SCHOOL OF PUBLIC HEALTH

COLLEGE OF HEALTH SCIENCES

UNIVERSITY OF GHANA

CHARACTERIZING OCCUPATIONAL INJURIES AMONG SAWMILL WORKERS OF AGBOGBLOSHIE TIMBER MARKET, ACCRA.

BY

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THIS DISSERTATION IS SUBMITTED TO THE UNIVERSITY OF GHANA, LEGON IN PARTIAL FULFILMENT OF THE REQIREMENT FOR THE AWARD OF MSC OCCUPATIONAL HEALTH DEGREE

JULY, 2017

DECLARATION

I, Abigail Agyei Brefo, declare that except for other people's investigations which have been acknowledged, this dissertation is the result of my own original thought and hypothesis, and that this thesis either in whole or in part has not been presented elsewhere for another degree.

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Abigail Agyei Brefo **Date**

(Student)

…….. ……

Dr. Uri Selorm Markakpo **Date**

(Supervisor)

DEDICATION

I dedicate this work to you my dearest husband, Emmanuel Kwaku Salifu Asubay, for being the most amazing husband any schooling wife will ever wish for, friends and all well-wishers who supported me in the course of my studies and in diverse ways that have led to the successful completion of this dissertation. Above all, I dedicate this work to Almighty God for his protection and guidance during the conduct of the studies reported in this dissertation.

ACKNOWLEDGEMENT

This work was completed with the help of individuals and groups in diverse ways and is therefore duly acknowledged.

I am highly grateful to the Almighty God for his guidance and support through the difficulties I encountered during this work.

I recognize the cooperation of the study subjects and also the chief and secretary of the Timber Market association, Agbogbloshie.

I could not have done this work without the immense contribution and guidance by my kind- hearted supervisor, Dr. Uri Selorm Markapo and Professor Julius Fobil. I am sincerely grateful.

My immense gratitude also goes to all staff of BEOH department and school of Public Health for their diverse.

Am also grateful to friends and family members, especially **Mr Andrews Agyei Brefo.** The Ethical Review Committee of the Ghana Health Service, the various heads of the saw mills are also appreciated.

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LIST OF ABBREVATIONS

ILO	International Labour Organisation
NR	Regulatory Norms
OHS	Occupational health and safety
OSHA	Occupational Safety and Health Administration
RPE	Respiratory protective equipment
SPSS	Statistical Package for Social Sciences
WHO	World Health Organization

ABSTRACT

Background: The wood products industry historically has been considered to be one of the most dangerous industries for construction employees, especially sawmill workers. Sawmill workers are exposed to several occupational injuries including burns, cuts, breathing disorders, noise pollution, electrocution, etc., which can have serious consequences on the health of workers.

Objective: The study characterized occupational injuries among sawmill workers of the Timber market.

Methods: The study was a cross-sectional study using structured interviewer administered questionnaire as a survey instrument. The study randomly picked sawmills' workers while they were on normal duties. The results were obtained by processing data into frequencies and percentages, chi-square values and regression models. Data that were analyzed include demographic data, types of injuries sustained by sawmill workers at the Timber market, and factors influencing occupational injury among sawmill workers as well as the occupational safety standards used by saw mills at the Timber market.

Results: In total, 150 respondents were sampled for this study. Generally, injuries recorded among the saw mill workers comprised injuries to the hand and legs (56%), shoulder and hand injury (12.7%), and eye injury (4.7%). Workers who were not educated were two times more likely to experience occupational injury as compared to their counterparts. Majority of the injuries occurred during wood cutting but most of the workers were not using personal protective equipment.

Conclusion: Considering that majority of saw mill workers do not wear personal protective equipment, resulting to injuries during wood cutting, occupational safety education on the importants of personal protective equipment will greatly enhance occupational safety.

CHAPTER ONE

1.0 INTRODUCTION

1.1. Background

Occupational health can be traced back to the Italian doctor Bernadino Ramazzini in the early 18th century, when he sought to drive for the recognition of the role of occupations in the dynamics of health and disease (Agbana, Joshua, Daikwo, & Metibobba, 2016). According to the most recent estimates, some 2.3 million workers die from work-related accidents and diseases; over 474 million people suffer from occupational diseases and non-fatal accidents; with associate economic costs of these exceeding US$2.8 trillion (Pillay, 2015). In addition, World Health Organization (WHO) statistics indicates that there are about 250 million cases of occupational injuries and illnesses occurring annually worldwide, with prevalence studies from Botswana, Zimbabwe, Zambia, Ghana and Nigeria suggesting that there is a high occurrence of occupational disease in Africa (Diwe et al., 2016). One of such occupations associated with several occupational injuries is the sawmill industry. Approximately, 3.6 million workers worldwide within this industry are exposed to wood dust, when timber is being processed into semi-finished products and finished fresh wood, plywood and wood composites (Jacobsen, Schaumburg, Sigsgaard & Schlunssen, 2010). This has mandated several organizations and countries to set standards limiting wood-dust (as the commonest injury source) or drawn up recommendations for exposure (Chamba & Nunes, 2016).

As cited by previous literature, noise-induced hearing loss is the most common health outcome associated with exposure to noise from sawmills (Kling, Demers, Alamgir, & Davies, 2011). Results from earlier surveys also suggest that aside hearing challenges, noise exposure may be an important risk factor for acute myocardial infarction in a timber

mill environment (Davies et al., 2005). In spite of this, Ghana's domestic timber market accounts for more than 80% of the annual 600,000m3 of lumber traded on the domestic market (Amos & Seth, 2016). One of such industries that process wood into lumber and various wood products is the saw mill industry.

Saw mills process raw logs in a few simple operating steps. Green logs enter the sawmill where they are first debarked and then cut into cants that are further cut into finished pieces of lumber using either circular saws or band saws (Verma, Dermers, Shaw, & Tombe, 2010). Sawmill workers are grouped into machine operators, saw technicians, dust packers, overseers, wood loaders, machine off-loaders and administrative staff with different duration of exposure to occupational injuries at the workplace (Agbana et al., 2016). During timber processing, sawmill workers may be exposed to multiple chemical, physical and biological hazards, such as , wood dust, pesticides, fungicides, noise and so on (Akinyeye, Solanke, & Oyadongha, 2013), which often lead to diseases or injuries such as sprain, bruise, wounds or deep cuts in the body of the workers, however, very limited interventions have been put in place to reduce physical injuries among them. The parties responsible for ensuring internationally and national acceptable standards and occupational health policies on wood processing and construction sites in Ghana are Government, clients, consultants, contractors, workers and civil society (Laryea & Mensah, 2010). Ghana has a low infrastructural growth rate and a fairly unstable political climate, coupled with a dormant inspectorate division, which leads to poor construction and factory site health and safety (Kheni, Gibb, & Dainty, 2006). Meanwhile, other researchers have indicated that low adherence to safety practices within the wood industry promotes the vulnerability to different hazards that are capable of predisposing sawmill workers to various forms of health problems (Agunbiade, 2015).

Studies are therefore required to generate evidence-based scientific data necessary to formulate policy measures for health and safety of sawmill workers.

1.2. Problem Statement

The wood products industry has historically been considered to be one of the most dangerous for manufacturing employees (Michael & Wiedenbeck, 2004), especially the occupational category of sawmill workers. The International Labour Organisation (ILO) estimates that workers suffer 270 million accidents and at least 335, 000 fatal injuries annually (Kwame, Kusi, & Lawer, 2014). Sawmill workers are exposed to hazardous actions, such as manual lifting of heavy materials, improper body postures, difficult machine control, use of machinery and electrical equipment, intense movements, cargo transportation, and wood sawing which lead to several types of injuries among them (Tavares et al., 2015).Epidemiological investigations have also indicated that forty percent of all sawmill injuries in California were associated with manual materials handling (lifting, pushing, pulling, and carrying), primarily of lumber and logs (Holcroft & Punnett, 2016)

This situation is complicated by the use of obsolete machines and equipment, poor working conditions, poor safety practices, inadequate monitoring, workers' negligence and poor work posture (Agunbiade, 2015). For example, a study on small scale sawmilling industries in Tamale Metropolis in Ghana also indicated that a significant number of the workers in the study area did not use personal protective equipment when operating machines or performing jobs that require their use (Mitchual, Donkoh, & Bih, 2015). Due to such industrialized practices in Ghana, the annual number of industrialized fatal job-related accidents and illness was estimated to be more than two million in the year 2012 (Dwomoh, Owusu, & Addo, 2013). Previous national surveys in Ghana have also indicated that annual occupational injury rates were 11.5 injuries/1,000 persons and were

highest among Plant and Machine Operators (Deroo, Mock, Adjei, Frederick, & Simpson, 2005).

It is a fact that several preliminary investigations have focused on occupational injuries occurring among this working category (Diwe et al., 2016 ; Dutkiewicz et al., 2001 ; Kling et al., 2011 ; Agbana et al., 2016), yet most of these studies have focused on the prevalence and impact of these injuries. As a result, statistics on timber and construction injuries in Ghana is very scanty, providing little evidence of the health and safety performance of the sector (Kheni et al., 2006). In addition, limited number of studies have investigated the health seeking behavior of sawmill workers and the existence of possible safety standards and regulations within the sawmill industry in Ghana. Furthermore, investigations on the safety standards and health conditions among sawmill workers of Agbogbloshie timber industry in Ghana is limited. Consequently, this study aims to characterize the occupational injuries among sawmill workers at the Agbogbloshie Timber market in Ghana.

1.3. Study Objectives

1.3.1 General objective:

To characterize the categories of occupational injuries among sawmill workers at Timber market

1.3.2 Specific objectives:

1. To determine the types of injuries sustained by sawmill workers at the Agbogloshie timber market.
2. To assess the occupational safety standard guidelines and practices used by sawmill workers within the Abgogbloshie Timber market.

3. To assess the health seeking behavior of sawmill workers at the Abgogbloshie Timber market

1.4. Research questions

1. What type of occupational injuries occur at each stage of the timber processing among sawmill workers of the Abogbloshie timber market?
2. What occupational and safety standards and practices are available and used by various sawmill workers at the Agbogbloshie timber market?
3. What is the attitude of sawmill workers towards seeking health care in the event of injury?

1.5. Justification of the study

Preliminary studies have explored occupational injuries among sawmill workers but not many studies have characterized the occupational injuries among workers at each stage of the timber processing industry at Agbogloshie. Furthermore, only few studies reported on the health seeking behavior, safety standards and practices used by sawmill workers. To fill the gap in literature, the current study systematically characterized the prevalence of occupational hazards among sawmill workers, the type of hazards at each stage of the wood processing. Characterizing the occupational injuries among sawmill workers at the Agbogbloshie timber market would provide data needed to formulate or implement policy to prevent or minimize occupational injuries among sawmill workers in general. Also, it would augment scientific information available on the subject. Finally, characterizing occupational injuries among these sawmill workers would increase awareness of the safety standards and practices and the need to observe them in order to prevent or minimize occupational injuries among them.

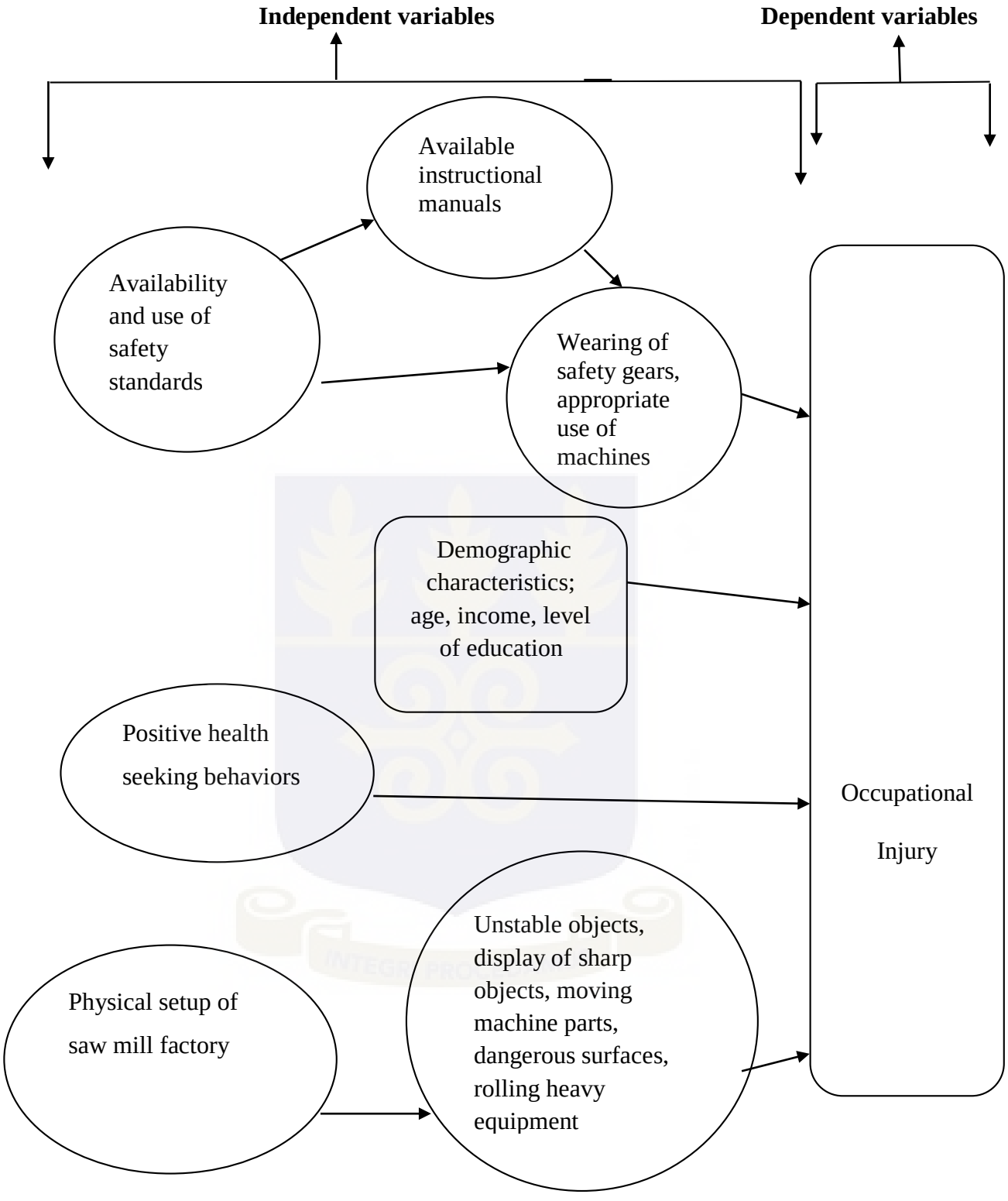

Figure 1.1: Conceptual framework for characterizing occupational injuries among saw mill workers of Timber Market, Accra.

1.6. Conceptual framework

Figure 1 illustrates the conceptual framework for characterizing occupational injuries among saw mill workers of Timber Market, Accra. Above is a diagrammatic presentation of the concept of occupational injuries adopted by this study. This model identifies various factors that can influence the occurrence of occupational injuries among sawmill workers. The factors can be grouped into two main categories (occupational factors and socio-demographic factors) with sub-categories.

Availability of occupational safety standards and protocols; globalization in the wood industry leads to subcontracting and availability of instruction manuals, which helps improve

health and safety standards in many developing countries (Tawiah & Dartey, 2011). As such, it is believed that if the parameters of regulatory standards are adhered to and implemented correctly, there is a great possibility that the work environment will become safer (Tavares et al., 2015). Areas where standard health and safety procedures are not observed, wearing of eye protection, and wearing of 'high visibility vest, still create room for the occurrence of injuries (Laryea & Mensah, 2010). Indeed, the key may be better enforcement of workplace standards and targeted training of those with the power over these conditions (Roelofs, Sprague-martinez, Brunette, & Azaroff, 2011). The sawmill Inspectorate Department ensures that all workplaces maintain minimum standards of health and safety prescribed, leading to reduction in occupational injuries (Kheni et al., 2006).

Exposed to sharp tools and machines; improperly designed tools and machinery have the capacity to exert influence on the health and safety of sawmill workers (Vyas, Das, & Mehta, 2011). Previous data also suggest that unsafe machines and tools within the work environment are some of the likely causes of occupational injuries (Pillay, 2015).

Furthermore, management or industry owners do not provide adequate finance for the purchase and routine maintenance of protective clothing, efficient processing machines, equipment and tools that are linked to the health requirements of workers, leading to injuries among workers (Kwame et al., 2014). In other adapted safety measures, all planning machines equipped with an air vacuum system and the sawing which generate large quantity of wood dust, were situated away from the workers assigned to these work sites (Oppliger, Rusca, Charrie, Duc, & Droz, 2005). Studies show that approximately 45 percent of work injuries are due to careless behavior by workers in using machines while the other 55 are due to physical hazards like improperly guarded machines (Bavon, 2000). In other studies, the increasing number of injuries caused by repetitive motion of machines has become a critical factor in workplace safety that still needs attention (Jaffar & Lop, 2011).

Availability and use of personal protective equipment; Mitchual et al., (2015) suggests that the management of the sawmill needs to do more to enforce practice of safety, especially the use of personal protective equipment, to reduce hazards and injuries associated with wood processing in the firm. Unfortunately, some employers encourage workers to use personal protective equipment without ever considering the introduction of prevention and control measures that could minimize heath related risks of the workers (Kwame et al., 2014). Accident prevention programmes, including the use of protective equipment, safety education, machine guarding, a work permit system, effective supervision at work sites and the enforcement of factory laws and regulations, are recommended to improve accidental injury and death in the factories (Ezenwa, 2001). Studies that had examined the effectiveness of respiratory protective equipment (RPE) had shown that these devices reduced the severity of acute respiratory complications (Maestrelli, Rooyackers, & Schlu, 2012), reduces productive labor force injuries which

leads to sustainable development (Jilcha & Kitaw, 2016). In addition, a reasonable and effective intervention to prevent many occupational injuries would be the introduction of personal protective equipment in combination with effective worker safety training (Vyas et al., 2011). Indeed, many are the organizations that operate under the assumption that the provision of personal protective equipment is sufficient to prevent occupational accidents and should be encouraged (Tawiah & Dartey, 2011).

Age; A sufficient body of data indicates that older age is associated with poorer occupational asthma prognosis (Maestrelli et al., 2012), and advanced age has consistently been associated with increased occupational injury fatality rates (Herbert & Landrigan, 2000). Preliminary body of literature indicate that occupational injury rates remained high after age 20 but decreased in the elderly (Deroo et al., 2005). In other analysis, factors significantly associated with hospitalization for asthma included older age and exposure to agents other than isocyanates (Liss, Tarlo, Farlane, & Yeung, 2000). Workers 65 years or older had a workplace fatality rate 2.6 times the rate of workers aged 16 through 64 years (Herbert & Landrigan, 2000). Associations of hearing loss with age, and noise exposure duration were significant as studied by other researchers in the (Pouryaghoub, Mehrdad, & Mohammadi, 2007).

CHAPTER TWO

2.0. LITERATURE REVIEW

2.1. Occupational injuries associated with timber processing.

Workers processing wood could be exposed to various hazards that lead to injury (Dutkiewicz et al., 2001 ; Akinyeye et al., 2013). Sawmill work involves shaping, cutting, processing and marketing of wood. These activities expose workers to various hazards with negative health effects, which include injuries to various parts of the body (Diwe et al., 2016). Various exposures have been linked previously to cases of chronic and acute non-malignant injuries at different stages of wood processing, especially among workers in sawmills, wood chip and debarking operations, plywood factories, logging and landscaping (Ronald et al., 2003). Though these injuries are prevalent at different processing stages, loggers who perform the first processing operation are the most at-risk among workers of the wood products manufacturing and supply chain (Michael & Wiedenbeck, 2004). During the 1980s, Norwegian sawmill workers were frequently exposed to extensively high spore concentrations, particularly, those working in the wood-trimming departments, after introduction of kiln drying and indoor sorting of the timber (Rydjord et al., 2007). By-products of wood processing such as wood dust and noise are also well known with respect to their occupational health effects (Verma et al., 2010). Workplace exposures occurred primarily through direct skin contact and, to a lesser extent, through inhaling chlorophenol vapors, aerosols, and contaminated sawdust (H. Heacock et al., 2000).

2.2. Health seeking behavior of sawmill workers at the Timber market

In recent years a growing body of evidence has been generated investigating the impact of occupational activities on a wide range of health outcomes among workers (Ostry et al., 2009). Although the rates of work-related injuries and physical ill-nesses have declined over the past two decades in developed countries (Robson et al., 2016) occupational injury preventive coverage in developing countries ranges from 5% to 10% at best, with services being found mainly in manufacturing enterprises, while some sectors of industry, the self-employed, and the informal sector like the wood industry are usually not covered at all (Jahangiri et al., 2016). Thus, although the wood product industry has high rates of both acute and chronic injuries as a result of occupational factors, there is only limited evidence regarding preventable risk factors for these injuries and diseases (Holcroft & Punnett, 2016). Also, while the etiology of these diseases/injuries is not fully known (Akinyeye et al., 2013), workers, often are well aware, not only of the occupational and the environmental health hazards that they face, but also of the need to address the underlying causal factors (Barten, Sousa, & Rongo, 2008). Previous studies (Alamgir, Koehoorn, Ostry, Tompa, & Demers, 2006) have however shown that workers injured in the workplace do not always report injuries for health attention or file a claim for workers' compensation. Consequently, with inadequate medical compensation and absence of medical aid or free health services, it is predictable that timber factory workers would engage in self-care practices including medication and consumption of herbal mixtures that could lead to other health complications (Agunbiade, 2015). Even among severely injured Ghanaian sawmill workers, almost one fourth of those injured received no proper medical care, and cited financial barriers as the reason (Deroo, Mock, Adjei, & Simpson, 2005). Though marginal efforts have been directed at ensuring the safety and health of those working and living around sawmills (Agunbiade, 2015), workers at the highest level,

enterprises with 500 or more employees are obliged to establish a Labour Health Center staffed by an occupational physician, occupational health nurse, industrial hygienist, and a safety department staffed by safety officers and managers (Jahangiri et al., 2016), in order to ensure their health and safety. Therefore, there is an urgent need of taking into account the health impact of production processes and services on workers' health (Montano, 2014). Pertinent to achieving this, is to engage with workers' and recognize risk factors that are crucial to developing efficient policies and programs that will impact positively in their health, safety and well-being (Barten et al., 2008).

2.3. Occupational safety standard guidelines used by sawmill workers within the Timber market.

Lack of organized occupational health services and use of personal protective equipment among workers of the sawmill industry, leads to hazards that have grievous consequences on their health (Ugheoke, Ebomoyi, & Iyawe, 2006). Occupational health and safety inspection and supervision have been subject to regulations by many National and International agencies worldwide (Adedeji & Nwosu, 2016). The International Labour Organisation (ILO) considers issues relating to occupational health and safety (OHS) to be of much importance in injury prevention to the extent that it has devoted about 80% of its standards and instruments either wholly or partly to it (Mitchual et al., 2015). In addition, the Occupational Safety and Health Administration of the US Department of Labor (OSHA) has determined threshold limit values for noise and pressure levels that represent conditions which workers may be legally exposed to repeatedly (Aryanezhad, Hheirkhah, Deljoo, & S.M, 2008). Improved safety in the work-place, both through voluntary efforts and through governmental regulation, has been an important component of promotion of occupational health and of injury control in general (Deroo et al., 2005). Other injuries that

come as a result of poor practices of occupational safety measures among sawmill workers have also been investigated (Agbana et al., 2016).

In a study conducted on the theme "Awareness of Occupational Hazards, Health Problems and Safety Measures among Sawmill Workers in North Central Nigeria", it was concluded that less than 20% of the sawmill workers wore protective devices/clothing (Mitchual et al., 2015), and another 5% of the workers wore face masks and working boots (Ugheoke et al., 2006). This was due to the fact that health and safety standards were neither practiced nor enforced. Meanwhile, work practices and safety observations are crucial to ensuring safety and minimizing workplace injuries (Agunbiade, 2015). As indicated by (Dwomoh et al., 2013), when workers understand the health and safety rules and procedures of their job and the tools used for working, through continuous monitoring and supervision, hazards are avoided, injuries are prevented and workers work effectively and efficiently leading to better productivity. As a result, legislative guidelines were introduced in Quebec that mandated annual surveys and supervision of working conditions in the Quebec population (Smith et al., 2010). Similarly, countries like Brazil has instituted 36 Regulatory Norms (NR) and safety guidelines whose main objectives are to regulate and guide the required procedures related to safety and occupational medicine (Tavares et al., 2015). These guidelines aim to upgrade occupational health standards, contribute importantly to transnational legal harmonization and reduce the high socio-economic burden caused by occupational injuries (Maestrelli et al., 2012), especially among sawmill workers. Control of exposure can also be achieved by different control measures commonly applied in elimination, reduction, isolation, ventilation, avoidance of exposure and personal protection (Chamba & Nunes, 2016). However, before this can be done, it is useful to have a nuanced understanding of how (i) accidents are caused (and therefore prevented); and (ii) safety management in organizations (Pillay, 2015). What is known is

that despite great advances in occupational health surveillance in several countries in the last decades, adverse health outcomes are still more frequently observed among workers in hazardous occupations due to lack of safety standards (Montano, 2014). For example, recent studies in Ghana (Laryea & Mensah, 2010) found that only one construction site out of fourteen surveyed sites had more than 50% of the standard health and safety indicators investigated. This is because, the implications for ensuring occupational safety policy and practice are not yet well understood and often not recognized among decision-makers that are mostly located outside this working class timber processors (Barten et al., 2008). Characterizing occupational injuries among sawmill workers therefore, will produce data necessary for formulation of safety standard guidelines for injury prevention among sawmill workers.

2.4. Availability of occupational safety standards and occurrence of occupational injuries

Globalization in the wood industry leads to subcontracting and availability of instruction manuals, which helps improve health and safety standards in many developing countries (Tawiah & Dartey, 2011). As such, it is believed that if the parameters of regulatory standards are adhered to and implemented correctly, there is a great possibility that the work environment will become safer (Tavares et al., 2015). Areas where standard health and safety procedures are not observed, more than 50% of the time centre on wearing of 'eye protection', and wearing of 'high visibility vest, still creating room for the occurrence of injuries (Laryea & Mensah, 2010). Indeed, the key may be better enforcement of workplace standards and targeted training of those with the power over these conditions (Roelofs et al., 2011). The sawmill Inspectorate Department ensures that all workplaces maintain minimum standards of health and safety prescribed by the Factories, Offices and

Shops Exposed to shape tools and machines, leading to reduction in occupational injuries (Kheni et al., 2006).

2.5. Exposure to sharp tools, machines and the occurrence of occupational injuries

Improperly designed tools and machinery have the capacity to exert influence on the health and safety of sawmill workers (Vyas et al., 2011). Previous data also suggest that unsafe machines and tools within the work environment are some of the likely causes of occupational injuries (Pillay, 2015). Furthermore, management or industry owners do not provide adequate finance for the purchase and routine maintenance of protective clothing, efficient processing machines, equipment and tools that are linked to the health requirements of workers, leading to injuries among workers (Kwame et al., 2014). In other adapted safety measures, all planning machines equipped with an air vacuum system and the sawing which generate large quantity of wood dust, were situated away from the workers assigned to these work sites (Oppliger et al., 2005). Studies show that approximately 45 percent of work injuries are due to careless behavior by workers in using machines while the other 55 are due to physical hazards like improperly guarded machines (Bavon, 2000). In other studies, the increasing number of injuries caused by repetitive motion of machines has become a critical factor in workplace safety that still needs attention (Jaffar & Lop, 2011).

2.6. Availability and use of personal protective equipment and occupational injuries

Mitchual et al., (2015) suggests that the management of the sawmill needs to do more to enforce practice of safety, especially the use of personal protective equipment, to reduce hazards and injuries associated with wood processing in the firm. Unfortunately, some employers encourage workers to use personal protective equipment without ever considering the introduction of prevention and control measures that could minimize heath related risks of the workers (Kwame et al., 2014). Accident prevention programmes,

including the use of protective equipment, safety education, machine guarding, a work permit system, effective supervision at work sites and the enforcement of factory laws and regulations, are recommended to improve accidental injury and death in the factories (Ezenwa, 2001). Studies that had examined the effectiveness of respiratory protective equipment (RPE) had shown that these devices reduced the severity of acute respiratory complications (Maestrelli et al., 2012), reduces productive labor force injuries which leads to sustainable development (Jilcha & Kitaw, 2016). In addition, a reasonable and effective intervention to prevent many occupational injuries would be the introduction of personal protective equipment in combination with effective worker safety training (Vyas et al., 2011). Indeed, many are the organizations that operate under the assumption that the provision of personal protective equipment is sufficient to prevent occupational accidents and should be encouraged (Tawiah & Dartey, 2011).

2.7. Age of the working population and occupational injuries

A sufficient body of data indicates that older age is associated with poorer occupational asthma prognosis (Maestrelli et al., 2012), and advanced age has consistently been associated with increased occupational injury fatality rates (Herbert & Landrigan, 2000). Preliminary body of literature indicate that occupational injury rates remained high after age 20 but decreased in the elderly (Deroo et al., 2005). In other analysis, factors significantly associated with hospitalization for asthma included older age and exposure to agents other than isocyanates (Liss et al., 2000). Workers 65 years or older had a workplace fatality rate 2.6 times the rate of workers aged 16 through 64 years (Herbert & Landrigan, 2000). Associations of hearing loss with age, and noise exposure duration were significant as studied by other researchers in the (Pouryaghoub et al., 2007).

2.8. Marital status and occupational injuries

Countrywide surveys that assessed occupational health and safety in Ontario and British Columbia have linked marital status to samples of workers' compensation claim and reports of occupational injuries (Smith et al., 2010), while other data have suggested otherwise (Vyas et al., 2011). Empirical studies suggest that a worker's marital status can determine his/her risk preference within the working environment and increase (Oppong, 2015) or decrease an individual's chances to injury (Ostry et al., 2009). Again, as compared to workers who were married, unmarried people recorded more occupational injuries within their working period, considering that married workers were more vigilant to signals of injuries than their counterparts (Agbana et al., 2016).

2.9. Level of education and the occurrence of occupational injuries

Levels and trend of workers education are moderate for enhanced productivity and perhaps their moderate literacy would help to understand and adopt machine precautionary measures for accidents reduction (Adedeji & Nwosu, 2016). Besides, other factors such as education, living conditions and income, may contribute substantially to the causal mechanisms leading to work-related health inequalities (Montano, 2014). Similarly, studies done in Nigeria also indicated the importance of educational attainment on the level of awareness of occupational and subsequent ability to avoid occupational injuries (Diwe et al., 2016). Further evidence is required for all types of preventive actions, including improved education of workers and educational training for workers (Maestrelli et al., 2012). Among Vietnamese sawmill enterprises; workers with lower levels of education were also categorized as the poorly performing worker population in the industry (Jahangiri et al., 2016), and such industries yielded the lowest productivity. Furthermore, other writers argued that preventive measures including education of

workers and using mechanized methods for wood processing will lead to a dramatic decrease in mortality and morbidity among wood processors (Ersoy et al., 2014).

2.10. Employment/work duration and occupational injuries

The number of vibration measurements per subject varied according to the number, complexity, and duration of tasks performed (Yost, 2002). Job titles that existed for each time period in every mill throughout the study period were rated by 10-15 experienced workers for frequency and duration of exposure to chlorophenates (H. Heacock et al., 2000). Previous work organization research have focused primarily on work schedule factors such as long work hours, length of employment and psychosocial job stressors, such as job strain as major causes of occupational injuries (Landsbergis, Grzywacz, & Lamontagne, 2014). There was no significant difference between the sawmill workers and the controls in terms of duration of present employment but 88% reported at least one respiratory disorder and chest pain within the period of work (Ugheoke et al., 2006). Symptoms of cough were more common among sawmill workers who were exposed over a period of 12 months as compared to those exposed over a shorter duration of working years (Douwes, Mclean, & Pearce, 2001). As compared to exposure duration of less than 10years, occupational injuries are cited being prevalent among sawmill workers who had worked in sawmill establishments for between 11-20years and more (Pouryaghoub et al., 2007). Again, it has earlier been reported that wood trimmers may develop a restrictive impairment of lung function and that this impairment depends on the duration and the degree of exposure to moulds and dust within the sawmill environment (Johard et al., 1992). The length of time of exposure to an injury causing agents can determine the occurrence of occupational injuries (Boschetto et al., 2006). Previous evidence also suggest that symptomatic outcomes worsened with increasing duration of symptomatic exposure at the work environment (Maestrelli et al., 2012).

2.11. Physical setup of sawmills and occurrence of occupational injuries

Organizational setup and description of the ventilation and over-all hygiene of the workplace are helpful in attempting to quantify exposure of workers to occupational injuries (Boschetto et al., 2006). In other literature, data have indicated that workers who work in sawmill environments which are structured with booth/caps as a cutting area periodically reported injuries such as eye irritation, lack of breath, chest pains and minor cuts as compared those who worked outside enclosed sawmill structures (Ronald et al., 2003). Among other causes, Bavon, (2000) earlier found that more than half of occupational injuries at the work environment are due to physical hazards like wet floors and improperly guarded machines. Similarly, threat-avoidant vigilance (Landsbergis et al., 2014), as well as occupational asthma has also been attributed to increased airway resistance and limited ventilation within the occupational environment (Maestrelli et al., 2012). Again, in a cement factory, a worker was reported to be scraping raw materials from the crusher belt when he slipped and fell into the moving rollers of the limestone crusher (Ezenwa, 2001). In other setups, pre-assembly of machines and the movement and location of heavy machines are considered prior to installation, in order to protect the employees from Safety and Health risks during the structural erection (Al-mebayedh, 2014).

2.12. Unstable heavy objects and occupational injuries

Poorly designed tools, unsafe machinery and limited machinery control measures within the work environment are all causes of occupational injuries (Vyas et al., 2011). In other instances, a sawmill worker, in an attempt to stop a rolling log of wood, was crushed against another log on a band-saw rail (Ezenwa, 2001). National data shows that for 'all lost-time injuries sustained between 1987 and 1995, their most frequent cause was struck by falling object, followed by a miscellaneous category that includes hot metal bums,

fires, explosions (Bavon, 2000). In earlier studies, occupational injuries were also exacerbated by poorly installed equipment or misuse of equipment (Laryea & Mensah, 2010) and many of the wood constructions sites today which are characterized by pressure and demand due to the time limit and financial constraints record considerable number of injuries during work (Al-mebayedh, 2014).

2.13. Job pressure and occupational injuries

Non-operator trades were encountered less frequently at the sampled forestry sites. Workers in the six trades sampled per-formed 16 different tasks and used 12 different pieces of equipment (Yost, 2002). Physically demanding task situation working hours and poorly arranged work schedules are also cited to result in the occurrence of occupational injuries (Vyas et al., 2011). A substantial body of research also exists linking long working hours, shiftwork, job strain, and effort–reward imbalance at work with illnesses and injuries (Landsbergis et al., 2014). In response to corporate and job pressure, sawmill managers for the first time, sought the services health and safety coordinator as an effort to limit the occurrence of occupational injuries (Robson et al., 2016). Other authors have attributed the increasing fatality rates in the sawmill industries to increased labour competition as well as production pressure (Ezenwa, 2001). All cases had in common the lack of hazards recognition, and the pressure for productivity firms imposed to workers (Amorim & Pereira, 2015). Aside this, workers reported a difficult work environment characterized by supervisor pressure, competition for jobs and intimidation with regard to raising safety concerns (Roelofs et al., 2011). In other studies, job instability, job insecurity and supervisory demands have shown consistent associations with psychological ill health among sawmill workers (Landsbergis et al., 2014)

2.14. Income level and the occurrence of occupational injuries

Whatever task control they may have is likely reduced when economic pressures and limited sources income force them to work harder and for longer hour (Landsbergis et al., 2014). Again, most wood industry workers and sawmill operators consider dangerous job alternatives like chainsaw operation as a result of their income benefits and the household income levels (Obiri & Damnyag, 2011), thereby exposing workers to several health risk and injuries. Wood processing and sawmill operations contribute significantly to household budgets but is also considered a dangerous avenue for the occurrence of injuries lasting a life time (Marfo, 2009). While other trees and their processing are considered a tremendous export potential and an important source of income for wood workers, accident and emergency reports have indicated high occurrence of injuries within this sector (Tabish, Jan, Rasool, Geelani, & Farooq, 2004). Studies have shown that informal workers stand poor life conditions, as a result of low wages or income, and lack or limited access to indirect salaries like health insurance, leading them to engage in extra strenuous jobs of harmful nature (Barten et al., 2008). In other surveys, significant observations were also made which related job stress and type of job to the income levels and household demands of sawmill workers (Rhee, Kim, & Cho, 2015).

CHAPTER THREE

3.0. METHODOLOGY

3.1. Study design

The study was a descriptive cross-sectional study. It characterized occupational injuries among saw mill workers at the timber market. Also, it determined how sawmill workers sought health during injury, the types of injuries that occurred at each stage of their work and the safety standards and guidelines of a section of the workers.

3.2. Study population

This study defined sawmill workers as a category of workers within the timber processing industry who are employed to process wood into planks of wood, boards and other semi-finished or finished wood products, using machines and other equipment. Workers were eligible to participate in the study if they were full-time employees of the saw mill. The sample however excluded all residents around the saw mill setting, whose occupations were not directly related to timber processing.

3.3. Study area location

The study was done at the Timber market located in the Greater Accra Region of Ghana. Timber market is situated close to the Agbogbloshie e-waste dumpsite and around the banks of the Korle-lagoon on the western side of the Odaw River in central Accra, Ghana (Srigboh et al., 2016). The site is known for its processing of timber into finished or semi-finished products for the carpentry and construction industry in Ghana. It is also said to be one of the largest timber markets in Ghana. Timber processing at this saw mills is usually done using machines but can sometimes involve manual logging. Agbogloshie serves as the largest waste dumpsite in Ghana (Burns, Sun, Fobil, & Neitzel, 2016) and one of the biggest in Africa (Asampong et al., 2015). Over 40,000 people live and work at Timber

market, it is also considered one of the world's 10 worst toxic threats (Heacock, Kelly, & Asante, 2015). Preliminary data indicate that hundreds of workers are employed at the Timber market study site (Burns et al., 2016), some of whom are mainly sawmill workers.

3.3.1 Ethnicity

The predominant Religious Denominations in Ghana are Christianity, Islam and Traditional Religion. Traditional practice and beliefs in Ghana, although the workers of Timber marker community belong to different religious background majority are Christians and Muslims. Like elsewhere in the world, are more prominent in the rural areas. Most of the workers of the Timber market are Akans and speak Twi. Few of them, however, are from the northern sector of Ghana and speak Dagbani, Hausa and Dagaare.

3.4. Variables

Dependent Variable

Occupational injuries among sawmill workers

Independent Variables:

1. **Occupational factors**
    i. Availability of occupational standards and protocols at the sawmills
    ii. Physical setup of saw mill
    iii. Exposed sharp machines and objects
    iv. Unstable heavy objects
    v. Availability and use of personal protective equipment.
    vi. Income level
    vii. Job pressure
    viii. Availability and use of safety standards

2. **Socio-demographic factors**

   i. Age

   ii. Marital status

   iii. Level of education

   iv. Income level

   v. Length of time working at the sawmill

3.5. Sampling technique

The study randomly selected participants who were available at the time of the survey. The recruitment was done by the principal investigator and research assistants, assisted by heads of the various sawmill set-ups. The purpose of the study and procedures involved were explained to the workers before commencement of sampling. The study included sawmills workers who were full time workers at the saw mill. The workers were pre-informed about the survey and were observed during their work to detect occupational related hazards. For the systematic assessment of the different occupational injuries at the saw mill, an inspection of the site was carried out using questionnaire. Each participant was approached while doing their normal daily activity. Participants were approached in person, the consent form was read to potential subjects in their native language. Interested individuals were given informed consent and invited for recruitment after the purpose of the study had been explain to them. If a worker who is approached was not qualified or unwilling to participate, he was replaced with the next available participant. This was done until the total sample size was obtained.

3.6. Sample size

Total sample size of 150 individuals was randomly selected for the study. These were individual working and willing to participate in the study as well as meeting the inclusion

criteria were sampled for the study. The total number of participants came to one hundred and fifty (150)

3.7. Data collection tools and techniques

Data were collected through a face-to-face interview using interviewer administered questionnaire, comprising both open-ended and closed-ended questions. The consent of participants was sought prior to the commencement of questionnaire administration. The survey was preceded by recruitment and training of research assistants to conduct the data collection. They were also informed about the purpose of the research, the focus of the study, the administration of complete questionnaires without any form of coercion, and the handling of unresponsive interviewees during the process. Before the start of the data collection however, permission was first sought from the various heads of the saw mills. Data were collected over a period of one month.

3.8. Quality control

Research assistants were given two days training on the data collection and interviewing skills and the motive of the research explained to them. Sections of the research questionnaire were explained clearly to principal research assistants. At the end of each day during the data collection period, each questionnaire was inspected upon return and all corrections made. Incomplete research questionnaire and forms due to non-respondents and mistakes were taken out and replaced with new questionnaire and were administered the next day.

3.9. Data analysis

The data entry and analysis were performed using the Statistical Package for Social Sciences (SPSS) version 20. Administered questionnaires were collated at the end of each day. All necessary differences and errors were rectified before the processing. The data

were then processed into tables to show the frequency and percentages of the distribution of the data. Uni-variate analysis was used for frequencies; Bi-variate analyses (chi-square test) were also used to test association between outcome variable and independent variables. P-value <0.05 denoted statistical significance. Adjusted odds ratios were used to control confounders in a multiple logistic regression model.

3.10. Ethical considerations

Ethical clearance was obtained from the Ethics Committee of the Ghana Health Service. Permission was obtained from the various heads and representatives of the saw mill working establishments in the Timber market. The participants were duly informed that their participation in the study was purely voluntary and as such they could choose to partake or not. Their withdrawal from the study was of complete harm-free to them; confidentiality of their responses however was of high priority and was not be compromised in any way

CHAPTER FOUR

4.0 RESULTS

4.1. Background characteristics of respondents

Table 4.1 below summarizes the demographic characteristics of the respondents. In total, 150 respondents were sampled for this study. Overall, 18% of these respondents were between ages 30 and 34. Respondents who were between ages 35 to 39 represented 14% of the sample size. Only 12.7% were of ages between 20 to 24 years. Also, majority (70.7%) of the respondents were married, 30% had attained primary level of education, 18% were not educated and only 7.3% had tertiary education. 43.3% belonged to the Twi speaking ethnic group. Furthermore, 27.3% of the respondents were of the Ga/Adangbe ethnic group, 14.7% were Hausa, while the Ewe speaking workers constituted 14.7%. Eight in every ten (80%) of the respondents were Christians and almost all (92.7%) workers were full time workers.

Table 4.1: Background characteristics of respondents

Attribute	Frequency	Percent
Age group (in years)		
15 – 19	7	4.7
20-24	19	12.7
25-29	23	15.3
30- 34	27	18.0
35- 39	21	14.0
40-44	16	10.7
45-49	17	11.3
50-54	11	7.3
55 and above	9	6.0
Marital status		
Married	106	70.7
Not married	44	29.3
Level of education		
Tertiary	11	7.3
Senior High	26	17.3
Junior High	41	27.3
Primary level	45	30.0
Not educated	27	18.0
Primary language		
Twi	65	43.3
Ewe	22	14.7
Ga/Adangbe	41	27.3
Hausa	22	14.7
Religious denomination		
Christian	120	80.0
Muslim	26	17.3
Traditional	4	2.7
Type of employment		
Full time	139	92.7
Part time	11	7.3

4.2. Occupational injuries at each stage of the timber processing

Table 2, summarizes the occupational injuries among the saw mill workers at each stage of timber processing. Generally, injuries recorded among the saw mill workers comprised injuries to the hand and legs (56%) during wood cutting, shoulder and hand injury (12.7%) during wood logging, and eye contact with saw-dust leading to eye injury (4.7%) during wood cutting and trimming and cuts by sharp objects. However, 26.7% of workers never recorded any injury. A significant number (44.7%) of respondents experienced breathing and respiratory challenges, 31.3% of the workers manually operated their machines, and more than half (75.3%) of sawmill workers ever got struck by falling objects. Again, respondents were exposed to sharp objects and hazardous chemicals (51.3%).

Table 4.2: Occupational injuries at each stage of the timber processing

Attribute	Frequency	Percent
Job category considered dangerous		
Wood-trimming	28	18.7
Logging	41	27.3
Cutting	67	44.7
Marketing	14	9.3
Injuries easily record		
Shoulder/head injury	19	12.7
Hand/leg injury	84	56.0
Eye contact with Sawdust	7	4.7
No injury recorded	40	26.7
Experience breathing/respiratory challenges		
Yes	67	44.7
No	83	55.3
Work involved manual operation of equipment		
Yes	47	31.3
No	103	68.7
Easily get struck by falling object		
Yes	113	75.3
No	37	24.7
Exposed to sharp objects and hazardous chemicals		
Yes	77	51.3
No	73	48.7

Respondent's job category

Figure 4.1 below, summarizes the results of characterization of occupational injuries among saw mill workers at each stage of the timber processing. As shown, the highest prevalence (47.3%) of occupational injuries such as hand injury, eye injury, head injury, leg injury, breathing complications, chemical burns, chemical ingestion and cuts, occurred among saw mill workers who engage in wood cutting, logging and processing (smoothing and painting) as compared to only hand, leg, and head injuries which occurred among those involved in timber marketing, who had the least prevalence (10%) of injuries.

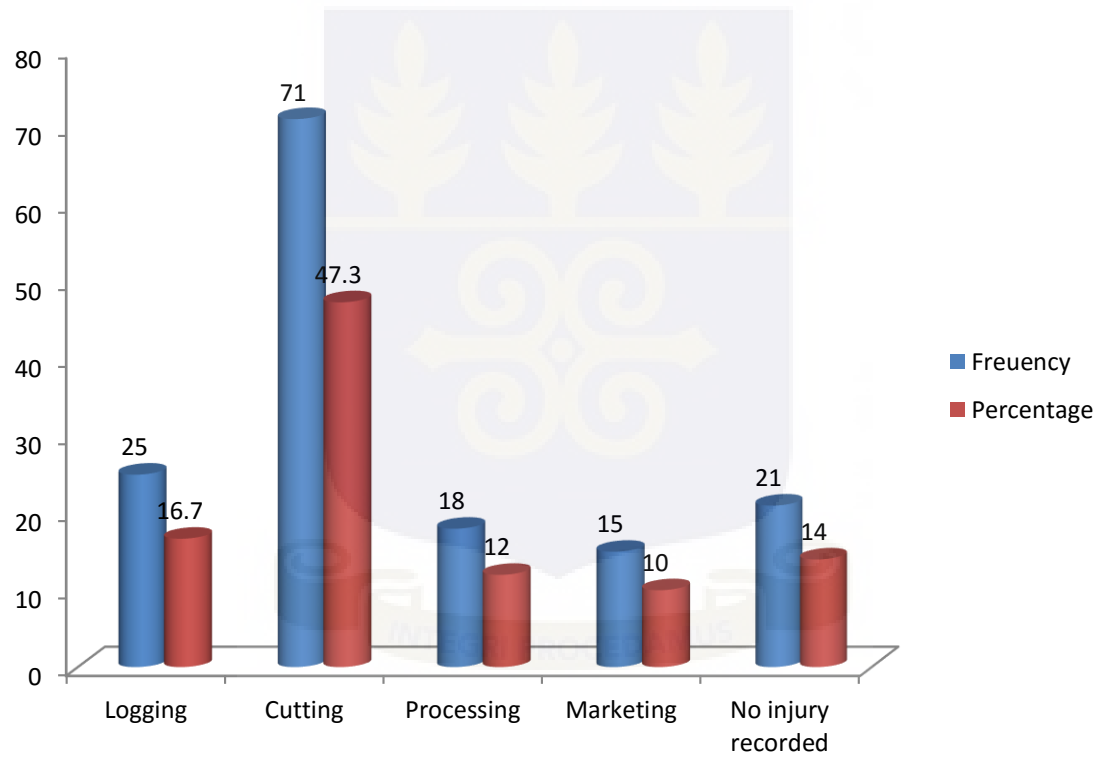

Figure 4.1: Job Category recording frequent injuries

4.3 Occupational safety standard guidelines used by sawmill workers

Table 4.3 below summarizes the results of the assessment of the availability and use of occupational safety standard guidelines among sawmill workers, nearly all (93.3%) of the workers confirmed the absence of safety protocols and manuals at the Agbogbloshie

Timber market while only 6.7% said that manuals and safety standards were available and being implemented .Also, more than half (62.7%) of respondents said an on-site health post was available to handle minor injuries. With respect to the use of personal protective equipment, 90.7% of workers never used gloves and overalls (90%) during work. Only 12% used goggles, 4.7% used face shields, and 12.7% workers used nose and mouth mask during work. In addition, workers who use earplugs were only 8.7%, and 2% ever used a head protection (helmet) during work. Furthermore, only 29.3% of trained professionals were available to operate machines, 66% confirmed electrical gargets were usually not switched off after working hours, but more than half (58.7%) the machines under use were repaired and maintained. A little over half (50.7%) of the workers periodically conditioned and maintained their cutting saw blades but more than half (58.7%) of them never repaired their worn-out chain saws and blades. Prevalence of occupational injury at the Timber market was 67.3%.

Table 4.3: Occupational safety standard guidelines used by sawmill workers

Attribute	Frequency		Percent	
	Yes	No	Yes	No
Safety protocols and manuals available	10	140	6.7	93.3
On-site health corner available to handle minor injuries	94	56	62.7	37.3
Safety manuals are implemented	10	140	6.7	93.3
Use gloves/mittens when working	14	136	9.3	90.7
Use overall when working	15	135	10	90
Use goggles when working	18	132	12	88
Use face shield when working	7	143	4.7	95.3
Use nose and mouth mask when working	19	131	12.7	87.3
Use earplugs or muffs when working	13	137	8.7	91.3
Use helmet when working	3	147	2	98
Occurrence of occupational injuries	101	49	67.3	32.7
Guards and fences are in place	18	132	12	88
Machines operated by trained personnel	44	106	29.3	70.7
Workers put off electrical gargets	99	51	66	34
Workers maintain and repair machines	88	48	58.7	32
Not applicable	14		9.3	
Saws are adequately conditioned	76	64	50.7	42.7
Not applicable	10		6.7	
Worn out chains and ropes are repaired	46	88	30.7	58.7
Not applicable	16		10.7	

4.4. Health seeking behavior of sawmill workers

Table 4.4 below, summarizes the results of the study to assess health seeking behavior among the saw mall workers. As shown,

In assessing the health seeking behavior of sawmill workers, only 25.3% of sawmill workers confirmed having a first aid available for minor injuries, 50.7% said a resident health professional was available to attend to injuries and emergencies, while 46.7% seek medical attention within the first 30 minutes after injury. However, 42.7% never sought medical attention, either due to no injury recorded or some other reasons. Among workers who never sought medical attention, 21% said they never recorded a severe injury and so did not need a medical attention while 11% were self-medicating during injury (not included on table). On general health assessment, 89.3% of workers were practicing self-medication, and majority (57.3%) of those who self-medicated were using pain killers like paracetamol, to treat minor ailments and injuries.in addition 22% relied on prescriptions by a pharmacies, while 8.7% used herbal medications for treatment of injuries. More than half (58%) of injuries that occur among workers go unreported to management and supervisors and as a result, only 36% of the worker said they have ever undergone periodic health screening initiated by management. Management provided health insurance for only 20.7%, but never provided incentives for 20.7% of workers when they were sick. 17.3% of the workers also confirmed management paid their hospital bills during injury. However, more than half (62%) of the workers said there were no incentives or other advantages available to them as workers. *Other details are presented on Table 4.4*

Table 4.4: Health seeking behavior of sawmill workers

Attribute	Frequency		Percent	
	Yes	No	Yes	No
First aid is available	38	112	25.3	74.7
Resident health professional to attend to injuries	76	74	50.7	49.3
Report injuries to superiors/managers	63	87	42	58
Self-treat or medicate	134	16	89.3	10.7
Officially have periodic health screening	54	96	36	64
Management provides health insurance	31	119	20.7	79.3
Other health advantages available to workers				
Incentives when sick	119	31	20.7	79.3
Paid hospital bills	124	26	17.3	82.7
No incentives	57	93	62.0	38
Seeks medical attention after injury				
Within the first 30 minutes	80	70	46.7	53.3
After an hour	134	16	10.7	89.3
Not at all	86	64	42.7	57.3
Medications used				
Pharmacy prescribed drug	117	33	22.0	78
Paracetamol/Pain killers	64	86	57.3	42.7
Herbal medication	137	13	8.7	91.3
Not applicable	132	18	12.0	88

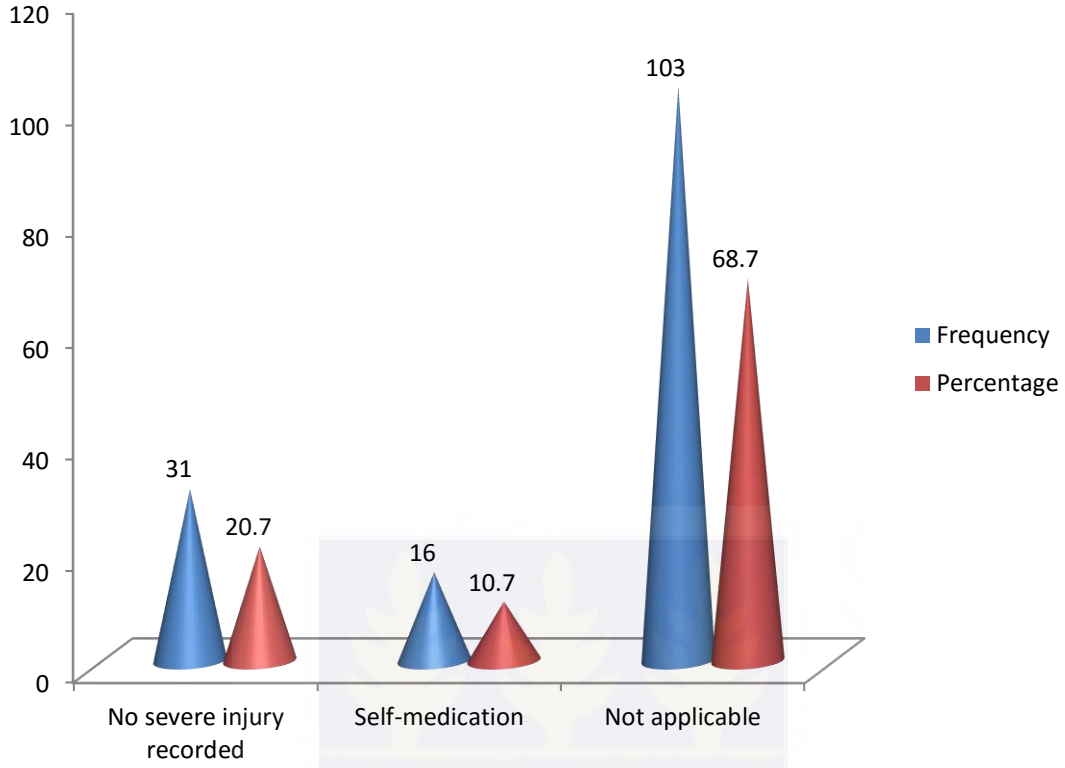

Figure 4.2: Reasons for not seeking medical attention

4.5. Associations between background characteristics and occupational injury

Table 4.5, below summarizes the results of respondents bi-variate analysis to determine the association between respondents' background demographic characteristics and occupational injuries. Background characteristics, such as respondents' age ($p<0.22$), marital status ($p<0.99$), their primary language ($p<0.11$), and respondents' religious affiliation ($P<0.72$) were all not significantly related to the occurrence of occupational injury. However, respondents' educational status ($P<0.02$), and their type of employment were significant to the occurrence of occupational injury.

Table 4.5: Bi-variate analysis of the Associations between background characteristics and occupational injury

	Occupational injury		P value
Attribute	**Yes Number (%)**	**No Number (%)**	
Age group (in years)			
15 – 19	7(100.0)	0(0.0)	.387
20-24	13(68.4)	6(31.0)	
25-29	13(56.5)	10(43.5)	
30- 34	18(66.7)	9(33.3)	
35- 39	15(71.4)	6(28.6)	
40-44	9(56.2)	7(43.8)	
45-49	12(70.6)	5(29.4)	
50-54	6(54.5)	5(45.5)	
55 and above	8(88.9)	1(11.1)	
Marital status			
Married	71(67)	35(33)	.886
Not married	30(68.2)	14(31.8)	
Level of education			
Tertiary	6(54.5)	5(45.5)	.213
Senior High	17(65.4)	9(34.6)	
Junior High	31(75.6)	10(24.4)	
Primary level	33(73.3)	12(26.7)	
Not educated	14(51.9)	13(48.1)	
Primary language			
Twi	46(70.8)	19(29.2)	.056
Ewe	18(81.8)	4(18.2)	
Ga/Adangbe	21(51.2)	20(48.8)	
Hausa	16(72.7)	6(27.3)	
Religious denomination			
Christian	83(69.2)	37(30.8)	.569
Muslim	16(61.5)	10(38.5)	
Traditional	2(50.0)	2(50.0)	
Type of employment			
Full time	90(64.7)	49(35.3)	.016
Part time	11(100.0)	0(0.0)	

4.6 Bi-varitate analysis of Occupational injuries among saw mail workers at each stage of Timber processing.

Table 4.6, summarizes the Bi-variate analysis of occupational injuries among participants at each stage of timber processing. Generally, the job category workers consider dangerous (P<0.35), the category of job recording frequent injuries (P<0.09), and the type of injuries easily recorded (P<0.14), were all not significant. In addition, the type of injuries experienced during wood cutting (P<0.22), whether workers easily get struck by falling objects (P<0.07) and the exposure of workers to sharp objects and hazardous chemicals (P<0.83), did not also have any significance with the occurrence of occupational injuries among sawmill workers. On the contrary, respondents' job category (P<0.02), their experience of breathing and respiratory challenges (P<0.02), and manual operation of machines (P<0.008) were significantly related to the occurrence of occupational injuries. (*Table 4.6)*

Table 4.6: Bi-variate analysis of occupational injuries among saw mill workers at each stage of the timber processing.

Attribute	Occupational injury		P value
	Yes Number (%)	No Number (%)	
Respondent's job category			
Cutting	53(69.7)	23(30.3)	.019
Processing	11(64.7)	6(35.3)	
Marketing	37(64.9)	20(35.1)	
Job category considered dangerous			
Wood-trimming	17(60.7)	11(39.3)	.348
Logging	34(82.9)	7(17.1)	
Cutting	39(58.2)	28(41.8)	
Marketing	11(78.6)	3(21.4)	
Job category recording frequent injuries			
Logging	15(60)	10(40)	.098
Cutting	40(56.3)	31(43.7)	
Processing	14(77.8)	4(22.2)	
Marketing	14(93.3)	1(6.7)	
No injury recorded	18(85.7)	3(14.3)	
Injuries easily record			
Shoulder/head injury	8(42.1)	11(57.9)	.137
Hand/leg injury	58(69)	26(31)	
Eye contact with Sawdust	7(100)	0(0.0)	
No injury recorded	28(70.0)	12(30.0)	
Injuries experienced during wood cutting			
Sawdust ingestion	9(64.3)	5(35.7)	.221
Hand injury	21(65.6)	11(34.4)	
No injury recorded	13(100)	0(0.0)	
Not applicable	58(63.7)	33(36.3)	
Experience breathing/respiratory challenges			
Yes	54(80.6)	13(19.4)	.017
No	47(56.6)	36(43.4)	
Work involved manual operation of equipment			
Yes	40(85.1)	7(14.9)	.008
No	61(59.2)	42(40)	
Easily get struck by falling object			
Yes	70(61.9)	43(38.1)	.065
No	31(83.8)	6(16.2)	
Exposed to sharp objects and hazardous chemicals			
Yes	50(64.9)	27(35.1)	.827
No	51(69.9)	51(30.1)	

4.7 Bi-variate analysis of the association between the availability and use of Occupational safety standard guidelines and occupational injury.

Table 4.7 below summarizes the association between the availability and use of occupational safety standard guideline and occurrence of occupational injuries.

Availability of safety protocols and manuals (P<0.46), the implementation of safety protocols (P<0.67), the use of gloves during work (P<0.29), and the use of overall (P<0.06) were all not significantly associated with the occurrence of occupational injuries among saw mail workers Also, the use of face shield during work (P<0.17), the use of nose and mouth mask (P<0.12), use of earplugs (P<0.36) and the use of head protector-helmet (P<0.39) also had no significance on the occurrence of occupational injury among workers. However, factors that were significantly associated with occupational injuries include the availability of an on-site health post to handle minor injuries (P<0.001), repair of worn-out chains saw (P<0.01) and the use of goggles during work (P<0.03), significantly influenced the occurrence of occupational injuries among workers. Similarly, the operation of machines by trained personnel (P<0.02), the maintenance of machines (P<0.02), and the maintenance of chain saw blades and ropes (P<0.01) were also significant.

Table 4.7: Occupational safety standard guidelines used and occupational injury (Bi-variate analysis)

	Occupational injury		P value
Attribute	**Yes Number (%)**	**No Number (%)**	
Safety protocols and manuals available			
Yes	8(80)	2(20)	.464
No	93(66.4)	47(33.6)	
On-site health corner available to handle minor injuries			
Yes	52(55.3)	42(44.7)	.001
No	49(87.5)	7(12.5)	
Safety manuals are implemented			
Yes	6(60)	4(40)	.673
No	95(67.9)	45(32.1)	
Use gloves/mittens when working			
Yes	12(85.7)	2(14.3)	.286
No	89(65.4)	47(34.6)	
Use overall when working			
Yes	15(100.0)	0(0.0)	.062
No	86(63.7)	49(36.3)	
Use goggles when working			
Yes	12(66.7)	6(33.3)	.033
No	89(67.4)	43(32.6)	
Use face shield when working			
Yes	7(100.0)	0(0.0)	.174
No	94(65.7)	49(34.3)	
Use nose and mouth mask when working			
Yes	17(89.5)	2(710.5)	.107
No	84(64.1)	47(35.9)	
Use earplugs or muffs when working			
Yes	11(84.6)	2(15.4)	.364
No	90(65.7)	47(34.3)	
Use helmet when working			
Yes	3(100.0)	0(0.0)	.397
No	98(66.7)	49(33.3)	
Guards and fences are in place			
Yes	14(77.8)	4(22.2)	.432
No	87(65.9)	45(34.1)	
Machines operated by trained personnel			
Yes	30(68.2)	14(31.8)	.018
No	71(67)	35(33)	

Table 4.7: (Continuation)

Attribute	Occupational injury Yes Number (%)	No Number (%)	P value
Workers put off electrical gargets			
Yes	72(72.7)	27(27.3)	.166
No	29(56.9)	22(43.1)	
Workers maintain and repair machines			
Yes	63(71.6)	25(28.4)	.014
No	32(66.7)	16(33.3)	
Not applicable	6(42.9)	8(57.1)	
Saws are adequately conditioned			
Yes	54(71.1)	22(28.9)	.191
No	43(67.2)	21(32.8)	
Not applicable	4(40.0)	6(60.0)	
Worn out chains and ropes are repaired			
Yes	39(84.8)	3236.4)	.007
No	56(63.6)	17(29.8)	
Not applicable	6(37.5)	10(62.5)	

4.8. Bi-variate analysis of the Associations between Health Seeking behavior and occupational injury among saw mail workers

Table 4.8 below summarizes the association between health seeking behavior and occupational injury, among sawmill workers as determined by bi-varite analysis of the results as shown in table 4.8.

The availability of first aid (P<0.51), seeking of medical attention by workers (P<0.50), refusal to seek medical attention (P<0.83), the type of medications used by workers (P<0.33), were all not significantly associated with prevalence of occupational injuries among saw mill workers Apart from this, the reporting of injuries to managers/supervisors (P<0.97), periodic health screening (P<0.58), and advantages available to workers (P<0.69) were also not significant. In determining the prevalence of occupational injuries among saw mail workers. . However, the provision of health insurance by management (P<0.04), self-medication (P<0.02), and the presence of a resident health professional (P<0.03), were significantly related to occupational injury.

Table 4.8: Associations between health seeking behavior and occupational injury (Bi-variate analysis)

	Occupational injury		P value
	Yes	No	
Attribute	**Number (%)**	**Number (%)**	
First aid is available			
Yes	28(73.7)	10(26.3)	.508
No	73(65.2)	39(34.8)	
Resident health professional to attend to injuries			
Yes	44(57.9)	32(42.1)	.026
No	57(77)	17(23)	
Seeks medical attention after injury			
Within the first 30 minutes	52(74.3)	18(25.7)	.504
After an hour	10(62.5)	6(37.5)	
Not at all	39(60.9)	25(39.1)	
Reasons for not seeking medical attention			
No severe injury recorded	21(67.7)	10(32.3)	.826
Self-medication	9(56.2)	7(43.8)	
Not applicable	71(68.9)	32(31.1)	
Self-treat or medicate			
Yes	91(67.9)	43(32.1)	.021
No	10(62.5)	6(37.5)	
Medications used			
Pharmacy prescribed drug	26(78.8)	7(21.2)	.328
Paracetamol/Pain killers	55(64)	31(36)	
Herbal medication	10(76.9)	3(23.1)	
Not applicable	10(55.6)	8(44.4)	
Report injuries to superiors/managers			
Yes	41(65.1)	22(34.9)	.971
No	60(69)	27(31)	
Officially have periodic health screening			
Yes	35(64.8)	19(35.2)	.577
No	66(68.8)	30(31.2)	
Management provides health insurance			
Yes	17(54.8)	14(45.2)	.038
No	84(70.6)	35(29.4)	
Other health advantages available to workers			
Incentives when sick	24(77.4)	7(22.6)	.686
Paid hospital bills	18(69.2)	8(30.8)	
No incentives	59(63.4)	34(36.6)	

4.9. Strength of association between the occurrence of occupational injuries and various determinants by multiple logistic regressions.

Table 4.9 below, summarizes the result of the determination of the strength of association between the Prevalence of occupational injuries among saw mill workers and various determinants. The model was built using all the significant variables from the simple logistic analysis, considering a significance level of P<0.05. As shown, the results suggest that workers who were not educated were two times more likely to experience occupational injury (OR 2.28, 95%Cl: 0.65-7.94) as compared to workers who were educated. Meanwhile, workers who worked part time (OR 0.03, 95%Cl: 0.04-0.07), and those whose job category was wood processing (OR 0.95, 95%Cl: 0.22-4.03) were both less likely to experience an occupational injury. Those who worked as marketing staff were however more likely to experience occupational injury (OR 1.34, 95%Cl: 0.51-3.49). Workers who never experienced breathing and respiratory challenges were three times more likely to experience an occupational injury (OR 3.19, 95%Cl: 1.19-8.51), while those whose work does not involve manual operation of machines were also four times more likely to experience the outcome (OR 4.43, 95%Cl: 1.38-14.12). Respondents who said there was no on-site health post to treat minor injuries were less likely associated with occupational injury (OR 0.17, 95%Cl: 0.05-0.55). The use of goggles during work was not a significant determinant of occupational injury but workers were still more likely to experience injury during work (OR 1.06, 95%Cl: 0.26-4.26). The operation of machines by untrained professionals (OR 1.22, 95%Cl: 0.45-3.32), and the non-maintenance of machines (OR 1.27, 95%Cl: 0.45-3.32), were both highly associated with the occurrence of injury. Also, workers' failure to repair worn-out chain saws was a significant determinant of the occurrence of occupational injury (OR 3.29, 95%Cl: 1.06-10.78). In addition, the absence of a resident health professional to treat minor injuries (OR 0.36,

95%Cl: 0.14-0.90) and the provision of health insurance by management (OR 0.42, 95%Cl: 0.14-1.27), were both less likely to determine the occurrence of occupational injuries. However, self-medication had a higher odd of influencing occupational injuries among workers (OR 1.74, 95%Cl: 0.47-6.51).

Table 4.9: Predictors of occupational injury (multiple logistic regressions)

Attribute	AOR	(95%	CI)
Level of education			
Educated	Ref.		
Not educated	2.279	.654	7.938
Type of employment			
Full time	Ref.		
Part time	.035	.044	.069
Respondent's job category			
Cutting	Ref.		
Processing	.950	.224	4.027
Marketing	1.340	.514	3.493
Experience breathing/respiratory challenges			
Yes	Ref		
No	3.193	1.199	8.507
Work involved manual operation of equipment			
Yes	Ref.		
No	4.427	1.388	14.118
On-site health corner available to handle minor injuries			
Yes	Ref.		
No	.172	.054	.549
Use goggles when working			
Yes	Ref.		
No	1.062	.264	4.264
Machines operated by trained personnel			
Yes	Ref.		
No	1.224	.452	3.316
Workers maintain and repair machines			
Yes	Ref.		
No	1.274	.478	3.393
Not applicable	4.718	.935	23.807
Worn out chains and ropes are repaired			
Yes	Ref.		
No	3.294	1.006	10.782
Not applicable	12.917	2.200	75.835
Resident health professional to attend to injuries			
Yes	Ref.		
No	.359	.143	.902
Self-treat or medicate			
Yes	Ref.		
No	1.740	.465	6.511
Management provides health insurance			
Yes	Ref.		
No	.424	.142	1.265

CHAPTER FIVE

DISCUSSION

5.0 Introduction

The aim of this study was to assess the occurrence of occupational injury among saw mill workers at a timber market in Accra, Ghana. Saw mill work at the timber market usually involves wood cutting, trimming, preservation and processing into finished products. All these processes are accompanied with injuries, sometimes leading to permanent disability. Even though studies on occupational injuries among saw mill workers have been conducts elsewhere, very few of such studies have been conducted in Ghana, which explains why there is little or no evidence on the health and safety performance of the saw mill industry in Ghana.

Characterizing occupational injuries among saw mill workers would provide evidence on the prevalence of injury and the types of injuries that occur at different stages of timber processing among saw mill workers. Also, it would increase awareness of the safety standards and practices and to observe them in order to prevent or minimize occupational injuries among them. Furthermore, this study would provide additional baseline data necessary for the formulation of policies to prevent occupational injuries among saw mill workers. Finally, the assessment of occupational injuries among saw mill workers would provide sufficient evidence that will positively influence policy towards minimizing the adverse effects of injuries on saw mill workers and augment existing scientific knowledge in the field of occupational injuries. In order to achieve these objectives therefore, questionnaires were administered to 150 saw mill workers at the Agbogbloshie timber market in Accra, to obtain information on the prevalence of occupational injuries, presence and use of safety standards and health seeking behavior among saw mill workers

5.1. Socio-demographic characteristics of participants

The study revealed that most of the workers at the timber market were of ages between 30 and 34. This finding is in contrast with results from other studies conducted elsewhere, where respondents of ages between 30 and 34 were the minority (Olaoye, Emechete, Onigbinde, & Mbada, 2016), while other reports also indicated that the larger percentage of saw mill workers and saw mill workers of ages between 20 to 30 years were the majority (Jilcha & Kitaw, 2016). In several countries, national and industrial policies that regulate employment age and labor force, sometimes lead to more employment among the younger generation, which could be the reason for age differentials in the labor market.

Also, the results indicated that most of the workers at the timber market were married. This observation was similar to the findings of other related studies (Aytac, 2015 ; Zare, Choobineh, & Keshavarzi, 2016 Adedeji & Nwosu, 2016), which also reported that the majority of saw mill workers were married. However, in spite of this agreement, observations from this study and earlier ones conducted elsewhere (Ma et al., 2015 ; Agbana, Alabi, Daikwo, & Olufunto, 2016 ; Vyas, Das, & Mehta, 2011), showed that there was no association between marital status and occupational injuries among saw mill workers.

Knowledge and practice of occupational safety can also be influenced by respondents' education on occupational health and safety. In line with this, studies conducted by Endroyo, Yuwono, & Mardapi, (2015), indicated that education and training are required to minimize occupational accidents among saw mill workers. Indeed, in support of this argument Tarlo and Frcp (2006) reported that level of education is a determinant of occupational injury are could therefore, be use to predict occupational asthma among workers. However, contrary to the observations made in these earlier studies, occupational injuries among saw mill workers, in this current study, were not found to be associated

with education, thereby corroborating the report by Kwankye, (2012). Considering the conflicting observations made in the various studies discussed in comparison to this present study, therefore, it could be suggested that perhaps, occupational injuries among saw mill workers could be associated with a variety of environmental factors which are interacting in synergy with one another to lead to the conditions.

5.2. Occupational injuries at each stage of the timber processing

Several factors contribute to the prevalence and difference in occupational injuries among saw mill workers which include the characteristics of the worker station of each saw mill worker with associate environmental hazards that could lead to injury.

As such, observations from this present study indicating a strong association between job category and work station among saw mill workers therefore work activities should be structured towards preventing occupational injuries by pairing staff with different job experiences and knowledge of occupational health and safety. Initiating tasks scheduling, (Yi, Maris and Shu-guang, 2014).

Another observation that was made from this present study in relation to job category and occupational injury is that saw mill workers involved in wood cutting, generally recorded the highest prevalence of injurie, particularly, to the hands compared to the other categories of saw mill worker. This finding confirms the reports by Frank et al. (2010) and Holcroft and Punnett, (2016) who explained that cutting of timber mostly involves manual handling of tools, timber and operation of machine, which exposes the hand to bruises, cuts. And other hazards associated with saw mill work, hence the highest prevalence of hand injury among them. Finally, the other most prevalent injury among the saw mill workers which was associated with the category of sawmill work in this present study, were breathing / respiratory challenges as reported by Holcroft and Punnett (2016) and Douves, Mchean and Pearce (2001). Timber processing is characterized by the release of

copious amounts of wood dust which could lead to respiratory exposure in the saw mill workers. Since the majority of the saw mill workers who participated in this study were not using personal protective equipment, including face masks, it is logical that most of them would have respiratory problems.

5.3. Availability and use of occupational safety standard manuals, protocols and personal protective equipment

This observation was proven by the availability of occupational safety manuals and protocols that spell out safety standard guidelines that must be followed in the course of timber processing is essential for preventing occupational injuries among saw mill workers. Therefore, the report by earlier writers (Zilcha and Kitaw,2017) that absence of safety manuals and protocols had contributed significantly to the occurrence of occupational injuries among saw mill workers was logical.in this present study, majority of the saw mill workers reported that they did not have safety manuals and protocols to guide them in standard operating procedures, therefore, it was not surprising that a high prevalence of occupational injuries was recorded among these workers. . However, the fact that there was lack of statistical association between the absence of safety standard protocols and manuals, on one hand, and the occurrence of injuries among this workers, on the other hands suggests that perhaps, other confounding factors were involved which have not been identified yet.

5.4. Health seeking behavior among saw mill workers

The availability and proper use of first aid at work place is considered an important factor in minimizing occupational injuries. Meanwhile, more than half of the workers at the timber market confirmed the absence of first aid services at the site. This finding agrees with studies conducted elsewhere by(Diwe et al., 2016), where safety manuals of protocols were absent. Contrary studies in populations like Iran indicate that almost all

wood saw mill workers as reported by several writers (Ulutasdemir, Kilic, Zeki, & Begendi, 2015), (Mitchual et al., 2015), , Kwankye, (2012) a majority of them were not using PPE during timber processing. It is therefore, highly probable that the prevalence of occupational injuries observed among these saw mill workers was partly contributed by their negligence to use PPE.

In addition, both this study and earlier research (Roelofs et al., 2011), however suggest that the availability and use of first aid is not a predictor of occupational injury. Findings from this study suggest that majority of the workers at the site were self-medicating during injury and this significant use of self-medication suggest injury as observed determined their experience of injuries. However, other findings state that most saw mill workers in Nigeria, sought health care from a chemist (Diwe et al., 2016), as compared to respondents use this study. Again, other researchers have given reasons such as inadequate income and or free health services as a prediction that individuals would engage in self-care practices including medication and intake of herbal concoctions (Agunbiade, 2015).

In this current study, provision of health insurance was not a factor that greatly influenced the prevalence of occupational injuries at the timber market, even though majority of workers were not provided with health insurance. Similar provisions elsewhere, also established a correlation between health insurance and reduction in occupational injuries (Woods, 2005). Other evidence suggested that investments into workplace wellness initiatives would make favorable impact on reducing work absenteeism and lost productivity (Janssen, Bacon, & Pickett, 2011).

Health seeking behavior involving the availability and prompt use of first aid services are important in preventing complications and death after occupational injury, however, a majority of the saw mill workers indicated that they did not have access to first aid after

injury. Even though this observation was similar to that made in an earlier study (Roelofs et al., 2011) it was not associated with occurrence of injury among the saw mill workers and therefore, could not be used to predict the occurrence of injury among them. Moreover, though most of the saw mill workers in this study indicated they did not use any first aid services they admitted doing self-medication in addition to visiting an on-site health post which are other forms of first aid after occupational injury. Since individuals who carry out rarely visit the health posts, it may be a reason why low utilization of heath service was observed among these saw mill workers.

Also since most people do self-medication to solve health problems, it is possible that the high incidence of self-medication observed among the saw mill workers occurred as a result of the high prevalence of injuries they had sustained.

The foregoing therefore suggest that in a bid to ensure occupational health and safety among these saw mill workers health promotion measure that must be instilled among should include health education, provision and use of occupational health and safety protocols, a supporting health care system and an effective health insurance and compensation as well as employee assistance programmes as reported by Harrison and Dawson, 2016.

5.5. Limitations of the study

The study had no control group to compare if the prevalence is different in a non-exposed group. Another limitation associated with this study is the possibility of recall bias, especially, as the injuries occurred before data collection, challenges with remembering the exact instance of injury could influence responses. Finally, the study did not clinically assess the health status of saw mill workers, as this could be a possible confounder.

CHAPTER SIX

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1. Conclusions

In conclusion, this study has successfully characterized occupational injuries among saw mill workers. It has shown that occupational injuries that occur among saw mill workers include head, hand and leg injuries which sometimes this work entirely lead to permanent disability. This study also suggests that workers in the wood cutting category experienced the highest prevalence of injuries. Furthermore, occupational health and safety manual and protocols that spell out standard operating procedures needed to guide the performance of the saw mill workers were not available, which had probably contributed to the high prevalence of injury recorded among these workers. In addition, the study revealed that majority of the saw mill workers were not using personal protective equipment, including face masks which could be a reason why a number of them had respiratory exposures of wood dust.

Finally, majority of the saw mill workers were not using proper first aid services, which are essential for preventing complications after injury. The results therefore show that the current occupational health and safety policy needs to be reviewed towards the safety of not only saw mill workers, but all workers in general.

6.2. Recommendations

Recommendations for Policy Makers

Based on the findings of the study, the following recommendations are made for consideration by policy makers and researchers, to improve the health and safety of sawmill workers.

1. Involvement of government and workers' unions in implementing programs, including health insurance, that protect individuals from occupational injuries may improve the occupational health in the country.
2. Enhanced health education is needed among saw mill workers to improve the use of personal protective equipment.
3. It is also recommended that government and saw mill managers set up a health taskforce that will ensure strict implementation and adherence to occupational safety policies and standards, especially at saw mill industries.
4. Modern saw mill machines that reduce manual operation and human contact should also be purchased and used at the wood cutting departments, considering that most injuries were recorded there.

Recommendations for Future Research

1. More in-depth qualitative and quantitative research is needed to provide solid evidence of adverse impacts of workplace injury exposure.
2. Future research should also consider extending occupational injury assessment to other saw mill sites in Ghana, in order to give a broader view of workers experience for better policy formulation.

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APPENDICES

Estimated budget for the survey of the characteristics of occupational injuries among sawmill workers at the Agbogbloshie timber market.

APPENDIX I: BUDGET

ITEM	Quantity	UNIT PRICE (GH Cedis)	TOTAL COST PRICE (GH CEDIS)
Principal Investigator	1 person / 15 days	50	750
Research Assistants	2 people / 15 days	25	750
Transportation	3 people / 15 days	15	675
Printing cost	85 questionnaires (estimated)	0.50p	42.50p
Stationery	5 pens, 5 pencils, and 5 erasers	0.50p	7.50p
Communication cost	3 people	20	60
Data entry cost	5 people / 85 questionnaires	3.00/questionnaire	255
Total Expenses			**2,540**
Miscellaneous @10%			**2,794**
Total			**5,334**

Budget Justification (*The following costs are estimates based on experience with costs from similar studies)*

This budget is the estimated cost of the research. It was estimated based on previous research that investigated occupational injuries among sawmill workers. The estimated budget enabled the study to investigate the occupational injuries occurring at each stage of the timber processing, health seeking behavior of sawmill workers and the safety standards and protocols used at saw mill located at the Agbogbloshie timber market. The study was managed by the researcher (**Abigail Agyei Brefo**) together with other co-principal investigators. This budget is not a duplication of previous budgets used by the same investigator, another individual or institution.

Transportation expenses: Considering that the study was done at a different location outside that of the investigators, transportation cost was ghc 675 for a total of three people.

Remuneration for research assistants: The study was managed by only one principal investigator, and two other co-investigators who received a total of ghc 1,500 for the entire research period.

Data entry: For the estimated number of questionnaire used for analysis, data entry clerks received a total of Ghc 255 for all entry.

Communication cost: telephone cost and network airtime cost was Ghc 60 for the entire period of the study.

Cost of stationery supplies: All items supplied for this study including pens, pencils, erasers, etc, were estimated, considering each item. Overall, the total estimated cost for all supplies was ghc 7.50p.

With regards **printing,** total cost of printing all survey instruments was Ghc 42.50

Miscellaneous: A 10 percent miscellaneous was added to cover up for non-expected expenses, giving a total of ghc 1990.

APPENDIX II: DATA COLLECTION TOOLS

SECTION 1: TO BE COMPLETED BY INTERVIEWER [for office use]

SECTION 1: TO BE COMPLETED BY INTERVIEWER [for office use]			
Q001	Questionnaire Number	☐☐☐	
Q002	Date of interview	..../..../..... dd/mm/yyyy	
Q003	Name of Interviewer	.....	
Q004	Language in which interview is conducted	English Waale Dagaari Twi Ewe Ga/Adangbe Nzema Others,specify.....	1 2 3 4 5 6 7

SECTION A: **SOCIO-DEMOGRAPHIC INFORMATION ON RESPONDENT**

NO.	QUESTIONS AND FILTERS	CODING CATEGORY	
Q1	How old are you? (Age in completed years)	☐☐	
Q2	What is your current marital Status?	Married Not Married	1 2
Q3	What is the highest level of education completed?	Primary Junior High Senior High Voc/Technical Tertiary	1 2 3 4
Q4	What is your mother tongue?	English Twi Ewe Dagaare Ga/Adangbe Hausa Nzema Others, specify.....	1 2 3 4 5 6 7 8
Q5	What is your religious denomination?	Christian Muslim Traditional Others.....	1 2 3 4
Q7	What is your type of employment?	Full time Part time	1 2

SECTION B: Occupational injuries at each stage of the timber processing

Q8	What is your work category?	Wood-trimming Logging Cutting Processing Marketing Machine repairs Painting/wood preservation Wood-waste disposal Others…… ……..	1 2 3 4 5 6 7 8 9
Q9	Which of the above category do you consider dangerous?	Wood-trimming Logging Cutting Processing Marketing Machine repairs Painting/wood preservation Wood-waste disposal Others…… ……..	1 2 3 4 5 6 7 8 9
Q10	Which of the categories do you record frequent injuries?	Wood-trimming Logging Cutting Processing Marketing Machine repairs Painting/wood preservation Wood-waste disposal Others…… ……..	1 2 3 4 5 6 7 8 9
Q11	What type of injury do you easily record?	…… …… …… ……	
Q12	What type of injury do you experience during wood-trimming?	…… …… …… ……	
Q13	What type of injury do you experience during wood logging?	…… …… …… ……	
Q14	What type of injury do you experience during wood cutting?	…… …… …… ……	

Q15	What type of injury do you experience during wood processing?	…… …… …… ……	
Q16	What type of injury do you experience during wood marketing?	…… …… …… ……	
Q17	What type of injury do you experience during machine repairs?	…… …… …… ……	
Q18	What type of injury do you experience during wood Painting/wood preservation?	…… …… …… ……	
Q19	What type of injury do you experience during wood-waste disposal?	…… …… …… ……	
Q20	Do you experience breathing/respiratory challenges?	Yes No	1 2
Q21	Does you work involve manual operation of equipment?	Yes No	1 2
Q22	Do you easily get struck by falling object?	Yes No	1 2
Q23	Are you exposed to sharp objects, hazardous chemicals or explosives?	Yes No	1 2

SECTION C: Occupational safety standard guidelines used by sawmill workers within the Timber market.

Safety protocols and standards

Q24	Do you have safety protocols and manuals for use?	Yes No	1 2
Q25	Do you have an on-site health corner available to handle minor injuries?	Yes No	1 2
Q26	Do you think these manuals are being implemented?	Yes No	1 2

Personal protective equipment

Q27	Do you wear gloves/mittens when working?	Yes No	1 2
Q28	Do you wear overall when working?	Yes No	1 2
Q29	Do you wear goggles when working?	Yes No	1 2
Q30	Do you wear face shield when working?	Yes No	1 2
Q31	Do you wear nose and mouth mask when working?	Yes No	1 2
Q32	Do you wear earplugs or ear muffs when working?	Yes No	1 2
Q33	Do you wear helmet when working?	Yes No	1 2

Machine and maintenance

Q34	Do you ensure that guards and fences are in place when working?	Yes No	1 2
Q35	Do you ensure that trained personnel operate the machines?	Yes No	1 2
Q36	Do you ensure that workers put off electrical gargets?	Yes No	1 2
Q37	Do you ensure that workers adhere to safety rules?	Yes No	1 2
Q38	Do you ensure that workers maintain and repair machines?	Yes No	1 2
Q39	Do you ensure that saws are adequately conditioned?	Yes No	1 2
Q40	Do you ensure that worn out chains and ropes?	Yes No	1 2

SECTION D: Health seeking behavior of sawmill workers

Q41	Do you have first aid available?	Yes No	1 2
Q42	Is there a resident health professional to attend to injuries?	Yes No	1 2
Q43	How long after an injury do you seek medical attention?	Within the first 30 minutes Within the first one hour After an hour Not at all	1 2 3 4
Q44	If you don't seek medical attentions, for what reason don't you?	…… …… …… …… ……	
Q45	Do you sometimes self-treat or medicate?	Yes No	1 2
Q46	If yes to **question 44**, what medications do you use? **If no, skip to Q46**	…… …… …… …… ……	
Q47	Do you report injuries to superiors/managers?	Yes No	1 2
Q48	Do you officially have periodic health check-ups and screening	Yes No	1 2
Q49	Are you covered by any health insurance by management?	Yes No	1 2
Q50	What other health advantages are available to you as a worker?	…… …… …… …… …….....	