**Occupational Hazards and Injuries among Healthcare Workers in Ahafo Ano North Municipal Hospital, Ghana**

#

**ABSTRACT**

**Background:** An occupational hazard or injury is described as any personal injury or hazard, disease or death that results from an occupational accident. Globally, occupational hazards have been identified as the leading cause of industrial ailment, accounting for over 11% of disability. Despite enormous strength in improving OHS over the past century, an estimated 317 million non-fatal occupational injuries and 321,000 occupational fatalities occur globally each year; that is, 151 workers sustain a work-related accident every 15 seconds. Failure to address operational injuries results in apathy, fatigue and disincentive to workers, which inhibits the zeal to work.

**Aim:** The study was conducted to assess the occupational hazards and injuries among health workers in the Ahafo Ano Municipal, Tepa.

**Methods:** A cross-sectional and health facility-based study was conducted between June 2020 to December 2020 to realise the objectives of the study. In order to take care of non-response in the recording of information of participants, the study added 10% of the total sample size to arrive at the required sample size of 259. Health workers were selected at the facility level using a convenient sampling technique. The study approach was quantitative, and a questionnaire was used to collect data among the health workers. Data collected was analysed using the SPSS package version 21.0. It involved a descriptive analysis where data was presented in the form of tables and charts.

**Results and Findings:** The findings revealed that health workers were not diagnosed with infections. However, physical injuries (75.7%) such as falls, burns and lifting of patients were major occupational hazards and injuries health workers suffered. The majority of health workers (78.9%) had no PPE to use in their facility, which hindered their work output. Few PPE available were cover/cap (26.5%) and mask (30.5%). However, only 38.6% of the health workers have had training on its usage. The majority of health workers, 235 (90.7%), had never reported any occupational hazards and injuries to the health facilities.

**Conclusions:** Occupational health hazards are common among health workers and are not adequately reported. Training of health workers on measures to mitigate these hazards and injuries may also enhance the reporting behaviour and its management when it occurs. Standard operating guidelines and protocols on occupational health and safety should be available at the occupational health and safety unit to ensure that safety procedures and protocols are followed.

**Key words*:*** *occupational hazard, health workers, Ahafo Ano Municipal Hospital, training, health and safety*

# **1.1 Background of the Study**

An Occupational hazard or injury is defined as any injury or hazard, disease or death that spring from an occupational accident (1). Globally, occupational hazards have been identified as the leading cause of industrial indisposition, accounting for over 11% of disability (2). Health care is a non-traditional employment setting, envisaged by the general public to be pristine and secure. However, hazard consciousness is frequently lacking. Furthermore, given the distinctive task of caring for the sick, self-protection practices, which normally succour in protecting workers, are suspended in a culture of selfless commitment to patient care (3). The world of work has changed dramatically. Proliferation has affected the structure of workplaces, the way work is performed, and occupational safety and health (OSH). Despite enormous strength in improving OHS over the past century, an estimated 317 million non-fatal occupational injuries and 321,000 occupational fatalities occur globally each year, that is, 151 workers sustain a work-related accident every 15 seconds {Citation}(ILO 2013). A poor workplace is a substantial economic burden on individuals, employers, and society. Estimates from the International Social Security Association (ISSA) suggest that costs associated with nonfatal workplace accidents alone equal approximately 4 per cent of the world's gross domestic product (GDP) each year (4). No country, hospital or clinic can keep patients safe unless its health workers are safe. Infections among health workers can lead to a depleted workforce at a time when they are most needed. The pandemic has highlighted the extent to which protecting health workers is key to ensuring a functioning health system and a functioning society (World Health Organisation, 2020).

Findings from the International Labour Organisation (ILO) revealed that work-related injuries and accidents that account for economic losses are as high as 4% of the global GDP (ILO, 2013). Sharps and needle stick injuries are occupational hazards to healthcare workers. Healthcare workers are exposed to deadly bloodborne pathogens through contaminated needles and other sharp objects (5). In most African and Asian countries, health workers are leaving their jobs due to the growing threat of injuries and illness related to occupationally acquired disease or illness (Mohammad, 2014). Significant improvement has been achieved in occupational health and safety (OSH) as several countries have identified its relevance and the need to give optimum premium to preventing accidents and ill-health. However, the correlation between OHS and workplace accidents and injuries shows that existing OHS are ineffective in the healthcare environment (6). A study on the assessment of safety practices and injuries associated with wood processing found that occupational injuries and illnesses such as headache, back pain, leg and hip pain and respiratory problems are repeatedly reported by workers (Amponsah et al. 2013). Therefore, managers need to put in measures to enforce the practice of safety, especially the use of personal protective equipment (PPE), to reduce hazards and injuries associated with wood processing (7). During the pandemic, Doctors without Borders provided health education activities, distributed soap and PPE for health care workers, and reinforced hygiene measures in all of its facilities (Bong et al., 2020). Similarly, other authors have high lifted open wounds and fractures as the commonest and least injuries recorded by building construction workers in Ghana (Amissah et al, 2019). Failure to address operational injuries results in apathy, fatigue and disincentive to workers, which inhibits the zeal to work. (8).

Clearly, failure to address health threats in the work environment may pose a barrier to retaining and sustaining caregiver ranks, which in turn threaten the delivery of health care. In identifying these gaps, this study seeks to assess the occupational hazards and injuries among health workers in the Ahafo Ano Municipal, Tepa.

# **1.2 Problem Statement**

Healthcare workers are frequently exposed to occupational hazards and are at risk of injuries, given that they are constantly in contact with patients (9). These exposures not only affect the quality of care delivered by healthcare workers but also their safety and well-being. Unsafe and injurious working environments affect service delivery quality and productivity, and retention of health workers (10).

Ghastly, stressing the vulnerability of health staff to occupational injuries, 96% of bloodborne infections occurred in low-income countries. Skillfully, Healthcare Professionals take care of sick people through diverse curative and preventive services. However, while they are engrossed in providing healthcare, they are exposed to hazards that could affect their health and well-being. This is the situation in developing countries where health services are implemented with the minimum protective precautions against being exposed to various occupational injuries and hazards (11). In addition, substandard attitudes toward the safety of health workers and minimal mastery of occupational injuries and hazards among health workers significantly contribute to their vulnerabilities (5).

Little is mentioned about occupational health hazards and injuries confronting healthcare practitioners and other health facility workers in Ghana. The Ahafo Ano North health facilities, especially Tepa Government Hospital, the busiest health facility in the Municipality, and serving as the main referral health centre, do not report any occupational injuries and hazards affecting them in their discharge of their duties. This study sought to assess the occupational hazards and injuries among health workers in the Ahafo Ano North Municipal, Tepa (Ahafo Ano North, 2020).

# **1.3 General Objective**

To assess the occupational hazards and injuries among health workers in the Ahafo Ano Municipal, Tepa.

# **1.3.1 Specific Objective of the Study**

Therefore, the specific objectives of the study were to:

1. Assess the nature of occupational hazards and injuries health care workers suffer during healthcare delivery in the Ahafo Ano North Municipal, Tepa.
2. Identify the possible reasons for occupational hazards and injuries among health care workers in the Ahafo Ano North Municipal, Tepa.
3. Assess whether health workers report occupational hazards and injuries they encounter at the workplace in the Ahafo Ano North Municipal, Tepa.

# **1.4 Research Questions**

The following set of questions directed the researcher in this study:

1. What are the nature of occupational hazards and injuries health care workers suffer during healthcare delivery in the Ahafo Ano North Municipal, Tepa?
2. What are the possible reasons for occupational hazards and injuries among health care workers in the Ahafo Ano North Municipal, Tepa?
3. What are the occupational hazards and injuries that healthcare workers report at the workplace in the Ahafo Ano North Municipal, Tepa?

# **1.5. Justification of the study**

Assessing the occupational hazards and injuries among health workers has the ability to create awareness of occupational health hazards and injuries and superintend and set standards to promote safety and health in the various healthcare settings (12).

Adequate knowledge on occupational hazards and injuries, coupled with an approving demeanour and consciousness among healthcare workers, is profoundly essential for preventing the harm of various classifications of occupational injuries and diseases. However, data on hazards and injuries faced by healthcare workers during the discharge of duties is scant, especially in less developed countries where the load of occupational injuries and diseases continue to wax (Agbana et al., 2016).

This study was expected to help provide data on hazards and injuries associated with the healthcare environment and ways to reduce the occurrence of these hazards by using equipment to safeguard employees at the health facilities.

The findings of this study may boon policy makers such as the Ministry of Health, Ghana Health Service and other healthcare-related organisations to fashion out the must-have policies to help improve the safety and health of healthcare workers in the country.

# **1.6. Conceptual Framework**

Figure 1 illustrates the relationship between the nature of occupational hazards and injuries, causes of occupational health and the types of occupational health hazards that healthcare workers are likely to report in the healthcare environment. The framework was adapted from (Adamu & Abdullahi, 2017), a study on conventional occupational health hazards associated with healthcare workers in tertiary institutions, revealed that healthcare workers encounter injuries and hazards such as back pain, latex allergy, violence, stress and many others, which inversely affect their work and health. The causes of these hazards and injuries may include non-availability of personal protective equipment/wear, accidental causes, inadequate training on safety measures and ignorance of safety measures among staff. However, there is little reporting or minimal data on injuries and hazards that occur in the health care environment.

Health care workers may be extremely careful in their line of duty when they know the health hazards and injuries associated with whatever procedure they are undertaking. The eventual goal of knowing the causes of occupational health hazards and injuries and reporting is to spawn a healthy working ambient for all categories of workers in the healthcare facility.

**Hazards Suffered by Health Workers**

-Biological (eg. Blood transmitted disease)

-Chemical (eg. Formalin)

-Physical (eg. Wet floors, Violence)

**Safety Practices**

-Uses of PPE

-Training

**OCCUPATIONAL HAZARDS AND INJURIES AMONG HEALTH WORKERS**

**Demographic Characteristics**

-Age

-Sex

-Level of Education

-Job category

-Marital Status

-Religion

**Possible reasons of Occupational Health Hazards**

-Non-availability of personal protective wears

-Inadequate training on safety measures

**Reporting of Occupational Health Hazard**

-Channels of reporting (eg. OHSU, OPD, etc)

**Figure 1: Occupational hazards and injuries among Health Workers** **Framework**

Source: Nsiah, 2021.

# **2.0 METHODOLOGY**

# **2.1 Introduction**

The purpose of this study was to assess the occupational hazards and injuries among health workers in the Ahafo Ano North Municipality, Tepa. This chapter focused on the study area, study design and type, study populations, sampling technique and sample size, data collection tool, data collection technique, data analysis, pre-testing, limitations of the study, pre-test and ethical considerations.

# **Background of the Study Area**

The study was conducted in the Ahafo Ano North Municipality, Tepa, which is one of the forty-two (42) administrative municipal/districts in the Ashanti Region, Ghana. It is located in the northern part of the Ashanti Region and shares common boundaries with Ahafo Ano South district, Tano North, Tano South and Asutifi district. It has a total population of 119,024 according to the 2010 population census, with a growth rate of 2.7%, containing 4,761 children under one, 19,639 children under five years and 31,422 WIFA, respectively, calculated. Administratively, the Municipality is divided into five (5) Sub-municipalities, namely Tepa, Manfo, Anyinasuso, Betiako and Subriso.

# **2.3 Study Design and Type**

A descriptive cross-sectional study design was used to assess the occupational hazards and injuries among health workers in the Ahafo Ano North Municipal, Tepa. Descriptive study design is a scientific method that involves observing and describing the behaviour of a subject without influencing it in any way (Shuttlewortg, 2008). Descriptive designs result in the collection and description of data, whether in words, pictures, charts or tables (Gay,1992). The study was designed to assess the occupational hazards and injuries among health workers in the Ahafo Ano North Municipal, Tepa. The advantage of this study is that the subjects are observed in a completely natural and unchanged environment. Descriptive research is mostly used as the precursor to more quantitative research designs and is a general overview, giving some valuable indicators of what variables are worth testing quantitatively. In addition, the use of descriptive design allows variables and procedures to be described as accurately and completely as possible so that other researchers can replicate the study.

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Cross-sectional design as a research design was used and carried out at one time point or over a short period. It is conducted to estimate the prevalence of the outcome of interest in a given population, commonly for the purposes of public health planning. In this study, a cross-sectional design was used to assess the occupational hazards and injuries among health workers. Cross-sectional design provided a ‘snapshot’ of the occupational hazards and injuries affecting health workers in the Ahafo Ano North Municipality, Tepa, between June 2020 to December 2020. A cross-sectional study is used when the purpose of the study is descriptive, often in the form of a survey. Inability to follow up is a common concern in cross-sectional design studies, and one of the strategies used to overcome this is to increase sample size to have a better description of the population within the time frame.

**2.4 Study Population**

Polit and Hungler (1999:37) define study population as the totality of all the subjects, objects or members that conform to a set of specifications for a specific study. The study population included health workers of the Ahafo Ano North Municipal health facilities who were present at the time of the study. Health workers here consisted of nurses (Nurses, Midwives and Healthcare assistants), Doctors (Doctors and Physician assistants), Laboratory staff (Biomedical scientists and laboratory technicians), Pharmacists (Pharmacists, pharmacy technicians and dispensary technicians), Radiologists, Physiotherapists, Orderlies, Mortuary staff, Labourers and Security Officers. These categories of health workers were relevant to this study since they are directly exposed to hazards and injuries in their routine activities. The study assumed that these health workers would provide information on occupational hazards and injuries among health workers in the municipality, Tepa. Therefore, the number of health workers required to represent each cadre of health workers was calculated in Table 1 below

Table 1: Proportionate Representation of Cadre of Health Workers in the Study Population

|  |  |  |  |
| --- | --- | --- | --- |
| **Health Workers** | **Health workers population** | **Proportion per population** | **Required no. of Health workers** |
| Nurse | 143 | 143/270\*259 | 137 |
| Doctors/PAs | 13 | 13/270\*259 | 12 |
| Laboratory Staff | 9 | 9/270\*259 | 9 |
| Pharmacy Staff | 17 | 17/270\*259 | 16 |
| Physiotherapy staff | 3 | 3/270\*259 | 3 |
| Orderlies | 26 | 26/270\*259 | 25 |
| Mortuary workers | 9 | 9/270\*260 | 9 |
| Labourers | 33 | 33/270\*261 | 32 |
| Security Officers | 17 | 217/270\*262 | 16 |
| Total | 270 |  | 259 |

**Source: Field Data, 2020**

Keys: Numerator – number of health workers per cadre, Denominator – total health workers, and multiplier – calculated sample size for the study

# **2.5 Sampling Technique and Sample Size**

Two sampling techniques were employed in the study, namely, proportionate sampling and the convenience sampling technique. Proportionate sampling is a sampling strategy (a technique for turnout participants for a study) that is used when the population is made up of several subgroups that are substantially different in number. The number relative to the entire population decides the number of participants from each subgroup (13). In this study, the number of facilities for the study is ten (10). Each facility has a different staff strength, and therefore, to achieve equal representation of all health workers in the study, the number of health workers to represent each facility was proportionately derived from the total staff strength of the facility.

Again, a convenient sampling technique was used to select participants from the health workers for the study. Convenient sampling technique is a non-probability sampling technique where subjects are drawn from part of a population (health workers) because of their convenient accessibility and proximity to the researcher. A convenient sampling technique was used because the health workers were readily available in the facility. In this regard, the researcher, upon reaching each facility, gave the questionnaire to any health worker within the facility who was willing and ready to participate in the study.

This process continued until the required number of study participants needed for the study from each category of health workers in that facility was achieved.

# **2.5.1 Sample Size Estimation**

The minimum sample size that was required for this study was determined using the Cochran formula as cited in Cochran (1963:75). The Cochran formula was used because it aids in calculating an ideal sample size, a desired level of precision, a desired confidence level and the estimated proportion of the attribute present in the population. It is considered appropriate in situations with large populations. The study area has an estimated population of 119,024, and therefore, using Cochran’s formula was ideal. An estimated 20% health staff population from the 2010 population census was used and substituted in the formula, and the sample size was calculated as follows;

 $N=\frac{Z^{2}pq}{e^{2}}$

Where:

N-sample size

P-The proportion of the targeted population that has the characteristics of focus in the study. In the study, the particular characteristics were all health workers, which were 20% of the municipal population.

p = expected proportion of health workers experiencing occupational hazards and injuries = 20% =0.2 (Ahafo Ano North Municipal, 2020).

Z = Z value corresponding to a 95% level of significance = 1.96

q- 1-p = 1-0.234 = 0.766

e- = Level of precision. This study adopted 5% level of precision (0.05)

Therefore, from the above, the sample size will be calculated as N=$ \frac{\left(1.96^{2}\right)\left(0.2\right)(0.766)}{0.05^{2}}$

**n= 235**

In order to take care of non-response in the recording of information of participants, the study added 10% of the total sample size to arrive at the required sample size of **259**. Therefore, the proportionate representation of health workers in facilities was calculated as follows;

Table 2: Proportionate Representation of Health Workers in Facilities

|  |  |  |
| --- | --- | --- |
| **Health facility** | **Number of staff** | **Required Sample** |
| Tepa Hospital |  170/270\*259 | 163 |
| Manfo HC |  21/270\*259 | 20 |
| Anyinasuso HC |  18/27\*259 | 17 |
| Betiako HC | 13/270\*259 | 12 |
| Twabidi HC |  12/270\*259 | 11 |
| Subriso HC |  14/270\*259 | 13 |
| Asuhyiae CHPS |  7/270\*259 | 6 |
| Akwasiase CHPS |  6/270\*259 | 5 |
| Tettehkrom CHPS |  5/270\*259 | 4 |
| Numesua CHPS |  9/270\*259 | 8 |

Source: Field Data, 2020

Keys: Numerator – number of health workers per category, Denominator- total health workers, and multiplier – calculated sample size for the study

**2.6 Data Collection Tools and Techniques**

A structured questionnaire was designed and distributed to health workers to collect the data for the study. Upon reaching each facility, permission was sought from the facility in charge and unit heads and health staff for this study, and my interest was made known to them before data collection commenced. All COVID-19 protocols were duly observed.

The questionnaire was self-administered. The principal investigator distributed the questionnaire to all eligible health workers in the municipality who consented to and were ready to participate in the study. Health workers who needed further assistance in responding to the questionnaire were aided by the principal investigator

The health workers were given a time of 30 minutes within which they were required to respond to and submit the questionnaire. The principal investigator, upon completion, collected the questionnaire and ensured a high completion rate and return of the questionnaire.

# **2.7 Data Analysis**

 The data collected was analysed using a quantitative data analysis method. It involved a descriptive analysis where data was presented in the form of charts, tables and percentages. The completely filled questionnaires were serially numbered and cross-checked by the principal investigator for easy identification. To ensure that data entry into the computer is accurate, the principal investigator independently cross-checked each entry. Data was coded and entered into SPSS version 21.0 for analysis.

The data was presented in charts and tables for interpretation and analysis based on descriptive analysis of the variables under study. To analyse the demographic characteristics of respondents, frequencies and percentages were used. Pie and bar charts were used to analyse the nature of occupational hazards and injuries health care workers suffer during healthcare delivery. Frequencies and percentages were used to analyse both possible reasons for occupational hazards among health care workers and whether health workers report occupational hazards and injuries they encounter at the workplace.

# **2.8 Limitation of the Study**

The study limitations that affected this study included the measures used in data collection and the sampling procedure.

* Measure used in data collection: Unwillingness by some participants to return the questionnaire, and other participants not ready to fully participate in the study as expected. Some of the participants had less time to spend with the researcher during the data collection, which affected the study.
* Sampling procedure: The participants were selected conveniently. This sampling technique did not constitute the true representation of the study participants and therefore affected the generalisation of the results.

# **2.9 Ethical Consideration**

The Ethics Review Committee of the Ghana Health Service (GHS) approved the protocol of this study. Permission was sought from the Ahafo Ano North Municipal Health Directorate with an introductory letter from the School of Health and Allied Sciences, Catholic University College of Ghana, Fiapre-Suyani, before data collection commenced. Approval was also obtained from all facility In-charges and unit heads in all 10 facilities after the proposal presentation was made at the Municipal Health Directorate. The study was done at the facilities with no risk.

The data collected was known only to the researcher and was used for academic purposes. Consent was sought before the start of the study.

Data collected was stored for five (5) years under lock and key, and if it had to be used for another study, approval would be sought from the Ghana Health Service Ethics Review Committee (GHS-ERC) before doing so.

# **3.0**. **RESULTS AND FINDINGS**

The purpose of the study was to assess occupational hazards and injuries among health workers in the Ahafo Ano North Municipal, Tepa. This chapter presents the results of the study based on the research objectives. They were; demographic characteristic of respondents, the nature of occupational hazards and injuries health care workers suffer during healthcare delivery in the Ahafo Ano North Municipal, Tepa, identify the possible reasons of occupational hazards and injuries among health care workers in the Ahafo Ano North Municipal, Tepa, and assess whether health workers report occupational hazards and injuries they encounter at the work place in the Ahafo Ano North Municipal, Tepa.

## **3.1 Demographic Characteristics of Respondents**

The study gathered data about the demographic characteristics of the respondents, and it is presented in Table 3. The sex distribution of the health workers indicated that 50.2% males and 49.8 were females. The age of the respondents showed 34.4% were 20-29 years, 50.6% were 30-39 years, 2.7% were 40-49 years, and 12.4% were 50-59 years. Educational level of health workers revealed that 81.9% tertiary education, 12.7% secondary education, and 5.4% completed JHS. On the religious denomination of health workers, there were 91.1% Christians and 8.9% Muslims. Most health workers (54.1%), 3.1% clinicians, 3.9% midwives, 3.1% laboratory technicians, 8.1% record officers, 2.7% physiotherapists and 25.1% other health staff such as labourers, security and mortuary attendants. Finally, (14.7%) were working at OPD, (10.4%) at laboratory, (6.9%) at paediatric ward, (42.1%) at medical ward, (4.6%) at surgical ward, 5(1.9%) at maternity, (3.5%) at records and (15.8%) at other departments such as mortuary, stores, security and reproductive and child health unit. On number of years health workers have worked in their department, (10.8%) had worked for 1-4years, (52.1%) had worked for 5-9 years, (23.6%) had worked for 10-14 years, (12.7%) had worked for 15-19 years and (8%) had worked for more than 20 years.

Table 3: Demographic Characteristics of Respondents

|  |  |  |
| --- | --- | --- |
| **Variable** | **Frequencies** | **Percentage (%)** |
| **Gender** |  |  |
| Males | 130 | 50.2 |
| Females | 129 | 48.9 |
| **Age** |  |  |
| 20-29 years | 89 | 34.4 |
| 30-39 years | 139 | 50.6 |
| 40-49 years | 7 | 2.7 |
| 50-59 years | 32 | 12.4 |
| **Educational Level** |  |  |
| Tertiary | 212 | 81.9 |
| Secondary | 33 | 12.7 |
| JHS/MSLC | 14 | 5.5 |
|  **Religious Denomination** |
| Christian | 236 | 91.1 |
| Muslim | 23 | 8.9 |
| **Profession** |  |  |
| Nurse | 140 | 54.1 |
| Clinician | 8 | 3.1 |
| Midwife | 10 | 3.9 |
| Lab Tech | 8 | 3.1 |
| Records | 21 | 8.1 |
| Physiotherapy | 7 | 2.7 |
| Others | 65 | 25.1 |
|  |  |  |
| **Department** |  |  |
| OPD | 38 | 14.7 |
| Laboratory | 27 | 10.4 |
| Paediatric | 18 | 6.9 |
| Medical | 109 | 42.1 |
| Surgical | 12 | 4.6 |
| Maternity | 5 | 1.9 |
| Records | 9 | 3.5 |
| Others | 41 | 15.8 |
|  |
|  **No. of years worked in the facility** |
| 1-5years | 28 | 10.9 |
| 5-10years | 135 | 52.1 |
| 10-15years | 61 | 23.5 |
| 15-20years | 33 | 12.7 |
| More than 20 years | 2 | 0.8 |
|  **Total** | **259** | **100.0%** |

Source: Field data, 2021

## 4.2 Nature of Occupational hazards and injuries healthcare workers suffer during healthcare delivery

The purpose of this analysis was to assess the nature of occupational hazards and injuries health care workers suffer during healthcare delivery using pie charts, frequencies and percentages. Hazards such as biological, chemical and physical were assessed and the results were presented as follows.

Source: Field data, 2021

Figure 2: Health Workers Ever Diagnosed of Infection at the Facility

Figure 2 showed that 25 respondents (9.6%) have ever been diagnosed with an infection at the facility before, while 234 (90.4%) said they have never been diagnosed with any infection in the facility

Source: Field data, 2021

Figure 3: Type of Infection

On the type of infections health workers were diagnosed with in the health facility, Figure 3 showed that 2 (8%) said Tuberculosis, 7 (28%) said skin rashes, 2 (8%) said hepatitis and 14 (56%) said other infections such as diarrhoea, malaria and common cold.

Source: Field data, 2021

Figure 4: Infection Acquired through Routine Duties at the Workplace

Whether the infections were acquired through routine duties at the workplace, Figure 4 showed that 4 (16%) said yes and 21 (84%) said no.

Source: Field data, 2021

Figure 5: Healthcare Workers’ Management of Infection

On management of infections acquired by healthcare workers, Figure 5 illustrates that 19 (75.7%) said they self-medicated and 6 (24.3%) said they sought medical attention.

Source: Field data, 2021

Figure 6: Health Workers Ever Injured at the Health Facility

On health workers who have ever been injured at the health facility, figure 6 indicates that 196 (75.7%) said yes, while 63 (24.3%) said no.

Source: Field data, 2021

Figure 7: Type of Injury

On type of injuries healthcare workers often face hazards in the workplace, figure 7 showed that, 15 (5.8%) was needle prick, 33 (12.7%) was back pain, 50 (19. 3%) was leg injury and 104 (40.2 %) was other injuries such as fall, burns, lifting of patient and cut through weeding.

Figure 8: Attended any Workshop/training on Occupational Health and Safety

Figure 8 revealed that 70 (26.9%) of health workers said they had attended a workshop on occupational health and safety while 189 (73.1%) said they have never attended any workshop on occupational health and safety.

Figure 9: Recommendation for Management to organise more Training on Occupational Health and Safety

Figure 9 revealed that most health workers 239, (92.3%) recommended that management should organise more training on occupational health and safety practices, 9 (3.9%) said no, and 11 (4.2%) said they do not know whether management should organise training on occupational health and safety or not.

## **3.3. Possible Reasons of Occupational Hazards and injuries among Health Care Workers**

The aim of this analysis was to identify the possible reasons of occupational hazards and injuries among health care workers in the Ahafo Ano North Municipal, Tepa using frequency and percentage calculations. Majority (78.8%) of the health workers had no PPE to use in the facility. The most prevalent PPE available for use was the hand gloves (41.9%), followed by the face mask (30.5%) and then the head cap (26.6%)

Again, health workers (57.1%) use PPE all the time, (16.6%) do not use and (26.3%) sometimes use it. In addition, health workers responses to the PPE they use at work, (26.6%) use head cover, (41.7%) use glove, (41.7%) use facemask and (1.2%) was non-response. Furthermore, health workers (38.6%) have had adequate training on the use of PPE, (61.4%) said no.

Table 4: Possible Reasons of Occupational Hazards and injuries among Health Care Workers

|  |  |  |
| --- | --- | --- |
| **Variable** | **Frequencies** | **Percentage (%)** |
| **Do you have PPE to use in your facility** |
| Yes | 204 | 78.8 |
| No | 47 | 18.1 |
| Don’t know | 8 | 3.1 |
| **Which PPE are available for use** |
| Head cover/cap | 69 | 26.6 |
| Gloves | 108 | 41.7 |
| Face mask | 79 | 2.7 |
| Missing system | 3 | 1.2 |
| **Do you use PPE when working all the time** |
| Yes | 148 | 57.1 |
| No | 43 | 16.6 |
| Sometimes  | 68 | 26.3 |
| **Which of the PPE do you use at work** |
| Head cover | 69 | 26.6 |
| Gloves | 108 | 41.7 |
| Face mask | 79 | 30.5 |
| Missing system | 3 | 1.2 |
| **Have you had adequate training on the use of these PPE** |
| Yes | 100 | 38.6 |
| No | 159 | 61.4 |
| **Total** | **259** | **100.0%** |

**Source: Field data, 2021**

## **3.4 Occupational Hazards and Injuries Health Workers Report**

This analysis focused onassessing whether health workers report occupational hazards and injuries they encounter at the work place in the Ahafo Ano North Municipality, Tepa. Frequency and percentage calculations were used. The results were analyzed in table 4 as follows; health workers (22%) said there is a department/unit in the facility earmarked to handle OHI in the facility, (54.4%) said there is no department/unit in the facility earmarked to handle OHI. However, (23.6%) said they are not sure such department for OHI exist. Health workers (94.7%) said the department /unit is the emergency, (5.3%) said is the OPD. However, no one said there is special department/unit for OHI. Health workers (1.5%) had ever reported an OHI in their facility, (16.2%) said no and (82.2%) there is no need reporting any OHI to the facility. Again, health workers (1.2%) mentioned their facility have a protocol to follow when encountered with OHI, (11.2%) said no such protocol exist. However, (87.6%) said they do not know. Finally, (98.4%) had never reported any OHI, (0.4%) had reported a case of needle prick, and (1.2%) had reported other cases such as diarrhea, headache and backache respectively to the unit.

Table 5: Occupational Hazards and Injuries Health Workers Report

|  |  |  |
| --- | --- | --- |
| **Variable** | **Frequencies** | **Percentage (%)** |
| **Department/unit in the facility earmarked to handle OHI** |
| Yes | 57 | 22.0 |
| No | 141 | 54.4 |
| Not sure | 61 | 23.6 |
| **If yes, which department** |
| Emergency | 54 | 94.7 |
| OPD | 3 | 5.3 |
| Special unit for OHI | 0 | 0 |
| **Have you ever reported any OHI**  |
|  Yes | 4 | 1.5 |
| No  | 42 | 16.2 |
| No need | 213 | 82.2 |
| **Facility has a protocol to follow when encountered with OHI** |
| Yes | 3 | 1.2 |
| No | 29 | 11.2 |
| Do not know | 227 | 87.6 |
| **OHI health workers have ever reported** |
| None | 255 | 98.4 |
| Needle prick | 1 | 0.4 |
| Others | 3 | 1.2 |
| **Total** | **259** | **100.0%** |

Source: Field data, 2021.

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**4.0 DISCUSSION**

This chapter discusses the results of this study based on the research objectives. They were the nature of occupational hazards and injuries health care workers suffer during healthcare delivery in the Ahafo Ano North Municipal, the possible reasons of occupational hazards and injuries among health care workers in the Ahafo Ano North Municipal, and whether health workers report occupational hazards and injuries they encounter at the work place in the Ahafo Ano North Municipal, Tepa.

# **4.1 Nature of Occupational Hazards and Injuries Health Care Workers suffer during Healthcare Delivery**

The findings of this study revealed that 234 (79.9%) of health workers had never been diagnosed of an infection at the facility. However, 25 (20.1%) of the health workers had been diagnosed with an infection in the facility. This study finding is not in agreement with a study conducted by Russi (2017), which found that health care workers are mostly diagnosed with blood-borne pathogens and other related infections. HIV/AIDS, hepatitis B virus, tuberculosis specimens and other infectious diseases that can be acquired in the workplace during their processes and preparations are toll on the healthcare worker and the healthcare environment. Similarly, (14) dissenting to this finding also revealed that Health workers are diagnosed with different infections in the healthcare environment. Most of these infections were found in laboratories and include Tuberculosis, hepatitis, and HIV/AIDS. Other chemical hazards such as harsh detergents, flammables, lead, radiation, solvents and many others are a consequent risk to health workers who are exposed to them. furthermore, findings from (15) also found the opposite to the findings of this study, which revealed that SARS-CoV-2 infection was diagnosed in health workers (7.3%) than in non-health care workers. Few health workers 25 (9.6%) diagnosed of infection further affirmed a study conducted by Eyayo, (2014) on evaluation of occupational health hazards among health workers, which found that, majority of workers working in the facility are familiar with the three main hazards in the work environment and therefore are careful of coming into contact with it. The workers know them (biological, physical, and chemical) and the risk imposed by these hazards, since management is always educating them on the causes and the health effects of these hazards. On the type of infections health workers were diagnosed with in the health facility, the study found that most of the health workers, 14 (56%) were infected with diarrhoea, malaria, and common cold, with only 7(28%) having skin disease. Again, 4 (16%) health workers said these infections were acquired through routine duties at the workplace. These study findings confirmed studies conducted by Chhabra (2016) and on healthcare hazards among healthcare professionals, which revealed that nurses who go on night duties are usually infected with malaria, skin rashes and diarrheal diseases, and chemicals (disinfectants, diagnosis, and drugs) are among the leading causes of disorders in healthcare providers(16). A primary cause of occupational injuries among nurses is a lack of proper equipment and resources, including gloves, masks, and gowns. Again, nurses are often overworked and fatigued due to high workloads, long working hours, and a shortage of resources (Poku et al., 2025).

Similarly, Von Delft et al. (2015), on why healthcare workers are sick of TB, revealed that rather than being protected, thousands of healthcare colleagues are at an increased risk of TB and especially drug-resistant TB. Health workers are the first to suffer the consequences of a progressively more resistant and fatal TB epidemic, and urgent interventions are needed to ensure the safety and continued availability of these precious healthcare resources(17). Dudeia & Singh (2017) also confirmed this finding when it was revealed in their study that health care workers, in their quest to provide quality health service to patients, the majority of them send for food when they are in need. Food handlers, during preparation and processing, contaminate the food with several chemical and biological agents unintentionally(18). A similar study conducted by Ulutasdemir & Tanir, 2017 on the occupational risk of health professionals iterated that, healthcare environment is considered the most breeding site for occupational hazards(19), (15). The study further found that the majority of health workers, 75.7% self-medicate when they acquire infections, while 24.3% seek medical attention. This study finding is in line with a study conducted by Onchonga, Omwoyo, & Nyamamba, 2020 on assessing the prevalence of self-medication among health care workers before and during the 2019 SARS-CoV-2(COVID-19) pandemic in Kenya added that most health care workers usually self-medicate when they find out they have acquired an infection (p<0.05)(20). (Sadio et al., 2020) in their study on assessment of self-medication practices in the context of COVID outbreak in Togo affirmed that self-medication was prevalent in the treatment of COVID-19. Most of the health workers were using vitamin C (27.6%), and some relied on traditional medicine (95% CI: 31.2-37.3). The study, in addition, found that 75.7% of health workers had ever been injured and 24.3% had not. Again, 104 (40.2%) had injuries such as fall, burns, lifting of patient, and cut through weeding; other injuries included needle prick (5.8%), back pain (12.7%) and leg injury 50 (19.3%). This finding affirmed studies conducted by (Suliman et al., 2018); (Wåhlin et al., 2020) who revealed that averagely, 3.5% of health workers had injuries such as needle prick, workplace violence, injuries during patient manual handling and sharp injuries and these injuries are common in the health care environment, especially student nurses who are at high risk of needle prick injuries(21,22). Similarly, a systematic review conducted by (23) on occupational hazards among health care workers in Africa revealed that needle stick injuries are among the leading causes of injuries among care workers, the rate of recapping was prominent, and nurses lacked adequate knowledge.

 In addition, Ulutasdemir & Tanir (2017) on occupational risk of health professionals iterated that, healthcare environment is considered the most breeding site for occupational hazards(24). The study further revealed that the majority of health workers, 189 (73.1%), had had no workshop on occupational health and safety, whilst 70 (26.9%) said yes, they have had a workshop on occupational health and safety. Again, 239(92.3%) recommended that management should organise more training on occupational health and safety practices. These findings are similar to the findings of the study conducted by (24) which affirmed that there is little or no workshop for most health staff and further recommended regular in-service training on OHS. (25) also added that Training of health care workers on the prevention of occupational injuries can prevent work injuries. Training is widely acknowledged as an important component of occupational hazard control and risk management. Again, (26) also revealed that factors associated with injuries at the workplace include non-wearing PPE, overtime working, work-related pressures, working in multiple facilities and inadequate training on the use of equipment. These hinder compliance with protocols and expose workers to work-related injuries

# **4.2 Possible Reasons for Occupational Hazards and Injuries among Health Care Workers.**

The study revealed several possible reasons for occupational hazards and injuries among health workers in the health facilities. The use and non-use of PPE have diverse effects on the health of workers. The majority of health workers, 78.8% had no PPE to use in their facility, 18.1% said PPE were available for use, and 3.1% said they do not know whether PPE were available. These findings are similar to studies conducted by (27); (28) on non-availability and persistent use of PPE which revealed that in an outbreak of acute contagious infections such as COVID-19, Ebola, and severe acute respiratory syndrome(SARS), personal protective equipment (PPE) needed were not available causing apathy and fear among healthcare workers(27); (28). Again, experience with other respiratory viruses requires persistent usage of PPE and is essential in reducing transmission of nosocomial infections, and its non-existence proves detrimental to healthcare givers. Martin-Delgado et al, 2020 also affirmed these findings when they revealed in their study that 70% of healthcare workers reported a lack of PPE, which hindered the progress of work output (29). Further findings from (Rebmann et al., 2021) regarding the availability of PPE, infection and prevention repository in the first month added that, soon after COVID-19 was declared a pandemic, a lot of hospitals and health care facilities were running low to almost full shortage of all PPE (P<001 for all)(30). Further findings of the study revealed that some PPE available for use were head cover/cap 69 (26.6%), gloves 108 (41.9%), face mask 79 (2.7%). These findings confirm a study conducted by Chughtai & Khan (2020) on the use of personal protective equipment to protect against respiratory infections in Pakistan: a systematic review found that the face mask and gloves were the most commonly used to protect HCWs from respiratory and other infections(31). Similar findings from Livingston, Desai, & Berkwits, 2020 on sourcing personal protective equipment during the COVID-19 pandemic affirmed that the shortage of PPE such as face masks, goggles, coveralls and aprons, was so rapid that propositions such as turning plastic garbage bags into gowns and water bottles cutouts for eye protection were considered. Finding out whether health workers have had adequate training on the use of PPE, 38.6% said they have had training, and 61.4% said no training had been done(32). This finding of the study was similar to a study conducted by Park (2020), which found that health care workers(HCWs) are at a high risk of exposure and therefore protecting the health care worker is important(33). However, severe acute respiratory syndrome such as coronavirus 2(SARS-CoV-2) requires continuous and further training on the use of PPE such as face masks, face shields and respirators for health workers. The study further added that HCWs are often not sure of what to wear and when to wear. The decision to wear a mask or a shield is dependent on the level of protection particular PPE provides. Therefore, understanding the usage is key in selecting the appropriate PPE. Again, Schröder et al. (2016) in their study on laboratory safety attitudes and practices: A comparison of academic, government and industry researchers affirmed that safety training in healthcare institutions is woefully inadequate, and they sometimes base on experience to avoid certain striking challenges which affect their mode of delivery in the workplace environment(34). The study further recommended the need to involve experts to train, especially laboratory staff, on the right PPE to use when handling specific samples. Furthermore, Alao et al. (2020) assessment on health workers’ knowledge, beliefs, attitudes and use of PPE for prevention of COVID-19 infection in low-resource settings in Nigeria found that only 25% of health workers had adequate knowledge about PPE(35). Even health workers who had adequate knowledge had difficulty in donning and doffing masks (p=0.002).

# **4.3 Occupational Hazards and Injuries Health Workers Report**

In order to find out whether health workers report occupational hazards and injuries (OHI) they encounter at the workplace during the provision of health services to clients, the study found out if there is an availability of an OHI department or unit earmarked to handle OHI for health workers. The majority of health workers, 141 (54%) said there is no department or unit in the facility earmarked to handle OHI. Few health workers, 57 (22%), said there is a department or unit in the facility that takes care of OHI encountered during routine health service delivery. However, 61 (23.6%) said they are not sure such a department for OHI even exists. Most Health workers, 54(94.7%), assumed the emergency unit at the hospital is the place earmarked for OHI, while other health workers spotted the outpatient department (OPD) as the place earmarked for OHI. No health worker mentioned that there is a special unit/department earmarked to handle OHI. This study finding is not in agreement with the policy guidelines on occupational health and safety in Ghana, which explained that health facilities should have an OHS unit. The unit would be manned by a Public Health Officer/clinician and report directly to the District Director of Health Services (36). Again, the policy document on occupational health and safety of Komfo Anokye Teaching Hospital provided similar findings. The facility has no specific system for collecting and collating health data on the staff of the health sector in, specific structure to address occupational challenges for health workers is at large (37).

On whether health workers have ever reported any OHI to the department, the majority, 213 (87.6%) said there was no need to report any OHI to the department, only a few, 4 (1.5%), said they had ever reported a case at the facility. This study finding affirms the findings of a study conducted by (21) on student nurses' level of knowledge about NSI and its prevalence and post-exposure measures in Jordan, which found that student nurses had exposure to NSI. However, the majority of the students who suffered NSI found it difficult to report to their clinical instructors or even write a short report. A similar study conducted by (38) on the experiences of frontline nursing staff on workplace safety and occupational health hazards in two psychiatric hospitals in Ghana also revealed that, although the majority of health staff knew about occupational hazards, less than half of the healthcare workers reported exposure to workplace health hazards. Moreover, several of these healthcare workers had had exposure to occupational hazards and injury. Again, findings from (39) on reasons why healthcare workers are sick of TB explained that most healthcare workers feel stigmatised and therefore feel reluctant to report occupational hazards to management. Findings from (26) on occupational health hazards among healthcare workers in Kampala, Uganda found the affirmative, that 50% of respondents reported experiencing occupational health hazards. In addition, (40) in their study on common occupational health hazards in a tertiary health institution in Bida, North-Central, revealed that of 108 health workers who sustained various occupational health hazards, 57.4% reported to management. Respondents, 32% did not report to the committee, and six of the health workers felt there was no need to inform anybody about it. Again, 169 (65.3%) of respondents said their facilities have no protocol to work with when encountering OHI, 30 (11.6%) said a protocol exists; however, 40 (15.4%) said they do not know. This study finding is in affirmative with the provision of standardised protocols to health workers when encountering health hazards or injuries in Kenya, according to Kenyan guidelines on occupational health and safety (36).

The study further revealed that 235 (90.7%) had never reported any OHI, 15 (5.8%) had reported cases of needle prick, and 9 (3.5%) had reported other cases such as diarrhoea, headache and backache to the unit. This finding from the study further confirmed earlier findings from (21); (38), which revealed that most nurses (students and background) find it difficult to report occupational hazards and injuries they encounter at the workplace. However, few of the health workers had reported needle prick injuries, and other infections (24), (5).

# **4.4 Summary of Chapter**

Health workers may not suffer biological hazards such as HIV/AIDS, skin diseases, Tuberculosis, Hepatitis and diarrhoea. However, occupational injuries were very common among health workers in the Ahafo Ano North Municipal health facilities. It was evident from this study that only 4 (16%) of health workers who had acquired infection (malaria) were through routine activities in the health care environment. Most health workers had had one form of occupational injury or another other through burns, falls, lifting of patients and weeding. Other injuries included a needle prick and back pain. These study findings were substantiated with findings from (Suliman et al., 2018); (Wåhlin et al., 2020), who affirmed that health workers had injuries such as needle prick, workplace violence, injuries during patient manual handling, and these injuries are common in the health care environment(22,41). (23)Further, further added that falls, burns, and needle stick injuries are among the leading causes of injuries among healthcare workers, the rate of recapping was prominent, and nurses lacked adequate knowledge. The majority of health workers recommended that management should organise more training on occupational health and safety practices. This was necessary in-behalf-of, more health workers can prevent themselves from occupational injuries and improve work effectiveness. (24); (25); , (26).

Inadequate PPE may be a possible reason for occupational hazards and injuries in the healthcare environment. It was evident from this study that the majority of health workers had inadequate PPE to use in their facilities, and its non-availability caused fear and apathy among respondents. However, limited PPE that was available for use, such as gloves, face masks and cover/caps, most of the HCWs had had no training on its usage. Studies from (Rebmann et al., 2021), (Chughtai & Khan, 2020), and (Livingston, Desai, & Berkwits, 2020) confirmed that healthcare workers reported a lack of PPE, which hindered the progress and process of work (27); (28); (29). This notwithstanding, face mask and gloves were the most commonly used PPE to protect HCW from respiratory and other infections yet, safety trainings in healthcare institutions are woefully inadequate and they sometimes base on experience to avoid certain striking challenges which affect their mode of service provision. (33); (34); (35).

Most health workers said no department or unit is earmarked to take care of OHI. They are compelled to mix with patients to receive treatment whenever they encounter any OHI at the emergency unit and the OPD. Staff at the Municipal Hospital assumed the emergency unit is the first point of call when you encounter any OHI, while the sub-municipal facilities assumed is the OPD (37)(Chireh, 2010). Again, no standardised protocol on OHI exists in the units/departments (36). The majority of health workers do not see the need to report any OHI to the health facility because the facilities lack basic protocols on OHI, and feel stigmatised when they report cases of OHI. This notwithstanding, few health workers had reported cases of needle prick, diarrhoea, headache, and backache to the units (38); (39); (40); (21); (5).

**5.0 CONCLUSIONS AND RECOMMENDATIONS**

The purpose of the study was to assess the occupational hazards and injuries (OHI) among health workers in the Ahafo Ano Municipal, Tepa. This chapter focuses on conclusions and the recommendations of the study.

# **5.1 Conclusion**

The following conclusions are drawn based on the findings:

1. Health workers may not suffer biological hazards such as HIV/AIDS, Tuberculosis, Hepatitis B and diarrhoea. However, physical injuries such as needle pricks, burns, falls, and lifting of patients affect health workers.
2. Essentially, inadequate PPE may contribute to occupational hazards and injuries in the healthcare environment. Non-availability of PPE may influence fear and apathy among health workers in the discharge of their duties.
3. Safety training on the use of PPE is inadequate. To this extent, health workers are at high risk of exposure to several occupational hazards and injuries.
4. No occupational health and safety facility exists in any of the health facilities in the Ahafo Ano North Municipality; therefore, the majority of health workers are not encouraged to report occupational hazards and injuries (OHI) to the health facilities.
5. The emergency unit and the outpatient department (OPD) unit, some health workers assume, are the point of call when encountering any OHI that lacks basic OHI protocols.

# **5.2 Recommendations**

 Based on the study findings, some recommendations are proposed to health workers and managers of health services in the Ahafo Ano North Municipal on OHI, possible reasons and whether health workers report OHI they encounter.

1. The study recommended that there should be enough PPE available for use by health workers to protect and prevent them from OHI, since non-availability may cause fear and apathy among health workers in their discharge of their duty.
2. Managers of health facilities should organize training on occupational health and safety practices (prevention of OHI and use of PPE). This is necessary in-behalf-of, health workers may prevent themselves from occupational injuries and improve work effectiveness.
3. The study further recommended that health facilities establish an occupational health and safety unit to address all concerns of OHI. This will encourage health workers to report all OHIs affecting them in their routine activities.
4. Standard operating guidelines and protocols on occupational health and safety should be available at the occupational health and safety unit to ensure that safety procedures and protocols are followed.

# **5.3 Recommendations for Further Studies**

The study recommended that further research be conducted on how knowledge and awareness of Occupational Health and safety facilities influence the report of OHI in health facilities.

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# **REFERENCES**

1. Stanaway JD, Afshin A, Gakidou E, Lim SS, Abate D, Abate KH, et al. Global, regional, and national comparative risk assessment of 84 behavioural, environmental and occupational, and metabolic risks or clusters of risks for 195 countries and territories, 1990-2017: A systematic analysis for the Global Burden of Disease Stu. The Lancet. 2018;392(10159):1923–94.

2. Gyedu A, Nakua EK, Otupiri E, Mock C, Donkor P, Ebel B. Incidence, characteristics and risk factors for household and neighbourhood injury among young children in semiurban Ghana: a population-based household survey. Injury Prevention. 2015 Apr;21(e1):e71–9.

3. McDiarmid MA. Hazards of the health care sector: Looking beyond infectious disease. Annals of Global Health. 2014;80(4):315–9.

4. Abdalla S, Apramian SS, Cantley LF, Cullen MR. Occupation and Risk for Injuries. In: Disease Control Priorities, Third Edition (Volume 7): Injury Prevention and Environmental Health. The World Bank; 2017. p. 97–132.

5. Bekele T, Gebremariam A, Kaso M, Ahmed K. Factors Associated with Occupational Needle Stick and Sharps Injuries among Hospital Healthcare Workers in Bale Zone, Southeast Ethiopia. Tang JW, editor. PLOS ONE. 2015 Oct 15;10(10):e0140382.

6. Liu S, Nkrumah ENK, Akoto LS, Gyabeng E, Nkrumah E. The State of Occupational Health and Safety Management Frameworks (OHSMF) and Occupational Injuries and Accidents in the Ghanaian Oil and Gas Industry: Assessing the Mediating Role of Safety Knowledge. BioMed Research International. 2020 Mar 13;2020:1–14.

7. Mitchual SJ, Donkoh M, Bih F. Assessment of Safety Practices and Injuries Associated with Wood Processing in a Timber Company in Ghana. Open Journal of Safety Science and Technology. 2015;05(01):10–9.

8. Amissah J, Badu E, Agyei-Baffour P, Nakua EK, Mensah I. Predisposing factors influencing occupational injury among frontline building construction workers in Ghana. BMC Research Notes. 2019;12(1):8–15.

9. Langenhan MK, Leka S, Jain A. Psychosocial risks: Is risk management strategic enough in business and policy making? Safety and Health at Work. 2013;4(2):87–94.

10. Jaju A, Kurian JS, Ravikanth P. Health, safety and welfare measures for employees at hindustan coca-cola pvt. Ltd: An empirical study. International Journal of Mechanical Engineering and Technology. 2018;9(2):698–709.

11. Aluko OO, Adebayo AE, Adebisi TF, Ewegbemi MK, Abidoye AT, Popoola BF. Knowledge, attitudes and perceptions of occupational hazards and safety practices in Nigerian healthcare workers. BMC Research Notes. 2016 Dec 6;9(1):71.

12. Johnson OE, Umoren QM. Occupational hazards and health problems reported by workers in a Sawmill in Uyo ,. 2018;7(2):17–24.

13. Taherdoost H. Sampling Methods in Research Methodology; How to Choose a Sampling Technique for Research. SSRN Electronic Journal. 2016;8(9):27–78.

14. Nas A, Vaer H, Nasd P. Occupational health scenario of Indian informal sector. INDUSTRIAL HEALTH. 2016;54(4):377–85.

15. Barrett ES, Horton DB, Roy J, Gennaro ML, Brooks A, Tischfield J, et al. Prevalence of SARS-CoV-2 infection in previously undiagnosed health care workers at the onset of the U.S. COVID-19 epidemic. medRxiv. 2020;20(853):1–10.

16. Chhabra S. Health hazards among health care personnel. J Mahatma Gandhi Inst Med Sci. 2016;21(1):19.

17. Von Delft A, Dramowski A, Khosa C, Kotze K, Lederer P, Mosidi T, et al. Why healthcare workers are sick of TB. International Journal of Infectious Diseases. 2015 Mar;32:147–51.

18. Food handlers. In: Food Safety in the 21st Century [Internet]. Elsevier; 2017 [cited 2025 Jul 10]. p. 269–80. Available from: https://linkinghub.elsevier.com/retrieve/pii/B9780128017739000212

19. Li H, Yu C, Chen R, Li J, Li J. Novel ionic liquid-type Gemini surfactants: Synthesis, surface property and antimicrobial activity. Colloids and Surfaces A: Physicochemical and Engineering Aspects. 2012 Feb;395:116–24.

20. Onchonga D, Omwoyo J, Nyamamba D. Assessing the prevalence of self-medication among healthcare workers before and during the 2019 SARS-CoV-2 (COVID-19) pandemic in Kenya. Saudi Pharmaceutical Journal. 2020 Oct;28(10):1149–54.

21. Suliman M, Al Qadire M, Alazzam M, Aloush S, Alsaraireh A, Alsaraireh FA. Students nurses’ knowledge and prevalence of Needle Stick Injury in Jordan. Nurse Education Today. 2018 Jan;60(12):23–7.

22. Wåhlin C, Kvarnström S, Öhrn A, Nilsing Strid E. Patient and healthcare worker safety risks and injuries. Learning from incident reporting. European Journal of Physiotherapy. 2020 Jan 2;22(1):44–50.

23. Mossburg S, Agore A, Nkimbeng M, Commodore-Mensah Y. Occupational hazards among healthcare workers in africa: A systematic review. Annals of Global Health. 2019;85(1):1–13.

24. Ulutasdemir N, Tanir F. Occupational Risks of Health Professionals. Occupational Health. 2017;6(13):38–68.

25. Atuahene Mensah JE. Effectiveness of OHS education and training. Sharing Best Evidence. 2019;4(01):1–4.

26. Ndejjo R, Musinguzi G, Yu X, Buregyeya E, Musoke D, Wang JS, et al. Occupational Health Hazards among Healthcare Workers in Kampala, Uganda. Journal of Environmental and Public Health. 2015;2015(3):1–9.

27. Verbeek JH, Rajamaki B, Ijaz S, Sauni R, Toomey E, Blackwood B, et al. Personal protective equipment for preventing highly infectious diseases due to exposure to contaminated body fluids in healthcare staff. Cochrane Database of Systematic Reviews. 2020 Apr 15;

28. Nguyen LH, Drew DA, Graham MS, Joshi AD, Guo CG, Ma W, et al. Risk of COVID-19 among front-line health-care workers and the general community: a prospective cohort study. The Lancet Public Health. 2020;5(9):e475–83.

29. Martin-Delgado J, Viteri E, Mula A, Serpa P, Pacheco G, Prada D, et al. Availability of personal protective equipment and diagnostic and treatment facilities for healthcare workers involved in COVID-19 care: A cross-sectional study in Brazil, Colombia, and Ecuador. PLoS ONE. 2020;15(11 November):1–13.

30. Rebmann T, Loux TM, Arnold LD, Charney R, Horton D, Gomel A. SARS-CoV-2 Transmission to Masked and Unmasked Close Contacts of University Students with COVID-19 — St. Louis, Missouri, January–May 2021. MMWR Morb Mortal Wkly Rep. 2021 Sep 10;70(36):1245–8.

31. Chughtai AA, Khan W. Use of personal protective equipment to protect against respiratory infections in Pakistan: A systematic review. Journal of Infection and Public Health. 2020 Mar;13(3):385–90.

32. Livingston E, Desai A, Berkwits M. Sourcing Personal Protective Equipment During the COVID-19 Pandemic. JAMA. 2020 May 19;323(19):1912.

33. Park SH. Personal Protective Equipment for Healthcare Workers during the COVID-19 Pandemic. Infection & Chemotherapy. 2020;52(2):165.

34. Schröder I, Huang DYQ, Ellis O, Gibson JH, Wayne NL. Laboratory safety attitudes and practices: A comparison of academic, government, and industry researchers. Journal of Chemical Health and Safety. 2016 Jan;23(1):12–23.

35. Alao MA, Durodola AO, Ibrahim OR, Asinobi OA. Assessment of Health Workers’ Knowledge, Beliefs, Attitudes, and Use of Personal Protective Equipment for Prevention of COVID-19 Infection in Low-Resource Settings. Advances in Public Health. 2020;2020(5):1–10.

36. Macharia J. OCCUPATIONAL SAFETY AND HEALTH POLICY GUIDELINES FOR THE HEALTH SECTOR. African Field Epidemiology Network. 2016;8(19):2–80.

37. Ohene Adjei. Occupational Health and Safety Guide, Komfo Anokye Teaching Hospital. Advances in Public Health. 2019;3(31):3–28.

38. Alhassan RK, Poku KA. Experiences of frontline nursing staff on workplace safety and occupational health hazards in two psychiatric hospitals in Ghana. BMC Public Health. 2018 Dec;18(1):701.

39. von Delft A, Dramowski A, Khosa C, Kotze K, Lederer P, Mosidi T, et al. Why healthcare workers are sick of TB. International Journal of Infectious Diseases. 2015 Mar;32:147–51.

40. Umar AG, Aisha A. Common occupational health hazards amongst Health care workers in a Tertiary Health Institution in Bida , North-central. 2017;8(01):1–6.

41. Suliman M, Al Qadire M, Alazzam M, Aloush S, Alsaraireh A, Alsaraireh FA. Students nurses’ knowledge and prevalence of Needle Stick Injury in Jordan. Nurse Education Today. 2018 Jan;60:23–7.

42. World Health Organisation (2020). Protecting health workers from COVID-19. https://www.who.int/westernpacific/newsroom/feature-stories/item/protecting-health-workers-from-covid-19

43. Bong, C. L., Brasher, C., Chikumba, E., McDougall, R., Mellin-Olsen, J., & Enright, A. (2020). The COVID-19 pandemic: effects on low-and middle-income countries. Anesthesia & Analgesia, 131(1), 86-92.

44. Poku, C. A., Ahulu, A. A., Otomo, J., Hagan, D., Dwumfour, C. K., Issifu, J. S., & Dzomeku, V. (2025). Occupational injuries, mental workload and coping strategies among the nursing workforce in the Eastern Region of Ghana: a multi-centre study. *BMC nursing*, *24*(1), 78.