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FACTORS ASSOCIATED WITH OCCUPATIONAL INJURIES AMONG SOLID WASTE COLLECTORS OF ZOOMLION GHANA LIMITED IN THE ACCRA METROPOLITAN ASSEMBLY

BY

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DECLARATION

I, Patrick Ephraim, declare that with the exception of the work of other individuals which have been properly recognized, this dissertation is the outcome of my own original study undertaken under supervision and that it has never been fully or partially submitted for another degree in this university or elsewhere.

PATRICK EPHRAIM

……

Date ……

Academic Supervisor:

DR. JUDITH KORYO STEPHENS

…….

Date…….

DEDICATION

This work is dedicated to my dearest mother of blessed memory, Paulina Bissue Ephraim, Ignatius and Adelaide Baidoo family, Mr. Eugiano Picco and the entire Ephraim family.

ACKNOWLEDGEMENT

I am very grateful to the Lord for his tender mercies and love toward me throughout my period as a student. I also sincerely appreciate Dr. Judith Koryo Stephens, my academic supervisor for her selfless effort and guidance towards the successfulness of this work. Much appreciation also goes to President Ignatius and Adelaide Baidoo for their love and support through this journey. I am also grateful to Mr. Eugiano Picco, Francisca Afeni and my family members for their financial support and encouragement. My heartfelt gratitude goes to the management and staff of Zoomlion, Ghana Limited, especially, Mr. Lokko and all the hardworking employees (all the Solid Waste Collectors) within the Accra Metropolitan Assembly who participated in the study. I also acknowledge the support I received from Mr. Richard Otwey, all other lovely friends and colleagues from the School of Public Health.

ABSTRACT

Background: Globally, occupational injuries account for 15% of mortalities associated with occupational accidents. The work of Solid Waste Collectors exposes them to numerous occupational hazards, which results in injuries. Increasing rates of occupational injuries from 43.7% to 63.9% among solid waste collectors in sub Saharan Africa opens room for more research to be done.

Objective: The study assessed the magnitude of occupational injuries and associated factors among solid waste collectors of Zoomlion Ghana Limited in the Accra Metropolis.

Methods: A cross-sectional quantitative study was carried out among the Solid waste collectors. Occupational injuries and its associated factors among the solid waste collectors was assessed using questionnaires. Multi stage sampling approach was used to select study participants. Data was collected through the administration of questionnaires. Bivariate and multivariable logistic regression was used to assess the association between the dependent and independent variables.

Results: In this study, 21.8 % (78/358), 95 % CI (0.1749 - 0.2608) among the Solid Waste Collectors reported having at least one work-related injury in the last six months. The factors that were significantly associated with at least one occupational injury among the solid waste collectors in the Accra Metropolis were Work duty (collection and transportation), the zone of assignment for respondents and lack of PPE use.

The result of the study demonstrated that cuts/puncture was the injury that was mostly sustained by the municipal solid waste workers while the leg was the body part that was mostly injured followed by the hands.

Working in the collection and transportation category and lack of PPE for use at work were significantly and positively associated with occupational injury among the solid waste collectors. Again, working in the La Dade Kotopon zone had reduced odds of sustaining injuries as compared to those in Ablekuma South zone.

Conclusion: This study showed that the prevalence of occupational injuries among municipal solid waste collectors in the Accra Metropolis was lower as compared to similar research conducted in Ethiopia, Egypt and India.

Keywords: Municipal, Occupational injuries, Solid waste collectors, Solid waste management.

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LIST OF ABBREVIATIONS

PPE Personal Protective Equipment

ILO International Labour Organization

SWC Solid Waste Collectors

SWM Solid Waste Management

MSWW Municipal Solid Waste Worker

SW Solid Waste

AMA Accra Metropolitan Assembly

WRI Work Related Injuries

SWM Solid Waste Management

EPA Environmental Protection Agency

PHS Periodic Health Surveillance

GDP Gross Domestic Product

UNEP United Nations Environmental Programme

OPERATIONAL DEFINITIONS OF TERMS

Hazard

A source of exposure to danger

Occupational hazard

Dangers associated with work that result in injury, illness or death

Occupational health

These are the health and safety activities ensured in the working environment, in order to prevent hazards and optimize employee performance and productivity.

Personal Protective Equipment

Any device or material worn or used by an individual to reduce threats to an individual's wellbeing. This includes a broad range of protective wears and devices.

Utilization of PPE

Wearing of PPE while at work

Collectors

This category of MSWWs are involved in collection of solid waste from the point of generation such as homes, market places, institutions, and putting them in compactor trucks.

Transporters

This category of MSWWs help in moving municipal solid waste from collection point to the disposal sites such as the landfill sites.

Sweepers

Sweepers involve in the gathering of solid waste by the use of brooms. Their work involves sweeping streets, markets, lorry stations, gutters, beaches and other public spaces such as dumping sites.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background of the Study

Municipal solid waste (MSW) comprises several kinds of waste such as unwanted food items, discarded papers, broken glasses, used plastic materials, rubbers and metals (Rushton, 2003). Unwanted paint containers and construction materials also form part of solid waste (Miezah et al., 2015). A wide variety of human activities result in the generation of household or municipal solid waste. Studies have indicated that about 55-80% of municipal solid waste is generated from household in developing countries. Commercial activities also account for 10–30% of while industrial, institutional, streets and other activities contribute to the remainder of solid waste (Nabegu, 2010, Nagabooshnam, 2011, Okot-Okumu, 2012).

Waste that is generated from commercial, industrial and household sources are made up of different matter (Valkenburg et al., 2008) and have varying physical features. Miezah et al. (2015) reported that the average waste generation per day in Ghana ranges from 0.2 to 0.8 kg/person irrespective of the person's social or economic status. Reports also indicate that several Sub-Saharan African cities including Accra have the same waste generation rate (Friedrich & Trois, 2011, UNEP, 2013). Previously, the Organization for Economic Cooperation and Development (OECD) reported an increased waste generation rate of 1.39 kg/person/day (OECD, 2010).

Management of municipal solid waste is a burden to urban governance in most developing countries due to the increasing rate of generation and the impact it has on the environment (Addaney & Oppong, 2015).

Solid waste management in Ghana includes storage, collection, transport and final disposal at landfill sites or sometimes to the waste recycling plant for recycling and composting (Boadi & Kuitunen, 2005). Also, with increasing technological advancement and industrial establishment in Ghana as a developing country, a compost and recycling plant has been established which also plays an important role in waste management in Ghana especially in the capital city, Accra.

The various Metropolitan, Municipal and District Assemblies or private waste management companies employ workers involved in waste management. The duties required of the solid waste workers are mainly sweeping the streets and public places where refuse has been indiscriminately disposed; collection of solid waste from households, communal dumping sites in less affluent areas, offices, commercial and industrial facilities; transporting and finally processing (recycling and composting) the waste before disposal.

Generally, solid waste is dumped or littered directly on the ground. Municipal solid waste workers then use broom to sweep and shovels to gather them in waste bins. In some cases, plastic bags or baskets are used to keep the waste and picking is done manually. With the help of a sack or pushcart, the waste collectors move the waste to collection points. The waste is then emptied into a refuse truck manually. The strenuous activity of Solid Waste management exposes the Solid Waste Collectors (SWC) to diverse forms of health hazards (Abd El-Wahab et al., 2014). Thus, although waste collection contributes greatly to human health by reducing exposure to the risk of several infectious diseases among communities,

the SWC are placed at a high risk for fatal and non-fatal occupational accidents (Kuijer & Frings-Dresen, 2004).

Work-related injuries (WRIs) and sicknesses are caused by several factors and remain one of the vital concerns of public health of which stakeholders need to pay attention to (Olorunnishola et al., 2010). For instance, Driscoll et al. (2005) reported on the global burden of occupational injuries and sicknesses among developing and developed regions. They found out that, the rates of occupational injury fatalities in the developing regions of the world was at least two to five times higher as compared to North America and Western Europe. The International Labour Organization (ILO) reported that 374 million accidents and diseases related to occupation occur every year (ILO, 2017). Globally, studies have shown an increased rate of work related deaths and injuries. Injuries related to work account for an approximated number of 3.4 million disabling injuries. On a daily basis, a fatal injury occurs every two (2) hours, which results in disabling injury every eight (8) hrs. (Gyekye, 2006; Wilkins & Mackenzie, 2007).

Work related accidents and injuries play a major role in human and economic cost. In 2007, the annual compensation cost for workers globally was $85 billion (Lund & Marriott, 2011). Approximately four percent (4%) of world's gross national product was lost due to occupational accidents and illness (ILO, 2017).

Work related injuries and illnesses are of global public health concern. The incidence rate varies by the type of occupation with the management of solid waste ranking sixth among the hazardous occupations with a rate of 35.5 per 100,000, after fishing whiles Loggers, Pilots and Flight Engineers, Iron and Steel Workers, Ranchers and Farmers follow in ascending order (Dan, 2012).

It is important for employers of municipal solid waste workers to encourage good health and safety of their staff by putting in place measures that will facilitate efficient and safe solid waste management. Engineering and administrative controls should be adopted in addition to the provision and use of personal protective equipment (PPE) (Konya et al., 2013). Job rotation among work components, employee salary increment, regular training on health and safety, job specific guideline in relation to maximum production limits, and provision of new and improved working equipment such as new bags and containers that can be wheeled are measures expected to reduce the burden of occupational injuries among SWC. Specific periodic health surveillance (PHS) is also required for solid waste workers to detect early signs of ailments associated with their work and to keep an eye on work ability (Eskezia, Aderaw, Ahmed, & Tadese, 2016).

This study seeks to determine the prevalence of occupational injury and its associated factors among municipal solid waste workers in the Accra Metropolis.

1.2 Problem Statement

According to the International Labour Organization (ILO), (Nenonen, Saarela, Takala, & Hamalainen, 2014), an estimated 2.3 million workers die as a result of 350 million occupational injuries each year. Workplace accidents lead to loss of about 4 percent of the world's Gross Domestic Product (GDP). Sub Saharan Africa records the greatest occurrence of occupational injuries followed by Asia (Olorunnishola et al., 2010). Economic and social growth may be hindered as a result of increased death and illness associated with work. Occupational injuries occur during solid waste management. Several studies such as have reported high prevalence of occupational injuries sustained by

Municipal Solid Waste Collectors in both Sub Saharan Africa and the Western world (Eskezia et al., 2016; Olorunnishola et al., 2010). Solid Waste Workers are working tirelessly to protect public health. Although waste collection has been contributing greatly to human health by reducing the risk of several infectious diseases, workers are at high risk of fatal and non- fatal injuries (Kuijer & Frings-Dresen, 2004). As observed by Jerie (2016), in many of the developing countries, municipal waste, which is a mixed bag of waste, is handled by workers with relatively low monthly earnings coupled with unimproved and limited protective equipment. In addition, their ignorance towards the risk involved in handling municipal solid waste results in incidence of high rate of occupational injuries. Ghana generates 12710 tons of solid waste daily (Miezah et al., (2015). There is a higher probability of having an increase in the quantity of the solid waste as far as the population increases.

In the developing countries, solid waste management leaves a lot of concern. This is due to the fact that a variety of manual tasks are employed in the collection of solid waste which exposes the workers to several hazards hence, employers and employees continue to be challenged with both injuries and illnesses (Bunn, 2011).

Scientific research on the health and safety of solid waste collectors have mostly focused on workers outside Ghana. Therefore, this research seeks to determine the burden of occupational injuries and its associated socio-demographic, behavioural factors as well as the working environment among solid waste collectors in Zoomlion Ghana Limited in the Accra Metropolitan Assembly. This study will also help to provide information that will be essential in formulation of policies on occupational health and safety precaution in Solid waste management.

1.3 Conceptual Framework

The Conceptual Framework illustrated by figure 1.1 shows that socio demographic factors, job related conditions and individual behavioural characteristics are some of the factors that lead to occupational injuries sustained by Solid Waste Collectors. The above factors may be direct or indirect causes of occupational injuries. The direct factors include Solid Waste Management activities, lack of Health and Safety training for Solid Waste Collectors, duration of exposure and also the availability, inadequacy and under-utilization of Personal Protective Equipment (Ahlijah, 2016). Individual behavioural characteristics such as sleep disturbances, job satisfaction, job related stress, substance use e.g. tobacco & alcohol also account for direct factors resulting in occupational injuries sustained by Solid Waste Collectors (Eskezia et al., 2016). Variables such as age, level of education, marital status are part of the indirect factors that account for occupational injuries (Bogale et al., 2014).

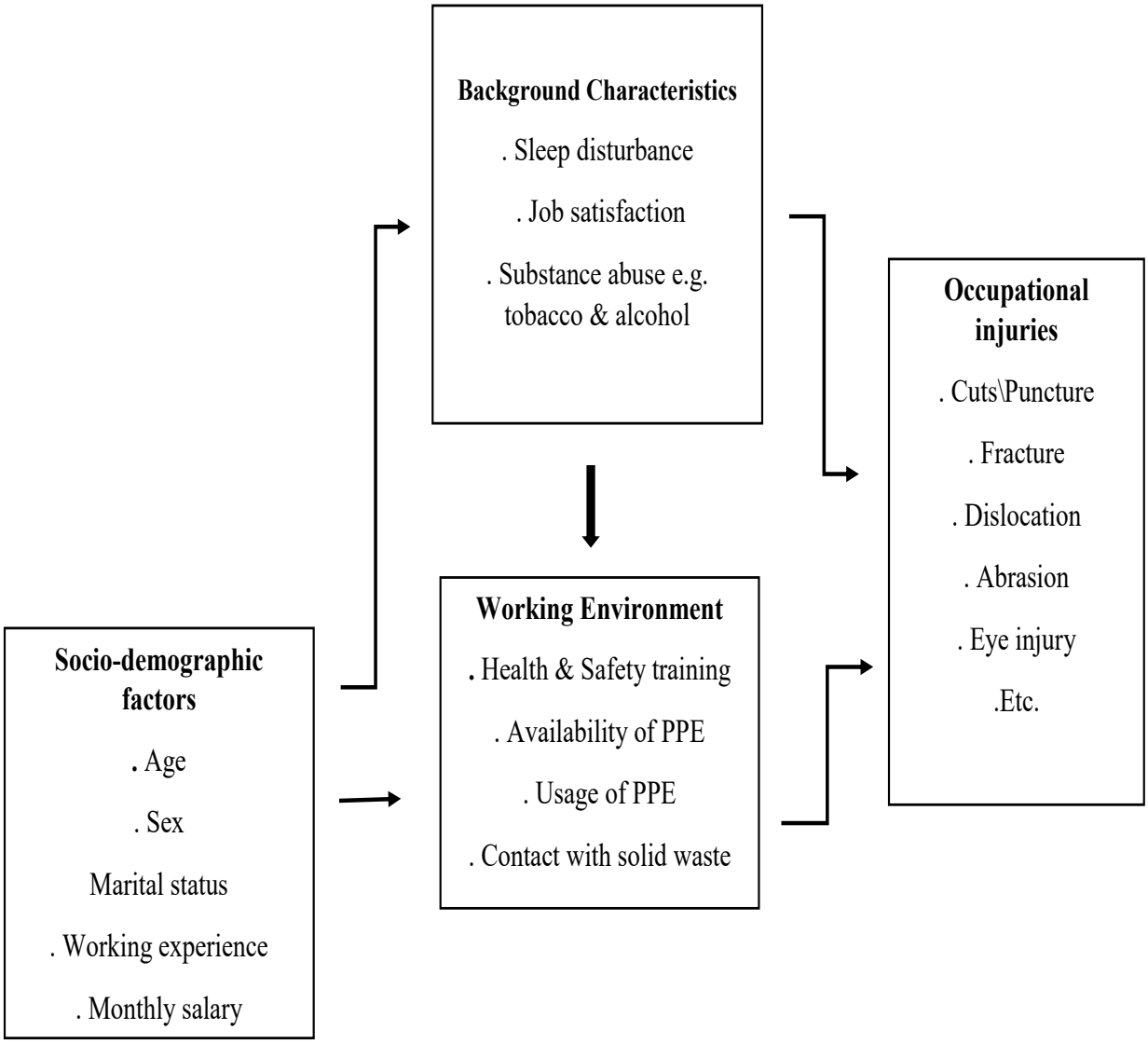

Figure 1.1: Conceptual framework for Occupational injuries and its associated factors among solid waste workers

1.4 Justification of the Study

The work of solid waste collectors is important in promoting good environmental health and economic development. Municipal solid waste workers of Zoomlion (MSWW) Ghana limited work tirelessly in the Accra metropolis ensuring an environment devoid of waste and its associated environmental impacts. They are prone to numerous occupational health

risks. This is due to their daily routine working activities which comprises lifting of heavy waste bins and repeated direct contacts with hazardous and infectious materials, which results in sustenance of injuries. Globally and locally, most of the employees of solid waste management companies tend to be people of low socioeconomic status, and thus lack the resources to protect their health (Wilson, Velis, & Cheeseman, 2006). Although, quite a number of studies have been done on the health conditions associated electronic waste (e-waste) management, there is limited information in relation to the health effect associated with MSWWs and their work.

There is a need for continuous research to provide essential information for policy makers to implement policies that will ensure healthy working environment for MSWWs. This is because MSWWs are exposed to myriad of occupational health hazards that are of concern to both environmentalists and government agencies both at the local and international levels.

Stakeholders, industries and policy makers may use the recommendations that will be made from this study to establish and implement reforms that will improve solid waste management and ensure that the health risks of Municipal Solid Waste Collectors (MSWWs) are minimized. Findings and recommendations from this study will perhaps be an essential information for Stakeholders such as the Ministry of Local Government, Ministry of Health, waste management companies, to formulate and implement policies that will result in improved solid waste management practices. This will lead to a minimization of the exposure of MSWWs to health risks.

Moreover, MSWWs, will benefit from this research in that, they will be informed about the numerous occupational injuries that are associated with their work. They will also come

to appreciate the need to comply with health and safety measures put in place by their employers. Implementation of safety measures will lead to good health status of the MSWWs, which result in an increase in productivity by reducing loss of person-hours and employee turnover. Reduction in cost of treating occupational injuries will also be ensured.

1.5 Research Questions

1. What is the prevalence of occupational injuries among solid waste collectors in the Accra Metropolis?

2. What behavioural characteristics among SWC result in injuries in the city of Accra?

3. What is the distribution of occupational injuries among SWC in Accra?

4. Are MSWWs in Accra compliant with the usage of PPE at work?

1.6 Study Objectives

1.6.1 General Objectives

To determine the prevalence of occupational injuries and associated factors among solid waste collectors of Zoomlion Ghana Limited in the Accra Metropolis.

1.6.2 Specific Objectives

To determine the distribution of occupational injuries sustained by the Solid Waste Collectors (SWC) of Zoomlion Ghana Limited in Accra metropolis.

To assess the usage of Personal Protective Equipment among SWC of Zoomlion Ghana Limited in the Accra metropolis.

To determine behavioural characteristics associated with injuries among SWC of Zoomlion Ghana Limited in the Accra metropolis.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Municipal Solid Waste

2.1.1 Background

According to Parvathamma, (2014), solid waste constitute unwanted or unneeded solid materials that result from activities which are residential, industrial and commercial in nature. In an ecological perspective, Kumar & Pandit, (2013) explained that solid waste comprises three categories, namely biodegradable, non-biodegradable and inert waste.

Solid waste can also be classified as domestic, industrial, commercial, construction or institutional based on its origin of generation. Again, based on the content of the waste, it can also be grouped as organic material, glass, metal and plastic. Other researchers classify waste based on it hazardous nature. In that regard, waste can be categorized into toxic, non-toxic, flammable, radioactive, infectious etc. (Festus & Omoboye, 2015).

Ziraba et al. (2016) also defined solid waste as unneeded and discarded solid materials that is generated from sources such as households, industries, healthcare, construction, agriculture, commercial, and institutions. They emphasized that solid waste that is generated from activities conducted in cities are often known as municipal solid waste.

Solid waste management is among the top environmental and public health concerns of every nation especially the developing countries. This is due to the fact that solid waste is known to have negative effects on environmental and human health if not well managed (Ziraba et al., 2016). Management of solid waste is essential to human health since the

materials that make up the waste could have negative effect on human health and the environment.

2.1.2 Generation of Municipal Solid Waste

Economic productivity and consumption result in the generation of municipal waste. The generation of waste has a close relation with urbanization or industrialization (Ziraba et al., 2016). Hoornweg & Bhada-Tata, (2012) observed that the rate at which urban solid waste is generated is faster than urbanization growth with a global urban resident population estimate of 3 billion with a waste generation rate of 1.2 kg/person/day in 2012. It is essential to say that solid waste is at high rates in urban areas than in rural areas. A study by Miezah et al. (2015) in Ghana affirmed this. Their study disclosed that Ghana generates 12,710 tonnes of waste daily with the majority of it coming from urban centres such as Kumasi, Accra, Tamale and Tema.

2.1.3 Composition of Municipal Solid Waste

Municipal solid waste result from diverse human activities hence its constituents also comprises plethora of materials. Organic and inorganic materials are the major categories of Solid waste. Putrescible, fermentable, and non-fermentable materials make up the organic components of solid waste. Putrescible waste consist of unneeded products that decompose fast. For instance, food items decompose very fast. Biodegradation of fermentable wastes is faster as compared to non-fermentable wastes which hardly break down due resistance to decomposition (Ziraba et al., 2016). Inorganic solid waste comprises objects such as plastics, metals and other non-decomposable materials (Ziraba et al., 2016). According to the United Nations Environmental Programme (UNEP) and

CalRecovery Inc., (2005) substances such as pesticides, medical waste, electrical waste, herbicides, fertilizers and paints constitute the hazardous component of MSW. They recommended that disposal of such waste must be done based on procedures authorised by Environmental Protection Agency (EPA). Mixing of such waste with general municipal waste is not a good practice due to their toxicity.

In comparison, organic matter forms greater percentage of the content of Solid waste generated in developing countries than that of developed countries (Ziraba et al, 2016). For instance, studies in Juba, South Sudan and Jimma, Ethiopia estimated that, organic matter formed 31 % and 54 % respectively by weight of all of the waste generated.

Miezah et al. (2015) asserted variation in the components of municipal solid waste across Ghana in a MSW characterization study, with the southern zones generating more than the northern zone. Their study again disclosed that, the organic content of the waste was 61%. Materials such as plastics, paper, metal and glass made up 16%, 5%, 3% and 3% of the waste respectively. The greater percentage of organic content pose a great concern for the management of the waste including recycling. Furthermore if not properly managed, it serves as a source of threat to the environment and human health (Ziraba et al., 2016).

2.1.4 Municipal Solid Waste Management

LeBlanc, (2018) defined solid waste management (SWM) as "the discipline associated with control of generation, storage, collection, transport or transfer, processing and disposal of solid waste materials in a way that best addresses the range of public health, conservation, economics, aesthetic, engineering and other environmental considerations".

He further emphasized that activities or procedures involved in SWM comprises administrative planning, financial, engineering and legal functions. Expertise knowledge from other disciplines is essential for the success of SWM. For instance, the role of experts such as public health

practitioners, city and regional planners, political scientists, geographers, sociologists, economists, communication and conservationists, demographers, engineers and material scientists is expedient in the successfulness of SWM. Yousuf & Rahman, (2007)observed that, "Many of the successful cases in waste management involved a wide range of stakeholders in their implementation".

There are variations in practices involved in solid waste management across different geographical locations. For example, difference in SWM activities can be observed between developed and developing countries and sometimes within a country (Getahun et al., 2012). The fundamental processes involved in solid waste management have been illustrated in Figure 2.1 below. These processes involve identification of items that are no longer usable and kept in waste bins, which facilitate easier collection. Collection and transportation of waste is carried out using waste collection vehicles to move waste from the point of collection to regional or municipal disposal sites. The waste is then processed to recover reusable or recyclable material or finally disposed of at locations such as landfills.

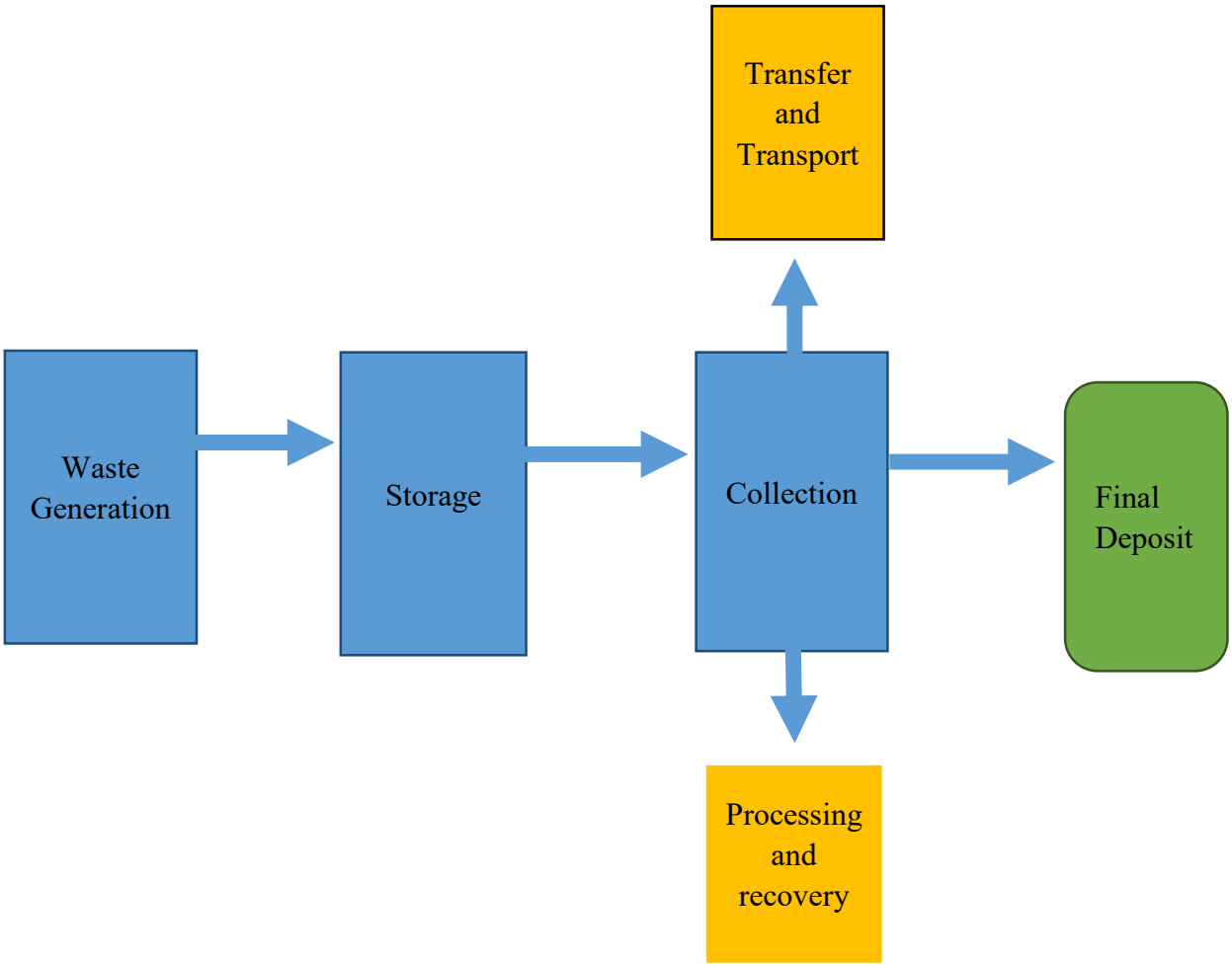

FIGURE 2.1: Fundamental processes involved in solid waste management

Across regions, countries and even within country, there are variations in practices involved in Solid waste management (Hoornweg & Bhada-Tata, 2012, UNEP, 2005). Solid waste management is undertaken with the aim of mitigating and eliminating negative impacts of waste materials on public health, enhance the development of the economy, and promote living conditions of life (LeBlanc, 2018). The aim of solid waste management is not achieved in most developing countries hence large quantities of waste is not re-used

but rather disposed of on open dumpsites or often burnt. This is due to the lack of the practice of waste sorting mostly at the point where waste is generated (Oguntoyinbo, 2012). Municipal authorities and private institutions are mostly responsible for solid waste management in most developing countries (Hoornweg & Bhada-Tata, 2012, UNEP and CalRecovery, 2005, NEMA, 2015).

In developed countries, the processes involved in waste management has been improved and carried out efficiently which has led to a reduction in occupational and environmental effects of SW (Bogale et. al 2014). For instance, Steiner et al. (2005) did not find any effects of occupational exposure of garbage and wastewater workers to bio-aerosols in prospective study conducted in Switzerland. They attributed the findings to good working conditions.

In developing countries like Ghana and many others, the situation is quite different; the waste is mostly collected at the point of generation or temporary dumping site. Final disposal of waste usually take place at open dump sites located at the outskirts of the city (Osibanjo & Nnorom, 2015). Some of the challenges that negatively affect effective waste management are unsuitable bin collection methods, uncoordinated collection schedule and poor route planning (Hazra & Goel, 2009).

Oduro-kwarteng & Dijk, (2013) reported that private waste management companies now collect more than 60% of SW in the major cities in Ghana. Zoomlion Ghana Limited is one of the leading private companies involved in Solid waste management in Ghana. More risk is added to the hazardous work of solid waste collectors as some individuals

indiscriminately dispose their waste at the street corners and in open drains, to be swept and collected by employees of waste management companies (Ahlijah, 2016).

2.2 Occupational Health Hazards of Solid Waste Collection

The line of duty of Solid waste collectors exposes them to a wide range of occupational health hazards. This is a global public health concern because the manner in which solid waste collectors handle the waste materials together with the physical effort exerted in handling the waste exposes them to the hazards (Bogale et al., 2014).

Again, the direct contact with bottles and metal containers containing residues of chemicals and pesticides and solvents, medical waste, devices containing heavy metals, and human faecal matter are some of the occupational risks associated with the work of the solid waste collectors (Sarkar, 2003).

As part of their work, waste collectors assume awkward working positions and engage in repetitive motion. Most of the times, their work involves manual handling together with forceful hand exertions. Their work sometimes requires them to work during early morning hours. This exposes them to dim lighting and rains as well. These factors potentially result in ergonomic issues among SWC (Englehardt et al., 2014).

There has been a significant reduction in occupational and environmental health impact due to improved working procedures employed in municipal solid waste management in the developed world. On the other hand, solid waste workers in developing countries still face high risk levels as a result of poor public health practice (Bogale et al., 2014). According to Sabde & Zodpey, (2008), solid waste collectors in low-income countries have low socio-economic status such as poverty, poor housing conditions and poor nutrition.

Such conditions also prevents them from seeking health care. They again stated that, this group of workers are exposed directly to municipal solid waste (MSW) and without adequate personal protection to protect them from hazardous substances. Studies such as Rushton, (2003) have observed that respiratory symptoms, irritation of the skin, nose and eyes, fatigue, headaches, psychological problems, allergies, musculoskeletal and dermal injuries are some of the health problems commonly experienced among these municipal solid waste collectors.

2.3 Occupational Injuries of Solid Waste Collectors

The work of municipal solid collectors often exposes them to hazardous components of waste like chemicals, sharp objects such as broken glass, poorly disposed surgical blades that they directly come into contact with. This is due to some improper practices in relation to solid waste management. Presence of sharp waste materials present a high risk of injury to both those who generate the waste and the collectors (Abd El-Wahab et al., 2014). Moreover, a study by Eskezia et al. (2016) also indicated that inexperience, low monthly income, history of job related stress, and sleeping disturbance were significantly and positively associated with severe occupational injuries among solid waste collectors.

A study on prevalence of occupational injuries among SWC by Bogale et al. (2014) reported an overall prevalence of 43.7%. They also reported that hands were the most part of the body that was injured with cuts being the most sustained injury followed by fall, abrasion, fracture, strain, dislocation, burn and others such as chemical splash and car and bicycle accident. In a study by Abd El-Wahab et al. (2014), there was a report of 46.5% and 32.7%, occurrence of accidents and needle stick injuries respectively among SWC. In

the same study, the solid waste collectors who sustained cut wounds reported that sharp objects such as disposable razors, broken glass, pins, sharp can lids, thorns, or broken tree limbs caused the cuts. The workers also said that loose needles and other sharp objects commonly protrude from ruptured garbage bags in the waste stream and puncture skin, when they handle them during the waste management activities.

2.4 Use of Personal Protection Equipment (PPE) among Solid Waste Collectors

Personal Protective Equipment (PPE) are clothes, barrier products or gadgets that are made specially and specifically to be used by workers to prevent injuries and workplace hazards or diseases that they may be exposed to as part of their work. Usage of personal protective equipment (PPE) is an essential basic component that help prevent or reduce the effects of occupational hazards (Konya et al.,2013)

The use of PPE play an important role in the life of workers. The American occupational safety and health administration (AOSHA) agency (1973), insist that employers protect employees from work place hazards that can result in life threatening injuries by the provision of PPE, and health and safety training as well. The accessibility and appropriate usage of protective equipment protects workers from occupational hazards. This is not always the case in low and middle income countries because PPE are always in short supply with diminutive supervision of their utilization (Bogale et. al., 2014). Solid waste collectors play a vital role in ensuring healthy environment, and hence, it essential for them to be protected from the plethora of health hazards associated with their work.

The Ghana's Labour Law states that "wherever workers are involved in any process involving exposure to any injurious or offensive substance or environment, effective

protective equipment shall be provided and maintained by employer for the use of the persons employed" (Labour Act, 2003).

Though PPE usage has been highly recommended, the rate at which MSWWs patronize them is very low (Abd El-Wahab et al., 2014). In a study to evaluate the use of PPE among workers of five refuse disposal companies in Port Harcourt, Nigeria, Konya et al. (2013) reported 28% compliance and 72% non-compliance. Unavailability and the discomfort that comes with PPE usage were some of the reasons for non-compliance. Kretchy et al. (2018) also reported that most users complained that, the wearing of PPE such as gloves and boots often resulted in dermatological problems because of hot and humid conditions they do experience within them.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study Design

A cross sectional quantitative study was used to determine the prevalence of occupational injuries and its associated factors among the solid waste collectors of Zoomlion Ghana Limited, a waste management company in the Accra Metropolitan Assembly. The study was carried out from May to July 2018. Questionnaire was used to obtain from the participants of the study.

3.2 Study Area

In the Greater Accra region of Ghana, there are sixteen (16) Metropolitan, Municipals and Districts. Among them is the Accra Metropolitan Assembly, which has Accra as its Administrative capital. The Accra Metropolitan Assembly shares common boundaries to the west with Ga West Ga South municipal, Ga central municipal assemblies. To the south, the metro shares boundary with the Gulf of Guinea and La-Dade Kotokpon municipal to the east.

According to the 2010 population and housing census, the metro is estimated to be the most populated district in the Greater Accra Region with a population of 1,665,086 comprising 800,935 males and 864,151 females. The estimated total household population is 1,559,914 (Ghana Statiscal Service, 2014).

The Accra metropolitan assembly has a waste generation rate of 0.72 kg/person/day and a total waste generation rate of 1552 population/tonnes (Miezah et al., 2015). About 59.4% of waste generated from households in the Accra Metropolis is collected from houses while about 33 % of the waste is disposed through public dumping (container). Only 1.1 percent

of households dump indiscriminately while 0.3 percent disposed their waste by burying. The methods of solid waste disposal in the Metropolis are the same as in the region (Ghana Statiscal Service, 2014). Figure 3.1 shows the various towns and cities which fall within the metropolis. It also shows the other districts in the Greater Accra region, which share boundaries with the metropolis.

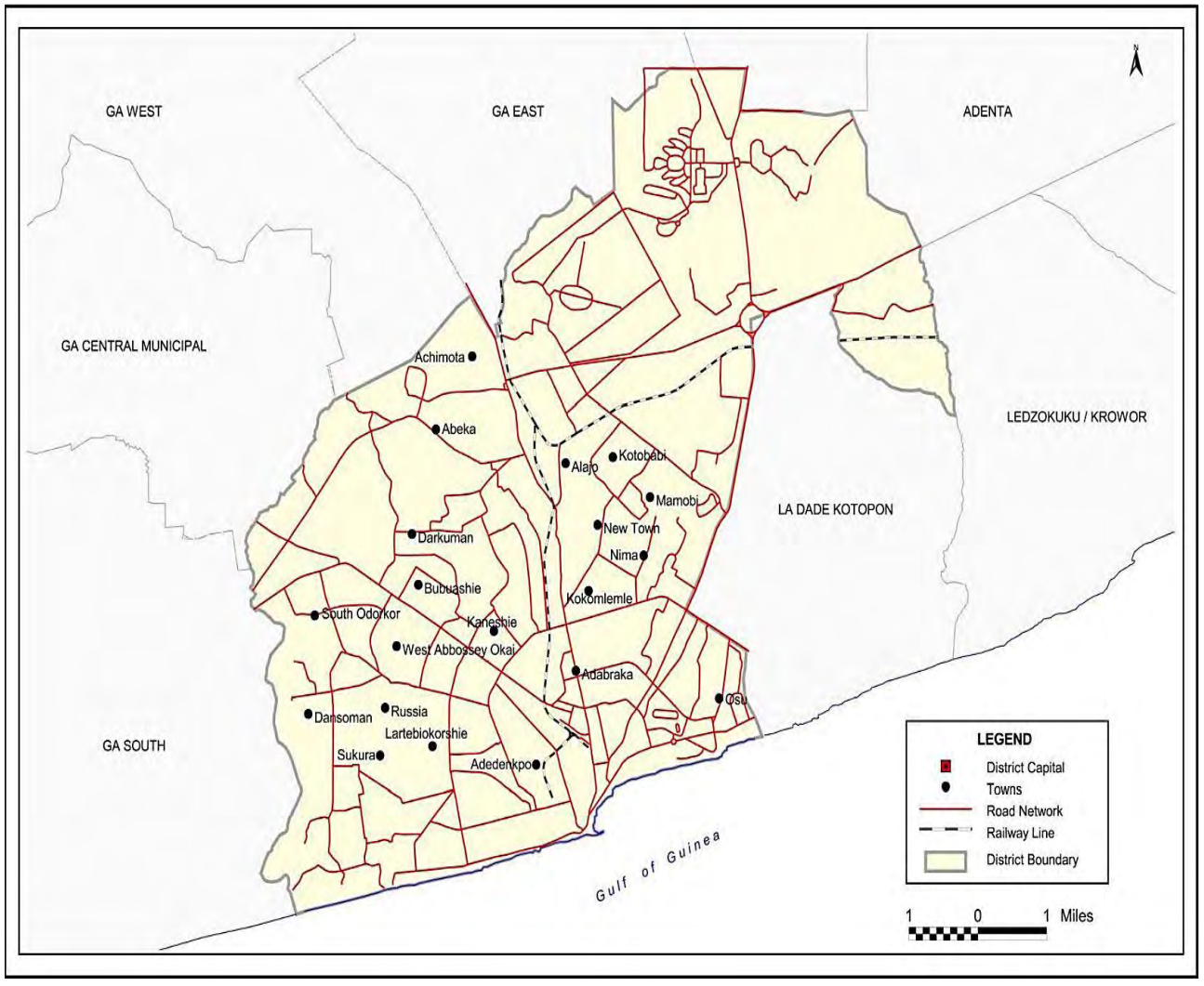

Figure 3.1: Map of the study area (source: Ghana statistical service, 2014)

3.3 Variables of Interest

Operational definitions

Occupational injuries: Work related physical damage to body tissues caused by accident or by exposure to environmental agent in the last six months in the working environment.

Working environment: This refers to the work related conditions experienced by workers as part of their work and the accompanying benefits of employment in the waste management company. These include:

Health and safety training: Whether workers receive health and safety training at the time of employment or periodic on the job training after appointment.

Job satisfaction: this was a subjective response for the participants to indicate if their work is enjoyable or not.

Job related stress: subjective response of the respondents if their work is stressful or not.

Availability of PPE: Provision of appropriate PPE (eye goggles, boots, gloves, nose mask) by the employer.

Use of PPE: use all PPE expected to be used for solid waste collection during working time.

Behavioural characteristics: This consists of individual's personal behavioural practices such as substance abuse

Substance use: use of alcohol and cigarette in the last six months.

Dependent variable -

- Occupational injuries: any work related injury including cuts, fracture, dislocation, abrasion, eye injury and ear injury.

Independent variables-

1. Working environment e.g. Health & Safety training, access and use of PPE, job related stress, job satisfaction
2. Behavioural characteristics e.g. substance use, sleep disturbances
3. Socio-demographic characteristics: age, sex, educational level, monthly salary, working experience.

3.4 Study Procedures

Permission was sought from the management of Zoomlion Ghana Limited, Accra zone for data collection. The data were collected over a 14 - day period among the five zones that were selected out of the eleven (11) zones in the metro using simple random technique. The zones included; Osu-Klottey, La Dade Kotopon, Teshie/Nungua, Ablekuma south and Ayawaso east zones.

Explanation of the study was made plainly to all the participants. The researcher and the two trained research assistants administered the questionnaires in the languages that were understood by each participant. The languages used for interviews were Ga, Twi, Ewe and Fante. The questionnaire was translated into these languages based on the type that was well understood by the participant after their consent had been sought. The participants answered questions in relation to socio demographic characteristics, behavioural characteristics, work environment and occupational related injuries, existing or a (6) month recall period, were recorded.

3.5 Study Population

"According to the Ghana Statistical service, the total population of the Accra Metropolitan Assembly in 2010 was estimated to be 1,665,086. Females constituted 51.9 percent while males formed 48.1 percent. About 12.4% of them were within the ages of 20-24 followed by the 25-29 age group (11.5%). In all the age groups, females constituted the higher proportion.

They further indicated that the total dependency ratio of the Metropolis is 48.5 with children (0-14) constituting 42.6.

About 47.0 percent (778,267) of the total population in the metropolis were migrants, which implies that they were born in other places either than the metropolis. In terms of marital status 49% of individuals from 12 years and above had never marry and 36 percent were married with the rest divorced, cohabiting or are widows/widowers. About 10.7 % of the married population had never had education while 49.9% have had basic education with 20.5 % of them having secondary education. The rest of them have had tertiary and other post-secondary education.

Their report also shows that out of the population 15 years and older in the Metropolis in 2010, 70.1 percent were economically active while 29.9 percent were economically not active. Out of the economically active population, 93% of them are employed with slightly more males (92.9%) than females (92.6%) employed in the Metropolis.

They also indicated that more than a third (38.5%) of the population of both sexes were engaged in service and sales work but females constituted more than half (52.5%) of the population engaged in service and sales. This is not surprising because traditionally such

occupations are associated with females. Higher proportions of males than females were engaged in craft and related trades (26.0%). Others are engaged in managerial duties, technical and associate professionals and clerical support works.

Concerning religious affiliation in the Accra Metropolis, the Christian population (Catholic, Protestant, Pentecostal/Charismatic and other Christians) was the dominant religion (78.7%) in the Metropolis followed by Islam (17.0%) while the least (0.3%) was Traditionalist" (Ghana Statistical Service, 2014).

3.6 Sample Population

The study population was the workers in the waste and sanitation department (sweepers, collectors, transporters) of Zoomlion Ghana Limited in the Accra Metropolitan Assembly.

5i3.6.1 Sampling Size Calculation

The Fisher's formula, ($n = Z^2 (p\ q)/d^2$) was used to calculate the sample size of this study. Where n = sample size, Z=Z value (e.g. 1.96 for 95% confidence interval); d= is the margin of error. By using prevalence of a study conducted in Northwest part of Ethiopia (Prevalence, P = 63.9 %), (Gizaw et al., 2012). Assuming a confidence interval of 95%, z=1.96 and a margin of error, d= 0.05, q=0.36. Ten (10) % non-response rate was also considered. A sample size of 389 was obtained.

$n = Z^2 (p\ q)/d^2$

$n = (1.96)^2(0.64)\ (0.36) / (0.05)^2$

$n = (3.8416)\ (0.64)\ (0.36) / (0.0025)$

$n= (3.8416)\ (0.2304) / (0.0025)$

n = 354.04

Therefore n = 354 but taking into consideration a non-response rate of 10%,

(10) / (100)* 354 = 35.4

n = 354+35.4

Therefore total sample size for the study, n = 389

3.6.2 Sampling Method

Zoomlion Ghana Limited in the Accra Metropolitan assembly is divided into eleven (11) zones. Participants for the study were selected using Multi stage sampling method. Each of the zones in the Metropolis was considered a stratum. Computer generated random sampling was used to select five (5) (strata) zones out of the eleven zones in the metropolis. The five zones or strata selected included Osu-Klottey, Teshie/Nungua, La Dade Kotopon, Ablekuma South and Ayawaso West. After that, proportion to size sampling was used to determine the number of respondents from each zone to be involved in the study. In each of the five (5) zones (clusters), names of the workers in the zones were listed and numbers were assigned to each employee. Computer generated simple random technique was used to select the participants based on the number that was used for the study in that particular zone.

Proportion to Size Sample calculation

Sample size n = 389

Total population of five Strata = 714

TABLE 3-1 PROPORTION TO SIZE SAMPLE SIZE OF THE VARIOUS ZONES

ZONES	POPULATION	PROPORTION TO SIZE	PROPORTION NEEDED FOR THE STUDY
La Dade Kotopon	145	(145/714)* (389)	79
Teshie- Nungua	150	(150/714)* (389)	82
Osu Klottey	140	(140/714)* (389)	76
Ayawaso west	114	(114/714)* (389)	62
Ablekuma South	165	(165/714)* (389)	90
TOTAL	714		389

3.7 Eligibility Criteria

All the workers under the waste and sanitation department who meet the inclusion criteria and agree to be part of the study.

3.7.1 Inclusion Criteria

Workers who are between the ages of 18-65 years and have been part of the company for more than six (6) months and agree to be involved in the study.

3.7.2 Exclusion Criteria

Workers who did not consent to participate in the study, less than six (6) months with the company, and those with serious illness (unresponsiveness) other than occupational injuries. The next worker on the list after the worker who was previously selected randomly but did not meet the eligibility criteria was chosen to be part of the study.

3.8 Data Collection, Tools and Technique

Data were collected by the administration of a questionnaire that was adapted from (Eskezia et al., 2016.

3.8.1 Questionnaire

The questionnaire comprised of four (4) parts: socio demographic factors (age, sex, place of residence, marital status, religion, educational status, monthly salary, work experience, form of medical bill payment). Injuries characteristics (occurrence of injury, number of injuries sustained by each participant within the six month period, types of injury, body part affected, working days lost due to injury, number of days the worker stayed home due to the injury, where the injury was treated and the number of days the injured worker was admitted in a health facility). Work environment (working hours, PPE availability, health and safety training, PPE usage, whether worker have had tetanus vaccination) and behavioural characteristics (alcohol intake and cigarette smoking).

3.8.2 Data Collection Technique

A cross sectional survey was used in collecting the data. The eleven zones within Accra Metropolitan were considered as strata. Computer generated simple random technique was used to select five zones out of the eleven zones. The five zones included Ablekuma South, Ayawaso West, La Dade Kotopon, Teshie/Nungua and Osu-Klottey. A proportion to size sample calculation was done to obtain the number of participants needed to participate in the study from each of the zones. Each of these of zones has a zonal head. Permission was obtained from the heads prior to data collection. This was done for zonal leaders and workers in the zone to be aware of the data collection that was to take place in their zones. Each zone has a specified day within the week that the workers meet after their duties.

Data collection at each zone was done on a day that coincided with the zone's meeting day. On the of the data collection, the list of names of workers in the zones were obtained and numbers were assigned to them. Computer generated simple random technique was used to select the participants for the study. The next worker on the list after the worker who was previously selected randomly but did not meet the eligibility criteria was chosen to be part of the study.

Data were collected using semi-structured questionnaire administered by the principal investigator as well the two research assistants. Interviews were done on individual basis and in privacy to ensure confidentiality. The questionnaire was prepared in English and translated to Ga, Twi, Ewe and Fante for most of the respondent who could not read and write. This helped the participants to understand the questions in their own language and to provide suitable answers.

3.9 Data Management

3.9.1 Data Processing and Analysis

Each questionnaire was coded to avoid double entry of data and to enhance verification. The principal investigator did data entry. Data were transferred from the questionnaire into Microsoft Excel software, 2013 and then exported to STATA software version 15.1 for analysis.

Descriptive statistics of the collected data was done for the variables in the study using statistical parameters: ranges, standard errors, means, standard deviation, percentages as well as p-values. The result was presented in frequency tables. Bivariate analysis was done to check variables that are associated with the dependent variable individually. Multivariable logistic regression was then used to analyse variables that were found to have association with the dependent variables.

3.10 Quality Control

Two research assistants were employed to help in the study. They were all trained before data collection and supervised during data collection. The training was on the purpose of the study, data collection technique and ethical issues to be observed during interviews with participants. The principal investigator was actively involved in data collection procedures and supervision as well. This was done to avoid deviation from the protocol. The rationale of the study was made known to the study participants. Each completed questionnaire was assigned a unique identification number to enhance easy retrieval of information. There was a pretesting of the questionnaire on 5% municipal solid waste collectors who met the inclusion criteria but residing on University of Ghana Campus. This place was chosen because it was outside the study site. Modifications were done on the

questionnaire based on the inputs from the pre - testing. Safety and confidentiality of the documents were ensured by keeping them in locked cabinet. Thorough check was ensured before, during and after entering the data in to computer for consistency purposes. The data were stored on an external hard drive and the principal investigator was the only person who had access to it.

3.11 Ethical Issues

Ethical clearance was sought from the Ghana Health Services Ethical Review Committee (GHSERC). The ethical identification approval number is GHS-ERC: 033/01/18. A letter of request was used to seek permission from the management of Zoomlion Ghana Limited, Accra for their employees to be used as the participants of the study.

Research assistants were trained on observing ethical protocols during interviews with participants to help minimize the violation of ethical laws. Again, the principal investigator as well as the research assistants were trained to be time conscious in order not to waste time during the interviews. Confidentiality was ensured during data collection and processing.

Before the participants took part in the study, the study purpose was made known to them. This was done through group discussions. Consent forms were translated to Ga, Ewe, Twi and Fante to enable the participants to understand their role in their study. Participants who agreed to be part of the study provided their consent by either appending their signature or thumbprint on the consent form to approve of their willingness to be part of the study. Interviews were done privately for confidentiality. In addition, names of the participants were not mentioned in any report that came out of the study.

The confidentiality of the data obtained from participants was ensured by keeping the completed questionnaire under key and locked to prevent unauthorized people from getting access to them. The data, which were entered into the computer (stored on hard drive), was password protected. Only the principal investigator had access to the key to the locker and the password. The data from the study was used only for academic and publication purposes.

Participants were given the option to drop out of the study at any point they wished to do so without prejudice. Respondents were not provided with any incentives for their time spent in answering the questionnaire. No conflict of interest is declared.

CHAPTER FOUR

4.0 RESULTS

4.1 Socio-demographic Characteristics of Study Participants

A total of three hundred and fifty-eight (358) municipal solid waste collectors of Zoomlion Ghana Limited took part in the study with a response rate of 92.0%. The Females accounted for a greater percentage of the respondents 88.6% (317/358). The mean age of the participants was 47.3 (±8.87) years. Concerning marital status, 44.7% (160/358) of the respondents were married. The educational levels ranged from the tertiary level to no formal education.

The highest educational level, the tertiary level, was represented by 0.6% (2/358) and most of the respondents 45.3% (162/358) have had education up to the Junior High School (JHS) level. Most of the respondents, 83.2% (298/358) have been with the company for more than 5 years. About 71.2% (255/358) paid their medical bills on their own (Table 4.1).

Table 4-1: Socio-Demographic Characteristics of Municipal Solid Waste Collectors of Zoomlion Ghana Limited in the Accra Metropolitan Assembly, Accra, 2018 (N=358)

Variable	Frequency	Percentage (%)
Sex		
Female	317	88.6
Male	41	11.5
Total	358	100
Age group		
> 30 years	344	96.1
≤ 30 years	14	3.9
Total	358	100
Residence		
Urban	200	55.9

Peri-urban	158	44.7
Total	358	100
Marital Status		
Married	160	44.7
Single	81	22.6
Widow/Widower	63	17.6
Divorced	43	12.0
Separated	11	3.1
Total	358	100
Religion		
Christian	328	91.9
Muslim	24	6.7
Other(s)	3	0.8
Traditionalist	2	0.6
Total	358	100
Educational Status		
Junior High School	162	45.3
Primary	94	26.3
No formal education	62	17.3
Senior High School	38	10.6
Tertiary	2	0.6
Total	358	100
Work Experience		
> 5 years	298	83.2
2 to 3 years	26	7.3
6 months to 1 year	19	5.3
4 to 5 years	15	4.2
Total	358	100
Monthly Salary		
100 Ghana Cedi	325	90.8
150 Ghana Cedi	33	9.2
Total	358	100

* Descriptive analysis

4.2 Work-related and behavioural characteristics

Majority of the Solid Waste Workers 83.0% (297/358) who participated in the study were involved in sweeping and collection of solid waste. About 45.5% (163/358) of the respondents indicated they work for 5 days per week while 45.3% (162/358) of them also

reported a working period of more than 5 days per week. A majority, 83.5% (299/358), reported that the company supplied them with Personal Protective Equipment (PPE).

Among the participants, 82.1% (294/358) responded that they sometimes used their PPE at work and reason for not using PPE all the time at work was lack of PPE, 56.7% (203/358). As high, as 93.9% (336/358) of them reported they received Occupational Health and Safety training prior to their employment while more than half of the respondents 77.7% (278/358) reported that they received periodic Occupational Health and safety training. About 93.3% (334/358) of them reported that they did not find their job enjoyable and most of them 73.2% (262/358) indicated that their work as solid waste collectors was stressful.

Majority of the respondents 83.8% (300/358) reported that they had difficulty with sleeping for the past six months. About 15.9% (57/358) and 0.8% (3/358) of them had a history of alcohol consumption and smoking cigarette in the last 6 months respectively (Table 4.2).

Table 4. 2: Work- related and behavioural characteristics of Municipal Solid Waste Workers of Zoomlion Ghana Limited in the Accra Metropolitan Assembly, Accra, 2018 (N = 358).

Variable	Frequency	Percentage (%)
Work duties		
Sweeping & Collection	297	83.0
Collection	24	6.7
Collection & Transporting	23	6.4
Sweeping	14	6.7
Total	358	100
Working days per week		
5 days	163	45.5
> 5 days	162	45.3

< 5 days	33	9.2
Total	358	100
Provision of PPE		
By Company	299	83.5
By employee	59	16.5
Total	358	100
Use of PPE at work		
Sometimes	294	82.1
Always	63	17.6
Never	1	0.3
Total	358	100
Reason for Non-use of PPE		
Lack of PPE	204	57.0
PPE not comfortable	154	43.0
Total	358	100
OHS Training before Employment		
Yes	336	93.9
No	22	6.2
Total	358	100
Periodic OHS training		
Yes	278	77.7
No	80	22.4
Total	358	100
Satisfied with work		
Yes	334	93.3
No	47	13.1
Total	358	100
Difficulty in sleeping		
Yes	300	83.8
No	58	16.2
Total	358	100
Work related Stress		
Yes	262	73.2
No	96	26.8
Total	358	100
Alcohol use		
No	301	84.1
Yes	57	15.9
Total	358	100
Cigarrete Use		

No	3	99.2
Yes	355	0.8
Total	358	100

* Descriptive analysis

4.3 Prevalence of occupational injuries

A total of 21.8% (78/358) with 95 % CI (0.1749, 0.2608) among Solid Waste Collectors reported having at least one work-related injury in the last six months. Out of the 78 who had injuries, 74.4% (59/78) were injured once while 24.4% (19/78) of them were injured twice or more. The highest number of occurrence of injuries was thrice in the last six months. The injuries ranged in severity from minor to severe injuries.

The most common injury among them was cut/puncture 55.1% (43/78) followed by dislocation 29.5% (23/78) and fracture 19.2% (15/78). Injuries of the leg accounted for 46.2% (36/78) followed by hands and finger 25.6% (20/78) and 18.0% (14/78) respectively. The source of injuries were mainly due to falls 39.8% (31/78) while sharp objects accounted for 24.4% (19/78) of the injuries. The rest were due to collision, falling objects, hand tool, lifting of heavy objects and snakebite. Loss of working days from the work-related injuries was reported to range from one to thirty days with 28.2% (22/78) losing less than 10 working days while 9.0% (7/78) lost more than 10 working days.

About half 52.6% (41/78) of the injuries were treated at a health facility out of which 80.5% (33/41) were treated and discharged as outpatients while 9.0% (7/41) of them were admitted for less than 10 days and 2.4% (1/41) was admitted for more than 10 days. The rest of the injuries 46.5% (36/78) and 1.3% (1/78) were treated at home and by herbalist

respectively. Fifty-three (68.0%) out the 78 of them who reported occupational injuries, had tetanus vaccination after the injuries. (Tables 4.3).

The common type of Occupational injury, which was sustained by the respondents who reported of occupational injuries within the past six months, was cuts (55.1%) followed by dislocation (29.5%), fracture (19.2%) and snake bite (Figure 4.1).

Table 4. 3: Prevalence of occupational injuries among municipal solid waste collectors of Zoomlion Ghana limited in the Accra metropolitan assembly, Accra.

Variable (%)	Frequency	Percentage
Occupational Injury		
Yes	78	21.8
No	280	78.2
Total	358	100
Frequency of Occupational injury (*n=78*)		
Number of times injury		
Once	59	75.6
Two or more times	19	24.4
Total	78	100
Body Part injured		
Leg	36	46.2
Hands	20	25.6
Finger	14	18.0
Back	7	8.7
Head	6	7.70
Knee	5	6.4
Toe	3	3.9
Total	78	100
Source of Injury		
Falls	31	39.7
Injured by sharp object	19	24.4
Collision	10	12.8

Hit by falling object	9	11.5
Injured by hand tool	5	6.4
Lifting heavy object	2	2.6
Snake bite	1	1.3
Fire	1	1.3
Total	78	100.00
Number of Working days lost		
Injured but no home stay	49	62.8
Injured but stayed home for <10 days	22	28.2
Injured and stayed home for >10 days	7	9.0
Total	78	100.00
Place of Injury treatment		
Health facility	41	52.6
Home	36	46.2
Herbalist	1	1.3
Total	78	100.00
Tetanus vaccination		
Yes	53	68.0
No	25	32.1
Total	78	100.00
Frequency of those treated at a health facility (*n*=41)		
Number of days of Admission		
Treated but no admission	33	80.5
Treated but admitted for <10 days	7	17.1
Treated and admitted for >10 days	1	2.4
Total	41	100.00

*Descriptive analysis

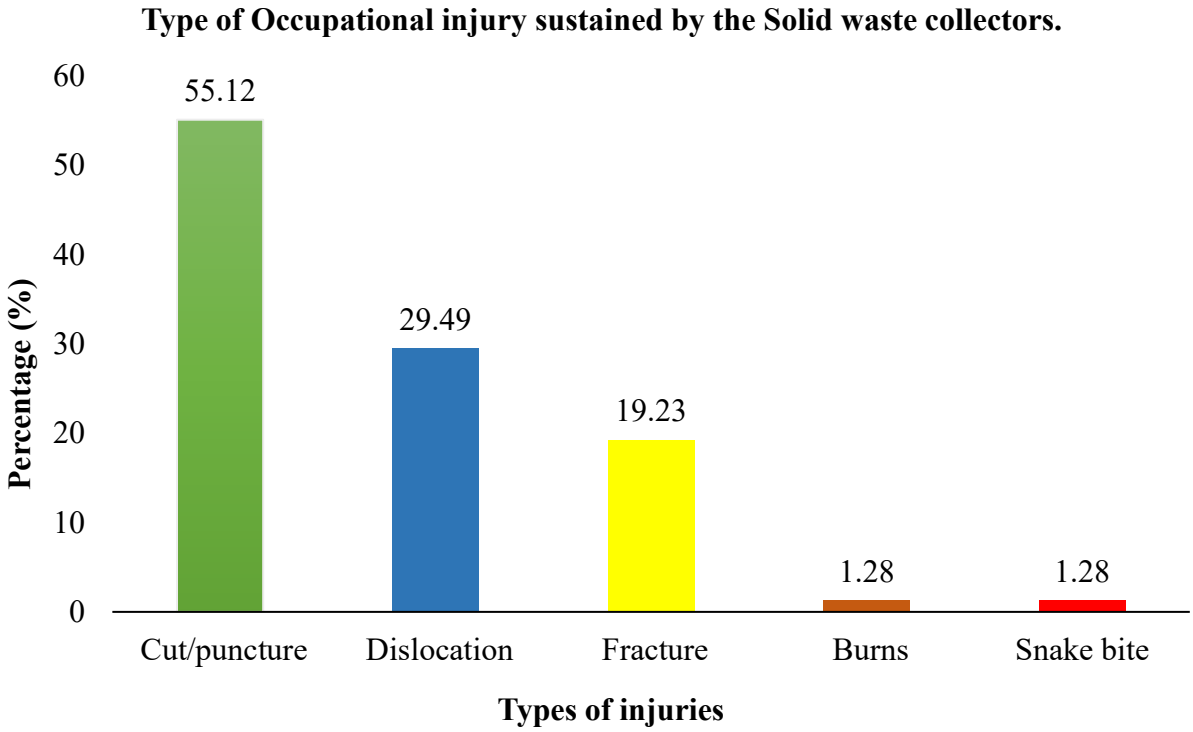

Figure 4.1: Type of occupational injuries sustained the Solid waste collectors.

4.4 Distribution of Occupational injuries among solid waste collectors

The proportion of male workers who reported occupational injuries was 0.21 (17/41) and that of females is 0.78 (61/317). The difference in proportions is significant, ($\chi^2 = 10.52$, $p < 0.01$). The age, marital status and educational level were not significantly associated with occupational injury.

Table 4. 4: Prevalence of Occupational injuries in the past 6 months by Sociodemographic factors among Solid Waste Collectors

	Occupational Injures			
Variable	**No (n=280) *n* (%)**	**Yes(n=78) *n* (%)**	**χ^2**	**p-value**
Sex				
Male	24(8.6)	17(21.8)	10.5192	0.001**
Female	256(91.4)	61(78.2)		
Age groups				
≤30	12(4.3)	2(2.6)	0.4812	0.488
>30	268(95.7)	76(97.4)		
Marital status				
Single	64(22.9)	17(21.8)	1.6055	0.808
Married	127(45.4)	33(42.3)		
Divorced	35(12.5)	8(10.3)		
Widow/Widower	46(16.4)	17(21.8)		
Separated	8(2.9)	3(3.9)		
Education level				
No formal education	48(17.1)	14(18.0)	1.784	0.881
Primary	71(25.4)	23(29.5)		
Junior High School	129(46.1)	33(42.3)		
Senior High School	30(10.7)	8(10.3)		
Tertiary	2(0.7)	0(0.0)		

Notes. *—significant, p < 0.05 **—significant, p < 0.01, N =358 * Chi square analysis

Occupational injuries were also significant among different work duties (p<0.01) than work experience as well as the zone of assignment (p < 0.01) while the number of working days per week was not significantly associated with occupational injuries (Table 4.5).

Table 4. 5: Prevalence of Occupational injuries in the past 6 months by working and behavioural factors among Solid Waste Collectors of Zoomlion Ghana Limited in the Accra Metropolitan Assembly, Accra.

	Occupational Injures			
Variable	**No (n=280) *n* (%)**	**Yes(n=78) *n* (%)**	**X^2**	**p-value**
Work Experience				
Six months to One year	17(6.1)	2(2.6)	2.8713	0.412
Two to three years	18(6.4)	8(10.3)		
Four to Five years	11(3.9)	4(5.1)		
More than 5 years	234(83.6)	64(82.1)		
Number of working days per week				
< 5 days (32 hrs)	26(9.3)	7(9.0)	0.0181	0.991
= 5 days (40 hrs)	127(43.4)	36(47.0)		
> 5 days (48hrs)	127(43.4)	35(44.9)		
Work duties				
Collection	22(7.9)	2(2.6)	25.1988	0.000**
Sweeping	13(4.6)	1(1.3)		
Collection & transportation	9(3.2)	14(18.0)		
Sweeping & collection	236(84.3)	61(78.2)		
Zone				
Ablekuma South	48(17.1)	31(39.74	33.5663	0.000**
Ayawaso West	46(16.4)	20(25.6)		
La Dade Kotopon	61(21.8)	5(6.4)		
Osu Klottey	60(21.4)	17(21.8)		
Teshie Nungua	65(23.2)	5(6.4)		
Use of PPE at work				
Sometimes	227(81.1)	67(23.9)	0.9678	0.325
Always	53(68.0)	11(14.1)		
Reason for Non-use of PPE				
Lack of PPE	148(52.9)	56(71.8)	8.9257	0.003**
PPE not comfortable	132(47.1)	22(28.2)		
OHS Training before Employment				
Yes	261(93.2)	75(96.2)	0.914	0.339
No	19(24.4)	3(3.9)		
Periodic OHS training				
Yes	207(73.9)	70(89.7)	8.7159	0.003**
No	73(19.0)	8(10.3)		

Satisfied with work				
Yes	16(5.7)	8(10.3)	2.0123	0.156
No	264(94.3)	70(89.7)		
Difficulty in sleeping				
Yes	228(81.4)	72(92.3)	5.3183	0.021*
No	52(18.6)	6(7.7)		
Work related Stress				
Yes	193(68.9)	69(88.5)	11.8604	0.001**
No	87(31.07)	9(11.54)		
Alcohol use				
No	239(85.4)	62(79.5)	1.5702	0.21
Yes	41(14.6)	16(20.5)		
Cigarrete Use				
No	278(99.3)	77(98.7)	2367	0.627
Yes	2(0.7)	1(1.3)		

Notes. *—significant, $p < 0.05$ **—significant, $p < 0.01$, N =358 * Chi square analysis

4.4 Factors associated with occupational injuries

4.4.1 Univariate Analysis

The association between predictor variables and occupational injuries was computed. In the univariate analysis, males were 2.97 times more likely to sustain an injury when compared to females (COR = 2.97 95 % CI: 1.50 - 5.87). Work duty was another variable, which was positively associated with occupational injury, those who were engaged in the collection and transporting of solid waste were 17.1 times more likely to be injured as compared to their counterparts (COR = 17.1 95 % CI: 3.21- 91.10).

The likelihood of occupational injury was found to be higher (COR =2.27 95% CI: 1.31, 3.91) among workers who reported lacking PPE. The odds of sustaining occupational injury was 3.45 times higher among respondents who reported worked stress (COR = 3.45 CI: 1.65 - 7.24) (Table 4.6).

4.4.2 Multivariable Analysis

In the multivariable analysis, work duty (collection and transportation), the zone of assignment for respondents and lack of PPE were significantly associated with occupational injury among solid waste collectors after adjusting for all other socio-demographic, work-related and behavioural factors. Among the respondents, those involved in collection and transportation were 8.5 times more likely to sustain an occupational injury (AOR= 8.5 95% CI: .34, 48.81) than those involved in other work duties. The likelihood of occupational injury was found to be 2.24 more likely to occur among respondents who reported lack of PPE (AOR =2.24 95% CI: 1.21, 4.17) (Table 4.6).

Table 4. 6: Factors associated with Occupational Injuries among Municipal Solid Waste Collectors of Zoomlion Ghana Limited in the Accra Metropolitan Assembly.

	Occupational Injures		Crude odd	Adjusted Odd
Variable	**No (n=280) *n* (%)**	**Yes(n=78) *n* (%)**	**Ratio with 95 CI**	**Ratio with 95 CI**
Sex				
Male	17	24	2.97(1.50,5.87)	2.2(0.50, 10.22)
Female	31	256	1	1
Work duties				
Collection & Transporting	14	9	17.1(3.21,91.10)	8.50(1.34, 48.81)*
Collection	2	22	1	1
Zone				
La Dade Kotopon	5	61	0.13(0.05,0.35)	0.16(0.05, 0.47)*
Teshie-Nungua	5	65	0.12(0.04,0.33)	0.31(0.06, 0.52)
Ayawaso West	46	20	0.67(0.33,1.35)	1.84(0.34, 1.55)
Osu Klottey	17	60	0.44(0.22, 0.89)	0.05(0.25,1.21)
Ablekuma South	31	20	1	1
Reason for no PPE use				
Lack of PPE	56	148	2.27(1.31,3.91)	2.24(1.21, 4.17)*
PPE not comfortable	22	132	1	1

Difficulty in Sleeping				
Yes	72	228	2.73(1.12,6.64)	2.16(0.82, 5.71)
No	6	52	1	1
Work Stress				
Yes	69	193	3.45(1.65,7.24)	1.30(0.55, 3.10)
No	9	87	1	1

Note: 1 = Reference * = p < 0.01 N = 358 * Simple logistic regression

4.5 Level of Personal Protective Equipment use.

4.5.1 PPE use by Solid waste collectors.

Some of the Personal Protective Equipment that were in possession by all the respondents were overcoats, safety boots, hand gloves and nose masks as shown in Figure 4.2. It also shows the proportions of Municipal Solid Waste Collectors who possessed PPEs as at the time of data collection and how often they use them.

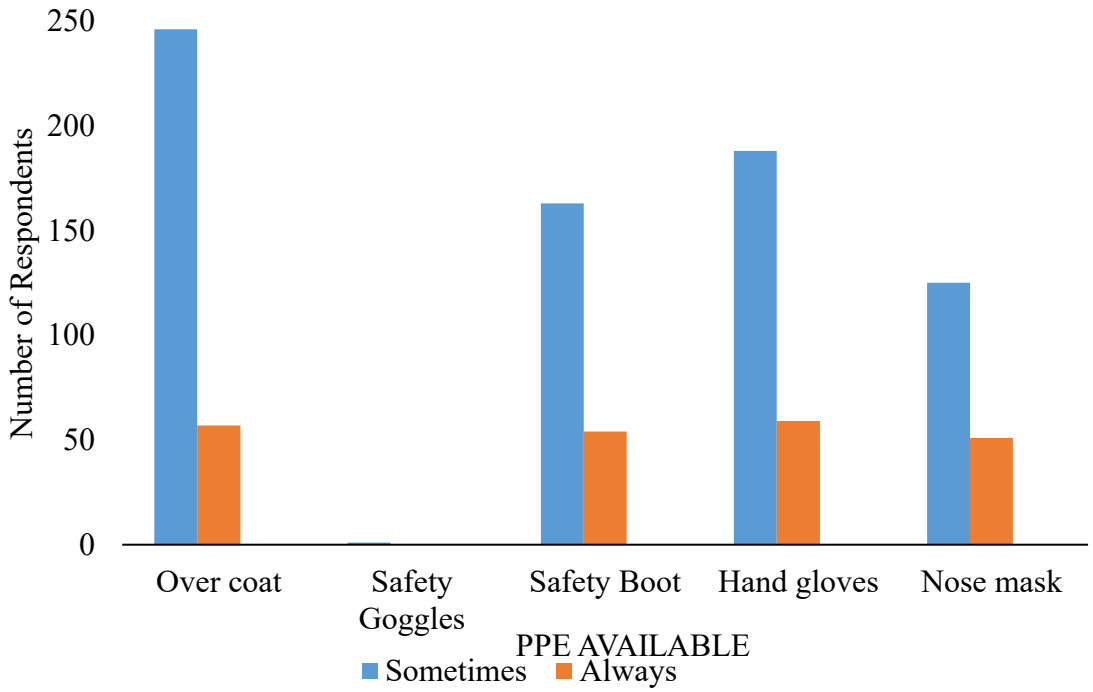

Figure 4.2: Personal Protective Equipment use by Municipal Solid Waste Workers

4.5.2 PPE available for use by different Categories of MSWWs.

The proportions of workers in each category of Solid Waste Collectors who reported the possession of PPE are shown in Table 4.7 below.

Table 4. 7: PPE Availability among different categories of Solid Waste Collectors of Zoomlion Ghana Limited in the Accra Metropolitan Assembly

	Collectors (n=24) n(%)	Sweepers (n=14) n(%)	Sweeping & Collecting (n=297) n(%)	Transporting (n=23) n(%)
PPE Available				
Over coat	23(95.83)	13(92.86)	251(84.51)	13(56.52)
Safety Goggles	0(0.00)	0(0.00)	0(0.00)	1(4.35)
Safety Boots	15(62.5)	10(71.43)	180(60.61)	13(56.52)
Hand gloves	18(75)	11(78.57)	201(67.68)	18(78.26)
Nose mask	11(45.83)	7(50)	147(49.49)	12(52.17)

*Descriptive analysis

4.5.3 PPE available for use by MSWWs

Personal Protective Equipment used among different categories of Solid Waste Collectors within the last six months are presented in Figure 4.3 below. In each of the categories, greater percentage of workers, Sweeping & Collection (83.2%), Collection & Transporting (78.3%), Collectors (75%) and Sweepers (71.4%) indicated that they sometimes used their PPE. In all 17.88% (64/358) of respondents indicated, they always use their PPE at work.

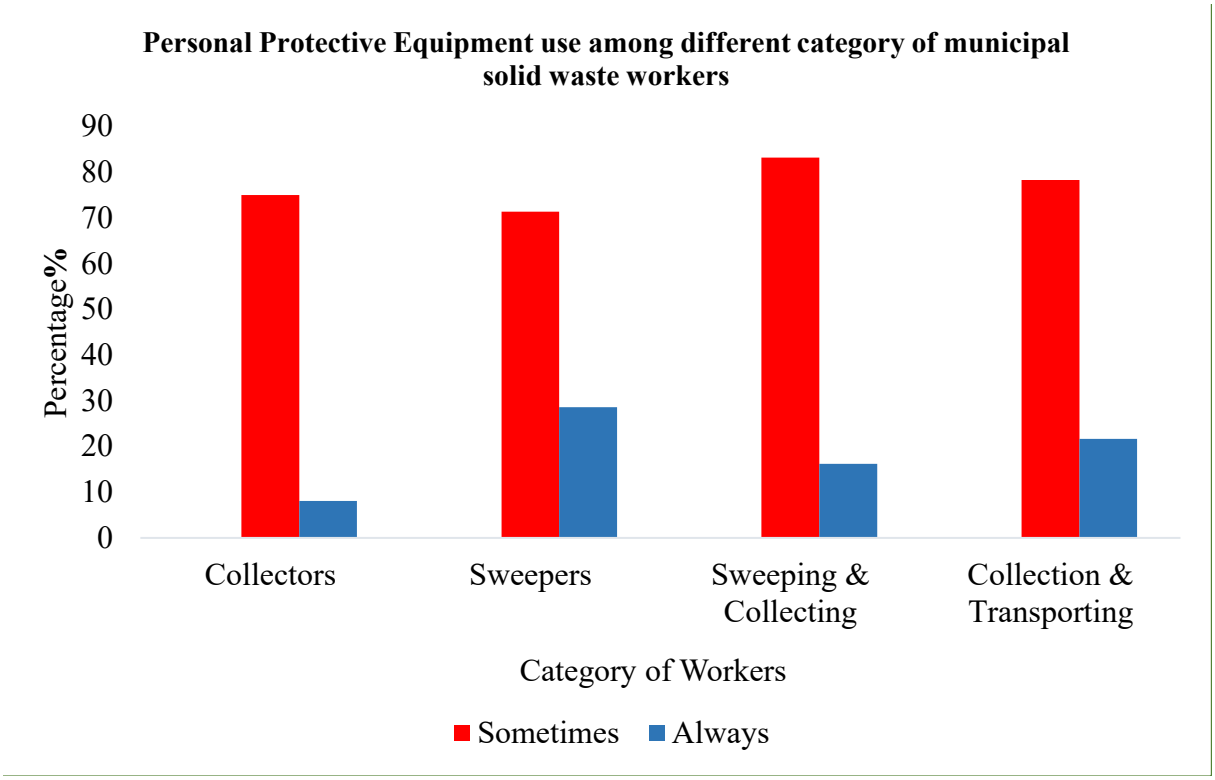

Figure 4.3: Personal Protective Equipment use among different categories of Municipal Solid Waste Workers

Table 4.8 below shows proportions of solid waste collectors who reported the use of personal protective equipment and occurrence of occupational injuries respectively.

Table 4. 8: PPE availability among Solid Waste Collectors by Occupational injury.

	Occupational Injures	
PPE AVAILABLE	**Yes (n=78)** ***n* (%)**	**No(n=280)** ***n* (%)**
Over Coat		
Yes	56(71.8)	247(88.2)
No	22(28.2)	33(11.8)
Total	78(100)	280(100)

Hand gloves		
Yes	54(69.2)	194(69.3)
No	24(30.8)	86(30.7)
Total	78(100)	280(100)
Nose Cover		
Yes	32(41.0)	145(51.8)
No	46(59.0)	135(48.2)
Total	78(100)	280(100)
Safety Boots		
Yes	45(57.7)	173(61.8)
No	33(42.3)	107(38.2)
Total	78(100)	280(100)
Eye goggles		
Yes	1(0.0)	0(0.0)
No	77(98.7)	280(100)
Total	78(100)	280(100)

*Descriptive analysis

CHAPTER FIVE

5.0 DISCUSSION

5.1 Socio-demographic Characteristics

The response rate for the study was 92.0% (358/389) comprising 88.6% (317/358) females and 11.5% (41/358) males. This is consistent with other studies conducted on solid waste collectors (Norman et al., 2013; Gizaw et al., 2014; Bogale et al., 2014; Eskezia et al., 2016). This finding could be attributed to the fact that most of the participants are of low education level which does not pave way for them to be employed in lucrative businesses hence resort to waste collection to earn a living (Huysman, 1995).

Forty five percent (45%) (162/358) of the respondents have had education up to the Junior High School level. Such a finding is similar with other studies, which showed that individuals involved in Solid waste collection are of very low level of formal education (Norman et al., 2013, Abd El-Wahab et al., 2014; Eskezia et al., 2016). Most of the participants (96%) were between the ages of 30 and 65 years. This is consistent with findings from similar studies conducted on solid waste collectors (Jayakrishnan et al., 2013; Gizaw et al., 2014; Bogale et al., 2014). This could be associated to the fact that old people involved in solid waste collection especially the sweepers and collectors may not be in the capacity to be employed in high labour intensive industries hence find themselves picking of waste to obtain income for daily living (Huysman, 1995).

5.2 Prevalence of Occupational injuries

The overall prevalence rate of occupational injuries within the last six months was 21.8% (78/358). However, the result from this study is lower as compared to similar studies conducted in and outside of Africa which reported occupational injury prevalence of 73.2%, 63.9%,43.7% and 33.4% respectively (Jayakrishnan et al., 2013; Bogale et al., 2014; Gizaw et al., 2014; Eskezia et al., 2016). The difference in the findings could be due to the fact most of the participants in this study have worked as Solid Waste Collectors for more than 6 years hence they have gained experience on hazards associated with their work and ways to avoid injuries. This is in accordance with other studies which have proven that more experienced waste collectors work safer hence reduced the occurrence of occupational injuries (Bunn et al., 2011; Eskezia et al., 2016).

About 74% (59/78) of the respondents who reported occupational injuries, indicated that they have had injuries once during the past six months from this study which is in line a study where majority of the workers reported one occupational injury within a period of six months (Bogale et al., 2014). However, in a study conducted by Eskezia et al. (2016) more than half of the participants reported occupational injury for more than one time.

The most common type of injuries recorded in this study were cut/puncture and fracture which is in line with most research works done in Africa and Europe which showed cuts, punctures and fractures as the most common injuries (Rushton, 2003; Gizaw et al., 2014; Bogale et al., 2014). This could be attributed to the nature of waste these workers have contact with which is mostly a mixture of a waste from several sources, which may contain sharp and slender objects. Again, the mode of waste collection which mostly involves manual handling together with dim lighting and rains due to early morning duties exposes them as well to the sharps and slender objects. (Englehardt et al., 2014).

The leg is the part of the body that was mostly injured accounting for 46% (36/78) of the injuries followed by hands and finger with 25% (20/78) and 17% (14/78) respectively. Similar studies conducted in Ethiopia also reported high percentages of injuries on the hands, legs, and finger (Bogale et al., 2014; Gizaw et al., 2014 Eskezia et al., 2016). This might be because most Solid Waste Collectors manually collect waste and put it into the sacks and trucks using their hands which increase the probability of cuts and abrasions at the hands and legs (Bogale et al., 2014). Also, Solid Waste Collectors especially those involved in the transportation usually use their legs to press the waste in tricycles to make it compact for easy transportation. The result of the study could also be due to lack or

underutilization of PPE by respondents as most of the respondents indicated they do not use PPE all the time because of lack of PPE or discomfort in using them. Again, most of the PPE used by the participant were below standard and not in good condition to effectively protect the workers from injuries.

Regarding the cause of injury, falls resulted in most 39% (31/78) of the occupational injuries followed by sharp objects and collision with 24% (19/78) and (12%) respectively.

Meanwhile, other studies such as Eskezia et al. (2016) and Rushton, (2003) have reported being struck by falling objects and injury by hand tools were the most common sources of injury. The difference in this finding could be due to the safety shoes that are worn by the study participants which most of them complained were uncomfortable to wear due to its weight and therefore they chose to wear slippers and canvas while at work. It may also be due to the use of other unsuitable and unimproved protective equipment such as gloves, overcoats and respirators for each job category (Gizaw et al., 2014).

Concerning the number of work days lost due to injury, 28% (22/78) of those who were injured stayed home for less than 10 days while 8.9% (7/78) of them stayed home for more than 10 days. A study indicated by (Yiha & Kumie, 2010) that the severity of an occupational injury is directly associated with number days lost from due to injury. Moreover, more than half (62%) of the workers who had injuries never stayed home due to injury. On the other hand, workers who lost more than 10 working days (73.8%) were more than those who lost less than 10 working days in a study conducted by Eskezia et al. (2016). This could be attributed to the fact that most of the injuries sustained by the participants in this study were minor injuries.

In this study, about 50% (41/78) of the injured respondents had their injuries treated at a health facility followed by 46% (36/78) who were treated at home. More than half 76.9 % (60/78) of the participants indicated they paid their own medical bills. This could explain why most of them preferred treating their injuries in the home due to the cost of health care services in Ghana.

5.3 Factors associated with occupational injuries

In this study, the occurrence of occupational injuries was significantly associated with the work category, which is collection and transportation of solid waste. This can be attributed to the fact that workers in this category are those involved in repeated heavy physical activities such as lifting and carrying of waste into trucks, and tricycles for transport to dump and landfill sites (Bogale et al., 2014). These workers are highly exposed to sharps and other hazardous agents and lack of the use of unimproved protective equipment results in the high occurrence of injuries among them. On the other hand, findings from other studies showed that occupational injuries are associated with work experience and work-related stress (Bunn et al., 2011; Aderaw et al., 2011; Eskezia et al., 2016).

Literature indicates that there is a strong relationship between the use of PPE and reduced work accident rates among solid waste collectors. This is because Personal Protective Equipment minimizes exposure to several hazards in the workplace (Konya et.al., 2013). This study also indicated that workers who lack Personal Protective Equipment were 2.24 times more likely to report occupational injury than workers who had PPE. This is consistent with findings from other studies (Bogale et al., 2014; Khalil & Milhem, 2004).

The risk of occupational injuries for workers who work within La Dade Kotopon zone was reduced by 84% as compared to those who work in Ablekuma South (AOR = 0.16, 95% CI: 0.06, 0.47).

These findings could be attributed to high alcohol consumption levels among workers in the Ablekuma South zone. The result of the study indicated that the odds of consuming alcohol for those in Ablekuma South is 1.3 times higher than those in La Dade Kotopon zone. Several literature on occupational injuries and associated factors found alcohol consumption to be positively associated with the occurrence of injuries among workers (Chau et al., 2004; Nakata et al., 2006; Pezzullo & Crook, 2004; Tadesse & Kumie, 2007).

5.4 PPE availability and use among Municipal Solid Waste Workers

The availability and consistent use of PPE help to minimize exposure to several health hazards that Solid Waste Collectors are exposed to (Ahlijah, 2016). In Zoomlion Ghana Limited, the management supplies solid waste collectors with hand gloves and nose mask every quarter. The supply of overcoats and safety boots is done twice a year. The supply of PPE to the workers is independent of the type of duty of the workers.

In this study, about 83% (299/358) of the workers indicated receiving PPE from the company while 16% (59/358) of them reported purchasing their PPE themselves. The purchase of the PPE by the workers themselves was because of the delay in supply of PPE as well as the discomfort associated with the use of some of the PPE such as safety boots, hand gloves and nose covers.

Most of the workers reported having in possession almost all the PPE needed for their line of duty. Majority 84.6% (303/358) of the respondents reported having overcoat followed by hand gloves 69.7% (248/358); safety boots 60.9% (218/358) and nose mask 49.4% (177/358). With the exception of one person, no other respondent reported possessing safety goggles. Most of the workers indicated they did not have safety goggles because management no longer supplies them. The use of goggles is essential for some of the workers especially those involved in collection and transportation as it could be a source of protection against eye injury. The participant who reported using safety googles is a tricycle rider (who is involved in collection and transportation) hence, the goggles protect the eye from particulate matter and other occupational hazards.

This finding is similar to report from studies conducted in Accra and Egypt (Ahlijah, 2016; Abd El-Wahab et al., 2014). Even though respondents had these PPE in possession most of them were not in suitable condition to protect the workers from hazards associated with solid waste collection. This could be attributed to the period used in supplying PPE for the workers. Most of the workers complained about using most of their PPE over a long period because the time allocated by management for the supply of PPE is not functional.

Regarding the use of PPE at work, about 82% (294/358) of them reported using their PPE sometimes at work while 17% (64/358) indicated they use their PPE all the time while on duty. However, a research conducted in Ethiopia reported that about 77% of the participants reported using their PPE all the time at work (Bogale et al., 2014). The reasons for non-use of PPE in this study was lack of PPE 56.9% (218/358) and PPE not comfortable 43.0% (154/358).

About 43% of the respondents complained about discomfort in the use of certain PPE such as safety boots, hand gloves, and nose covers because these items are either old, unimproved or heavy to use. The company does not measure workers for suitability before purchase and supply of PPE. This mostly resulted in the supply of oversized boots, overcoats, and hand gloves.

Out of those who had cut/puncture, 30% (13/43) were injured on the finger while 25% (11/43) of them had injuries on the hand. About 42.3% (33/43) of those who had cut/puncture used hand gloves. This finding could be explained by the fact that the hand gloves were not suitable enough to protect the worker from sharp or pointed objects.

About 44.18% (19/43) of the injuries that occurred on the leg were cut/puncture and 53.5% (23/43) of the workers who had cuts or puncture used safety boots. Most participants reported that safety shoes supplied by the company were very heavy making it uncomfortable for use at all the time. As a result, many of the workers especially the females usually used slippers or shoes that were not protective enough against occupational hazards hence the high occurrence of injuries on the leg.

CHAPTER SIX

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

1. This study showed that the prevalence of occupational injuries among municipal solid waste collectors in the Accra Metropolis was lower as compared to similar research conducted in Ethiopia, Egypt and India.

2. Working in the collection and transportation category as a solid waste worker, lack of PPE for use at work were significantly and positively associated with at least one occupational injury among the solid waste collectors. Again, zone of assignment was associated with occupational injuries, as working in La Dade Kotopon zone had reduced odds of sustaining injuries as compared to those in Ablekuma South zone.

3. The result of the study demonstrated that cuts/puncture was the injury that was mostly sustained by municipal solid waste workers while the leg was the body part that was mostly injured followed by the hands.

4. Report from the study indicated that majority of the workers had access to some of the basic PPE needed for solid waste collection. However, most of them do not always use all PPE while on duty. Many of the workers reported not using all PPE at work always due to lack of PPE or discomfort associated using certain PPE such as safety boots, overcoats and nose mask.

6.2 Recommendations

1. There is a need for a regular and timely supply of improved and standard PPE such as hand gloves respirators, suitable and comfortable safety boots, and safety goggles for solid waste collectors. More importantly, Occupational Health and Safety Specialist must ensure regular and effective usage of PPE among workers.

2. Regular and Effective Occupational Health and Safety training prior to and after employment to educate workers about work hazards and risks. Such a training must create awareness about behavioural factors such as alcoholism that could result in occupational injuries.

3. Policies should be formulated and implemented regarding treatment of injured workers to help minimize economic burden of injury treatment on worker.

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APPENDICES

Appendix 1: Consent form

The above information describing the benefits, risks and procedure for the research title (Factors associated with occupational injuries among solid waste collectors of Zoomlion Ghana Limited in the Accra metropolis) has been and explained to me. I have been given the opportunity to ask questions and I am satisfied with all the answers in response to all the questions. I give my consent to participate as volunteer.

…….. ……..

Date Signature or Thumbprint of Participant

In case volunteers cannot read the form themselves, a witness here:

I was present while the benefits, risks and procedure were read to the volunteer. All questions were answered to the satisfaction of the volunteer. The volunteer agreed to be involved in the research.

……... ……

Date Signature of witness

I certify that the nature and purpose, the potential benefits, and possible risks associated with being part of this research have been explained to the above individual.

…… ……

Date Signature of person who obtained consent

Appendix 2: Questionnaire

Dear Participant,

We would be very pleased if you would assist in helping us undertake this essential study at the School of Public Health in the University of Ghana.

Information that will be obtained from this study will add up more knowledge in relation to already existing job – related health information which will result in maintenance of good health.

Kindly help us complete this questionnaire by responding to a few questions in relation to yourself, your occupation, behavioural characteristic and occupational injuries. Your involvement is essential to the success of the study.

Please be assured that all information you will provide will be confidential and will be known only to the researchers. The data will be reported in statistical summary form only.

Please do not hesitate to contact the Principal Investigator in case there are questions about the study with the questions in the questionnaire. The details of the principal investigator are provided below.

We appreciate your desire to take part in this important research project.

Contact:

Patrick Ephraim (Student)

Phone number: 0557064690

Email: pephraim45@gmail.com

1. Questionnaire number …… **2. Date of interview DD/MM/YY**

……/…..…../……..

Time ……. Interviewer name

……

Signature of Interviewer ……

PART A. DEMOGRAPHIC DATA

3. Age ……

4. Sex (Please tick as appropriate)

Male…… 0[ ] Female…… 1[ ]

5. Place of Residence

Urban ……1 [ ] Rural……..2 [ ]

5. Marital Status (Please tick as appropriate)

Single ……..……1[ ] Widowed/ Widower……..……4[ ]

Married……2[ ] Separated ……5[ ]

Divorced……..3[ ]

6. Religion

Christian……..1[ ] Muslim ……2[ ]

Traditionalist……...3[ ] Other……4[ ]

6. How do you pay for your medical care?

National health Insurance ……1[ ] Private Health Insurance……4[ ]

Self …..…… 2[ ] Family…… 5[ ]

Paid by company……...3[ ]

7. What is your highest educational level?

No formal education …… 1 [ ]

Primary……..2 [ ]

Junior High School……3 [ ]

Senior High School……4 [ ]

Tertiary……5[ ]

8. Monthly Salary

100-300 (GH¢) ……1[ ] 400-600(GH¢) …….. 2[ ]

>600 (GH¢)……..3[ ]

Part B (Work Environment)

8. How long have you been with your current company?

6 months – 1 year……1[ ] 4-5 years …….....3[ ]

2-3 years ……2[ ] > 5 years ……4[ ]

9. What does your work entail? (Please tick as appropriate).

Collection……1[ ] Sweeping ……2[ ]

Transporting ……3[ ] Collection & Sweeping ……..4[ ]

10. How many days do you work per week?

< 5 days (39 hrs) …… 1[ ]

≥ 5 days (40 hrs) ……2[ ] Other …….. 3[ ]

11. Do you have Personal Protective Equipment (PPE)?

Yes …… 1[ ] No……..2[ ]

11 (b). Which of the following PPE do you use while at work?

Eye googles ……1[ ] Boots ……..2 [ ] Nose cover …..3[ ]

Hand gloves ……4[ ]

11(c) How was the PPE obtained?

Provided by company ……1[ ] Provided by Employee …...2 [ ]

Other ……...3[ ]

11(d). Do you use Personal Protective Equipment while at work?

Yes ……..…..1[ ] No ……2[ ]

11(e). How often do you use your PPE while at work?

Never …….. 1[ ] Always ……. 2 [ ]

Sometimes …….. 3[ ]

11(f) What is the reason of not using Personal Protective Equipment?

Lack of PPE ……1[ ] Not Comfortable ……2[ ]

Not aware of PPE ……3[ ]

12(a). Job training on Occupational Health and Safety Prior to Employment.

Yes ……1 [ ] No ……..2 [ ]

12(b). Periodic job training on Occupational Health and Safety Employment.

Yes …… 1[ ] No ……2 [ ]

13. Are you Satisfied with your Job as a Solid waste worker?

Yes ……1 [ ] No ……2 [ ]

PART C. Behavioural Characteristics

14. Do you have any difficulty with sleeping?

Yes …….. 1[ ] No …….. 2[ ]

15. Is your job as a solid waste worker stressful?

Yes ……...1[ ] No ……. 2[ ]

16. Do you use substance?

Yes ……...1[ ] No ……. 2[ ]

16(a). Do you drink alcohol?

Yes ……...1[ ] No ……. 2[ ]

16(b). Do you smoke cigarrete?

Yes ……...1[ ] No ……. 2[ ]

Part D-Work Related Injuries

17. Have you had any injury related to your work within the past six months?

Yes ……...0[ ] No ……. 1[ ]

17(a). If yes in 17, how many times have you sustained an injury(s)?

Once ……1[ ] Two or more times ……...2[ ]

17(b).Which of the following injury(s) were you affected with? (Please tick as appropriate).

Cut/ puncture ……1[ ] Abrasion ……2[ ]

Dislocation ……. 3[ ] Fracture ……4[ ]

Eye injury …… 5[ ] Ear injury……...6[ ]

Burn……...……7[ ]

Others ……..…8[ ]

17 (c). Which part(s) of the body is/was the injury?

Hand ……1[ ] Finger …….. 2[ ]

Leg ……...3[ ] Back ……. 4[ ]

Knee……..5[ ] Toe ……... 6[ ]

Eye ……... 7[ ] Tooth ……...……8 [ ]

Head ……9[ ] Other …….

17(d). What was the source of the injury?

Hit by falling object(s) ……1[ ] Injured by hand tool ……2[ ]

Falls……3[ ] Lifting heavy object ……....4[ ]

Splintering object ……..5[ ] Collision ……. 6[ ]

Other ……..

17(e). How many days did you stay home from work due the injury(s)?

< 10 days …… 1[ ] ≥ 10 days …… 2[ ]

17(f) Where was the injury treated?

At a health facility …….. 1[ ] At home …… 2[ ]

Herbalist …….. 3[ ] Other …….. 4[ ]

17(g) If at a health facility, how many days were you admitted?

< 10 days …… 1[ ] ≥ 10 days …… 2[ ]

18. Have you had tetanus vaccination?

Yes ……1 [ ] No ……..... 2 [ ]

Appendix 3: Ethical Approval

GHANA HEALTH SERVICE ETHICS REVIEW COMMITTEE

In case of reply the number and date of this Letter should be quoted.

Research & Development Division
Ghana Health Service
P. O. Box MB 190
Accra
Tel: +233-302-681109
Fax + 233-302-685424
Email: ghserc@gmail.com
9th February, 2018

MyRef. GHS/RDD/ERC/Admin/App/95
Your Ref. No.

Patrick Ephraim
University of Ghana
School of Public Health
Legon, Accra

The Ghana Health Service Ethics Review Committee has reviewed and given approval for the implementation of your Study Protocol.

GHS-ERC Number	**GHS-ERC: 033/01/18**
Project Title	Factors Associated with Occupational Injuries among Solid Waste Collectors of Zoomlion Ghana Limited in the Accra Metropolis
Approval Date	9th February, 2018
Expiry Date	8th February, 2019
GHS-ERC Decision	**Approved**

This approval requires the following from the Principal Investigator

- Submission of yearly progress report of the study to the Ethics Review Committee (ERC)
- Renewal of ethical approval if the study lasts for more than 12 months,
- Reporting of all serious adverse events related to this study to the ERC within three days verbally and seven days in writing
- Submission of a final report **after completion** of the study
- Informing ERC if study cannot be implemented or is discontinued and reasons why
- Informing the ERC and your sponsor (where applicable) before any publication of the research findings.

Please note that any modification of the study without ERC approval of the amendment is invalid.

The ERC may observe or cause to be observed procedures and records of the study during and after implementation.

Kindly quote the protocol identification number in all future correspondence in relation to this approved protocol.

SIGNED.....
DR. CYNTHIA BANNERMAN
(GHS-ERC CHAIRPERSON)

Cc: The Director, Research & Development Division, Ghana Health Service, Accra