential as it offers quick insights into current safety procedures and problems faced by the rural hospitals.

3.2.2 Study Areas

At Muvonde and Driefontein Sanatorium rural hospitals healthcare workers carry out their activities in different departments such as maternity ward, theatre, X-ray department, dental unit, pediatric ward, male ward, female ward, psychiatric unit, outpatient department (OPD) and optical unit. According to Tichapondwa (2012) Muvonde hospital was a reformatory school and was turned into a full hospital with 140 bed capacity in 1962 and later a school of nursing was constructed. Construction and expansion of the hospital took place from the 1990s and the bed capacity increased to about 190 beds while the number of departments also increased. Driefontein Sanatorium hospital which is well known for diagnosis of Tuberculosis in Zimbabwe (Tichapondwa, 2012) has a bed capacity of approximately 120 beds. The two

hospitals shown in Figure 1 were selected for the study in order to get a large population sample for the research hence, the results become valid.

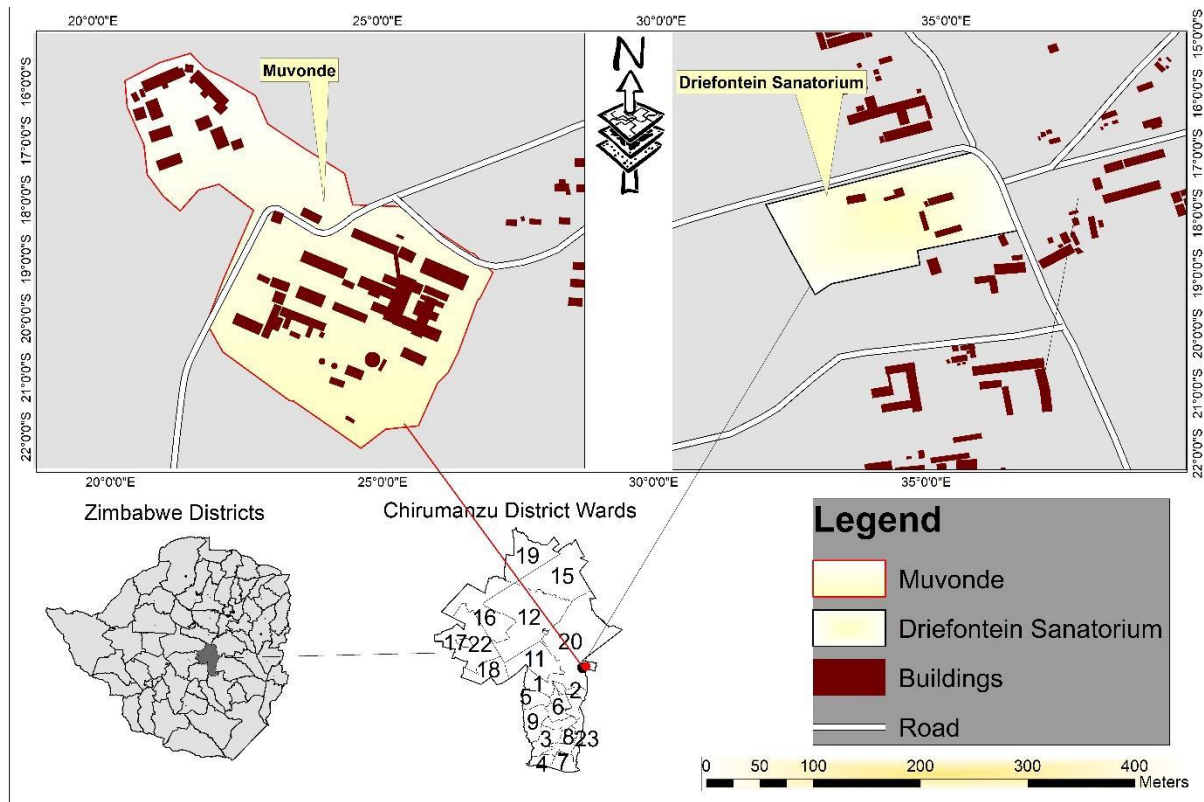


Figure 1: Map Showing Location of Muvonde and Driefontein Sanatorium Hospital.

Source: Authors

3.2.3 Study Population

The research targeted medical and paramedical staff located at different departments within the rural hospitals of Chirumanzu district to collect information on the causes, types, effects of risks and work safety procedures used to manage risks. Questionnaire respondents include counsellors, nurses, technicians, anesthetist, hospital cleaners, dentist, radiologists, eye optician and physiotherapist. The target population also consist of interviewees notably the Human Resource Manager, Head of Environmental Health Department, Matron (Hospital Manager), Nurse in Charge, Medical Superintendent within each hospital and National Social Security Authority (NSSA) Officer as well as District Medical Officer of Chirumanzu District.

3.2.4 Sampling

The appropriate sample size for the questionnaire respondents was calculated using Yamane 1967's formula. As a result, after calculations were done a sample of 109 participants was derived from 150 healthcare workers at Muvonde hospital and a sample of 68 questionnaire respondents was derived from 81 healthcare workers at Driefontein Sanatorium hospital. Random sampling was used to select 109 questionnaire respondents at Muvonde and 68 respondents at Driefontein Sanatorium rural hospitals from each stratum as indicated in Table 1. Respondents for interviews were purposively selected.

Table 1: Sample size for questionnaire respondents

Hospital name	Number of health workers	Grouping of workers according to their occupation	Required sample size using Tara Yammane formula $n = \frac{N}{1 + N(e)^2}$	Sample size to represent each stratum $\frac{\text{Required Sample Size}}{\text{Population size}} \times \text{strata size}$	Total
Muvonde Hospital	150	Nurses 121, Counsellors 3, Laboratory technicians 4, Physiotherapist 3, Radiologic technologist 3, Anesthetist 2, Eye optician 1, Cleaners 12 and 1 Dentist.	109	Nurses 88, Counsellors 2, Laboratory technicians 3, Physiotherapist 2, Radio technologist 2, Anesthetist 1, Eye optician 1, Cleaners 9 and 1 Dentist.	109
Driefontein Sanatorium Hospital	81	Nurses 58, Counsellors 2, Laboratory technicians 4, Physiotherapist 1, Radiologic technologist 2, Anesthetist 2, Eye optician 1, Cleaners 10 and 1 Dentist.	68	Nurses 48, Counsellors 2, Laboratory technicians 3, Physiotherapist 1, Radiologic technologist 2, Anesthetist 2, Eye optician 1, Cleaners 8 and 1 Dentist.	68

Source: Field Survey (2023)

3.2.5 Data Collection

A questionnaire with both open format questions and closed format questions was used for the survey. This means during the study the questionnaire allows the collection of both quantitative and qualitative data. This dual method help the researcher to measure safety measures while capturing hospital staff members' perspectives and experiences regarding occupational safety matters within the rural hospitals. A questionnaire with closed and open endend questions was

used to increase the flexibility of healthcare workers when responding the questions. This was significant during the study since it enables comparability of the results. The questionnaire was self-administered to reduce margin of error. The questionnaire collected information on demographic data, risks affecting healthcare workers, causes and impacts of risks affecting healthcare workers as well as methods used to manage these risks. Ten percent (10%) of study participants was used as a specimen size for pilot study. A pilot study of the questionnaire was conducted to assess its applicability to the research. A pilot test was important since it helps the researcher to correct some feasibility and technical problems which were related to the questionnaire. This conformed to Matsa et al. (2015)'s assertion that pilot survey of a questionnaire requires 10% from the target population before it is used in the main survey. Following the pilot survey the questionnaire was administered to the healthcare workers selected at Muvonde and Driefontein Sanatorium rural hospitals in Chirumanzu district.

Furthermore, semi-structured interviews were done with purposively selected respondents notably Medical Superintendent, Hospital Manager (Matron), Human Resource Manager (HRM), Head of Environmental Health Department, Nurse in Charge within each hospital and National Social Security Authority (NSSA) inspector as well as District Medical Officer. Semi-structured interview guide was used to collect issues pertaining work-related risks affecting healthcare workers at Muvonde and Driefontein Sanatorium rural hospitals in Chirumanzu district. An interview guide with semi-structured questions pertaining work safety analysis of rural hospitals was drafted to provide room for the interviewees to give examples and explanations where they are necessary. This flexibility allows the researcher to focus on certain subjects and modify inquiries in response to participant's replies. In addition to interviews, field observations were conducted. Observations were used to obtain firsthand knowledge about the real work procedures and safety measures being used in rural hospitals. Real-time data about healthcare professionals' interactions with their surroundings, the tools they use and the safety precaution measures they can take were gathered using observations. Throughout the research observations carried mainly focus on essential features of the workplace notably work environment, workers, work tasks performed and equipment used which are likely to cause risks at work. The researcher drafted an observational checklist to use during the observations. The behaviour of rural hospital workers when carrying out their risky procedures was observed. Observations help to examine how environmental elements (including layout, available resources and personnel levels) affect safety practices which gives background to the data. This contextual knowledge is essential in creating a model that appropriately captures the realities

encountered by healthcare professionals in rural hospital work environments. Moreover, secondary data was also used during the study. The use of secondary data sources to collect data has increased popularity recently especially in the healthcare facilities research (Cole et al. 2018). Secondary data was collected from journals, textbooks, review articles, inspection reports, accidents reports and the internet. Secondary data was also obtained from weekly, monthly and annual reports within the hospitals.

3.2.6 Data Management and Analysis

Returned questionnaires were screened for quantitative data analysis. Quantitative data collected throughout the research was cleaned, coded and a summary of the data was produced based on the objectives of the study before entering the data into the Microsoft Excel Spreadsheet. The data was analysed by Microsoft Excel Spreadsheet to produce graphs and pie charts. The data was also exported from the Microsoft Excel Spreadsheet to Statistical Package for Social Sciences version 25.0 for Chi-Square tests. Chi-Square test was performed to find the relationship between work experience and rating the effectiveness of measures used to manage risks at Muvonde and Driefontein Sanatorium rural hospitals. The level of significance was set at $p = 0.05$ (5%) and 95% confidence interval was used to determine the relationship between probed factors. Content analysis was used for qualitative data analysis.

3.2.7 Ethical Considerations

In order for the researcher to carry out the research freely the researcher sought an ethical approval form from Midlands State University and the District Medical Officer to be able to collect data using different data collection methods such as interviews, observations and questionnaires within the rural hospitals. The participants were informed that participation was voluntary.

3.3 Results

3.3.1 Demographic Characteristics

Most of the healthcare workers who participated during the study at Muvonde Hospital were females since it consist (70%) of the respondents and (30%) of the respondents were males. This is also similar to Driefontein Sanatorium Hospital where the majority (69%) of participants who take part during the study were females and (31%) were males. The majority (42.2%) of the questionnaire respondents at Muvonde Hospital specified their work experience between 5–10 years followed by (20.2%) who pointed out 4 years and below as their work

experience and (19.3%) indicated 11–15 years. Some (12.8%) of the study participants at Muvonde Hospital revealed 16–20 years as their work experience period however, very few (5.5%) of healthcare workers who participated during the survey at Muvonde Hospital specified that their work experience was 20+ years. At Driefontein Sanatorium Hospital most (41.2%) of the study respondents marked 5–10 years as their work experience, followed by 4 years and below which was indicated by (26.5%) and 11–15 years was shown by (19.1%). About (10.3%) of the questionnaire respondents at Driefontein Sanatorium Hospital implied that their work experience was between 16–20 years nevertheless, minority (2.9%) of the healthcare workers who participated during the study at Driefontein Sanatorium Hospital denotes that their work experience was 20+ years.

3.3.2 Types of risks affecting healthcare workers

Various categories of risks affecting healthcare workers at Muvonde Hospital and Driefontein Sanatorium Hospital are presented in Figure 2. Majority (44%) of healthcare workers at Muvonde hospital indicated that they are experiencing ergonomic risks while majority (30.9%) at Driefontein Sanatorium Hospital reported biological risks. At Muvonde Hospital physical risks (19.3%) followed by chemical risks (16.5%) and psychosocial risks (11.9%). However, at Driefontein Sanatorium Hospital ergonomic risks were reported by (25%) participants followed by physical risks (19.1%) and chemical risks (14.7%). Biological risks recorded the least percentage (8.3%) at Muvonde hospital and at Driefontein Sanatorium Hospital psychosocial risks recorded the least percentage (10.3%).

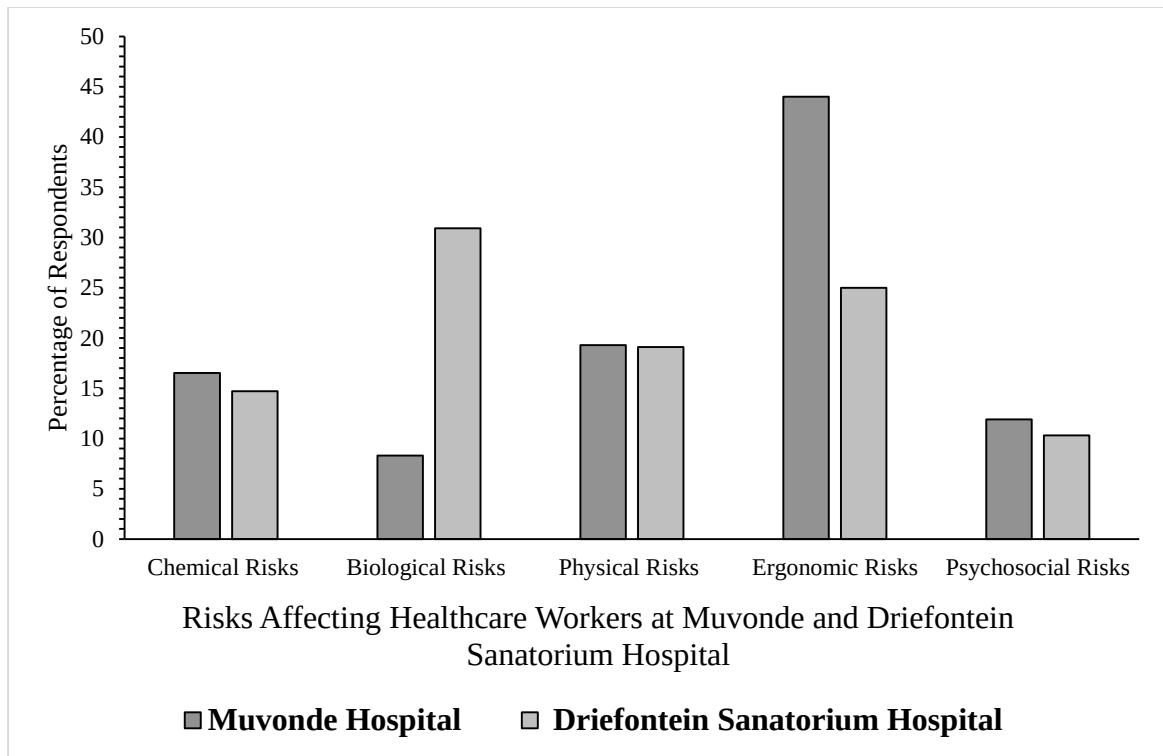


Figure 2: Types of Risks Affecting Healthcare Workers at Muvonde Hospital and Driefontein Sanatorium Hospital.

Source: Field Survey (2023)

3.3.3 Distribution of Risks Affecting Healthcare Workers at Muvonde Hospital and Driefontein Sanatorium Hospital

Figure 3 reveals the distribution of ergonomic risks, physical risks, biological risks, chemical risks and psychosocial risks at Muvonde Hospital and Driefontein Sanatorium Hospital.

3.3.3.1 Distribution of Ergonomic Risks

According to the study conducted at Muvonde Hospital, the majority of respondents (33.9%) who reported experiencing ergonomic risks indicated standing for a long time, followed by repetitive work (20.2%), lifting patients (17.4%) and manual therapy (11.1%). The issue of uncomfortable position was reported by (10.1%) of the respondents during the study, making it the second last on the list. Lifting of medical devices consists the least respondents (6.2%). At Driefontein Sanatorium Hospital majority (27.9%) of the respondents reported standing for a long time as the most significant factor, while only (5.9%) indicated lifting of medical devices as a concern. Lifting of patients was reported by (25%) of healthcare workers, while repetitive work and manual therapy were revealed by (17.6%) and (11.8%) of participants respectively.

Similarly, uncomfortable positions were reported by (11.8%) of respondents at Driefontein Sanatorium Hospital.

3.3.3.2 Distribution of Physical Risks

Figure 3 indicated that study participants at Muvonde Hospital and Driefontein Sanatorium Hospital were asked about the physical risks they face at work. At Muvonde Hospital the majority of the participants (28.4%) indicated sharp objects, followed by extreme temperatures (cold/hot) (24.8%), noise (22%) and slips and falls (15.6%). The proportion of radiation was (5.5%) and electric shock consists of the least (3.7%). Figure 3 also shows that at Driefontein Sanatorium Hospital sharp objects (30.9%) were indicated by most of the respondents, followed by extreme temperatures (cold/hot) (26.5%), noise (20.6%) and slips and falls (13.2%). Radiation was the second least since it consists of (5.9%) of the respondents while the least was electric shock which covers (2.9%) of the study participants.

3.3.3.3 Distribution of Biological Risks

Figure 3 shows that (39.4%) of the respondents reported blood spillage followed by breathing contaminated air (17.4%), vomitus, sputum and urine (16.5%), contact with wounds was reported by (15.6%) and the least (11%) reported viral infections at Muvonde Hospital. Majority of respondents at Muvonde Hospital reported blood spillage. This is likely due to the high prevalence of invasive procedures and surgeries carried out in hospital settings, which can result in accidental exposure to blood spillages. Viral infections were reported as the least common risk factor at Muvonde hospital. This could be due to effective infection control measures in place for preventing the spread of viral diseases such as HIV/AIDS. At Driefontein Sanatorium Hospital majority (31%) revealed breathing contaminated air, followed by blood spillage (25%), viral infections (16%), vomitus, sputum or urine of patients (15%) and contact with wounds was reported by (13%) of the participants.

3.3.3.4 Distribution of Chemical Risks

Regarding chemical risks affecting healthcare workers at Muvonde Hospital most (29%) reported sanitizers, followed by cleaning detergents (24%) and latex gloves (20%). Anaesthetic gases and sterilising agents were reported by (14%) of the respondents and mercury was reported by (13%) of the participants at Muvonde Hospital. Sanitizers (28%), followed by cleaning detergents (21%) and latex gloves (19%) were also expressed as the dominant chemical risks at Driefontein Sanatorium Hospital. Anaesthetic gases and sterilizing agents'

proportion was (19%) which was similar to the proportion of latex gloves. Mercury consists the least (13%) at Driefontein Sanatorium Hospital as shown in Figure 3.

3.3.3.5 Distribution of Psychosocial Risks

Majority (33%) of the study respondents reported dealing with very ill patients, followed by overwork (26.6%) and verbal abuse (16.5%) at Muvonde Hospital. About (11.9%) of the participants at Muvonde Hospital elucidated fatigue and physical abuse was indicated by (6.4%) and (5.5%) of the respondents experienced problems with the top management. At Driefontein Sanatorium Hospital most (39.7%) of the respondents reported dealing with severely ill patients, followed by overwork (26.5%) and verbal abuse (13.2%). Fatigue was experienced by (11.8%), physical abuse (4.4%) and problems with the top management was revealed by (4.4%) at Driefontein Sanatorium Hospital as shown in Figure 3.

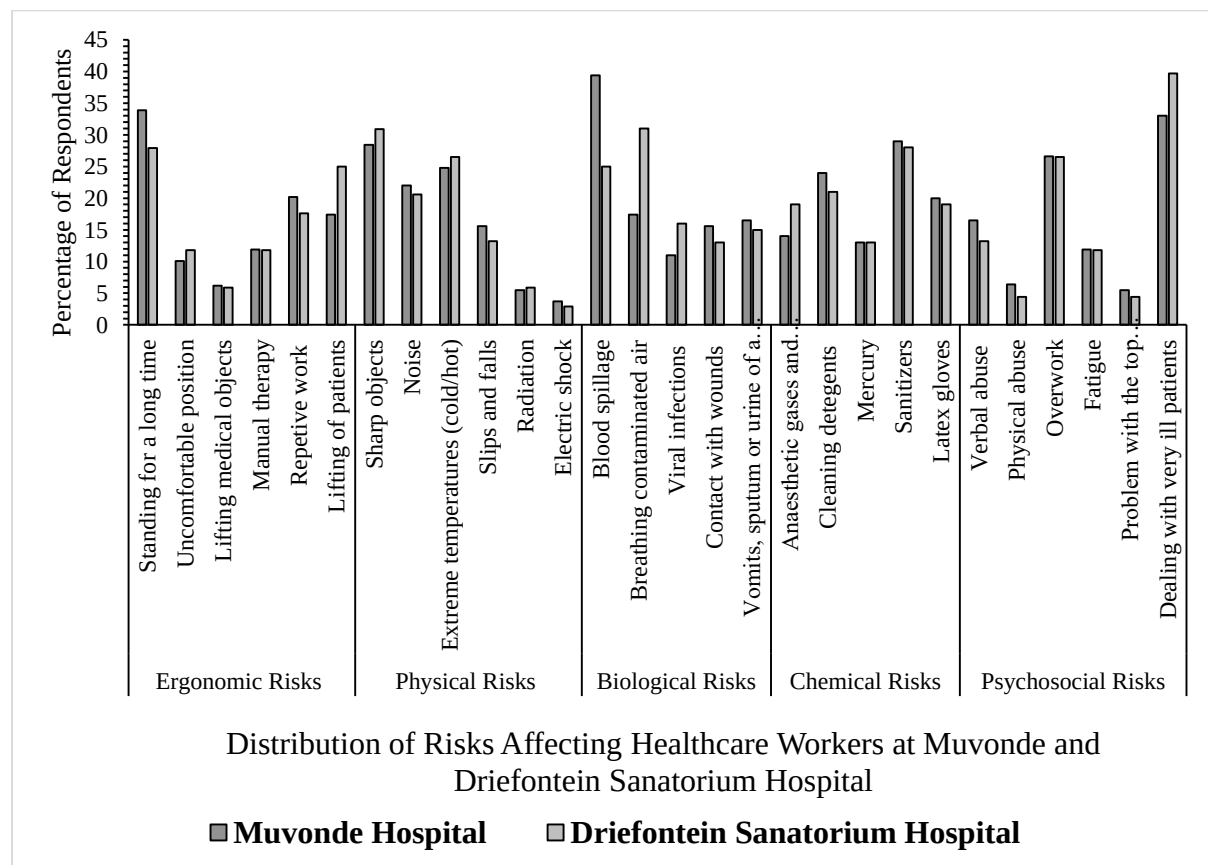


Figure 3: Distribution of Risks Affecting Healthcare Workers at Muvonde Hospital and Driefontein Sanatorium Hospital.

Source: Field Survey (2023)

3.3.4 Causes of Risks Affecting Healthcare Workers at Muvonde Hospital and Driefontein Sanatorium Hospital

During the study causes of risks affecting healthcare workers at Muvonde Hospital and Driefontein Sanatorium Hospital were examined. Results in Figure 4 indicated the causes of risks which were reported by the respondents. At Muvonde Hospital most (20.2%) of the respondents reported pressure due to high workload and at Driefontein Sanatorium Hospital (25%) of the questionnaire respondents reported pressure due to high workload. To support this, the Matron at Muvonde Hospital indicated that, due to increase of pressure nurses sometimes run in passages hurrying with the results of a patient which they collect from the medical laboratory so that they submit them to the doctor in time however, this result to slips and falls and sometimes dislocation of any part of the leg occurs. The Nurse in Charge at Driefontein Sanatorium Hospital reveals that work-related pressure is increasing as a result of emerging epidemics which increase the number of patients which need to be attended. Shortage of labour was reported by (17.4%) at Muvonde hospital and at Driefontein Sanatorium Hospital was signified by (16.2%) of the study participants. One of the key informants interviewees the Matron of Driefontein Sanatorium Hospital highlighted that, there is shortage of labour which causes some healthcare workers to perform extra duties in order to meet targets of the day, sometimes we allocate few health workers in a ward full of patients which means they have to spend the whole day standing and walking attending to the needs of the patients.

According to (14.7%) of the respondents at Muvonde Hospital risks affecting healthcare workers occur as a result of inadequate equipment while at Driefontein Sanatorium Hospital (11.8%) of the study participants reported inadequate equipment. Age was indicated as a factor which causes risks affecting healthcare workers by (3.7%) of the respondents at Muvonde Hospital and at Driefontein Sanatorium Hospital it was reported by (2.9%) respondents. The Nurse in Charge supported this by saying, young healthcare workers are the ones who are frequently reporting needle stick injuries because they ignore use of gloves when handling sharps and they do not handle sharps with care even when disposing off them. The Nurse in Charge indicated that young healthcare workers are involved in vigorous tasks such as lifting patients and pushing trolleys compared to their old counterparts. However, this exposes them to musculoskeletal disorders.

Results shown in Figure 4 indicated that some (10.1%) of the respondents at Muvonde Hospital and (4.4%) of the study participants at Driefontein Sanatorium Hospital reported gender as a

factor which determines the risks which affect healthcare workers. During the interview the Human Resource Manager at Muvonde hospital indicated that, sometimes I move around the hospital to check the operations and equipment and you find that, patients verbally abuse our workers especially female healthcare workers. In addition, (6.4%) of the participants at Muvonde hospital and (8.8%) of the healthcare workers at Driefontein Sanatorium Hospital specified that poor training exposes healthcare workers to risks. The Nurse in Charge at Driefontein Sanatorium Hospital highlighted that safety training performed at the hospital are poor and they mainly focus on safety of patients ignoring workers and this exposes workers to work-related risks because they will put much attention on patient safety ignoring their well-being.

Negative safety behaviour was indicated as a factor which causes risks by (6.4%) and (8.8%) at Muvonde and Driefontein Sanatorium hospital respectively as shown in Figure 4. This is supported by the Environmental Health Technician (EHT) at Muvonde hospital that healthcare workers are affected with risks due to negative safety behaviour. The EHT reveals that some healthcare workers did not wear full PPE/C which exposed them to risks. During observations negative safety behaviour was noticed as shown by Plate 1 which shows a healthcare worker who did not wear full PPE/C.



Hands of a healthcare worker
without gloves.

Plate 1: A healthcare worker who did not wear full PPE/C

Source: Field Survey (2023)

Poor management was indicated by (8.3%) of the study participants at Muvonde Hospital while (7.4%) of the respondents at Driefontein Sanatorium Hospital reported that they were exposed to risks due to poor management. This is supported by EHT at Muvonde Hospital indicating that hospital risks which affect workers occur due to poor implementation of occupational safety and health guidelines by the top management to protect workers. The EHT adds that management focuses on safety of patients neglecting safety of workers. Moreover, at Muvonde Hospital (5.5%) and (5.9%) at Driefontein Sanatorium Hospital of the questionnaire respondents reported that the department the worker is allocated is among the factors which causes risks which affect healthcare workers. This was supported by the Matron at Driefontein Sanatorium Hospital that healthcare workers who work in the surgical wards such as male and female wards are mostly affected with musculoskeletal disorders because they are mainly involved in repositioning ill patients in beds and pushing patients on wheelchairs to bathrooms and toilets.

Figure 4 also depicts that some respondents (7.3%) and (8.8%) at Muvonde Hospital and Driefontein Sanatorium Hospital respectively indicated that using PPE/C for a long time expose healthcare workers to risks. To support this, the District Medical Officer (DMO) indicated that outbreaks of pandemics such as Covid-19 cause healthcare workers to wear full PPE/C for a long time however, full PPE/C traps heat inside and exposes workers to exhaustion. The DMO also indicated that some healthcare workers are affected with allergy and skin irritation due to prolonged use of latex gloves.

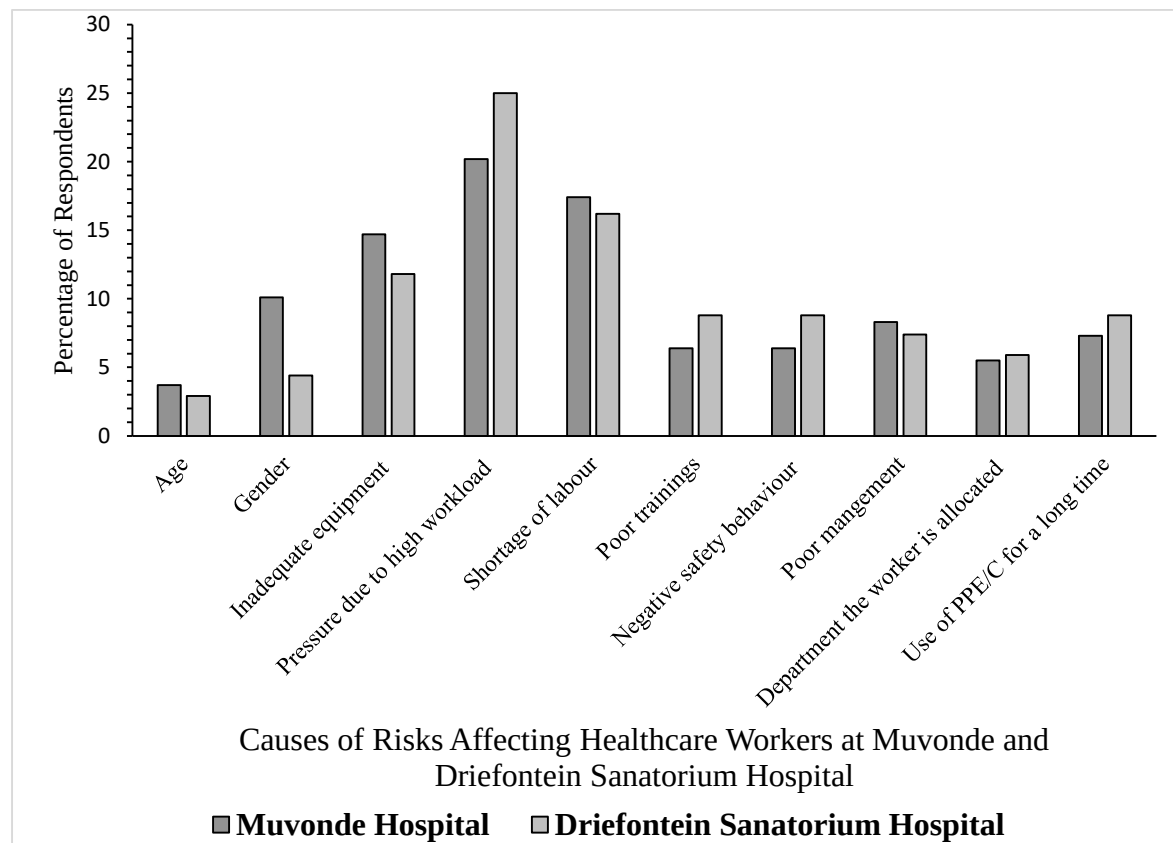


Figure 4: Causes of risks affecting healthcare workers at Muvonde Hospital and Driefontein Sanatorium Hospital.

Source: Field Survey (2023)

During the study questionnaire respondents (healthcare workers) were requested to indicate the most strenuous work shift between night shift and day shift. Majority (84.4%) of healthcare workers at Muvonde hospital indicated that the night shift was more strenuous while the minority (15.6%) reported day shift as strenuous shift. Results in Figure 5 also indicate that most (83.8%) of the participants at Driefontein Sanatorium Hospital revealed that night shift is strenuous whereas (16%) pointed out that day shift is strenuous.

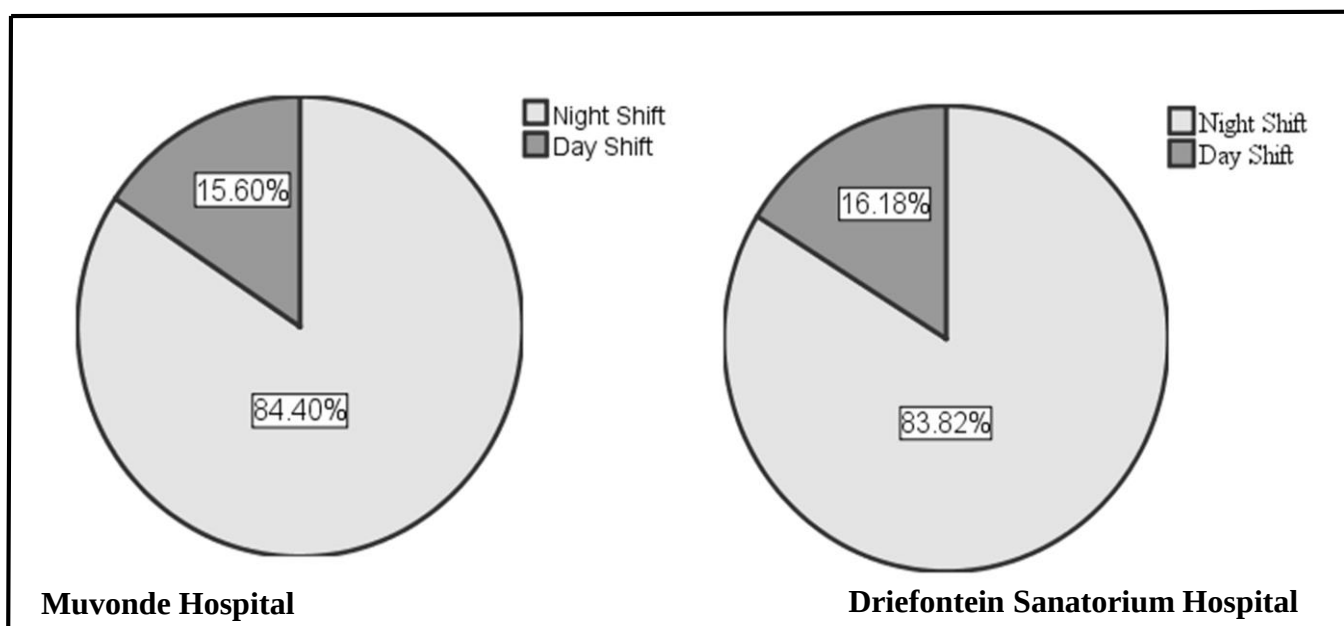


Figure 5: Strenuous work shift between night shift and day shift at Muvonde Hospital and Driefontein Sanatorium Hospital

Source: Field Survey (2023)

3.3.5 Effects of Risks Affecting Healthcare Workers at Muvonde Hospital and Driefontein Sanatorium Hospital

Ergonomic, biological, physical, chemical and psychosocial risks affecting healthcare workers at Muvonde Hospital and Driefontein Sanatorium Hospital expose them to different effects such as injuries, diseases and infections as shown in Figure 6.

3.3.5.1 Effects of Ergonomic Risks to Healthcare Workers

Results of the study carried at Muvonde Hospital on effects of ergonomic risks indicated that the majority (51.4%) reported back injuries, followed by neck pain (21.1%), shoulder discomfort (16.5%) and muscular strain was reported by (11%). Figure 6 also demonstrates effects of ergonomic risks reported by questionnaire respondents at Driefontein Sanatorium Hospital. Majority (57.4%) reported back injuries, followed by neck pain (19.1%), shoulder pain/discomfort (13.2%) and muscular strain was reported by (10.3%) at Driefontein Sanatorium Hospital.

3.3.5.2 Effects of Biological Risks to Healthcare Workers

Figure 6 also shows effects of biological risks which were reported by respondents at Muvonde and Driefontein Sanatorium rural hospitals. At Muvonde Hospital about (29.4%) specified that they experience Covid-19 virus, tuberculosis (6.4%), hepatitis B/C (3.7%) and few (1.8%) reported that they were exposed to HIV/AIDS. However, the majority (58.7%) of the respondents at Muvonde Hospital pointed out that none of the infections affect them due to biological risks. In addition, Figure 6 demonstrates that at Driefontein Sanatorium Hospital (33.8%) reported that they experience Covid-19, tuberculosis (25%), hepatitis B/C (13.2%) and very few (1.5%) reported HIV/AIDS. Nevertheless, (26.5%) of participants pointed out that they experienced none of the mentioned infections and they did not indicate other types of infections which affect them at Driefontein Sanatorium Hospital.

3.3.5.3 Effects of Physical Risks to Healthcare Workers

Over half (57.8%) of the study participants at Muvonde Hospital experienced needle stick injuries, followed by cuts/pricks (19.3%), influenza (14.7%) and crumps (8.3%). None of the participants at Muvonde Hospital reported hearing loss or other effects which arise from physical risks. In addition, among those respondents who reported physical risks at Driefontein Sanatorium Hospital, the majority (52.9%) experienced needle stick injuries, followed by cuts/pricks (27.9%) and influenza consists of (11.8%) and (7.4%) reported crumps. None of questionnaire respondents specified that they experienced hearing loss or other health impacts due to physical risks at Driefontein Sanatorium Hospital.

3.3.5.4 Effects of Chemical Risks to Healthcare Workers

Figure 6 also reveals the effects of chemical risks affecting healthcare workers at Muvonde and Driefontein Sanatorium rural hospitals. At Muvonde Hospital the highest (39.4%) of the healthcare workers experienced skin irritation, (33.9%) reported allergies, (11.9%) revealed pulmonary irritation and (2.8%) of the study participants pointed out that they experienced asthma. Very few (1.8%) experienced birth defects due to chemical risks while none of the respondents at Muvonde Hospital reported kidney and liver damage. At Muvonde Hospital (10.1%) of the participants never experienced any of the mentioned effects of chemical risks and they did not provide any other effects of chemical risks. On the other hand, questionnaire respondents who participated during the study at Driefontein Sanatorium Hospital most (48.5%) experienced skin irritation, followed by allergies (26.5%) and pulmonary irritation (17.6%). The proportion of questionnaire respondents who reported asthma was (4.4%) and

(2.9%) indicated they never experienced problems related to chemical risks at Driefontein Sanatorium Hospital.

3.3.5.5 Effects of Psychosocial Risks to Healthcare Workers

According to the results obtained during the study at Muvonde Hospital most (47.7%) experienced stress, followed by fatigue (20.2%), anxiety (15.6%), insomnia (3.7%) and persistent tiredness was reported by (2.8%) of the participants. Very few (0.9%) reported blood pressure and almost (9.2%) pointed out that they never experience any effect related to psychosocial risks. Figure 6 also demonstrates effects of psychosocial risks reported by respondents at Driefontein Sanatorium Hospital. Majority (45.6%) experienced stress, followed by fatigue (23.5%), anxiety (16.2%), insomnia (5.9%) and persistent tiredness was designated by (2.9%) participants at Driefontein Sanatorium Hospital. Minority (1.5%) of questionnaire respondents at Driefontein Sanatorium Hospital revealed that they experienced BP (Blood Pressure) while (4.4%) specified that they never experienced any health effects related to psychosocial risks.

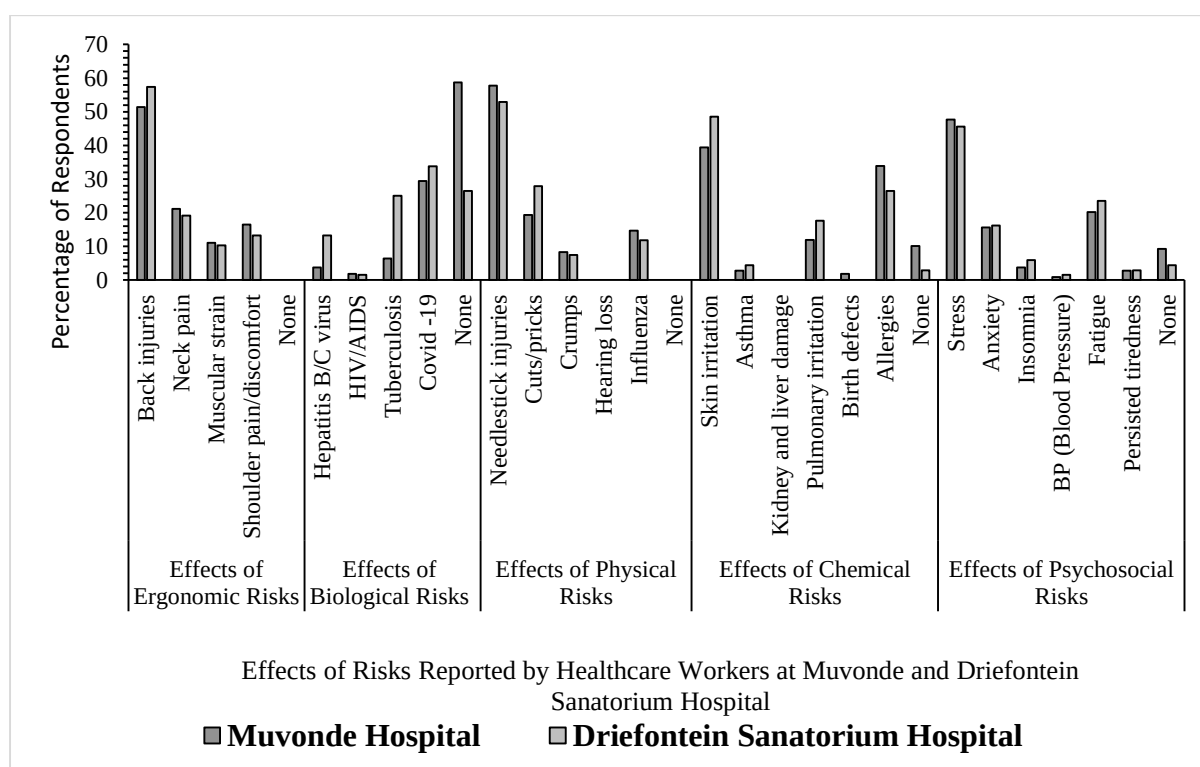


Figure 6: Effects of risks affecting healthcare workers at Muvonde Hospital and Driefontein Sanatorium Hospital

Source: Field Survey (2023)

3.3.6 Methods used to Manage Risks at the Hospitals

3.3.6.1 Personal Methods used by Healthcare Workers to Manage Risks

The findings of this study indicated some positive and negative methods used by healthcare workers at Muvonde Hospital and Driefontein Sanatorium Hospital to manage risks. Of all the positive personal methods indicated by healthcare workers at Muvonde Hospital majority (29.4%) reported personal hygiene for example washing hands after performing procedures, medical examinations (14.7%) and request assistance from their colleagues when handling both admitted patients and outpatients was revealed by (13.8%) Figure 7. At Muvonde Hospital some (19.3%) of the healthcare workers indicated that they adjust their work equipment. However, at Driefontein Sanatorium Hospital majority (33.8%) reported personal hygiene such as washing hands after performing procedures, (19.1%) indicated adjustment of equipment notably adjusting heights of beds, (16.2%) revealed medical examination and (11.8%) they request their colleagues to assist them when handling inpatient and outpatient within the hospital. At Muvonde Hospital (11.7%) pointed out that they use tablets that induce sleep, very few (4.6%) indicated excessive smoking and (6.4%) of the healthcare workers specified that they take excessive alcohol to manage the risks which affect them at work. Of all the participants who indicated negative personal methods at Driefontein Sanatorium Hospital few (10.3%) specified that they develop the habit of taking sleeping tablets, very few (4.4%) reported use of excessive smoking which is also similar to (4.4%) of the healthcare workers who reported that they take excessive alcohol in order to manage risks.

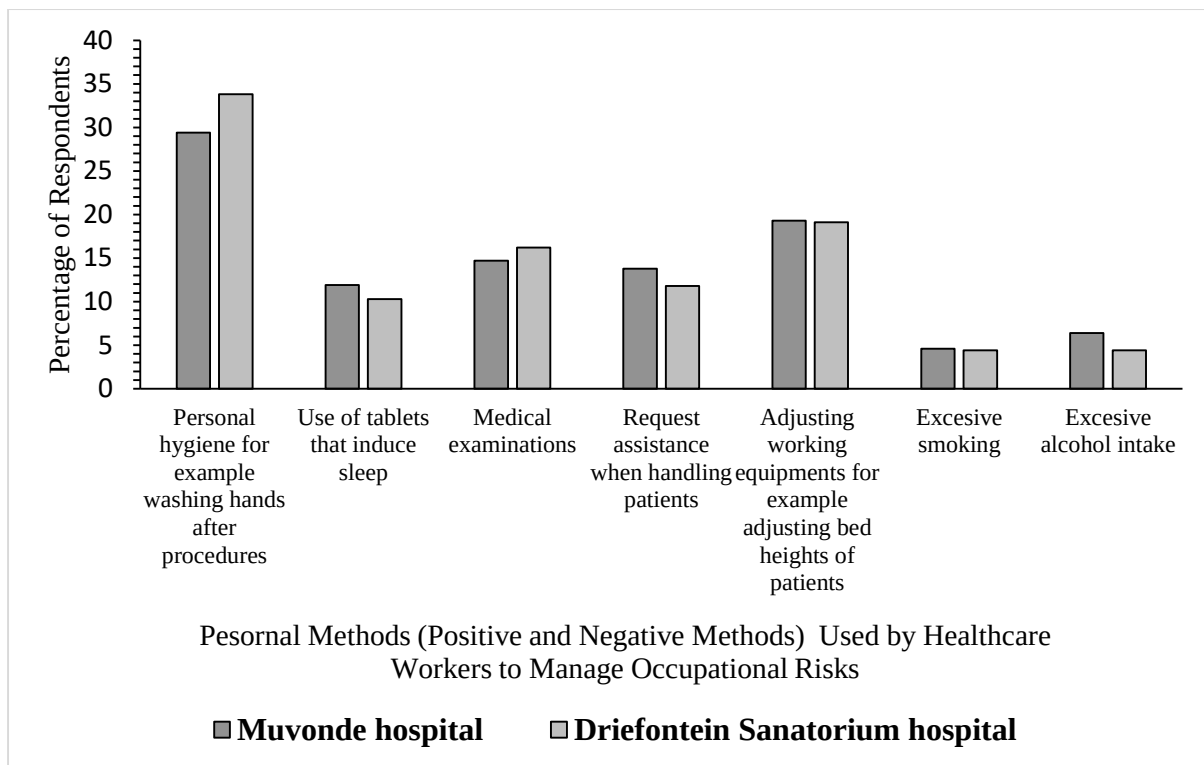


Figure 7: Personal methods (positive and negative methods) used by healthcare to manage occupational risks at Muvonde Hospital and Driefontein Sanatorium Hospital

Source: Field Survey (2019)

3.3.6.2 Institutional Methods Used to Manage Risks

During the study questionnaire respondents at Muvonde Hospital and Driefontein Sanatorium Hospital were asked to indicate institutional measures used to manage occupational risks. Figure 8 illustrates that the majority (38%) of the participants indicated personal protective equipment at Muvonde hospital. The results are also similar to Driefontein Sanatorium Hospital since the majority (40%) reported use of personal protective equipment. During observations carried at Driefontein Sanatorium Hospital personal protective equipment/clothes were observed in the dressing rooms used by healthcare workers as shown by Plate 2. This was supported by the Human Resource Manager (HRM) at Driefontein Sanatorium Hospital that they work hand in hand with the procurement department to make sure they provide personal protective equipment/clothes such as gowns, aprons and masks for healthcare workers to use during procedures.



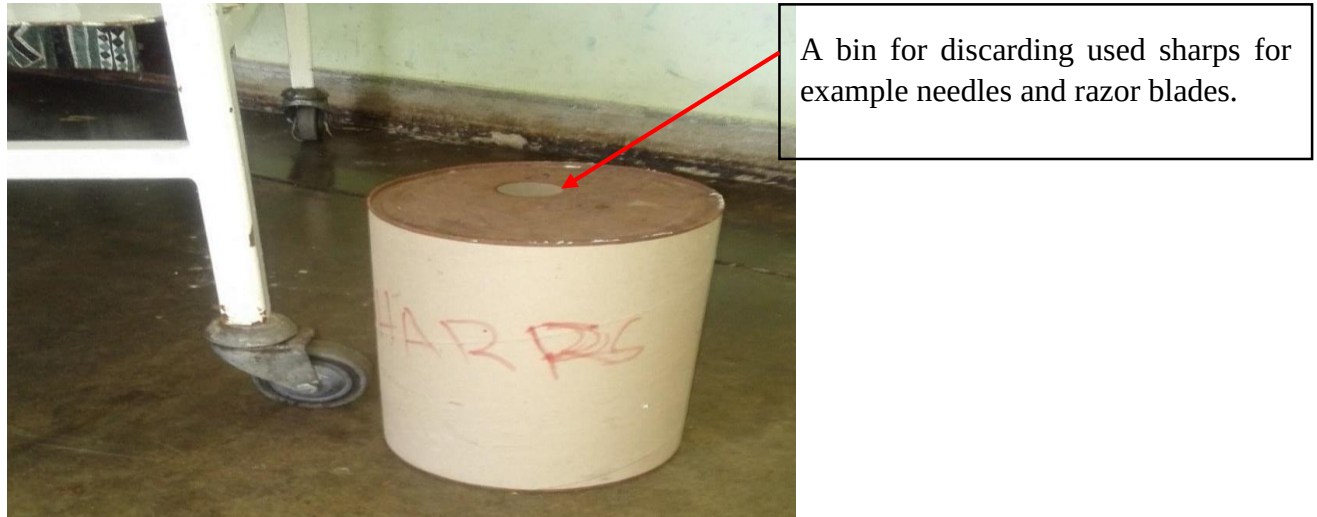
Plate 2: Personal protective cloth observed in the dressing room at Driefontein Sanatorium hospital.

Source: Field Survey (2023)

At Muvonde Hospital (13%) of the questionnaire respondents indicated safety inspection while at Driefontein Sanatorium Hospital (10%) of the study participants specified safety inspection as a measure used to manage risks. To support this, the EHT at Muvonde Hospital indicated that safety inspections are done here on a weekly basis for departments then for the whole hospital safety inspections are done on a monthly basis. The Matron at Muvonde Hospital also indicated that safety inspections are carried out by the EHT and the Infection Prevention Control team focusing on environment, equipment, availability of hand hygiene facilities and waste management.

Figure 8 illustrates that (12%) of the questionnaire respondents at Muvonde Hospital revealed that proper disposal of waste was among institutional measures and at Driefontein Sanatorium Hospital proper disposal of waste was indicated by (9%) of the questionnaire respondents. Questionnaire results were supported by the Matron at Driefontein Sanatorium Hospital that every department is provided with a bin for sharp waste, for infectious waste and bin for non-infectious waste in order to reduce risks associated with waste. Sharp waste bin, infectious

waste bin and non-infectious waste bin were noted during observations as indicated in Plate 3, Plate 4 and Plate 5 which illustrates pictures of sharp bin, infectious waste bin and non-infectious bin respectively. The pictures were taken when observations were carried out in hospital units.



A bin for discarding used sharps for example needles and razor blades.

Plate 3: Sharp bin for discarding used sharps

Source: Field Survey (2023)



Infectious waste bin

Plate 4: Bin for infectious waste

Source: Field Survey (2023)

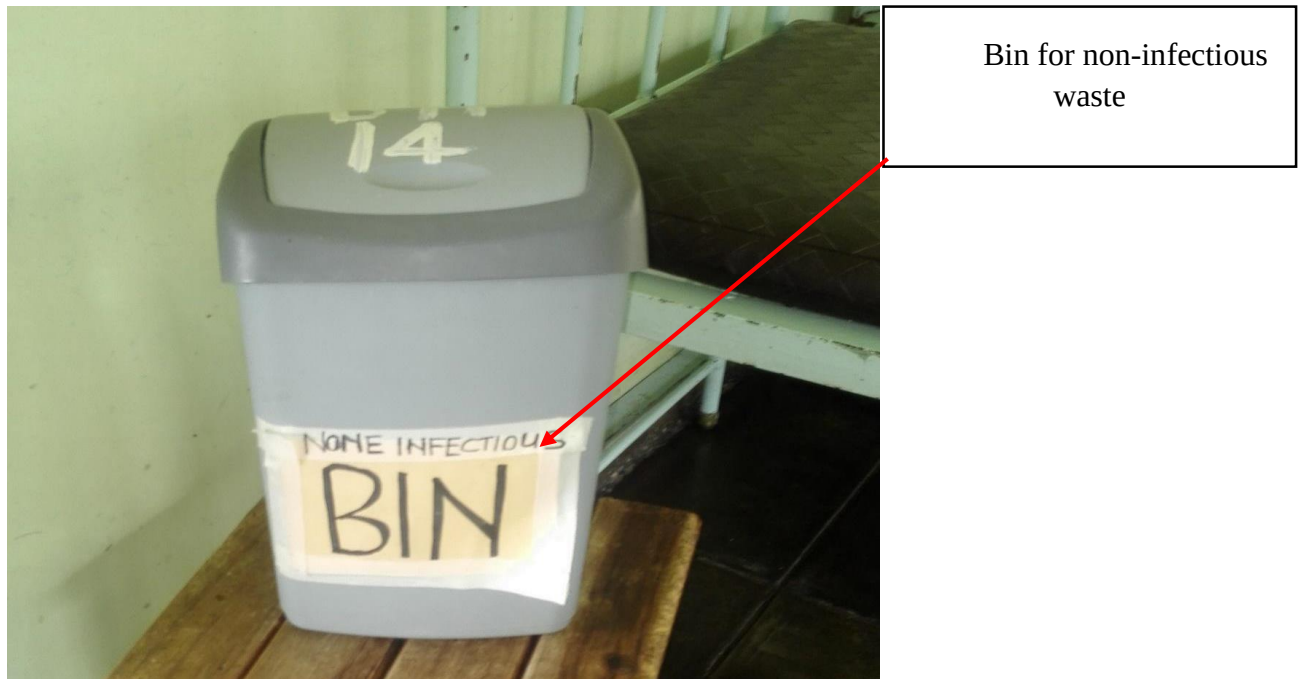


Plate 5: Bin for non-infectious waste

Source: Field Survey (2023)

Moreover (11%) of the questionnaire respondents at Muvonde Hospital reported that monitoring of workers' safety behaviour is among the institutional measures used to manage risks while at Driefontein Sanatorium Hospital monitoring of workers' safety behaviour was pointed out by (7%) participants. The Nurse in Charge at Muvonde Hospital indicates that the behaviour of using PPE/C by healthcare workers when performing risk procedures is monitored to check the way they wear PPE/C. Figure 8 demonstrates that safety training was reported by (9%) as an institutional measure used to manage risks at Muvonde Hospital and safety workshops was also indicated by (9%). At Driefontein Sanatorium Hospital (6%) of the participants pointed out that safety training was among institutional measures used to manage risks and safety workshops was also indicated by (6%) of the respondents.

Of all the respondents who participated as questionnaire respondents at Muvonde Hospital only (8%) indicated other institutional methods used to manage risks for example screening workers for diseases such as tuberculosis, Covid-19 and hepatitis B/C virus as illustrated by Figure 8. On the other hand, (22%) of workers indicated other institutional measures used to manage risks at Driefontein Sanatorium Hospital for example screening of workers for diseases such as Tuberculosis (TB), Covid-19 and Hepatitis B/C. The Nurse in Charge at Driefontein

Sanatorium Hospital pointed out that screening of healthcare workers for infectious diseases such as tuberculosis, Covid-19 and Hepatitis B/C virus is done at the wellness clinic. Therefore, regular screening is necessary to detect any potential infections early and prevent further spread to other healthcare workers and patients.

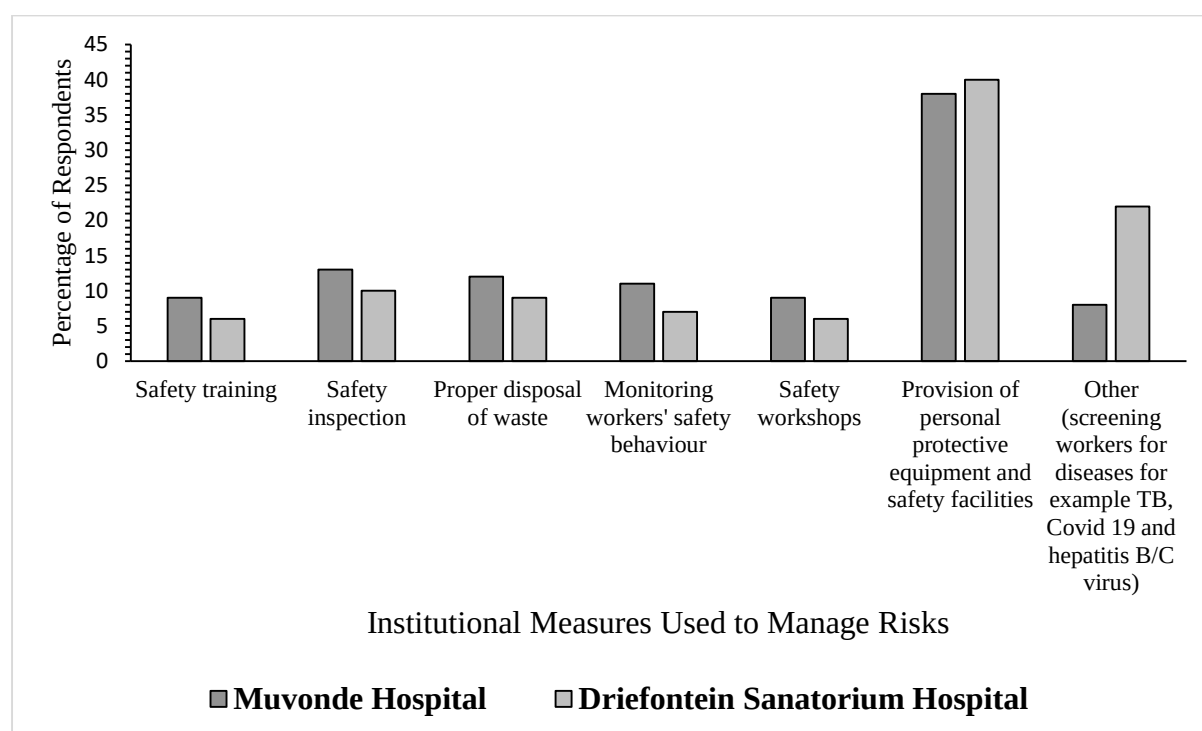


Figure 8: Institutional measures used to manage risks at Muvonde hospital and Driefontein Sanatorium hospital.

Source: Field Survey (2023)

3.3.7 Effectiveness of Institutional Measures used to Manage Risks

Figure 9 illustrates that more than half (56%) reported that the measures are good, (21.1%) specified the measures are very good, (15.6%) pointed out that the measures are excellent while very few (7.3%) of the questionnaire respondents indicated that institutional measures used to manage risks at Muvonde Hospital are poor. Figure 9 highlighted that most (51.5%) of the study participants stipulated that institutional measures used to manage risks at Driefontein Sanatorium hospital were effective because they mentioned that the institutional measures are good, followed by (30.9%) who indicated very good and (13.2%) marked excellent. However, a minority (4.4%) of the healthcare workers at Driefontein Sanatorium Hospital indicated that the institutional measures are poor.

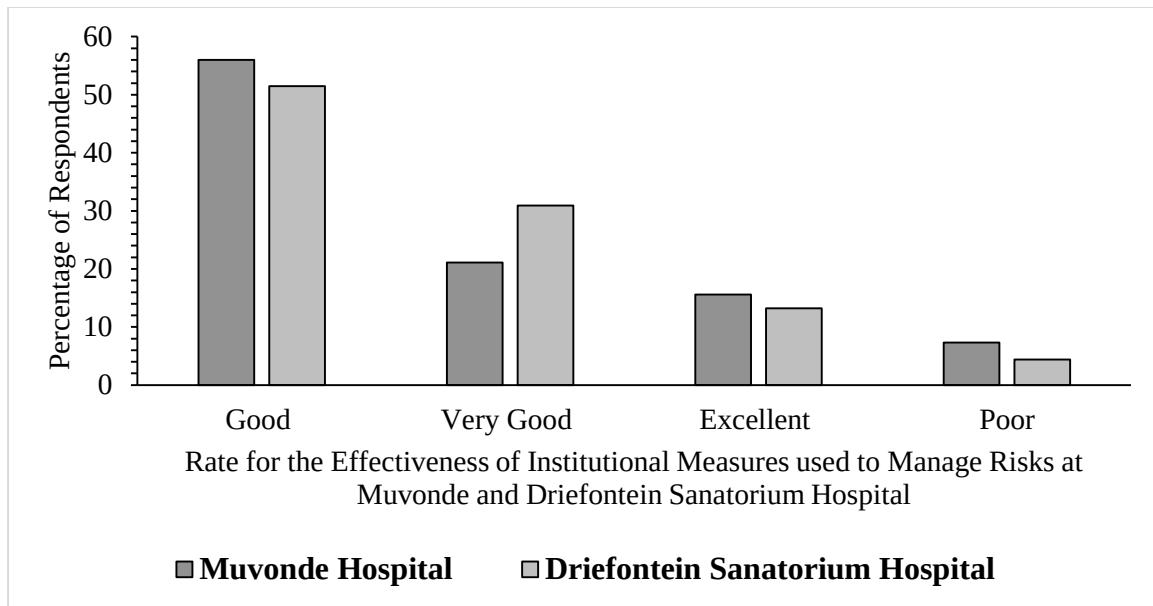


Figure 9: Effectiveness of Institutional Measures Used to Manage Risks

Source: Field Survey (2023)

Table 2 illustrates the Chi-Square test which was done to test whether there is association or there is no association between work experience and effectiveness of institutional measures used to manage risks. Results obtained during the Chi-Square tests was 0.000 and is less than 0.05. Regarding the results we accept H_1 and reject H_0 . The results attained during the analysis provide evidence that there is an association between work experience and effectiveness of institutional measures used to manage risks.

Table 2: Chi-Square Tests Between Work Experience (Years) * Effectiveness of Institutional Measures Used to Manage Risks

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.114E2 ^a	12	.000
Likelihood Ratio	173.584	12	.000
Linear-by-Linear Association	88.739	1	.000
N of Valid Cases	109		

a14 cells (70.0%) have expected count less than 5. The minimum expected count is 0.44

Source: Field Survey (2023)

3.4 Discussion

The majority of the healthcare workers who participated in the study carried at Muvonde Hospital and Driefontein Sanatorium Hospital were females. The findings concur with Himmelstein and Venkataramani (2019) that females constitute the majority of healthcare workers in the United States. According to Ahmad et al. (2021) females constitute 70% of the healthcare workers working in healthcare facilities of Pakistan. The results obtained during the study at Muvonde and Driefontein Sanatorium rural hospitals also coincide with WHO (2018) that there are 136 million employees in the social sector and health sector globally and 70% of them are females. Women are often attracted to caregiving professions due to their nurturing nature and empathy towards others. The results obtained during the study suggest that a significant number of healthcare professionals at Muvonde Hospital and Driefontein Sanatorium Hospital have substantial work experience, with a majority falling within the 5–10 year range. Healthcare workers with more experience may have developed better coping mechanisms for dealing with work related risks. There is a positive relationship between work experience and coping methods and resilience of healthcare workers to work-related risks (Finstad et al. 2021). Therefore, asking for work experience is essential when studying work-related risks affecting healthcare workers.

Findings at Muvonde Hospital indicated that the majority of the healthcare workers reported ergonomic risks due to the nature of work they performed. At Driefontein Sanatorium Hospital the majority of the respondents reported biological risks since the hospital mainly deals with infectious diseases for example tuberculosis. The findings are in line with the results obtained by Abiramalakshmi and Shree (2018) healthcare workers are exposed to various occupational hazards notably chemical, biological, physical, ergonomic and psychosocial risks. Results suggest that healthcare workers are exposed to various types of occupational hazards in their day-to-day activities which can affect their health and well-being.

Regarding the distribution of ergonomic risks reported at Muvonde Hospital and Driefontein Sanatorium Hospital the majority indicated standing for a long time. These findings suggest that both hospitals share similar working conditions that require employees to stand for extended periods of time due to the nature of their work. This requires them to be on their feet and moving around the hospital, checking on patients, administering medication and performing various medical procedures. Additionally, many hospital workers are responsible for lifting and moving patients, which require them to be on their feet for extended periods.

The findings are in line with the results obtained by Chiwaridzo et al. (2018) which indicates that standing for a long time and repetitive work expose healthcare workers to ergonomic risks.

In addition, regarding the distribution of physical risks sharp injuries were reported by the majority of the healthcare workers at Muvonde and Driefontein Sanatorium rural hospitals. Indeed, use of sharp objects such as needles and scalpels in hospitals is common due to their ability to make precise incisions and punctures and if they are not handled properly, they cause injuries and infections. The results coincide with results of Cui et al. (2018) which illustrated that the prevalence of sharp injuries is high among physical risks affecting healthcare workers. Majority of the healthcare workers reported blood spillages as a biological risk affecting them at work. This is likely due to the high prevalence of invasive procedures and surgeries carried out in hospital settings, which can result in accidental exposure to blood spillages. Blood spillage can occur during medical procedures such as surgery or phlebotomy, increasing the risk of exposure to healthcare workers and patients. The findings correspond with a study carried by Rai et al. (2021a; b) which designates that occupational hazards such as biological hazards notably blood spillages prevail among healthcare workers in low and middle-income countries.

At Muvonde and Driefontein Sanatorium rural hospitals the high percentage of healthcare workers reported sanitizers as a chemical risk is concerning, as they are an essential tool in preventing the spread of infections in hospitals. This implies that although sanitizers are important in preventing the spread of infections, they contain high levels of alcohol which can expose workers to risks such as skin irritation. The distribution of chemical risks obtained during the study concur with results obtained by Rai et al. (2021a; b) which reveals that continuous use of hand sanitizers exposes healthcare workers to skin diseases. The study established that majority of healthcare workers are vulnerable to psychosocial risks as a result of dealing with severely ill people. The stressors associated with caring critically ill patients can include witnessing suffering and death and managing high levels of responsibility. These experiences can have a profound impact on their mental health and well-being, leading to conditions such as post-traumatic stress disorder (PTSD). This finding supports evidence by Chingono et al. (2022) which reveals that during the Covid-19 pandemic healthcare workers were exposed to psychosocial distress due to dealing with severely ill people.

Majority of the healthcare workers were exposed to risks due to pressure as a result of high workload. The constant demand for healthcare services, coupled with an increasing number of

patients can lead to long working hours and increased workload. This can have psychosocial and physical effects on healthcare workers, which may result in burnout, fatigue, and stress related illnesses. The findings concur with Alenazi et al. (2020) which indicates pressure and high workload during the Covid-19 pandemic expose healthcare workers to anxiety in Saudi Arabia. Moreover, pressure due to high workload can also lead to a lack of communication among healthcare team members. Poor safety communication and education reduces the knowledge of workers on factors which expose them to risks within the workplace (Shabani et al. 2023). Results also indicates that healthcare workers who work during the night shift are exposed to risks since the night shift is more strenuous than the day shift. The reasons for this could be attributed to several factors such as disrupted sleep patterns. This suggests that night shift disrupted the body's natural circadian rhythm and exposed healthcare workers to stress, insomnia and fatigue. Night shift can also lead to social isolation and disruption of personal relationships which can have an impact on mental health. The findings are in line with the findings of Cheng et al. (2023) which states that night shift is associated with rigorous tasks which expose hospital workers to different stresses. Psychosocial risks such as stress and fatigue are associated with shift duties (Minikumary et al. 2023).

Considering effects of ergonomic risks findings at Muvonde hospital and Driefontein Sanatorium Hospital were similar since at both hospitals the majority of the study participants reported that they experience back injuries, followed by neck pain and shoulder discomfort/pain. The results of the study tallies with Nhokovedzo and Nembaware (2022) that ergonomic risks expose healthcare workers to different musculoskeletal disorders which involve back injuries and shoulder discomfort/pain. Back injuries are a common problem among healthcare workers due to the nature of their work. Healthcare workers are required to lift, move and transfer patients on a regular basis, which puts a lot of strain on their backs. The findings concur with the findings of Chiwaridzo et al. (2018) at Parirenyatwa Group of hospitals which denotes that back injuries were mostly reported by healthcare workers as a musculoskeletal disorder which affect them due to ergonomic risks.

On effects of biological risks majority of the healthcare workers indicated exposure to Covid-19. The high prevalence of Covid-19 virus can be attributed to the ongoing pandemic. Healthcare workers are at higher risk of exposure to Covid-19 virus because they come into close contact with infected patients. Frontline healthcare workers were exposed to Covid-19 to a larger extent due to their close contact with infected patients (Moyo et al. 2022). Results reveals that there is high prevalence of tuberculosis at Driefontein Sanatorium Hospital than

Muvonde hospital. This occurs because Driefontein Sanatorium Hospital focuses mainly on treating infectious diseases such as tuberculosis.

Moreover, majority of the healthcare workers reported sharp injuries as an effect of physical risks. The reasons for such a high incidence of needle stick injuries at Muvonde Hospital and Driefontein Sanatorium Hospital could be due to several factors, including inadequate training on safe handling procedures needle stick injuries and understaffing leading to rash or careless handling of needles. The results tallies with Sithole et al. (2018) that needle stick injuries increase in Harare city due to poor training which affects the knowledge of the healthcare workers negatively on how to handle need sticks. The exposure of healthcare workers to various chemicals used in hospitals such as disinfectants, cleaning agents and sterilizing solutions expose them to skin irritation. Chemicals can cause skin irritation and allergic reactions when they come into contact with the skin and or are inhaled (Wilcox et al. 2020).

The study indicated that healthcare workers suffer as a result of psychosocial risks. Majority of the healthcare workers indicated that they suffer from stress as a result of psychosocial risks. This could be attributed to various factors such as workload, interpersonal conflicts, job insecurity which result in stress. Fatigue was reported as the effect of psychosocial risk and this could be due to long working hours, lack of rest breaks and poor working conditions. The results obtained are in line with results of Asante et al. (2019) which states that psychosocial risks expose healthcare workers to stress to a larger degree.

On personal methods used to manage risks by healthcare workers most reported personal hygiene for example washing hands after procedures. These findings are significant because proper personal hygiene practices are crucial in preventing the spread of infections in healthcare settings. Hand hygiene, in particular, is essential in reducing the transmission of pathogens between patients and healthcare workers. Personal hygiene is an important component for infection prevention in hospitals (Hirai et al. 2021). The study also highlights some detrimental measures used to manage risks by healthcare workers such as taking sleep-inducing tablets, excessive smoking, or alcohol consumption can be detrimental to their health in the long run. Study carried out in the United Kingdom (UK) indicated that 59% of healthcare workers use alcohol and 41% are addicted to drugs in order to manage emotional stress (Minikumary et al. 2023). Therefore, it is important for healthcare workers to adopt positive methods to manage the risks effectively.

Results obtained during the study indicated that the majority of the healthcare workers at Muvonde hospital and Driefontein Sanatorium Hospital specified use of personal protective equipment as an institutional measure used to manage risks. This indicates that both hospitals prioritize the use of PPE/C as a measure to manage occupational risks. In developing countries for example Zimbabwe, the use of personal protective equipment/cloth is prioritized in hospitals and during the Covid-19 pandemic they imported PPE/C to cover the shortages in hospitals (Murewanhema and Dzinamarira 2022). During observations personal protective equipment such as aprons and gowns were observed. The Human Resource Manager confirmed that hospital workers are provided with PPE/C for example gowns, aprons, masks and gloves. Personal protective equipment is significant in protecting healthcare workers from occupational hazards which affect them at hospitals (Nankongnab et al. 2021).

At Muvonde Hospital and Driefontein Sanatorium Hospital healthcare workers specified safety inspection as an institutional measure used to manage risks. This is because safety inspections are an effective way to identify potential hazards and mitigate them before they cause harm to patients, staff or visitors. Interview results also confirm that safety inspections are conducted by the Environmental Health Technician and the Infection Prevention Control Team. Respondents at both hospitals revealed that proper disposal of waste was among institutional methods used to manage risks within the hospitals. Proper waste management practices, such as segregation, storage, transportation, treatment and disposal are critical in reducing the risk of infection and ensuring the safety of healthcare workers and the environment. The findings of the study are in line with Shabani and Jerie (2023) that proper management of medical waste reduces infection diseases which affect healthcare waste as a result of hazardous waste such as sharps. Observations also confirmed that since different types of bins were observed within different departments at the hospitals.

At both hospitals healthcare workers confirmed that monitoring of workers' safety behaviour was among institutional measures used to manage risks. By monitoring safety behaviour hospital management can identify potential risks and take necessary steps to prevent accidents and injuries. Furthermore, monitoring safety behaviour helps to promote a culture of safety among healthcare workers, which can lead to better compliance with safety protocols and reduce the likelihood of injuries and accidents. The findings of the study coincide with a study carried by Chinene et al. (2022) at hospitals in Harare Metropolitan Province in Zimbabwe that understanding the behaviour of healthcare workers such as radiographers is significant since it improves safety of healthcare workers and patients. During the interview, the Nurse in Charge

confirmed that behaviour of using PPE/C by hospital employees when performing risk duties is monitored to check the way they wear PPE/C. Supervision of the use of personal protective equipment among healthcare workers reduces cross infection (Moyo et al. 2022). This implies that monitoring the use of PPE/C by healthcare workers during risk procedures is essential for ensuring proper protection against infectious agents, preventing cross contamination between patients and identifying any gaps in training or knowledge among healthcare workers.

Healthcare workers at Muvonde Hospital and Driefontein Sanatorium Hospital identified safety training and workshops as essential measures to manage risks at the workplace. Safety training and workshops promote a safety culture within the hospitals, where all healthcare workers are actively involved in managing risks and promoting a safe working environment. The results coincide with Sithole et al. (2018)'s results which indicates that training is used in hospitals for example in Harare city hospitals to manage needle stick injuries. Instead of focusing on marking measures provided on the questionnaire, healthcare workers at Muvonde Hospital and Driefontein Sanatorium Hospital go on to mention other institutional methods used to manage risks for example screening workers for diseases like tuberculosis, Covid-19 and hepatitis B/C virus. Screening for these diseases also helps in identifying infected individuals early and providing them with timely treatment, thus preventing further transmission. Screening healthcare workers for diseases, for example, severe acute respiratory syndrome helps in monitoring the prevalence of these diseases among healthcare workers and taking necessary steps to prevent outbreaks (Kavenga et al. 2021).

The majority of respondents rated both rural hospitals' risk management practices as good, indicating a largely positive impression of them. This indicates a broad trust in the mechanisms these rural hospitals have put in place to successfully manage risks. Data obtained during the study suggests that Driefontein Sanatorium Hospital has a greater concentration of strong recommendations for risk management measures although Muvonde Hospital may have favourable replies regarding measures used to manage risk. In both rural hospitals, the proportion of respondents who thought the measures were excellent was comparatively low. This indicates that there is space for improvement in reaching higher standards regarding risks management procedures used within the rural hospitals. Minority of the healthcare workers who participated during the study within the rural hospitals indicated that the safety measures used are poor. This implies that the majority of healthcare employees agree that the risk management techniques are adequate but it also shows that certain employees still have issues that need to be addressed.

Chi-Square test results indicate that there is a relationship between work experience and rating the effectiveness of work safety analysis procedures used to manage risks at the hospital. Hence, the rating of effectiveness of measures in managing risks is influenced by work experience of the healthcare worker. This could be due to several factors, such as increased knowledge and understanding of the procedures, greater confidence in healthcare worker's ability to identify and mitigate risks and a greater appreciation for the importance of safety in the workplace. The findings concur with Purwanto et al. (2021) which indicates that rating of effectiveness of institutional measures used to manage losses is strongly related to the experience of the workers.

3.5 Implications of the Study

The results of this study can help to guide national and local health policies that aim to enhance the working circumstances for employees in healthcare settings. Policymakers can select initiatives to address the dangers that healthcare workers encounter in rural hospitals by understanding the unique risks they experience. This might entail creating rules pertaining to occupational safety requirements in rural healthcare facilities and making sure they have the tools and training needed to reduce risks that have been identified. Healthcare employees' well-being and overall health are directly impacted by mitigating work-related risks. Healthcare organisations may increase employee retention and job satisfaction by reducing exposure to psychosocial and physical risks. This is vital especially in rural regions where there is shortage of healthcare workers with the necessary qualifications. Implications of the study are also extendend to the health of the community. Healthcare professionals are more inclined to give patients better treatment when they are happier and healthier.

3.6 Limitations of the Study

This study is associated with various limitations for example generalisability. The study was conducted within two rural hospitals in Chirumanzu district located in Midlands Province of Zimbabwe. Due to differences in infrastructure, resources and healthcare practices healthcare employees in other areas or urban healthcare centers may face different work-related risks making this narrow geographical scope inaccurate. This means the study can provide valuable results regarding risks affecting healthcare workers in rural hospitals of Chirumanzu district, but its insights can not be applied to all hospitals in Zimbabwe and beyond. Additionally, the study's validity may be impacted by potential biases introduced by the use of self reported data. Participants might not be fully aware of the risks involved with their jobs or they could

underreport unpleasant events out of fear of the consequences or the stigma attached to revealing weaknesses.

3.7 Conclusion and Recommendations

The assessment of work-related risks among healthcare workers in rural hospitals of Chirumanzu District, Zimbabwe is a critical issue that requires urgent attention. The study has shown that healthcare workers in rural hospitals are exposed to various work-related risks including biological risks, physical risks, psychosocial risks, chemical risks and ergonomic risks. These risks can have significant impacts on the health and well-being of healthcare workers, as well as on the quality of care provided to patients. There are some methods which are used to manage risks for example PPE/C but risks are still occurring. Therefore, occupational safety in hospitals is a critical issue that requires attention to minimize workplace hazards and ensure the well-being of healthcare workers. This means hospitals should provide regular training to employees on various aspects of occupational safety, including infection control, proper handling of hazardous materials and safe patient handling techniques. Training should be mandatory for all employees and should be tailored to their specific job functions.

Additionally, hospitals should have clear policies and procedures in place to address workplace hazards and ensure compliance with regulatory requirements. Policies should cover a range of issues, including the use of personal protective equipment, handling of sharps and reporting of workplace injuries. Hospitals should allocate sufficient resources to support occupational safety initiatives. This includes providing appropriate equipment and supplies, such as gloves, masks and gowns as well as investing in technology and infrastructure to minimize workplace risks. At hospitals employees should be encouraged to participate in the development and implementation of occupational safety programs. This can include forming safety committees or providing feedback on existing policies and procedures. Hospitals should conduct regular inspections to identify potential hazards and address them promptly. Inspections should cover all areas of the hospital, including patient rooms, laboratories and storage areas. More to it, hospitals should monitor compliance with occupational safety policies and procedures through regular audits and reviews. This can help to identify areas where additional training or resources are needed. This shows that improving occupational safety and health at hospitals requires a comprehensive approach. By adopting these recommendations, hospitals can create safer workplaces for their employees while ensuring high-quality patient care.

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Chapter 4

Work Safety Analysis for Rural Hospitals in Chirumanzu District of Midlands Province, Zimbabwe

Tapiwa Shabani¹; Steven Jerie¹ and Takunda Shabani¹

¹Department of Geography Environmental Sustainability and Resilience Building, Midlands State University, P. Bag 9055 Gweru, Zimbabwe

Corresponding Author: Shabani Tapiwa, Email Address: tapiwashaban@gmail.com

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Abstract

This paper focuses on work safety analysis for rural hospitals in Chirumanzu District of Midlands Province, Zimbabwe. The aim of this study is to identify and analyze the various work safety challenges faced by healthcare workers in rural hospitals and propose an effective model to mitigate these risks. The study employed a descriptive cross-sectional design to gather data from a total of 109 healthcare workers at Muvonde Hospital and 68 healthcare workers at Driefontein Sanatorium Hospital. Various methods were utilized to collect the data, including questionnaires, interviews, observations and secondary data sources. The study delves into a comprehensive analysis of work safety risks faced by healthcare workers in rural hospitals. These risks include chemical, biological, physical, psychosocial and ergonomic risks. Findings of the study shows work safety challenges faced by healthcare workers such as lack of training, poor commitment of the management, poor equipment and poor safety behavior. Each challenge is examined in detail, supported by relevant data and statistics. Furthermore, the paper explores the potential consequences of these work safety challenges on healthcare workers and patients. It also discusses some of the measures used to manage risks such as provision of PPE/C and safety inspection and identify gaps or challenges in those current safety approaches. To address these challenges or gaps the study proposes a process-based model for effective work safety analysis in rural hospitals. The proposed model enhance risk identification, risk assessment, implementation of control measures and monitoring and evaluation of implemented control measures. The model was proposed based on the Swiss Cheese Model. The paper emphasizes the need for tailored solutions within the model to consider the unique context of rural hospitals in Zimbabwe.

Keywords: Healthcare Workers; Risk Assessment; Risk Identification; Rural Hospitals; Work Safety Analysis

4.1 Introduction

Healthcare centers are significant in any country because they are responsible for serving the lives of the citizens especially during the outbreak of pandemics such as Covid-19 (WHO 2020; Moyo et al. 2022). However, healthcare workers are exposed to a myriad of hazards at work (Nhokovedzo and Nembaware 2022; Chingono et al. 2022; Shabani et al. 2023a, b, c, d, e). If healthcare workers are compared with other workers from other industries, a high percentage of employee's compensation claims for infectious diseases, mental disorders, eye diseases, hepatitis, strains and sprains is recorded among hospital workers (O'Neill 2020; WHO 2021). Until today, occupational health and safety policies in healthcare facilities were established primarily for patients ignoring employees, except for sharp injuries and infectious viruses which are recognized by healthcare center administrators as risks which might affect healthcare workers (Dowlati et al. 2021; Gan et al. 2020). Florence Nightingale was the first person to introduce methods to protect patients from infectious diseases in hospitals through simple sanitation methods notably one patient per hospital bed, hand washing and open window aeration to avoid cross infection (McEnroe 2020; Gilbert 2020). However, in the 1900's physicians were exposed to radiation when they were experimenting with X-rays and healthcare workers in the operating room were affected with anesthetic gases (Hernigou et al. 2019; Cuttler 2020). At the end these exposures captured the attention of hospital administrators and started to monitor the health of their employees (healthcare workers) (Mossburg et al. 2019; Nkomo 2021).

Further, in 1958 the American Hospital Association and American Medical Association introduced a joint announcement to backing up safety programs which support employees in hospitals, the joint statement reads "Hospital must lead by example in terms of health training, education and work safety" (Perkins 2022; Steinreich 2022). However, these days' occupational safety and health programs are proliferating in hospitals in order to identify hazards which might affect both patients and employees and implement control measures (Nhokovedzo and Nembaware 2022; Shabani et al. 2023a, b, c, d, e). As a result, hazard identification within the hospital work environment is among the tasks which can be used to understand system operation and hazards occurring during the system operation however, work safety analysis is the most desired technique for hazard identification in healthcare facilities (Zaroushani 2020; Zaroushani and Khajehnasiri 2022). Work Safety Analysis (WSA) is an approach which is used to analyse and evaluate hazards that are encountered when a particular job is carried out with the intention of alleviating risks to As Low as Reasonably Possible

(ALARP) (Ganguly et al. 2018; Ramaganesh et al. 2021; Shabani et al. 2023a, b, c, d, e). By work safety analysis, the job is divided into steps, then risks associated with each step are identified and recorded, and at the end control measures are developed (Albrechtsen et al. 2019; Adamopoulos 2022). This asserts that when risk identification is done and control measures are developed, risks remain at acceptable levels. Moreover, a view upheld by Ibrahim and Lebowitz (2018) and Kumar Mishra and Aithal (2021) that risk factors such as chemical, physical, biological and psychosocial risks within the work environment are identified with the use of work safety analysis techniques in a logical and systematic way to give better safety recommendations.

According to Buheji and Buhaid (2020) and Sulaiman et al. (2020) work safety analysis can be utilized in healthcare centers as a practical tool to develop work safety systems associated with resilience. Resilience is among the challenges that are faced by healthcare sectors therefore it must be considered when designing safety systems within healthcare centers (Fallah-Aliabadi et al. 2020; Corvalan et al. 2020). This clearly indicates that the outcomes of work safety analysis can be utilized to improve the resilience of hospitals due to its ability to identify hazardous tasks or work and provide recommendations for safety design. Ibrahim and Lebowitz (2018), and Albrechtsen et al. (2019) asserted that proper use and choosing of PPE/C based on worker's needs and supervisor's instructions of every task is also determined by work safety analysis. With work safety analysis, hazards identified can be revised in the following years and the procedure can be recorded as a subsection of occupational health and safety management system (Ibrahim and Lebowitz 2018; Zaroushani and Khajehnasiri 2022; Shabani et al. 2023a, b, c, d, e). Steps of work safety analysis include selecting a job to be analysed, record the steps in the task, identify the hazards and assess the risks, develop control measures, control of work procedure, communicate and implement the work safety analysis and monitor the work and maintain controls (Kumar Mishra and Aithal 2021). Work safety analysis step number four which uses the hierarchy of controls framework methods that includes elimination, minimization, substitution, engineering control measures, administrative controls and use of personal protective equipment/clothes (PPE/C) is the one which is mostly applied by hospitals in preventing risks (Elhadi et al. 2020; Herbec et al. 2020).

Additionally, in the year “2 000”, injuries caused by sharps result in 6 000 cases of HBV, 16 000 cases of HCV and 1 000 cases of HIV infections in Africa (Mossburg et al. 2019). Considering the statistics most health workers in African countries are exposed to work related risks and those in Zimbabwe are not exempted. Healthcare workers in Zimbabwe are exposed

to different types of risks such as ergonomic, physical, chemical, biological and psychosocial risks due to various duties they perform at work (Chiwaridzo et al. 2018; Wilcox et al. 2020; Moyo et al. 2022). As a result, Muvonde and Driefontein Sanatorium rural hospitals employees are not exempted from risks affecting other healthcare workers of Zimbabwe since they perform similar duties performed by other hospital workers located in the same country with them. In Zimbabwe different laws such as the Public Health Act are used to create safe environments within workplaces including hospitals. However, bearing in mind the capabilities of work safety analysis as an occupational health and safety (OHS) technique, it is necessary to evaluate the work safety analysis procedures and their effectiveness in managing risks at rural hospitals in Chirumanzu District, Zimbabwe. The study focusses on identifying and assessing the risks associated with hospital work, analyzing the current safety procedures in place and assessing their effectiveness in managing these risks in order to develop a process-based model for effective and sustainable work safety analysis. The developed work safety analysis model narrows the gap to achieve sustainable development goals such as Sustainable Development Goal number 8.8 on protecting labour rights and promoting safe and secure working environments by 2030. The results of the research help to meet the requirements of National Development Strategy 1, Sustainable Development Goals and Vision 2030.

4.2 Materials and Methods

4.2.1 Study Design

The study design determines and controls methods used to collect data as well as data analysis techniques applied during the study. Descriptive cross-sectional design was applied for the study design because it combines both qualitative and quantitative approach which is known as triangulation to achieve the aims of the study objectives.

4.2.2 Study Areas

At Muvonde and Driefontein Sanatorium rural hospitals healthcare workers carry out their activities in different departments such as maternity ward, theatre, X-ray department, dental unit, pediatric ward, male ward, female ward, psychiatric unit, outpatient department (OPD) and optical unit. According to Tichapondwa (2012) Muvonde Hospital was a reformatory school and was turned into a full hospital with 140 bed capacity in 1962 and later a school of nursing was constructed. Construction and expansion of the hospital took place from the 1990s and the bed capacity increased to about 190 beds while the number of departments also increased. Driefontein Sanatorium Hospital which is well known for diagnosis of Tuberculosis

in Zimbabwe (Tichapondwa 2012), has a bed capacity of approximately 120 beds. The two hospitals were selected for the study in order to get a large population sample for the research hence, the results become valid. Location of Muvonde Hospital and Driefontein Sanatorium Hospital is shown in Figure 1.

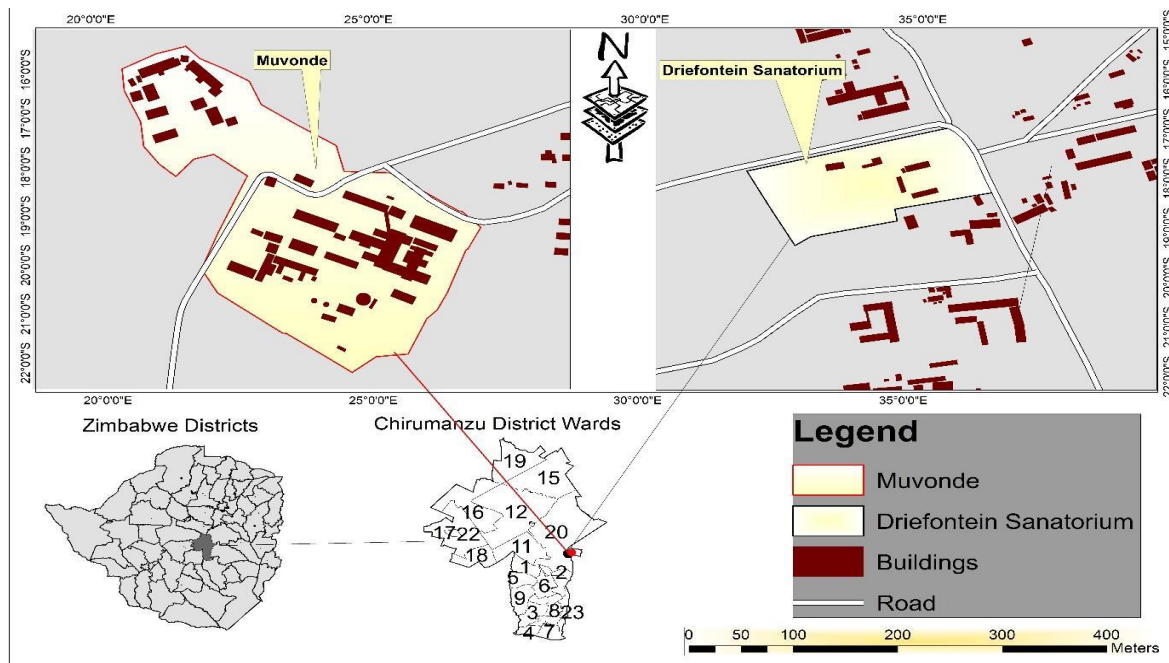


Figure 1: Map Showing Location of Muvonde Hospital and Driefontein Sanatorium Hospital.

Source: Authors

4.2.3 Study Population

The research targeted medical and paramedical staff located at different departments within the rural hospitals of Chirumanzu district to collect information on the causes, types, effects of risks and work safety analysis procedures used to combat risks. Questionnaire respondents include counsellors, nurses, technicians, anesthetist, hospital cleaners, dentist, radiologists, eye optician and physiotherapist. The target population also consist of interviewees notably the Human Resource Manager, Head of Environmental Health Department (Environmental Health Technician), Matron (Hospital Manager), Nurse in Charge, Medical Superintendent within each hospital and National Social Security Authority (NSSA) Officer as well as District Medical Officer of Chirumanzu District.

4.2.4 Sampling

The appropriate sample size for the questionnaire respondents was calculated using Yamane 1967's formula. As a result, after calculations were done a sample of 109 participants was derived from 150 healthcare workers at Muvonde Hospital and a sample of 68 questionnaire respondents was derived from 81 healthcare workers at Driefontein Sanatorium Hospital. Random sampling was used to select 109 questionnaire respondents at Muvonde and 68 respondents at Driefontein Sanatorium rural hospitals from each stratum as indicated in Table 1. Respondents for interviews were purposively selected.

Table 1: Sample size for questionnaire respondents

Hospital name	Number of health workers	Grouping of workers according to their occupation	Required sample size using Tara Yammane formula $n = \frac{N}{1 + N(e)^2}$	Sample size to represent each stratum $\frac{\text{Required Sample Size}}{\text{Population size}} \times \text{strata size}$	Total
Muvonde Hospital	150	Nurses 121, Counsellors 3, Laboratory technicians 4, Physiotherapist 3, Radiologic technologist 3, Anesthetist 2, Eye optician 1, Cleaners 12 and 1 Dentist.	109	Nurses 88, Counsellors 2, Laboratory technicians 3, Physiotherapist 2, Radio technologist 2, Anesthetist 1, Eye optician 1, Cleaners 9 and 1 Dentist.	109
Driefontein Sanatorium Hospital	81	Nurses 58, Counsellors 2, Laboratory technicians 4, Physiotherapist 1, Radiologic technologist 2, Anesthetist 2, Eye optician 1, Cleaners 10 and 1 Dentist.	68	Nurses 48, Counsellors 2, Laboratory technicians 3, Physiotherapist 1, Radiologic technologist 2, Anesthetist 2, Eye optician 1, Cleaners 8 and 1 Dentist.	68

Source: Field Survey (2023)

4.2.5 Data Collection

A questionnaire with both open format questions and closed format questions was used for the survey. The questionnaire was self-administered to reduce margin of error. The questionnaire collected information on demographic data, risks affecting healthcare workers, causes and impacts of risks affecting healthcare workers as well as methods used to manage these risks. Ten percent (10%) of study participants was used as a specimen size for pilot study. A pilot

study of the questionnaire was conducted to assess its applicability to the research. A pilot test was important since it helps the researcher to correct some feasibility and technical problems which were related to the questionnaire. This conformed to Matsa et al. (2015)'s assertion that pilot survey of a questionnaire requires 10% from the target population before it is used in the main survey. Following the pilot survey the questionnaire was administered to the healthcare workers selected at Muvonde and Driefontein Sanatorium rural hospitals in Chirumanzu district.

Furthermore, semi-structured interviews were done with purposively selected respondents notably Medical Superintendent, Hospital Manager (Matron), Human Resource Manager (HRM), Head of Environmental Health Department (Environmental Health Technician), Nurse in Charge within each hospital and National Social Security Authority (NSSA) inspector as well as District Medical Officer. Semi-structured interview guides were used to collect issues pertaining work-related risks affecting healthcare workers at Muvonde and Driefontein Sanatorium rural hospitals in Chirumanzu district. In addition to interviews, field observations were conducted. Throughout the research observations carried mainly focus on essential features of the workplace notably work environment, workers, work tasks performed and equipment used which are likely to cause risks at work. The researcher drafted an observational checklist to use during the observations. The behaviour of rural hospital workers when carrying out their risky procedures was observed. Moreover, secondary data was also used during the study. The use of secondary data sources to collect data has increased popularity recently especially in the health facilities research (Cole et al. 2018). Secondary data was collected from journals, textbooks, review articles, inspection reports, accidents reports and the internet. Secondary data was also obtained from weekly, monthly and annual reports within the hospitals.

4.2.6 Data Management and Analysis

Returned questionnaires were screened for quantitative data analysis. Quantitative data collected throughout the research was cleaned, coded and a summary of the data was produced based on the objectives of the study before entering the data into the Microsoft Excel Spreadsheet. The data was analysed by Microsoft Excel Spreadsheet to produce graphs and pie charts. The data was also exported from the Microsoft Excel Spread sheet to Statistical Package for Social Sciences version 25.0 for Chi-Square tests. Chi-Square test was performed to find the relationship between work experience and rating the effectiveness of measures used to

manage risks at Muvonde Hospital and Driefontein Sanatorium Hospital. The level of significance was set at $p = 0.05$ (5%) and 95% confidence interval was used to determine the relationship between probed factors. Content analysis was used for qualitative data analysis.

4.2.7 Ethical Considerations

In order for the researcher to carry out the research freely the researcher sought an ethical approval form from the Midlands State University. The District Medical Officer also provided the ethical approval letter for the researcher to be able to collect data using different data collection methods such as interviews, observations and questionnaires within the rural hospitals. The participants were informed that participation was voluntary.

4.3 Results and Discussion

4.3.1 Risks identified at the hospitals

Figure 2 indicates that different types of risks were identified at Muvonde and Driefontein Sanatorium rural hospitals. At Muvonde Hospital most (44%) of the healthcare workers indicated that they experienced ergonomic risks however at Driefontein Sanatorium Hospital majority (30.9%) reported biological risks. The second dominant risk reported at Muvonde hospital was physical risks (19.3%), followed by chemical risks (16.5%), psychosocial (11.9%) and biological risks (8.3%). At Driefontein Sanatorium Hospital the second dominant risk was ergonomic risks since it consists of (25%) of the study respondents, followed by physical risks (19.1%), chemical risks (14.7%) and psychosocial risks (10.3%). There are several reasons why majority of healthcare workers at Muvonde Hospital may have reported experiencing ergonomic risks. Firstly, healthcare work often involves repetitive tasks such as lifting and transferring patients, which can put strain on the muscles and joints. This repetitive motion can lead to musculoskeletal disorders over time. At Driefontein Sanatorium Hospital majority of the healthcare workers reported biological risks. Driefontein Sanatorium Hospital is a hospital where patients with various infectious diseases are treated. This increases the likelihood of healthcare workers coming into contact with infectious agents. The findings concur with Abiramalakshmi and Shree (2018) that healthcare workers are exposed to various occupational hazards notably chemical, biological, physical, ergonomic and psychosocial hazards.

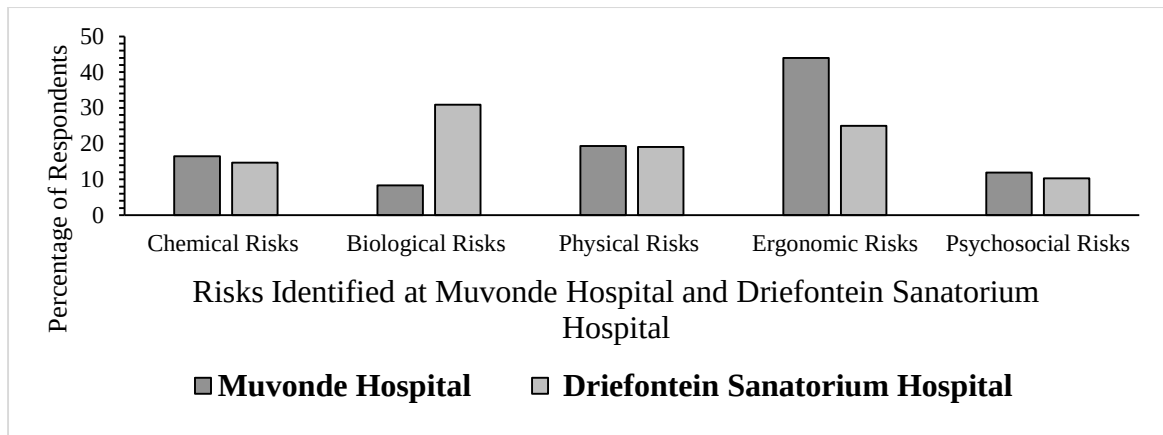


Figure 2: Types of Risks Identified at Muvonde Hospital and Driefontein Sanatorium Hospital
Source: Field Survey (2023)

4.3.2 Distribution of Risks Identified at the Hospitals

4.3.2.1 Distribution of Ergonomic Risks

Among the questionnaire respondents who designated ergonomic risks at Muvonde Hospital the majority (33.9%) reported standing for a long time, followed by repetitive work (20.2%), lifting patients (17.4%), manual therapy (11.9%), few (10.1%) participants reported uncomfortable position and very few (6.2%) pointed out the lifting of medical devices Figure 3. However, at Driefontein Sanatorium Hospital among healthcare workers who experienced ergonomic risks most (27.9%) revealed standing for a long time followed by lifting of patients (25%), repetitive work (17.6%), manual therapy (11.8%), uncomfortable positions (11.8%) and the least (5.9%) specified lifting of medical devices. These findings suggest that both hospitals share similar working conditions that require employees to stand for extended periods of time due to the nature of their work. The majority of the respondents reported standing for a long time as one of the main ergonomic risks they encounter. Healthcare professionals, such as nurses and doctors, often spend long hours on their feet attending to patients. Prolonged standing can lead to fatigue, foot problems and lower back pain. It can also increase the risk of developing varicose veins and circulatory problems. Healthcare workers stand for a long time since they need to be constantly vigilant to their patients' needs (Perlini et al. 2020).

4.3.2.2 Distribution of Physical Risks

Most (28.4%) of the healthcare workers designated sharp objects followed by extreme temperatures (hot/cold) (24.8%), noise (22%), slips and falls (15.6%), radiation (5.5%) and the least (3.7%) specified electric shock as physical risks at Muvonde hospital. Driefontein Sanatorium Hospital results shown in Figure 3 designated that the majority (30.9%) reported sharp objects, followed by extreme temperatures (hot/cold) (26.5%), noise (20.6%), slips and falls (13.2%), radiation (5.9%) and very few (2.9%) indicated electric shock. Most of the healthcare workers at Muvonde Hospital and Driefontein Sanatorium Hospital reported sharp injuries. Healthcare workers often come into contact with sharp objects such as needles, scalpels, and razor blades during various medical procedures. These objects can cause accidental injuries if not handled properly or if there is a lack of proper safety measures in place.

The use of sharp objects such as needles and scalpels in hospitals is common due to their ability to make precise incisions and punctures and if they are not handled properly they cause injuries and infection (Cui et al. 2018). During the study conducted at Muvonde and Driefontein Sanatorium rural hospitals, it was found that only a small number of respondents reported electric shock as a physical risk affecting healthcare workers. This implies that the hospitals have strict safety protocols in place to prevent such electric shock incidents. These protocols include regular maintenance and inspection of electrical equipment, proper grounding of electrical systems, and the use of safety devices such as circuit breakers and residual current devices. Overall, the low incidence of reported electric shocks can be attributed to the combination of strict safety protocols, proper training, and the availability of safer medical equipment.

4.3.2.3 Distribution of Biological Risks

Figure 3 shows that most (39.4%) of the respondents reported blood spillage followed by breathing contaminated air (17.4%), vomitus, sputum and urine (16.5%), contact with wounds was reported by (15.6%) and the least (11%) reported viral infections at Muvonde Hospital. Blood spillage was reported by majority of the healthcare worker because blood spillage can occur during medical procedures such as surgeries, injections, or venipuncture, where accidental punctures or cuts may lead to the release of blood. Additionally, healthcare workers may come into contact with blood through handling contaminated materials or equipment. Furthermore, inadequate training or lack of adherence to proper infection control practices can

contribute to the occurrence of blood spillage incidents. The findings correspond with a study carried by Rai et al. (2021) which designates that occupational hazards such as biological hazards prevail among healthcare workers in low and middle-income countries.

At Driefontein Sanatorium Hospital majority (31%) revealed breathing contaminated air, followed by blood spillage (25%), viral infections (16%), vomitus, sputum or urine of patients (15%) and few (13%) of the participants reported contact with wounds. Breathing contaminated air was high at Driefontein Sanatorium Hospital. Driefontein Sanatorium Hospital often have a high concentration of patients with infectious diseases, leading to the release of airborne pathogens. These pathogens can be transmitted through respiratory droplets or aerosols, putting healthcare workers at risk of inhaling them. Furthermore, the use of certain medical procedures or treatments, such as nebulizers or aerosol-generating procedures, can generate fine particles that remain suspended in the air for extended periods, increasing the risk of exposure for healthcare workers. The high concentration of infectious patients, inadequate ventilation systems, and the use of certain medical procedures expose healthcare workers to contaminated air (Shabani et al. 2023a, b, c, d, e).

4.3.2.4 Distribution of Chemical Risks

Concerning chemical risks identified at Muvonde Hospital majority (29%) specified sanitizers, followed by cleaning detergents (24%), latex gloves (20%), anaesthetic gases and sterilizing agents (14%) and mercury (13%). Regarding chemical risks acknowledged at Driefontein Sanatorium Hospital most (28%) indicated sanitizers, followed by cleaning agents (21%), latex gloves (19%), anaesthetic gases and sterilizing recorded (19%) and mercury (13%). Results indicated that although sanitizers are important in preventing the spread of infections, they contain high levels of alcohol which can expose workers to risks such as skin irritation. The high percentage of respondents highlighting sanitizers as a risk may be attributed to the fact that they are frequently used in hospitals and healthcare facilities, increasing the likelihood of accidents or incidents related to their use. According to Kavenga et al. (2021) sanitizers used to prevent Covid-19 infection among healthcare workers in Zimbabwe contain alcohol which causes skin irritation. Cleaning detergents are essential for maintaining cleanliness and preventing the spread of pathogens in healthcare environments. However, they often contain strong chemicals that can be harmful if not used correctly or if there is inadequate ventilation during their application. Latex gloves are commonly used in healthcare settings to protect both patients and healthcare workers from potential infections. However, some individuals may

develop allergies or sensitivities to latex proteins present in these gloves. Allergic reactions can range from mild skin irritation to severe anaphylaxis, which can be life-threatening.

4.3.2.5 Distribution of Psychosocial Risks

Figure 3 designated that at Muvonde Hospital most (33%) of the healthcare workers who participated during the study reported dealing with severely ill patients, followed by overwork (26.6%), verbal abuse (16.5%), fatigue (11.9%), physical abuse (6.4%) and the least (5.5%) of the study proportion indicated that they experienced problems with the top management. However, at Driefontein Sanatorium Hospital majority (39.7%) of the questionnaire respondents specified dealing with severely ill patients, followed by overwork (26.5%), verbal abuse (13.2%), fatigue (11.8%), physical abuse (4.4%) and few (4.4%) of the study participants revealed problems with the top management. The findings within the two hospitals suggests that healthcare professionals are vulnerable to emotional and psychosocial. Working with severely ill patients can be emotionally challenging for healthcare workers. Witnessing the suffering and deterioration of patients can take a toll on their mental well-being.

The constant exposure to pain, distress, and loss can lead to feelings of helplessness, sadness, and even guilt. This emotional burden can contribute to the development of psychosocial risks such as anxiety, depression and burnout. Caring for severely ill patients often involves making difficult decisions and dealing with complex medical situations. Healthcare workers may face ethical dilemmas, such as deciding on appropriate treatment options or end-of-life care. These decisions can be emotionally draining and may lead to moral distress, which is known to increase the risk of psychological harm. The distribution of psychosocial risks obtained during the study goes hand in hand with results obtained by Chingono et al. (2022) which reveals that during the Covid-19 pandemic healthcare workers were exposed to psychological distress.

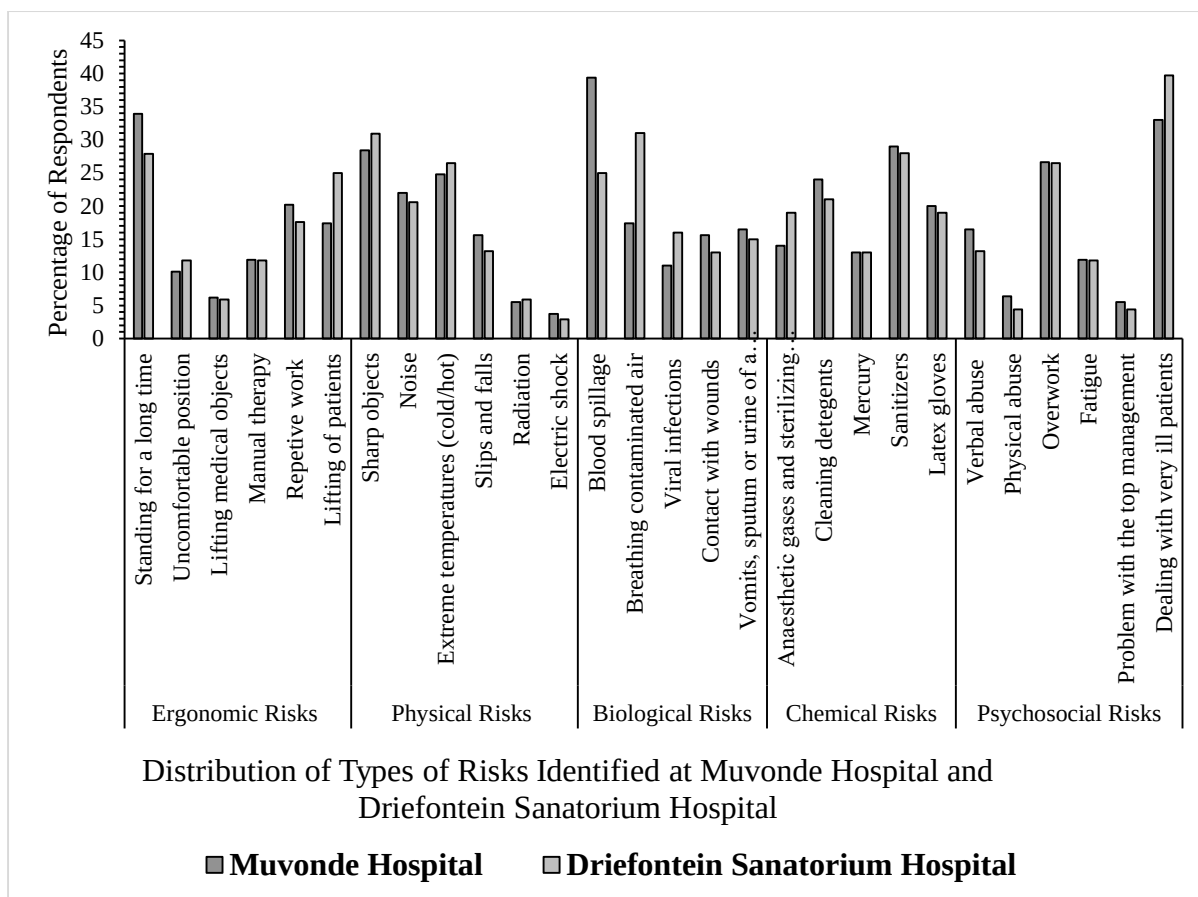


Figure 3: Distribution of Types of Risks Identified at Muvonde Hospital and Driefontein Sanatorium Hospital

Source: Field Survey (2023)

4.3.3 Causes of Risks Affecting Healthcare Workers at Muvonde Hospital and Driefontein Sanatorium Hospital

Results in Figure 4 indicated the causes of risks which were reported by the healthcare workers. At Muvonde Hospital most (20.2%) respondents reported pressure due to high workload and at Driefontein Sanatorium Hospital (25%) of the healthcare workers reported pressure due to high workload. To support this, the Matron at Muvonde Hospital indicated that, due to increase of pressure nurses sometimes run in passages hurrying with the results of a patient which they collect from the medical laboratory so that they submit them to the doctor in time however, this result to slips and falls and sometimes dislocation of any part of the leg occurs. The reasons behind these reported risks are multifaceted. Firstly, the high workload experienced by healthcare workers can be attributed to various factors such as understaffing, increased patient load, and limited resources. When healthcare facilities are understaffed, it puts immense pressure on the existing work force to handle a larger number of patients and tasks within a

limited timeframe. This increased workload can lead to fatigue and stress among healthcare workers, making them more prone to accidents and errors. The findings concur with Alenazi et al. (2020) which indicates pressure and high workload during the Covid-19 pandemic expose healthcare workers to anxiety in Saudi Arabia.

Shortage of labour was reported by (17.4%) at Muvonde Hospital and at Driefontein Sanatorium Hospital was signified by (16.2%) of the study participants as a factor which expose healthcare workers to risks. A shortage of labour in healthcare settings can lead to various challenges and risks for healthcare workers. When there is a lack of sufficient staff, healthcare workers may be required to work longer hours or take on additional responsibilities to compensate for the shortage. This can result in increased fatigue and stress levels among healthcare workers, which can negatively impact their physical and mental well-being. With fewer staff members available to handle patient care, healthcare workers may have to attend to a higher number of patients than they can adequately manage. This can compromise the quality of care provided and increase the likelihood of errors or omissions in treatment. The results of the study are in line with the findings of Dzinamarira and Mususku (2021) which indicates that there is shortage of workers in Zimbabwe's health sector due to brain drain.

According to (14.7%) respondents at Muvonde Hospital and (11.8%) at Driefontein Sanatorium Hospital risks affecting healthcare workers occur as a result of inadequate equipment. During the interview the Environmental Health Technician at Driefontein Sanatorium hospital indicated that lack of proper equipment compromises the safety and well-being of healthcare workers. The Environmental Health Technician also emphasize that working with inadequate equipment adds additional stress to healthcare workers' already demanding jobs. The Environmental Health Technician go on to say when healthcare workers constantly work with limited resources, it can lead to frustration, exhaustion and burnout. However, this does not affect the well-being of healthcare workers only but also has implications for patient care quality. Results suggests that there is a concern among healthcare workers regarding the availability and quality of equipment necessary for their safety and well-being. Inadequate equipment can pose various risks to healthcare workers, compromising their ability to provide effective care and potentially leading to adverse outcomes. Inadequate equipment, such as personal protective equipment (PPE), can increase the risk of healthcare-associated infections. It is important to note that the perception of inadequate equipment among respondents does not necessarily reflect the actual state of equipment availability or quality in these hospitals. However, it highlights the need for healthcare institutions to prioritize the

provision of adequate resources and equipment to ensure the safety and well-being of their healthcare workers. The findings correspond with findings of Gage and Bauhoff (2020) which designates that low-income countries are struggling to protect healthcare workers due to shortage of equipment.

Age was indicated as a factor which causes risks affecting healthcare workers by (3.7%) at Muvonde hospital and at Driefontein Sanatorium hospital it was reported by (2.9%) respondents. Older healthcare workers may experience physical limitations that can increase their vulnerability to workplace hazards. As individuals age, they may encounter a decline in strength, agility and overall physical fitness. These factors can impede their ability to respond quickly and effectively in emergency situations or when faced with physically demanding tasks. Consequently, older healthcare workers may be at a higher risk of injury or accidents compared to their younger counterparts. During the interviews, the Nurse-in-Charge indicated that, young healthcare workers are the ones who are frequently reporting needle stick injuries because they ignore use of gloves when handling sharps and they do not handle sharps with care even when disposing them off. There are several reasons, firstly, young healthcare workers may lack experience and proper training in handling sharps. As they are new to the field, they may not have developed the necessary skills and knowledge to handle sharps safely. This can lead to a higher risk of needle stick injuries as they may not be aware of the correct procedures or precautions to take. Secondly, young healthcare workers may underestimate the potential risks associated with needle stick injuries. They may have a sense of invincibility or believe that such accidents only happen to others. This mind set can lead to complacency and a disregard for safety measures such as using gloves or handling sharps with care.

Results shown in Figure 4 indicated that some (10.1%) of the respondents at Muvonde Hospital and (4.4%) of the study participants at Driefontein Sanatorium Hospital reported gender as a factor which determines the risks which affect healthcare workers. Healthcare settings are often characterized by long working hours, high levels of stress, and exposure to infectious diseases. These factors can disproportionately affect individuals based on their gender due to biological differences or societal expectations. For instance, women may face additional challenges related to pregnancy and maternity leave, while men may experience pressure to conform to traditional masculine ideals of strength and resilience.

In addition, (6.4%) of the participants at Muvonde Hospital and (8.8%) of the healthcare workers at Driefontein Sanatorium Hospital specified that poor training exposes healthcare

workers to risks. The Nurse in Charge at Driefontein Sanatorium Hospital highlighted that safety training performed at the hospital are poor and they mainly focus on safety of patients ignoring workers and this exposes workers to work-related risks because they will put much attention on patient safety ignoring their well-being. One reason why poor training can expose healthcare workers to risks is that they may not possess the necessary knowledge and skills to handle potentially dangerous situations. In a healthcare setting, there are numerous hazards and potential risks that workers may encounter, such as handling infectious materials, operating complex medical equipment, or dealing with aggressive patients. Without proper training, healthcare workers may not be equipped with the appropriate techniques and protocols to mitigate these risks effectively. This lack of preparedness can lead to accidents, injuries, or even the transmission of infections.

Negative safety behaviour was indicated as a factor which causes risks by (6.4%) and (8.8%) at Muvonde hospital and Driefontein Sanatorium Hospital respectively as shown in Figure 4. Negative safety behaviour can manifest in various ways within a hospital setting. Some examples include failure to adhere to proper hand hygiene practices, disregarding infection control protocols, not following medication administration guidelines, inadequate use of personal protective equipment (PPE), and failure to report incidents or near misses. These behaviours can undermine the overall safety culture within a hospital and increase the potential for harm to patients and healthcare workers. This is supported by the Environmental Health Technician (EHT) at Muvonde Hospital that healthcare workers are affected with risks due to negative safety behaviour. The EHT reveals that some healthcare workers did not wear full PPE/C which exposed them to risks. During observations negative safety behaviour was noticed as shown by Plate 1 which shows a healthcare worker who did not wear full PPE/C. The results obtained during the study coincides with the findings obtained by Gülen et al. (2022) which indicates that safety behaviour affects nurses' perceptions towards risks within the hospital.



Hands of a healthcare worker
without gloves.

Plate 1: A healthcare worker who did not wear full PPE/C

Source: Field Survey (2023)

Poor management was indicated by (8.3%) as a factor which expose healthcare workers to risks at Muvonde Hospital while (7.4%) of the respondents at Driefontein Sanatorium Hospital reported poor management. This clearly indicates that, poor management in healthcare facilities can expose healthcare workers to various risks. Insufficient training and support for staff is another indicator of poor management in healthcare facilities. Healthcare workers need ongoing training and professional development opportunities to stay updated with the latest medical advancements and best practices. When these opportunities are lacking, it can hinder their ability to provide high-quality care and expose them to unnecessary risks. Ineffective policies and procedures also contribute to poor management in healthcare settings. Policies and procedures should be regularly reviewed and updated to reflect current evidence-based practices and ensure the safety of both patients and healthcare workers. When policies are outdated or not followed consistently, it can lead to confusion, errors, and compromised workers' safety (Shabani et al. 2023a, b, c, d, e). This was supported by the EHT at Muvonde Hospital that hospital risks which affect workers occur due to poor implementation of occupational safety and health guidelines by the top management to protect workers. This suggests that there may be issues with management practices at these healthcare facilities that need to be addressed in order to ensure the safety and well-being of workers. The findings are in line with the results obtained by Muthuri et al. (2020) which illustrates that poor management demotivates healthcare workers in the East African Community and this results in psychosocial risks.

Moreover, at Muvonde Hospital (5.5%) and (5.9%) at Driefontein Sanatorium Hospital of the questionnaire respondents reported that the department the worker is allocated is among the factors which causes risks which affect healthcare workers. The allocation of healthcare workers to different departments within a hospital or healthcare facility can have various implications for their safety and well-being. Different departments may have distinct characteristics and working conditions that can pose specific risks to the workers involved. This was supported by the Matron at Driefontein Sanatorium Hospital that healthcare workers who work in the surgical wards such as male and female wards are mostly affected with musculoskeletal disorders because they are mainly involved in repositioning ill patients in beds and pushing patients on wheelchairs to bathrooms and toilets. This suggests that the department the healthcare workers operate can have an impact on their safety and well-being.

Figure 4 also depicts that some respondents (7.3%) and (8.8%) at Muvonde Hospital and Driefontein Sanatorium Hospital respectively indicated that using PPE/C for a long time expose healthcare workers to risks. One possible concern is related to the discomfort and physical strain that can arise from wearing PPE/C for long durations. PPE/C typically includes items such as masks, gloves, gowns, and face shields, which can be cumbersome and restrictive when worn for extended periods. PPE/C can lead to issues such as difficulty in breathing, skin irritation, and musculoskeletal discomfort. Another potential concern is the increased risk of contamination or infection due to prolonged use of PPE/C. While PPE/C is designed to protect healthcare workers from exposure to pathogens, there is a possibility that prolonged use without proper maintenance or replacement could compromise its effectiveness. To support this, the District Medical Officer (DMO) indicated that outbreaks of pandemics such as Covid-19 cause healthcare workers to wear full PPE/C for a long time; however, full PPE/C traps heat inside and exposes workers to exhaustion. The DMO also indicated that some healthcare workers are affected with allergy and skin irritation due to prolonged use of latex gloves. The findings harmonize with the results obtained by Jose et al. (2021) which illustrates that frontline healthcare workers who wear personal protective equipment/clothe for a long time during the Covid-19 pandemic were affected with various health problems and skin damages. However, it is worth noting that while these concerns are valid, they should be balanced against the crucial role that PPE/C plays in protecting healthcare workers from infectious diseases. PPE/C is a vital component of infection prevention and control measures, especially during outbreaks or pandemics.

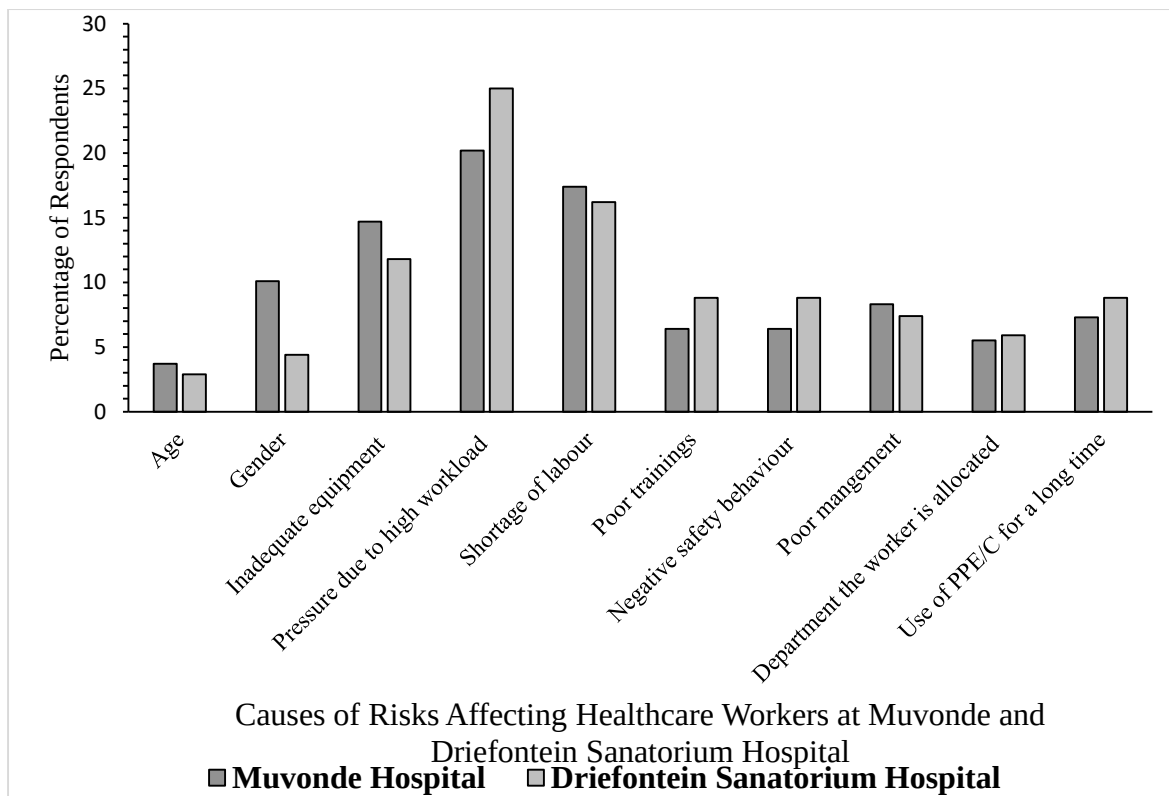


Figure 4: Causes of risks affecting healthcare workers at Muvonde Hospital and Driefontein Sanatorium Hospital.

Source: Field Survey (2023)

During the study questionnaire respondents (healthcare workers) were requested to indicate the most strenuous work shift between night shift and day shift. Majority (84.4%) of healthcare workers at Muvonde Hospital indicated that the night shift was more strenuous while the minority (15.6%) reported day shift as strenuous shift. Results in Figure 5 also indicate that most (83.8%) of the participants at Driefontein Sanatorium Hospital revealed that night shift is strenuous whereas (16%) pointed out that day shift is strenuous. The preference for night shift being perceived as more strenuous by the majority of healthcare workers can be attributed to several factors. Firstly, working during the night disrupts the natural sleep-wake cycle, leading to sleep deprivation and fatigue. The human body is naturally programmed to be awake during daylight hours and asleep during night time. Therefore, working against this natural rhythm can result in increased tiredness and reduced alertness during the night shift. Working during the night can also impact social and personal life. Night shifts often require healthcare workers to sacrifice time with family and friends, as well as miss out on important social events or activities that typically occur during day time hours. This disruption in personal life can further contribute to the perceived strain of working the night shift. The findings are in line with the

findings of Cheng et al. (2020) which states that night shift is associated with rigorous tasks which expose hospital workers to different stresses.

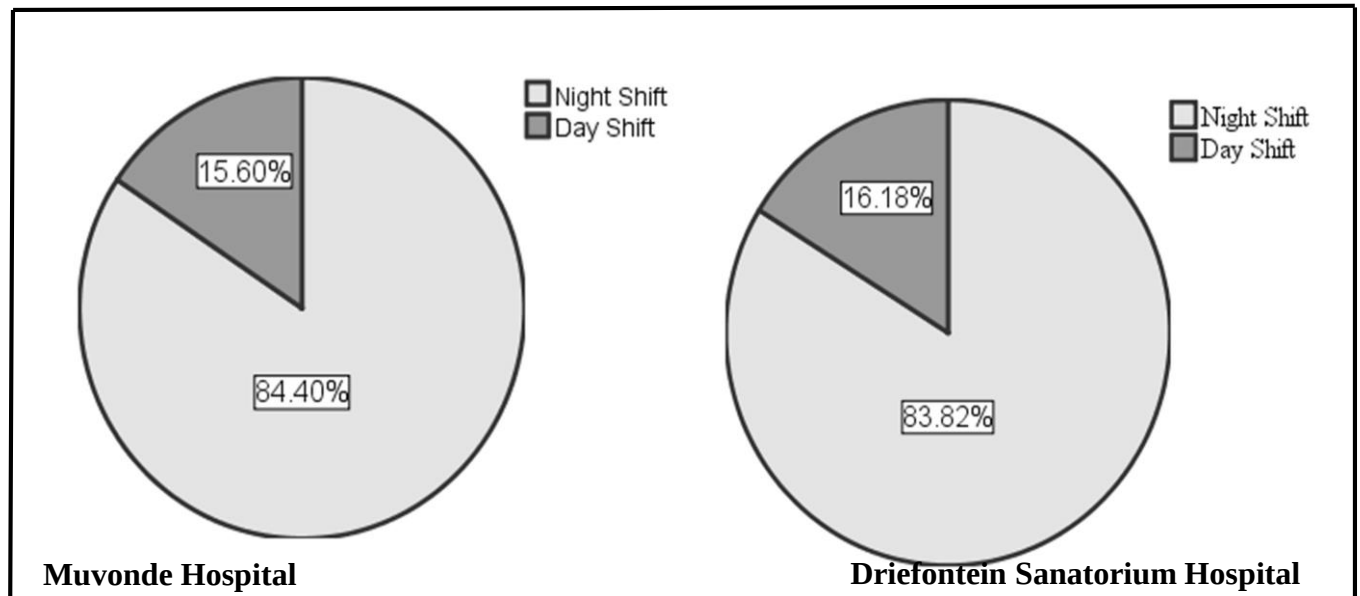


Figure 5: Strenuous work shift between night shift and day shift at Muvonde Hospital and Driefontein Sanatorium Hospital

Source: Field Survey (2023)

4.3.4 Effects of Risks Affecting Healthcare Workers at Muvonde Hospital and Driefontein Sanatorium Hospital

4.3.4.1 Effects of Ergonomic Risks

Regarding effects of ergonomic risks reported at Muvonde Hospital most (51.4%) specified back injuries, followed by neck pain (21.1%), shoulder discomfort (16.5%) and the least (11%) muscular strain as shown by Figure 6. At Driefontein Sanatorium Hospital on effects of ergonomic risks most (57.4%) identified back injuries followed by neck pain (19.1%), shoulder discomfort (13.2%) and few (10.3%) reported muscular strain. According to the data provided in Figure 6, back injuries were the most commonly reported ergonomic risk at Muvonde hospital and Driefontein Sanatorium Hospital. This is not surprising considering the frequent lifting, transferring, and repositioning of patients that health care workers are required to perform. These activities can put a significant strain on the lower back, leading to acute or chronic injuries. Healthcare professionals frequently have to adopt awkward postures while performing their duties. This can include bending, twisting, reaching, or maintaining static positions for extended periods. These postures can place stress on the spine and surrounding muscles, leading to back pain and injuries over time. The findings concur with the findings of

Chiwaridzo et al. (2018) at Parirenyatwa Group of hospitals which denotes that back injuries were mostly reported by healthcare workers as a musculoskeletal disorder which affect them due to ergonomic risks.

4.3.4.2 Effects of Biological Risks

More than a quarter (29.4%) of the respondents revealed that they experienced Covid-19, tuberculosis (6.4%), hepatitis B/C (3.7%) and the minority (1.8%) specified HIV/AIDS at Muvonde Hospital Figure 6. Nevertheless, most (58.7%) of the healthcare workers who participated during the study at Muvonde Hospital indicated that they never experienced any of the infections related to biological risks. At Driefontein Sanatorium Hospital about (33.8%) specified that they experience Covid-19 virus, tuberculosis (25%), hepatitis B/C (13.2%) and few (1.5%) reported that they were exposed to HIV/AIDS. Nevertheless, (26.5%) of the participants pointed out that they experienced none of the mentioned infections and they did not indicate other types of infections which affect them at Driefontein Sanatorium Hospital. The high percentage of respondents reporting Covid-19 as their experienced disease is not surprising considering the ongoing global pandemic caused by the novel coronavirus (SARS-CoV-2). Covid-19 is a highly contagious respiratory illness that spreads through respiratory droplets when an infected person coughs, sneezes, or talks. It has affected millions of people worldwide since its emergence in late 2019. Frontline healthcare workers were exposed to Covid 19 to a larger extent due to their close contact with infected patients (Moyo et al. 2022). However, very few respondents reported HIV/AIDS and this indicates that healthcare workers are trained how to protect themselves from exposure to HIV/AIDS.

4.3.4.3 Effects of Physical Risks

Among those respondents who reported effects of physical risks at Muvonde Hospital, the majority (57.8%) experienced needle stick injuries, followed by cuts/pricks (19.3%), influenza consists of (14.7%) and (8.3%) reported cramps as illustrated by Fig. 6. Additionally, over half (52.9%) of the study participants at Driefontein Sanatorium hospital experienced needle stick injuries, followed by cuts/pricks (27.9%), influenza (11.8%) and the least (7.4%) reported cramps. The reasons for such a high incidence of needle stick injuries at Muvonde and Driefontein Sanatorium hospital could be due to several factors, including that, needle stick injuries are commonly associated with healthcare settings, especially hospitals, where medical procedures involving the use of needles are frequently performed. These procedures include blood draws, injections, and intravenous therapy, among others. Due to the nature of these

procedures and the fast-paced environment in hospitals, healthcare workers may inadvertently experience accidental needle stick injuries. Moreover, inadequate training and lack of adherence to safety protocols can contribute to the occurrence of needle stick injuries. Healthcare professionals may not receive sufficient training on proper handling and disposal of needles, or they may fail to follow established safety guidelines due to time constraints or other factors. This can increase the risk of accidental needle sticks and subsequent injuries. The results tallies with Sithole et al. (2018) that needle stick injuries increase in Harare city due to poor training which affects the knowledge of the healthcare workers negatively on how to handle need sticks.

4.3.4.4. Effects of Chemical Risks

Majority (39.4%) of the study participants at Muvonde Hospital indicated that they experienced skin irritation, followed by allergies (33.9%), pulmonary irritation (11.9%), asthma (2.8%), birth defects (1.8%) and (10.1%) never experienced chemical risks. Figure 6 indicated that most (48.5%) of the healthcare workers who participated during the study at Driefontein Sanatorium hospital reported that they experienced skin irritation, followed by allergies (26.5%), pulmonary irritation (17.6%), asthma (4.4%) and (2.9%) never experienced any chemical risks. The exposure of healthcare workers to various chemicals used in hospitals such as disinfectants, cleaning agents and sterilizing solutions expose them to skin irritation. Skin irritation can manifest as redness, itching, or as rash, and it is often a result of an allergic reaction or sensitivity to a particular substance. The study conducted at Muvonde Hospital revealed that the most commonly reported effects of chemical risks among the participants were skin irritation and allergies. Pulmonary irritation, asthma, and birth defects were also reported but to a lesser extent. It is important to note that individual susceptibility and the nature of chemical exposures can vary, leading to different outcomes among the study participants. Chemicals can cause skin irritation and allergic reactions when they come into contact with the skin and or are inhaled (Wilcox et al. 2020). The limited number of healthcare workers reporting no experience of risks related to chemicals at Muvonde hospital and Driefontein Sanatorium Hospital can be attributed to factors such as the nature of their work and lack of knowledge on chemical risks.

4.3.4.5 Effects of Psychosocial Risks

Regarding psychosocial risks at Muvonde hospital majority (47.7%) experienced stress, followed by fatigue (20.2%), anxiety (15.6%), insomnia (3.7%), persistent tiredness (2.8%)

and BP (Blood Pressure) (0.9%). However, (9.2%) specified that they never experienced any health effects related to psychosocial risks as indicated by Figure 6. At Driefontein Sanatorium Hospital most (45.6%) experienced stress, followed by fatigue (23.5%), anxiety (16.2%), insomnia (5.9%) and persistent tiredness was reported by (2.9%) of the participants. Very few (1.5%) reported blood pressure and almost (4.4%) pointed out that they never experience any effect related to psychosocial risks at Driefontein Sanatorium Hospital as designated by Figure 6. Stress was reported most of the healthcare workers at Muvonde Hospital and Driefontein Sanatorium Hospital. Stress is a common psychosocial risk in healthcare settings due to the demanding nature of the work and the high levels of responsibility involved. Healthcare professionals often face heavy workloads, long working hours, and challenging situations that can contribute to elevated stress levels. Factors such as dealing with critically ill patients, making life-or-death decisions, and managing time constraints can all contribute to increased stress among hospital staff.

Anxiety and fatigue were reported by healthcare workers because fatigue and anxiety can arise from a combination of physical and mental exhaustion due to prolonged periods of work without adequate rest or breaks. Healthcare professionals often work long shifts, including night shifts, which can disrupt their sleep patterns and lead to fatigue. Additionally, the demanding nature of their work can require constant focus and attention, further contributing to fatigue and anxiety. Healthcare professionals may experience anxiety due to various factors such as high job demands, fear of making mistakes or causing harm to patients, and dealing with emotionally challenging situations. The results tallies with the findings obtained by Chingono et al. (2022) that healthcare workers in Zimbabwe are exposed to effects of psychosocial risks such as anxiety, stress, BP and fatigue.

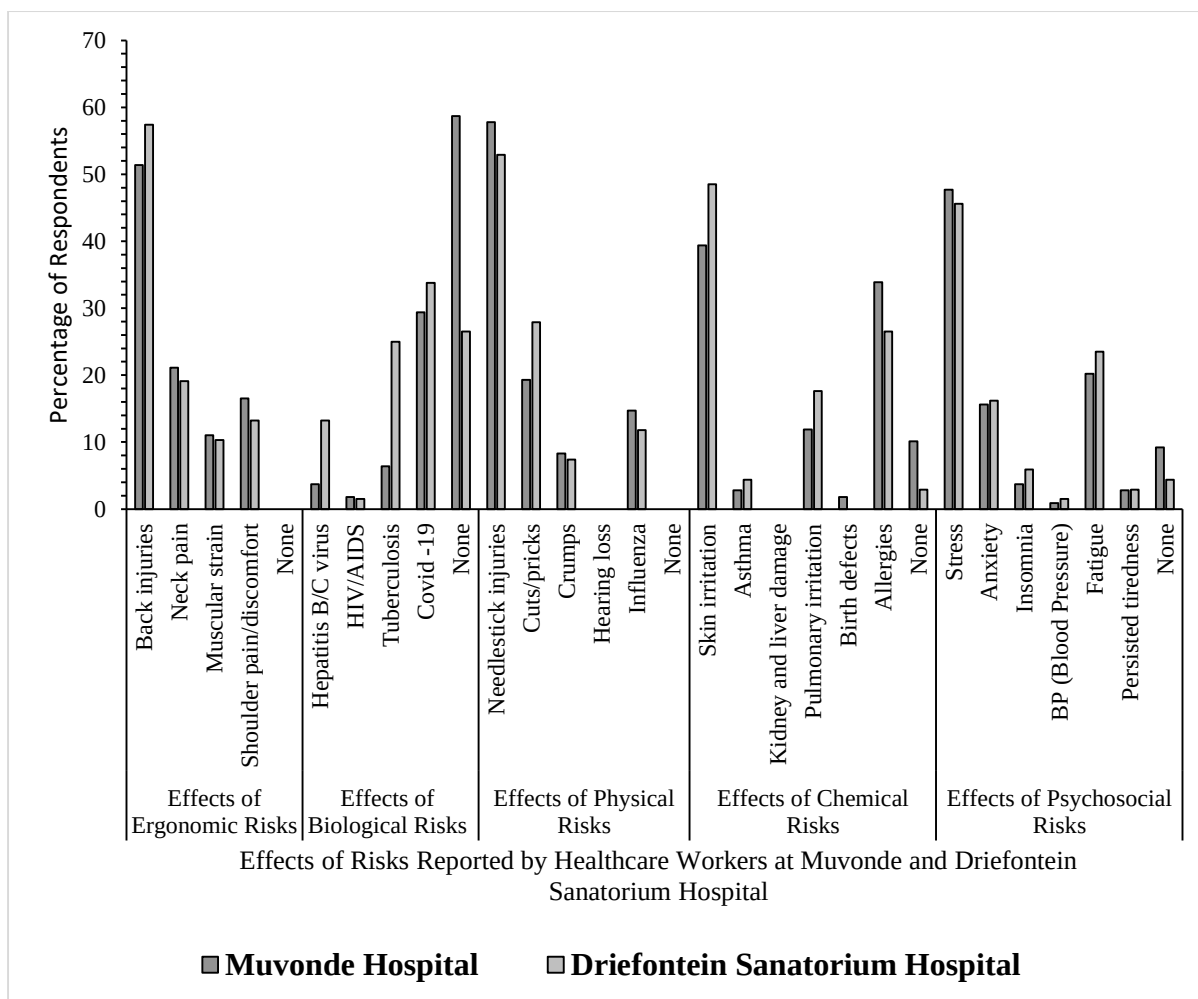


Figure 6: Effects of risks affecting healthcare workers at Muvonde Hospital and Driefontein Sanatorium Hospital

Source: Field Survey (2023)

4.3.5 Assessment of Risks Identified at the Hospitals

Section C of the questionnaire examines levels of physical, chemical, ergonomic, psychosocial and biological risks affecting health care workers at Muvonde hospital and Driefontein Sanatorium hospital using the risk score matrix. Figure 7 shows levels of risks which were marked by questionnaire respondents at Muvonde hospital and Driefontein Sanatorium hospital. Figure 7 indicated that the majority of the healthcare who participated during the study at Muvonde Hospital and Driefontein Sanatorium Hospital reported that the level of risks was at the medium, followed by high, low and very high. This suggests that they perceived the risks associated with their work to be moderate. Following the medium level, the next most commonly reported level of risk was high, indicating that some healthcare professionals perceived their work to involve significant risks. The least commonly reported level of risk was

low, suggesting that fewer healthcare professionals believed their work to be associated with minimal risks. Interestingly, very few respondents indicated that the level of risks identified at Muvonde Hospital and Driefontein Sanatorium Hospital was very high, implying that only a small number of healthcare professionals perceived their work to involve extremely high levels of risk.

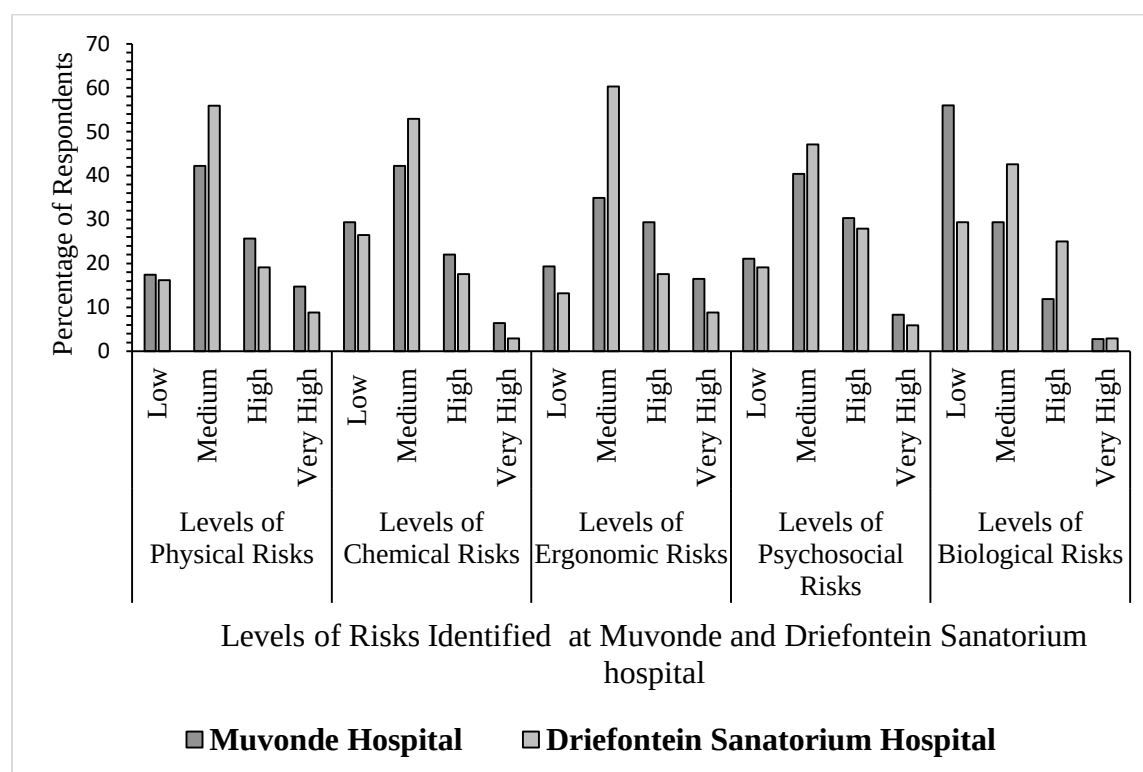


Figure 7: Physical, chemical, ergonomic, psychosocial and biological risks level at Muvonde Hospital and Driefontein Sanatorium hospital by risk score matrix

Source: Field Survey (2023)

The results illustrated in Table 2 shows that the Chi Square value obtained was 0.000 and is less than 0.05. In this scenario we accept H_1 and reject H_0 . This reveals that there is a significant association between the level of risks affecting healthcare workers at the hospital and the department of the healthcare worker at the hospital. Factors such as the nature of the work performed, physical environment, and level of training contribute to varying risk levels among different departments. Understanding these risks is essential for implementing targeted interventions and preventive measures to protect healthcare workers. Healthcare workers in different departments may have different levels of training or access to protective equipment, which could impact their exposure to risks. The results obtained during the study are in line

with the findings of Faroux et al. (2019) which indicate that there is a relationship between the department of the healthcare workers and level of exposure to risks.

Table 2: Chi-Square Tests Between Department of the healthcare worker at the hospital * Level of Risks Affecting healthcare worker at the hospital

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.872E2 ^a	45	.000
Likelihood Ratio	254.582	45	.000
N of Valid Cases	109		

a. 60 cells (93.8%) have expected count less than 5. The minimum expected count is .15.

Source: Field Survey (2023)

4.3.6 Methods Used to Manage Risks at the Hospitals

4.3.6.1 Personal methods used by healthcare workers to manage risks

The findings of this study indicated some positive and negative methods used by healthcare workers at Muvonde Hospital and Driefontein Sanatorium Hospital to manage risks. Of all the positive personal methods indicated by healthcare workers at Muvonde Hospital majority (29.4%) of the respondents reported personal hygiene for example washing hands after performing procedures, medical examinations (14.7%) and request assistance from their colleagues when handling both admitted patients and outpatients was revealed by (13.8%), adjustment of work equipment (19.3%) Figure 8. At Driefontein Sanatorium Hospital majority (33.8%) reported personal hygiene such as washing hands after performing procedures, (19.1%) indicate adjustment of equipment notably adjusting heights of beds, (16.2%) revealed medical examination and (11.8%) they request their colleagues to assist them when handling inpatient and outpatient within the hospital. Findings indicate that healthcare workers commonly employ personal methods to manage risks, with one of the most frequently reported practices being personal hygiene, such as washing hands after procedures. These findings hold significant importance as proper personal hygiene practices play a crucial role in preventing the spread of infections within healthcare settings. Hand hygiene, in particular, is essential for reducing the transmission of pathogens between patients and healthcare workers. Personal hygiene serves as a vital component in infection prevention within hospitals (Shabani et al. 2023a, b, c, d, e).

At Muvonde Hospital (11.7%) pointed out that they use tablets that induce sleep, very few (4.6%) indicated excessive smoking and (6.4%) of the healthcare workers specified that they take excessive alcohol to manage the risks which affect them at work. Of all the participants who indicated negative personal methods at Driefontein Sanatorium Hospital few (10.3%) specified that they develop the habit of taking sleeping tablets, very few (4.4%) reported use of excessive smoking which is also similar to (4.4%) of the healthcare workers who reported that they take excessive alcohol in order to manage risks. The study also sheds light on certain harmful practices employed by healthcare workers to mitigate risks, such as the use of sleep-inducing tablets, excessive smoking, or alcohol consumption. These behaviors can have long term detrimental effects on their health. This concurs with the study carried out in the United Kingdom indicated that 59% of healthcare workers use alcohol and 41% are addicted to drugs in order to manage emotional stress (Minikumary et al. 2023). However, using negative methods such as taking sleep-inducing tablets, excessive smoking or alcohol consumption can be detrimental to their health in the long run. Therefore, it is important for healthcare workers to adopt positive methods to manage the risks effectively.

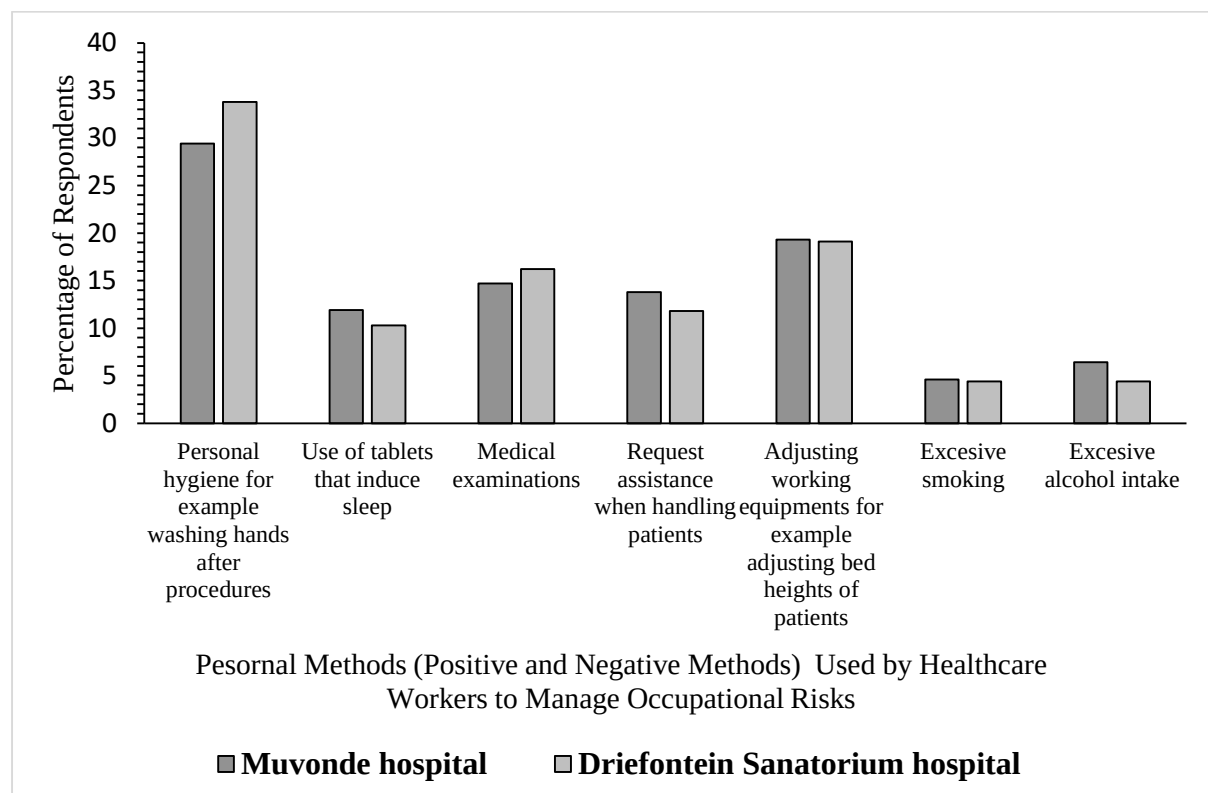


Figure 8: Personal methods used by healthcare to manage risks at Muvonde Hospital and Driefontein Sanatorium hospital

Source: Field Survey (2023)

4.3.6.2 Institutional Methods Used to Manage Risks

Figure 9 illustrates that the majority (38%) of the study participants at Muvonde hospital and most (40%) at Driefontein Sanatorium Hospital indicated personal protective equipment as an institutional method used to manage risks at the hospital. The results obtained from the study revealed that a majority of healthcare workers at Muvonde Hospital and Driefontein Sanatorium Hospital emphasised the utilization of personal protective equipment (PPE) as an institutional measure to effectively manage occupational risks. This finding suggests that both hospitals prioritize the implementation of PPE as a means to mitigate potential hazards in the workplace. In developing countries like Zimbabwe, the use of PPE is given high priority within hospital settings (Shabani et al. 2023a, b, c, d, e). Moreover, during the Covid-19 pandemic, there was an increased demand for PPE, leading to the importation of PPE to address shortages in hospitals (Elhadi et al. 2020). Questionnaire results obtained during the study at Driefontein Sanatorium Hospital concurs with the observations carried at Driefontein Sanatorium Hospital since personal protective equipment/clothes were observed in the dressing rooms used by healthcare workers as shown by Plate 2. This was supported by the Human Resource Manager (HRM) at Driefontein Sanatorium Hospital that they work hand in hand with the procurement department to make sure they provide personal protective equipment/clothes such as gowns, aprons and masks for healthcare workers to use during procedures. The response of the HRM designates that provision of adequate PPE/C is a legal requirement and failure to comply can result in penalties for healthcare facilities. Overall, ensuring that healthcare workers have access to adequate PPE/C is essential for protecting their health and preventing the spread of infectious diseases in healthcare settings. The results harmonize with results obtained by Nankongnab et al. (2021) which indicates that personal protective equipment is significant in protecting healthcare workers from occupational hazards which affect them at hospitals.



Plate 2: Personal protective cloth observed in the dressing room at Driefontein Sanatorium hospital

Source: Field Survey (2023)

At Muvonde Hospital (13%) of the questionnaire respondents indicated safety inspection while at Driefontein Sanatorium Hospital (10%) of the study participants specified safety inspection as a measure used to manage risks. Healthcare workers at Muvonde Hospital and Driefontein Sanatorium Hospital consider safety inspections as an institutional measure to effectively manage risks. The purpose of safety inspections is to identify potential hazards and take necessary actions to mitigate them before they pose any harm to patients, staff, or visitors. Safety inspections play a crucial role in ensuring the overall safety and well-being of individuals within the healthcare facility. By conducting regular inspections, healthcare workers can proactively identify any potential risks or hazards that may exist within the hospital environment (Mossburg et al. 2019). To support this, the EHT at Muvonde Hospital indicated that safety inspections are done here on a weekly basis for departments then for the whole hospital safety inspections are done on a monthly basis.

Figure 9 illustrates that some (12%) of the questionnaire respondents at Muvonde Hospital and (9%) of the participants at Driefontein Sanatorium Hospital revealed that proper disposal of waste was among institutional measures used to manage risks. According to the respondents from both hospitals, one of the institutional methods employed to manage risks within the healthcare facilities is the proper disposal of waste. It has been recognised that implementing effective waste management practices, including segregation, storage, transportation, treatment, and disposal, plays a crucial role in minimising the risk of infection and ensuring

the safety of healthcare workers as well as the environment. These findings align with the research conducted by Fadaei (2023), which emphasizes that appropriate management of medical waste can significantly reduce the incidence of infectious diseases associated with healthcare waste, particularly those resulting from hazardous materials like sharps. Results were supported by the Matron at Driefontein Sanatorium Hospital that every department is provided with a bin for sharp waste, for infectious waste and bin for non-infectious waste in order to reduce risks associated with waste. Sharp waste bin, infectious waste bin and non-infectious waste bin were noted during observations as indicated in Plate 3, Plate 4 and Plate 5 which illustrates pictures of sharp bin, infectious waste bin and non-infectious bin respectively which were captured by a phone.

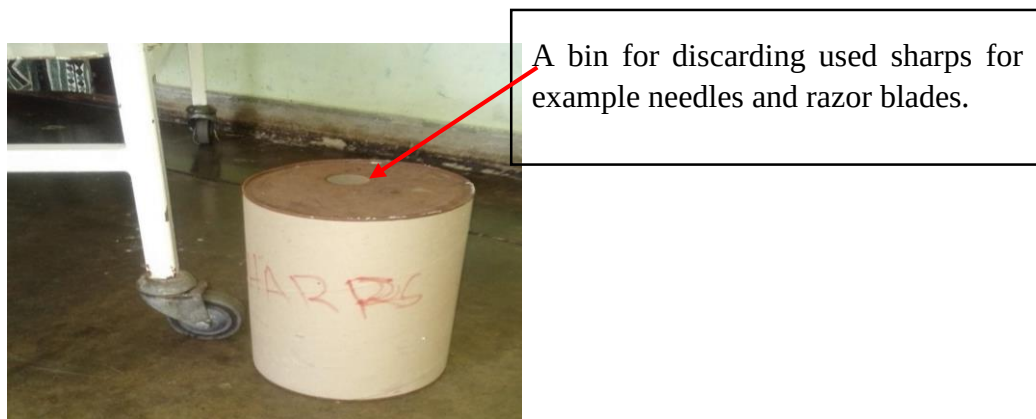


Plate 3: Sharp bin for discarding used sharps

Source: Field Survey (2023)



Plate 4: Bin for infectious waste

Source: Field Survey (2023)

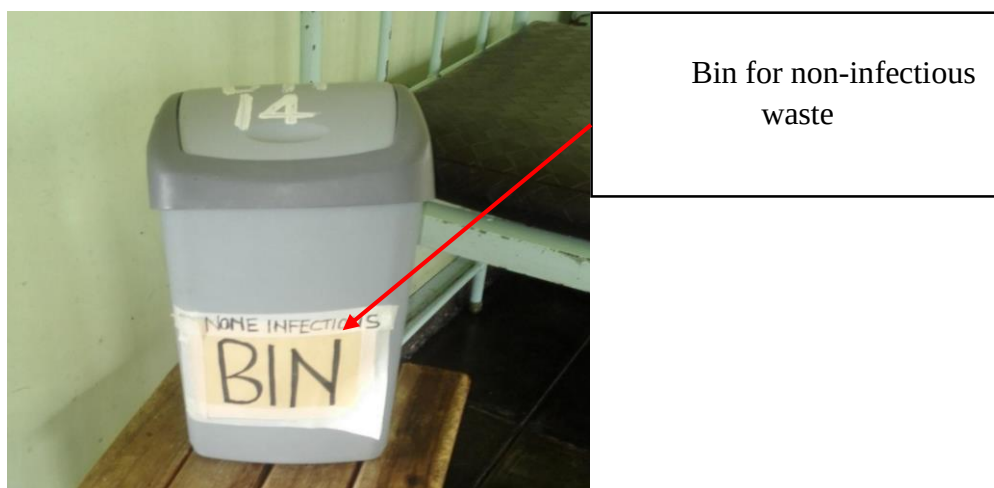


Plate 5: Bin for non-infectious waste

Source: Field Survey (2023)

Moreover, (11%) of the questionnaire respondents at Muvonde Hospital and (7%) respondents at Driefontein Sanatorium hospital reported that monitoring of workers' safety behaviour is among the institutional measures used to manage risks. Healthcare workers at both hospitals have confirmed that one of the institutional measures employed to manage risks is the monitoring of workers' safety behavior. This practice allows hospital management to identify potential risks and take the necessary steps to prevent accidents and injuries. Additionally, monitoring safety behavior plays a crucial role in promoting a culture of safety among healthcare workers, which in turn leads to better compliance with safety protocols and reduces the likelihood of injuries and accidents. The Nurse in Charge at Muvonde Hospital indicates that the behaviour of using PPE/C by healthcare workers when performing risk procedures is monitored to check the way they wear PPE/C. This implies that monitoring the use of PPE/C by healthcare workers during risk procedures is essential for ensuring proper protection against infectious agents, preventing cross-contamination between patients and identifying any gaps in training or knowledge among healthcare workers.

Safety training was reported by (9%) as an institutional measure used to manage risks at Muvonde hospital and safety workshops was also indicated by (9%). At Driefontein Sanatorium Hospital (6%) of the participants pointed that safety training was among institutional measures used to manage risks and safety workshops was also indicated by (6%). Healthcare workers at Muvonde Hospital and Driefontein Sanatorium Hospital have recognised the significance of safety training and workshops in effectively managing risks within the workplace. The implementation of safety training and workshops plays a crucial role in fostering a safety culture within the hospitals, ensuring that all healthcare workers actively

participate in risk management and contribute to the promotion of a safe working environment. These findings align with the results presented by Sithole et al. (2018), which highlight the utilization of training programs in hospitals, such as those in Harare city hospitals, to effectively address needle stick injuries.

Of all the respondents who participated as questionnaire respondents at Muvonde hospital only (8%) indicated other institutional methods used to manage risks for example screening workers for diseases such as tuberculosis, Covid 19 and hepatitis B/C virus as illustrated by Figure 8. On the other hand, (22%) of healthcare workers indicated other institutional measures used to manage risks at Driefontein Sanatorium hospital for example screening of workers for diseases such as Tuberculosis (TB), Covid-19 and Hepatitis B/C. Screening for these diseases also aids in the early identification of infected individuals and ensures they receive timely treatment, thereby preventing further transmission. For instance, screening healthcare workers for diseases such as severe acute respiratory syndrome (SARS) assists in monitoring the prevalence of these diseases among healthcare workers and implementing necessary measures to prevent outbreaks (Buheji and Buhaid 2020). The possible reason in the difference between the respondents who reported screening of workers is that at Driefontein Sanatorium Hospital there is high prevalence of infectious disease since the hospital deal with people affected with infectious diseases such as tuberculosis. As a result, the hospital prioritizes screening as a method to manage risks. The Nurse-in-Charge at Driefontein Sanatorium Hospital pointed out that screening of health care workers for infectious diseases such as tuberculosis, Covid-19 and Hepatitis B/C virus is done at the wellness clinic. Therefore, regular screening is necessary to detect any potential infections early and prevent further spread to other healthcare workers and patients.

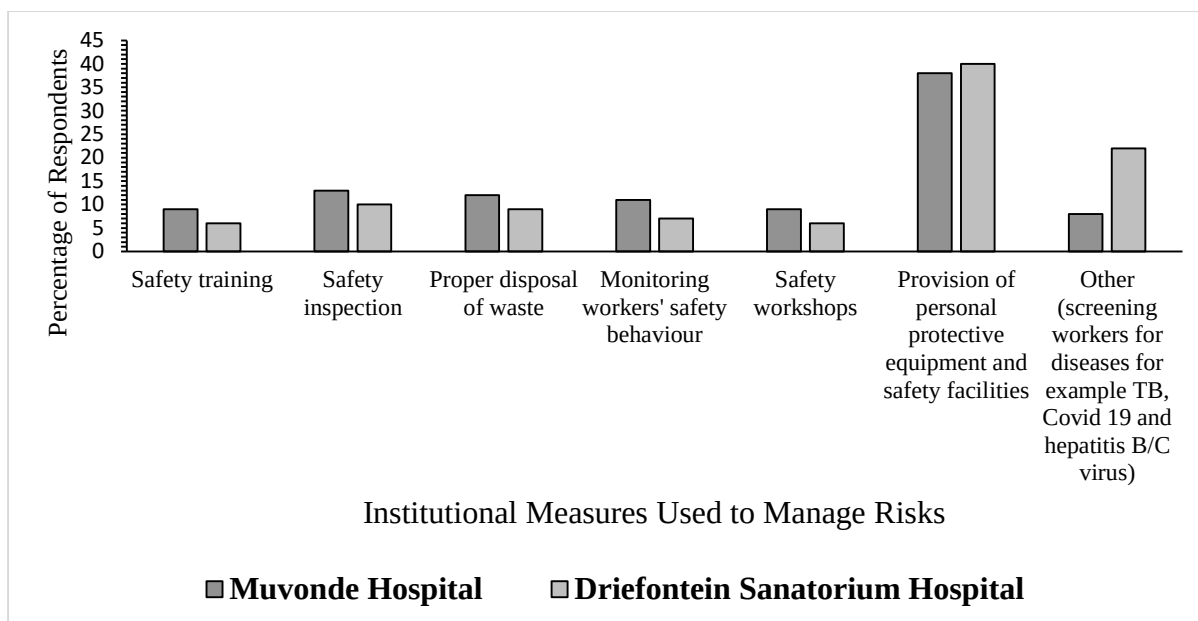


Figure 9: Institutional measures used to manage risks at Muvonde hospital and Driefontein Sanatorium hospital

Source: Field Survey (2023)

4.3.7 Effectiveness of Institutional Measures Used to Manage Risks

Figure 10 illustrates that more than half (56%) reported that the measures are good, (21.1%) specified the measures are very good, (15.6%) pointed out that the measures are excellent while very few (7.3%) indicated poor at Muvonde hospital. Figure 10 highlighted that most (51.5%) of the study participants stipulated that institutional measures used to manage risks at Driefontein Sanatorium Hospital were good, followed by (30.9%) who indicated very good, (13.2%) marked excellent and minority (4.4%) reported poor. The majority of the participants expressed their satisfaction with the measures implemented to manage risks. This indicates that a significant portion of the respondents believe that the risk management strategies employed at the hospitals are effective and reliable. This positive perception may be attributed to factors such as comprehensive risk assessment, adequate training and education, implementation of best practices, effective communication channels, regular monitoring and evaluation, patient involvement, and strong leadership and governance. Although the majority of the comments were positive, minority of the the respondents were dissatisfied with safety measures used with the rural hospitals. This might occur as result of inconsistency in terms of implementation. Other staff members may get concerned about safety gaps resulting from staff members' inconsistent use of established safety practices. The measures can be rated poor due to limited safety feedback mechanisms. Ineffective methods for providing concerns or recommendations

about safety precautions might make people feel as their opinions are not valued which could result in annoyance and low ratings. As a result, there is need to address issues raised by healthcare workers who indicated that safety measures within the rural hospitals were poor in order to enhance their overall satisfaction. The issues can be addressed by aspects such as training employees about new barriers or defences implemented to manage risks within the rural hospitals.

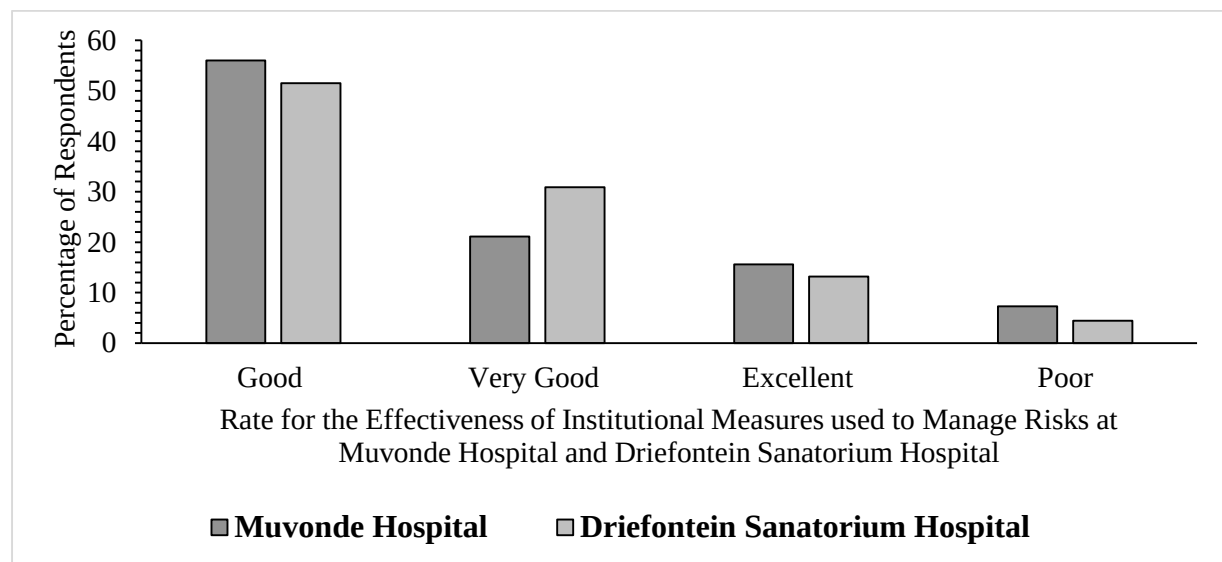


Figure 10: Effectiveness of Institutional Measures Used to Manage Risks.

Source: Field Survey (2023)

Table 3 illustrates the Chi-Square test which was done to test whether there is association or there is no association between work experience and effectiveness of institutional measures used to manage risks. Results obtained during the Chi-Square tests was 0.000 and is less than 0.05. Regarding the results we accept H_1 and reject H_0 . The results attained during the analysis provide evidence that there is an association between work experience and effectiveness of institutional measures used to manage risks. This shows that the rating of institutional measures used to manage risks of the hospital is influenced by work experience of the healthcare worker who participated during the study. There are multiple factors that could contribute to this phenomenon, including an increase in knowledge and understanding of procedures, a higher level of confidence in healthcare workers' ability to identify and mitigate risks, and a greater recognition of the importance of safety in the workplace. These findings align with the research conducted by Purwanto et al. (2021), which suggests that the effectiveness rating of institutional measures used to manage losses is strongly correlated with the experience of the workers.

Table 3: Chi-Square Tests Between Work Experience (Years) * Effectiveness of Institutional Measures Used to Manage Risks

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.114E2 ^a	12	.000
Likelihood Ratio	173.584	12	.000
Linear-by-Linear Association	88.739	1	.000
N of Valid Cases	109		

14 cells (70.0%) have expected count less than 5. The minimum expected count is 0.44.

Source: Field Survey (2023)

4.4 Proposed Process-Based Model for Effective and Sustainable Work Safety Analysis for Rural Settings

Work safety analysis is an essential aspect of any organization or workplace to ensure the safety and well-being of its employees. Numerous models and methods have been devised to analyze and manage work safety risks, but most of them fail to consider the complexities of modern work environments. Therefore, developing an effective and sustainable processe-based model for work safety analysis is crucial. The Process-Based Model for effective work safety analysis (Figure 11) was developed based on the Swiss Cheese Model. The Swiss Cheese Model is a concept used in risk management and safety engineering to understand how accidents occur (Wiegmann et al. 2022; Shabani et al. 2023a, b, c, d, e). The Swiss Cheese Model was developed by Professor James Reason in 1990, the model visualizes how errors and failures can occur at several levels within an organization's systems and processes, and how multiple barriers can mitigate the impact of those failures (Vernaz et al. 2020). A Process-Based Model developed would aim at improving internal processes by aligning them with the Swiss Cheese Model.

The Process-Based Model would take a holistic approach to identify and manage the root causes of errors and failures within the hospital. It would bring together people, systems and processes to work in sync to avoid errors or mitigate risks. In order to develop this model, various interdependent processes within the hospital would be carefully analyzed and a

framework would be developed based on the Swiss Cheese Model. Each process would require its own set of layers of defense or barriers that would help in reducing the probability of error occurring.

Firstly, the proposed model identifies the critical processes performed within the hospital which are associated with different hazards. This is vital since it provides information on work which needs to be analyzed. At this stage the team involved during the work processes understand the nature and scope of work safety analysis. The team identifies the specific work processes, activities and tasks that need to be evaluated for safety risks. Once identified, each process would be broken down into discrete components and a layered approach would be implemented to mitigate any risk. To increase the strength of this defense method in preventing accidents employees, supervisors and safety professionals should be involved to get a comprehensive view of the workplace environment.

The second step barriers focus on hazard identification and risk assessment. This involves identifying potential hazards such as chemical, physical, psychosocial, ergonomic and biological hazards. Various methods should be used to identify hazards, including observation, interviews, checklists and safety audits. Once the hazards are identified, the next step is to assess the level of risk associated with each hazard. Risk assessment determines the likelihood and severity of harm that could result from each hazard. Hazard identification and risk assessment helps in identifying the various layers of defenses that can be put in place to reduce the probability of an error from happening. After hazards are identified layer analysis should be done using the Swiss Cheese Model to identify potential gaps or weaknesses in each layer and developing strategies to strengthen the accident barriers.

The third stage of the developed process-based model for effective work safety analysis includes implementation of controls. The barriers or defenses which could be implemented involve engineering controls, administrative controls, or personal protective equipment. The implementation is done after hazard identification and risk assessment are done in order to implement barriers which can reduce failures within the barriers used to manage hazards within the hospital. The measures must be implemented to prevent both latent and active errors mentioned by the Swiss Cheese Model. Each layer would be implemented with the aim of increasing the strength of the overall defense. Training is involved in the fourth step of the model. The employees within the hospitals must be trained about the latent and active errors which cause risks to occur within the hospital. All employees should receive training on the

barriers/defenses developed to manage hazards within the hospital and how to properly use any controls that have been implemented. This indicates that training is essential to be incorporated in the process-based model for effective work safety analysis since holes on the Swiss Cheese Model can also decline due to adequate safety training.

The fifth step of the developed process-based model involves continuous monitoring and review of barriers/defenses implemented to reduce the occurrence of failures represented by holes in the Swiss Cheese Model occurring within the hospital. Layer analysis which focuses on analyzing defenses used to manage risks should be done using the Swiss Cheese Model. This helps to ensure that controls remain effective over time and identify new hazards or risks which arise. It is also important to involve workers in this process by soliciting their feedback on the effectiveness of controls. This is significant since the information brought by the employees helps to improve the barriers/ defences implemented within the hospital in order to reduce both latent and active errors in the Swiss Cheese Model. Continuous monitoring and review should be done by conducting regular safety audits and inspections to identify the deficiencies in the safety management system represented as holes in the Swiss Cheese Model.

By following this process-based model for effective and sustainable work safety analysis developed using the Swiss Cheese Model, hospitals can improve their overall safety culture and reduce the likelihood of accidents occurring. Hospitals ensure effective and sustainable work safety analysis by identifying potential hazards, assessing risks, implementing appropriate controls, training employees and monitoring and reviewing the effectiveness of those controls.

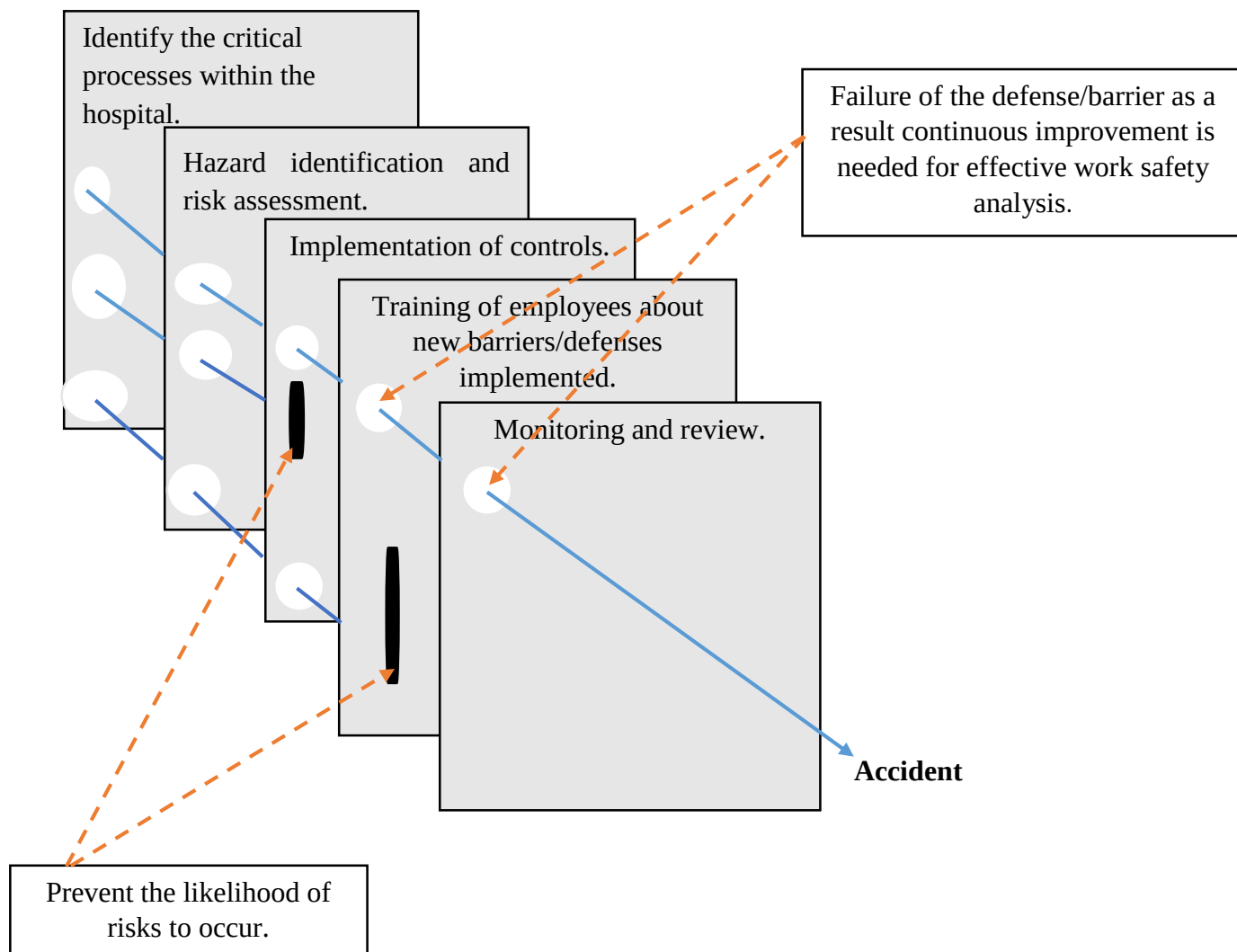


Figure 11: Proposed Process-Based Model for Effective and Sustainable Work Safety Analysis for Rural Settings

Source: Authors

4.5 Implications of the Study

The report emphasizes on how rural hospitals need to improve their safety procedures. Through the identification of particular risks and hazards related to work environments at rural hospitals, the research can result in the creation of customized safety regulations that take local factors into account. This may lead to occurrence of few occupational mishaps and injuries among medical personnel. The analysis' conclusions can help local and national officials understand the particular difficulties encountered by rural hospitals. This can lead to the development or reform of health and safety laws tailored to rural areas, making sure that they receive the necessary assistance in preserving safe work conditions. The study's findings could have an

impact on the healthcare system's resource allocation. Stakeholders may prioritize financing and assistance for rural hospitals by identifying places where safety and health improvements are required. This will guarantee that these rural healthcare centers have access to training, equipment and infrastructure upgrades they require.

4.6 Limitations of the Study

The study was conducted within two rural hospitals in Chirumanzu district. As a result the sample size for the study can be limited which affect the issue of generalisability of the results to other regions. The results reveal rural context hence the results can not be generalised to urban context. The varied circumstances and procedures prevalent in various healthcare settings could not be sufficiently represented by a small sample. In rural hospitals of Zimbabwe, cultural views on safety and health may have an impact on how employees behave and how they report work-related safety issues. The study may not completely understand or account for these cultural influences which can potentially skew results.

4.7 Conclusion

The findings of the study indicated that healthcare workers at Muvonde Hospital and Driefontein Sanatorium Hospital are exposed to various work-related risks. These risks involve physical, chemical, biological, ergonomic and psychosocial risks. Risks affecting healthcare workers expose them to injuries, strains, infections, irritations, stress, cuts and diseases. The study also found that shortage of labour, high workload, inadequate equipment, poor training, negative safety behaviour, age and gender as well the department of the healthcare worker within the hospital contribute to the risks affecting healthcare workers. The study also examined procedures used to manage risks at Driefontein Sanatorium Hospital and Muvonde Hospital. Results obtained reveal that the most used safety procedures include use of personal protective equipment/cloth, safety inspections, and proper disposal of waste, monitoring of workers' behaviour and safety training and workshops. Based on the findings of the study a process-based model for effective and sustainable work safety analysis for rural settings such as rural hospitals in Chirumanzu District was developed based on the Swiss Cheese Model. The process-based model involves a systematic approach to identify risks, assess risks, implementation of control measures, training healthcare workers about the implemented measures and continuous monitoring. Continuous monitoring and reviewing makes the proposed model sustainable since review and monitoring reflects alterations within the hospitals' operations and the work environment.

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Chapter 5

Assessment of Work Safety Analysis Performance Among Rural Hospitals of Chirumanzu District of Midlands Province, Zimbabwe

Tapiwa Shabani¹; Steven Jerie¹ and Takunda Shabani¹

¹Department of Geography Environmental Sustainability and Resilience Building, Midlands State University, P. Bag 9055 Gweru, Zimbabwe

Corresponding Author: Shabani Tapiwa, E-mail Address: tapiwashaban@gmail.com

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Abstract

Ensuring workplace safety for healthcare workers is vital considering the important role they play in various societies which is to save life. Healthcare workers face different risks when performing tasks in various departments within hospitals, hence there is a need to assess work safety analysis procedures among healthcare workers. As a result, this study aims to assess the effectiveness of work safety analysis procedures among healthcare workers at Muvonde and Driefontein Sanatorium rural hospitals in Chirumanzu district. The research applied the descriptive cross-sectional design, combining quantitative and qualitative data collection methods. A questionnaire with both closed and open-ended questionnaire was used for data collection among 109 healthcare workers at Muvonde hospital and 68 healthcare workers at Driefontein Sanatorium hospital. Secondary data sources, observations and interviews were also included as data collection methods. Quantitative data collected during the study was analysed using SPSS version 25. Braun and Clarke (2006)'s six phase framework was applied for qualitative data analysis. Ethical approval form was obtained from the District Medical Officer and Midlands State University. Findings of the study indicated that risks identified at Muvonde and Driefontein Sanatorium rural hospitals are classified as ergonomic, physical, chemical, psychosocial and biological risks. Respondents specified that these risks occur as a result of inadequate equipment, poor training, negative safety behaviour, poor management and pressure due to high workload. Safety inspection, safety workshops and monitoring of worker's safety behaviour were mentioned as measures to manage risks. However, the strengths and weaknesses of the current safety procedures need to be assessed to highlight areas for improvement to reduce occurrence of risks within the hospitals.

Keywords: Healthcare Workers; Hospital Risks; Risk Identification; Risk Management; Rural Hospitals; Work Safety Analysis

5.1 Introduction

Professionals in hospitals save the lives of people in various communities as a result, this job requires a high level of commitment [1, 2]. However, the community must not forget that healthcare workers who save their lives are exposed to various risks during work. [3] opined that the nature of tasks performed by healthcare workers in hospitals expose them to risks. Healthcare facilities, including rural hospitals, are work environments where workers are exposed to different work-related risks regularly [4, 5]. Duties performed by healthcare workers involve lifting and transferring patients, dealing with patients with unpredictable behaviour, and handling infectious materials and exposure to chemicals [6–8]. This implies that healthcare workers are affected with both ergonomic, biological, chemical, psychosocial and physical risks. However, the protection of healthcare workers from risks depends on the effectiveness of work safety analysis procedures within the healthcare facility [9, 10]. Therefore, guaranteeing the efficiency of work safety analysis procedures is important for reducing risks affecting healthcare workers and creating a safe work environment. In the healthcare industry, where employees are exposed to various risks, it is essential to have effective work safety analysis procedures in place to minimise the risks of accidents and injuries [2, 11].

Insufficient work safety measures can prompt a scope of negative results in the healthcare facilities [12, 13]. According to [14] and [15] results of inadequate work safety analysis procedures within the workplace include work-related illnesses, injuries, accidents, stress and reduced productivity. Ergonomic risks affecting healthcare workers as a result of tasks they perform expose them to upper and lower back pain, muscular strain and neck pain [16, 17]. In healthcare facilities healthcare workers always report high levels of musculoskeletal injuries related to ergonomic risks. Musculoskeletal disorders expose healthcare workers to acute and chronic injuries [8, 18, 19]. According to [20] and [21] healthcare workers are also affected with work-related pressure which expose them to stress, fatigue and anxiety which are categorised as psychosocial risks. Work related stress is common among healthcare employees as a result of long working hours, shift work and dealing with patients who are critically ill [22, 23]. Biological risks affecting healthcare workers globally expose them to tuberculosis, HIV/AIDS and hepatitis B/C [24, 25]. In healthcare facilities, piercing materials such as needles are used; however, they result in sharp injuries among healthcare workers [26, 27]. Nurses are mostly affected with physical risks such as needle stick injuries and pricks/cuts as well as ionizing and non-ionizing radiation [28, 29]. Allergies, eye and skin irritation are

affecting hospital workers as a result of different chemicals used during hospital procedures [30, 31]. This denotes that healthcare workers are exposed to chemical risks when performing their duties.

In sub-Saharan Africa the issue of work-related risks affecting healthcare workers increase as a result of ineffective safety procedures [32, 33]. This means poor work safety analysis, negative safety behaviour, inadequate resources and poor safety training expose healthcare workers to risks. In less developed countries hospital employees are affected with occupational risks due to shortage of labour [4, 5]. Due to shortage of labour in African countries during the outbreak of Covid-19 they increased the time of shifts for healthcare workers to cope with the high rate of hospitalization [34, 35]. However, this increases mental and physical exhaustion among healthcare workers. In developed countries measures used to manage risks affecting workers in healthcare facilities are effective compared to developing countries [6, 10, 16]. This occurs because in developing countries such as Zimbabwe the use of effective work safety analysis procedures is commonly applied in timber, mining and manufacturing companies neglecting healthcare institutions.

Health workers are usually vulnerable to work related risks since issues of safety are always neglected in the health sector, specifically in hospitals located in marginal areas [36, 37]. Therefore, this study assesses the effectiveness of work safety analysis procedures among healthcare workers at Muvonde and Driefontein Sanatorium rural hospitals in Chirumanzu district. As rural healthcare facilities Muvonde hospital and Driefontein Sanatorium hospital, they face unique challenges related to staffing constraints, resource limitations and infrastructure deficiencies. As a result, assessing the effectiveness of work safety analysis procedures at Driefontein Sanatorium and Muvonde rural hospitals is significant for understanding the existing safety protocols and identifying areas for improvement that are tailored to their operational context.

Through a thorough evaluation of the work safety analysis performance in these particular healthcare facilities, the research pinpoint important areas that require improvement and create focused recommendations to improve workplace safety procedures. This will result in the use of cutting-edge technologies for risk assessment and hazard identification, the creation of a culture of continuous improvement in work safety procedures, the introduction of new safety protocols, and the execution of customized training programs. Ultimately, the research findings may improve the health and safety of medical staff in remote hospitals while also acting as a

template for raising occupational health and safety standards in similar environments around the world. The findings of the study would help the rural healthcare centres to achieve the demands of Sustainable Development Goal number 3 which focus on good health and well-being.

5.2 Materials and methods

Descriptive cross-sectional design was used during the study. The study was conducted at Muvonde and Driefontein Sanatorium rural hospitals. The two hospitals serve as referrals for clinics and other hospitals in Chirumanzu district and outside Chirumanzu district. The study population were medical and paramedical staff within the hospitals. The sample size was calculated using Yamane (1967) formula shown below:

$$n = \frac{N}{1+N(e)^2}$$

Where: **n** is the sample size, **N** is the total population and **e** is the margin of error.

After calculations a sample of 68 healthcare workers were selected as questionnaire respondents at Driefontein Sanatorium hospital and 109 healthcare workers were selected as questionnaire respondents at Muvonde hospital as indicated by Table 1. Healthcare workers who participated as questionnaire respondents were selected randomly from every stratum. Key informant interviewees were selected purposively.

Table 1: Sample size for questionnaire respondents

Hospital name	Number of health workers	Grouping of workers according to their occupation	Required sample size using Tara Yammane formula $n = \frac{N}{1 + N(e)^2}$	Sample size to represent each stratum $\frac{\text{Required Sample Size}}{\text{Population size}} \times \text{strata size}$	Total
Muvonde Hospital	150	Nurses 121, Counsellors 3, Laboratory technicians 4, Physiotherapist 3, Radiologic technologist 3, Anesthetist 2, Eye optician 1, Cleaners 12 and 1 Dentist.	109	Nurses 88, Counsellors 2, Laboratory technicians 3, Physiotherapist 2, Radio technologist 2, Anesthetist 1, Eye optician 1, Cleaners 9 and 1 Dentist.	109
Driefontein Sanatorium Hospital	81	Nurses 58, Counsellors 2, Laboratory technicians 4, Physiotherapist 1, Radiologic technologist 2, Anesthetist 2, Eye optician 1, Cleaners 10 and 1 Dentist.	68	Nurses 48, Counsellors 2, Laboratory technicians 3, Physiotherapist 1, Radiologic technologist 2, Anesthetist 2, Eye optician 1, Cleaners 8 and 1 Dentist.	68

Source: Field Survey (2023)

A questionnaire with both closed and open-ended questionnaires was prepared and self-administered during data collection to reduce margin of error. The pilot study of the questionnaire consisted of 10% of the participants from each of the two rural hospitals which were considered during the study. This conformed to [38] that 10% of the target population is used for pilot study before the main survey is done. At Muvonde hospital 10% of 109 questionnaire respondents were considered during the pilot study. This entails that 11 healthcare workers participated during the pilot study of the questionnaire at Muvonde hospital. At Driefontein Sanatorium Hospital 10% of 68 healthcare workers were selected for pilot study. This clearly means 7 healthcare workers were taken as participants during the pilot study at Driefontein Sanatorium Hospital. The participants who take part during the pilot study provide their suggestions and recommendations on how to improve the drafting of questionnaire items. Test-retest reliability has also been used to assess response stability over time, making sure that the questionnaire produced consistent answers when it was administered again. Experts in healthcare management and work safety analysis examine the questionnaire items to make sure they comply with industry best practices and standards in order to improve

validity. To further increase validity and reliability, a pilot test including a sample of rural hospitals in Chirumanzu District was conducted to evaluate the questions' clarity and relevance.

Semi-structured interviews were prepared to conduct interviews with the Nurse in Charge, Hospital Manager (Matron), Medical Superintendent, Head of Environmental Health department and Human Resource Manager at each rural hospital participating during the interviews. The District Medical Officer and National Social Security Authority (NSSA) Officer were also taken as interviewees to collect the information regarding the objectives of the study. Observations were carried out using an observation checklist focusing much on work environment, equipment, duties performed by healthcare workers and safety procedures used within the hospitals. Rural hospitals' weekly inspection reports, monthly reports, annual reports and incidents reports as well as review articles and journals were used as secondary data sources.

Quantitative data collected using a questionnaire was analysed using Statistical Package for Social Sciences version 25.0. Quantitative data was presented in the form of tables, pie-charts and graphs which were produced by the SPSS. Braun and Clarke (2006)'s six phase framework for doing thematic analysis was applied during qualitative data analysis. Ethical approval forms were obtained from the District Medical Officer and Midlands State University before data collection starts. All participants participated voluntarily. Every participant was enlightened that participating during the study was voluntary.

5.3 Results

5.3.1 Socio-demographic Characteristics

5.3.1.1 Demographic Characteristics According to Gender, Age and Marital Status

Table 2 presents the demographic characteristics of the respondents according to gender, age and marital status. From the results, the majority (70%) of the healthcare workers who participated during the study at Muvonde hospital were females. At Driefontein Sanatorium Hospital most (69%) of the questionnaire respondents were females. At Muvonde Hospital (26.6%) of the participants identified 34–41 years as their age group while at Driefontein Sanatorium hospital revealed that they were aged 34–41 years as indicated in Table 2. The majority (47.7%) respondents at Muvonde Hospital are married and at Driefontein Sanatorium

Hospital majority (61.8%) of the healthcare workers who participated during the study were married.

Table 2: Demographic characteristics according to gender, age and marital status

Variable	Category	Muvonde Hospital		Driefontein Sanatorium Hospital	
		Frequency	Percentage (%)	Frequency	Percentage (%)
Gender	Male	33	30	21	31
	Female	76	70	47	69
	Total	109	100	68	100
Age	18-25 years	17	15.6	7	10.3
	26-33 years	22	20.2	18	26.5
	34-41 years	29	26.6	23	33.8
	42-49 years	15	13.8	9	13.2
	50-57 years	11	10%	5	7.4
	58-64 years	9	8.3%	4	5.9
	65+ years	6	5.5%	2	2.9
	Total	109	100	68	100
Marital Status	Single	32	29.4	16	23.5
	Married	52	47.7	42	61.8
	Divorced	8	7.3	3	4.4
	Widowed	17	15.6	7	10.3
	Total	109	100	68	100

Source: Field Survey (2023)

5.3.1.3 Demographic Characteristics According to Level of Education and Work Experience

Table 3 shows demographic characteristics of the health care workers according to level of education and work experience. Based on the feedback provided by the questionnaire respondents the majority (52.3%) of the participants at Muvonde Hospital are holders of diplomas. At Driefontein Sanatorium hospital most (54.4%) of their respondents designated diplomas as their highest level of education as indicated in Table 3. Results in Table 3 demonstrated that the majority (42.2%) of the questionnaire respondents at Muvonde Hospital specified their work experience between 5 and 10 years. Most (41.2%) of the healthcare workers who participated as questionnaire respondents at Driefontein Sanatorium Hospital indicated their work experience between 5 and 10 years.

Table 3: Demographic characteristics according to level of education and work experience

Variable	Category	Muvonde Hospital		Driefontein Sanatorium Hospital	
		Frequency	Percentage (%)	Frequency	Percentage (%)
Level of Education	Certificate	32	29.4	17	25
	Diploma	57	52.3	37	54.4
	Bachelor's degree	8	7.3	5	7.4
	Master's degree	4	3.7	2	2.9
	Doctorate (PhD)	0	0	0	0
	Other	8	7.3	7	10.3
	Total	109	100	68	100
Work Experience (Years)	4 Years and below	22	20.2	18	26.5
	5-10 Years	46	42.2	28	41.2
	11-15 Years	21	19.3	13	19.1
	16-20 Years	14	12.8	7	10.3
	20+ Years	6	5.5	2	2.9
	Total	109	100	68	100

Source: Field Survey (2023)

5.3.2 Risks Identified at Muvonde and Driefontein Sanatorium Rural Hospitals

Different types of risks were identified at Muvonde and Driefontein Sanatorium rural hospitals notably ergonomic, chemical, biological, physical and psychosocial risks as illustrated by Figure 1. Majority (44%) of the questionnaire respondents at Muvonde Hospital identified ergonomic risks as the main risks affecting them. However, at Driefontein Sanatorium Hospital most (30.9%) of the healthcare workers who participated as questionnaire respondents reported biological risks as the risk which mainly affect them at work. At Driefontein Sanatorium Hospital psychosocial risks recorded the least percentage (10.3%) while at Muvonde Hospital psychosocial risks recorded (11.9%) as designated by the results shown in Figure 1.

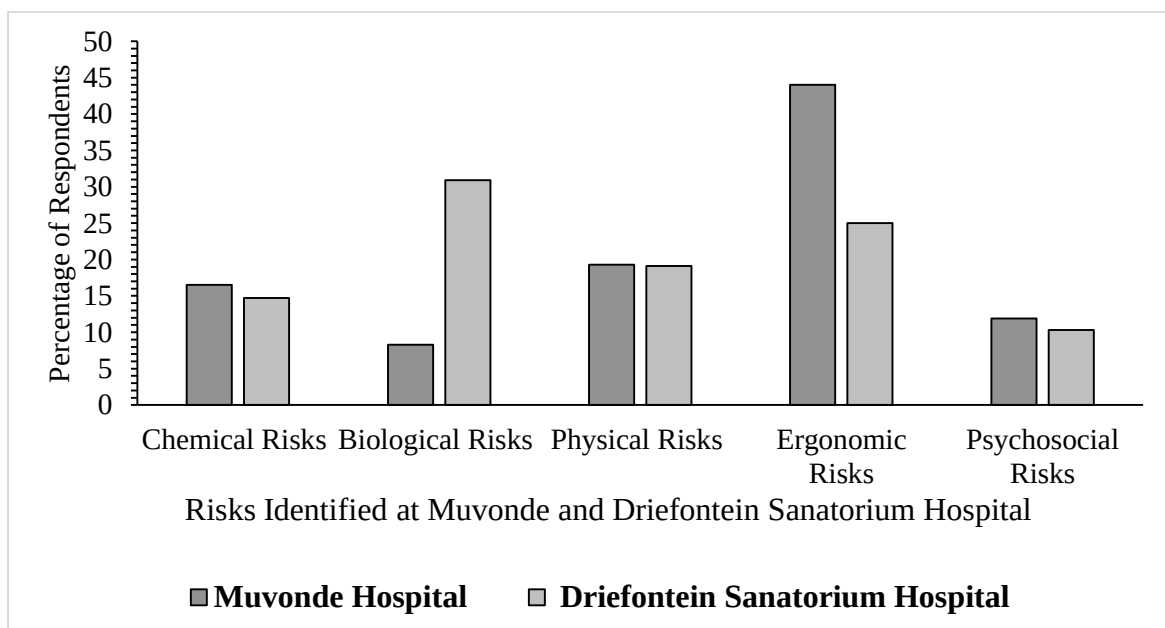


Figure 1: Types of risks identified at Muvonde hospital and Driefontein Sanatorium hospital

Source: Field Survey (2023)

5.3.3 Distribution of Risks Identified at Muvonde hospital and Driefontein Sanatorium Hospital

5.3.3.1 Distribution of Ergonomic Risks

The distribution of ergonomic risks is illustrated by Figure 2. Based on the findings of the study on distribution of ergonomic risks, the majority (33.9%) reported standing for a long time while (20.2%) specified repetitive work at Muvonde Hospital as shown in Figure 2. Some (17.4%) of the participants indicated lifting patients, manual therapy (11.1%), uncomfortable position (10.1%) and lifting of medical devices was reported by (6.2%) of questionnaire respondents at Muvonde hospital. Based on the results of distribution of ergonomic risks obtained at Driefontein Sanatorium Hospital majority (27.9%) reported standing for a long time, lifting of patients (25%), repetitive work (17.6%), manual therapy (11.8%) and (5.9%) indicated lifting of medical devices as a concern as illustrated by Figure 2.

5.3.3.2 Distribution of Physical Risks

Regarding the distribution of physical risks at Muvonde Hospital the majority (28.4%) reported sharp injuries, extreme temperatures (cold/hot) (24.8%), noise (22%), slips and falls (15.6%), radiation (5.5%) and electric shock (3.7%). Results obtained at Driefontein Sanatorium Hospital indicated that the majority (30.9%) of the study respondents specified sharp objects, extreme temperatures (cold/hot) (26.5%), noise (20.6%), slips and falls (13.2%), radiation (5.9%) and electric shock (2.9%). The distribution of physical risks is indicated in Figure 2.

5.3.3.3 Distribution of Biological Risks

Majority (39.4%) of the healthcare workers who participated as questionnaire respondents at Muvonde Hospital reported blood spillage while at Driefontein Sanatorium Hospital the majority (31%) regarded breathing contaminated air as the major biological risk Figure 2. Findings at Muvonde Hospital shows that (17.4%) of the study participants specified breathing contaminated air, vomitus, sputum or urine of patients (16.5%), contact with wounds (15.6%) and viral infection (11%) was considered as the least biological risk among the biological risks. Furthermore, at Driefontein Sanatorium Hospital (25%) of questionnaire respondents stated blood spillage, viral infections (16%), vomitus, sputum or urine of patients (15%) and contact with wounds (13%) were reported as biological risks.

5.3.3.4 Distribution of Chemical Risks

The study provides data about the distribution of chemical risks at Muvonde Hospital as sanitizers (29%), cleaning detergents (24%), latex gloves (20%), anaesthetic gases and sterilizing agents (14%) and mercury (13%). Sanitizers (28%), cleaning detergents (21%), latex gloves (19%), anaesthetic gases and sterilizing agents (19%) and mercury (13%) were reported by questionnaire respondents as chemical risks prevailing at Driefontein Sanatorium Hospital as shown in Figure 2.

5.3.3.5 Distribution of Psychosocial Risks

Regarding the distribution of psychosocial risks at Muvonde Hospital majority (33%) reported dealing with very ill patients, overwork (26.6%), verbal abuse (16.5%), fatigue (11.9%), physical abuse (6.4%) and problems with the top management was specified by (5.5%) of participants Figure 2. During the study at Driefontein Sanatorium Hospital the majority (39.7%) of the questionnaire respondents indicated dealing with severely ill patients however, (26.5%) specified overwork, and (13.2%) indicated verbal abuse, (11.8%) reveals fatigue, and (4.4%) reported physical abuse and (4.4%) stated problems with the top management as a risk among psychosocial risks.

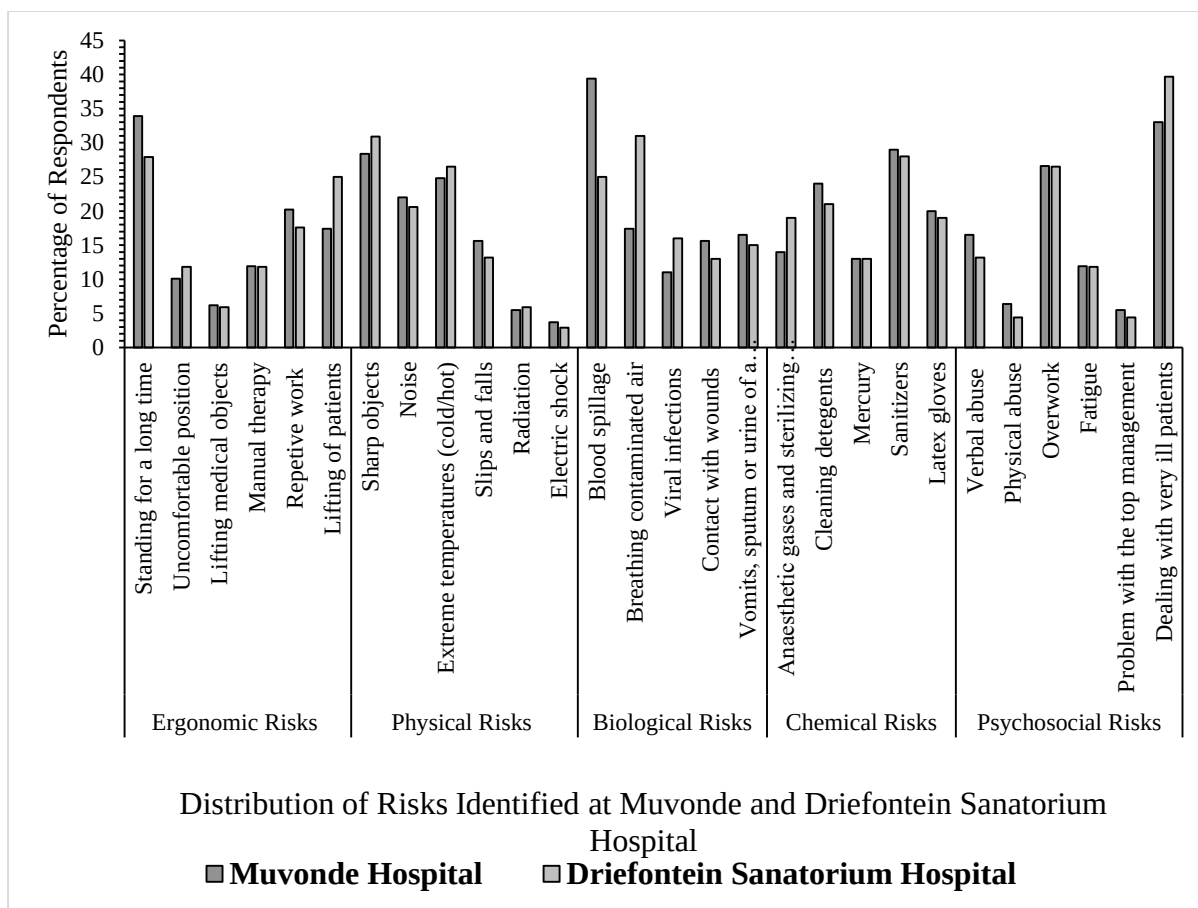


Figure 2: Distribution of risks identified at Muvonde hospital and Driefontein Sanatorium hospital

Source: Field Survey (2023)

5.3.4 Causes of Risks Identified at Muvonde Hospital and Driefontein Sanatorium Hospital

Study participants were asked to indicate causes of risks identified at Driefontein Sanatorium Hospital and Muvonde Hospital. Based on the findings shown in Figure 3 majority (20.2%) of the healthcare workers who participated as questionnaire respondents at Muvonde Hospital reported that risks occur as a result of pressure due to high workload, followed by (17.4%) who specified shortage of labour, (14.7%) indicated inadequate equipment, (3.7%) designated age, gender (10.1%), poor trainings (6.4%) and negative safety behaviour (6.4%). However, findings of the study at Muvonde Hospital indicated that (8.3%) of the respondents reported poor management, department the worker is allocated (5.5%) and (7.3%) of the healthcare workers reported that use of personal protective equipment/cloth for a long time exposes them to risks Figure 3.

At Driefontein Sanatorium Hospital the majority (25%) specified that they are exposed to risks as a result of pressure due to high workload, followed by (16.2%) who stated shortage of labour, (11.8%) indicated inadequate equipment and (2.9%) and (4.4%) pointed out age and gender as the factors which expose them to risks respectively Figure 3. Results obtained at Driefontein Sanatorium Hospital shows that (8.8%) of the study participants indicated that they are exposed to risks as a result of poor training and this was similar to (8.8%) healthcare workers who indicated negative safety behaviour as a factor which expose healthcare workers to risks. Poor management was designated by (7.4%), the department the worker is allocated was specified by (5.9%) and (8.8%) use of personal protective equipment/cloth for a long time was reported as a factor which expose healthcare workers to occupational risks in hospitals as indicated by Figure 3.

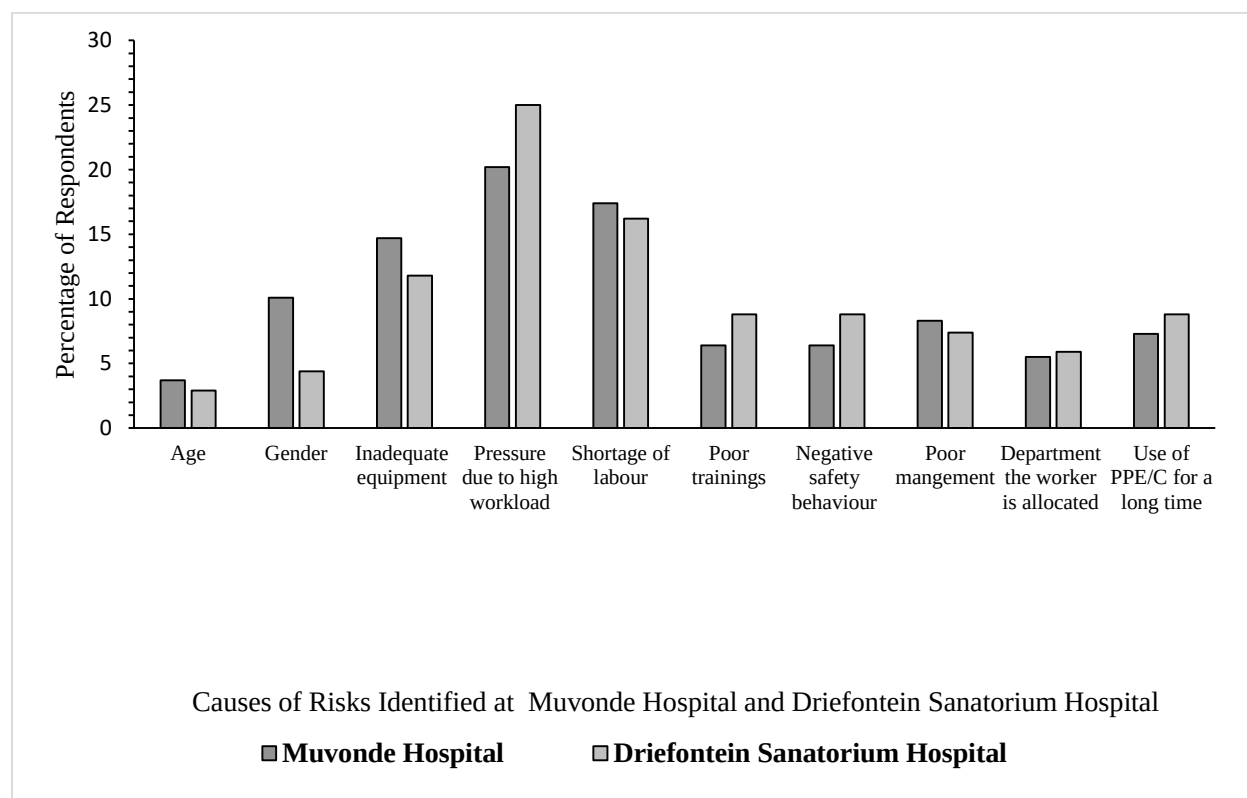


Figure 3: Causes of risks identified at Muvonde Hospital and Driefontein Sanatorium Hospital
Source: Field Survey (2023)

5.3.5 Effects of Risks Identified at Muvonde Hospital and Driefontein Sanatorium Hospital

5.3.5.1 Effects of Ergonomic Risks

Study findings at Muvonde Hospital shows that the majority (51.4%) specified back injuries regarding effects of ergonomic risks Figure 4. Based on the results (21.1%) reported neck pain while (16.5%) indicated shoulder discomfort followed by muscular strain which was designated by (11%) of the questionnaire respondents at Muvonde Hospital. Regarding effects of ergonomic risks at Driefontein Sanatorium Hospital most (57.4%) indicated back injuries while neck pain and shoulder discomfort was reported by (19.1%) and (13.2%) respectively Figure 4. However, at Driefontein Sanatorium Hospital muscular strain was designated as an effect of ergonomic risks by (10.3%) of the study participants.

5.3.5.2 Effects of Biological Risks

Regarding effects of biological risks at Muvonde hospital (29.4%) of the respondents reported Covid-19 virus while (6.4%) specified tuberculosis, (3.7%) indicated hepatitis B/C and very few (1.8%) designated HIV/AIDS Figure 4. However, the majority (58.7%) of the study participants at Muvonde Hospital specified that none of the infections related to ergonomic risks. Based on the findings obtained at Driefontein Sanatorium Hospital pertaining effects of ergonomic risks, the majority (33.8%) specified Covid-19 virus whereas (25%) reported tuberculosis, (13.2%) specified hepatitis B/C and (1.5%) indicated HIV/ AIDS. Nonetheless, (26.5%) designated that they never experienced any infections related to biological risks at work as shown by Figure 4.

5.3.5.3 Effects of Physical Risks

Effects of physical risks were examined at Muvonde Hospital and Driefontein Sanatorium Hospital. Results shows that more than half (57.8%) of the questionnaire respondents at Muvonde hospital reported needle stick injuries. Figure 4 also indicated that (19.3%) of the healthcare workers at Muvonde Hospital specified cuts/pricks, (14.7%) indicated influenza and (8.3%) of the study participants designated crumps. Based on the findings regarding effects of physical risks at Driefontein Sanatorium Hospital most (52.9%) stated needle stick injuries. Cuts/pricks were reported by (27.9%) healthcare workers, (11.8%) specified influenza while (7.4%) designated crumps among effects of physical risks at Driefontein Sanatorium rural Hospital.

5.3.5.4 Effects of Chemical Risks

Considering effects of chemical risks at Muvonde Hospital most (39.4%) of the study participants reported skin irritation, followed by allergies specified by (33.9%) respondents, (11.9%) stated pulmonary irritation while (2.8%) of the participants identified asthma. However, (10.1%) of the questionnaire respondents indicated they never experienced effects of chemical risks related to tasks they perform at Muvonde Hospital and the least (1.8%) indicated birth defects as effects of chemical risks Figure 4. At Driefontein Sanatorium Hospital the majority (48.5%) of the healthcare workers who participated as questionnaire respondents specified skin irritation regarding effects of chemical risks. Allergies were reported by (26.5%) study participants, (17.6%) indicated pulmonary irritation and (4.4%) stated asthma among the effects of chemical risks they experienced at Driefontein Sanatorium Hospital (Figure 4). Nonetheless, very few (2.9%) did not report any effect of chemical risks at Driefontein Sanatorium Hospital.

5.3.5.5 Effects of Psychosocial Risks

Majority (47.7%) of the questionnaire respondents at Muvonde Hospital indicated stress as an effect of psychosocial risks (Figure 4). However, some (20.2%) of the respondents reported fatigue, (15.6%) specified anxiety, (3.7%) stated insomnia, and (2.8%) of the participants pointed out persistent tiredness as effects of psychosocial risks they experienced at Muvonde Hospital. Blood pressure was specified by the least (0.9%) of the healthcare workers at Muvonde hospital while (9.2%) of the healthcare employees specified that they never experienced any challenges related to psychosocial risks. Figure 4 also indicates effects of psychosocial risks reported by healthcare workers at Driefontein Sanatorium Hospital. Most (45.6%) of the study participants at Driefontein Sanatorium Hospital indicated that they experienced stress as a result of psychosocial risks. At Driefontein Sanatorium Hospital fatigue was reported by (23.5%) respondents, anxiety was specified by (16.2%) participants, insomnia (5.9%) and (2.9%) participants indicated persistent tiredness. Nevertheless, minority (1.5%) of the questionnaire respondents indicated that they are affected with blood pressure as a result of psychosocial risks and some (4.4%) specified that they never experienced effects of psychosocial risks.

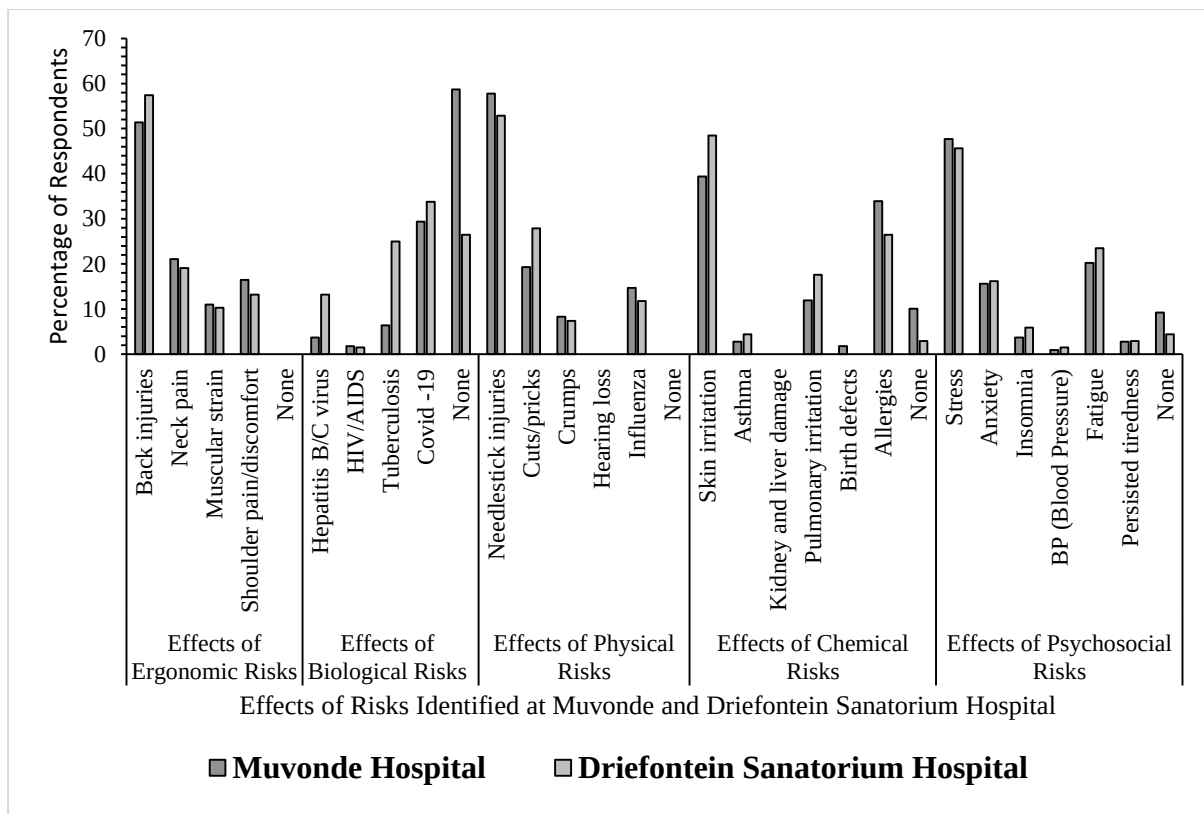


Figure 4: Effects of risks identified at Muvonde hospital and Driefontein Sanatorium hospital
Source: Field Survey (2023)

5.3.6 Work Safety Measures used to Manage Risks Identified at Muvonde Hospital and Driefontein Sanatorium Hospital

Study participants at Driefontein Sanatorium Hospital and Muvonde Hospital were requested to indicate work safety measures used for coping with work-related risks. Regarding work safety measures at Muvonde Hospital the majority (38%) of the questionnaire respondents indicated personal protective equipment/cloth Figure 5. However, at Muvonde Hospital (13%) of the study participants specified safety inspection, (12%) of healthcare workers reported proper waste disposal, (11%) designated monitoring of workers' safety behaviour, (9%) safety training and (9%) of the respondents stated safety workshops as methods used to manage risks. Other (8%) of the health care workers who participated as questionnaire respondents indicated other measures that can be used to manage risks for example screening healthcare workers for diseases such as hepatitis B/C virus, Covid-19 and tuberculosis as indicated by Figure 5.

Based on the results obtained at Driefontein Sanatorium Hospital pertaining safety measures the majority (40%) stated personal protective equipment/cloth as indicated by Figure 5. At Driefontein Sanatorium Hospital safety inspection was reported by (10%) of the questionnaire

respondents, proper disposal of waste (9%), monitoring of workers' safety behaviour (7%), safety training (6%) and safety workshops was specified by (6%) of the healthcare workers. However, Figure 5 indicated that (22%) of the questionnaire respondents at Driefontein Sanatorium Hospital stated other safety measures such as screening healthcare workers for diseases for example Covid-19, tuberculosis and hepatitis B/C.

During the study survey at Driefontein Sanatorium hospital the Matron indicated that, as a hospital which is focusing on maintaining high standard of sterility using available resources to promote quality healthcare service in Chirumanzu district and beyond we put safety informative charts for the benefit of both patients, visitors and workers. The Matron go on to indicate that we also provide safety facilities such as washing hand facilities. This was supported by observations results. During observations informative charts and washing hand facilities were observed at Driefontein Sanatorium hospital as shown by Plate 1 and Plate 2 respectively.

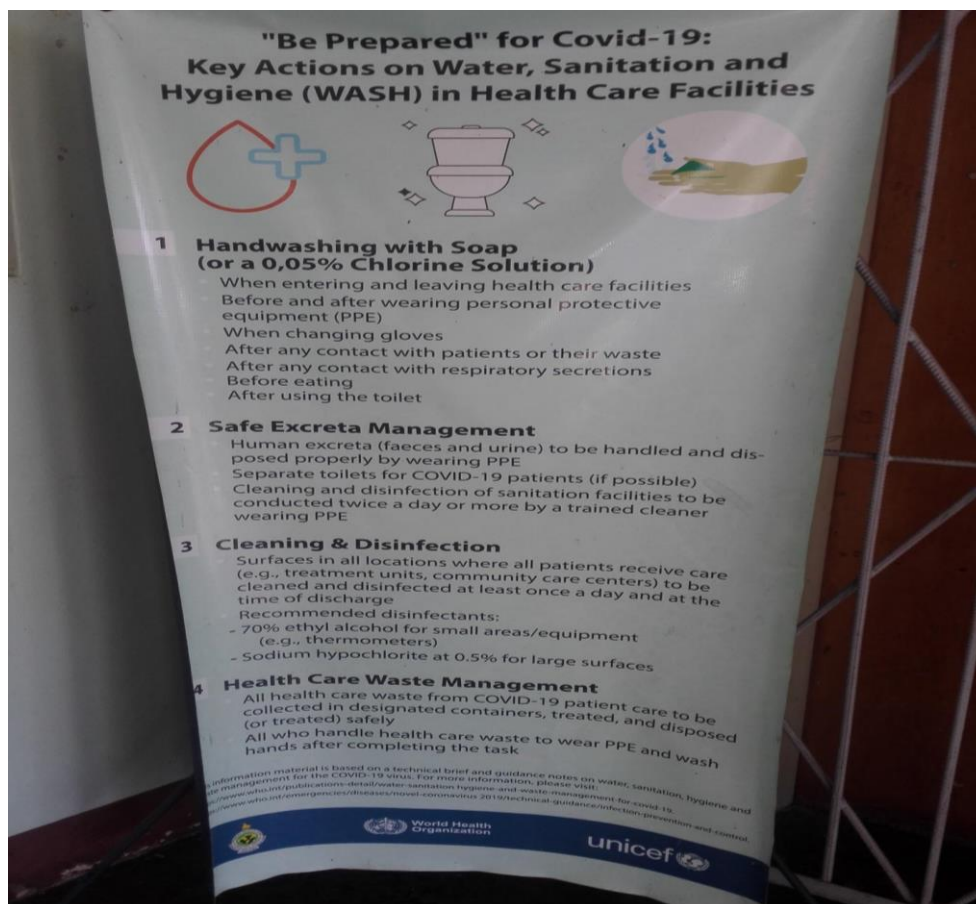


Plate 1: Informative chart shown at Driefontein Sanatorium Hospital

Source: Field Survey (2023)



Plate 2: Washing hand facility (bucket) observed at Driefontein Sanatorium Hospital

Source: Field Survey (2023)

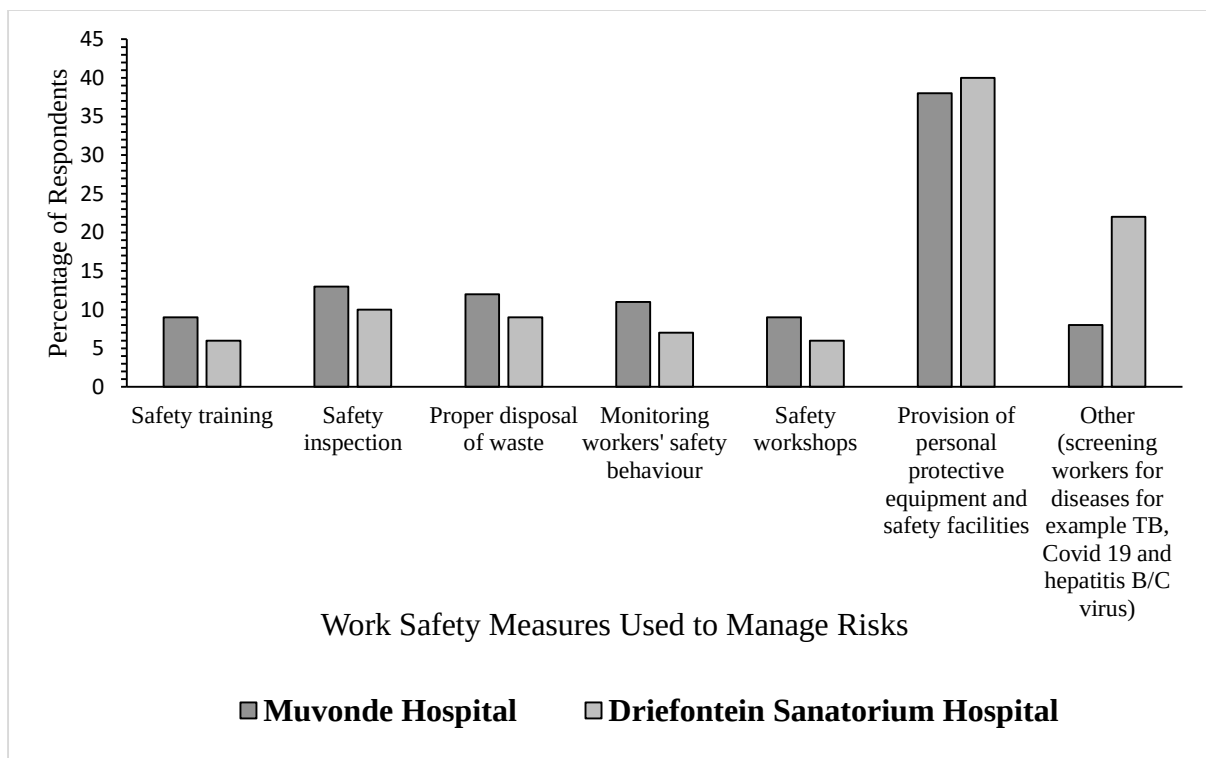


Figure 5: Work Safety Measures used to Manage Risks Identified at Muvonde Hospital and Driefontein Sanatorium Hospital

Source: Field Survey (2023)

5.3.7 Safety Policies at Muvonde Hospital and Driefontein Sanatorium Hospital

The majority (47.7%) of the questionnaire respondents agree that at Muvonde Hospital there are clear safety policies while (33.9%) strongly agree, (10.1%) disagree and (8.3%) strongly disagree Figure 6. However, at Driefontein Sanatorium Hospital most (54.4%) of the healthcare workers agree and (27.9%) strongly agree about the availability of clear safety policies at Driefontein Sanatorium Hospital. During the study at Driefontein Sanatorium Hospital the researcher was given access to some of the hospital's documents to use them as secondary data sources. The researcher discovered a safety policy manual and went through it and it was showing clear objectives. The objectives of the policy manual include 1) To provide continued guidance to health workers and students on infection prevention control measures and policies. 2) To promote an educational strategy for healthcare workers with a broader aim in mind. 3) To promote participation in infection prevention and control by healthcare workers, patients, relatives and visitors on how to reduce hospital acquired infection. 4) To allay unnecessary anxiety by providing fundamental information on infection prevention and control measures. 5) To promote, maintain and strengthen the high standard of cleanliness in the hospital and its environment. Supplementary material 2 only presents the cover page, preface, table of contents and objectives of hospital rules, regulations and policies related to infection prevention and control at Driefontein Sanatorium hospital. At Driefontein Sanatorium hospital few (10.3%) disagree and very few (7.4%) strongly disagree about the availability of clear safety policies at Driefontein Sanatorium hospital Figure 6.

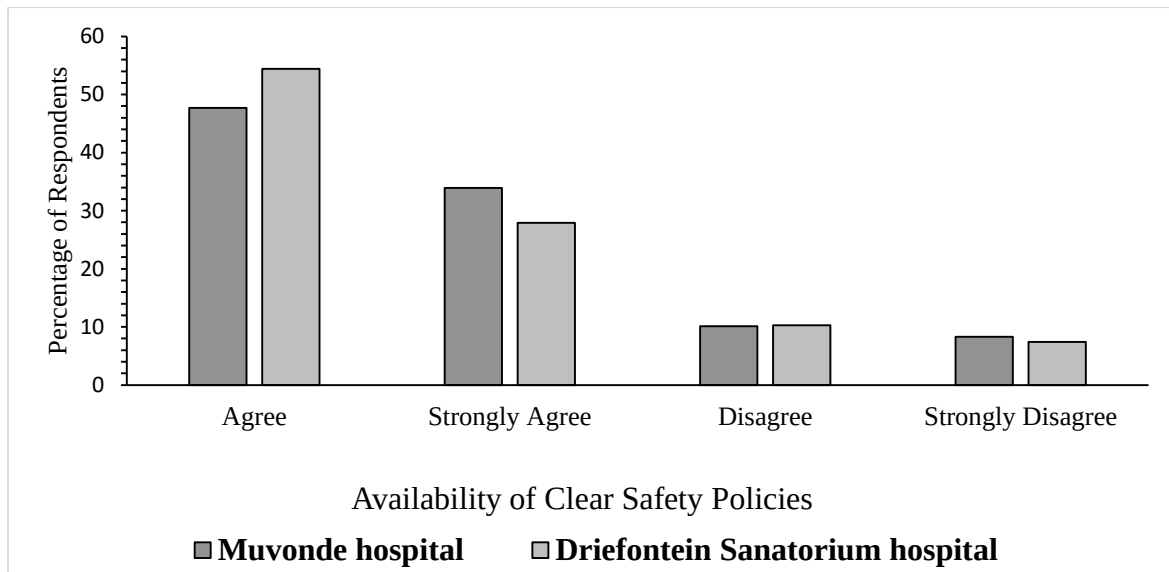


Figure 6: Availability of clear safety policies at Muvonde Hospital and Driefontein Sanatorium Hospitals

Source: Field Survey (2023)

5.3.8 Effectiveness of Work Safety Measures Used to Manage Risks at Muvonde Hospital and Driefontein Sanatorium Hospital

Figure 7 shows that while a small percentage of survey respondents (7.3%) said that institutional measures used to manage risks at Muvonde Hospital are poor, more than half (56%) said the measures are good, (21.1%) indicated that the measures are very good and (15.6%) specified that the measures are excellent. As seen in Figure 7, the majority of the study participants (51.5%) stated that the institutional measures in place at Driefontein Sanatorium Hospital to manage risks are effective because they are good. This is followed by (30.9%) who said the measures are very good and (13.2%) stated that the measures are excellent. A small percentage (4.4%) of the questionnaire respondents at Driefontein Sanatorium Hospital indicated that the safety measures are poor.

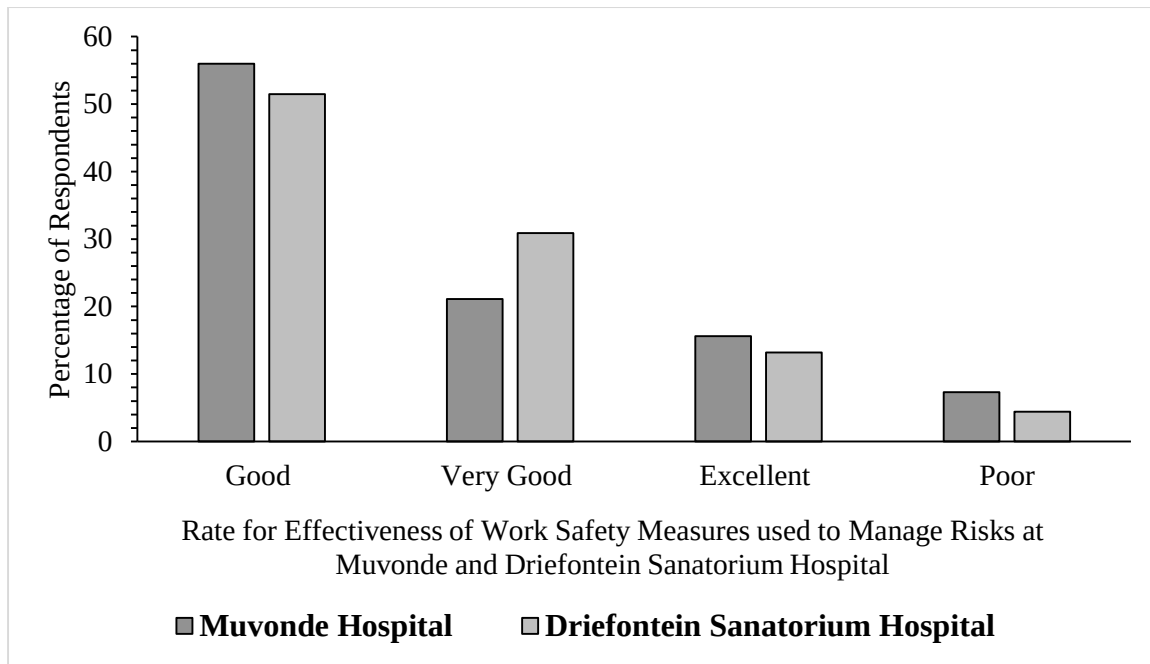


Figure 7: Effectiveness of Work Safety Measures used to Manage Risks at Muvonde Hospital and Driefontein Sanatorium Hospital

Source: Field Survey (2023)

Association between Work Experience (years) and Effectiveness of Work Safety Measures used to Manage Risks

During data analysis Chi-Square test was employed to test the association between work experience and rating the effectiveness of work safety measures used to manage risks at Muvonde hospital and Driefontein Sanatorium hospital.

The following hypotheses were tested:

Null hypothesis (H0) – There is no association between work experience and rating the effectiveness of work safety measures used to manage risks at Muvonde Hospital and Driefontein Sanatorium Hospital.

Alternative hypothesis (H1) - There is an association between work experience and rating the effectiveness of work safety measures used to manage risks at Muvonde Hospital and Driefontein Sanatorium Hospital.

0.05 was set as the probability value.

If X^2 is above 0.05 accept H_0 and reject H_1 . There is no relationship between work experience and rating the effectiveness of work safety measures used to manage risks at Muvonde Hospital and Driefontein Sanatorium Hospital.

If X^2 is below 0.05 accept H_1 and reject H_0 . There is a relationship between work experience and rating the effectiveness of work safety measures used to manage risks at Muvonde Hospital and Driefontein Sanatorium Hospital.

Table 4: Chi-square tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.114E2 ^a	12	.000
Likelihood Ratio	173.584	12	.000
Linear-by-Linear Association	88.739	1	.000
N of Valid Cases	109		

Source: Field Survey (2023)

Table 4 shows that the Chi-Square test results were 0.000, which is less than the significance level 0.05. In light of the findings, we accept H_1 and reject H_0 . Based on the analysis, the findings show that evaluating the effectiveness of work safety measures at Muvonde Hospital and Driefontein Sanatorium Hospital is associated with work experience.

5.4 Discussion

Females made up the majority of the healthcare workers who took part during the study conducted at Driefontein Sanatorium Hospital and Muvonde Hospital. The findings of the research conducted at Muvonde Hospital and Driefontein Sanatorium Hospital align with the findings of [39] that females constitute the majority of healthcare workers in the United States. A study carried by [40] also indicated that females constitute 70% of the healthcare workers working in healthcare facilities of Pakistan. This implies that healthcare workers who are men are less than women. The explanations for the gender gap in hospital employment are varied. For example, women are typically drawn to caregiving-related fields due to their nurturing disposition and empathy for others. Given that women frequently work in nursing in Zimbabwe, the prevalence of female hospital workers maybe be a reflection of larger cultural trends in the country. Various genders might have distinct requirements and experiences in healthcare settings and this demographic trait might have an impact on safety measures and regulations. The purpose of asking the gender of the respondents was to discover risks that are

associated with gender. Recognizing that women make up a large proportion of the workforce enables customised safety awareness courses that target particular risks that women encounter in healthcare environments. The findings point to the necessity of accurate risk assessments that are specific to gender vulnerabilities. As a result of this, stakeholders may create more sustainable and efficient safety procedures that improve the health of all workers in healthcare centers by concentrating on the demands and dangers unique to each gender.

Overall, data gathered for the study suggests that healthcare staff at Driefontein Sanatorium Hospital and Muvonde Hospital have a different age range, which offers a variety of perspectives and experiences about dangers impacting healthcare workers. Because this is the traditional age range for people to start their careers in medical institutions, the majority of healthcare workers are between the ages 26–33 and 34–41. Different perspectives on occupational risks may result from this disparity in age ranges. Younger healthcare employees could be more flexible and receptive to new safety procedures where as more experienced professionals might have developed habits and procedures based on their professional experiences. Regarding the findings at Muvonde Hospital and Driefontein Sanatorium Hospital most of the healthcare personnel who took part during the study are in the active group. This concurs with a study conducted by [41] from healthcare facilities in Oriental Mindoro, which shows that the majority of hospital employees who took part in the study were between the ages of 26 and 33 which is the active group. Therefore, developing a thorough safety model requires striking balance between viewpoints provided by healthcare workers of various age groups. Incorporating input from different age groups in safety evaluations allows hospitals to create long lasting procedures that change over time to accommodate shifting workforce demographics.

Most of the healthcare workers who participated as questionnaire respondents at Driefontein Sanatorium Hospital and Muvonde Hospital are married. Similar findings about marital status were found at Muvonde Hospital and Driefontein Sanatorium Hospital. This could be due to the fact that hospital staff members prioritise marriage over pursuing their careers or because marriage is culturally valued in the communities where the hospitals are located. However, there is a connection between married status and the risk levels that impact healthcare workers. For instance, married healthcare workers have additional duties in addition to their jobs, which increases their exposure to risk. Healthcare workers' responsibilities towards their families have a significant impact on how well they function and perform at work. The findings on the marital status of employees within the rural hospitals are both consistent which implies that

this issue should be taken into account when evaluating the safety of employees and creating interventions meant to enhance safety.

The majority of healthcare personnel who participated in the study at Muvonde and Driefontein Sanatorium rural hospitals indicated that their highest level of education was a diploma, however, some of them held certificates. This is mainly because the majority of medical training institutions in Zimbabwe provide hospital workers with diplomas and certificates rather than degrees. The inquiry concerning the level of education for healthcare workers was raised on the grounds that it influences how they might interpret potential risks at their work environment and how to alleviate them. Higher educated medical practitioners are more aware of the risks related to their work and they can prepare more effectively for occupational risks before they occur [42]. This suggests that there is an association between the level of education of healthcare practitioners and safety attitudes and safety practices. Healthcare professionals who hold diplomas usually receive more training than those who merely hold certificates. This might result in a deeper comprehension of safety procedures and practices. Thus, it's critical to evaluate if the skills gained by healthcare workers during training transfer into the successful use of safety precautions at work.

The results obtained at Muvonde Hospital and Driefontein Sanatorium Hospital demonstrated that most of the healthcare workers indicated 5–10 years range as their work experience. However, very few indicated 16 years or above as their work experience range. This proposes that turnover rates at Driefontein Sanatorium Hospital and Muvonde Hospital are high and this leads to the availability of less experienced and youthful workforce. Asking healthcare workers their work experience was vital because experienced hospital workers can be better equipped with better methods for managing risks when performing their tasks. Comprehensive safety training programs centered on safety regulations and safety procedures are needed because the majority of staff members are still in the early stages of their profession. In order to successfully overcome workplace risks younger employees might need greater mentoring. According to [12] an association exists between work experience and effectiveness of safety measures used to manage work-related risks. Therefore, creating a solid safety culture is essential particularly in situations where most of the employees lack an extensive experience.

According to the results obtained at Driefontein Sanatorium Hospital and Muvonde Hospital ergonomic, chemical, psychosocial, biological and physical risks were identified. Multiple risk classes have been identified which emphasizes the need for a through risk assessment system

that takes into account every facet of occupational safety. This comprehensive strategy guarantees that all possible risks are dealt with systematically. Regarding risks identified by healthcare workers at Muvonde hospital, the majority indicated ergonomic risks. Interventions to improve workplace ergonomics are needed as evidenced by the prevalence of ergonomic dangers. In order to lessen the burden on healthcare employees there is need to rearrange workstations or putting in place training courses that emphasize safe lifting methods and good posture while working. Duties performed by healthcare workers involve manual tasks, pushing, transferring and lifting patients as well as repetitive tasks which expose them to ergonomic risks. Most (30.9%) of the healthcare workers at Driefontein Sanatorium Hospital reported biological risks because the hospital deals mainly with contagious diseases such as tuberculosis. According to high proportion of biological risks mentioned, healthcare employees may be exposed to tuberculosis and other infectious diseases. Workers may have health issues as a result of this exposure which may lower labor capability and cause absenteeism. Some of the healthcare workers at both Muvonde Hospital and Driefontein Sanatorium Hospital reported chemical risks. In hospitals healthcare employees are exposed to various types of chemicals such as disinfection chemicals used for cleaning and disinfecting equipment and facilities. Chemical exposures in the hospital setting should be identified and measured on a regular basis. Therefore, in order to detect trends associated with chemical exposure and enable prompt actions healthcare employees' health should be continuously monitored.

According to [16] workers who perform their tasks in healthcare facilities are affected with various types of work-related risks such as psychosocial, physical, biological, ergonomic and chemical risks. Numerous musculoskeletal disorders, exhaustion and a decline in healthcare employees' productivity can result from conditions associated with risks which affect them. Based on the distribution of ergonomic risks at Driefontein Sanatorium Hospital and Muvonde Hospital, standing for a long time was reported by most of the questionnaire respondents. Duties performed by healthcare professionals require them to stand for long periods of time. Healthcare workers stand for a long time when providing services to patients. In hospitals workers usually stand in queues and move around the hospital on their feet helping patients on wheelchairs or stretchers to get their services. Determining particular tasks that necessitate extended periods of standing is vital in identifying areas that require safety interventions. Results showing the distribution of physical risks at Muvonde Hospital and Driefontein Sanatorium Hospital indicated that sharp objects were specified by most of the healthcare workers who participated during the study. In healthcare facilities there is high use of sharp

objects such as needles, razorblades, scalpels and scissors however, if safety precautions are not followed when using them, they expose workers to injuries, cuts and pricks. The findings of the study coincide with the findings of [4] which indicates that healthcare workers are exposed to sharp injuries as a result of continuous use of sharp objects in hospitals. Risks associated with sharp objects are common which raises the possibility that these rural hospitals' current work safety procedures are insufficient or not well implemented. As a result of this, it is imperative that existing safety procedures used within the rural hospitals be reviewed so that some procedures that can address dangers posed by sharp objects can be implemented. Regarding distribution of biological risks at Driefontein Sanatorium Hospital and Muvonde Hospital, healthcare workers stated contact with wounds, viral infections, vomitus, urine of patients, breathing contaminated air and blood spillage. Blood spillage was reported as the major biological risk by the majority of healthcare employees. Healthcare workers are mainly exposed to blood spillages when carrying out surgeries and procedures. However, blood carries various types of contagious agents for example, hepatitis B, hepatitis C, HIV/AIDS and some blood-borne pathogens which can be transferred from one person to the other through contact with blood which is contaminated.

Regarding the distribution of chemical risks mercury, latex gloves, anaesthetic gases, sanitizers and cleaning detergents were reported by questionnaire respondents at Muvonde Hospital and Driefontein Sanatorium Hospital. Majority of the healthcare workers who participated during the study stated sanitizers. This occurs because sanitizers are mostly used by healthcare workers after procedures to sanitize their hands in order to prevent cross infection. Healthcare employees may be more aware of the risks associated with the increased dependence on sanitizers for infection prevention as a result of the Covid-19 epidemic. Sanitizer contains alcohol that kills bacteria; however, it exposes healthcare employees to skin irritation [17, 31]. Findings of the study on distribution of psychosocial risks at Driefontein Sanatorium Hospital and Muvonde Hospital indicated fatigue, over work, abuse and dealing with severely ill patients. Nevertheless, most of the healthcare employees specified dealing with very ill patients. Caring severely ill patients is highly demanding which increases the rate of stress affecting workers in hospitals.

Results indicated that risks identified at Muvonde Hospital and Driefontein Sanatorium Hospital are caused by various aspects notably, use of personal protective equipment/cloth for a long time, department the worker is allocated at the hospital, poor management, negative safety behaviour, poor training, gender, age, inadequate equipment, shortage of labour and

pressure due to high workload. Regarding the mentioned causes of risks at Muvonde and Driefontein Sanatorium rural hospitals, the majority of the healthcare workers specified pressure due to high workload. The increasing number of patients can prompt long working hours and increase workload to healthcare workers. High workload affecting healthcare workers in rural hospitals indicated that there is shortage of staff within the rural hospitals. As a result of this, healthcare professionals may experience physical and psychosocial side effects, including exhaustion, burnout and illnesses linked to stress caused by overwork. This implies that safety in hospitals is compromised by strain brought by heavy workload, putting healthcare personnel at risk. However, in addition to endangering the health of rural hospital employees, this circumstance also makes it more difficult for these rural hospitals to perform efficiently. In order to improve work safety assessments and guarantee sustainable healthcare practices within rural hospitals, a process based model for effective and sustainable work safety analysis is essential.

Based on the results obtained at Muvonde Hospital and Driefontein Sanatorium Hospital pertaining to ergonomic risks, respondents indicated muscular strain, shoulder discomfort, neck pain and back injuries. However, most of the healthcare workers reported back injuries. These findings imply that back injuries are a serious problem in both hospitals as a result medical practitioners need to pay attention to them. Because of the nature of their jobs, healthcare personnel frequently suffer from back injuries. Regular lifting, moving and transferring of patients puts a lot of strain on the backs of healthcare professionals. Furthermore, working in awkward positions is a common requirement for healthcare professionals, which can potentially lead to back injuries. Back injuries can also result from pushing large items like wheelchairs and hospital beds. Results of the study also indicate that Covid 19, HIV/AIDS and tuberculosis were indicated as effects of biological risks. Global health systems have been significantly impacted by the introduction of Covid-19. Lack of resources and insufficient infection control procedures increase the danger of transmission between medical staff and patients in remote hospitals for example Muvonde and Driefontein Sanatorium rural hospitals located in Chirumanzu district. At Muvonde Hospital and Driefontein Sanatorium Hospital influenza, cuts/pricks and needle stick injuries were specified as effects of physical risks. However, within the two rural hospitals the majority of the study participants stated needle stick injuries. In addition to the acute physical suffering they cause, many sharp injuries have long-term consequences related to exposure to infections like hepatitis B/C and HIV/AIDS. The explanations behind such a high frequency of needle stick

injuries at Driefontein Sanatorium Hospital and Muvonde Hospital could be due to poor training of healthcare workers on how to handle needle sticks with care. Additionally, in hospitals there is high use of needle sticks due to their piercing nature.

Healthcare professionals at Muvonde Hospital and Driefontein Sanatorium Hospital have reported birth defects, skin irritation, allergies, asthma and pulmonary irritation as effects of chemical risks. Similar to Driefontein Sanatorium Hospital, where the majority of healthcare workers (48.5%) reported skin irritation, the majority of hospital employees at Muvonde Hospital (39.4%) expressed experiencing skin irritation. Healthcare personnel are susceptible to skin irritation due to their exposure to a variety of chemicals used in hospitals, including cleaning agents/products, disinfectants and sterilising solutions. When chemicals come into contact with the skin or when they are inhaled, they result in allergic reactions [33]. In hospital settings, the need for repeated sanitization and handwashing can deplete the skin's natural oils causing irritation and dryness. Stress, exhaustion, anxiety, sleeplessness, chronic fatigue and blood pressure are among the psychosocial dangers that healthcare staff at Muvonde hospital and Driefontein Sanatorium Hospital encounter. The study's results support those of [3, 21] that psychosocial hazards such as anxiety, stress, blood pressure and exhaustion can have an impact on healthcare professionals in Zimbabwe. The majority of healthcare professionals within the two rural hospitals specified that psychosocial risks cause them to experience stress. This could be caused by a number of factors, including stress inducing variables including workload, interpersonal issues and job uncertainty. Psychosocial risk has been linked to fatigue, which may be brought on by extended workdays and unfavourable working conditions. The fact that most healthcare workers report feeling stressed suggests that there is a structural problem within the workplaces. Lack of infrastructure, staff and medical supplies is a common problem for rural hospitals. Therefore, existing healthcare workers may experience additional strain as a result of this shortage as they are forced to care for numerous patients than what they are capable of handling.

Findings of the study indicated that work safety measures applied at Muvonde hospital and Driefontein Sanatorium hospital include safety inspection, safety training, monitoring worker's safety behaviour, proper disposal of waste, provision of personal protective equipment and other measures such as screening workers for hepatitis B/C and tuberculosis. The study found that most healthcare employees at Muvonde and Driefontein Sanatorium rural hospitals stated use of PPE/C. This suggests that the two hospitals prioritise the use of PPE/C as a way for controlling occupational risks. Protecting healthcare employees from infectious pathogens and

dangerous chemicals requires the provision of personal protective equipment/cloth. In Sub-Saharan Africa, hospitals prioritise the use of PPE/C and during the outbreak of Covid-19 pandemic they imported PPE/C to cover scarcity in healthcare facilities [32]. These hospitals exhibit adherence to both national and global health standards by making the use of personal protective equipment/cloth a priority. Putting the use of personal protective equipment/cloth first promotes a culture where safety is the top priority within the company. Healthcare professionals at Muvonde Hospital and Driefontein Sanatorium Hospital identified safety inspection as a risk management strategy. This is due to the fact that safety inspections are a useful tool for spotting possible risks and addressing them before they endanger patients, employees as well as visitors. Safety inspections assist in ensuring that appropriate infection control procedures are implemented.

Safety workshops and training have been recognised by healthcare professionals at Muvonde and Driefontein Sanatorium rural hospitals as crucial steps in reducing work place risks. This is because healthcare professionals are subjected to a wide range of risks therefore, safety workshops and training give them the knowledge and abilities they need to recognise possible hazards, evaluate risks and put control measures in place. Healthcare personnel at Muvonde hospital and Driefontein Sanatorium Hospital indicated that one institutional risk management strategy was the appropriate disposal of waste. Healthcare professionals may bring up waste disposal as a safety precaution because hospitals have stricter policies and procedures related to waste in place. Healthcare professionals stated appropriate waste management as a risk reduction strategy because inappropriate hospital waste disposal can spread infectious diseases and seriously jeopardise public health. Proper waste storage of medical waste protects healthcare workers from risks associated with improper waste disposal [43].

Results of the study shows that most of the healthcare workers at Driefontein Sanatorium Hospital and Muvonde Hospital agree that there are safety policies within the hospitals. This indicates a high level of confidence in the hospital's safety protocols and procedures. So, the hospital's commitment to ensuring the safety of everyone within its premises is commendable and should serve as an example to other healthcare facilities. The positive response from the questionnaire respondents could be due to the hospital's strict adherence to regulatory requirements. This indicates that healthcare workers recognize the significance of having well-defined policies in place to ensure their safety while performing their duties. As a result, the policies can create a culture of safety within the workplace, where employees are aware of the risks associated with their job and take proactive measures to mitigate them. According to [25]

proper safety policies improve safety communication within the hospital departments and encourages hospital workers to protect patients and safeguard their own well-being.

The outcomes at Muvonde Hospital and Driefontein Sanatorium Hospital are consistent with each other since, when it came to work safety measures, most healthcare workers at both facilities rated them as good, very good, excellent with a minority indicating poor. Many factors may have contributed to the majority of respondents' ratings of the institutional safety measures as good, very good and excellent. For example, hospitals may have spent money on staff training programmes to make sure they are aware of and adhere to appropriate safety procedures. Furthermore, hospitals might have conducted routine audits to find possible risks and hazards at work and take appropriate measures to address them. The small percentage of respondents who gave work safety analysis a low percentage rating might be the result of other staff members' ignorance. Lastly, there might not be enough accountability or enforcement systems in place to guarantee that every employee follows the right safety procedures. This suggests that in order to guarantee that all factors are sufficiently addressed, there is space for improvement in hospital risk management procedures.

The results of the Chi-square test show a correlation between rating the effectiveness of work safety measures and work experience. This means that a health worker's work experience affects how effective the measures used to manage risks are rated. This might be a result of a number of issues, including improved procedure knowledge, increased confidence in hospital employees' abilities to recognise and reduce risks and increased awareness of the significance of workplace safety. Furthermore, workers with greater work experience might have witnessed more accidents or incidents at work, which might have improved their awareness of safety precautions that reduce risks. The results are in line with [16] who show that worker's experience has a significant impact on how effective safety measures are rated for managing losses.

5.5 Conclusion and Recommendations

The study indicated that healthcare workers in hospitals of Chirumanzu district are affected with work-related risks as a result of inadequate equipment, poor training, negative safety behaviour, poor management and pressure due to high workload. As a result of this, the study has pinpointed areas where these hospitals' work safety analysis performance needs to improve, highlighting the necessity of thorough risk assessments, the use of safety procedures and employee training to reduce possible dangers. Furthermore, the study has emphasised how

important it is to promote a safety and accountability-oriented culture in these healthcare environments. The research's conclusion allow the formulation of recommendations to improve the effectiveness of work safety analysis in Chirumanzu District's rural hospitals. To identify possible risks and weaknesses in the workplace, hospital management must perform comprehensive risk assessments. Assessment should include the tools and physical infrastructure as well as human factors. Additionally, healthcare facilities should develop and implement strict safety policies and procedures to manage hazards that have been identified. This covers procedures for managing hazardous items, preventing infections and responding to emergencies. Moreover, staff training and education should be improved. Regular training on work safety methods and procedures should be provided to healthcare staff. This will enable them to identify any hazards and take appropriate action. Hospital administration should place a high priority on fostering a culture of safety among employees by fostering open dialogue about safety issues and encouraging responsibility at all levels. In hospitals work safety efforts should receive sufficient funding, which should go towards purchasing safety gear, improving infrastructure and continuing training courses.

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12913-024-.-x>.

Supplementary Material 1.

Supplementary Material 2.

5.6 References

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Chapter 6

Developing a Process-Based Model for Effective and Sustainable Work Safety Analysis for Rural Hospitals in Chirumanzu District of Midlands Province, Zimbabwe

Tapiwa Shabani¹; Steven Jerie¹; Pedzisai Kowe¹ and Takunda Shabani¹

¹Midlands State University, Department of Geography, Environmental Sustainability and Resilience Building

Corresponding Author: Tapiwa Shabani, email address: tapiwashaban@gmail.com

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Abstract

At healthcare facilities, particularly in rural areas with limited resources and amenities work safety analysis is essential. The aim of this study is to develop a process-based model for effective and sustainable work safety analysis for rural hospitals in Chirumanzu district of Midlands Province, Zimbabwe. Descriptive cross-sectional design was used during the study. Data was collected from 109 healthcare workers at Muvonde Hospital and 68 healthcare employees at Driefontein Sanatorium Hospital. Data was collected using interviews, observations, questionnaires and secondary data sources. During the study a review of existing work safety analysis models such as Bow-Tie Analysis model and Fault Tree Analysis was done. Data collected within the two rural hospitals focus on identifying types of risks, causes of risks, effects of risks and measures used to manage risks. Results indicated that at Muvonde and Driefontein Sanatorium rural hospitals workers are affected with psychosocial, physical, ergonomic, chemical and biological risks. Risks affecting healthcare workers expose them to diseases, infections, injuries, stress and musculoskeletal disorders. At Muvonde Hospital (51.4%) and at Driefontein Sanatorium Hospital (57.4%) reported back injuries. Methods used to manage risks within the two rural hospitals include use of PPE/C. Gaps such as inadequate equipment was identified in safety measures used at the hospitals. Data collected was synthesised and a process-based model for effective and sustainable work safety analysis was developed. There is an opportunity that the proposed process-based model can improve occupational safety measures and improve workers' well-being in rural hospitals because the model includes steps of work safety analysis, management commitment and stakeholder involvement.

Keywords: Healthcare Workers; Risk Assessment; Risk Identification; Rural Hospitals; Work-Related Risks; Work Safety Analysis

6.1 Introduction

Ineffective work safety analysis exposes hospital workers to various work related risks which affect their well-being (Ullah *et al.*, 2021; Thielmann *et al.*, 2022). Healthcare professionals put themselves at risk while doing their duties such as lifting patients and administering injections to patients (Liu *et al.*, 2020). Healthcare workers are exposed to numerous types of risks for example physical, biological, chemical, ergonomic and psychosocial risks (Saleh *et al.*, 2022; Mary, 2023). While research has been done on risks affecting different subsets of healthcare workers in developed countries, a comprehensive analysis of risks affecting healthcare practitioners working in developing countries especially those located in rural healthcare facilities yields relatively little information (Rai *et al.*, 2021; Guerra *et al.*, 2023). This means there is a need for a process-based model for effective and sustainable work safety analysis in rural hospitals for developing countries and Zimbabwe is not exempted. Effects of work-related risks affecting healthcare workers include stress, musculoskeletal disorders, injuries, fatigue, skin irritation and infections (Mossburg *et al.*, 2019; Thielmann *et al.*, 2022). Healthcare professionals are suffering from an increasing incidence of back injuries as a result of lifting and transferring patients manually (Friedenberg *et al.*, 2022; Mary, 2023; Eltoukhy *et al.*, 2024).

Healthcare workers are affected with stress due to their demanding job they perform (Saleh *et al.*, 2022; van Elk *et al.*, 2023). Although there has been a 60% increase in the number of physicians in China over the last 20 years, there has been a 276% and 355% increase in patient admissions which expose them to stress and burnout (Fu *et al.*, 2018). In healthcare facilities located in countries with adequate resources for example China there is use of Effort Reward Imbalance (ERI) model to identify if the healthcare facility is exposing its employees to psychosocial risks notably stress (Cheng *et al.*, 2023). It is possible to forecast health conditions and identify psychosocial risks associated with the work environment by using the ERI model (Erwandi *et al.*, 2021; Zhang *et al.*, 2021). The ERI model has shown value for analysing occupational stress in different organisations worldwide, but its applicability is probably restricted in evaluation of stress affecting healthcare workers in developing countries (Clinchamps *et al.*, 2021) and Zimbabwe's rural healthcare facilities are not spared. Challenges affecting rural healthcare facilities are unique since they are related to inadequate resources, shortage of labour and high workload to the available workers (Kakyo and Xiao, 2019; Okoroafor *et al.*, 2021). As a result of this, the application of the ERI model can be restricted by inadequate resources at rural hospitals. This signifies that it is important to develop a

process-based model for effective and sustainable work safety analysis which is specifically tailored to realities encountered by healthcare workers operating at rural hospitals.

Potential risks in hospitals are detected using work safety analysis because it guarantees risk evaluation (Zaroushani and Khajehnasiri, 2022). In the field of work safety analysis, a number of safety models are employed to improve safety within the workplace and efficiently reduce possible hazards (College and Bass, 2020). This suggests that the models focus on risk assessment, implementation of safety control measures and continuous improvement. The Bow-Tie Analysis model is one of the models which is applied for work safety analysis (Poletto *et al.*, 2021; Fajiri *et al.*, 2024). This shows that the interaction between prospective hazards, their root cause as well as the preventive and mitigation measures in place can be visualised using Bow-Tie analysis method. The Bow-Tie Analysis method is extensively employed in many sectors, including the healthcare sector to improve safety protocols and avert mishaps (McLeod *et al.*, 2021; Fabiano *et al.*, 2024). However, its application requires adequate data of accidents, injuries and near-misses incidents. In developed countries such as Netherlands where safety incidents, accidents and near-misses incidents are reported by healthcare workers the application of Bow-Tie Analysis model is high (Poldervaart *et al.*, 2019). The Bow-Tie Analysis model may fail to meet the demands of rural hospitals where availability of data related to occupational safety is limited. A view supported by Rai *et al.* (2021) and Singh *et al.* (2024), that adequate data on accidents and near-misses incidents is lacking at rural hospitals. As a result, a process-based model which encompasses the reporting and recording of data related to occupational incidents at rural hospitals is required for effective and sustainable work safety analysis.

According to Song *et al.* (2020) and Coronato and Cuzzocrea (2020) the most used technique for assessing risks at healthcare facilities is Fault Tree Analysis (FTA). Fault Tree Analysis is a technique which is frequently employed to examine system failures and identify hazards associated with the failures (Yazdi *et al.*, 2023). The main goal of FTA is to find systematic flaws or malfunctions that might cause an undesirable outcome (Song *et al.*, 2020; Pan *et al.*, 2022; Faiz and Yuamita, 2023). Nevertheless, in rural healthcare facilities such as hospitals technical failures are not the only contextual factors that expose employees to hazards but other factors such as limited ability to respond to emergencies. This limit FTA's ability to address the issue of identifying hazards and assessing risks affecting health workers at hospitals in rural areas. Hence, a model which includes all contextual factors such as limited ability of rural hospital staff to respond to emergencies and limited resources which increases vulnerability of

healthcare workers to risks at rural hospitals need to be developed. In the 1990s James Reason developed the Swiss Cheese Model (SCM) suitable for identifying the main causes of workplace accidents and providing ways to reduce the risks associated with them (Toto and Limone, 2019; Gui *et al.*, 2022). The SCM is frequently used in hospitals to comprehend safety of employees and flaws that could result in failure of systems (Elsehrawy *et al.*, 2021; Wiegmann *et al.*, 2022). However, rural hospitals are frequently affected with issues related to lack of modern equipment, understaffing and restricted access to safety training programs. These factors lead to gaps in the defences, which makes it challenging for the SCM to successfully reduce risks at rural hospitals. This infers that there is need for a process-based model which considers aspects such as training programs for it to be effective and sustainable in terms of work safety analysis within rural settings.

Maintaining high quality patient care and organisational effectiveness in the healthcare industry depends critically on protecting healthcare employees from work-related risks (McDiarmid *et al.*, 2021; Guerra *et al.*, 2023). Nonetheless, healthcare institutions located in rural areas have the greatest prevalence of occupational risks due to inadequate interventions directed to protecting the health and well-being of healthcare workers (Kakyo and Xiao, 2019). This means some of the safety measures used by healthcare workers to manage work-related risks in rural hospitals are less effective and sustainable. However, sustainability is contingent upon the company's overall commitment towards safety of its workers and rural hospitals are not excluded. As a result, a process-based model which encompasses the issue of management commitment is needed for effective and sustainable work safety analysis at rural hospitals. The model would improve safety in rural hospitals and improve the well-being of workers. The proposed model would help rural hospitals to meet the demands of Sustainable Development Goal 3 which focus on good health and well-being. The study's conclusions would also help rural hospitals to achieve target 8.8 of Sustainable Development Goal 8 which calls for fostering safe and secure working conditions for workers by 2030. Therefore, this study explores the complexities of work safety analysis at rural hospitals, with a particular emphasis on Muvonde and Driefontein Sanatorium rural hospitals in Chirumanzu district. The main objective of this study is to develop a process-based model for effective and sustainable work safety analysis for rural settings such as Muvonde and Driefontein Sanatorium rural hospitals in Chirumanzu District of Midlands Province, Zimbabwe.

6.2 Materials and Methods

6.2.1 Study Design

During the study a study design was applied in order to decide methods used for data collection and analysis. The research design applied during the study was descriptive cross-sectional design. Descriptive cross-sectional design was applied because it combines qualitative and quantitative data collection and analysis methods in addressing the needs of the objectives. The approach of combining quantitative and qualitative methods during the study is known as triangulation (Bans-Akutey and Tiimub, 2021).

6.2.2 Study Areas

The study was carried out at Muvonde and Driefontein Sanatorium rural hospitals located in ward 20 of Chirumanzu district as shown in Figure 1. The bed capacity of Muvonde Hospital is 190 beds and Driefontein Sanatorium Hospital has a bed capacity of 120 (Tichapondwa, 2012). In Zimbabwe Driefontein Sanatorium Hospital is popular in terms of Tuberculosis diagnosis.

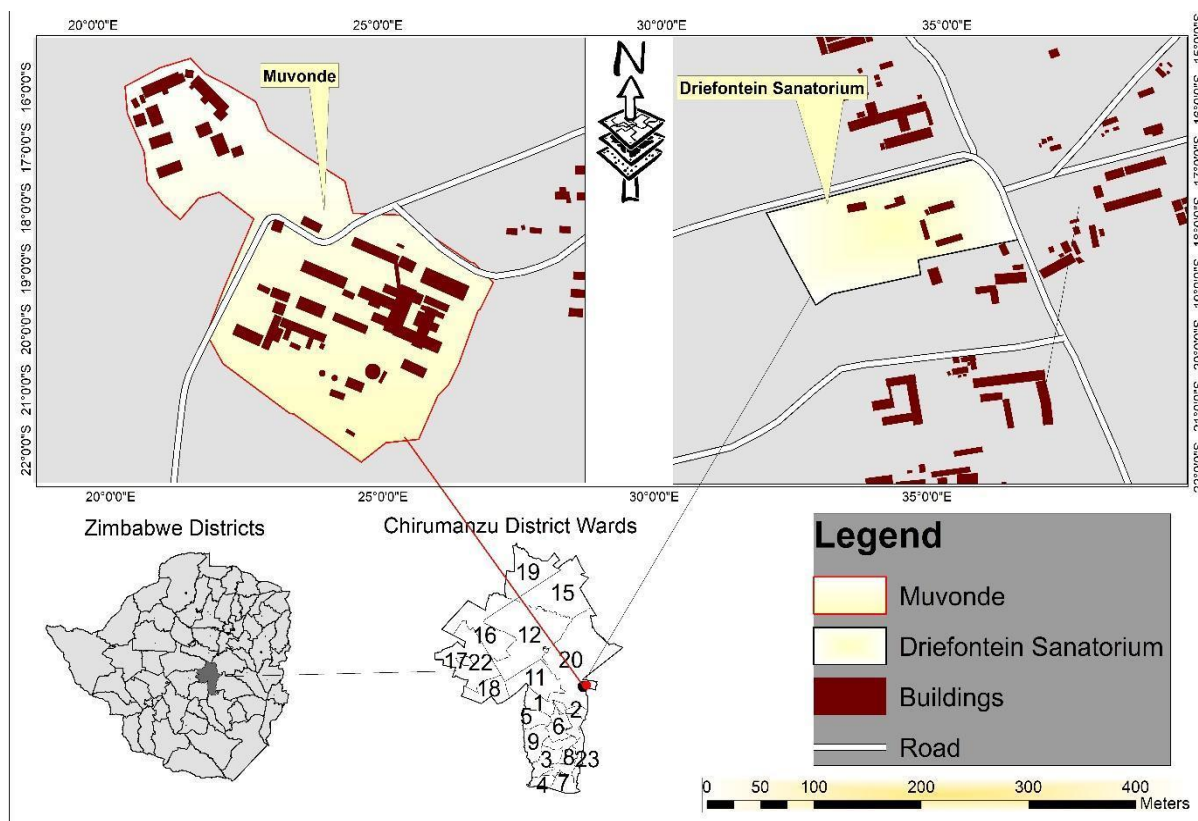


Figure 1: Map Showing Location of Muvonde Hospital and Driefontein Sanatorium Hospital
Source: Authors

6.2.3 Study Population

The study encompasses various types of healthcare workers working at Driefontein Sanatorium Hospital and Muvonde Hospital. Healthcare workers for example nurses, radiologists, dentists, cleaners, technicians, anesthetist, physiotherapist and eye optician were included as questionnaire respondents during the study. Human Resource Manager, Matron (Hospital Manager), Head of Environmental Health Department, Medical Superintendent and Nurse in Charge at each rural hospital under study were included as key informant interviewees. The District Medical Officer (DMO) and National Social Security Authority (NSSA) Officer were also involved to participate as key informant interviewees during the study.

6.2.4 Sampling

Yamane 1967's formula was used to calculate the appropriate sample size for healthcare workers who were going to participate as questionnaire respondents as shown in Table 1. The sample size was determined by 95% confidence interval and 0.05 ($\pm 5\%$) margin of error. After

calculations were done out of 150 healthcare workers at Muvonde Hospital 109 were taken as questionnaire respondents. However, after calculations were done at Driefontein Sanatorium Hospital 68 healthcare workers out of 81 were taken as questionnaire respondents. Stratified random sampling was applied to select 109 healthcare workers at Muvonde Hospital and 68 healthcare workers at Driefontein Sanatorium Hospital to participate as questionnaire respondents. Healthcare workers to participate as questionnaire respondents were selected from each stratum as shown in Table 1. Purposive sampling was applied during the selection of key informant interviewees.

Table 1: Sample size for questionnaire respondents

Hospital name	Number of health workers	Grouping of workers according to their occupation	Required sample size using Tara Yammane formula $n = \frac{N}{1+N(e)^2}$	Sample size to represent each stratum $\frac{\text{Required Sample Size}}{\text{Population size}} \times \text{strata size}$	Total
Muvonde Hospital	150	Nurses 121, Counselors 3, Laboratory technicians 4, Physiotherapist 3, Radiologic technologist 3, Anesthetist 2, Eye optician 1, Cleaners 12 and 1 Dentist.	109	Nurses 88, Counselors 2, Laboratory technicians 3, Physiotherapist 2, Radio technologist 2, Anesthetist 1, Eye optician 1, Cleaners 9 and 1 Dentist.	109
Driefontein Sanatorium Hospital	81	Nurses 58, Counselors 2, Laboratory technicians 4, Physiotherapist 1, Radiologic technologist 2, Anesthetist 2, Eye optician 1, Cleaners 10 and 1 Dentist.	68	Nurses 48, Counselors 2, Laboratory technicians 3, Physiotherapist 1, Radiologic technologist 2, Anesthetist 2, Eye optician 1, Cleaners 8 and 1 Dentist.	68
			Total of questionnaire respondents		177

Source: Field Survey (2023)

6.2.5 Data Collection

During the study a questionnaire with open and closed ended questions was used to collect data from the healthcare workers at Muvonde and Driefontein Sanatorium rural hospitals. The questionnaire was used to collect demographic data, information about types, causes, effects of risks affecting healthcare workers and measures used to manage risks at the two rural hospitals. A pilot study of the questionnaire was conducted to assess its applicability to the

research. The pilot study of the questionnaire consisted of 10% of the participants from each of the two rural hospitals which were considered during the study. This conformed to Nyariki (2009) that 10% of the target population is used for pilot study before the main survey is done. At Muvonde hospital 10% of 109 questionnaire respondents were considered during the pilot study. This entails that 11 healthcare workers participated during the pilot study of the questionnaire at Muvonde hospital. At Driefontein Sanatorium Hospital 10% of 68 healthcare workers were selected for pilot study. This clearly means 7 healthcare workers were taken as participants during the pilot study at Driefontein Sanatorium Hospital. After the questionnaire was corrected based on the recommendations made during the pilot study it was administered to 109 healthcare workers at Muvonde Hospital and 68 healthcare workers at Driefontein Sanatorium Hospital.

During data collection interviews were done with the key informant interviewees. The interviewees include Medical Superintendent, Hospital Manager (Matron), Human Resource Manager, Head of Environmental Health Department, Nurse in Charge within each hospital and National Social Security Authority (NSSA) Officer as well as District Medical Officer were chosen as interviewees. Key informant interviewees were purposively selected to gain an in-depth understanding of their perceptions regarding types, causes, effects of risks affecting rural healthcare workers and measures used to manage them at Muvonde and Driefontein Sanatorium rural hospitals. Semi-structured interview guides were used to collect information from interviewees. Additionally, observations were carried out during the study. An observation checklist was prepared to collect data during observations. Through observations duties performed by the healthcare workers and risks related to the tasks were observed. During the research observations focus on the work environment, workers, work tasks performed and equipment used which are likely to cause risks at work. A phone was used to take pictures during the observations and notes were written in a handbook. During the study secondary data sources were used to collect already analysed data to reinforce data collected by primary data collection methods such as interviews and questionnaires. Sources such as journals, textbooks, review articles, weekly, monthly, and annual hospital reports were used as sources of secondary data.

6.2.6 Data Management and Analysis

Questionnaires returned were screened for quantitative data analysis. Quantitative data collected throughout the research was cleaned, coded and a summary of the data was produced based on the objectives of the study before entering the data into the Microsoft Excel Spreadsheet. The data was exported into the Statistical Package for Social Sciences (SPSS) version 25.0 for analysis. The level of significance was set at $p=0.05$ (5%) and 95% confidence interval was used to determine the relationship between probed factors. If the value of p is less than 0.05 there is a significant association hence, we accept H_1 and reject H_0 . However, H_0 is accepted and H_1 is rejected if the value of p is greater than 0.05. This indicates that there is no association between probed aspects. SPSS statistical tests notably Chi-Square test was used to determine whether a relationship exists between work experience and rating the effectiveness of measures used to manage risks within the hospital. The Chi-Square test was performed to test an association between the levels of risks affecting healthcare worker at the hospital and the department of the healthcare worker at the hospital. Quantitative data was presented in the form of tables, pie-charts and graphs so that the frequencies can be easily interpreted. Content analysis was used to analyse qualitative data. Quotations were used to present data collected through interviews. Observations were presented in the form of images.

6.3 Results and Discussion

6.3.1 Risks Identified at the Rural Hospitals

Five major risks were identified as affecting healthcare workers at Muvonde and Driefontein Sanatorium rural hospitals (Figure 2). The majority (44%) of healthcare workers at Muvonde Hospital highlighted the persistence of ergonomic risks. Physical risks accounted for (19.3%) of the reported risks, chemical risks (16.5%), psychosocial risks (11.9%) and biological risks (8.3%) at Muvonde Hospital. The prevalence of ergonomic risks at Muvonde Hospital can be attributed to the repetitive lifting and transfer of patients often which is common at the hospital. Repetitive motion and awkward postures can strain muscles and joints resulting in musculoskeletal injuries. These findings are consistent with those of Muthukrishnane and Maqbool Ahmad, (2021); Zaheer *et al.* (2023) and Hwang *et al.* (2024) who in their studies conducted in the UAE, Korea and Pakistan respectively reported the dominance of ergonomic risks among hospital staff from the surveyed hospitals. Nonetheless, most (30.9%) of healthcare workers who participated during the study at Driefontein Sanatorium Hospital

indicated biological risk. Other risks identified at Driefontein Sanatorium Hospital were ergonomic risks (25%), physical risks (19.1%), chemical risks (14.7%) and psychosocial risks reported by (10.3%) of the healthcare workers. Driefontein Sanatorium Hospital provides care for patients with infectious diseases such as Tuberculosis. This increases the possibility of healthcare workers contracting infectious viruses. Overall, the study points to a multiplicity of risks present at the two rural hospitals in Chirumanzu District of Zimbabwe. These findings concur with those of Minikumary *et al.* (2023) who reported that healthcare workers are exposed to chemical, biological, physical, ergonomic and psychosocial risks.

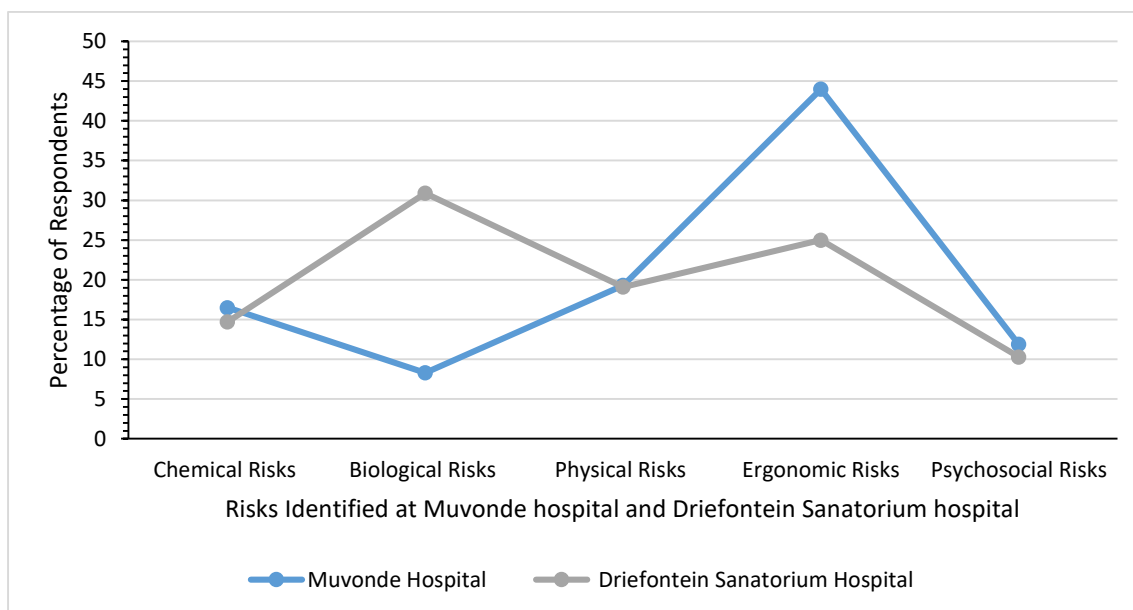


Figure 2: Types of Risks Affecting Healthcare Workers at Muvonde Hospital and Driefontein Sanatorium Hospital

Source: Field Survey (2023).

6.3.2 Distribution of Risks Identified at the Rural Hospitals

6.3.2.1 Distribution of Ergonomic Risks

Most (33.9%) of hospital workers who identified ergonomic risk as a cause for concern at Muvonde Hospital mentioned standing for a long time. Figure 3 indicated that (20.2%) of the healthcare workers indicated repetitive work, (17.4%) lifting patients, (11.9%) manual therapy, (10.1%) uncomfortable position while a minority (6.2%) indicated lifting of medical devices. At Driefontein Sanatorium hospital majority (27.9%) of the healthcare workers who experienced ergonomic risks indicated standing for a long time, (25%) reported lifting of patients, (17.6%) indicated repetitive tasks, (11.8%) manual therapy and this is similar to

uncomfortable positions which was designated by (11.8%) of the healthcare workers. Very few (5.9%) of the healthcare workers identified lifting of medical devices. Results indicated that Muvonde and Driefontein Sanatorium rural hospitals show a similarity in working conditions which require workers to stand for a long time. In hospitals employees notably doctors and nurses spend most of the time standing on their feet while attending patients. Hamid *et al.* (2018) reported that due to their ongoing need to be aware of their patients' requirements, healthcare workers often stand for extended periods which results in health issues such as lower back and upper back discomfort. These findings are similar to those reported by Chiwaridzo *et al.* (2018) that there is an association between working hours and the prevalence of musculoskeletal disorders among healthcare professionals.

6.3.2.2 Distribution of Physical Risks

Regarding physical risks at Muvonde Hospital majority (28.4%) of the healthcare employees reported sharp objects, (24.8%) presented extreme temperatures (hot/cold), (22%) noise, (15.6%) slips and falls, (5.5%) radiation and very few (3.7%) reported electric shock as shown in Figure 3. Survey results at Driefontein Sanatorium Hospital showed that most (30.9%) indicated sharp objects, while (26.5%) specified extreme temperatures (hot/cold), (20.6%) reported noise and (13.2%) of the healthcare workers specified slips and falls. Few (5.9%) of the healthcare workers indicated radiation and very few (2.9%) specified electric shock at Driefontein Sanatorium Hospital. Sharp objects were reported as the most prevalent at both Muvonde and Driefontein Sanatorium rural hospitals. Healthcare personnel frequently come into contact with sharp instruments including scalpels, razor blades and needles. If these instruments are handled carelessly or if appropriate safety precautions are not taken, these objects may cause accidental injuries and infections. On the other hand, respondents at both hospitals indicated electrical shocks as the least common risk affecting healthcare workers. This suggests that precautionary measures are taken at both hospitals to prevent the occurrence of electrical shocks. These procedures include grounding electrical systems properly, using safety devices like circuit breakers and residual current devices and performing routine maintenance and inspections on electrical equipment. Strict safety procedures, appropriate training and the availability of better medical equipment can be attributed for the low incidence of reported electric shocks.

6.3.2.3 Distribution of Biological Risks

Concerning distribution of biological risks at Muvonde Hospital majority (39.4%) of the healthcare workers specified blood spillage, (17.4%) reported breathing contaminated air, and (16.5%) indicated vomitus, sputum and urine, and (15.6%) identified contact with wounds while (11%) acknowledged viral infection (Figure 3). Blood spillage was reported as the most common biological risk at Muvonde Hospital. Incidents of blood spilling may arise from insufficient training or noncompliance with recommended infection control procedures. Healthcare workers may be exposed to blood spills during procedures such as surgery, venepuncture and vaccination where mishandling of equipment may lead to release of blood. Handling of equipment and materials contaminated with blood during surgeries causes healthcare workers to contact blood. These findings are not unique to Muvonde hospital, Rai *et al.* (2021) reported the prevalence of biological hazards particularly blood spillage among healthcare workers in low and middle-income countries.

However, at Driefontein Sanatorium Hospital most (31%) of the healthcare workers specified breathing contaminated air, (25%) reported blood spillage, (16%) designated viral infections, (15%) indicated vomitus, sputum and urine and minority (13%) revealed contact with wounds as shown by Figure 3. Driefontein Sanatorium hospital is an infectious diseases hospital, visited by patients with infections such as TB, hepatitis and recently COVID-19 which increase the risk of airborne pathogens. These infections are caused by viruses which can be aerosolised and spread through respiratory droplets putting healthcare workers at risk of inhaling them. Moreover, the use of specific medical devices or processes, including nebulizers or aerosol-generating techniques, can produce fine particulates that hang in the air for a long time, raising the risk of exposure for medical personnel. These findings correspond with findings of (Liu *et al.*, 2020) who reported the exposure of healthcare personnel to contaminated air due to the high concentration of infectious patients, insufficient ventilation systems, and the usage of specific medical procedures.

6.3.2.4 Distribution of Chemical Risks

Results of the distribution of chemical risks at Muvonde Hospital shows that most (29%) of the healthcare workers reported sanitizers, (24%) of the participants designated cleaning detergents and (20%) specified latex gloves. Figure 3 presented that (14%) of the healthcare workers indicated anaesthetic gases and sterilising agents while (13%) identified mercury at

Muvonde Hospital. Concerning the distribution of chemical risks at Driefontein Sanatorium Hospital majority (28%) specified sanitizers, (21%) reported cleaning detergents, (19%) latex gloves, (19%) anaesthetic gases and sterilising agents and (13%) of the healthcare workers indicated mercury as indicated in Figure 3. Survey results from both hospitals indicated that healthcare workers perceive sanitizers as the most prevailing chemical risk. Despite the importance of sanitizers in preventing the spread of infections, their frequent use in hospitals causes skin irritation among healthcare workers. During the outbreak of Covid-19 infection sanitizers used by healthcare workers in Zimbabwe contain high levels of alcohol which expose them to skin irritation (Kavenga *et al.*, 2021). Cleaning detergents were indicated as the second chemical risk. Cleaning detergents are used daily in hospitals to prevent the spread of pathogens and they are used to clean the hospital environment. Although detergents are vital in maintaining the cleanliness of the hospital environment they contain harmful chemicals which affect the users. Latex gloves were specified by healthcare workers during the study because they are used to prevent the spread of infections to healthcare workers when dealing with patients. Nonetheless, some healthcare workers are allergic and sensitive to latex proteins in latex gloves. Severity of allergic reactions vary from minor skin irritation to extreme anaphylaxis.

6.3.2.5 Distribution of Psychosocial Risks

Most (33%) of the healthcare workers at Muvonde Hospital specified dealing with severely ill patients, followed by (26.6%) of the participants who reported overwork and (16.5%) designated verbal abuse. Figure 3 shows that among the healthcare workers at Muvonde Hospital (11.9%) indicated fatigue, (6.4%) elucidated physical abuse and (5.5%) of the study participants stated problems with the top management. At Driefontein Sanatorium Hospital dealing with severely ill patients was reported by the majority (39.7%) of the healthcare workers. During the study at Driefontein Sanatorium Hospital (26.5%) of the hospital workers indicated overwork, (13.2%) reported verbal abuse, (11.8%) identified fatigue, (4.4%) designated physical abuse and (4.4%) specified problems with the top management. Results indicated that the majority of the healthcare workers located within the two rural hospitals are susceptible to psychosocial risks due to dealing with severely ill patients. Caring critically ill patients is highly demanding and witnessing their suffering is associated with various stressors. However, the issue of experiencing various stressors affect the well-being and mental health of healthcare workers leading to fatigue, anxiety and post-traumatic stress disorder. The study's findings regarding the distribution of psychosocial risks are consistent with those of Chingono

et al. (2022), who found that healthcare workers experience psychosocial risks such as fatigue, stress and anxiety due to duties they perform at work.

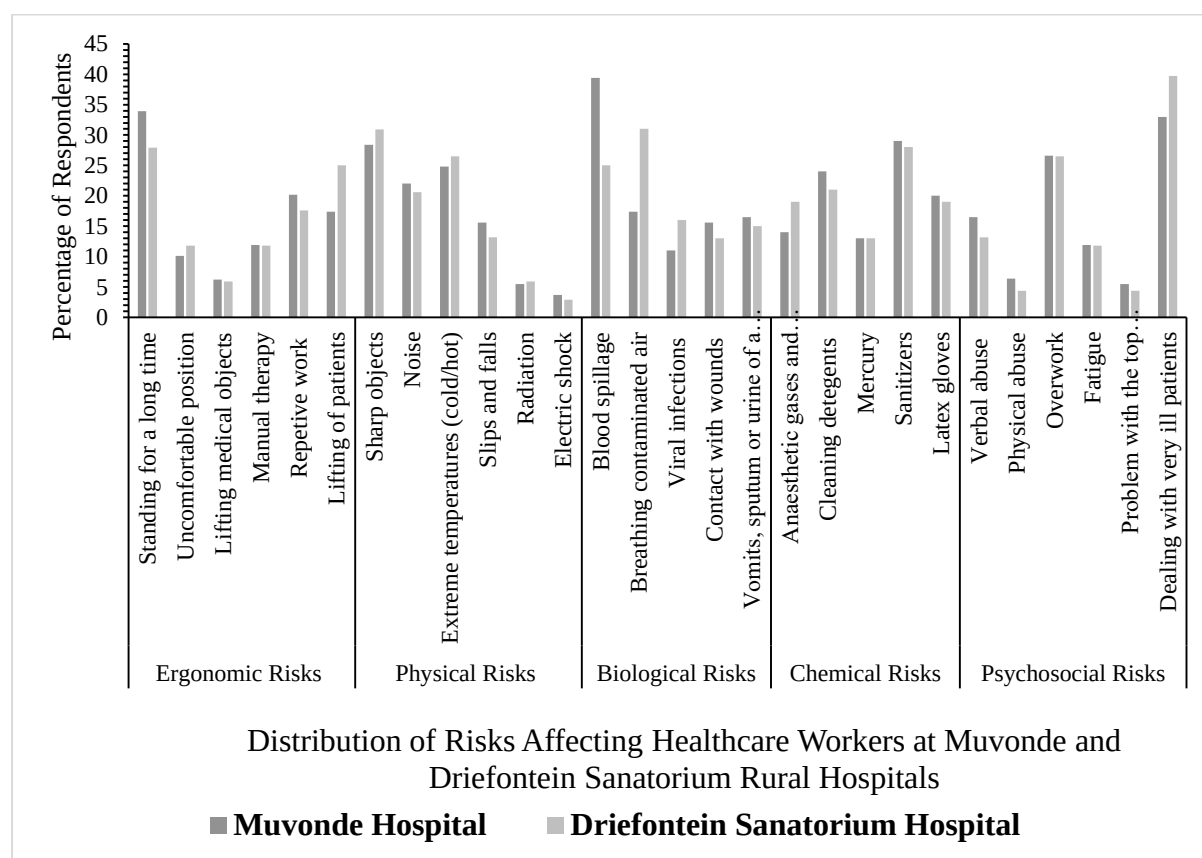


Figure 3: Distribution of Risks Affecting Healthcare Workers at Muvonde Hospital and Driefontein Sanatorium Hospital

Source: Field Survey (2023)

6.3.3 Causes of Risks Affecting Healthcare Workers at Muvonde Hospital and Driefontein Sanatorium Hospital

Figure 4's results demonstrated the causes of risks indicated by healthcare workers at Muvonde and Driefontein Sanatorium rural hospitals. Among the causes of risks, pressure attributed to high workload was highlighted by (20.2%) of the health workers at Muvonde Hospital and (25%) at Driefontein Sanatorium Hospital. This was supported by Muvonde Hospital Matron who indicated that owing to increase of work pressure, health workers, specifically nurses sometimes run in corridors to collect results of patients from hospital laboratories. Nevertheless, this has the potential to trigger slips as well as falls, causing dislocation of leg joints and injuries. High workload experienced by health workers at Muvonde Hospital and Driefontein Sanatorium Hospital is possibly attributed to various factors including increased number of patients, limited resources coupled by understaffing. Shortage of staff at healthcare

facilities expose health workers to huge pressure since they force themselves to cover duties within a short period of time while handling a large number of patients. Immense workload and pressure increased vulnerability of health workers to stress and fatigue, translating to high occurrence of errors during diagnosis procedures. These findings are supported by AIAteeq *et al.* (2020) who indicated that health workers in Saudi Arabia were impacted by anxiety due to high workload during Covid-19.

Shortage of labour worsened susceptibility of health workers to work related risks as noted by (17.4%) of the healthcare workers at Muvonde Hospital and (16.2%) of the healthcare workers at Driefontein Sanatorium Hospital. Lack of sufficient staff generally means the available health workers are required to compensate for the shortage by working long hours, attending to a higher number of patients and performing other additional responsibilities. This has the potential to affect physical as well as mental health of the healthcare workers due to fatigue and stress while compromising quality of services offered to patients. In the Zimbabwean context, inadequate number of healthcare workers at hospitals including those in rural areas is common and largely attributed to brain drain (Chipunza and Nhamo, 2023). Respondents at Driefontein Sanatorium Hospital (11.8%) and Muvonde hospital (14.7%) pointed that occurrence of risks was ascribed to shortage of equipment at the hospitals. This was in line with Driefontein Sanatorium Hospital Environmental Health Technician who indicated that shortage of equipment affects safety and health by adding stress to healthcare workers. The Environmental Health Technician also stated that working with limited resources exacerbated exhaustion and frustration among healthcare workers, causing detrimental impacts to both workers and patients. These findings entails that there was concern regarding the availability of equipment to utilise within the rural hospitals. According to Mossburg *et al.* (2019) healthcare facilities located in developing countries expose healthcare workers to risks due to shortage of equipment such as personal protective equipment.

Results illustrated that age is among factors which cause work related risks affecting healthcare workers as asserted by (2.9%) of the respondents at Driefontein Sanatorium Hospital and (3.7%) of the healthcare workers at Muvonde Hospital. During the interview the Medical Superintendent at Muvonde Hospital argued that older health workers are characterised by decline of strength as well as physical fitness, hindering their ability to respond effectively and quickly to physically demanding tasks or emergency situations. As a result, older health workers are at higher risk of being affected with work related risks such as ergonomic risks compared to their younger counterparts. However, the Nurse in Charge indicated that young

healthcare workers with less experience took safety gear like gloves for granted and they are highly affected by sharp injuries compared to old, experienced healthcare workers. This is probably attributed to lack of knowledge and necessary skills regarding correct procedures for handling sharp materials during utilisation and disposal among young healthcare workers. Although, the situation can also be a result of underestimating the potential health risks associated with sharp injuries such as needle stick injuries. Moreover, gender was indicated as a factor which determine risks affecting healthcare workers by (10.1%) of the participants at Muvonde Hospital and (4.4%) at Driefontein Sanatorium Hospital (Figure 4). Working conditions at health facilities are characterised by high levels of stress and long working hours which have potential to affect individuals differently due to gender and biological differences. Therefore, most of the time female healthcare workers become more vulnerable to factors which trigger occurrence of work-related risks at health facilities.

Furthermore, participants at Muvonde Hospital (6.4%) and Driefontein Sanatorium Hospital (8.8%) and the Nurse in Charge at Driefontein Sanatorium Hospital concur that health workers are exposed to risks due to poor training. The Nurse in Charge at Driefontein Sanatorium Hospital argued that safety training activities carried out at the hospital put much emphasis on patients compared to workers, therefore healthcare workers expose themselves to risks since they put much attention on patient safety ignoring their well-being. One of the interviewees, the NSSA Officer indicated that there is need to ensure proper safety training among workers working in healthcare facilities of Zimbabwe to safeguard their well-being. Owing to weaknesses associated with training methods, health workers lack necessary skills to handle infectious materials, deal with aggressive patients and expertise to operate complex medical equipment. A view supported by Rai *et al.* (2021) that without proper training healthcare workers lack enough capacity to minimise work-related accidents and injuries.

Negative safety behaviour was indicated as a factor which causes risks by (6.4%) and (8.8%) at Muvonde Hospital and Driefontein Sanatorium Hospital respectively (Figure 4) and the aspect of negative behaviour was supported by the Environmental Health Technician (EHT) at Muvonde Hospital. The EHT indicated that failure to adhere to proper hand hygiene practices, infection control protocols, failure to report incidents or near misses and inappropriate use of safety gear constituted some of the negative safety behaviour presented by health workers. During observations at Muvonde Hospital negative safety behaviour was noticed since some of the healthcare workers were seen without wearing full PPE/C as shown by Plate 1. Thielmann *et al.* (2022) argued that among other aspects negative safety behaviour affects

nurses' perceptions towards risks while undermining the overall safety culture within a hospital and increase the potential for harm to patients and healthcare workers.

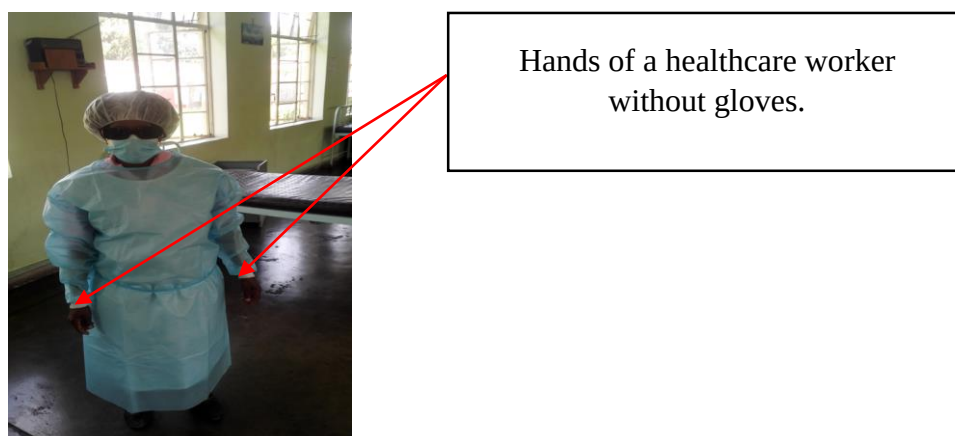


Plate 1: A healthcare worker without full PPE/C

Source: Field Survey (2023)

Poor management was indicated as a factor which expose healthcare workers to risks at Muvonde Hospital (8.3%) and Driefontein Sanatorium Hospital (7.4%). Insufficient training and support for healthcare workers by responsible management teams was highlighted as an indicator of poor management at these rural hospitals. Poor management coupled by lack of training, ineffective policies and procedures directed to safety of health workers exacerbate exposure of health workers to unnecessary work related risks. This corresponds with Muvonde Hospital Environmental Health Technician's view that occupational risks which impact health workers was partly owed to poor implementation of occupational safety and health guidelines by the top management. The responsible management team should offer health workers exposure to ongoing training and professional development opportunities to stay updated with the latest medical advancements and best safety practices. The Environmental Health Technician at Muvonde hospital argued that hospital safety policies and procedures need to be reviewed by the responsible authorities including top management to ensure safety of health workers and patients. Zaroushani and Khajehnasiri (2022) indicated that for safety policies and procedures to serve their purpose in the health sector, continuous reviewing is essential so that they meet current demands. In East African communities achieving continuous monitoring of safety matters in rural hospitals is difficult since the top management is providing less attention to safety issues (Muthuri *et al.*, 2020).

Moreover, the department of the worker was among the causes of risks which affect health workers as reported by (5.5%) of the respondents at Muvonde Hospital and (5.9%) at Driefontein Sanatorium Hospital (Figure 4). Driefontein Sanatorium Hospital Matron highlighted that healthcare workers who work in the surgical wards namely male and female wards are mostly affected by musculoskeletal disorders since they are mainly involved in repositioning ill patients in beds and pushing patients on wheelchairs to bathrooms and toilets. This suggests that the department the healthcare workers operate at the rural hospital can have an impact on their safety and well-being. The allocation of healthcare workers to different departments within a hospital or healthcare facility can have various implications for their safety and well-being (Atnafie *et al.*, 2021). Figure 4 demonstrated that utilisation of personal protective equipment/clothing for a long time exposes healthcare workers to risks as reported by (7.3%) of the healthcare workers at Muvonde Hospital and (8.8%) at Driefontein Sanatorium Hospital. This is supported by Radha *et al.* (2022) that one possible concern in the health sector is discomfort and physical strain related to wearing of personal protective equipment/clothing for long durations. This means prolonged use of personal protective equipment/clothing can lead to issues such as difficulty in breathing, skin irritation, musculoskeletal discomfort and exposure to pathogens. During the interview the District Medical Officer argued that infectious diseases such as COVID-19 require health workers to put on personal protective equipment/cloth for a long time, but exposing health workers to exhaustion, dehydration and skin irritation. During the peak period of COVID-19, frontline health workers were impacted by skin problems due to perpetual utilisation of personal protective equipment/cloth (Atibioke *et al.*, 2022). Nevertheless, personal protective equipment is vital in controlling cross-infection in the health sector, therefore despite these weaknesses, its strengths outweigh its demerits in protecting healthcare workers from infectious diseases.

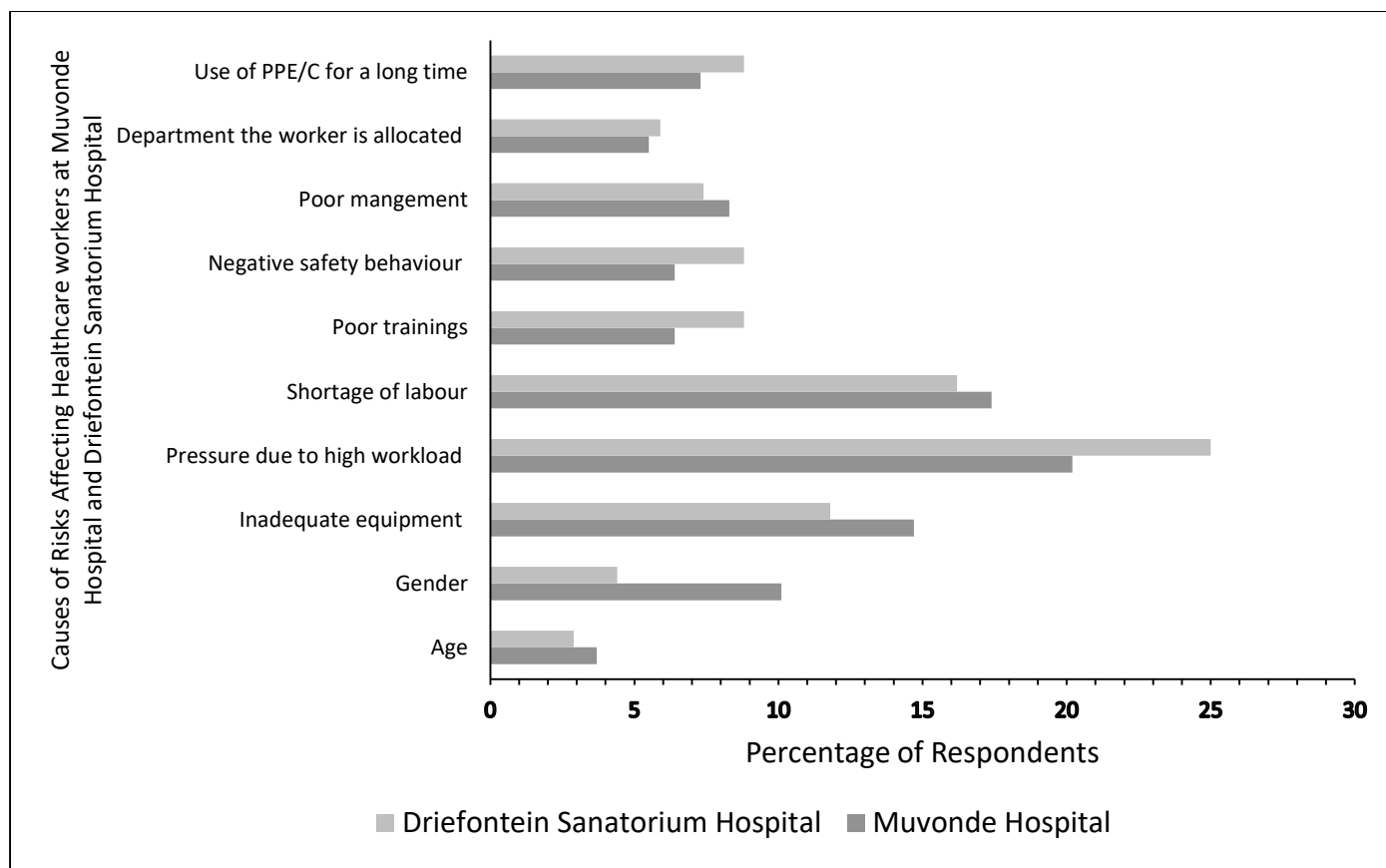


Figure 4: Causes of risks affecting healthcare workers at Muvonde Hospital and Driefontein Sanatorium Hospital

Source: Field Survey (2023)

Additionally, questionnaire respondents at Muvonde Hospital and Driefontein Sanatorium Hospital were requested to indicate the most strenuous work shift between night shift and day shift. Majority of the respondents at Muvonde Hospital (84.4%) and Driefontein Sanatorium Hospital (83.8%) illustrated that the night shift was more strenuous as compared to day shift. However, (15.6%) and (16%) at Muvonde Hospital and Driefontein Sanatorium Hospital respectively noted day shift as strenuous. Night shift was perceived as more strenuous since it is associated with sleep deprivation, thus disturbing the sleep-wake cycle translating to fatigue and insomnia. During the interview the Medical Superintendent at Muvonde Hospital and the NSSA Officer agreed that night shift intensifies complications among workers since the worker is working while the natural clock of the body is telling it to rest. The human body is naturally programmed to be awake during daylight hours and asleep during night-time (Boivin *et al.*, 2022). Hence, working against this natural phenomenon can result in tiredness and limited alertness, increasing occurrence of work-related risks and errors. Night shifts require health workers to sacrifice their time while missing various social events. Night shift has the potential

to affect the social and personal life of nurses, thus worsening psychosocial risks, as supported by Books *et al.* (2020).

6.3.4 Effects of Risks Affecting Healthcare Workers at Muvonde Hospital and Driefontein Sanatorium Hospital

6.3.4.1 Effects of Ergonomic Risks

At Muvonde Hospital effects of ergonomic risks indicated by participants encompassed back injuries (51.4%), neck pain (21.1%), shoulder discomfort (16.5%) and muscular strain (11%) as indicated by Figure 5. Results at Driefontein Sanatorium Hospital demonstrated that health workers were affected by back injuries (57.4%), shoulder pain (13.2%), neck pain (19.1%) while (10.3%) highlighted muscular strain. Figure 5 results are supported by the District Medical Officer as well as Muvonde Hospital Matron that back injuries are regarded as the common impact of ergonomic risks affecting healthcare workers. This is possibly ascribed to the fact that healthcare workers are involved in activities like lifting, transferring and repositioning patients which put strain on the upper and lower back. Additionally, healthcare workers' activities are associated with awkward postures encompassing twisting, bending or maintaining static positions for extended periods which cause back injuries, neck pain and muscular strain. Similarly, Chiwaridzo *et al.* (2018)'s study at Parirenyatwa Group of Hospitals highlighted that healthcare workers are exposed to neck, shoulder, and muscular pain although back pain was common.

6.3.4.2 Effects of Biological Risks

Questionnaire respondents at Muvonde Hospital indicated that biological risks impacting them encompassed COVID-19 (29.4%), tuberculosis (6.4%), hepatitis B/C (3.7%) as well as HIV/AIDS (1.8%) (Figure 5). However, at Muvonde Hospital (58.7%) of the respondents who participated indicated that they never experienced effects of biological risks. At Driefontein Sanatorium Hospital (33.8%) specified that they experience Covid-19 virus, tuberculosis (25%), hepatitis B/C (13.2%) and (1.5%) reported HIV/AIDS. Nevertheless, (26.5%) of the participants at Driefontein Sanatorium Hospital revealed that they experienced none of the infections related to biological risks. Verdicts of the study are supported by Rai *et al.* (2021) that healthcare workers are vulnerable to work related infectious diseases such as HIV/AIDS, COVID-19, Hepatitis B/C and tuberculosis. High mentioning of COVID-19 was probably owed to its contagious nature since it can spread from person to person when the affected person sneezes or coughs. The findings from these two rural hospitals concurs with Atnafie *et*

al. (2021) that health workers were highly vulnerable to COVID-19 during its peak period due to their close contact with infected patients.

6.3.4.3 Effects of Physical Risks

Majority (57.8%) of the respondents at Muvonde Hospital indicated that they experienced needle stick injuries, although (19.3%) noted cuts/pricks, (8.3%) reported crumps and (14.7%) stated influenza as illustrated by Figure 5. At Driefontein Sanatorium Hospital most (52.9%) of health workers reported needle stick injuries, (7.4%) crumps, (11.8%) influenza and (27.9%) specified cuts/pricks. The aspect of needle stick injuries was also reinforced by views of key informants namely Nurse in Charge at Driefontein Sanatorium Hospital and Environmental Health Technician at Muvonde Hospital. The reasons for such a high incidence of needle stick injuries can be a result of medical procedures like blood draws, injections, intravenous among others which are frequently performed utilising needles. However, the scenario was worsened by inadequate training, scarce resources and lack of adherence to safety protocols at these two rural hospitals. An aspect supported by Rai *et al.* (2021) that healthcare workers, particularly those at rural hospitals may fail to receive appropriate training on proper handling, disposal of needles and may fail to follow established safety guidelines due to shortage of resources.

6.3.4.4 Effects of Chemical Risks

In terms of effects of chemical risks, study participants at Muvonde hospital stated skin irritation (39.4%), allergies (33.9%), asthma (2.8%) birth defects (1.8%), pulmonary irritation (11.9%), although (10.1%) never experienced chemical risks. Most (48.5%) of the health workers who participated at Driefontein Sanatorium hospital reported skin irritation, followed by allergies (26.5%), pulmonary irritation (17.6%), asthma (4.4%) and (2.9%) never experienced any chemical risks (Figure 5). The limited number of healthcare workers reporting no experience of risks related to chemicals at Muvonde Hospital and Driefontein Sanatorium Hospital can be attributed to factors such as the nature of their work. Exposure to chemicals such as disinfectants, detergents and sterilising solutions which expose health workers to skin irritation was also indicated by the District Medical Officer. The District Medical Officer argued that skin irritation manifests in the form of itching, burns, rash and redness and it is mostly attributed to an allergic reaction or sensitivity to a particular substance. This goes in line with Mary *et al.* (2023) who asserted that chemicals have potential to cause skin problems although the effects of chemicals are usually determined by nature of chemicals, duration of exposure and nature of the affected skin.

6.3.4.5 Effects of Psychosocial Risks

A total of (9.2%) of the respondents at Muvonde Hospital highlighted that they never experienced any health impacts related to psychosocial risks, but (47.7%) indicated stress, fatigue (20.2%), anxiety (15.6%), blood pressure (0.9%), persistent tiredness (2.8%) and insomnia (3.7%) (Figure 5). At Driefontein Sanatorium Hospital healthcare workers were affected by stress (45.6%), fatigue (23.5%), anxiety (16.2%), insomnia (5.9%), and persistent tiredness (2.9%) and very few (1.5%) reported blood pressure while (4.4%) pointed out that they never experience any effect related to psychosocial risks. These findings tally very well with results from interviewees like hospital Matrons who highlighted fatigue, anxiety as well as stress. Stress reported by the majority of healthcare workers was probably attributed to the demanding nature of the work and dealing with critically ill patients. Additionally, healthcare professionals often work during the night for long hours which expose them to physical and mental exhaustion translating to anxiety and fatigue. High job demands, fear of making mistakes or causing harm to patients while dealing with emotionally challenging situations exacerbated the aspect of anxiety among healthcare workers, a situation denoted by the District Medical Officer. Research findings congruent with Chingono *et al.* (2022) that like in other developing countries healthcare workers in Zimbabwe are exposed to effects of psychosocial risks such as anxiety, stress and fatigue.

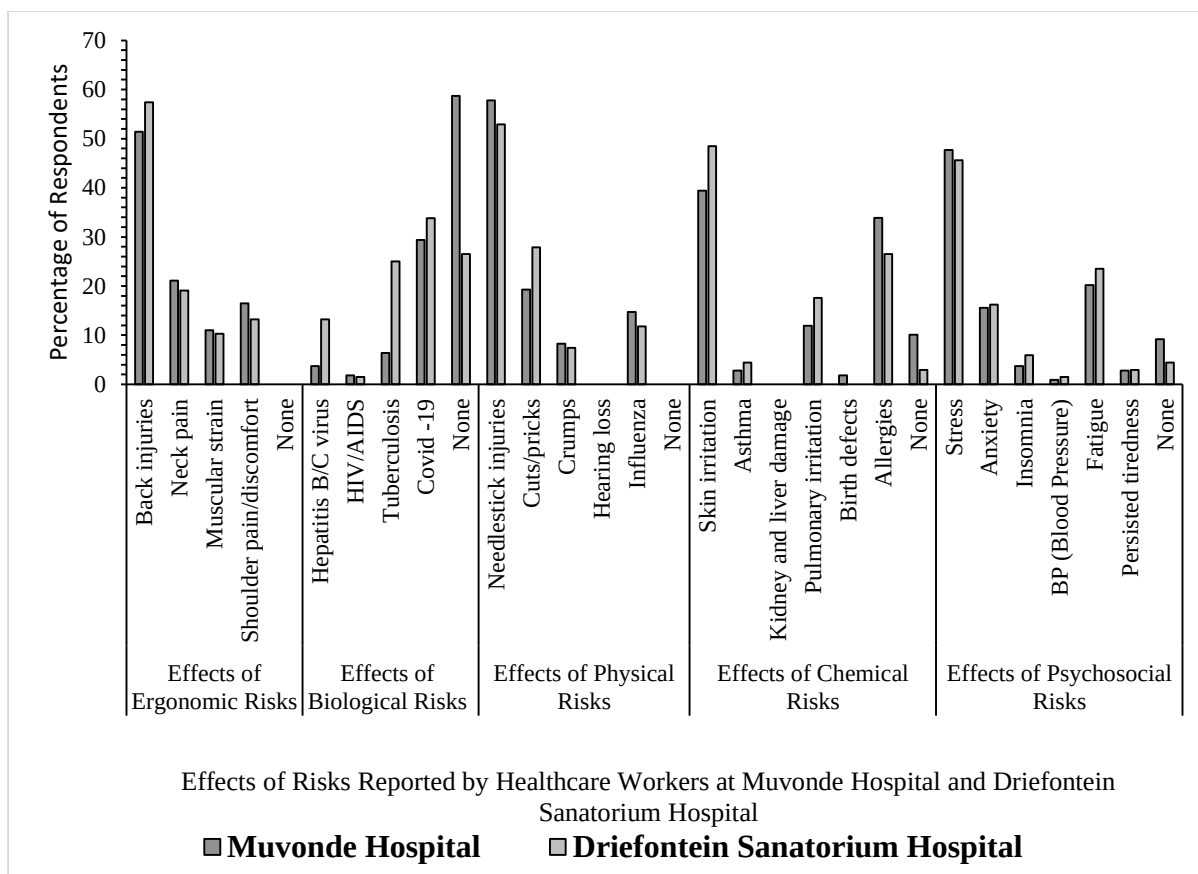


Figure 5: Effects of risks affecting healthcare workers at Muvonde Hospital and Driefontein Sanatorium Hospital
Source: Field Survey (2023)

6.3.5 Assessment of Risks Identified at Muvonde Hospital and Driefontein Sanatorium Hospital

Section C of the questionnaire examines levels of biological, chemical, physical, psychosocial and ergonomic risks impacting healthcare workers at the rural hospitals understudy. Levels of risks marked by questionnaire respondents at Muvonde Hospital and Driefontein Sanatorium Hospital are illustrated by Figure 6.

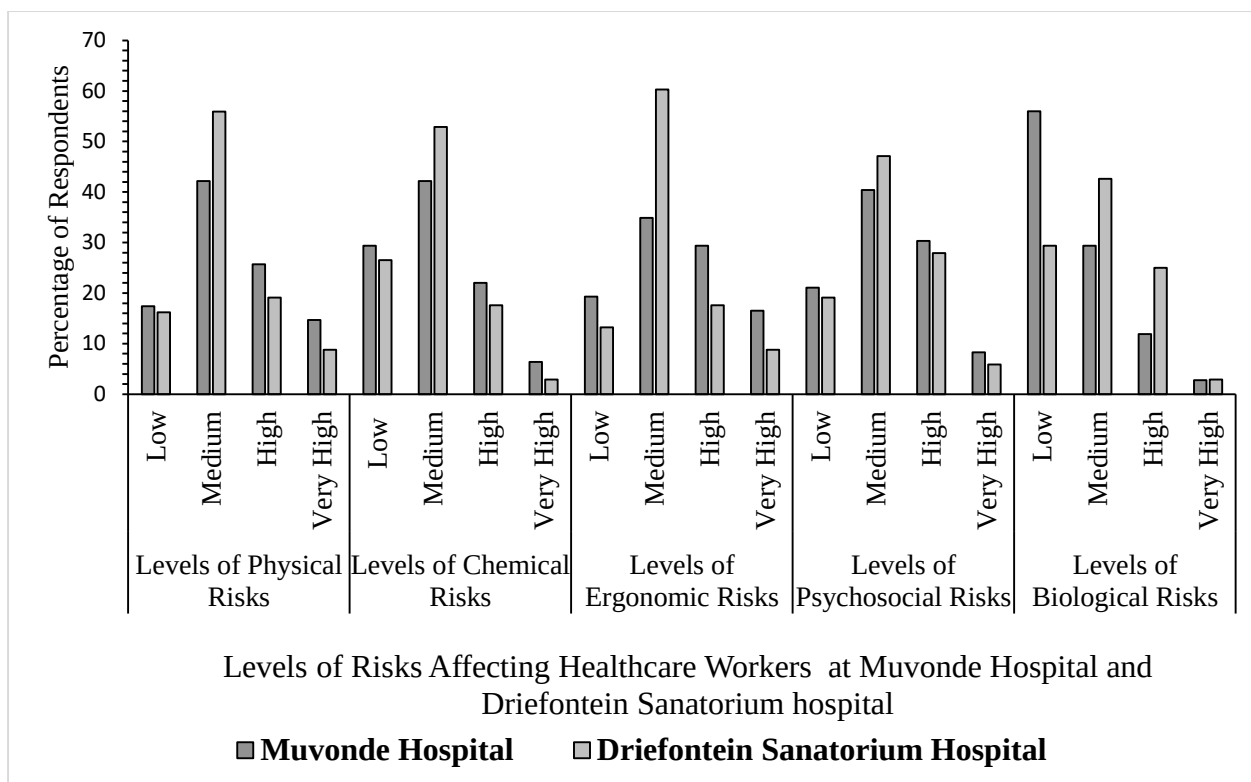


Figure 6: Physical, chemical, ergonomic, psychosocial and biological risk level at Muvonde Hospital and Driefontein Sanatorium Hospital

Source: Field Survey (2023)

Majority of the participants at these two rural hospitals demonstrated that the level of risks was at medium, followed by high, low and very high. This suggests that a number of healthcare workers considered the risks associated with their work to be moderate. Although, those who indicated high perceived that their work involved significant risks (Figure 6). The least reported level of risk was low, signifying that fewer healthcare professionals assumed that their work is associated with minimal risks. Moreover, very few respondents indicated that the level of risks identified at Muvonde Hospital and Driefontein Sanatorium Hospital was very high, implying that only a small number of healthcare professionals perceived their work to involve extremely high levels of risk.

The results illustrated in Table 2 demonstrated that the Chi-Square value obtained was 0.000 and is less than 0.05. In this scenario we accept H_1 and reject H_0 . This reveals that there is a significant association between the level of risks affecting healthcare workers at the hospital and the department of the healthcare worker at the hospital. There is a relationship between the department of the healthcare workers and level of exposure to risk since nature of the work performed, physical environment, and level of training contribute to varying risk levels among

different departments within the hospital (Atnafie *et al.*, 2021). Therefore, understanding this relationship and variation is essential to develop interventions directed to each department when implementing safety measures and providing safety gear to health workers.

Table 2: Chi-Square test between department of the health worker at the hospital* Level of risks affecting healthcare worker at the hospital

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.872E2 ^a	45	.000
Likelihood Ratio	254.582	45	.000
N of Valid Cases	109		

a. 60 cells (93.8%) have expected count less than 5. The minimum expected count is .15.

Source: Field Survey (2023)

6.3.6 Approaches used to Manage Risks at Muvonde Hospital and Driefontein Sanatorium Hospital

6.3.6.1 Personal Methods used by Healthcare Workers to Manage Risks

Research indicated that positive and negative personal strategies were utilised to manage occupational risks by health workers at Driefontein Sanatorium Hospital and Muvonde Hospital. Among the positive methods, healthcare workers at Muvonde Hospital noted personal hygiene for example washing hands after performing procedures (29.4%), medical examinations (14.7%), and requesting assistance from colleagues (13.8%) while adjusting work equipment properly was reported by (19.3%) of the study participants. At Driefontein Sanatorium Hospital respondents reported personal hygiene practices such as washing hands (33.8%), adjustment of equipment like beds (19.1%), and requesting assistance from other healthcare workers (11.8%) and medical examination (16.2%). Majority of questionnaire respondents were supported by key informants like Muvonde Hospital Environmental Health Technician who argued that health workers applied various safety strategies but practising good personal hygiene such as washing hands was frequently used. Verdicts of the study are essential since personal hygiene like hand washing minimise spread of infection and transmission of pathogens between healthcare workers and patients. According to Moore *et al.* (2021) hand

hygiene is significant in a hospital setting since it suppresses cross infection prevention and health risks triggered by ingestion.

Moreover, other methods to manage occupational risks indicated by participants at Muvonde Hospital encompassed use of tablets that induce sleep (11.7%), excessive smoking (4.6%) and taking excessive alcohol (6.4%). Similarly, respondents at Driefontein Sanatorium Hospital also indicated negative personal methods, namely developing a habit of using sleeping tablets (10%), excessive smoking (4.4%) and taking of alcohol (4.4%). Nevertheless, continuous utilisation of sleeping tablets, smoking and taking of alcohol have potential to cause adverse effects to healthcare workers' health in the long run. A scenario upheld by Minikumary *et al.* (2023)'s studies that in the United Kingdom healthcare workers used alcohol and drugs to manage emotional stress, although the strategy is associated with health problems like addiction. Consequently, it is vital for healthcare workers to be capacitated with enough information so that they adopt positive methods with limited consequences to their well-being.

6.3.6.2 Institutional Strategies Utilised to Manage risks

The majority of the respondents at Muvonde Hospital (38%) and Driefontein Sanatorium Hospital (40%) highlighted personal protective equipment/cloth (PPE/C) as an institutional method used to manage risks at the hospitals (Figure 7). Results demonstrated that utilisation of personal protective equipment/clothing was the most applied approach to minimise potential work-related risks experienced at these hospitals. In developing countries not sparing Zimbabwe, utilisation of personal protective equipment/cloth is highly prioritised, a situation which was worsened by high prevalence of infectious diseases like COVID-19 (Kavenga *et al.*, 2021). The Human Resource Manager highlighted that provision of personal protective equipment/clothing to health workers was vital for legal compliance while safeguarding well-being of health workers. Therefore, the manager goes on to indicate that they work hand in hand with the hospital procurement department to ensure availability of all kinds of personal protective equipment needed by healthcare workers. During observations at Driefontein Sanatorium hospital PPE/C was observed in the dressing rooms as indicated by Plate 2. This suggests that ensuring that healthcare workers have access to adequate personal protective equipment/clothing is essential for protecting their health and preventing the spread of infectious diseases in healthcare settings. The results concur with Putri *et al.* (2024) who indicated that personal protective equipment/clothing is important in protecting healthcare workers from work related risks.



Plate 2: Personal protective cloth observed in the dressing room at Driefontein

Sanatorium Hospital

Source: Field Survey (2023)

Respondents at Muvonde Hospital (13%) and Driefontein Sanatorium Hospital (10%) stated utilisation of safety inspection among measures used to manage risks (Figure 7). The Environmental Health Technician at Muvonde Hospital indicated that safety inspections were done on weekly basis at department level and on monthly basis at hospital level to identify potential hazards and take necessary actions to mitigate them before they pose harm to patients, staff or visitors. This entails that continuous safety inspections play a pivotal role in ensuring safety and well-being of those involved in activities carried out at these two rural hospitals. Mossburg *et al.* (2019) revealed that regular inspections assist responsible authorities to identify potential work-related risks that exist within the hospital environment. Healthcare workers at Muvonde Hospital (12%) and Driefontein Sanatorium Hospital (9%) revealed that appropriate management of waste was among institutional measures utilised to manage risks. It is clear that appropriate segregation, treatment, transportation and storage of waste plays a crucial role in minimising the risk of infection and ensuring the safety of healthcare workers as well as the environment, as asserted by Yi and Jusoh (2023). Questionnaire respondents were supported by Driefontein Sanatorium hospital's Matron that each department was offered a bin for sharp waste, infectious waste and non-infectious waste to reduce risks associated with indiscriminate storage of waste. This was supported by observations since some types of bins were observed for example infectious waste bin shown in Plate 3.



Plate 3: Bin for infectious waste

Source: Field Survey (2023)

Furthermore, monitoring of workers' safety behaviour was among institutional measures used to manage risks as reported by (11%) of the participants at Muvonde Hospital and (7%) of the respondents at Driefontein Sanatorium Hospital. The Nurse in Charge at Muvonde Hospital indicated that monitoring of workers' safety behaviour assisted them to identify potential risks as well as taking necessary steps to prevent injuries and accidents. The Nurse in Charge asserted that healthcare workers were monitored to check the way they used available personal protective equipment/cloth. This suggests that monitoring safety behaviour of health workers plays a crucial role in promoting a culture of safety among healthcare workers while checking their compliance with safety protocols when using personal protective equipment/cloth. Monitoring the use of personal protective equipment/clothing is essential for ensuring protection against infectious agents, preventing cross-contamination and identifying any gaps in training or knowledge among healthcare workers (Qiu *et al.*, 2021). During the questionnaire survey, safety training and workshops were illustrated as institutional measures reported by (9%) and (9%) at Muvonde Hospital respectively. At Driefontein Sanatorium Hospital (6%) of the healthcare workers reported safety training which was similar to safety workshops which was also identified by (6%) (Figure 7). This entails that few healthcare workers have knowledge that safety training and workshops have potential to foster safety culture while encouraging healthcare workers to participate actively in promoting a safe working environment at a hospital. This congruence with Huang *et al.* (2012)'s studies which indicates

that few health workers are aware that safety training reduced needle stick injuries at a hospital in central Taiwan.

Figure 7 illustrated that screening of healthcare workers for diseases such as tuberculosis and hepatitis was among institutional measures used to manage occupational risks as indicated by respondents at Muvonde Hospital (8%) and Driefontein Sanatorium Hospital (22%). At Driefontein Sanatorium Hospital, the Nurse in Charge indicated that screening of healthcare workers for infectious diseases was done at the wellness clinic within the hospital premises. Screening of healthcare workers was pointed out by a large number of respondents at Driefontein Sanatorium Hospital compared to Muvonde Hospital probably because Driefontein Sanatorium Hospital is known for dealing with patients with deadly infectious diseases. As a result of this, regular screening for infectious diseases facilitates early identification of infected healthcare workers and they are diagnosed in time to avert spreading of the disease among healthcare workers and to patients. This goes in line with Talbot *et al.* (2023)'s view that screening healthcare workers for diseases enhances monitoring and implementation of appropriate measures to deter outbreaks.

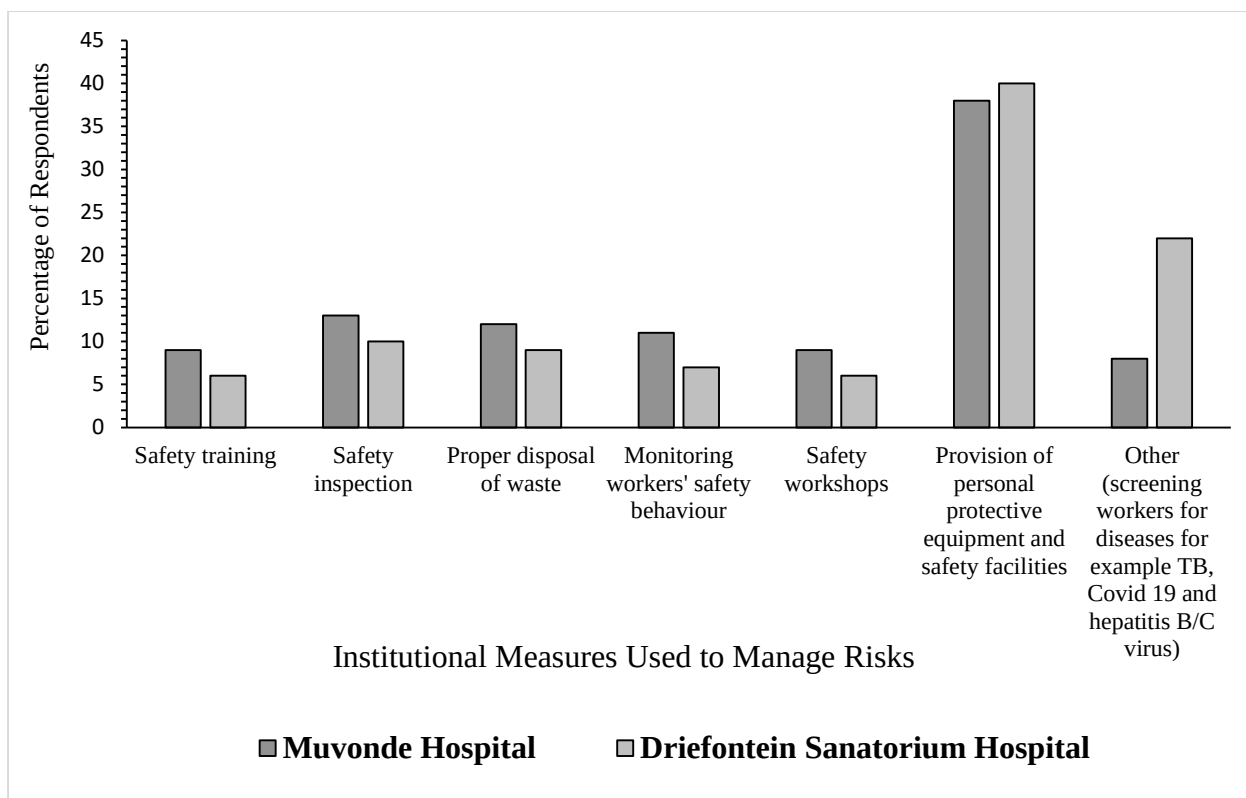


Figure 7: Institutional Measures Used to Manage Risks at Muvonde Hospital and Driefontein Sanatorium Hospital

Source: Field Survey (2023)

6.3.7 Effectiveness of Institutional Measures Utilised to Manage Risks at Muvonde Hospital and Driefontein Sanatorium Hospital

A large number of respondents at Muvonde Hospital argued that the existing measures are good (56%), while others reported very good (21.1%), excellent (15.6%) and poor (7.3%). Similarly, most of the respondents at Driefontein Sanatorium Hospital consider the effectiveness as good (51.5%) although the remaining proportion highlighted very good (30.9%), excellent (13.2%) and poor (4.4%). These results demonstrated that a significant proportion of the respondents expressed their satisfaction about the risk management strategies, therefore can be regarded as effective and reliable. This optimism among the healthcare workers can be accredited to factors such as comprehensive risk assessment, adequate training and education, implementation of best practices, effective communication and continuous evaluation of the measures carried out at these hospitals. A minor percentage of the respondents consider the existing measures as poor, suggesting that the existing measures are associated with various gaps which need attention. These respondents were partly supported by Environmental Health Technician and

Matron at Muvonde Hospital who indicated that effectiveness of safety measures to control risks was limited by shortage of resources, largely finance, lack of adequate awareness among healthcare workers, lack of proper equipment coupled by shortage of staff. They go on to argue that due to shortage of resources within the hospital, priority was highly given to aspects related to treatment of patients while giving less attention to safety of healthcare workers. However, the Nurse in Charge at Driefontein Sanatorium Hospital asserted that the existing safety measures failed to fully serve their purpose since inclusion of various stakeholders during planning and implementation of safety measures was low. Consequently, taking into account these aspects, it is clear that prevailing measures to safeguard healthcare workers from risks are failing to fully address the demands of a sustainable working environment. This clearly presents the need for proposing a process-based model for effective and sustainable work safety analysis for rural hospitals such as Muvonde Hospital and Driefontein Sanatorium Hospital.

Table 3 illustrates the Chi-Square test which was carried out to test whether there is association or there is no association between work experience and effectiveness of institutional measures used to manage risks. Results obtained during the Chi-Square tests was 0.000 and is less than 0.05. Regarding the results we accept H_1 and reject H_0 . The results attained during the analysis provide evidence that there is an association between work experience and effectiveness of institutional measures used to manage risks. This illustrates that the rating of institutional measures used to manage risks of the hospital is influenced by work experience of the healthcare worker who participated during the study. There are numerous factors that could contribute to this phenomenon, including an increase in knowledge and understanding of procedures, a higher level of confidence in healthcare workers' ability to identify and mitigate risks and a greater recognition of the importance of safety in the workplace. These findings align with the research conducted by Dziuba *et al.* (2020), which suggests that the rating of the effectiveness of institutional measures utilised to manage losses is strongly correlated with the experience of the workers.

Table 3: Chi-Square test between work experience (years)* Effectiveness of institutional measures used to manage risks

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.114E2 ^a	12	.000
Likelihood Ratio	173.584	12	.000
Linear-by-Linear Association	88.739	1	.000
N of Valid Cases	109		

a. 14 cells (70.0%) have expected count less than 5. The minimum expected count is .44.
Source: Field Survey (2023)

6.4 Proposed Process-Based Model for Effective and Sustainable Work Safety Analysis for Rural Settings such as Muvonde and Driefontein Sanatorium Rural Hospitals

In order to guarantee the provision of high-quality services, hospitals located in rural areas must prioritise the health and well-being of their healthcare employees (Kakyo and Xiao, 2019). As a result, developing a process-based model for effective and sustainable work safety analysis for rural hospitals is vital to ensure the safety and well-being of hospital workers. The proposed process-based model shown in Figure 8 includes a comprehensive strategy that takes into account a number of important factors that are necessary in improving the safety of workers at rural hospitals. The model shows steps that should be followed by rural hospitals when doing work safety analysis. The steps include assessing the already existing safety measures, risk assessment, gathering and analysing data, developing safety control strategies and capacity building as well as continuous monitoring and improvement which are indicated on the left side of the model. Steps of work safety analysis are significant in risk identification, risk evaluation and proposing suitable control measures to manage risks (Zaroushani and Khajehnasiri, 2022). Stakeholder involvement, regulatory compliance, management commitment, regular communication, sustainability planning and emergency preparedness are shown on the right side of the model as other factors responsible for enhancing safety at rural hospitals.

Integration of factors on the left side and right side of the model results in effective and sustainable work safety analysis at rural hospitals. The proposed model includes aspect of

assessing the already existing safety measures. The first phase enables carrying out of a baseline assessment of the safety precautions that are currently in place within the hospitals located in rural areas. Assessing the already existing safety measures is vital in identifying areas that require improvement (College and Bass, 2020). During the assessment of existing safety measures all stakeholders should be included for example hospital management, healthcare workers and other members from regulatory bodies such as Zimbabwe Institute of Occupational Safety and Health (ZIOSH). This helps in sharing ideas on the current safety measures used in rural hospitals, identifying their weaknesses and this results in collaboration in improving them. The proposed process-based model indicated that risk assessment should be involved for effective and sustainable work safety analysis. Risk assessment helps to identify risks occurring within the rural hospitals. This is supported by Coronato and Cuzzocrea (2020) that information collected during risk assessment is important in developing safety measures tailored to risks identified within the workplace. Therefore, information collected during assessment of already existing safety measures and risk assessment can be used to check if the rural hospitals are complying with the already existing safety regulations such as Public Health Act, Chapter 15:09.

The proposed process-based model highlighted that effective work safety analysis is achieved through proper gathering and analysis of data related to occupational accidents, injuries and near misses incidents. In order to recognise patterns, trends and areas for enhancing work safety, gathering and analysing data is essential (College and Bass, 2020). According to the proposed model, management commitment is essential when it comes to collecting data related to safety at rural hospitals. This means in order to drive hospital safety efforts according to insights driven from collected safety data, commitment from the management is crucial in terms of providing assistance, resources as well as leadership. Workplace safety culture is promoted by the combination of management commitment and analysis of data related to safety (Guerra *et al.*, 2023). After risk assessment and data collection safety measures are developed. The model indicated that appropriate safety control measures should be developed to address recognised risks based on the results of data analysis and risks assessment. The developed procedures should aim to protect rural healthcare workers from injuries, illnesses and accidents. Measures developed for effective and sustainable work safety analysis at the rural hospitals should encompass safety trainings and workshops as well as safe ways of performing tasks. All stakeholders should be involved during the development of safety measures and the measures should be communicated clearly with every staff member within the rural hospital. There is a

relationship between employee safety awareness and safety compliance when safety measures developed within the workplace are clearly communicated to the employees (Rai *et al.*, 2021). Hence, involving stakeholders also fosters responsibility and transparency, all of which are necessary for establishing commitment and development of sustainability planning. Creating sustainable future strategies guarantees that rural hospital operations continue to incorporate work safety practices.

The proposed process-based model for effective and sustainable work safety analysis shown in Figure 8 include the aspect of capacity building. At this stage healthcare workers are trained about safety measures developed within the workplace. Rural hospital employees can be guaranteed to have information and abilities needed to successfully execute safety procedures by investing in capacity building and training programs. Training programs initiated at rural hospitals should focus on equipping healthcare workers with safety knowledge, emergency preparedness and procedures to keep the hospital environment safe. A coordinated reaction in the event of an emergence is ensured by involving stakeholders in planning, training and emergency situations (Thielmann *et al.*, 2022). As a result, the model encourages involvement of stakeholders in safety training to increase emergency preparedness and safety resilience within the rural hospitals. After healthcare workers are trained about safety measures developed within the workplace continuous monitoring and improvement should be done. Consistent surveillance of safety performance parameters facilitates continuous assessment of the efficiency of the applied control measures (Wiegmann *et al.*, 2022). In this process, ongoing communication among rural hospital workers and management as well as stakeholder involvement is essential since it guarantees that everyone is informed of updates or modifications of safety measures. Rural hospitals can assess performance indicators, pinpoint areas for development and proactively respond to changes through continuous monitoring and evaluation using the developed process-based model. Therefore, the developed process-based model for effective and sustainable work safety analysis for rural hospitals is a crucial step in enhancing work safety in hospitals located in rural areas.

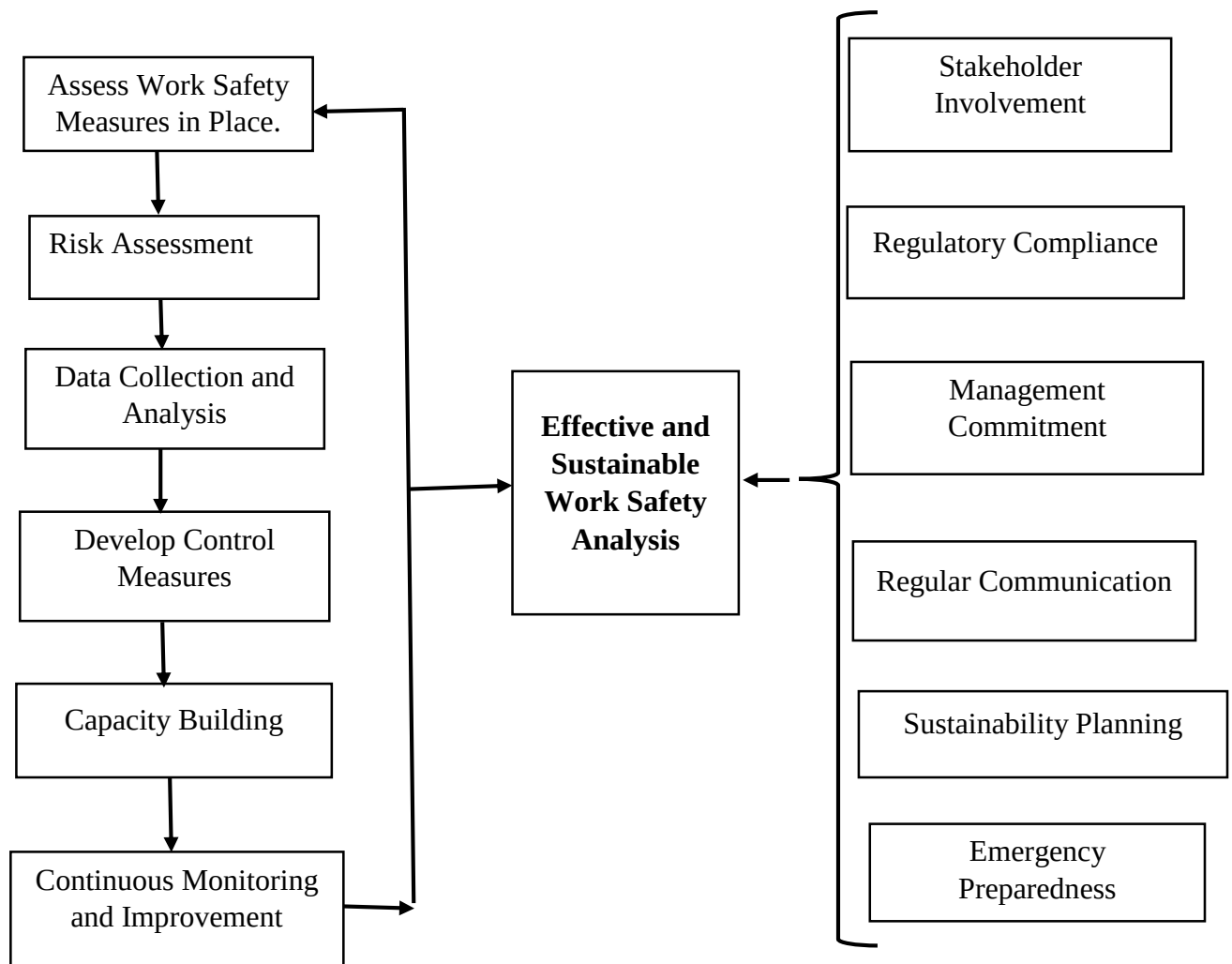


Figure 8: Proposed Process-Based Model for Effective and Sustainable Work Safety Analysis for Rural Settings Such as Muvonde and Driefontein Sanatorium Rural Hospitals
Source: Authors

6.5 Implications of the Study

Developing a process-based model will result in the creation of standardised occupational safety procedures designed especially for hospitals in rural areas. This can increase healthcare professionals' general safety and drastically lower workplace accidents. In order to ensure continued dedication to workplace safety, the models's emphasis on sustainability pushes hospitals to implement procedures that take into account both short-term safety issues and long-term effects on employee well-being. The developed model might be used as a standard by other hospitals in rural areas of Zimbabwe and in other similar situations across the world, offering a framework which can be modified and applied in other places to improve work safety

regulations. Policymakers can utilize the model's conclusions to develop rules that raise occupational safety and health in rural healthcare centers in Zimbabwe.

6.6 Limitations of the Study

The study focus on rural hospitals in Chirumanzu district located in Midlands Province, Zimbabwe. This geographic restriction can limit the findings' applicability to other areas or metropolitan hospitals where occupational safety analysis dynamics and difficulties might be very different from those located in rural areas. Hospital administration and employees' involvement in the study may have varied, which have an impact on their willingness to implement any suggested modifications in light of the research's conclusions. The results might become subjective due to the dependence on qualitative techniques for example interviews. Social desirability or personal biases may have skewed the findings by influencing participant's answers. Additionally, the proposed process-based model could be difficult to put into effect since various rural hospitals have differing levels of assets and experiences. This intricacy may make it more difficult to adopt and use it effectively.

6.7 Conclusion and Recommendations for Future Research

Healthcare workers at rural hospitals of Chirumanzu district are exposed to various risks including ergonomic, psychosocial, chemical, biological and physical risks. At rural hospitals risks are caused by inadequate equipment, shortage of labour, pressure due to high workload, poor safety training and poor management commitment to safety initiatives. Risks affecting healthcare workers at Muvonde and Driefontein Sanatorium rural hospitals causes serious consequences to healthcare personnel, including the possibility of infections, musculoskeletal disorders, stress and fatigue as well as reduced their productivity. Currently basic personal protective equipment/cloth, safety inspection and safety training are used as safety measures within the rural hospitals but, because of limited resources and inadequate risk assessment techniques, there are still substantial shortcomings in their application. This calls for the development of a process-based model for effective and sustainable work safety analysis focusing on challenges faced by rural settings such as Muvonde and Driefontein Sanatorium rural hospitals. The model is essential for improving the healthcare workers' general safety as well as enhancing their well-being. This model offers customised solutions that can be used to reduce work-related risks and raise work safety standards by concentrating on the particular difficulties. For example, inadequate equipment faced by hospitals located in rural areas. Moreover, by putting such a model into practice, occupational injuries, accidents and other

work-related risks in hospitals might be reduced. Additionally, this model can support the sustainability of occupational safety measures in hospitals located in rural areas by fostering safety culture and supporting continual improvement. However, it is advised that more investigation should be carried out in order to confirm and enhance the suggested process-based model for effective and sustainable work safety analysis at hospitals situated in rural areas. To guarantee the process-based model's applicability and efficacy in the real world, a comprehensive field test and cooperation with hospital workers in Chirumanzu district should be part of this validation process.

6.8 References

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Chapter 7

7.1 Introduction

A summary of discussions is provided in this chapter. Firstly, synthesis of the results attained during the study is presented in this chapter. The synthesis serves as an overview of the key findings of the study. The chapter concludes by providing the recommendations that were derived from the findings of the study. These recommendations provide practical solutions to the issues raised in the study and offer insights into future research directions.

7.2 Findings and Synthesis

7.2.1 Risks Affecting Healthcare Workers

At Muvonde Hospital and Driefontein Sanatorium Hospital healthcare workers are exposed to various risks notably ergonomic, biological, chemical, physical and psychosocial risks. At Muvonde Hospital the majority (44%) of the questionnaire respondents indicated that they are exposed to ergonomic risks. Nature of tasks performed by healthcare workers involve lifting patients, repetitive movements and awkward postures hence, this exposes them to ergonomic risks. According to this conclusion, actions targeted at enhancing ergonomic procedures in this rural hospital are needed. Potential methods include redesigning workstations to improve movement patterns and posture and offering training courses that concentrate on safe lifting procedures. However, at Driefontein Sanatorium Hospital most (30.9%) of the healthcare workers indicated that they are exposed to biological risks. The results are not surprising since Driefontein Sanatorium Hospital deals mainly with patients affected with infectious diseases, for example, tuberculosis. The existence of biological risks calls for strong infection control methods, such as appropriate hygiene practices, staff immunization campaigns against diseases which can be prevented and training on safe handling of potentially infected objects. Physical risks such as sharp objects, noise, radiation, and slips and falls were reported at Driefontein Sanatorium Hospital and Muvonde Hospital. Regarding distribution of chemical risks, the majority of healthcare workers at Muvonde Hospital and Driefontein Sanatorium Hospital reported sanitizers, followed by cleaning detergents, latex gloves, sterilizing agents and mercury. In addition, distribution of psychosocial risks identified at the two rural hospitals involve dealing with very ill patients, overwork, fatigue, verbal abuse and physical abuse. These risks draw attention to serious weaknesses in the safety procedures in place. This means there is need for a comprehensive safety and health model tailored to address particular risk

profiles. This is essential since it helps to create a positive safety culture among healthcare workers and improve their well-being. Putting healthcare personnel's health first is crucial for both their safety and improving the standard of patient care.

7.2.2 Causes of Risks Affecting Healthcare Workers

Healthcare workers at Muvonde Hospital and Driefontein Sanatorium Hospital are exposed to risks due to shortage of labour, high workload, inadequate equipment, gender, age, poor training, poor management and use of personal protective equipment/cloth for a long time, negative safety behaviour as well as the department the healthcare worker is allocated within the hospital. The findings emphasize the necessity of a thorough understanding of these concerns in order to establish effective safety procedures, since results show that there are a number of factors which contribute to occurrence of work-related risks. At Muvonde Hospital the majority (20.2%) of the healthcare workers specified that pressure due to high workload exposes healthcare workers to risks. The findings concur with results obtained at Driefontein Sanatorium Hospital since most (25%) of the healthcare workers indicated that they are exposed to risks as a result of pressure due to high workload. A significant percentage of the healthcare employees indicated that high workload is the main source of risks affecting workers in rural hospitals. Inadequate staffing exposes healthcare workers to high workload because if there is shortage of staff the available workforce take additional tasks and work for long hours. However, this affects the well-being of healthcare workers. In hospitals healthcare workers are involved in duties performed in high pressure departments, for example, intensive care departments and emergency departments where quick decisions are made and this results in pressure and burnouts since the decisions are linked to life or death. Therefore, it is a necessity for Driefontein Sanatorium Hospital and Muvonde Hospital to take steps to manage causes of risks affecting their workers. However, for a work safety analysis to be effective all relevant aspects which causes risks must be taken into account holistically rather than separately.

7.2.3 Effects of Risks Affecting Healthcare Workers

Risks affecting healthcare workers at Driefontein Sanatorium Hospital and Muvonde Hospital are associated with different problems. Regarding effects of ergonomic risks the majority (51.4%) healthcare workers at Muvonde Hospital and most (57.4%) of the study participants at Driefontein Sanatorium hospital reported back injuries, followed by neck pain, shoulder discomfort and muscular strain. The high rate of back injuries among rural healthcare workers highlights a serious problem in these rural healthcare facilities. According to this research,

these injuries are probably caused by ergonomic issues including poor lifting skills, poorly designed workspaces and a lack of instruction on safe handling procedures. The evidence suggests that ergonomics-focused measures may considerably lower the incidence of effects of ergonomic risks. Discomfort and injuries can result in absenteeism and lower production which can eventually impact outcomes provided by healthcare workers. The results also imply that the capacity of healthcare professionals to deliver high-quality treatment is closely related to their well-being. As a result, managing ergonomic risks is crucial for preserving efficient healthcare service in rural areas as well as for worker safety. At Muvonde Hospital and Driefontein Sanatorium Hospital Covid-19, tuberculosis, hepatitis B/C and HIV/AIDS were indicated as effects of biological risks by healthcare workers. Ongoing training programs centered on preventing and controlling infections using techniques designed especially for remote hospitals are needed. This training should include the most recent recommendations for managing biological risks related to tuberculosis, hepatitis B/C and HIV/AIDS. Results obtained at Muvonde Hospital and Driefontein Sanatorium Hospital on effects of physical risks indicated needle stick injuries, cuts/pricks, influenza and crumps. Findings indicated that needle stick injuries were indicated as the most prevalence. Given how frequently needle stick injuries occur, there may be a serious lack of safety procedures and instruction on how to handle sharp objects. This suggests that healthcare professionals are regularly exposed to potentially pathogenic materials and this can have detrimental effects on their health. The study emphasizes the need for enhanced training curricula that emphasize on safe procedures for handling needles as well as other sharp objects. At Driefontein Sanatorium Hospital and Muvonde Hospital healthcare workers specified that chemical risks are associated with various effects which include skin irritation, allergies, pulmonary irritation, asthma and birth defects. According to the results obtained at Driefontein Sanatorium Hospital and Muvonde Hospital healthcare workers are affected with stress, fatigue, anxiety, insomnia, blood pressure and persistent tiredness due to psychosocial risks. This shows that the working environment for rural healthcare workers may jeopardise their health and safety.

7.2.4 Methods used to manage risks

Healthcare workers at Driefontein Sanatorium Hospital indicated personal methods they use to manage risks and institutional methods used to manage risks within the hospitals. On personal methods the majority (29.4%) of the healthcare workers at Muvonde Hospital indicated personal hygiene, for example, washing hands and at Driefontein Sanatorium Hospital most (33.8%) reported personal hygiene notably washing hands after performing procedures. This

indicated that hand hygiene is a crucial method in reducing transmission of bacteria among healthcare workers and patients. The significant number of healthcare employees indicated handwashing as a crucial practice and this shows that hospital staff members are aware of infection control guidelines. Although handwashing is crucial, concentrating just on one technique may reveal ignorance of other personal hygiene practices such as proper handling of materials which are regarded as hazardous in hospitals. This means there is need for more trainings for knowledge development. Use of tablets that induce sleep, requests for assistance when handling patients and adjusting working equipment, for example, adjusting bed heights of patients were indicated as personal measures used by healthcare workers to manage risks. However, some of the personal measures reported by healthcare workers such as, smoking and alcohol intake to manage stress are negative since they can expose them to detrimental effects which can lead to health deterioration. As a result, adoption of positive methods when managing occupational risks is significant. This means the developed model must involve safety training aspects to improve the knowledge of rural healthcare workers pertaining to safety.

Healthcare workers at Driefontein Sanatorium Hospital and Muvonde Hospital indicated measures regarded as institutional measures used to manage risks at the hospitals. Institutional methods used reported by healthcare workers include safety training, proper disposal of waste, safety inspection, use of safety workshops, monitoring workers' safety behaviour, screening workers for diseases for example tuberculosis, Covid-19 and hepatitis B/C virus as well as provision of personal protective equipment and safety facilities. The majority (38%) of the healthcare workers at Muvonde Hospital indicated provision of personal protective equipment. This is similar to the results obtained at Driefontein Sanatorium Hospital since most (40%) of the healthcare workers reported provision of personal protective equipment/cloth as a method used to protect healthcare workers from risks. Findings regarding institutional methods reported by healthcare workers indicated that Muvonde Hospital and Driefontein Sanatorium Hospital prioritize the provision of PPE/C in order to protect workers from risks related to tasks they perform. Majority of the healthcare workers at Driefontein Sanatorium Hospital and Muvonde Hospital reported the provision of PPE/C as a measure to manage risks. This implies that healthcare workers at Driefontein Sanatorium Hospital and Muvonde Hospital are aware that PPE/C is important in protecting them from risks. Personal Protective Equipment/Cloth is essential for protecting healthcare employees' health and safety particularly in rural areas where infrastructure and resources constraints may increase exposure to a variety of

occupational risks. While there are various safety methods used within the two rural hospitals, systematic frameworks for risk assessment that could anticipate risks are lacking.

Some of the healthcare workers who participated as questionnaire respondents at Muvonde Hospital and Driefontein Sanatorium Hospital indicated that safety measures applied within the hospitals are poor which means they are associated with various challenges. The EHTs at both rural hospitals noted that inadequate resources, shortage of labour and poor training. This means the safety measures used within the rural hospitals were ineffective and unsustainable. According to the report, both hospitals' current work safety analysis practices are more reactive than proactive. This suggests that both resource allocation and training need to be improved in rural hospitals. As a result, a process-based model for effective and sustainable work safety analysis for rural hospitals in Chirumanzu district was developed.

7.3 Proposed Process-Based Model for Effective and Sustainable Work Safety Analysis for Muvonde and Driefontein Sanatorium Rural Hospitals

The developed process-based model is new. However, it encompasses terms which are usually used in the field of occupational safety and health. The way the terms incorporated in the model were organised and the structure of the process-based model is unique in the field of work safety analysis. The novelty of the proposed process-based model for effective and sustainable work safety analysis for rural hospitals is its thorough incorporation of contextual elements and procedural stages that suit to the challenges encountered by rural healthcare centers. In contrast to conventional safety analysis models such as Fault Tree Analysis which frequently concentrate on risks associated with failures, the proposed model put much emphasis on a comprehensive approach which include management commitment, regulatory compliance and stakeholder participation as crucial elements in work safety analysis. The model addresses the issue of ongoing monitoring and improvement and it's essential in dynamic rural environments where the availability of resources is limited. This dual emphasis distinguishes it from other work safety analysis models that might not have such an integrated viewpoint and neglecting sustainability of safety procedures over time.

Utilisation of the developed model follows a process which starts with assessing work safety measures in place, risk assessment, data collection and analysis, development of control measures, capacity building and continuous monitoring and improvement. This offers a comprehensive approach for effective and sustainable work safety analysis in rural hospitals. The proposed model's emphasis on capacity building and continuous monitoring promotes

continuous evaluation and improvement of safety practices within the rural hospitals. In rural areas where circumstances can change often, this capacity for adaptation is essential. The model also considers aspects such as stakeholder involvement, management commitment, regular communication, sustainability planning and emergency preparedness. The issue of stakeholder involvement encourages cooperation between different groups, such as rural healthcare workers, administration and Environmental Health Technicians translating to sharing of ideas. According to Fraboni *et al.* (2023) using a participative approach increases support for safety measures and guarantees that different viewpoints are taken into consideration. The model puts emphasis on the value of management's commitment and this supports the notion that management is essential in fostering safety culture within the healthcare facilities. Effective leadership has the power to establish safe practices for employees and allocates funds to initiatives associated with occupational safety (Anaba *et al.*, 2024). The model also integrates sustainability planning in order to establish long lasting advancements in rural hospitals' work safety. This helps the rural hospitals to meet the demands of Sustainable Development Goal (SDG) 3 which focuses on Good Health and Wellbeing. The model also focuses on emergency preparedness so as to improve rural hospitals' resilience to unexpected incidents.

7.4 Conclusion

Healthcare workers at Driefontein Sanatorium Hospital and Muvonde Hospital are affected by different work-related risks. Occupational risks affecting healthcare workers at Driefontein Sanatorium Hospital and Muvonde Hospital include chemical, physical, ergonomic, psychosocial and biological risks. Effects of risks affecting healthcare workers include strains, injuries, stress, diseases, cuts, irritations and infections. The study also found that healthcare workers are exposed to risks as a result of high workload, shortage of labour, poor training, inadequate equipment, age, gender and negative safety behaviour as well as the department of the healthcare worker within the hospital. The safety and well-being of rural healthcare workers is jeopardised by these circumstances. During the research procedures used to manage risks were examined. Results attained during the study reveal that most safety procedures used at Driefontein Sanatorium Hospital and Muvonde Hospital include use of personal protective equipment/cloth, safety inspections, proper disposal of waste, monitoring of workers' safety behaviour, safety training and safety workshops. Safety measures for managing work-related risks exist at Driefontein Sanatorium Hospital and Muvonde Hospital however, risks continue to affect healthcare workers within the two rural hospitals due to shortage of skilled personnel,

inadequate infrastructure, difficulties in getting support services and accessing safety training. The effectiveness of these processes was evaluated and the results indicated that although certain methods to manage risks are in place they are not regularly evaluated or implemented comprehensively. Healthcare employees continued to be vulnerable as a result of this deficiency highlighting the need for a process-based model for effective and sustainable work safety analysis. A process-based model for effective and sustainable work safety analysis was developed based on the findings of the study. The proposed model focuses on the needs of Muvonde and Driefontein Sanatorium rural hospitals to ensure that its work safety analysis process is applicable and relevant to rural context. The model takes a comprehensive approach by taking into account a number of significant variables that affect occupational safety within hospitals. The model includes factors such as assessment of work safety measures already in place, risk assessment, data collection and analysis, development of control measures, capacity building and continuous monitoring. The model also considers aspects such as stakeholder involvement, management commitment, regular communication, sustainability planning and emergency preparedness. The proposed model's emphasis on sustainability alludes a long-term approach in enhancing work safety procedures at rural hospitals. The model integrates continuous monitoring and improvement which means the aim of the model is to create long lasting changes that can endure changing conditions and problems faced over time. The findings of this study serve as a basis for improving occupational safety in rural hospitals of Chirumanzu district and as a benchmark for other similar rural hospitals nationally and internationally.

7.5 Recommendations for Further Research

Future studies should examine how to use technology to solve issues related to workplace safety while keeping in mind the limits of safety infrastructure associated with rural hospitals. It is imperative to take into account the incorporation of technology innovations, such as telemedicine platforms and digital health approaches, to enhance work safety protocols in rural hospitals.

It is recommended that future researchers should evaluate the effectiveness of the proposed work safety analysis model. This would include monitoring the model's use for a considerable period of time in order to assess its effect on work safety results, identify any new difficulties and improve the model based on the feedback.

Future academics must place a strong emphasis on community involvement in work safety evaluations. Involving the community may promote cooperative solutions and offer insightful information about the particular safety problems that rural hospitals encounter. Working together can help to create solutions that are relevant to their context and sensitive to cultural differences.

Future studies may focus on the ramifications of policies on safety of healthcare workers. This means that in the future, researchers should investigate the significance of introducing policies that support sustainable and successful work safety strategies in rural hospitals. The researchers should examine how current financing sources, political structures, and regulatory structures may help or impede initiatives to increase work safety in rural healthcare settings.

Scholars may conduct more studies on the value of information sharing in safety. This clearly indicates that in order to improve occupational safety in rural healthcare facilities, future research should concentrate on fostering information sharing and collaboration among scholars, healthcare practitioners, policymakers, and community people. It is critical to provide forums for the exchange of best practices, lessons and creative solutions to problems associated with workplace safety.

Taking the above recommendations into consideration, future studies can further our understanding of safety and progress towards sustainable and effective work safety analysis methods in Chirumanzu district rural hospitals and other hospitals in both developed and developing countries. Moreover, there is a need for pilot testing of the developed process-based model for effective and sustainable work safety analysis since it is in the development stage. Pilot testing of the model should involve the developer of the model, management team within the hospital, lower-level healthcare workers and other relevant stakeholders as well as safety personnel within the rural hospital for example the Environmental Health Technician. Pilot testing allows various stakeholders and researchers to assess the applicability, efficiency, weaknesses and implement the necessary modifications before the model is implemented at a larger scale.

7.6 References

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Appendix 1: Questionnaire for Health Workers.

Dear Participants

I am Shabani Tapiwa, an MPHIL student at Midlands State University under the Department of Geography Environmental Sustainability and Resilience Building. You are kindly requested to answer the specified questions created to gather information on **Developing A Process-Based Model for Effective and Sustainable Work Safety Analysis for Rural Hospitals in Chirumanzu District of Midlands Province, Zimbabwe**. Be free to give true information because the data would not be exposed to anyone and it is only for academic purposes.

Pattern for responding to the questionnaire.

Do not write names on the questionnaire to remain anonymous.

Accomplish the questionnaire by marking what you think is your best response or by writing your response in the space provided. Follow examples shown below:

1. How many workers are here? 210

2. Do you know anything about safety? No ☐ Yes ☒

Questionnaire Number.....

Name of Hospital.....

SECTION A: DEMOGRAPHIC INFORMATION

1. What is your gender? Male ☐ Female ☐

2. What is your age group?

18-25 ☐ 26-33 ☐ 34-41 ☐ 42-49 ☐ 50-57 ☐ 58-64 ☐
65+ ☐

3. Marital Status. Single ☐ Married ☐ Divorced ☐ Widowed ☐

4. Maximum level of education.

Certificate ☐ Diploma ☐ Bachelor's degree ☐ Master's degree ☐

Doctorate (PhD) ☐

Other (Specify).....

5. Present department you are working at the hospital.

Administration ☐ Pediatric Ward ☐ Eye Unit ☐ Family Health Clinic ☐
Female Ward ☐ Male Ward ☐ Maternity Ward ☐ Pharmacy/Dispensary ☐
Medical Laboratory ☐ X-Ray Department ☐ Operating Theatre ☐
Dental Unit ☐ Rehabilitation Department ☐ Operating Theatre ☐
Rehabilitation Department ☐ Outpatient Department ☐ Emergency Department ☐
Opportunistic Infection Clinic (OI) ☐

7. How long have you been working at the hospital?

.....

8. Job Title.

Nurse ☐ Doctor ☐ Laboratory technician ☐ Physiotherapist ☐
Cleaner ☐ Radiologic Technologist ☐ Anesthetist ☐ Eye Optician ☐
Dentist ☐

SECTION B: RISKS AFFECTING HOSPITAL WORKERS

9. Which risks often affect hospital workers?

Chemical risks ☐ Biological risks ☐ Physical risks ☐ Ergonomic risks ☐
Psychosocial risks ☐

10. What are the causes of risks affecting hospital workers?

Age ☐ Gender ☐ Work shifts ☐ Pressure ☐ Shortage of labour ☐
Poor trainings ☐ Negative safety behaviour ☐ Poor management ☐
Department the worker is allocated ☐ Use of PPE/C for a long time ☐
Other (Specify).....

.....

11. Which injury mostly affects hospital workers due to work related tasks?

Needle stick injury ☐ Back injury ☐ Neck pain ☐ Muscular strain ☐
None ☐ Other.....

.....

12. Which of the following diseases are affecting hospital workers as a result of occupational risks?

Hepatitis B/C ☐ HIV/AIDS ☐ Tuberculosis ☐ None ☐

Other

13. Have you ever been exposed to any chemical risk from mercury, cleaning compounds and anaesthetic gases? Yes ☐ No ☐

If yes, what are the effects of those risks.....

.....

14. How do you rate the level of stress affecting health workers?

Not stressed at all ☐ Moderately stressed ☐ Very stressed ☐

15. What signs show that you are being affected by occupational safety and health risks?

Loss of sleep ☐ Fatigue ☐ Stress ☐ Anxiety ☐

Mental health challenges ☐ Headache ☐

Other (Specify).....

16. Which shift do you find more strenuous? Night ☐ Day ☐

Why

.....

17. Workers take leave or off days due to any problem related to occupational safety and health risks within the hospital?

Agree ☐ Strongly agree ☐ Disagree ☐ Strongly disagree ☐

SECTION C: LEVELS OF RISKS AFFECTING HOSPITAL WORKERS

Risk Score Matrix.

Frequency of Occurrence or Likelihood	Consequences	(Severity	Of	Accident)	
	1 Incidental	2 Minor	3 Serious	4 Major	5 Catastrophic
5 Almost Certain	Medium	High	Very High	Very High	Very High
4 Likely	Medium	Medium	High	Very High	Very High
3 Possible	Low	Medium	High	High	Very High
2 Unlikely	Low	Low	Medium	High	High
1 Rare	Low	Low	Medium	Medium	High

Explanation of risk score matrix terms to the respondents.

Severity Terms:

Incidental: accidents dealt with in-house first aid.

Minor: Treatment done by medical professionals.

Serious: Non permanent injury.

Major: Extensive permanent injury.

Catastrophic: Associated with death and permanent disabling.

Likelihood Terms:

Almost certain: the risk is almost certain to occur in most circumstances.

Likely: Occur frequently.

Possible: Likely to occur at some time.

Unlikely: The risk is unlikely but not impossible to occur.

Rare: May occur but only in rare.

18. Risk Score Matrix Questions in Table Format.

number	Risks	Likelihood								Consequences				
		Yes	No	Almost Certain	Likely	Possible	Unlikely	Rare		Incidental	Minor	Serious	Major	Catastroph
	Example	✓		✓								✓		
1.	Physical risks													
2.	Ergonomic Risks													
3.	Chemical Risks													
4.	Biological Risks													
5.	Psychosocial Risks													

SECTION D: METHODS TO MANAGE RISKS

19. What measures are used by your institution to reduce occupational safety and health risks affecting hospital workers?

Safety training ☐ Safety inspection ☐ Proper disposal of waste ☐

Reporting of near miss accidents ☐ Monitoring workers ☐ Safety workshops ☐

Use of Personal Protective Equipment/ Clothe ☐ All mentioned aspects ☐

Other (Please specify).....

20. Does your institution have enough personal protective equipment/clothes for workers to use during procedures?

Agree ☐ Strongly Agree ☐ Disagree ☐ Strongly Disagree ☐

21. a) Are you satisfied with the safety measures in place?

Yes ☐

No ☐

b) Explain your reason for the answer you give in (a).....

.....

22. a) Rate the level of knowledge hospital workers have on methods to manage occupational risks?

Good ☐ Very Good ☐ Excellent ☐ Poor ☐

b) Explain your reason for the answer you give in question (a).....

.....

23. How often is safety monitoring, inspection and evaluation are conducted within the hospital?

Weekly ☐ After two weeks ☐ Monthly ☐ No definite time fixed ☐

24. a) Does the top management put clear policies on issues of safety?

Agree ☐ Strongly Agree ☐ Disagree ☐ Strongly disagree ☐

b) Do you think this is adequate?

.....

25. How do you rate the effectiveness of laws and measures used to manage risks within your hospital?

Good ☐ Very Good ☐ Excellent ☐ Poor ☐

26. What benefits will the hospital and employees derive from effective safety measures?

Reduces accidents ☐ Reduces cost of compensation to injured workers ☐

Improves image of the hospital ☐ Reduce staff turnover ☐

Reduce death of workers ☐ All the mentioned aspects ☐

Other (specify).....

.....

27. What other methods do you think can be used by the hospital management to improve occupational safety and health?

.....

.....

Appendix 2: Interview guide for the Medical Superintendent

1. What do you understand about occupational safety and health?
2. Indicate types of occupational safety and health risks which mostly affect hospital workers?
3. What are the causes and effects of health risks you noticed from health workers?
3. Have you ever attended a hospital worker who encountered fatal injuries within the workplace?
4. How effective are the methods used to reduce occupational safety and health risks within the hospital?
5. Do you have hospital workers you give off days due to work-related injuries?

Appendix 3: Interview guide for Hospital Manager (Matron)

1. What do you understand about occupational safety and health?
2. What types of risks mostly affect your employees and why?
3. What are the effects of occupational safety and health risks to your employees and the institution?
4. To what extent do you agree with safety issues as an institution?
5. Do you positively enforce and correct unsafe safety practices?
6. Is there a safety guideline and committee within the hospital?
7. What methods do you use to uplift the morale of workers?
8. What measures are used to manage occupational safety and health risks within the hospital and how effective are they?
9. How often do you accompany the Environmental Health Technician (EHT) during safety inspections?
10. How do you react to the negative results provided by the EHT in the inspection report?

Appendix 4: Interview guide for Nurse in Charge

1. What do you understand about occupational safety and health?
2. What are the types of occupational safety and health risks mostly reported by health workers?
3. What do you think are the causes and effects of occupational safety and health risks reported by workers within the hospital?
4. Are there any workers who are referred to the doctor from the wellness clinic due to fatal work-related injuries?
5. What measures are used to manage risks affecting workers within the hospital and how effective are they?
6. Do you compile reports of risks reported by hospital workers and submit them to the Human Resource Manager and Hospital Matron without fear?
7. How does the top management react to the documents you compiled showing the risks affecting hospital workers?

Appendix 5: Interview guide for National Social Security Authority (NSSA) Inspector

1. What do you understand about occupational safety and health?
2. Based on your experience, what types of occupational safety and health risks are affecting health workers?
3. What are the causes and effects of occupational safety and health risks affecting health workers in Zimbabwe?
4. Are there any regulations for occupational safety and health that specifically address health workers in Zimbabwe and how effective are they?
5. In what ways should International Organization for Standardization (ISO) 45001 occupational health and safety management system be administered to hospitals to address safety and health issues in Zimbabwe?
6. Do you administer examinations to specifically address occupational safety and health risks pertaining to health workers in Zimbabwe?
7. Do you have any hospital workers who claim compensation due to work-related injuries?

Appendix 6: Interview Guide for District Medical Officer (DMO)

1. What do you know about occupational safety and health?
2. What types of risks mostly affect hospital workers and why?
3. What are the effects of occupational safety and health risks?
4. Explain the safety policy which caters for hospitals in your district?
5. Do you positively enforce and correct unsafe safety practices in hospitals?
6. Is there a safety guideline and committee within the hospitals found in your district?
7. What methods do you use to uplift the morale of workers?
8. How often do you receive safety reports from the hospitals?
9. What type of resources do you distribute to hospitals in order to manage risks?
10. Do you visit hospitals in order to inspect changes that are related to safety?

Appendix 7: Interview guide for Human Resource Manager

1. What do you know about occupational safety and health?
2. What types of occupational safety and health risks are mostly reported by health workers?
3. What are the causes and effects of occupational safety and health risks to health workers?
4. How do you distribute materials such as PPE/C within the hospital to address the issue of occupational safety and health risks?
5. Do you hire safety experts to train and educate workers about safety?
6. Did you involve workers in making decisions that are related to their health and safety?
7. Do you have any methods you use to motivate workers to follow safe procedures when performing their tasks?
8. a) Does your institution have a documented safety policy?
b) If yes, are you following it?
9. Do workers request for leave due to work-related injuries or illnesses?

Appendix 8: Interview guide for Environmental Health Technician

1. What do you understand about occupational safety and health?
2. What are the causes and effects of occupational safety and health risks to workers?
3. What mechanisms are used to reduce occupational safety and health risks at your hospital and how effective are they?
4. Does your institution have a documented safety policy?
5. Is there a safety group here?
6. Do you take surveys (monitoring and inspection) for occupational safety and health?
7. To what degree do your employees follow safety guides?
8. How regularly do you carry out safety training and how effective are those trainings?
9. Are you able to say anything concerning safety in reports freely without being blamed?

Appendix 9: Observation Checklist

Hospital.....

Ward/Unit.....

Date.....

Aspect	Observation	Comment
Environment • Windows • Floors • Temperature	• Is the area free from contaminants • Dust on walls and windows • Spills of fluids and blood on floors • Noise • Is temperatures suitable for work	
Equipment • Trolleys • Wheelchairs • Chairs in offices • Oxygen cylinders • Observation machines in different departments for example X-ray department	• Are they suitable for work? • Are they maintained regularly • Are they adjustable where applicable • Are they in good state	
Personal Protective Equipment/clothes • Gloves • Gowns • Respirators • Eye goggles • Face mask • Theatre shoes	• Suitable for work • Their availability • Sequence of wearing PPE/C • Condition of the PPE/C	

Workers	• Nature of the duties they perform • Safety behaviours • Dressing of PPE/C • Safety culture • Risks associated with duties they perform	
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