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Work-Related Injuries and Associated Risk Factors among Workers in Selected Metal Engineering Companies in Gaborone District, Botswana

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Abstract

Worldwide, work-related accidents and illnesses contribute to significant deaths attributed to exposures at work. The broad objective of the study was to assess work-related injuries and associated risk factors among workers in metal engineering companies in Gaborone District, Botswana. The study used a descriptive cross-sectional study design where data were collected from all workers selected from thirteen metal engineering companies in the city. A sample size of 258 employees was selected systematically. Data was analyzed using frequencies, percentages, and binary logistic regression. The study found there was a 23.6% prevalence of occupation-related injuries among workers in selected metal engineering companies in the Gaborone District. Lack of awareness has the probability to cause work-related injuries (Exp(B) = 0.175, p =0.000). The probability of negative perceptions leading to work-related injuries (Exp(B) = 42.651, p =0.000) was significantly higher compared to positive perceptions. The probability of not having supportive supervision leading to work-related injuries (Exp(B) = 2.66, p =0.02) was significantly higher compared to having supportive supervision. The probability of not having trained first aiders leading to work-related injuries (Exp(B) = 0.247, p =0.000) was significantly higher compared to having trained first aiders. Metal engineering companies should innovate injury mitigation measures for their workers. Management together with policy makers of the engineering industry in Botswana should foster attitude change towards work safety through holding regular safety talks and seminars to educate workers on the importance of adherence to work safety as a way of reducing engineering industry work-related injuries. The engineering industry, in collaboration with the Botswana government, should enforce adherence to safety policies such as the use of PPEs and the circulation of constant reminders to reduce the prevalence of work-related injuries.

Keywords: *Work-Related Injuries, individual factors, organizational factors, Metal Engineering Companies*

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1. Introduction

Worldwide, statistics by the ILO indicate that about 2.78 million fatalities occur yearly as a result of occupationally related accidents. Additionally, there were approximately 374 million occupation-related accidents, and 160 million people reported work-related illnesses (WHO, 2022). This translates to 7,500 deaths daily from risky and unhealthy conditions of work. Workplace-related fatalities have been noted to be a major contributor to global deaths yearly (UN, 2022). This could be associated with a lack of adherence to occupational safety and health regulations and standards set forth by governing bodies to safeguard the health, safety, and well-being of employees (Abduladeem & Masood, 2023). Over the years, various standards and frameworks have been established to guide organizations in ensuring a safe working environment.

Disparities existed in the world regarding the burden of occupational morbidity and mortality across different industries and their workforce. An unreasonably large occupation-related load of disease was noticed in Africa and Asia (WHO, 2021). It was estimated that two-thirds of occupation-related deaths occurred in Asia, 11.8% in Africa, 11.7% in Europe, 10.9% in America, and 0.6% in Oceania (ILO, 2022). Africa and Asia reported fatal occupational accidents that were 4 to 5 times higher compared to those in developed countries. In Botswana, like other African countries, job-related accidents and fatalities were also rampant, with workers in the informal sector mostly affected (Mackenzie, 2023). The employees from manufacturing, construction, and storage firms experienced a higher rate of occupational accidents. Further, work-related injuries were more common among workers in casual employment, informal sectors, and small-scale and medium enterprises (Brauer, 2022).

Currently, government institutions have put a lot of pressure on employers to incorporate workplace safety and health measures as a priority to address workplace injuries and promote conducive working environments (WHO, 2023). The Occupational Safety and Health Administration (OSHA) implemented a series of standards that required organizations to teach their workers on the safety and welfare aspects of their respective jobs and provide relevant personal protective equipment (Chen et al., 2020). The significance of workplace health and safety extended beyond adherence to regulations and focused also on a safety culture within enterprises. Several frameworks utilized occupational safety and health practices based on recommendations established by a range of local, national, and worldwide institutions.

The Government of Botswana has demonstrated its commitment to enhancing occupational safety and health (OSH) by actively engaging in various labour conventions and accords at both national and international levels (ILO, 2020). This reflects the country's stand on the international and national standards towards workplace safety and health. The implementation of compliance standards on employee protection would enhance operational efficiency and improve work conditions, thus reducing work-related injuries (Vakhitova et al., 2019). Recent advances in industries highlighted the increasing recognition of the need for improved safety and health standards. Despite this, occupation-related injuries continued to wreak havoc across different sectors, including workers in the metal engineering industries. This underpinned the need to conduct a comprehensive analysis of the factors associated with occupation-related injuries among employees from metal engineering companies in Gaborone District, Botswana.

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1.1 Problem Statement

The Disability Adjusted Life Years (DALYs) attributed to workplace injuries and diseases were approximately 89.72 million globally. Occupational diseases accounted for about 80.7% work-related fatalities, and approximately 70.5% of DALYs, while injuries accounted for about 19.3% of work-related fatal accidents and 29.5% of DALYs (WHO/ILO, 2021). The risk factors associated with work-related fatalities and morbidities included being exposed to long hours of work, gases, particulate matter, fumes, and occupational injuries. Research had indicated that the top occupational diseases in metal engineering industries were chronic obstructive lung disease, cardiovascular accident, and ischaemic cardiac disease (Debela et al., 2021). The burden of work-related diseases was largely observed in Africa, South-Eastern Asia, and the Western Pacific (Pega et al., 2022).

Developing countries, mainly concentrated in manufacturing, did not have well-enforced health and safety regulations, resulting in a high burden of workplace injuries. Countries in the African region were more prone to serious occupational injuries (Debela et al., 2021). In Botswana, approximately 1000 job-related accidents are reported, with more than 3 days off work and over 60 fatalities yearly (Mackenzie, 2023). The prevalence of work-related injuries was 38 per 1000 workers. There were 1337 DALYs associated with work-related injuries in the country (WHO/ILO, 2021). Despite the existence of measures and calls to adhere to occupational safety and health standards, numerous workplace accidents and fatalities have been reported (Umugwaneza et al., 2019). The most common injuries in Gaborone district were due to machinery (9%) and being struck by objects (8.6%), while slips and falls were at 3.4%, with fingers, wrists and arms reported to be more affected (DOHS, 2023). The bulk of these accidents occurred in places of employment where following occupational health and safety laws was poor, leading to various adverse consequences such as accidents, injuries, diseases, and fatalities. Workplace accidents and illnesses had a significant financial impact, constituting about 4% world's Gross Domestic Product (GDP) annually (WHO, 2022). The economic pressures were exacerbated by wider societal consequences, which impacted not only the labour force but also families and communities (Mackenzie, 2023).

The nature of the work environment in metal engineering industries exposed significant threats to the well-being and security of personnel. The consequences were multifaceted, which ranged from physical harm to employees, legal ramifications for firms, monetary sanctions, and reputational damage. Such exposures resulted in fatalities and chronic and acute illnesses with huge economic implications (WHO, 2021).

This affected the overall productivity and financial stability of organizations. In safety and health management, workplace safety is a fundamental area due to its devastating effects not only on the health of workers but also on the economic status of their families. According to some studies, most of the sectors in Botswana fell short of attaining the basic components of organisational protection of employees as manifested by a lack of health and safety policies (Mackenzie et al., 2023).

Gaborone District had a population of over 246,325 inhabitants (Statistics Botswana, 2022). It is home to many manufacturing industries, which include metal engineering firms that contribute various occupational hazards that including exposure to harmful substances, risks

from heavy machinery, ergonomic issues, and noise pollution (Molaodi, 2019). These metal firms also placed profit above the well-being of workers. The city is the country's economic hub, with a rapid increase in workplace injuries and illnesses. The city could be a target for the mushrooming of companies that did not follow or implement laid-down occupational safety and health standards. In the year 2023, six hundred and thirteen (30.7%) of workers were involved in work-related injuries, with 2% of fatalities, 2.9% with permanent disability, and 33% compensation claims were processed for workers injured in metal engineering companies in Gaborone District (DOHS, 2023). This study, therefore, sought to explore the current prevalence of occupation-related injuries and related risk factors amongst workers from metal engineering firms in Gaborone District, Botswana.

1.2 Research Objectives

i. To determine the prevalence of work-related injuries amongst workers in selected metal engineering companies in the Gaborone District.

ii. To determine individual factors associated with occupation-related injuries amongst workers in selected metal engineering companies in Gaborone District.

iii. To establish the organizational factors associated with occupation-related injuries amongst workers in selected metal engineering companies in Gaborone District.

2. Literature Review

2.1 Work-related injuries in the metal engineering industries

Globally, it was estimated that 374 million work-related accidents and 160 million occupation-related illnesses were reported yearly (WHO, 2022). This has been a major contributor to global work-related fatalities, accounting for 2.78 million annually and 7,500 daily deaths due to exposure to risky and unhealthy work conditions (UN, 2022). Different sectors of the economy contributed to varying cases of work-related injuries in different countries (WHO, 2021). However, it was noted that employees in manufacturing, construction, and storage firms experienced a higher rate of occupational accidents. These injuries were more common among workers in casual employment, informal sectors, and small-scale and medium enterprises, including those working in metal engineering industries (Brauer, 2022).

Significant differences existed in occupation-related injuries across different countries. Developed countries seemed to report fewer work-related injuries compared to developing countries, which accounted for the largest burden. For instance, Europe, America, and Oceania contributed only 11.7%, 10.9% and 0.6% of the global burden of occupation-related injuries globally (ILO, 2022). However, studies have reported that in developed countries, 76.6% of the injuries were as a result of welding work (Wanjari & Wankhide, 2020). According to a study conducted across different metal companies in the United States of America (USA), it revealed over 5,000 deadly occupation-related injuries, with about 2.8 million non-deadly work-related injuries and illnesses (Gihleb et al., 2022).

Another study, 62.2% of Korean workers in the steel industry suffered from skin diseases as a result of the work environment (Park et al., 2020). An unreasonably large work-related injuries were noted in the Africa and Asia regions (WHO, 2021). This resulted in two-thirds of occupation-related deaths occurring in Asia, and 11.8% in Africa. Further, Africa and Asia

reported fatal occupational accidents that were 4 to 5 times more compared to those in developed countries (ILO, 2022). A study conducted in Malaysia revealed that 38.2% of injuries were a result of fall-related injuries among steelworkers (Rafindadi et al., 2022). In a study conducted in India on the most common work-related injuries, noted that hand and wrist injuries were the most reported at 62.5% in the metal industries (Kataria et al., 2022). In Pakistan, work-related accidents in steel construction industries showed that falls from elevation, electrocution, and mechanical injuries due to faulty tools and equipment were the most common (Khahro et al., 2020).

2.2 Individual factors associated with work-related injuries

Factors exhibited by the individual employees may contribute significantly to exposure to occupation-related injuries in different workplaces. This may, overall, determine how an employee behaves while in the place of work. For instance, workers' awareness of work-related injuries may be a precursor to taking safety precautions to avoid exposure to risk factors. A study conducted on risk factors related to occupational injuries showed that lack of awareness of safe working procedures was the main cause of injuries amongst welders in informal sectors in Botswana (Elvis C, France N, and Patience E, 2022). In another study carried out in Kenya on ocular-related effects of welding revealed that most respondents were aware of safe working procedures (Yego and Ragot, 2020). In India, the level of understanding of work safety was related to workplace injuries among employees in the iron and steel industries (Rajak et al., 2022). People's awareness of injuries related to work meant those who were better exposed were most likely to take precautions while performing their tasks. This further improved their literacy in using policies of safety, which may be compromised due to poor implementation.

Personal Protective Equipment use in respective working environments played a key role in the prevention of workplace injuries. However, due to the nature of the physiological effects that they have on the human body, sometimes employees may not be in their complete gear while at work (Behan, 2020). This exposed them to significant injuries while at work.

A study carried out in Uganda on knowledge, attitude, and practice among welders reported that 61.4% welders exhibited a high level of knowledge, 68.7% exhibited a good attitude, and 37.1% had good PPE-related practice (Nalugya et al., 2022). There has been a strong linkage between PPE use and the reduction of work-related injuries (Rafindadi et al., 2022). Meanwhile, in Indonesia, a study carried out on the use of PPEs among welders revealed, there was no association between PPE usage and workplace injuries (Asmita et al., 2022).

Sometimes people have different perceptions of risk exposure factors in the working environment. The degree of perceived self-vulnerability influenced individual responsibility towards observing safe working procedures and regulations. In India, workers who perceived themselves to be at a higher risk took greater responsibility for complying with health and safety regulations, thus reducing the chances of workplace injuries (Rajak et al., 2022). In another study conducted in Ethiopia among employees in large-scale metal manufacturing facilities, revealed that workers were using PPEs for the fear that they were susceptible to workplace injuries (Tamene et al., 2022). The majority of workers in Pakistan believed that they were vulnerable to work-related injuries, guided by the nature of their work environment (Jiskani et al., 2020).

Further, individual work experience is another factor that may significantly contribute to workplace injuries. Sometimes new workers who are not used to a given work environment may be naïve, resulting in committing some significant mistakes, which can lead to injuries. In study conducted in Ethiopia among workers in metal industries revealed that the majority of them had work experience of less than 5 years (Damtie & Siraj, 2020). This reflects a higher rate of turnover given the nature of the work environment. Results from different studies have revealed that workers who are more experienced are less likely to experience work-related injuries because they are used to the working conditions (Bao et al., 2020). Repetitively undertaking the same task improves on-the-job skills while rendering services longer in a given industry.

2.3 Organizational factors associated with occupation-related injuries

An effective workplace health and safety program requires the organization to remain committed towards the provision of necessary resources, occupation-related guidelines, and procedures to ensure compliance with workplace safety and health systems. One of the key requirements for all organizations was the provision of adequate PPE in the workplace. A study conducted among workers in metal engineering industries revealed that workers were provided with necessary PPEs, but not all employees were using them (Alayyannur et al., 2022). The provision of such PPE ensured workers are protected against unnecessary injuries that may be avoidable. However, due to the physiological challenges posed by them, sometimes some workers failed to comply. A study conducted among metal engineering workers in Uganda reported that despite the provision of PPEs to workers, the majority of them were using them inappropriately (Nalugya et al., 2022). A study conducted in Ethiopia reported an association between the provision of PPEs and the reduction of work-related injuries (Baye et al., 2022).

The frequency and availability of OSH trainings prepared workers to learn about their work environment and ways of preventing exposure to workplace injuries. The organization should ensure there is adequate OSH trainings for workers with respect to dynamics in occupation-related hazards and exposures. Workers in iron and steel manufacturing industries reported that increased frequency of OSH training resulted to a significant reduction in work-related injuries in Addis Ababa, Ethiopia (Berhan, 2020). Similarly, a systematic review among workers from metal engineering industries in Africa showed that regular OSH training had a statistically significant reduction in occupation-related injuries (Debela et al., 2022). There are cases of trained incapacity resulting in workers performing their tasks mechanically without engaging all their senses could end up injuring themselves or their colleagues.

Occupational health and safety policies also require that organizations ensure that safety drills are conducted once in a given period within any registered workplace. This ensured that workers familiarized themselves with what should be done during a given emergency and thus responded better. In Malaysia, a study revealed that fire drills were regularly done in steel smelting industries to minimise the occurrence of occupation-related injuries among employees (Rahardja, 2023). Drills could unearth the potential risks that workers were exposed to while working in such metal engineering companies. In another study conducted by de Maya and colleagues (2022), argued that conducting fire drills was very instrumental in minimising fire-related accidents in the workplace.

As in other industries, there was a need to have adequately trained first aiders in metal manufacturing companies, too. This is especially because the working conditions in such places encompassed a risky environment that was characterized by many hazards. Studies have indicated that first responders need training in first aid to increase their resilience to respond to workplace accidents and incidents (Wild et al., 2020). In another study that was done in Switzerland among workers joining manufacturing industries, it was concluded that they needed to be inducted and trained on first aid before starting to render their services in such industries (Dzemaili et al., 2023). This would adequately prepare and make them aware of the working environment that they were yet to be part of.

Supportive supervision was another organizational factor that may influence the nature and frequency of injuries related to work. Perceived support from management and through workers' superiors ensured that there was improved compliance with occupational health and safety guidelines and procedures at workplaces. According to a study carried out on the role of support supervision on workers' safety and health, there was a significant reduction in eye injuries after management improved workers' supervision (Haas, 2020).

Such supportive supervision is essential in identifying compliance gaps and building compliance targets among metal manufacturing industries. According to another study on preventive measures for fatal fall-related accidents among workers in Malaysia revealed the lack of supervision contributed to most of the fall-related accidents, thus injuring workers at their respective industries (Rafindadi et al., 2022).

3. Materials and Methods

The study used a descriptive cross-sectional study design where data were collected from all workers selected from thirteen metal engineering companies in the city. The researcher collected qualitative data from key informants, including human resource managers and OSH officers, and quantitative data from general workers. A sample size of 258 employees selected systematically at a predetermined interval of 2 from the employee registers in the respective 13 selected metal manufacturing companies was used. Key informants were purposively selected based on the virtue of the position they hold concerning occupational health, safety, and welfare in the workplace. The necessary approvals were sought from relevant institutions, and informed consent from respondents. Data management and analysis were done with the help of SPSS version 26.0. The presentation of results was through tables, frequencies, and charts. Chi-square tests were used to perform inferential statistics at a confidence interval of 95% and an error of precision allowed at 0.05 to estimate variable relationships. Data collected qualitatively was integrated with quantitative findings as direct narrations.

4. Results and Discussion

4.1 Prevalence of Work-Related Injuries Amongst Workers in Metal Engineering Companies

The first objective was to determine the prevalence of occupation-related injuries amongst workers in selected metal engineering companies in Gaborone District. Respondents were asked to indicate if they had incurred any work-related injury in the company in the past five years.

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Table 1: Work-Related Injuries

	Frequency	Percent
Yes	56	23.6
No	181	76.4
Total	**237**	**100**

The outcomes indicate that most of the respondents, 181(76.4%), had not incurred any occupation-related injuries, while 56(23.6%) had experienced occupation-related injuries in the past 5 years. This shows that most employees of metal manufacturing companies in the Gaborone District had no work-related injuries.

From the key informants, the respondents were asked to indicate their view on the prevalence of work-related injuries in this company. All the respondents agreed that there were minimal injuries in their companies. For example, one of the production managers indicated that;

> "*There are very minimal injuries, which in most cases are bruises and scratches. We had no major injuries*" (Production Manager 1, 2024).

The respondents were further asked to indicate the nature of the injury they experienced. Results are presented in Figure 1.

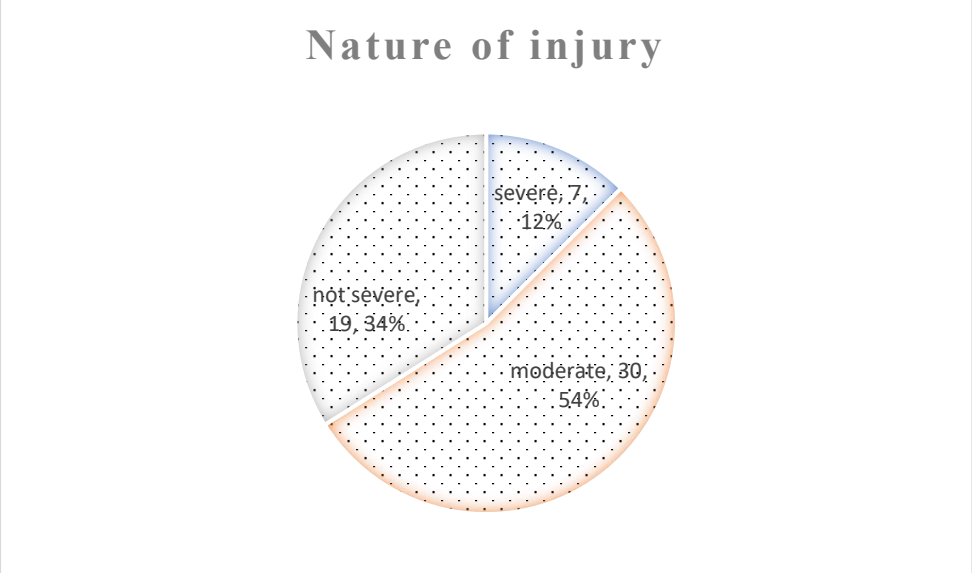

Figure 1: Nature of Injury

The results showed that the majority of the respondents who were 30 (54%) experienced a moderate injury, while 7(12%) indicated that the injury was severe. This denoted that most of the employees who incurred injuries had only moderate injuries.

The respondents were further asked to indicate whether they think the company had put in place enough measures to safeguard employees. The respondents indicated that the

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Journal of Medicine, Nursing and Public Health
Vol. 5||Issue 3||pp 42-59||September||2025
Email: info@edinburgjournals.org||ISSN: 3105-3394

organizations had put in place measures to safeguard their employees. For example, one of the OSH officers indicated that;

> '*There are measures put in place to safeguard employees, such as weekly Toolbox Talk, training on the use of machines, and provision of PPE'* (OSH Officer 1, 2024)

The respondents were asked to indicate the types of injuries that have affected them. Results are presented in Table 2.

Table 2: Types of Injury

Type of Injury	Frequency	Percent
Wound or superficial injury	34	60.71
Dislocation, sprain, or strain	8	14.29
Concussion, internal injury, burn, scalds, or frostbite	1	1.79
Bone fracture	7	12.50
other injuries	6	10.71
Total	**56**	**100**

The results showed that the majority of the respondents who were 34(60.71%) had wound and superficial injury, while 2(3.51%) had concussion, internal injury, burn, or scalds. This denotes that most of the employees of manufacturing companies in the Gaborone District who were injured had wounds or superficial injuries.

4.2 Individual factors related to work-related injuries

The second objective was to determine individual factors related to occupation-related injuries amongst workers in selected metal engineering companies in Gaborone District. The binary logistic regression was conducted to determine individual factors related to occupation-related injuries amongst workers in selected metal engineering companies in Gaborone District.

Table 3: Binary Logistic Regression

		B	Sig.	Exp(B)	95% C.I. for EXP(B)	
					Lower	Upper
Awareness	Yes			1		
	No	-1.74	0.000	0.175	0.073	0.422
Use of PPE	Yes			1		
	No	-1.429	0.253	0.24	0.021	2.78
Self-vulnerability	Yes			1		
	No	0.353	0.697	1.423	0.241	8.415
	Yes			1		
Experience (2)	No	-0.649	0.28	0.523	0.161	1.695
	Yes			1		
Perceptions	No	3.753	0.000	42.651	7.957	228.628

*sig<0.05.

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Table 3 presents binary logistic regression results. As indicated, lack of awareness has the probability to cause work-related injuries (Exp(B) = 0.175, p =0.000). This denotes that awareness is critical in reducing incidences of work-related injuries. Further, the probability of negative perceptions leading to work-related injuries (Exp(B) = 42.651, p =0.000) was significantly higher compared to positive perceptions. This suggests that positive perceptions are important in minimizing incidences of work-related injuries.

4.3 Organizational factors associated with occupation-related injuries

The third objective was to assess the organizational factors associated with occupation-related injuries among workers in selected metal engineering companies in Gaborone District. The binary logistic regression was conducted to assess the organizational factors associated with occupation-related injuries among workers in selected metal engineering companies in Gaborone District.

Table 4: Binary Logistic Regression

		B	Sig.	Exp(B)	95% C.I. for EXP(B)	
					Lower	Upper
	Yes			1		
OSH Training (1)	No	-0.32	0.4	0.726	0.344	1.532
	Yes			1		
PPE Adequate (1)	No	0.031	0.937	1.032	0.477	2.234
	Yes			1		
Safety Drills (1)	No	0.073	0.89	1.076	0.381	3.034
	Yes			1		
Supportive supervision (1)	No	0.978	0.02	2.66	1.169	6.054
	Yes			1		
First Aiders (1)	No	-1.398	0.000	0.247	0.12	0.509

*sig<0.05.

Table 4 presents binary logistic regression results. As indicated, the probability of not having supportive supervision leading to work-related injuries (Exp(B) = 2.66, p =0.02) was significantly higher compared to having supportive supervision. This implies that supportive supervision is essential in reducing cases of work-related injuries.

Further, the probability of not having trained first aiders leading to work-related injuries (Exp(B) = 0.247, p =0.000) was significantly higher compared to having trained first aiders. This implies that having trained first aiders is important in reducing incidences of work-related injuries.

4.4 Discussion

4.4.1 Prevalence of Work-Related Injuries Among Workers

The outcomes revealed that most of the respondents (76.4%) had not experienced any work-related injuries, while 23.6% had encountered occupational injuries. From the key informants, respondents agreed that there were minimal injuries in their companies. This shows that most employees of metal engineering companies in the Gaborone District had no work-related injuries. This was, however, not in agreement with WHO (2021), which noted that employees in manufacturing, construction, and storage firms experienced a higher rate of occupational accidents.

The results showed that the majority of the respondents experienced a moderate injury. The results also showed that the majority of respondents had fingers, arms, and wrists affected. From the interview guide, the major injuries that were indicated included bruises and scratches as well as minor finger cuts. This denotes that most employees of manufacturing companies in Gaborone District who were injured had their Fingers, arms, and wrists affected. The study findings agreed with Shewiyo et al. (2021), who indicated that the most common workplace-related injuries among employees in selected metal industries were finger cuts and bruises.

The results showed that the majority of the respondents had wound and superficial injury. This denotes that most of the employees of manufacturing companies in Gaborone District who were injured had wounds and superficial injuries due to machinery, bruises, and scratches. This finding agrees with a study conducted among manufacturing companies in South Korea, where machinery was the common cause leading to occupational accidents and deaths (Kim et al., 2021). Wounds and superficial injuries are the most non-fatal accidents mostly reported in metal engineering companies in the world (Mitrevska et al., 2023). Results also revealed that most of the injured employees (61%) had not been compensated. This denotes that most manufacturing companies in the Gaborone District did not compensate their injured workers. These findings were consistent with studies from South Africa, where countless workplace injuries are not compensated due to difficulties in processing such claims (Azubuike & Mgbamoka, 2023).

4.4.2 Individual Factors Related to Work-Related Injuries

The results showed that most of the respondents were aware of the existence of the risks with some workers in the metal engineering industries. This denotes that most of the manufacturing companies in the Gaborone District were aware of the existence of the risks with some workers in the metal engineering industries. Results also denote that there was an association between awareness of the risk of workplace injuries and occupation-related injuries among workers in selected metal engineering companies in Gaborone District. The study findings agreed with Rajak et al. (2022), who indicated that people's awareness of injuries related to work meant those who were better exposed were most likely to take precautions while performing their tasks.

The results also revealed that most of the respondents indicated that they sometimes used personal protective Equipment (PPEs). This denotes that most of the employees of the engineering firms did not always use PPE. Results also denote that there was an association between the use of PPEs and occupation-related injuries among workers in selected metal

engineering companies in Gaborone District. The study findings agreed with Behan (2020), who indicated that Personal Protective Equipment use in respective working environments played a key role in the prevention of workplace injuries. The study findings also agreed with Rafindadi et al. (2022), who indicated that there has been a strong linkage between PPE use and the reduction of work-related injuries. However, this was not in agreement with Asmita et al. (2022), who revealed that there was no association between PPE usage and workplace injuries.

The results further showed that they felt at risk of workplace injuries due to the nature of this environment. This denotes that most of the workers in selected metal engineering companies in Gaborone District felt self-vulnerability. The study findings agreed with Jiskani et al. (2020), who indicated that the majority of workers in Pakistan believed that they were vulnerable to work-related injuries guided by the nature of their work environment. Results also denote that there was no association between self-vulnerability and occupation-related injuries among workers in selected metal engineering companies in Gaborone District. The study findings were, however, not in agreement with Rajak et al. (2022), who indicated that the degree of perceived self-vulnerability influenced individual responsibility towards observing safe working procedures and regulations.

Results showed that amongst the employees who had 2 years of work experience, 53(80.30%) of the respondents had no work injuries, while 13(19.70%) of the employees experienced workplace injuries. The result further showed that among employees who had 3-4 years of work experience, 53(80.30%) of the respondents had no work injuries, while 13(19.70%) of the employees experienced workplace injuries. Further results showed that among employees who had 5-6 years of work experience, 16(61.56%) of the employees had no workplace injury, while 10(38.46%) of the employees experienced workplace injuries. Further results showed that among employees who had above 6 years of work experience, 54(72.80%) of the employees had no workplace injury, while 20(27.20%) of the employees experienced workplace injuries. The results showed that the work injuries cut across different people with different work experiences. This means that work experience was not a determinant of the workplace injuries. Results also denote that there was no association between work experience and occupation-related injuries among workers in selected metal engineering companies in Gaborone District. The study findings were therefore not in agreement with Bao et al. (2020) workers who are more experienced are less likely to experience work-related injuries because they are used to the working conditions.

The results showed that 168(70.9%) of the respondents indicated that policy requirement motivated them to adhere to the workers safety, 30(12.7%) indicated that a friend was injured which motivated them to adhere to the workers safety, 22(9.3%) of the respondents indicated that they had been injured before which motivated them to adhere to the workers safety while 17(7.2%) indicated that the community requirement motivated them to adhere to the workers safety. Results also denote that there was an association between Perceptions towards workplace injuries and occupation-related injuries among workers in selected metal engineering companies in Gaborone District. Risk perception plays a significant role in the occurrence of work-related occupational accidents (García-Mainar & Montuenga, 2024).

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Vol. 5||Issue 3||pp 42-59||September||2025
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4.4.3 Organizational Factors related to Work-related injuries

The third objective was to determine organizational factors related to occupation-related injuries among workers in selected metal engineering companies in Gaborone District. The results showed that majority of the respondents indicated that they attended the OSH trainings. This showed that most of the employees in metal engineering companies in Gaborone District attended OSH training. The results, however, showed that the majority of the employees who experienced work-related injuries (50 out of 56) had not attended OSH training. The key informant results showed that there are restrictions that make it difficult to freely execute safety mandates, a lack of enough OSH officers. This denotes that the majority of the employees who experienced work-related injuries had not attended OSH training. The results denote that there was an association between OSH training and occupation-related injuries among workers in selected metal engineering companies in Gaborone District. The study findings agreed with Debela et al. (2022), who indicated that OSH training had a statistically significant reduction in work-related injuries.

Results showed that the PPEs were adequate. This denotes that most metal engineering companies in the Gaborone District had adequate PPE. The results also showed that most of the workers who experienced injuries did not have adequate PPE (32 out of 56). This, therefore, meant that PPEs helped to minimize workplace injuries. Results denote that there was no association between PPE adequacy and occupation-related injuries among workers in selected metal engineering companies in Gaborone District. The study findings agreed with Behan (2020), who indicated that the use of Personal Protective Equipment in respective working environments played a key role in the prevention of workplace injuries. The study findings also agreed with Rafindadi et al. (2022), who indicated that there has been a strong linkage between PPE use and the reduction of work-related injuries. However, this was not in agreement with Asmita et al. (2022), who revealed that there was no association between PPE usage and workplace injuries.

The results showed that the majority of the respondents indicated that there were no safety drills. This denotes that most metal engineering companies in the Gaborone District had no safety drills. Further results showed that workers who experienced injuries, the majority of them (45 out of 56), did not have safety drills in the organization. From the interview guide, the measures that need to be taken to enhance compliance with occupational health and safety among workers in the company include regular safety audits, company audits, and safety drills. Results denote that there was no association between safety drills and occupation-related injuries among workers in selected metal engineering companies in Gaborone District. The study findings agreed with Rahardja (2023), who indicated that fire drills were regularly done in steel smelting industries to minimise the occurrence of work-related injuries among employees. In another study conducted by de Maya et al. (2022), it was argued that conducting fire drills was very instrumental in minimising fire-related accidents in the workplace.

The results showed that most of the respondents indicated that there was no supportive supervision in the organization. This suggests that supportive supervision is still a challenge among metal engineering companies in the Gaborone District. Results also denote that there is an association between supportive supervision and occupation-related injuries among workers in selected metal engineering companies in Gaborone District. The study findings were in

agreement with Haas. (2020), who indicated that the role of support supervision on workers' safety and health, noted that there was a significant reduction in eye injuries after management improved workers' supervision. The study findings also agreed with Rafindadi et al. (2022), who revealed that the lack of supervision contributed to most of the fall-related accidents, thus injuring workers in their respective industries.

The majority of the respondents indicated that the workload was manageable. This denotes that most metal engineering companies in the Gaborone District had a manageable workload. Results denote that there was no association between workload and occupation-related injuries among workers in selected metal engineering companies in Gaborone District. This meant that workload was not a determinant of workplace injuries. This was in agreement with Wild et al. (2020), who showed that the amount of work did not result in workplace injuries.

The results showed that majority of the respondents indicated that they had trained first aiders. The key informants' organizational measures that determine adherence with workplace safety and health practice within metal manufacturing workers include first aiders being available in the organization. This denotes that most metal engineering companies in the Gaborone District had trained first aiders. Results denote that there was an association between trained first aiders and occupation-related injuries among workers in selected metal engineering companies in Gaborone District. The study findings were in agreement with Wild et al. (2020), who indicated that first responders needed training in first aid to increase their resilience to respond to workplace accidents and incidents. The study findings agreed with Rajak et al. (2022), workers who perceived themselves to be at a higher risk took greater responsibility for

5. Conclusion

The study concluded that there was a lower prevalence of occupation-related injuries (23.6%) amongst workers in selected metal engineering companies in Gaborone District compared to the national prevalence of 30.7% (DOHS,2023). The study also concluded that Fingers, arms, and wrists were the most common parts (35, 62.50%) that were affected by the injuries. The study also concluded that wounds and superficial injuries (34, 60.71%) were the major injuries amongst workers in metal engineering companies.

The study concluded that there was an association between awareness of the risk of workplace injuries and occupation-related injuries amongst workers in selected metal engineering companies in Gaborone District. The study also concluded that there was an association between the use of PPEs and occupation-related injuries amongst workers in selected metal engineering companies in Gaborone District. However, there was no association between self-vulnerability and occupation-related injuries amongst workers in selected metal engineering companies in Gaborone District. There was also no association between work experience and occupation-related injuries amongst workers in selected metal engineering companies in Gaborone District. The study also concluded that there was an association between Perceptions towards workplace injuries and occupation-related injuries amongst workers in selected metal engineering companies in Gaborone District.

The study concluded that there was an association between OSH training and occupation-related injuries amongst workers in selected metal engineering companies in Gaborone District. The study also concluded that there was an association between supportive supervision and

occupation-related injuries amongst in selected metal engineering companies in Gaborone District. In addition, there was an association between trained first aiders and occupation-related injuries amongst workers in selected metal engineering companies in Gaborone District. However, there was no association between safety drills and occupation-related injuries among workers in selected metal engineering companies in Gaborone District. There was also no association between PPE adequacy and occupation-related injuries among workers in selected metal engineering companies in Gaborone District.

6. Recommendations

Metal engineering companies should innovate injury mitigation measures for their workers. Though the prevalence of the occupation-related injuries among workers is not high, the companies should work on minimizing the injury cases to zero. The management of these companies should come up with compensation measures for the workers who have experienced injuries in the workplace.

Management together with policy makers of the engineering industry in Botswana should foster attitude change towards work safety through holding regular safety talks and seminars to advise workers on the importance of adherence to work safety as a way of reducing engineering industry work-related injuries. Training sessions should also be held that are specifically geared towards acquiring knowledge on safety, including injury prevention, proper use of tools and equipment, and proper use of PPE. The supervisors of the engineering industry should also create a lot of awareness amongst the workers on workplace injuries.

The engineering industry, in collaboration with the Botswana government, should enforce adherence to safety policies such as the use of PPEs and the circulation of constant reminders to reduce the prevalence of occupation-related injuries. Further, first aiders should also be made available in every organization. In addition, trainings on first aid and OSH trainings should always be conducted amongst the workers in the engineering industry in Botswana, since First aid training helps employees learn to be more conscious of safety in the workplace, leading to a reduced number of accidents and injuries.

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