UNIVERSITY OF GHANA

SCHOOL OF PUBLIC HEALTH

SAFETY PRACTICES AND PERCEIVED HEALTH IMPLICATIONS ON WASTE COLLECTORS IN THE ADENTAN MUNICIPALITY OF ACCRA

BY

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DECLARATION

This dissertation is submitted to the College of Health Sciences of the School of Public Health, University of Ghana, in partial fulfilment of the requirements for the award of the Master of Public Health degree. I, **ERIC BLEWUSI**, hereby declare that, with the exception of references and quotations from other sources which have all been duly cited, the study on "SAFETY PRACTICES AND PERCEIVED HEALTH IMPLICATIONS ON WASTE COLLECTORS IN THE ADENTAN MUNICIPALITY OF ACCRA" is my independent work as a student of the University of Ghana, School of Public Health under the supervision of **DR. ALEXANDER ANSAH MANU** and has not been presented or accepted in any previous application for the award of degree in any institution.

Signed ……. Date ……

ERIC BLEWUSI

(Student/Principal Investigator)

Signed Date

DR ALEXANDER ANSAH MANU

(Supervisor)

DEDICATION

I dedicate this work to my lovely parents C/Supt Mr. Godwin Cashman Blewushie and Madam Gladys Tetteh; for their unfailing love and unrelenting support throughout my education and career.

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ABSTRACT

BACKGROUND: Waste collection plays a vital role in the waste management process since it rids the environment of some health hazards. Waste collection however, has been known to expose waste collectors to some health-related problems, especially when they do not use the personal protective equipment that helps to prevent them from being exposed to these health risks.

OBJECTIVES: This study aimed to assess safety practices and perceived health implications among different groups of waste collectors in the Adentan Municipality of Accra.

METHOD: This was a cross-sectional study with a mixed method approach. The quantitative component involved the administration of structured questionnaires to the waste collectors whiles the qualitative component involved in-depth interviews with purposively selected persons involved in the waste collection process and its management in the Adentan Municipality. A total of 90 participants took part in the quantitative component of the study whiles 12 participants were involved in the qualitative component.

RESULTS: Results show that helmets were the least used safety equipment, with only 68% of the waste collectors reporting helmet use. On the other hand, the most used safety equipment were hand gloves which 92% of participants reported using. Other safety effects participants reported using includes face masks (79%), goggles (70%), boots (78%) and safety clothing (83%). Most participants (82%) perceived respiratory diseases as one of the occupational health hazards associated with waste collection, followed by physical and musculoskeletal injuries or pains each scoring about 69%. However, only 54% perceived that they were prone to falls in line of their work.

Conclusion: Waste collectors in the Adentan Municipality in Accra are aware of the occupational health hazards associated with waste collection in the city of Accra.

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LIST OF ABBREVIATIONS

GH¢: Ghana Cedis

GSS: Ghana Statistical Service

NHIS: National Health Insurance Scheme

OHS: Occupational Health and Safety

PPE: Personal Protective Equipment

US$: US dollar

WHO: World Health Organization

ZL: Zoomlion

OPERATIONAL DEFINITION OF TERMS

Compliance: the practice of abiding with applicable rules and standard with the intent to improve outcome and increase productivity whilst reducing the incidence of accidents.

Formal waste collectors: waste collectors who work as employees of a waste collection company or contractor

Perceive: to be aware of something

Private waste collectors/informal waste collectors: refers to waste collectors who are not employed by any company or contractor, do not belong to any company but collect wastes as individuals.

Personal protection equipment refers to anything which provides safety from hazards and accidents taking into account the work and its risks

Waste Collectors: Individuals and companies involved in waste collection. They include waste pickers, sweepers, janitors, tricycle riders, cart pushers and anybody who pick up wastes to designated sites; and considers or regards such activities as an occupation.

CHAPTER ONE

INTRODUCTION

1.1 Background

Waste collectors all over the world endeavour to pick-up generated wastes to appropriate designated sites. According to Hoornweg & Bhada-Tata (2012), data on waste collection rates range from a low of 41% in low income countries to a high of 98% in high income countries.

Though statistics show that there are difficulties with waste management all over the world as reported by the World Bank (2018), a critical consideration for interventions is the health of the individuals who collect the waste generated from households and in public places. Studies have shown that the ways by which waste management is done may affect the general wellbeing and performance of people involved in waste collection. For instance, injuries from sharp hospital equipment usually dumped at dumpsites exposes children, adult scavengers and waste workers to diseases such as tetanus, human immuno-deficiency virus as well as hepatitis B and C (Ahmed, 2017).

Unfortunately, some waste collectors do not employ safety measures against possible occupational health hazards (Thirarattanasunthon, 2012). Kretchy et al., (2015) also pointed out that in Accra, some waste collectors perform their daily duties with bare hands instead of using gloves. This exposes waste collectors and community members to various types of health hazards including infectious diseases, respiratory tract infections, and communicable diseases as well as emerging zoonoses (Karshima, 2016).

The World Bank (2018) reports that in 2016, about 0.74kg of waste was generated per person per day amounting to a total of about 2 billion tons of solid waste generated in the world's cities. According to Hoornweg & Bhada-Tata (2012), about 169,119 tons of

wastes are being generated every day in Africa alone. “It is reported that less than 30% of urban waste in developing countries is collected and disposed appropriately” (Ziraba, Huragu & Mberu, 2016). However, Miezah et al., (2015) reported that in Ghana, a total of about 12,710 tons of household waste is generated from households with a breakdown of about 0.47kg per person per day. The city of Accra generates about 2,800 metric tons of municipal solid waste per day but only approximately 2,200 tons of the waste is collected, leaving a backlog of 600 tons in open drains and water bodies (Badoe, 2018). In the Adentan municipality, a suburb of Accra, people are fond of dumping wastes indiscriminately and less than 50% of wastes generated is collected (Ghana Statistical Service, 2014).

Waste management may cause major adverse effects to the natural environment and the health of the people if it is not done properly (Adu-Boahen et al., 2014). Karshima (2016) reported that some implications of poorly managed municipal solid waste on public health include contamination of air, water and land and this environmental contamination may culminate in emergence of air, water and food-borne zoonoses. Ghana’s Ministry of Health (2007) also explained that the poor air, water and soil quality in Ghana is mainly due to improper disposal of waste, emission of dangerous gases from industries and vehicles and smoke from burning of waste and bush fires.

In the midst of all these waste management challenges, it is prudent that waste collectors correctly perceive the health implications of their work since this may help them adopt measures to prevent exposure to hazards and associated diseases. “Proper hazard perception not only consists of scanning and perceiving a hazard in time, but also correctly appraising the seriousness of it and knowing what to do to avert the danger” (SWOV Institute for Road Safety Research, 2014).

1.2 Problem Statement

Waste collectors assist communities and individuals to effectively manage wastes. It is common phenomenon to notice heaps of uncontrolled rubbish and polythene bags scattered everywhere. Disposal sites also overflow with filth; thus, exposes residents to health hazards such as cholera, malaria and typhoid fever (Adu-Boahen et al., 2014). Majority of the residents of Accra cannot claim to benefit from well-established waste collection services, for the reason that authorities have not been committed enough to providing additional landfill sites which would help accommodate the approximately 2,500 tons of waste generated daily (Attafuah-Wadee (2017). Health officials in Ghana partly blamed the 2014 outbreak of cholera, where 17,000 people were infected and 150 died, on staggering piles of trash that littered Ghana's gutters (Adamu, 2018).

Although the activities of waste collectors in the community contribute tremendously to helping solve the menace of excess wastes in the environment, their occupation poses serious threats to their health. The problem even becomes greater if they are unaware of the implications of their occupation on their health. Addo & Acheampong (2015) listed some occupational health hazards among waste collectors which include respiratory infections, eye infections, gastrointestinal tract infections and musculoskeletal injuries. Other health threats like accidents were identified among the waste collectors, which include deep cuts and abrasions from sharp objects. Mostly, these health threats are linked with non-use of personal protective equipment like nose mask, boots and gloves (Rushton, 2003).

Unfortunately, due to issues such as unavailability of safety gears and discomfort experienced during their use, waste collectors fail to adhere to safety measures while performing their duties (Kretchy et al., 2015).

Already, waste management is one of the biggest challenges of urban areas in Ghana (Miezah et al., 2015). Adentan Municipality is also known to suffer the menace of indiscriminate dumping of waste and inadequate waste collection (GSS, 2014). Having an unhealthy group of waste collectors may worsen the problem of waste collection in the area since ill health is known to lower general productivity of workers in various fields of work. A less productive workforce of waste collectors in Adentan would mean that the already existing problems with waste collection might be worsened due to infrequent collection, leading to heaps of wastes in the community with resultant disease outbreak in the community.

To help understand such problems with waste collection, it is important to assess how waste collectors perceive hazards inherent in their work and how they use safety measures to prevent them.

1.3 Justification of the Study

It is important for waste collectors to adopt measures to prevent the health hazards associated with their occupation. Adopting safety measures does not only require the presence and use of safety equipment but also the ability of waste collectors to be aware of the dangers inherent in their occupation.

This study was conducted to provide information on the awareness of waste collectors regarding the hazards they are exposed to and how they achieve safe health by virtue of the way they comply with standard safety measures in waste collection.

This study also serves as a complement for already existing literature regarding how waste collectors perceive occupational hazards of waste collection and the safety practices they adopt as they perform their daily duties.

The study also ensures that stakeholders and policy makers concerned with waste management obtain relevant information that would likely inform their decisions when planning and drafting policies and guidelines aimed at addressing the needs of waste collectors especially in matters regarding the protection of their health.

1.4 Aims and Objectives

The main aim of this study is to assess safety practices and perceived health implications among different groups of waste collectors in the Adentan Municipality of Accra.

1.4.1 Specific Objectives

- To identify the different groups of waste collectors in the Adentan Municipality
- To assess safety practices among waste collectors in the Adentan Municipality
- To assess the perceived implication of waste collection on the health of waste collectors
- To compare the level of adherence to safety practices among the different groups of waste collectors in the Adentan Municipality.

1.5 Research Questions

- What are the different groups of waste collectors in the Adentan Municipality?
- What are the safety practices among waste collectors in the Adentan Municipality?
- What are the perceived implications of waste collection on the health of waste collectors?
- Is there any difference in the level of adherence to safety practices among the different waste collection groups in the Adentan Municipality?

1.6 A Conceptual Framework on Municipal Waste Collection and Its Effects on the Health of Waste Collectors in the Adentan Municipality

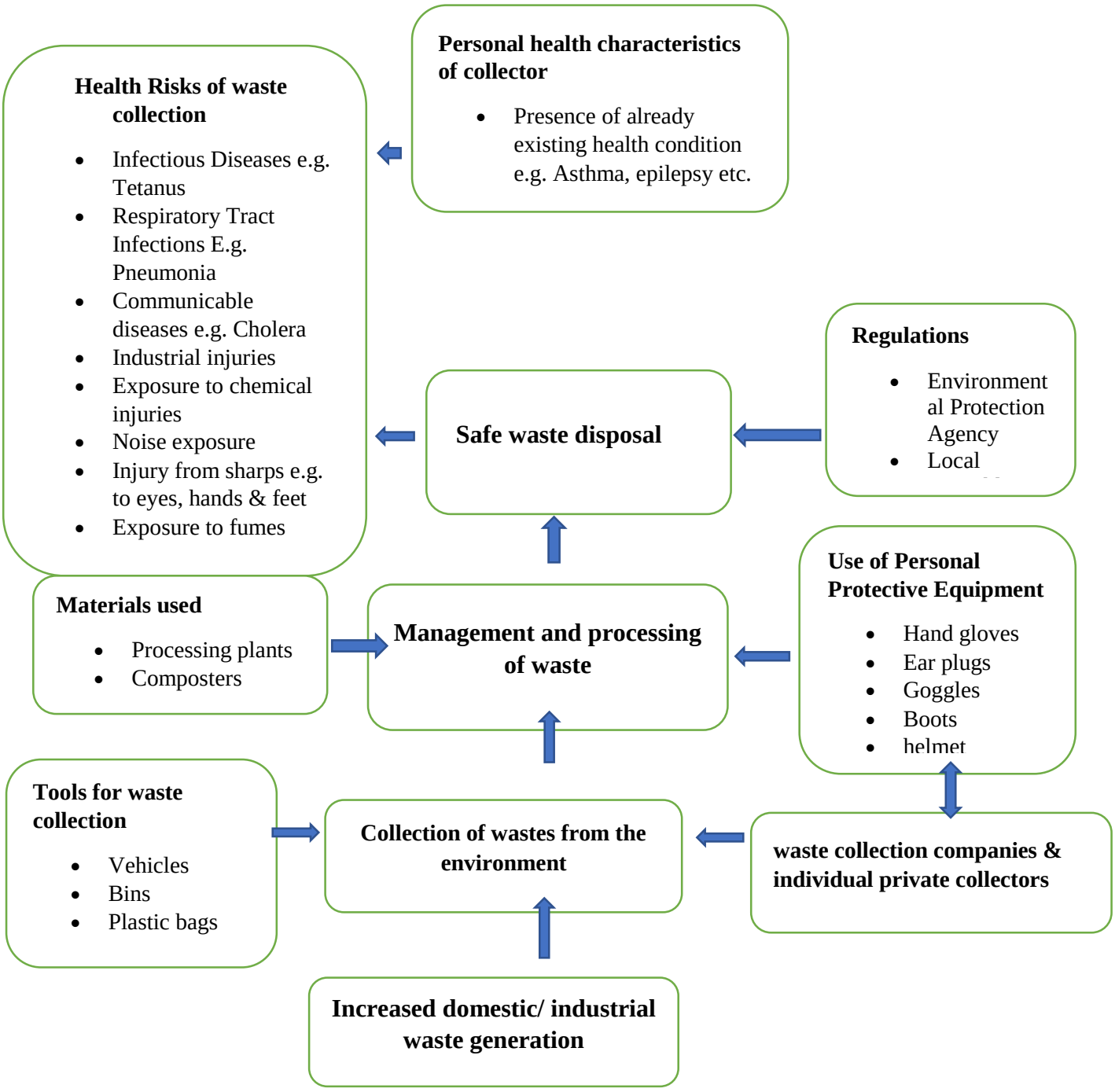

Figure 1: Conceptual Framework

The above framework explains the relationship between the health of waste collectors in the Adentan Municipality and how their occupation impacts their health. Indications from the bottom of figure 1 (the starting point) show that wastes generated (domestic and industrial) would need to be collected by waste collection companies and or private individuals, by the aid of vehicles after such wastes have been collected into bins and plastic bags. Whiles doing so, they use personal protective equipment (PPEs) to protect themselves from injury and other health hazards associated with waste collection. The waste, after collection, are either processed by processing companies that use composters or other processing equipment to process wastes. Unprocessed waste however, is disposed off at the dump site. These stages are regulated by the Environmental Protection Agency (EPA) and the assembly to ensure that waste is appropriately disposed.

When waste collectors collect wastes from households and public places, inadequate and lack of safety gears and equipment causes them to poorly collect waste. Also, wastes from public places are poorly organized for collection. All these amount to poor municipal waste collection.

After wastes have been poorly collected, the inadequate enforcement regulatory policies and mechanisms causes waste collectors to indiscriminately dump wastes. Such poor dumping of wastes causes the waste collector to come into direct or indirect contact with various disease-causing agents. Consequently, waste collectors may become infected with diseases and become ill. Subsequently, there might be an outbreak of diseases which might even affect the community where such waste collectors reside. To compound the issues of health concern, the presence of already existing health problems like asthma and epilepsy, on the waste collector, exposes him or her to worse health conditions.

CHAPTER TWO

LITERATURE REVIEW

2.1 A brief insight into Waste Collection and Health

According to Hoornweg and Bhada-Tata (2012) waste collection refers to collection of waste from point of production, thus residential, industrial, commercial and institutional locations; to the point of treatment or disposal; and some of the ways that they are collected include House-to-house, community bins, curb side pick-up, self-delivery as well as contract or delegated service collection. Waste collectors are therefore the companies and individuals who are involved in waste collection.

The World Health Organization (WHO, 1948), defines health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity." This definition has not been updated in recent years but it is still relevant in our settings today. For a person to be termed healthy, he or she must be physically, mentally and socially well. These three systems work together to ensure that people are strong enough to work (Nordqvist, 2017).

Waste collectors who are not healthy may experience challenges coping with work. It is very important for waste collectors to have the awareness that their health is highly dependent on the nature of their occupation. Blackman (2016), rightly puts it that, there would be no need to regulate waste workers if they have the necessary knowledge about health hazards associated with their work.

2.2 Burden of Wastes

Household and public waste generation and management is an issue that sparks global debates in modern times. The World Bank (2018) reports that in 2016, about 2.01 billion tons of solid waste was generated in the world's cities, amounting to a footprint of

0.74kg per person per day. These figures reported accounted for wastes collected from households and public places from all over the world. The World Bank further stated that increasing population and urbanization may increase the waste generation by 70% from 2016 amounting to 3.40 billion tons in 2050. About 169,119 tons of wastes are being generated every day in Africa alone (Hoornweg & Bhada-Tata, 2012).

In Ghana, however, Miezah et al., (2015) reported that a total of 12,710 tons of household wastes are generated from households; thus, about 0.47kg of waste is generated per person everyday. This study made the assertion that the city of Kumasi is slightly ahead of the capital City (Accra) in waste generation, thus resulting in a figure of 0.75kg/person/day and 0.74kg/person/day respectively.

2.3 Waste and Waste Management

According to Enent Protection Authority Southern Australiavironm (2009), waste can be defined in two main ways. It refers to any discarded, rejected, abandoned, unwanted or surplus matter, whether or not intended for sale or for recycling, reprocessing, recovery or purification by a separate operation from that which produced the matter; or anything declared by regulation or by an environment protection policy to be waste, whether of value or not. The European Environmental Agency (2008), also defines waste as any substance which the holder discards or intends or is required to discard. Vergara & Tchobanoglous (2012), assert that municipal solid wastes include all solid and semi-solid materials disposed by residents and businesses, excluding hazardous wastes and waste water. They further explained that household solid waste refers to discarded items that are no longer useful to households. Municipal solid wastes are also commonly referred to as garbage or refuse, which consists of everyday waste items that people discard and varies from country to country. Some examples include durable and non-durable goods, containers and packaging, food wastes and yard trimmings as well as

miscellaneous inorganic wastes (Karshima, 2016). The various places from which waste collectors collect their waste include households, commerce and trade areas, office buildings, institutions and small businesses, yard and garden, street sweepings, contents of litter containers, and market cleansing (Selin, 2013).

Waste management, however, refers to the collection, transport, recovery and disposal of waste, including the supervision of such operations and the after-care of disposal sites, including actions taken as a dealer or broker (European Environment Agency, 2008).

Proper collection and disposal of rural and urban waste has been the concern of various governing bodies of any jurisdiction all over the world. Waste collection which forms an integral part of the waste management process is very important and a good indicator of performance of a municipality (Okot-okumu, 2012). In Ghana, metropolitan and district assemblies award contracts to private waste management companies to collect wastes for local authorities while in a few instances, residents pay for waste collection. It is reported that the Accra Metropolitan Assembly spends about US$ 3.45 million each year (GH¢ 6.7 million) on collection and transport of waste for disposal (Monney, 2016).

Wastes generated from households and other public places are disposed of or managed in many ways. According to Domingo & Nadal (2009), some forms of waste management practices include recycling, composting, sewage treatment, incineration and landfill. These methods, if properly done, would help to ensure that waste is effectively collected from the environment.

As commonly practiced in and around the communities in Accra, some private individuals use tricycles fitted with containers, into which the wastes are poured and conveyed to the dumpsites. In the Adentan Municipality, waste management companies

are contracted by the municipal assembly to collect waste from households and public places. Also commonly known as contractors, these companies are responsible for picking or collecting wastes from homes into waste collection tricycles and trucks. Tricycles dump the wastes into bigger containers for trucks to eventually convey to the dumpsites. Trucks that directly collect wastes from collection points send the wastes to designated dumpsites or recycling plants for further management. A similar trend is practiced in Malaysia (Mohammed & Latif, 2014).

Waste collected in the Adentan municipality eventually ends up at the final designated dumpsite at Kpone, a place located some miles away from Adentan. Akwesi (2018), is of the view that citizens must make a conscious effort to come up with initiatives to improve waste management. According to statistics from the Adentan Municipality, only about 45.8% of generated waste is collected in Adentan (GSS, 2014).

2.4 Health risks of waste collection

Collection of wastes is normally accompanied by some severe consequences and threats to general wellbeing, especially to waste collectors. Such health threats include contact with disease-causing microorganisms, respiratory infections and various ranges of health problems (Gebremedhin, 2016). Outbreak of malaria, unforeseen floods, and ecological degradation are also some of the aftermath of poor waste collection practices and disposal. It is reported that in the nineteenth century, there were a continuing series of public health epidemics, made worse by bad sanitation. Over 250,000 people died from cholera between 1848 and 1854. Smallpox, typhoid, enteric fever and typhus were also major killers (Herbert, 2007). Jerie (2016), also made the assertion that the predominant manual handling of wastes during waste management may result in occupational health problems such as musculoskeletal disorders, diarrhea, viral hepatitis and high incidents of obstructive and restrictive disorders

2.4.1 Physical injuries

Waste collectors risk physical injuries when collecting waste. These physical injuries could be cuts from sharp-edged metals like razors, knives and or broken bottles. This is very possible especially if wastes are not separated in households and other collection points, to distinguish sharps from other wastes. Miezah et al., (2015), found out that waste collection is done within the Greater Accra Metropolitan Area (of which the Adentan community is contained), without any formal arrangements for waste separation at source or elsewhere, thus all waste is lumped together and eventually sent for final disposal. This suggests that waste collectors may be exposed to all kinds of injury-causing materials including sharps and thus, highly possible that they risk cuts from sharp objects if they are not well protected.

Waste collectors could also risk needle stick pricks that are very dangerous. Such pricks although causes pains, may expose the victim to various infections including HIV, Hepatitis and other fatal infections. Rauf et al., (2013), who conducted a study in Karachi found out that there was a high prevalence of Hepatitis B and C among waste collectors and therefore asserted that important factors that contributed for the high prevalence were needle prick injuries, bare-handed or bare footed collection of garbage, poor vaccination status, improper garbage disposal system and the site of waste collection.

Selin (2013) also lists some other hazardous wastes responsible for physical injuries among waste collectors and they include corrosives which may cause the destruction of living tissue on contact. Flammable and explosive substances may burn and or explode respectively to cause severe burns when heat is applied to them and irritants may also cause inflammation of the tissues on continuous exposure.

2.4.2 Respiratory problems

During collection and disposal of wastes, waste collectors are likely to inhale harmful substances such as smoke and its accompanying pollutant particles which normally occur when solid waste is burned. According to Giusti (2009), waste incineration may cause a fall-out of atmospheric pollutants into the environment. Some of these pollutants include persistent organic compounds known as “dioxins”, which are normally produced by the burning of solid wastes.

Respiratory conditions may also be caused or exacerbated among waste collectors. This may be associated with exposure to organic dust, bioaerosols, microorganisms and their toxins and persistent organic pollutants present in wastes (Domingo & Nadal, 2009). Pool & Wong (2013), explained that extrinsic allergic alveolitis is one of the diseases suffered by waste workers. Other respiratory problems noticed among them include asthma and other serious lung diseases. They therefore recommended that waste workers who are already sensitized to *A. fumigatus*, suffer from cystic fibrosis, immunosuppression or bronchiectasis should not work with compost unless it is possible that their exposure to airborne fungi can be controlled. Böhnel & Lube (2000) further explained that apart from humans, animals may suffer some health hazards as well. It is therefore important to note that although waste collection and its subsequent disposal may be beneficial as mentioned by Nzihou et al., (2012); it is known to be potentially hazardous to the humans, animals and the environment. There have also been suggestions that elevated incidence of work-related respiratory, gastrointestinal and skin problems is more prevalent among waste collectors, compared to the general workforce because of increased exposure to bioaerosols and volatile compounds (Rushton, 2003).

2.4.3 Infections

One of the many health problems that waste collectors face is infections. Waste collectors normally work in dirty environments where they handle dirty materials that could be harboring microorganisms. “Municipal solid waste workers are exposed to a number of pathogens (bacteria, fungi, viruses, parasites and cysts)’’ (Gebremedhin, 2016). As the UN Habitat (2010) states, it is interesting to note that many scientific studies prove that the relative risk of infections and parasites is three to six times higher among solid waste workers as compared to control baseline populations. These infections cause different problems depending on where they occur. For example, acute diarrhea, a sign of gastrointestinal infection, is known to have a ten times likelihood to occur among waste collectors as compared to other baseline populations. As stated earlier, some blood infections may also occur as a result of waste handling. These include HIV and Hepatitis (Rauf et al., 2013).

One issue of great concern is about contamination of water bodies close to dumpsites. Qasim (2017), asserts that leachate may migrate from landfills and contaminate adjacent water bodies. Also, it is not only waste workers who may suffer the health hazards; consumers who eat vegetables grown in soils treated with compost may also suffer some infections. This may possibly result in diarrheal and communicable diseases like Cholera and Typhoid fever. Other infections may include Tetanus and other respiratory tract infections (UN Habitat, 2010).

2.4.4 Musculoskeletal problems

Among all other health problems suffered by waste collectors, musculoskeletal injuries are not left out (Acheampong, 2015). It is common practice for waste collectors to be seen handling and lifting heavy materials. This may expose them to musculoskeletal problems. Rushton (2003), supports this by stating that considerable heavy lifting and

other manual handling of containers increases the risk of musculoskeletal problems among waste collectors. According to Abou-ElWafa et al., (2012), lower back pain is experienced by most waste collectors whiles other musculokeletal problems may include twisted ankle, muscle tear, joint pain, knee pains, shoulder pains, neck pains as well as falls and associated injuries while pushing waste trolley. There would be the need for medical, legislative and engineering measures since complains regarding musculosketal problems are highly prevalent among municipal solid waste collectors (Abou-ElWafa et al., 2012).

Another key musculoskeletal problem among waste collectors is described as botulism. Böhnel & Lube (2000) assert that composting materials contained about 50% of *Clostridium botulinum*, a gram-positive anaerobic, spore-forming, motile bacterium which has the ability to produce the neurotoxin botulinum. Mayorov et al., (2010), explained that Botulinum toxins are disease-causing agents responsible for botulism, a disease which is characterized by peripheral neuromuscular blockade and a characteristic flaccid paralysis of humans. Flaccid paralysis of muscles therefore occurs as a result of Botulinum toxins in the body, normally associated with exposure due to waste handling.

2.4.5 Others

Other forms of materials and accompanying health risks that waste collection may pose to waste collectors as stated by Selin (2013) include, carcinogens, infectious substances and substances which, if inhaled or ingested or if they penetrate the skin, may induce non-hereditary congenital malformations. Mutagenic substances may also induce hereditary genetic defects or increase their incidence.

2.5 Safety practices in waste collection

Safety in waste management is an issue of great importance. To ensure that waste collectors work free of exposure to any work-related health hazards, they must take active

precautionary measures to safeguard their health (Bogale & Tefera, 2014). Blackman (2016) explained that in order to prevent any events that would threaten human health and safety as well as the environment, precautions must be taken. These precautions involve the use of some apparel known to keep the users safe from harm as they perform their duties. Konya, Akpiri & Orji (2013), explained that personal protective equipment (PPE) are a very necessary functional element which helps to protect against or limit the effects of occupational hazards.

PPEs for waste management are worn to protect various parts of the body including the head, eyes, nose and mouth, trunk and upper limbs, hands, the lower limbs and the feet. These PPEs when worn, protect the body part from any kind of physical injuries and contact with microorganisms. The equipment used protects the head from injury and direct sunlight, the eyes from dust particles, allergens and infections as well as ultraviolet rays, excess noises, hazardous vapours and dust as well as infections on the hands and injuries to the feet respectively (Clear it Waste, 2014).

The PPEs include apron over their clothing, hand gloves, face mask, goggles, helmet and protective boots (Gebremedhin, 2016). Unfortunately, some waste collectors do not use gloves in their line of duty. A study conducted by Kretchy et al., (2015) in Ghana showed that many waste collectors used bare hands to handle wastes. This is a risky behavior since they could be exposed to injuries from sharps and other materials that cause physical injury and infections. Some waste collectors sighted that they did not use the PPEs because it made them uncomfortable and produced heat. Although protective against health hazards, Soezar & Owino (2016), assert that informal waste pickers work without safety equipment, legal protection or health insurance. This is very unfortunate because those waste collectors stand the risk of injuries and other problems associated with inability to use the safety equipment.

2.6 Perception on health hazards of waste collection

Waste collectors are bound to come into contact with hazardous wastes at any point of their working life (Gutberlet & Uddin, 2017). If armed with the right perception, it is highly possible that waste collectors would make a conscious effort to properly collect wastes, handle them appropriately and dispose of them as required by law and other regulations. When waste collectors rightly perceive the implications of their occupation on their health, know safety rules to adopt and comply accordingly, they are bound to avoid the health risks. Some waste collectors underestimate the importance of PPEs because of the inability to properly perceive the implications of their occupation on their health. Choudhry & Fang (2008), in a study asserts that normally, workers are involved in unsafe behavior because of lack of safety awareness. It is highly possible that waste collectors who work with waste management companies would rightly be able to perceive occupational hazards since companies have supervisors who help regulate activities of individual waste workers. Unlike formal waste collectors, private/informal waste collectors may, however, not know much about safety rules. This is possible because they lack adequate supervision and periodic training often enjoyed by their counterparts in the formal sector. “Training is a motivational factor which enhances the knowledge of the employee towards the job by which employees become proficient in their jobs and they become able to give better results (Bhat, 2013). Basic safety training and supervision which is normally lacking among this group of waste collectors may negatively impact their ability to comply with safety techniques. Yanar, Lay & Smith (2019) asserts that supervision is important for workers who are exposed to occupational hazards and are at risk of injury and illness. There is therefore the need for informal waste collectors to benefit from training and supervision programs since training and supervision influence their ability to comply with safety rules.

Waste collection and eventual disposal is regulated by the environmental protection agency and the district/municipal assemblies. As Jerie (2016), would put it, regulation of waste disposal is important because its original aim is to reduce the introduction of polluting substances into the atmosphere. Just like any other district or municipal assembly, the activities of waste collectors and dumpsites are actively regulated by the assembly and the officer responsible is the environmental health officer. “In workplaces where workers experience one or more types of occupational health and safety (OHS) vulnerability, having a supportive supervisor may play an important role in reducing the risk of injury and protecting workers” (Yanar, Lay & Smith, 2019). Together with his assistants, the environmental health officer ensures that waste collectors work diligently to keep the environment free of wastes whiles dumping them at appropriate dumpsites. These dumpsites are also to be managed appropriately such that they do not become nuisance to the society.

CHAPTER THREE

METHODOLOGY

3.1 Study Area

Being one of the sixteen districts created in the Greater Accra Region in the year 2008, the Adentan municipality covers a total area of 92.84 square kilometres. Adentan Municipality as recorded by the 2010 census, has a population of about 78,215, made up of 39,366 males and 38,849 females. Its capital is called Adentan. As seen in figure 2 below, the municipality is bordered by the La Nkwantanang Madina Municipal District to the north. To the east, it is bordered by the Kpone Katamanso District and the Tema Metropolis District. To the south, it is bordered by the Ledzokuku-Krowor Municipal District and to the west by the Accra Metropolis (Ghana Statistical Service, 2010). The municipality has a total of 20,478 households. The average household size in the municipality is 3.8 persons per household. The urban areas of the Adentan municipality have a high proportion of houses (59.9%) than their rural counterparts (40.1%), out of a housing stock of 13,669 with an average number of 5.7 persons per house (Ghana Statistical Service, 2010).

Records show that in Adentan, only about 45.8% of the waste generated is collected whiles, an excess of 54.2% of the waste is left uncollected.

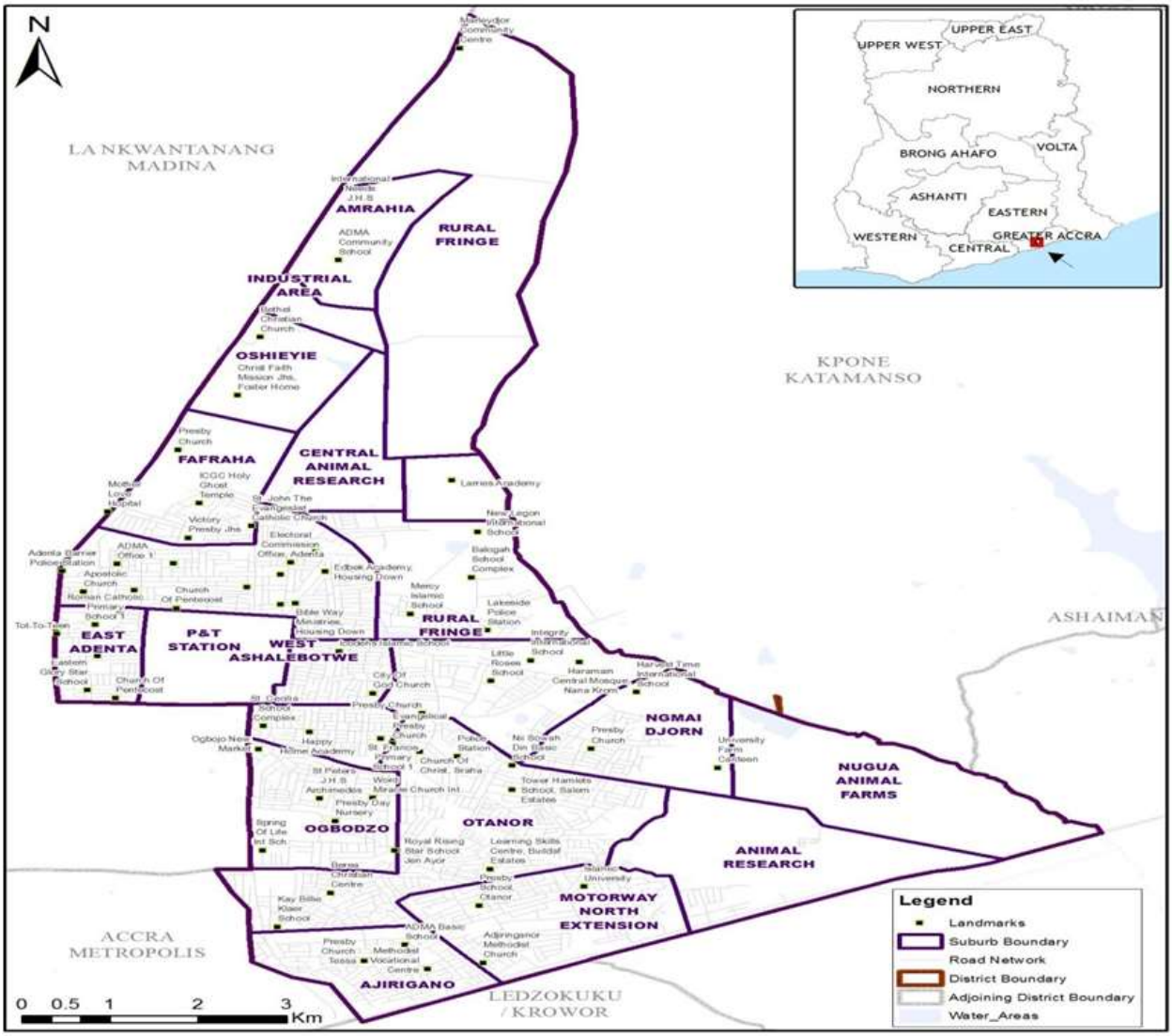

Figure 2 Geographical Map of the Adentan Municipality

Source: **(**Annan et al., 2019)

3.2 Study Design

This study used a cross-sectional design, which employed both qualitative and quantitative methods.

The qualitative component of the study involved in-depth interviews with key informants who provided information on the nature of operations of waste collectors in the municipality. The in-depth interviews involved supervisors, team leaders and some individuals that perform waste collection in the Municipal. They were sampled using the purposive sampling method, which enabled the interviewer to interview some supervisors, team leaders and waste collectors believed to have key information relevant for this study. The information collected in this component of the study helped in designing the data collection tool used in collecting data for the quantitative part of this study.

The quantitative component of the study involved a self-administered questionnaire interview approach, thus enabled waste collectors to answer questions regarding their demographic characteristics, daily waste collection routines, use of personal protective equipment, and perceived health implications of the occupation and the frequency and characteristics of the health risks among them within a particular time period.

3.3 The Study Population

All companies involved in collection of waste in the Adentan Municipality, together with the individuals directly involved in waste collection and management (supervisors) in the Adentan municipality were considered to be eligible to participate in this study. The main respondents interviewed were workers of the randomly selected waste collection companies in Adentan and other private individuals who collect waste on a private basis, and do not belong to any company.

In-depth interviews were conducted for some supervisors and team leaders that oversee the activities of waste collectors in their respective companies.

3.4 Sample Size Determination

The sample size for the study was largely calculated based on the number of waste collection groups operating in the Adentan municipality and the number of waste collectors each group had on the ground.

However, sample size was calculated from derived values realized in a study conducted by Kretchy et al., (2015). In this study, it was found that 87.1% of the participants used their bare hands to handle waste whiles 12.9% used gloves in handling wastes. In all, the total compliance was put at 25%; hence 25% compliance was used for this study. Factoring that into the Cochran (1963) formula, the following calculation was made:

$$N = \frac{Z^2\, p(1-p)}{e^2}$$

where

Alphabets	**Explanation**
Z=	z-score for two tailed-test based on 95% confidence level = 1.96= 1.96^2
e=	margin of error= 0.1^2
N=	Required minimum sample size
p=	proportion of waste collectors who use the safety measures=0.25

$$N = \frac{1.96^2\,(0.25)\,(1-0.25)}{0.1^2} = 72$$

Adding 20% of the calculated 72 to account for non-response and design effect,

72+ 0.20(72) (non-response) = 87 **participants.**

Thus, from the calculations, a rounded-up sample size of 90 participants was used to accomplish this study.

3.5 Sampling Procedure

3.5.1 Qualitative component

A purposive sampling method was used for the qualitative aspect of the study and this was conducted such that participants were interviewed until a saturation point was reached. Also known as judgement sampling, the purposeful sampling method refers to a non-probability sampling technique that is used by researchers to choose a sample of subjects from a population. It enables the researcher to deliberately choose participants due to qualities they possess such as knowledge and experience in particular field. To effectively conduct a study using purposive sampling, the researcher decides what he needs to know and sets out to find people who are knowledgeable or experienced to elicit responses from them. It is known to be affordable, easy and the study participants are readily available (Etikan, Musa & Alkassim, 2016).

In all, 12 participants were interviewed in this section. These included 3 supervisors, 4 team leaders and 5 waste collectors. This helped to ensure the gathering of varied views from each group. They were questioned regarding their demographic characteristics, the existent policies focused on protection of waste collectors' health and their daily operations respectively. Participants were made to sit comfortably at a place serene enough to help them concentrate to answer the questions. Interviews were conducted on an individual basis, free of any unwanted interruptions. The interviews lasted for an average of about 30 minutes. Participants were notified that the interviews were to be recorded to aid in post interview analysis. Conversations were then recorded with a digital recorder and later transcribed appropriately, with the consent of the participants.

3.5.2 Quantitative Component

This study used the cluster sampling method to draw samples from the different companies contracted to collect wastes from the Adentan Municipality. Letters were sent to the waste collection companies in the municipality and the companies gave a date on which their workers will be available for data collection. On the appointed dates, the companies assembled their workers and with the help of data collectors, questionnaires were administered to the workers in English and where participants were unable to speak or understand English, questionnaires were administered in the local language (Twi). A total of 90 participants were interviewed in all. These participants were individually taken to a serene place and the purpose and procedures of the study explained to them. Informed consent was obtained by means of appending of signatures and thumbprint (for those who could not append signatures). Participants were each requested to sit comfortably in order to aid in answering the questionnaires. Questionnaires took about 30 minutes each to be completed.

3.6 Inclusion Criteria

The following inclusion criteria were used to help define participant eligibility for the study:

- Adult waste collectors aged 18 and above
- Waste collectors who had worked for at least 6months
- Waste collectors who work in the Adentan Municipality

3.7 Exclusion Criteria

The following exclusion criteria were used for the study:

- Waste collectors who were 18 years of age and above and had worked for at least 6months in the Adentan Municipality but did not consent to participate in the study
- Waste collectors who were 18 years of age and above and had worked for at least 6 months in the Adentan Municipality but were not in good health condition to participate in the study

3.8 Data Collection Tools

An interview guide was developed based on the objectives of the study to serve as a reference in conducting the in-depth interviews, whiles structured questionnaires were used to collect the quantitative data.

3.9 Pretesting

The Data collection tools were pre-tested at Madina, a neighbouring district, for reliability before actual data collection. 20 waste collectors were used for the pre-testing**.** This helped to refine the tools and assess its validity – i.e. ability to measure what it was supposed to measure. All tools and strategy for implementation of the study were refined after the pretesting.

3.10 Variables

3.10.1 Dependent Variable:

- Use of personal protective equipment (PPEs) which includes gloves, facemask, safety boots, goggles, helmet and protective clothing such as reflectors.
- Participants' perception of health risks
- Compliance to Health and Safety Protocols

3.10.2 Independent Variable:

- Demographic Characteristics
- Hours per shift
- Company type
- Knowledge on Existence of Health and Safety Protocols
- Health and Safety Practices
- Participants' Perceived Factors Influencing Adherence

3.11 Data Analysis

3.11.1 Qualitative Analysis

Data obtained from the in-depth interviews was transcribed verbatim and entered into NVIVO 11 for coding. This helped to generate themes and patterns. Similar responses were grouped under the same theme and assigned codes. Participants' names were not used in the analysis and report writing, though some verbatim quotes were performed in cases where statements of participants were required for emphasis to be made.

3.11.2 Quantitative Analysis

Data was entered using MS Excel version 2016 and later exported into STATA version 15 for cleaning and analysis. The study largely made use of descriptive statistics and thus utilized graphs and tables to present results. Continuous variables were presented using mean and standard deviation. Also, categorical variables were analysed using proportions and frequencies. Chi-squared test of association and logistic regression were used to establish association between dependent and independent variables.

3.12 Ethical Considerations

Ethical approval for the study was obtained from the Ghana Health Service Ethics Review Committee with number (GHS-ERC 048/03/09). Prior to data collection, permission was also sought from the Adentan Municipal Assembly, Zoomlion Company

Limited and Jekora Ventures, where data was collected. Signed informed consent was obtained from all participants after the significance of the study was explained to them. For those participants who could not read and write, information on the study was translated to them by the interviewer or a translator. Participants were at liberty to willingly withdraw from the study at any time without any punitive action or threat to their wellbeing or jobs.

To ensure confidentiality, all participants' information was appropriately coded with letters and (or) numbers instead of actual names when questionnaires were being administered or during report writing. Participants were made to understand that, all their information shall be put under strict safekeeping and therefore would not be exposed to the general public or their superiors; thus, the study will in no way amount to them being dismissed from their respective workplaces. Also, participants were assured that the information that they provided was for academic purposes only and in case of any further use of such information, approval would be sought again from the appropriate quarters before such actions are taken.

CHAPTER FOUR

RESULTS

4.1 Socio-demographic Characteristics of Participants

The results for the background characteristics of participants are presented in **Table 1** below. The mean age of participants was 41.5±12.8 years. Males constituted 41% of the participants and 59% were females. The average number of years the participants had done the sanitation work was about 2 years.

Majority of the participants were married (41%) with only 2 participants reporting to be co-habiting (2.2%) while about 8.9% of the participants were widowed. The highest level of education among participants was senior high/Technical/Vocational with 22% having attained this level of education. The modal level of education among participants was Junior High education which represented about 37%. In all a minimum of about 11% said they had not had any form of formal education.

With regards to the monthly income of participants, majority (79%) of the participants reportedly earn between GH¢ 100 and GH¢ 300 a month while about 8% reported earning less than a GH¢ 100 a month. On the other hand, only 3% reported earning GH¢ 500-1000. Only 3% reported earning more than a GH¢ 1000 as well. In all, about 64% of participant paid for their medical bills themselves while only 22% were registered on the National Health Insurance Scheme.

Table 1: Background Characteristics of Participants

Background Characteristic	**N=90**
Age, Years Mean ±SD	41.5±12.8
Number of Years of Working, Mean ±SD	2.2±0.8
Sex, n (%)	
Male	37 (41.1%)
Female	53 (58.9%)
Marital Status, n (%)	
Married	43 (47.8 %)
Single	27 (30.0 %)
Divorced	10 (11.1%)
Widowed	8 (8.9 %)
Co-habiting	2 (2.2%)
Level of Education, n (%)	
None	10 (11.1%)
Primary	27 (30.0%)
JHS	33 (36.7 %)
SHS/Technical/Vocational	19 (22.2 %)
Monthly Income, n (%)	
< GH¢100	7 (7.8%)
GH¢ 100 – 300	71 (78.9%)
GH¢ 300 – 500	6 (6.7%)
GH¢ 500 – 1000	3 (3.3%)
> GH¢1000	3 (3.3%)
Payment of Med Bills, n (%)	
Self	58 (64.4 %)
NHIS	20 (22.2 %)
Employer	1 (1.1 %)
Others	11 (12.2%)

4.2 Categories of Waste Collectors

Findings on the categories of waste collectors who participated in this study are presented in **Fig 3.** In all four categories of waste collected were identified, these include; Zoomlion (ZL) tricycle operators, ZL sweepers, private tricycle operators and janitors. Zoomlion sweepers made up the majority of sanitation workers who were part of this study; they represented about 59% of all participants. However, janitors were the smallest group making up just over 4% of all participants.

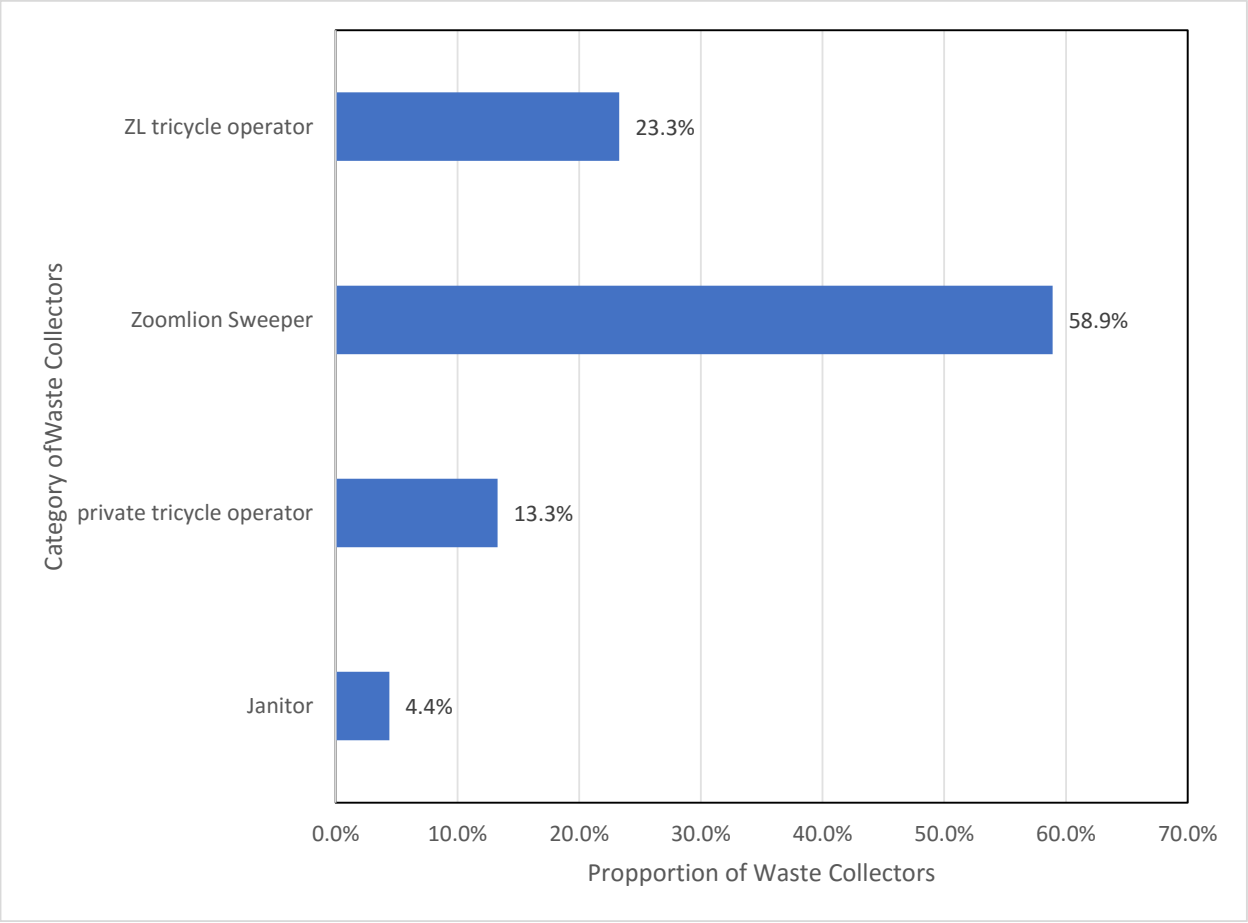

Figure 3: Categories of Waste Collectors

4.3 Participant's Knowledge on the Existence of Health and Safety Protocols

Findings in **Table 2** below, represent the knowledge of participants on the existence of health and safety protocols in their various organizations or daily operations.

In all, about 88% of participants said they have ever heard of occupational health and safety, while about 77% indicated there is adequate and strict monitoring of their safety records. Again about 80% of participants said there is basic safety education and training for them in their organization. Contrarily about 96% of participants said there is no first aid and welfare facilities available to help in case there is any injury whiles working in their organization.

Table 2: Participant's Knowledge on the Existence of Health and Safety Protocols

Knowledge on Existence of Health and Safety Protocols	**N=90**
Have you ever heard of occupational health and safety?	
Yes	79 (87.8%)
No	11 (12.2%)
Work environment always cleared and kept free from objects that can cause harm or injury to the worker?	
Yes	28 (31.1%)
No	62(68.9%)
Is there adequate and strict monitoring of safety records?	
Yes	69 (76.7%)
No	21 (23.3%)
Do you have safety briefs before the commencement of any day work?	
Yes	58 (64.4%)
No	32 (35.6%)
Is there any basic safety training and education?	
Yes	72 (80.0%)
No	18 (20.0%)
Are first aid and welfare facilities available to help in case there is any injury whiles you are working?	
Yes	4 (4.4%)
No	86 (95.6%)
Are you always supervised to use it?	
Yes	75 (83.3%)
No	15 (16.7%)

4.4 Use of Personal Safety Effects

The use of personal safety effects was high across board as shown in **Fig 4** below. The least used safety effect is goggles with only 30% using it. On the other hand, the most used safety effect is the hand gloves, which 92% of participants reported using. Other safety effects used by participants included face masks (79%), helmets (32%), boots (78%) and over cloths (83%).

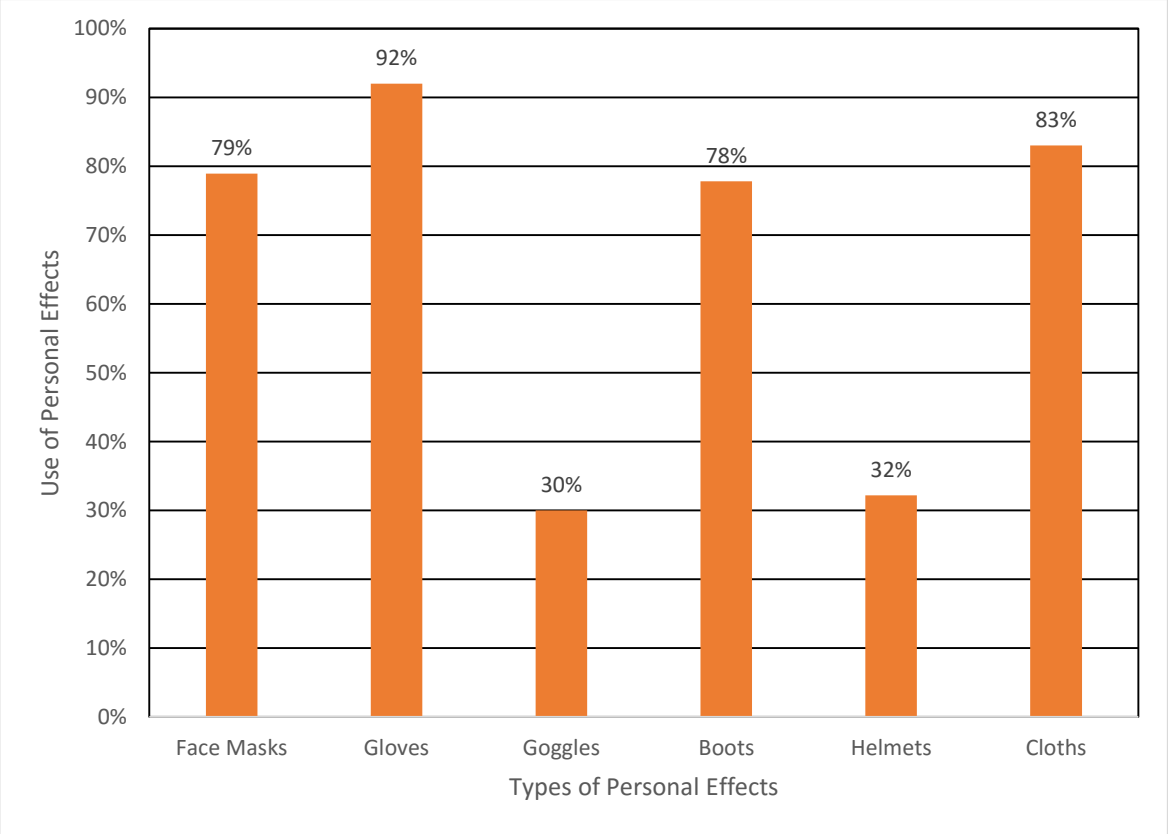

Figure 4: Use of Personal Safety Effects Among Participants

4.5 Perceived Diseases or Injuries Associated with Work

The findings on what participants thought were the diseases and injuries associated with the work they do are presented in **Fig 5** below. Most participants (82%) thought respiratory diseases were more associated with the work they do followed by physical injury and musculoskeletal injuries or pains each scoring about 69%. They however, thought they were less prone to fall in line of their work (54%).

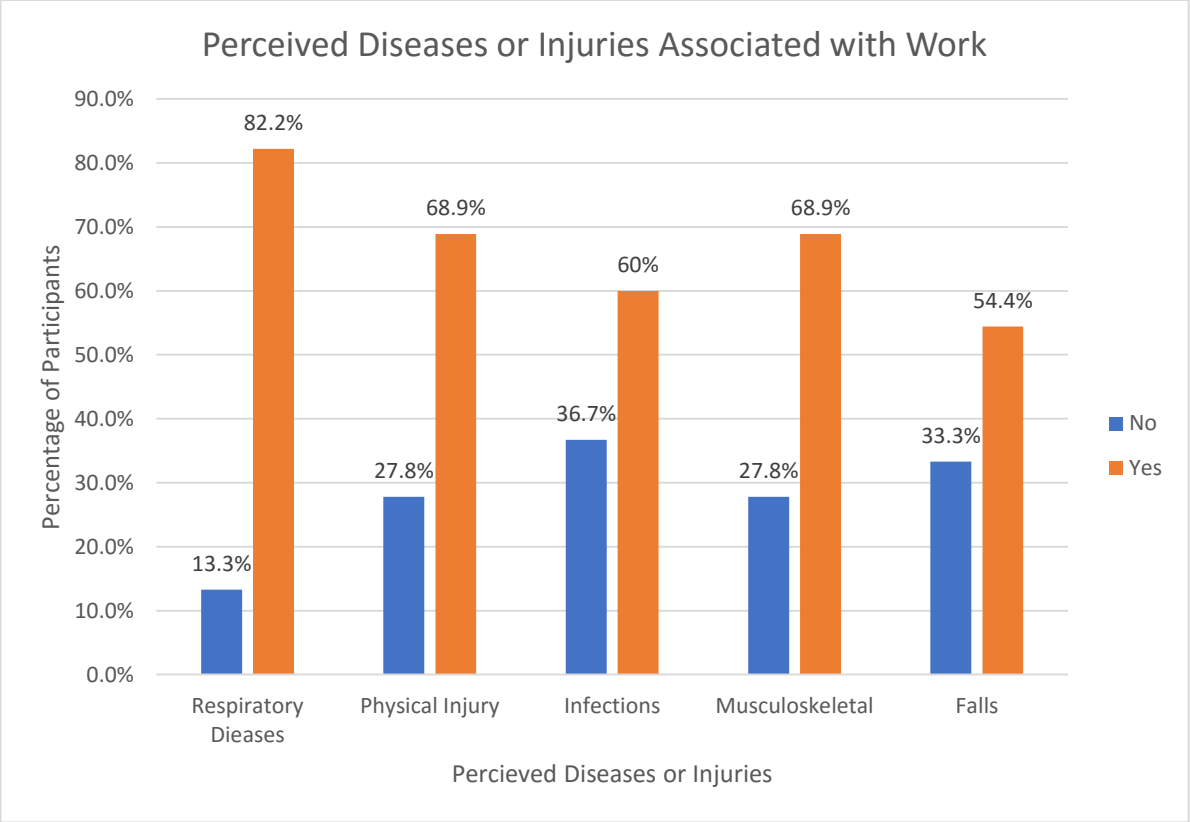

Figure 5: Perceived Diseases and Injuries Associated with the Work

4.6 Prevalence of Reported Health Conditions among Workers

The prevalence of reported health conditions among workers is presented in **Fig 6** below. Generally, the prevalence of reported diseases was low among participants. The most reported health condition was eye defect, which about 23% of participants reported having. No participant reported having tuberculosis.

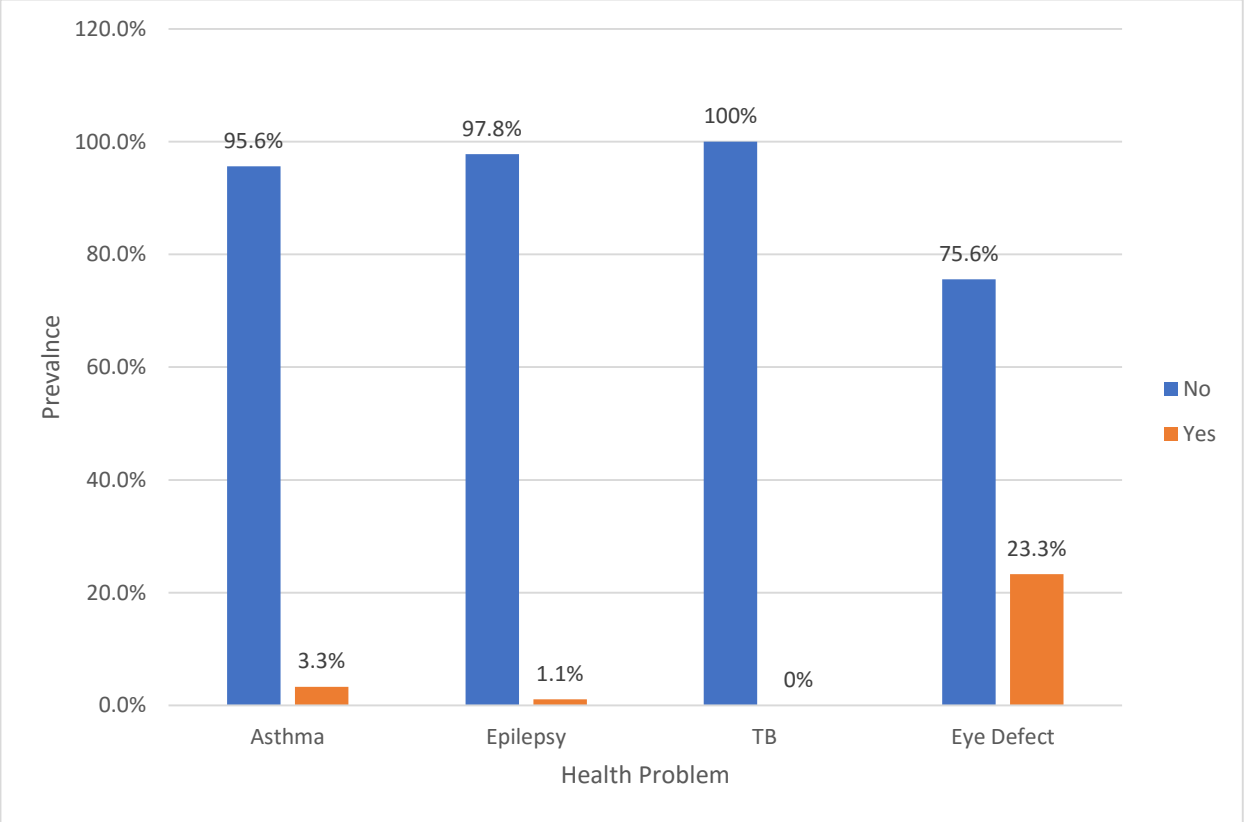

Figure 6: Prevalence of Health Conditions among Workers

4.7 Compliance to Health and Safety Protocol

Figure 7 shows the self-reported compliance of participants to health and safety protocols. Two-thirds (66.7%) of the participants strongly agreed that they use PPEs whiles they responded with varying levels to questions regarding rules and regulations regarding their compliance to safety protocols. However, 75% of the participants strongly agreed that they were always available for safety and health trainings.

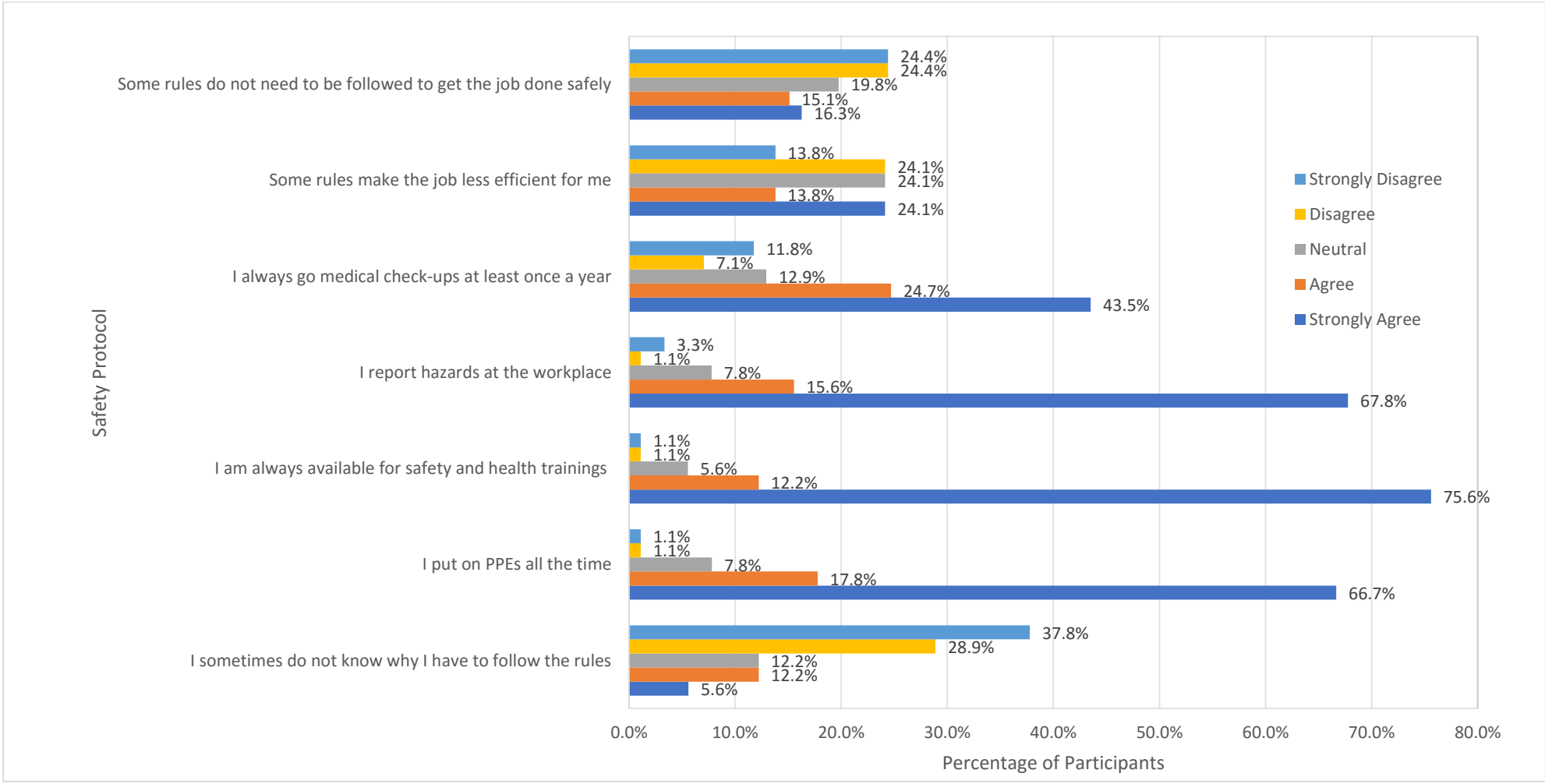

Figure 7: Compliance to Health and Safety Protocol

4.8 Participants' Perceived Factors Influencing Adherence

The figure below illustrates the thoughts of participants regarding factors that influence adherence to safety rules. Participants who strongly agreed that effective supervision influences adherence to safety rules were 47.7%. However, 48.2% strongly agreed that training on PPEs also influences adherence. Other factors also received varying degrees of responses as illustrated in the figure below.

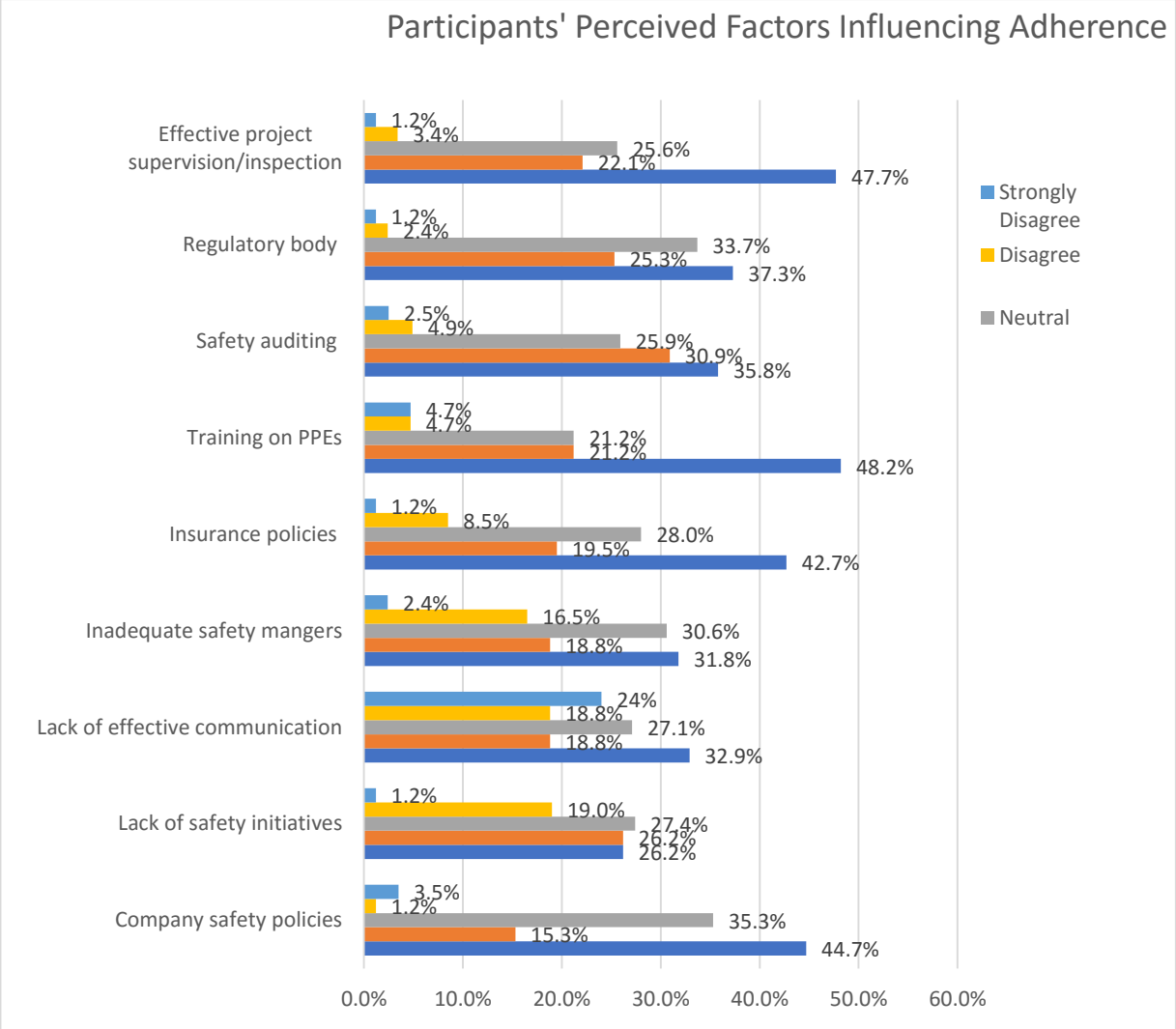

Figure 8: Factors Influencing Adherence

4.9 Comparison of Compliance with safety rules among various waste collection categories

Table 3 below shows a comparison between the two main categories of waste collectors. Waste collectors were regrouped into formal and informal waste collectors with informal waste collectors being private tricycle operators and the formal waste collectors being those who belong to waste collection companies such as Zoomlion sweepers, Zoomlion tricycle operators and the Jekora Janitors. Among waste collectors who have ever heard of occupational health and safety, 41.7% were informal waste collectors whiles 92.3% were formal waste collectors. However, this association was highly statistically significant at a 95% confidence level (P-value=0.001).

Comparing waste collectors who reported that they observed safety rules, 66.7% were informal waste collectors whiles 92.3% were formal waste collectors. This association was also statistically significant (P-value=0.004). Only 33.3% of the waste collectors from the informal sector reported that they were trained to use PPEs whiles 92.3% of the waste collectors from the formal sector mentioned that they were trained to use PPEs. This association was also statistically significant at a 95% confidence level (P-value=0.001).

Majority of the waste collectors from the informal sector reported that they knew hazard preventive measures, representing a total of 91.7% whiles waste collectors from the formal sector of waste collection who reported that they knew hazard preventive measures in waste collection were 97.4%. However, this association was not statistically significant (P-value=0.33). The percentage of waste collectors from the informal sector who reported that they comply with safety measures at work was 100% whiles 97.4% of those from the formal sector mentioned that they comply with safety measures at work. This association, however, was not statistically significant (P-value=0.58, CI 95%).

Table 3: Comparison of compliance level

Variable	Informal Collectors N (%) =12	Formal Collectors N (%) = 78	p-value
Have Ever heard of occupational health and safety?			0.001*
Yes	5(41.7%)	72(92.3%)	
No	7(58.3%)	6(7.7%)	
Reported Observation of safety rules?			0.004*
Yes	8(66.7%)	72(92.3%)	
No	4(33.3%)	6(7.7%)	
Trained to use PPEs?			<0.0001*
Yes	4(33.3%)	72(92.3%)	
No	8(66.7%)	6(7.7%)	
Know of preventive measures?			0.33
Yes	11(91.7%)	76(97.4%)	
No	1(8.3%)	2(2.6%)	
Do you comply with safety measures at your work?			0.58
Yes	12(100%)	76(97.4%)	
No	0(0%)	2(2.6%)	
Reported use of PPEs?			0.30
Yes	11(91.7%)	76(97.4%)	
No	1(8.3%)	2(2.6%)	

*Statistically significant at $p<0.05$, Chi-square / Fisher's Exact test analysis

4.10 In-depth Interview Results

4.10.1 Socio-demographic Characteristics of Participants

One out of the three supervisors was a female. Two of the supervisors belonged to one company (Zoomlion Ghana limited) whiles the last of the three belonged to Jekora Ventures, the second waste collection company. Out of the 4 team leaders interviewed, one was a female whiles the rest were males. The 5 waste collectors however were all males. All supervisors were married. One of the team leaders was divorced whiles all the waste collectors interviewed were married. All supervisors and team leaders had formal educated, with tertiary education as maximum level of education. Waste collectors interviewed also had some form of formal education.

4.10.2 Existence of Policies and Guidelines

When asked about the existence of policies and guidelines for ensuring that waste collectors' health is protected from health risks associated with their work, some supervisors were of the view that there were clear policies and guidelines to protect the health and safety of waste collectors and non-compliance to such regulations attracts sanctions. One of the supervisors mentioned, *"We have very clear policies on that. Any worker who doesn't want to go by those guidelines is sanctioned seriously. We don't compromise"*. Also mentioned was the fact that there were some waste collectors who were specially trained by the company to cater for hazardous wastes. A team leader mentioned use of PPEs as one of the safety practices among the waste collectors. One other team leader mentioned that the use of safety attire helps them to easily identify their workers. Also mentioned was the use of cones on sites where sweepers work, in order to alert oncoming vehicles of the presence of workers in the area. Among the policies mentioned was a policy on hazardous waste management which the company ensured by specially training experts who alone could work on hazardous wastes.

Supervisors also mentioned that there was a special department responsible for educating workers on health and safety. This department ensures that workers are regularly educated on the health and safety policies of the company. To reinforce this process, they ensure that visual aids are pasted around to serve as reinforcements for the waste collectors on issues of health and safety. A team leader also responded; *on the field, we ensure that workers are briefed before commencement of any day work and we insist that all the workers comply with the safety rules.*

4.10.3 Workers' Attitude towards Compliance to Safety Rules

A supervisor was of the view that some workers only use the safety equipment in their presence but refuse to use them when they are not around to supervise them. Some team leaders also mentioned that some of the workers failed to use the PPEs because they complained of the safety boots being heavy and the uniform causing heat especially during the afternoon. One supervisor also mentioned, *"On our blind side, they normally do not wear them especially the face mask. But generally, they comply when we are around*." They therefore ensure that workers who failed to comply with the regulations are reported to the authorities for sanctions. However, they all agreed that generally, the practise of safety measures has impacted positively on job performance.

4.10.4 Challenges for waste collectors

Most of the participants complained of inadequate and delayed monthly salary payments as one of the major challenges they face. Some supervisors complained of the fact that safety equipment meant for the waste collectors were not regularly and timeously supplied by the authorities. A team leader also mentioned; *face masks are disposable and so needs to be supplied regularly, but the supplies take a long time to arrive.*

On the part of the waste collectors who were interviewed, responses gathered showed that their daily work routine mostly involved use of tricycles to collect solid wastes from households. Averagely, they spent about 6 hours a day collecting wastes with one trip each. They mentioned that they paid for their medical bills themselves, either by cash or by the use of NHIS. A waste collector complained, *"the company does not pay attention to our needs. We foot those bills ourselves."*

4.10.5 Perceived work-related health problems

All the workers interviewed responded in the affirmative when asked whether their work could have a negative effect on their health; except one of them who mentioned that waste collection may have adverse effect on the health of only the waste collectors who do not exercise caution when working. They then mentioned waist pain, body pains and falls as some of the likely health problems one may face as a result of waste collection. A worker mentioned, *"I have attended the hospital several times because of body pains. I think I experience that a lot because of my work. I never experienced these problems when I was working at my former job."*

4.10.6 Use of personal safety effects

All waste collectors interviewed mentioned that they used personal safety effects. They mentioned gloves, face mask and safety boots. When asked why he used these effects, one of the waste collectors mentioned that he used gloves, boots and face masks in order to prevent himself from coming into contact with dirt and breathing bad air. A worker during an interview said; *"these equipment protect me from sickness."*

Unlike those who work with companies who said these materials are provided by their employers, one private individual waste collector responded that all his PPEs were procured by himself without any assistance.

CHAPTER FIVE

DISCUSSION

Many studies have shown that waste collectors suffer many health hazards. This study aimed at assessing the safety practices employed by waste collectors in Adentan municipality and how these waste collectors perceive the implications of their occupation on their health.

Waste collectors who participated in the study comprised of sweepers, tricycle operators and janitors who belonged to either the informal or the formal sector. However, results from this study show that most of the waste collectors belonged to the formal sector with females dominating the occupation. This is consistent with the findings of Gebremedhin et al., (2016), who reported that females dominate waste collection activities. This trend of dominance by women in the waste collection sector may be due to the fact that waste collection involves lots of sweeping, which women are normally fond of. Adogu et al., (2015), confirms this trend as they reported that females are actively involved in the waste collection sector.

Similar to claims by Giusti (2009), Domingo & Nadal (2009) and Gebremedhin (2016), who cited that waste collectors are at risk of respiratory diseases and other infectious diseases in the environment where they work; most of the participants exhibited awareness of the occupational health hazards they are exposed to, as most of them answered that respiratory diseases and other infectious diseases were associated with waste collection. Most of the participants also perceived that waste collection could expose the worker to physical injury, musculoskeletal problems and falls. This supports the claims by Selin (2013), Abou-ElWafa et al., (2012) and Mohammed and Puziah (2014); who mentioned these health problems as hazards associated with waste collection

respectively. However, one waste collector thought otherwise, as he explained that exposure to risks in waste collection was linked with carelessness on the job. He claimed, *"Unless maybe you are not careful whiles working."*

A confirmation by majority of the participants that they had ever heard of occupational health and safety indicates that the basic safety training and daily briefs, that most of them reported receiving was effective. This is a positive and promising trend since training reinforces good behaviours among workers. Mwesigye et al., (2009) supports this assertion in a report, that there is a good level of knowledge and awareness on the risks and impacts of waste among those involved in waste management and thus was attributed to good literacy levels. As stated by Abou-ElWafa et al., (2012), awareness campaigns are very important for changing the social aspects of waste collectors, and thus safety trainings are positive reinforcements to compliance to safety rules.

However, gloves were the highest used PPEs representing 92% of the participants whiles goggles were the least used by the waste collectors. Only 8% said they do not use gloves at all. This is contrary to the findings of Kretchy et al., (2015), who actually observed that most collectors rather used their bare hands to collect waste and thus exposed their body to hazards because they failed to use the PPEs appropriately.

Also, it was noticed that the proportion of waste collectors from the formal sector who have ever heard of occupational health and safety was significantly higher than that of the informal sector. These results are probably due to the fact that less than 50% of the waste collectors from the informal sector reported that they were trained to use PPEs whiles 92.3% of the waste collectors from the formal sector mentioned that they were trained to use PPEs. These findings are consistent with the findings of Bhat (2013),

(Githinji, 2014) and Saeed et al., (2013) who asserted that access to training impacts positively and culminates into better job performance.

Among the waste collectors who reported that they observe safety rules, 66.7% of them were from the informal sector whiles 92.3% were from the formal sector. A reason for this significant difference in proportions could be due to the fact that waste collectors who belong to the formal sector have a better chance of being supervised, as compared to their counterparts in the informal sector. This means that informal waste collectors are at a higher risk of physical injury as reported by Yanar, Lay & Smith (2019) that vulnerable workers without supervision have a 3.5 times higher risk of physical injuries than those who are supervised at work. One of the team leaders also mentioned; *"Everybody have their team leader that educates them. In case of non-compliance, they can be reported to the authorities so they don't repeat it."* (A team leader in an interview).

There was no statistically significant difference noticed between waste collectors from both divides as majority of the waste collectors from the informal sector reported that they knew hazard preventive measures, representing a total of 91.7% whiles waste collectors from the formal sector of waste collection who reported that they knew hazard preventive measures in waste collection were 97.4%, (P-value=0.33). This equally means that if majority of the workers from both sides are aware of the hazard preventive measures, they are as well aware of the risks involved in collecting or handling the waste. This finding is not different from the findings of Diwe et al., (2016). The findings of Gebremedhin (2016) was a bit contrary since he reported that most of the participants had moderate knowledge of prevention of occupational health hazards, and the magnitude of having safe occupational health practice was very low.

However, there was no statistically significant difference between participants from both groups since most of the waste collectors from groups mentioned that they comply with safety measures at work. One of the supervisors however thought otherwise as he said, "*"On our blind side, they normally do not wear them especially the face mask. But generally, they comply when we are around. But generally, the awareness is there among them. For example, whiles working, they question each other as to why their co-workers work without some of the safety equipment"* (A supervisor in an interview).

Participants who had no formal education formed only 11% of the population whiles the rest had some form of formal education. This is consistent with a study conducted in Nigeria by Diwe et al., (2017) in which it was observed that most of the waste handlers had either primary or secondary education. Most of the waste collectors confirmed that their monthly income ranged from GH¢ 100 to GH¢ 300 (78.9%) whiles only 3.3% confirmed they received a monthly income of more than GH¢ 1000. It means that majority of the waste collectors earn approximately $18.9-$55.46 which is below the accepted average monthly wage of individuals Ghana (GSS, 2018). However, this income may not be sufficient and thus may put a strain on the standard of living of waste collectors. This was confirmed in the in-depth interview conducted for the waste collectors, where one waste collector said, *"Our salary does not come on time and it is not enough"*. (A waste collector in an interview). Majority of the waste collectors pay for their own medical bills (64%) whiles only one person confirmed that the employer is responsible for payment of his medical bills. To support this claim, one waste collector mentioned, *"I use my own money to pay for my medical bills"* (A waste collector in an interview). One other said he used the NHIS to cover his medical bills, when he was asked if he was on the NHIS; *"Yes, I use insurance."*

The act of following safety rules helps the waste collector to use PPEs and this ensures protection since the PPEs act as a screen between the worker and the source of danger (Konya, Akpiri & Orji, 2013). The supervisors and team leaders interviewed mentioned that the safety policies and guidelines to protect the health of waste collectors involved the use of PPEs during working hours and they were strictly monitored to use them. Contrary to the claims by most waste collectors that they used these safety effects, some team leaders thought otherwise. When asked about the attitude of the workers, a team leader mentioned, *"Some of them do not use the PPEs. They find it difficult to comply with the rules. Some of them complain that the boots are heavy and, in the afternoon, they complain that the uniform makes them feel hot"* (A team leader in an interview). However, one major challenge faced by the waste collectors involved delays in the supply of work equipment, as one team leader mentioned, *"Our brooms don't come as often as expected. They get spoilt very frequently; logistics are a problem to us."* (A waste collector in an interview). These challenges may negatively impact their ability to use this safety equipment. This supports a claim by Choudhry & Fang (2008), who cited organizational factors as one of the reasons why workers adopt unsafe work behaviours.

5.1 Limitations of the Study

There were some limitations noticed in this study. A major disadvantage of the purposive sampling technique used in the qualitative component of this study, is that the findings realized cannot be generalized. Since participants were not randomly selected, findings from the qualitative component of this study therefore cannot be projected as the true state of affairs in other waste collection companies operating in the Adentan municipality or elsewhere.

Workers might have wanted to create positive impressions about themselves or were afraid of supervisors and so may have reported that they were trained or use PPEs when they actually do not. It is therefore possible that responses of participants were biased.

An unscheduled visit to the site of data collection showed that various waste collectors were working without the required PPEs; contrary to the responses given by most of them that they use PPEs.

CHAPTER SIX

CONCLUSION AND RECOMMENDATION

6.1 Conclusion

Waste collectors operating in the Adentan Municipality belong to the formal and the informal sector. Formal sector waste collectors are those employed by waste collection companies or contractors while informal sector waste collectors are private individual waste collectors who perform waste collection as their own private venture; thus, own tools and other equipment with which they perform waste collection.

Majority of the waste collectors confirmed that they knew the implications of their occupation on their health; so, practice safety measures and adhere to safety regulations meant to prevent hazards and injuries associated with waste collection.

Overall, there was no statistically significant difference in compliance to safety rules between both groups of waste collectors although majority of the waste collectors in the formal sector reported being trained on health and safety protocols whiles most of the informal waste collectors reported they received no training.

Findings from this study best confirms that most waste collectors are aware of the implications of their occupation on their health, so employ safety measures necessary to prevent health problems associated with waste collection.

6.2 Recommendations

Team leaders and supervisors complained that their logistics and equipment normally take a long time to arrive most of the time. This delays distribution of PPEs among the workers. The various waste collection companies that ensure waste collection in the Adentan Municipality should consider regular supply of logistics for waste collectors in order to improve their compliance level to use of PPEs in their daily work.

The Adentan Municipal Assembly should also consider taking the interest of the private/informal waste collectors into consideration and provide training and supervisory services for them. This would keep them abreast with new safety trends and improve their ability to adhere to safety rules.

Further research should also be conducted to identify the most prevalent health condition among waste collectors in the Adentan municipality.

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APPENDICES

Appendix 1: Questionnaire for Waste collectors

DEPARTMENT OF EPIDEMIOLOGY AND DISEASE CONTROL, SCHOOL OF PUBLIC HEALTH, COLLEGE OF HEALTH SCIENCES, UNIVERSITY OF GHANA, LEGON

Title: Safety Practices and Perceived Health Implications on Waste Collectors in the Adentan Municipality of Accra

Interviewer's Name: _____

Interview date (dd/mm/yyyy): __ __ / __ __ /2019

Participant's ID: _____

Work

Designation_____Company_____

A. Demographic Characteristics

1. How old are you? (Years) …… 1.____
2. Sex 1. Male 2. Female 2.____
3. Are you married?

   1. Married 2. Single 3. Divorced 4. Widowed 5. Co-habiting 6. Other 3.____

   ……
4. How many children do you have? …… 4.____
5. What is your highest level of education? 5.____

   1 . None 2. Primary 3. JHS 4. SHS 5. Tertiary 6. Others …….
6. What is your religion?

   1. Christianity 2. Islam 3. African Traditional Religion 4. Other..... 6.____

7. How do you pay for your medical bills? 7.____

1. Self. 2. NHIS 3. The institution 4. Other

8. How many years have you been working as a waste collector? …… 8.____

9. How much do you averagely make in a month?

1. < 100 GHS 2. GHS 100 – 300 3. GHS 300 – 500 4. GHS 500 – 1000 9.____

5> 1000

B. Knowledge on Existence of Health and Safety Protocols

10. Have you ever heard of occupational health and safety? 1. Yes 2. No 10.____

11. Is there a compulsory existence of Personnel Protective Equipment at the workplace? Please tick all that apply 11.____

Hand gloves ☐
Face Mask ☐
Goggles ☐
Safety Boots ☐
Helmet ☐
Safety Boots ☐
Protective clothing ☐
Like reflectors etc.

12. Is the work environment always cleared and kept free from objects that can cause harm or injury to the worker? 1. Yes 2. No 12.____

13. Is there adequate and strict monitoring of safety records? 1. Yes 2. No 13.____

14. Do you have safety briefs before the commencement of any day work? 14.____

1. Yes 2. No

15. If yes, how often? 1. Daily 2. Weekly 3. Monthly 15.____

16. Is there any basic safety training and education? 1. Yes 2. No 16.____

17. If yes, how often? 1. Monthly 2. Quarterly 3. Every 6months 4. Yearly 17.____

5. Other

18. Are first aid and welfare facilities available to help in case there is any injury whiles you are working? 18.____

    1. Yes 2. No

19. Do you regularly observe safety rules and regulations on site? 1. Yes 2. No 19.____

20. Do you have protective equipment like gloves, boots, face masks and helmets available to you for waste collection? 20.____

    1. Always 2. Sometimes 3. Not at all

21. Have you been trained to use them? 1. Yes 2 No 21.____

22. Are you always supervised to use it? 1. Yes 2. No 22.____

C. Perceived Health Hazards of Waste Collection

23. Do know of any health problems associated with your work as a waste collector?

    1. Yes 2. No

24. If yes, which of the following health risks do you think is associated with your work?

    1. Respiratory problems 2. Physical injuries 3. Infections 4. Musculoskeletal problems 5. Falls 6. Others……

25. Do you suffer any of the following health problems? Tick all that apply 23.____

    Asthma ☐
    Epilepsy ☐
    Tuberculosis ☐
    Any eye defect ☐
    Others (please specify)……..……

26. If Yes, have you sought medical intervention and thus on treatment for it? 1. Yes

    2. No please indicate reason if you answered "No"……..

26.____

27. How did you get to know of the health risks associated with your work?

1. Co-worker 2. Media 3. Relative 4. Magazines 5. Health Centre 27.____

6. Others …….

D. Health and Safety Practices

28. Do you know of hazard preventive measures in your line of duty as a waste collector? 28.____

1. Yes 2. No

29. If yes, what types of preventive measures do you know of in this company? Please select all that apply

1.Use of PPEs like gloves, face mask, boots and others ☐
2.Isolation of Hazardous agents or process ☐
3.Periodic Medical Examinatio ☐
4.Adequate ventilatio ☐
5.Sanitizing the workplac ☐
6.Personal Hygien ☐
7.Training of drivers and other workers on use of equipment e.g. composting plant, forklifts ☐
8.Other…….....

29.____

30. Do you comply with the safety measures of your work? 1 Yes 2. No 30.____

31. If yes, why? ……... 31.____

32. If no, why? …… 32.____

33. Do you use PPEs in your line of duty? 1. Yes 2. No 33.____

34. If No, why? …… 34.____

35. Were you trained on PPEs? 1. Yes 2. No 35.____

36. Are these PPEs readily available for your use? 1. Yes 2. No 36.____

37. If yes, name the ones available? …… 37.____

38. If yes, how often do you use these PPEs?

1. Always 2. Occasionally 3. When Reminded 4. When I feel it's necessary 38.____

5. Other ……

39. Are you trained periodically on health and safety protocols? 1. Yes 2. No 39.____

40. If no, why? …… 40.____

41. Do you often report of unsafe acts and conditions to your supervisors? 41.____

1. Yes 2. No

42. If yes, why? …… 42.____

43. If no, why? …… 43.____

E. Compliance to Health and Safety Protocols

Statement	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
44. I sometimes do not know why I have to follow the rules					
45. I put on PPEs all the time					
46. I am always available for safety and health trainings					
47. I report hazards at the workplace					
48. I always go medical check-ups at least once a year					
49. Some rules make the job less efficient for me					
50. Some rules do not need to be followed to get the job done safely					

F. Participants' Perceived Factors Influencing Adherence

51. Company safety policies					
52. Lack of safety initiatives					
53. Lack of effective communication					
54. Inadequate safety mangers					
55. Insurance policies					
56. Training on PPEs					
57. Safety auditing					
58. Regulatory body (OSHA representative)					
59. Effective project supervision/inspection					

G. External Supervision

60. Do external supervisors pay visits to your workplace to monitor your activities at the workplace? 1. Yes 2. No

61. If yes, how often do they do so? 1. Monthly 2. Quarterly 3. Every 6months 4. yearly

62. Has these visits been beneficial to you? 1.Yes 2. No

Appendix 2: Interview Guide for Waste collectors

DEPARTMENT OF EPIDEMIOLOGY AND DISEASE CONTROL, SCHOOL OF PUBLIC HEALTH, COLLEGE OF HEALTH SCIENCES, UNIVERSITY OF GHANA, LEGON

Title: Safety Practices and Perceived Health Implications on Waste Collectors in the Adentan Municipality of Accra

Interviewer's Name: _____

Interview date (dd/mm/yyyy): __ __ / __ __ /2019

Participant's ID: _____

In-depth-Interview Guide for waste collectors

Welcome and thank you for volunteering to take part in this interview. You have been asked to participate as your point of view is important. I realize you are busy and I appreciate your time.

This research is entitled: **Safety Practices and Perceived Health Implications on Waste Collectors in The Adentan Municipality of Accra.** We are gathering data on the safety practices that waste collectors employ when collecting wastes and how they perceive the implications of their work on their health. Data for this research will be collected by one of the members of the research team.

The interview will take no more than 30 minutes. May I tape the discussion to facilitate its recollection? (if "Yes" switch on the recorder)

Questions

1. Can you tell me about what you do?
    a. How long do you spend on the work in a day?
    b. How many trips do you make in a day?
2. What are some of the tools and equipment you use for your work?
3. Do you think your work has any effect on your general health?
    a. Why? If "Yes" can you share some of the effects of your work on your health?

4. What are some of the things you can do to reduce the effects of your work on your health?
5. Do you use any personal safety effects?
    a. If “No” why?
    b. Can you name some the safety effects and share how you use them to protect yourself?
6. What do your employers do to ensure that you are safe at work?
7. Are you on NHIS?
8. Is there any other thing you would like to share about your safety and health?

Thank you for your time

Appendices 3: In-Depth Interview Consent Form (Interview Form for Supervisors, Human Resource Manager, and Health and Safety Officers)

CONSENT FORM

STUDY TITLE: Safety Practices and Perceived Health Implications on Waste Collectors in the Adentan Municipality of Accra

PARTICIPANTS' STATEMENT

I acknowledge that I have read or have had the purpose and contents of the Participants' Information Sheet read and satisfactorily explained to me in a language I understand (Twi/Ga/Hausa/English/Other). I finally understand the contents and any potential implications as well as my right to change my mind (ie withdraw from the research) even after I have signed this form.

I voluntarily agree to be part of this research.

Name or Initials of Participant……. ID Code……

Participants' Signature……OR Thumb Print……OR Mark (Please specify)……..

Date: ……..

INVESTIGATOR'S STATEMENT AND SIGNATURE

I, the undersigned, certify that the participant has been given ample time to read and learn about the study, its procedures, risks and benefits. All questions and clarifications raised by the participant have been duly addressed and the participant has freely agreed to participate in the study.

Researchers' name…….

Signature……..

Date…….

Appendices 4: In-Depth Interview Form (Interview Form for Supervisors, Human Resource Manager, and Health and Safety Officers)

DEPARTMENT OF EPIDEMIOLOGY AND DISEASE CONTROL, SCHOOL OF PUBLIC HEALTH, COLLEGE OF HEALTH SCIENCES, UNIVERSITY OF GHANA, LEGON

Interview Form for Supervisors, Human Resource Manager, and Health and Safety Officers

Study Title: Safety Practices and Perceived Health Implications on Waste Collectors in the Adentan Municipality of Accra

Waste Management Company Name ……

Paper Code…….....

Date of data collection …….. /……. /……

Demographic Characteristics

1. Sex of Respondent 1. Male 2. Female
2. Age of Respondents (in years) …….
3. What is your marital status?
   1. Single 2. Co-habiting 3. Married 4. Divorced 5. Widowed
4. Highest level of education.
   1. None 2. JSS 3. SSS 4. Tertiary
5. What is your main occupation? …….
6. Religious affiliation
   1. Christian 2. Muslim 3. Traditional 4. Other (specify) …….
7. How long have you been working with this waste management company? ..……

8. What department are you currently assigned? ……

9. What is your current position? ……..

10. Are there policies and guidelines for ensuring that waste collectors' health is protected from health risks associated with their work?

    - Yes 2. No

11. If "***Yes***", list three of these guidelines and key issues they seek to address.

Policy 1
Key issues
Policy 2
Key issues
Policy 3
Key issues

12. Briefly, how is occupational health and safety described in your company?

    ……
    ……
    ……
    ……
    ……
    ……

13. How do you ensure employees are aware of all health and safety policies and guidelines of the company?

    ……
    ……
    ……

……
……

14. Are there regular simulation exercises on health and safety hazards and erasures in the company? If yes, how often?

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15. Briefly, how would you describe employees' attitude towards safety regulations of the company?

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16. List some of the safety practices in your company.

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17. What impact has these safety practices in the company have on job performance?

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18. What challenges do you face in implementing occupational health and safety in your company with employees being your primary focus?

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Appendix 5: Ethical Clearance

GHANA HEALTH SERVICE ETHICS REVIEW COMMITTEE

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

MyRef. GHS/RDD/ERC/Admin/App/19/226
Your Ref. No.

Research & Development Division
Ghana Health Service
P. O. Box MB 190
Accra
GPS Address: GA-050-3303
Tel: +233-302-681109
Fax + 233-302-685424
Email: ghserc@gmail.com
20th June, 2019

Eric Blewusi
University of Ghana
School of Public Health
Legon

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

GHS-ERC Number	**GHS-ERC 048/03/19**
Project Title	Safety Practices and Perceived Health Implications on Waste Collectors in the Adentan Municipality of Accra.
Approval Date	20th June, 2019
Expiry Date	19th June, 2020
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