



Assessment of occupational safety and health hazards among borehole drilling employees in harare district, Zimbabwe

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Received: 18 September 2023 / Revised: 25 September 2023 / Accepted: 3 October 2023 / Published online: 9 October 2023
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Abstract

The paper titled “Assessment of Occupational Safety and Health Hazards among Borehole Drilling Employees in Harare District, Zimbabwe” aims to investigate and evaluate the occupational safety and health hazards faced by employees involved in borehole drilling activities in the Harare District of Zimbabwe. The study focuses on identifying the potential risks and hazards associated with this occupation, as well as assessing the existing safety measures and practices implemented by employers. The research methodology employed for this study includes a combination of quantitative and qualitative approaches. The findings revealed that borehole drilling employees in Harare District are exposed to various occupational hazards, including physical hazards, chemical hazards, psychosocial hazards, as well as ergonomic hazards. Furthermore, the study identified several risk factors contributing to these hazards, such as operating poorly serviced machines, risk taking behaviour under pressure, lifting heavy equipment and inadequate and improper wearing of PPE/C. Measures used to manage hazards include training on standard work procedures, use of PPE/C, safety inspection, risk assessment, toolbox talks and accident reporting. However, the research highlighted the need for improved safety measures, training programs, and regulatory enforcement to mitigate hazards and ensure the well-being of borehole drilling employees in Harare district.

Keywords Occupational safety and health hazards · Borehole drilling employees · Risk assessment · Hazard identification and health surveillance

Introduction

There has been a surge in borehole drilling in Africa, with the main objective being the attainment of Sustainable Development Goal 6, which seeks to ensure universal access to sustainable water and sanitation (Bowen and Bayor 2022; Zindi and Shava 2022; Muhammad et al. 2023). According to the report published by the (SADC-GMI) in 2019, a significant proportion of the population in the SADC region, specifically 70%, depends on groundwater as their primary source of water. This implies that borehole drilling is a common practice, due to the scarcity of clean water

sources in the SADC region. A total of over 100,000 manually excavated boreholes are in use across several countries, including India, Vietnam, Nepal, Nigeria, and the Democratic Republic of the Congo (Martinez-Santos et al. 2020; Muhammed et al. 2021). Borehole drilling is efficient in providing safe water to people; however, it presents potential risks to workers (Shi et al. 2021; Somfula and Zhanda 2023). This suggests that borehole drilling employees play a crucial role in providing access to clean water sources, which is essential for both domestic and industrial purposes nevertheless, their work environment exposes them to various hazards that have detrimental effects on their health and well-being.

According to the International Association of Drilling Contractors (IADC, 2022), a total of 218 injuries related to drilling activities were recorded in Africa in the year 2021, with one fatality being reported. The data indicates that fingers were the predominant body part affected by injuries, constituting 24.77% of the documented cases (IADC, 2022).

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Subsequently, feet/ankles were the second most frequently injured body part, accounting for 14.22% of the total injuries. Employees involved in borehole drilling experience musculoskeletal problems and injuries due to handling heavy equipment, performing repetitive tasks, and adopting awkward working postures (Manyama 2018; Danert et al. 2019, 2020). Working in remote areas causes social isolation, stress, and physical health issues for workers in drilling companies (Prasetio et al. 2019; Siddique et al. 2019). Borehole drilling workers are exposed to noise levels exceeding 85dB (A) during a typical drilling operation (Oksanen et al. 2009; Lim et al. 2023). However, prolonged exposure to high noise levels causes stress, anxiety, and even hearing impairment. Additionally, in industries associated with drilling workers are at risk of being hit by stones thrown out by moving elements in the drilling process (Sharma et al. 2018; Singhal and Goel 2022).

Occupational safety and health hazards are a significant concern in various industries of Zimbabwe, including in industries where drilling is performed (Musasa and Jerie 2020; Singo et al. 2022). In addition to occupational hazards, borehole drilling employees are exposed to various health risks. Dust and particulate matter generated during drilling operations lead to respiratory problems (Nagesha et al. 2021; Xie et al. 2023). This means inhalation of dust particles cause or worsen respiratory symptoms and increase the risk of developing respiratory diseases among workers. Drilling operations generate significant amounts of dust and particulate matter that pose a range of respiratory problems, including silicosis, pneumoconiosis, asthma and chronic obstructive pulmonary disease (COPD) (Grainger 2021; Yu and Zahidi 2023). The use of chemicals and fuels in drilling processes also result in skin irritations and other dermatological issues, or even long-term health issues if proper protective measures are not implemented. Occupational safety and health hazards lead to injuries, illnesses, and even fatalities among workers (Shabani et al. 2023a, b, c, d). The presence of occupational safety and health hazards have a significant impact on both the physical and mental well-being of borehole drilling employees. Injuries and illnesses not only affect their quality of life but also result in absenteeism, decreased productivity, and increased healthcare costs (Carregaro et al. 2020; Shabani et al. 2023a, b, c, d). Addressing occupational hazards is crucial for promoting a healthy workforce and maintaining efficient operations within the borehole drilling industry (Mkungunugwa et al. 2022; Somfula and Zhanda 2023). As a result, it is crucial to identify and mitigate these hazards to protect the workforce and promote a safe working environment. One of the challenges faced by borehole drilling employees in Zimbabwe is the lack of comprehensive occupational safety and health regulations specific to their industry (Danert et al. 2020).

While general workplace safety regulations exist, they are not adequately addressing the unique hazards associated with borehole drilling activities in Zimbabwe (Manzungu et al. 2016).

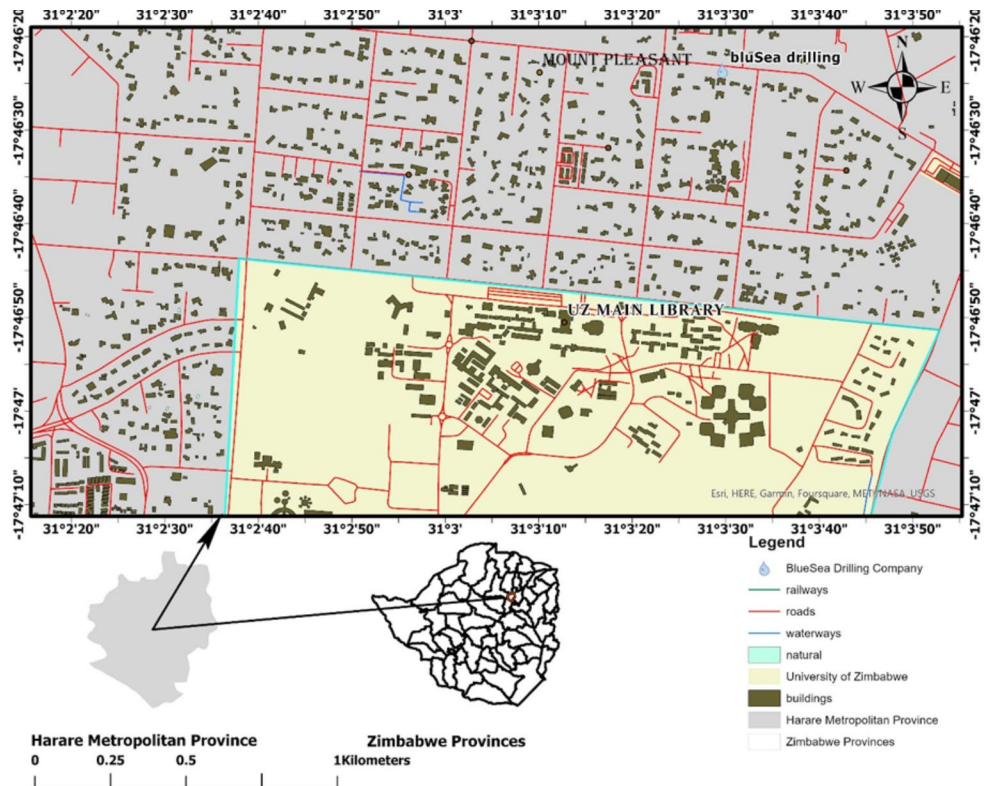
Therefore, the primary objective of this research is to assess the occupational safety and health hazards faced by borehole drilling employees in Harare District, Zimbabwe. Specific objectives include identifying the types of hazards present, evaluating their severity and frequency, examining current safety practices, and proposing recommendations for improving occupational safety and health in this industry. This research is significant as it would contribute to the existing body of knowledge on occupational safety and health in the borehole drilling industry. The findings would help raise awareness about the hazards faced by employees in this sector and provide valuable insights for policymakers, industry stakeholders, and employers to develop effective safety measures and regulations. This research is particularly relevant to safety and risk engineering because it addresses the identification and mitigation of potential hazards in the workplace. By understanding the specific risks associated with borehole drilling, engineers can design safer systems and processes, and develop effective safety protocols to protect workers. Additionally, the findings of this research can inform the development of industry standards and regulations, helping to ensure that all borehole drilling operations are conducted safely and responsibly. Ultimately, this research aims to improve the working conditions and well-being of borehole drilling employees in Harare District.

Materials and methods

Study area

The research was focusing on BluSea Drilling Company located in Mt Pleasant, found in ward 7 of Harare Province in Zimbabwe. Mt Pleasant has a population of 18,486 people (ZIMSTAT, 2022). Location of BlueSea Drilling Company is defined by geographical coordinates, 17.7732° south and 31.0582° east. The BlueSea Drilling Company employs the rotary drilling method for drilling purposes and the company also offers services for the installation of boreholes. The BlueSea Drilling Company has 2 branches, one in Water falls Park town and headquarter in Mt Pleasant and the two branches are located in Harare the capital city of Zimbabwe (BlueSea Drilling Annual Report, 2023). Location of BlueSea Drilling Company in Harare, Zimbabwe Fig. 1.

Fig. 1 Location of BlueSea Drilling Company in Harare, Zimbabwe. Source: authors



Study design

The study employed cross-sectional design because it uses both qualitative and quantitative data collection and analysis methods when addressing the objectives of the study. This was significant in addressing intentions of the study using quantitative and qualitative data collected by different tools.

Study population

The study targets workers located in different departments at BlueSea Drilling Company as questionnaire respondents to collect information on characteristics of occupational hazards among borehole drilling companies, causes and measures used to manage hazards as well effectiveness of methods used to manage hazards at BlueSea Drilling Company. However, the Manager, Engineer, Safety Officer and Supervisor were included as key informant interviewees in order to collect their knowledge on occupational safety and health hazards among BlueSea Borehole Drilling Company.

Sampling techniques

During the study saturation sampling was used because BlueSea Drilling Company consists of 20 employees. As a result all 20 employees were involved as questionnaire respondents to increase the validity of the data. Key interviewees were selected purposively.

Data collection

A questionnaire with both closed and open-ended questions was used to collect data during the survey at BlueSea Drilling Company. The questionnaire was used to collect demographic data, occupational safety and health hazards among BlueSea Drilling Company employees, work practices which expose employees to hazards and measures used to manage occupational hazards at BlueSea Drilling Company. The questionnaire ensures that all questionnaire respondents were asked the same questions and certifies that the collected data is consistent and comparable across all participants. The questionnaire was self-administered to reduce margin of error and bias.

A semi-structured interview guide was prepared to collect data at BlueSea Drilling Company. The interviews collect information on occupational safety and health hazards among BlueSea Drilling Company workers, work practices which expose workers to occupational hazards and measures used to manage hazards at BlueSea Drilling Company. Manager, Engineer, Safety Officer and Supervisor were taken as key informant interviewees to provide their knowledge of occupational safety and health hazards affecting employees at a borehole drilling company. In addition, observations were performed during the study in order to observe work practices performed by borehole drilling employees which expose them to risks and measures used to manage workplace hazards. An observational checklist

was used to collect observational data. Moreover, secondary data was collected during the study. Company reports, journals and textbooks were used as secondary data sources.

Data analysis and presentation

Quantitative data collected using closed ended questions on the questionnaire was entered in a Microsoft Excel Spreadsheet for analysis. The data was analysed to produce graphs, pie charts and tables. Data entered in the Microsoft Excel Spreadsheet was exported to the Statistical Package for Social Sciences version 25.0 in order to perform Chi-Square tests. The test was performed to find the relationship between work experience and rating of the effectiveness of measures used to manage occupational safety and health hazards at BlueSea Drilling Company. For qualitative data to be analysed content analysis was performed. Data collected during the study was presented in the form of graphs, tables, pie charts and images.

Ethical considerations

Prior to conducting data collection, the researcher obtained ethical approval from the Zimbabwe National Water Authority executives and Midlands State University. The researcher explained clearly the purpose of the study to the study participants before they participate during the study.

Results and discussion

Demographic characteristics

During the study at BlueSea Drilling Company in Harare majority (95%) were males and minority (5%) were females. This statement indicates that there was a significant gender imbalance within the company, with males comprising the majority and females representing the minority. There could be several reasons for such a gender disparity within the company. The drilling industry, including offshore drilling, has traditionally been male-dominated (Adams 2023). This industry is often associated with physically demanding work and harsh environments, which may have contributed to a perception that it is more suitable for men. As a result, fewer women have pursued careers in this field, leading to a smaller representation of females within companies like BlueSea Drilling Company.

Regarding level of education at BlueSea Drilling Company most (60%) of the questionnaire respondents indicated secondary education, followed by (35%) tertiary education and (5%) specified primary education. secondary education often serves as a stepping stone for further educational

pursuits. Many individuals may start their careers after completing secondary education and then continue their studies while working. A significant proportion of respondents indicated having tertiary education (35%). Tertiary education provides individuals with specialized knowledge and skills in specific fields related to their job roles. Employees who pursue tertiary education may have an advantage in terms of career advancement opportunities within BlueSea Drilling Company. Lastly, the small percentage of respondents specifying primary education (5%) could be attributed to various factors. Some employees may have entered the company at an early age or through alternative paths that did not require higher levels of formal education. Others may have gained relevant experience or acquired additional qualifications through vocational training or on-the-job learning.

Majority (60%) of the study participants stated their work experience between 6 and 9 years, (20%) designated 2 to 5 years, and (15%) reported more than 10 years and very few (5%) pointed out that their work experience was less than one at BlueSea Drilling Company. Majority of participants (60%) reported having work experience between 6 and 9 years. This indicates that a significant portion of the employees at BlueSea Drilling Company have been working for a considerable amount of time, which could suggest a stable and experienced workforce. This indicates that there is a notable proportion of long-term employees at BlueSea Drilling Company. These individuals likely possess extensive knowledge and expertise in their respective roles, which can contribute to the overall efficiency and effectiveness of the company's operations. A small percentage (5%) of participants pointed out that their work experience was less than one year. This suggests that there are very few employees who are relatively new to their roles or have recently joined the company. The low percentage could be attributed to factors such as low turnover rate or limited hiring of entry-level positions at BlueSea Drilling Company.

Characteristics of occupational health and safety hazards among employees at bluesea drilling company

Physical hazards

Results obtained during the study at BlueSea Drilling Company revealed that most (75%) of the questionnaire respondents agree that they were exposed to dust, noise and vibration as well as extreme temperatures. Some (15%) strongly agree that they are exposed to physical risks notably dust, noise, vibration and extreme temperatures. In addition, (8%) and (5%) of the study participants at BlueSea Drilling Company disagree and strongly disagree respectively about

their exposure to dust, noise, vibration and extreme temperatures at work. Majority of the workers indicated that they are exposed to physical hazards at BlueSea Drilling Company. Drilling operations often involve working in challenging environments such as offshore platforms or remote locations where extreme temperatures, dust, and noise are common. The drilling process generates dust particles, which can be harmful if inhaled over an extended period. Additionally, drilling equipment and machinery produce high levels of noise and vibration, which have adverse effects on workers' hearing and overall well-being. Moreover, drilling activities often take place in areas with extreme temperatures, exposing workers to heat stress or cold-related injuries. A small percentage of study participants at BlueSea Drilling Company disagree and strongly disagree about their exposure to dust, noise, vibration, and extreme temperatures at work. There could be several reasons why some participants disagree or strongly disagree about their exposure to these factors. Some individuals may be more sensitive to certain environmental factors than others. For example, one person may have a higher tolerance for noise, while another person may find even moderate levels of noise disturbing. Similarly, some individuals may be more susceptible to the effects of dust or extreme temperatures due to pre-existing health conditions or personal factors.

Ergonomic hazards

Regarding the distribution of ergonomic risks at BlueSea Drilling Company, the majority (33%) reported lifting heavy equipment, followed by awkward posture which was designated by (28%) participants and repetition motion was revealed by (24%) of questionnaire respondents. However, a minority (15%) of the employees who participated during the assessment of occupational hazards affecting workers at BlueSea Drilling Company pointed out working in a confined area. The distribution of ergonomic risks at BlueSea Drilling Company is primarily characterized by three main factors: lifting heavy equipment, awkward posture, and repetitive motion. This finding is not surprising considering the nature of the drilling industry, which often involves handling and moving heavy machinery and equipment. Lifting heavy objects places excessive strain on the musculoskeletal system, leading to various injuries such as strains, sprains, and even more severe conditions like herniated discs (Chireshe et al., 2023; Shabani et al. 2023a, b, c, d). In industries like drilling, workers often have to undertake awkward positions while performing their tasks. This includes bending, twisting, reaching, or working in confined spaces. Prolonged or repetitive exposure to such postures lead to musculoskeletal disorders (MSDs) such as back pain, neck pain, and joint problems. In drilling operations,

certain tasks require repetitive movements such as operating machinery controls or using handheld tools. Repetitive motions strain muscles and tendons over time, leading to conditions like tendonitis or carpal tunnel syndrome (Jerie and Matunhira 2022).

Chemical hazards

During the study most (69%) of the participants at BlueSea Drilling Company agree followed by (18%) who strongly agree that they are exposed to fumes, fluids, oil and diesel smoke as chemical hazards at work. Nonetheless, (9%) of the questionnaire respondents at BlueSea Drilling Company disagree and (4%) strongly disagree that they are exposed to fumes, fluids, oils and diesel smoke as chemical hazards at their occupation. This data suggests that a considerable portion of the workforce at BlueSea Drilling Company perceives their exposure to chemical substances. Fumes, fluids, oil, and diesel smoke contain various chemicals that can pose health risks when inhaled or come into contact with the skin. These substances often contain volatile organic compounds (VOCs), which cause respiratory issues, eye irritation, skin allergies, and other adverse health effects. Prolonged exposure to chemicals lead to chronic health conditions such as lung diseases or cancer (Singo et al. 2022).

Psychological hazards

During the study questionnaire respondents were asked about distribution of psychological hazards affecting them at BlueSea Drilling Company. Majority (37%) of the questionnaire respondents revealed high workload, followed by fatigue which was reported by (18%) and verbal abuse designated by (16%). About (13%) of the study participants pointed out job insecurity, (11%) specified discrimination and (5%) indicated workplace bullying. Firstly, the nature of the drilling industry often requires employees to work long hours and handle physically demanding tasks. The demanding nature of the work leads to increased stress levels and feelings of being overwhelmed, resulting in a perception of a high workload (Shabani et al. 2023a, b, c, d). Additionally, the drilling industry is known for its fast-paced and time-sensitive operations. This creates pressure on employees to meet tight deadlines and deliver results within strict timelines. The need to constantly meet production targets and maintain operational efficiency contribute to a perceived high workload among employees. In the drilling industry, long working hours and irregular shift patterns are common, which disrupt sleep patterns and lead to chronic fatigue. Fatigue not only affects physical health but also impairs cognitive function and decision-making abilities, increasing the risk of accidents and errors in a safety-critical environment

like drilling operations. The high-stress environment of the drilling industry, coupled with intense pressure to perform, contribute to instances of verbal abuse among colleagues or superiors. Verbal abuse erodes self-esteem, creates a hostile work environment, and negatively impacts mental health. Discrimination, specified by 11% of respondents, is a serious concern that has profound psychological effects on individuals. The drilling industry, like many other industries, may face issues related to discrimination based on factors such as gender, race, or age. Discrimination creates a hostile work environment, hinders career progression opportunities, and negatively impacts the mental health and morale of affected individuals (Monteiro and Joseph 2023).

Causes of occupational health and safety hazards affecting employees at bluesea drilling company

Operating poorly serviced machines

Figure 2 demonstrates (70%) of the study participants agree that they are exposed to occupational hazards as a result of operating poorly serviced machines at BlueSea Drilling Company. This response indicates that a significant majority of employees at BlueSea Drilling Company recognize the potential risks associated with using machines that are not adequately maintained or serviced. There are several reasons why these participants may have agreed with this statement: Employees who have experienced or witnessed

accidents or near-miss incidents resulting from poorly serviced machines may be more likely to agree with this statement. Such incidents could include equipment malfunctions, breakdowns, or failures that put workers at risk of injury or harm. Some employees may possess a good understanding of the importance of regular machine maintenance and its impact on occupational safety. They may be aware of the potential hazards that can arise from operating poorly serviced machines, such as increased likelihood of malfunctioning, decreased efficiency, or compromised safety features. In addition, (25%) of the questionnaire respondents at BlueSea Drilling Company strongly agree about their exposure to occupational hazards as a result of operating poorly serviced machines. This response indicates an even stronger conviction among a quarter of the employees at BlueSea Drilling Company regarding the potential risks associated with using inadequately maintained machines. The reasons behind this strong agreement may include: Employees who have personally suffered from accidents or injuries caused by poorly serviced machines may be more likely to strongly agree with the statement. These individuals may have experienced severe consequences, leading to a heightened awareness of the dangers involved and a stronger belief in the need for proper machine maintenance. However, (5%) of the employees at BlueSea Drilling Company disagree about the fact that operating poorly serviced machines expose them to occupational hazards. The reasons behind this disagreement could include: Lack of personal

Fig. 2 Operating poorly serviced machines. Source: field survey (2023)

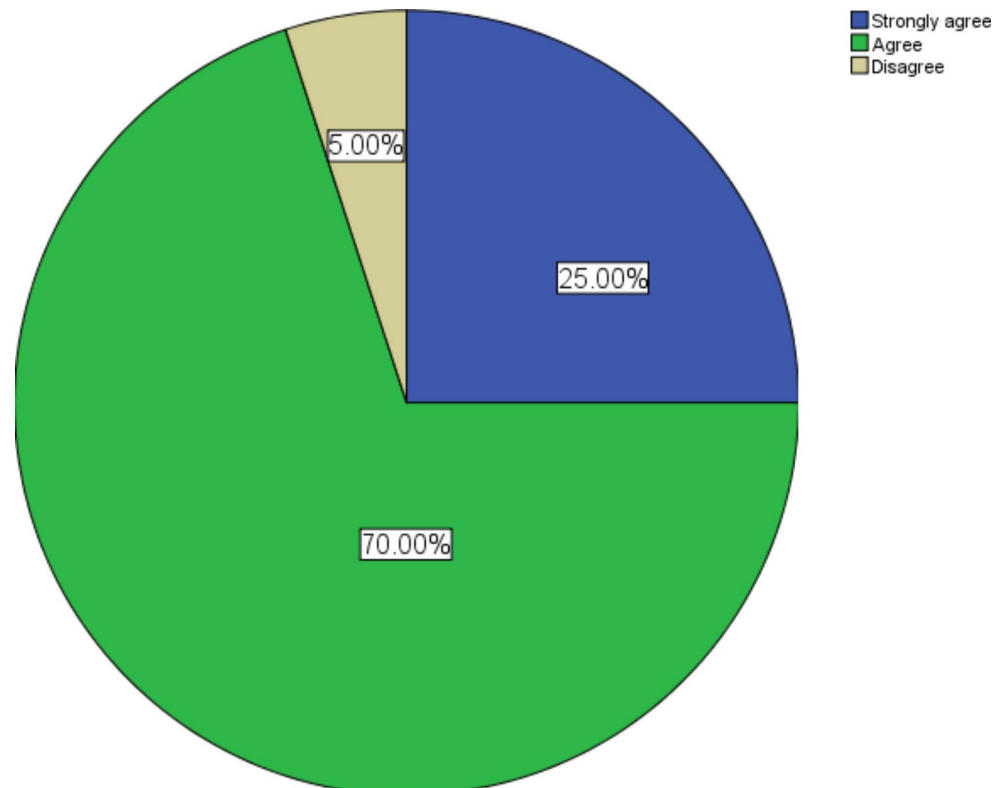


Fig. 3 Risk taking behaviour under pressure. Source: field survey (2023)

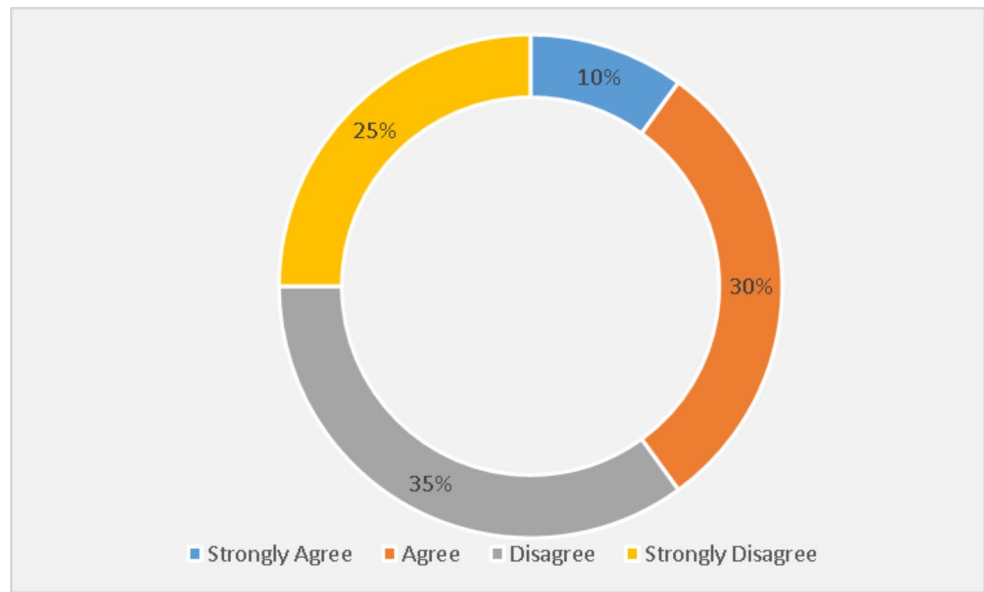


Table 1 Lifting Heavy Equipment

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	12	60.0	60.0	60.0
	Strongly agree	7	35.0	35.0	95.0
	Strongly disagree	1	5.0	5.0	100.0
	Total	20	100.0	100.0	

Source: field survey (2023)

experience: Some employees may not have personally encountered any significant issues or hazards resulting from operating poorly serviced machines. Without first-hand experience or witnessing accidents caused by inadequate maintenance, they may perceive the risks as minimal or non-existent.

Risk taking behaviour under pressure

During the study at BlueSea Drilling Company most (35%) of the employees disagree about the fact that they are exposed to occupational hazards due to risk taking behaviour under pressure, followed by (30%) of the participants who agree that they are exposed to hazards as a result of risk taking behaviour due to pressure Fig. 3. Moreover, (25%) of the employees strongly disagree about the fact that they are exposed to occupational hazards as a result of risk taking behaviour under pressure however, very few (10%) strongly agree with the notion that risk taking behaviour under pressure exposes them to occupational hazards at BlueSea Drilling Company. The study conducted at BlueSea Drilling Company revealed that a significant portion of the employees (35%) disagreed with the notion that they are exposed to occupational hazards due to risk-taking behaviour under pressure. This disagreement may stem from various reasons such as a lack of awareness about the potential

risks associated with their actions, a belief that they have sufficient control over the situation to mitigate any hazards, or a perception that the company has implemented effective safety measures. On the other hand, 30% of the participants agreed that they are indeed exposed to hazards as a result of risk-taking behavior due to pressure. This agreement could be attributed to factors like a high-pressure work environment that encourages employees to take shortcuts or make hasty decisions, inadequate training or resources to handle challenging situations safely, or a culture that prioritizes productivity over safety. It is important for organizations like BlueSea Drilling Company to address these concerns and ensure that proper safety protocols and training programs are in place to minimize occupational hazards and protect their employees’ well-being.

Lifting heavy equipment

Among the questionnaire respondents at BlueSea Drilling Company most (60%) agree that they are exposed to occupational hazards as a result of lifting heavy equipment Table 1. This is a concerning finding, as lifting heavy equipment leads to a variety of musculoskeletal disorders, such as back pain, herniated discs, and sprains. These types of injuries can not only be painful and debilitating, but they can also lead to long-term health problems and lost productivity.

Plate 1 A worker without adequate PP/C. Source: field survey (2023)



Some (35%) strongly agree that they are exposed to occupational hazards at work since they lift heavy equipment at work nevertheless, (5%) of the questionnaire respondents strongly disagree with the fact that they are exposed to occupational hazards due to lifting of heavy equipment. This disparity in responses may indicate that some employees are not aware of the risks associated with lifting heavy equipment, or that they do not feel that the risks are significant enough to warrant concern.

Inadequate and improper wearing of PPE/C

During the survey at BlueSea Drilling company questionnaire respondents were asked to indicate whether they were exposed to health hazards a result of inadequate and improper wearing of PPE/C. Majority (52%) of the questionnaire respondents at BlueSea Drilling Company agree that they were exposed to hazards due to inadequate PPE/C and (13%) of the participants strongly agree that inadequate PPE/C exposed to hazard. During observations a worker who has inadequate PPE/C was observed as shown in Plate 1 which indicates the workers without gloves. However,

(26%) and (9%) of the study participants disagree and strongly disagree respectively with the assertion that they are exposed to hazards as a result of inadequate PPE/C. These findings highlight the concerning issue of insufficient protection provided by PPE/C at BlueSea Drilling Company. Firstly, inadequate PPE/C can leave workers vulnerable to physical injuries such as cuts, burns, or impact injuries. Without proper protective gear, workers are more susceptible to accidents and incidents that can cause harm. Secondly, inadequate PPE/C can also lead to exposure to hazardous substances or materials. For example, if a worker does not have the appropriate respiratory protection, they may inhale harmful fumes or particles that can have long-term health effects. Lastly, inadequate PPE/C can compromise the overall safety culture within the company. When workers observe others not wearing proper protective gear, it can create a perception that safety measures are not taken seriously, leading to a potential disregard for safety protocols by other employees.

Occupational health and safety measures used to manage hazards at sites of bluesea drilling company

During the study at BlueSea Drilling Company questionnaire respondents were asked to indicate methods used to manage hazards. Majority (27%) of the employees at BlueSea Drilling Company specified that training on standard work procedures is used to manage hazards at the company. At BlueSea Drilling Company, the majority of employees (27%) specified that training on standard work procedures is used to manage hazards at the company. This indicates that the company recognizes the importance of providing comprehensive training to its employees in order to mitigate potential hazards and ensure a safe working environment. Training on standard work procedures is an effective method for managing hazards because it equips employees with the necessary knowledge and skills to identify and address potential risks (Shabani et al. 2023a, b, c, d). By familiarizing employees with standard operating procedures, they become aware of the correct protocols to follow in various situations, reducing the likelihood of accidents or incidents occurring. Additionally, training helps employees understand the importance of adhering to safety guidelines and encourages a culture of safety within the organization. Provision of PPE/C was indicated by (19%) of the questionnaire respondents as a measure used to manage hazards at the drilling company. PPE/C includes items such as helmets, gloves, safety glasses, earplugs, and protective clothing that are designed to protect workers from potential hazards in their work environment. Providing PPE/C is essential for managing hazards as it acts as a physical barrier between employees and potential dangers. Hazards in

drilling operations can range from falling objects and exposure to harmful substances to noise pollution and extreme temperatures. By providing appropriate PPE/C, BlueSea Drilling Company ensures that its employees have the necessary protection against these hazards. Some (18%) of the study participants reported safety inspection as a safety measure used to manage health hazards at BlueSea Drilling Company.

In addition, (13%) of the workers at BlueSea Drilling Company pointed out risk assessment is applied to manage hazards. The application of risk assessment allows companies like BlueSea Drilling to systematically identify and evaluate potential hazards in their operations. By conducting thorough assessments, they can determine the likelihood and severity of various risks, enabling them to prioritize and allocate resources effectively. This proactive (risk assessment) approach helps to prevent accidents and injuries by implementing appropriate control measures (Jerie and Matunhira 2022). Few (12%) revealed that toolbox talks before drilling manage hazards at the company however, very few (11%) illustrated that accident reporting was among methods used to manage occupational hazards at BlueSea Drilling Company. Toolbox talks are short safety meetings conducted before drilling activities, where workers discuss specific hazards associated with their tasks and the necessary precautions to mitigate them. These talks serve as a platform for sharing knowledge, raising awareness, and reinforcing safe work practices among employees. Accident reporting involves promptly documenting any incidents or near misses that occur in the workplace. Reported information is crucial for understanding the root causes of accidents, identifying trends, and implementing corrective actions to prevent future occurrences (Singo et al. 2022).

Effectiveness of methods used to manage occupational safety and health hazards

The study illustrated that most (63%) of the study participants rated methods used to manage hazards at BlueSea Drilling Company as good, followed by (22%) of the questionnaire respondents who indicated very good and (8%) of the participants specified excellent. This indicates that a significant portion of the participants found these methods to be satisfactory and effective in addressing potential hazards within the company. Nonetheless, (7%) of the workers at BlueSea Drilling Company shows that the methods used to manage hazards are poor. This indicates that there is a subset of employees who are dissatisfied with the company's approach to hazard management. Several reasons could contribute to this perception including inadequate training, lack of communication and inadequate resources.

It is important for BlueSea Drilling Company to address these concerns raised by the employees who perceive hazard management methods as poor. By investing in comprehensive training programs, improving communication channels, and providing adequate resources, the company can work towards enhancing hazard management practices and ensuring a safer work environment for all employees (Mkungunugwa, 2022).

Relationship between work experience and rating the effectiveness of methods used to manage hazards at bluesea drilling company

Chi-Square test was performed to test the relationship between work experience and rating the effectiveness of methods used to manage hazards at BlueSea Drilling Company. The Chi-Square results obtained during the tests was 0.000 and 0.000 is smaller than 0.05. In this scenario we accept H_1 and reject H_0 . H_1 shows that there is a relationship between work experience and rating the effectiveness of methods used to manage hazards at BlueSea Drilling Company. This suggests that work experience influences how individuals rate the effectiveness of hazard management methods at the company. It suggests that employees with different levels of work experience may have varying perceptions or opinions regarding the effectiveness of these methods. There could be several reasons for this relationship between work experience and rating effectiveness. Firstly, employees with more work experience might have encountered a wider range of hazards and have a better understanding of their management strategies. This increased knowledge and exposure could lead to more critical evaluations of hazard management methods. Secondly, employees with longer work experience may have witnessed the evolution of hazard management practices over time. They might have experienced changes in safety protocols, technological advancements, or organizational improvements that could influence their perception of effectiveness. It is important to consider work experience as a potential factor when evaluating and improving hazard management practices in the company (Sadeghi and Goerlandt 2023).

Conclusion and recommendations

The research paper titled “Assessment of Occupational Safety and Health Hazards among Borehole Drilling Employees in Harare District, Zimbabwe” sheds light on the significant occupational safety and health hazards faced by borehole drilling employees in Harare District. The study identifies and evaluates the various hazards present in this occupation and assesses the level of awareness among

employees regarding these hazards. The findings of this research indicate that borehole drilling employees in Harare District are exposed to a range of hazards that have detrimental effects on their well-being. These hazards include physical hazards such as noise, vibration, and manual handling, chemical hazards such as exposure to drilling fluids and fuel, biological hazards such as vector-borne diseases, and psychosocial hazards such as long working hours and job insecurity. The study also revealed that there is a lack of awareness among borehole drilling employees regarding these hazards, with many employees not receiving adequate training or information about occupational safety and health practices. This lack of awareness further exacerbates the risks faced by these employees.

Based on the findings, several recommendations were proposed to improve the occupational safety and health conditions for borehole drilling employees in Harare District. Firstly, it is crucial to develop comprehensive training programs that educate employees about the various hazards they may encounter and provide them with the necessary skills to mitigate these risks. Additionally, employers should implement effective control measures to minimize exposure to hazards, such as providing personal protective equipment (PPE) and ensuring regular maintenance of drilling equipment. Furthermore, it is essential to establish a robust monitoring system to regularly assess and address the occupational safety and health conditions in this industry.

Overall, this research paper highlights the urgent need for improved occupational safety and health practices among borehole drilling employees in Harare District. By implementing the recommended measures, it is possible to create a safer working environment for these employees, reduce the occurrence of work-related injuries and illnesses, and enhance their overall well-being.

Acknowledgements All sources were acknowledged.

Authors' contributions Takunda shabani, Tamiranashe Mapfumo and Tapiwa Shabani wrote the main manuscript under the guidance of Kudakwashe R. C. Muringaniza and Steven Jerie. Olivia C. Mudyazhza proof read the paper and prepare the figures. All authors reviewed the manuscript.

Funding The authors have no affiliation with any organization with a direct or indirect financial interest in the subject matter discussed in the manuscript.

Data Availability The data generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Competing interests This manuscript has not been submitted to, nor is under review at, another journal or other publishing venue.

Ethics approval Approval was granted by Midlands State University to carry out the research as well as to publish under its name. All sources were properly cited to avoid plagiarism.

Consent to participate All authors participated and agreed to participate up to the final revision of the manuscript. **Consent for publication.**

Consent for publication Authors agreed to let the paper be published when considered for publication.

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