



Occupational Hazards among the Solid Waste Workers in Eldoret Central Business District, Kenya

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Abstract: Waste management involves use of personnel who actively participate in sweeping, collection and disposal of wastes and thus are exposed to health hazards. This investigated the health hazards faced by solid waste collectors in Eldoret Central Business District. Cross-sectional descriptive research design was used and target population was 114 solid waste collectors and three (3) public Health officers. A sample size 89 waste handlers and 3 supervisors was used and were selected through simple random and purposive sampling. Questionnaires and interview guides were used to collect both quantitative and qualitative data. Validity was attained through expert judgement while reliability was attained through piloting and use of Cronbach Alpha coefficient. Quantitative data was analyzed using frequencies, mean and standard deviation and presented in tables and figures. Qualitative data were thematically classified and arranged before they were reported in narrations and quotations. The study found out that 97.6% of the waste handlers had been affected by wastes collected. In addition, 97.6%, had been pricked by sharped objects, 98.8% had cuts from sharp objects, 84.5% had been pierced by sharp objects, 83.1% had suffered dermal injuries and 74.7% had suffered strain. The paper concluded that the major hazards that were associated with solid waste handling included; cuts from metals and broken bottles, piercing, strain, corrosions and musculoskeletal injuries. It was recommended that there is need for segregation of wastes at the source to reduce mixing of solid wastes which increases the likelihood of an occurrence of hazards among waste handlers.

Keywords: Occupational, Hazards, Solid Wastes, Workers

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1. Introduction

Municipal solid waste (MSW) is an important economic and environmental issue worldwide (Yukalang, Clarke & Ross, 2018). Due to the exponential increase in waste creation in tandem with population growth, rising living standards, urbanization, and rapid development, MSW management is already a serious concern for municipal authorities, particularly in less developed countries (Kumar & Pandey, 2019). The MSW problem has become

an important challenge to sustainable development in developing countries (Rai, Bhattarai & Neupane, 2019). Lack of resources, combined with municipalities' weak institutional capacity to comply with existing solid waste management structures, insufficient facilities for waste collection, transportation, treatment, and disposal, limited technical competence, and low public awareness, have made solid waste management difficult for local governments (Azevedo, Scavarda & Caiado, 2019).

Municipal solid garbage collection is one of the world's most hazardous jobs (Joy & Chitra, 2018). Workers are exposed to physical, biological, and chemical risks, as well as occupational morbidities. Municipal solid waste management-related occupational morbidities are not well addressed in poor nations (Endreddy & Yasobant, 2015). Municipal solid waste management (MSWM) encompasses the collection, transportation, treatment, recycling, recovery, and disposal of solid waste in metropolitan settings (Shuvai, 2017). The amount and type of garbage produced varies depending on a country's technical advancement. Municipal solid wastes are generated and dumped on a regular basis, and if they are not collected, handled, and treated appropriately, they can cause health problems and pollution (Bonsa Taffere & Alemayehu, 2019).

There is a high increase of occurrence of job-related accidents and ailments in the less developed countries and it has been approximated that more than 120 million work related incidences are normally placed at over 200,000 fatalities yearly in developing world (Lund & Marriott, 2011). According to World Health Organization (WHO) (2010) the gross national product (GNP) of 10-20% of a country is caused by poor occupational health and the reduction of workers capacity, and worldwide occupational diseases illness and death accounts for a 4% of the country's GDP (Amponsah-Tawiah & Mensah, 2016). According to ILO, in 2016 it was estimated that about 6300 people died daily and occupational accidents were the main reason and that over 2.3 million deaths occurred per year due to work related diseases (ILO, 2016).

In the developed countries, like USA, health hazards to SWM are present in all stages. Their methods of solid waste management are more classical and include use of landfills; incineration and composting, yet, the workers in the sector are not exceptional in terms of hazards and health risks (Mehrad *et al.*, 2014). Former studies in Sweden and Denmark have found some incidences of respiratory illnesses amongst its waste collection workers. They include those working in the waste reception halls, staff on material recovery, picking lines and manual workers at composting facilities and landfills. It is also evident in these countries that inadequate extraction systems expose workers to higher concentrations of microbial contaminants from dust and aerosols (Brażoszevska & Pawlak, 2021).

In Romania, a medical review of records amongst waste workers in mid 1990s showed that workers had incidences of skin and eye infections aggravated by lack of protective clothing and washing facilities (Todor, 2021). In India presence of intestinal parasites and gastroenteritis illnesses amongst waste collectors, waste disposal workers and scavenge communities were prevalent. This was

caused by dusty working environment, lack of personal hygiene and clean water for drinking and washing (Ziraba, Haregu, & Mberu, 2016).

Waste handlers including collection workers and waste dumpsite managers face particular occupational hazards, including strains from lifting, injuries from sharp objects and contact with pathogens when manually handling the wastes (Patil & Kamble, 2017). They are exposed to a wide variety of health hazards, which can occur via skin contact, injection, ingestion and inhalation (Suleman *et al.*, 2015). However, there is evidence of substantial health effects on employees at particular waste sites, thus there is need to emphasize the importance of strict occupational exposure limits to hazardous compounds and the use of appropriate personal protective equipment (Adebola & Adeyemi, 2019).

Occupational health issues for municipal solid trash collectors in poor nations include muscle and ligament sprains, cuts and lacerations, and allergies (Thakur, Ganguly & Dhulia, 2018). Long working hours, frequent work accidents, and exposure to chemical, physical, mechanical, and biological threats expose municipal solid waste collectors to occupational health issues, resulting in physical and psychological diseases (Zolnikov *et al.*, 2018). The lack of protective equipment is one of the main causes for the occurrence of occupational health problems among municipal solid trash collectors in underdeveloped nations. This is primarily due to insufficient financial allocation for proper municipal solid trash collection. This exposes you to a variety of health risks, including the development of infections, exposure to hazardous pathogenic microbes, and musculoskeletal injuries such as muscle damage, lacerations and cuts, and fractures (Thakur *et al.*, 2018).

In Kenya, there is a continuous generation of solid wastes which are not disposed of safely, effectively or economically. This leads to an accumulation of garbage which causes pollution and unsightliness, as well as health hazards that negatively impact living standards of both citizens and waste collectors (Wanjohi, 2018). The EMCA Act in Kenya contains waste management regulations that apply to all waste categories and detail the standards for waste processing, storage, transportation, treatment, and disposal (Agong, & Otom, 2015). The EMCA was supplemented in 2008 by environmental bylaws that defined suitable waste methods and explained the consequences for failing to follow the rules (Mungai, Ndiritu & Rajwani, 2020). Furthermore, these ordinances gave local governments the ability to hire private waste collectors who were licensed by the National Environment Management Authority (NEMA). As a result, municipal trash management services are a collaborative effort between city councils, registered private collectors, and unregistered enterprises (Kain *et al.*, 2016).

In the Eldoret Central Business District (CBD) three-bin systems have been put in place by the county governments as the first point of waste collection and separation. These bins are labelled and colour coded to facilitate separation of waste at source. Organic waste is disposed of in the green bin, while plastics and other litter are blue and black, respectively. In other locations, yellow bins are used to separate glasses and bottles, with white bins for paper. However, studies by Aurah (2013) and Awuor (2016) in Kisumu and Nairobi cities have confirmed that the culture of waste separation is not engrained in the public. These studies revealed that in all the bins put in place in Kisumu City, wastes were mixed despite the presence of various labeled bins. Furthermore, when waste collectors, private and public, come to collect these wastes, they are all hurled into one container, thus mixing even those that were well segregated. This phenomenon causes hazards to these collectors thus the current study assessed the occupational health hazards among solid waste collectors in Eldoret Central Business District.

Currently, protective equipment for Covid-19 particularly masks litter the streets of Eldoret town due to lack of guidance on their disposal. These wastes are medical in nature and thus poses serious hazards to individuals who come in contact with them. According to Mihai, (2020), improper management of medical waste has the potential to expose patients, health workers and waste managers to injuries, infections, toxic consequences and air pollution.

Records from Uasin Gishu County labour office (2020) indicated that in a day at least one or two workers working the department of waste management is injured or hospitalized. In addition, other workers in the department do not report their injuries or sicknesses. This later leads to hospitalization or absence from work.

Handling of waste involves a lot of physical activities like bending, reaching, lifting, physically moving wastes amongst others (Takala, 2019). These activities are associated with an increased risk of direct contact with waste thereby increasing the risk of musculoskeletal problems and other waste management related hazards such as pricking, cutting and infections (Ramos, *et al.*, 2017). Working without the use of personal protective equipment as witnessed allows a direct contact of the individual to waste. In addition, individuals who are occupationally involved in waste management often use technologically outmoded or unsafe means of waste handling (Chokhandre, Singh & Kashyap, 2017). In other cases, the options for waste management is either completely absent, too expensive to purchase or in poor condition. Such conditions may compromise the health of persons directly involved in the management of waste in the communities as a whole. The Occupational Safety and Health Act of 2007 was ratified with the aim of ensuring safety, health and welfare of workers. However, there are

as still countless mishaps at the work place resulting in occupational hazards. It is with this background that this study sought to assess the occupational health hazards faced by Solid waste workers in Eldoret CBD.

2. Literature Review

Various studies have looked into the health impacts of solid waste management. Adipah, and Kwame, (2019) gave a detailed report on solid waste and population and worker health concerns, highlighting that the issue is frequently worse in low-income nations. The researchers' work is, without a doubt, the most thorough of the last 15 years. Except for dumpsites and open burning places, Aluko *et al.*, (2021) looked at epidemiological studies on the health implications of solid waste management. Makarenko & Budak, (2017) investigated the health consequences of landfills and incinerators on persons who live near them. Ashworth *et al.*, (2014) gathered information on garbage incineration and negative birth outcomes. Ncube *et al.* (2017) looked at epidemiological studies on municipal solid waste management and compiled the findings based on health risks (cancer, birth weight, congenital abnormalities, respiratory disorders), however this made comparing MSW procedures difficult. The current study investigated the occupational health hazards among solid waste workers in Eldoret Central Business District.

The majority of studies looked at how people were exposed to trash in general. Waste pickers who work with solid waste, on the other hand, are more vulnerable because they spend so much of their time exposed to the dangers (Fazzo *et al.*, 2017). Furthermore, considerable noncompliance with public health legislation for the disposal of health waste from health care facilities and people's homes exposes these professionals to additional risks (Ramos, *et al.*, 2017). It is important to note that these employees, notably in Asia, Africa, and South America, live in deplorable conditions, have poor educational levels, low wages, and receive little support from their governments (Cruvinel, *et al.*, 2019). As a result, determining the influence of this work on these persons' health, establishing causal relationships, and excluding alternative reasons is a huge difficulty for public health researchers, given that additional exposure to other elements in this setting could possibly cause the same outcomes. Furthermore, some clinical effects, such as cancer and other degenerative illnesses, appear months or even years after the initial exposure (Domingo, Marquès, Mari & Schuhmacher, 2020).

In order to examine the health conditions and occupational risks that waste collectors in Brazil face, a systematic review was done. The findings revealed that the sites are full of occupational dangers for workers, including extended working hours, exposure to physical, chemical,

mechanical, biological, ergonomic, and social agents, and frequent work accidents that result in psychological diseases (Cruvinel, *et al.*, 2019).

According to studies, waste pickers are exposed to conditions that put them at a high risk of developing morbidities, such as getting stuck in processing machinery, being run over by trucks, fires, explosions, being damaged by glass, infected needles, medical waste, and even death. Respiratory infections, eye infections, stomach issues, typhoid fever, diarrhea, musculoskeletal ailments, and carcinogenic consequences are all possible (Mol, Pereira, Greco, Cairncross & Heller, 2017). Individual risk factors, such as poor hygiene habits and a lack of or insufficient use of personal protective equipment, as well as living conditions linked to extreme social vulnerability and inhumane conditions, such as those linked to the use of intoxicating substances or stimulants that affect the central nervous system, can exacerbate their health vulnerabilities (Chokhandre, Singh & Kashyap, 2017). It is common to find a high prevalence of falls, accidents, waterborne diseases, and dermatological problems among these workers – as well as a high incidence of infections of the reproductive and urinary systems among female workers, which is likely caused by a lack of sanitary facilities and potable water in the areas where waste is collected and treated, as well as by the inadequacy of the waste collection and treatment facilities (Jayakrishnan, Jeeja & Bhaskar, 2013).

A systematic review looked at the link between exposure to toxic and industrial wastes (hazardous waste) and illnesses and health problems (Fazzo, Minichilli, Santoro, Ceccarini, Della Seta & Bianchi, 2017). The authors found enough evidence from the 57 papers included to link exposure to waste from the petroleum sector to a variety of acute symptoms, including neurological, otorhinolaryngological, respiratory, digestive, and dermatological. There is some evidence in association to cancers of the liver, bladder, breasts, and testicles; non-Hodgkin lymphoma; asthma; congenital malformations in general; neural tube and urogenital, connective, and musculoskeletal system defects; low birth weight; and preterm birth. Given that the majority of the research had ecological designs, the methodological constraints of the primary studies included in the systematic review were identified as a weakness (Fazzo *et al.*, 2017). A separate study by the World Health Organization highlighted methodological flaws in studies looking at the health effects of solid waste exposure (Ramos *et al.*, 2017).

Millions of contaminated Personal Protective Equipment (PPEs) used in the prevention of Corona-19 Virus such as facemasks and gloves, would end up as waste, posing environmental and health risks if not properly managed, especially since a recent study (Kampf *et al.*, 2020) found that the coronavirus can survive for up to 9 days on

material surfaces of metals, glass, and plastics. Such hazards may be mitigated in industrialized countries that employ green and sustainable waste management systems that are capable of containing viruses. However, in underdeveloped countries with insufficient waste management techniques, the dangers would be far worse. Solid wastes are dumped in the open and in poorly managed landfills in many developing nations, where waste pickers without suitable PPE scavenge for recyclable goods (Nzediegwu & Chang, 2020).

Work related accidents and diseases in developing countries are increasing in numbers. An estimation of over 120 million work-related incidences and over 200000 deaths have been estimated every year in these nations (Levitsky, 2019). In Africa, Sub-Saharan region seems to report the highest rate followed by Asia (Du & Leigh, 2011). About 42 million occupational accidents was expected with fatalities of more than 54,000 every year (Takala, Hämäläinen, Nenonen, Takahashi, & Chimed-Ochir, 2017).

Plastics, paper, cardboard, wires, glass bottles, rubber materials, sharp metals, and hazardous electronic components are collected by waste pickers from landfills and garbage collection centers (Adipah & Kwame, 2019). They can be hazardous to the health of waste pickers because they are exposed to a variety of infectious and poisonous factors that might cause sickness. Furthermore, they are subjected to social prejudice and abuse by certain segments of society, which can lead to societal issues. They also frequently reveal bad lifestyle choices at work, such as smoking, drinking alcohol, and using drugs, which puts their health at danger (Aluko *et al.*, 2021). Garbage pickers scour the streets, riverbanks, and residential or commercial/industrial areas for trash. For a living, they also collect rubbish from private waste bins, as well as landfills and landfill sites. They are, nevertheless, frequently subjected to low social status, deplorable housing and working conditions, and receive little assistance from community and local governments (Asante, 2016). They gather trash and sell recyclables to scrap dealers or middlemen. Some work for their cooperatives or associations in recycling warehouses or recycling plants. The working condition is differing from place to place according to working categories but in common they are collecting waste as a way of sustaining their livelihoods (Gebrekiros, *et al.*, 2015).

Injuries from various occupations results from a more complex interplay of a variety of risk factors. The most common factors in workplace were the psychological factors and ergonomic factors. Among the socio-demographic factors, training is one of the major aspects of dealing with occupational hazards in characteristics of employees and the environmental and social conditions (Chakraborty *et al.*, 2018). Studies from different

researchers have shown that early age employment (Berhe *et al.*, 2015), lack of formal education, (Khashaba *et al.*, 2018), low salary at the end of month (Gebrekiros, Abera, & Dessalegn, 2015) individuals smoking status (Alexander *et al.*, 2016) problems of sleeping (Salminen *et al.*, 2018), alcoholism, working on overtime, lack of proper or no health and safety training, (Ricci *et al.*, 2016), being either a metal or wood worker (Yessuf, Moges & Ahmed, 2014), job experience (duration), lack of personal protect and employee's lack of satisfaction (Ricci *et al.*, 2016) were the main contributing factors for injuries that were occupational.

According to Mehrad *et al.*, (2014) Africa's waste collectors are faced with different kinds of hazards and health risks. These hazards include musculoskeletal injuries, skin infections and injuries from sharp objects. This is because their job involves a great deal of heavy lifting, pushing and pulling of garbage bins and containers. Spinal injuries are also common in the continent. As well as those injuries caused by sharp objects such as broken glass, thorns, disposable razors and needles.

Workers and waste pickers managing solid trash are subject to occupational health and accident risks due to the materials they are handling, the pollutants produced by those items, and the equipment they are using all over the world (Cointreau as cited in Adeyi, & Adeyemi, 2019). Hazards and occupational health risks are more common for people living or working near solid waste processing and disposal sites. These dangers are related to solid waste emissions, pollution control systems used to manage these emissions, and the facility's general safety.

3. Methodology

This study was conducted in Central Business District of Eldoret town. Eldoret lies between 0° 30' 51.3972" N and Longitudes 35° 16' 11.2044" E and is found south of the Cherangani Hills and terrain varies from about 2100 metres above sea level at the airport to more than 2700 metres in nearby areas. It is located 312km North West of Nairobi (capital city of Kenya). The population of Eldoret was 475,716 according to the 2019 census and is the fifth largest urban centre in Kenya after Nairobi, Mombasa, Kisumu, and Nakuru in that order.

The study utilized cross-sectional descriptive research design which allows for rapid gathering of information from a large population within the shortest period possible by use of research questionnaires, interview schedules and document analysis. The study targeted all waste collectors within Eldoret Town. According to statistics from the Public health office, Uasin Gishu County, there are 114 solid waste collectors within Eldoret town. Thus, the target population was 114 workers. These were those workers

who picked the wastes from their source for dumping in the respective sites. They include manual workers and the waste truck drivers employed by the county government. In addition, the study targeted three (3) Public Health Officers who also doubles up as the waste management supervisors within the CBD.

Sample size for waste workers was determined by Yamene formula (Israel, 2006) for finite population. The formula is given as

$$n = \frac{N}{1 + N(e^2)}$$

Where;

n = required sample size

N = population size (140)

e = standard error in this case 0.05.

n = 114 / (1 + 114 (.05²)) = 114 / (1 + 0.285) = 89

Therefore, the minimum sample size was 89 waste collectors and three (3) key informants (public health officers who doubles up as the supervisors for waste collectors). Simple random sampling was employed to sample the 89 from a target population of 114 waste collectors while the three (3) public health officers were purposively sampled.

Adult workers who consented to participate in the study and had worked in the department of waste collection, transportation and disposal were included in the study. In addition, three public health officers in charge of waste collection in Eldoret CBD were included in the study since were also dealing with occupational health concerns of the workers dealing with waste handling. The exclusion criteria was waste workers who were under 18 years, waste handlers who were not employed by the county government and those who did not consent to participate in the study.

This study used questionnaire and interview guide as the research instruments for collecting both quantitative and qualitative data from the waste handlers and the supervisors. A pilot study was carried out in the neighboring Kitale Town in Trans-Nzoia County which shares similar characteristics as the study area. The researcher selected a total of 30 respondents to participate in the pilot study. The results from the pilot study were included in the final instruments' amendments so as to improve its content validity as well as questions, format and scale's reliability (Vogel, & Draper-Rodi, 2017).

The validity of the research instruments used in the research were ensured by availing the research tools to supervisors and other experienced scholars in the field of public health at Kisii University to evaluate the research tools. The outcomes from the pilot study in addition to the

remarks from the scholars were integrated in the ultimate instrument modifications to enhance the validity of the instruments. In ensuring the reliability of the instruments, the researcher pilot tested the instruments and thereafter Cronbach Alpha Coefficient was then used to determine the research equipment' dependability. Cronbach Alpha is a measure of internal consistency that is commonly utilized. The researcher was allowed to proceed with the investigation if the correlation coefficient was equal to or greater than 0.70 (Elliott, et al., 2020). The research tools in this study had a reliability coefficient of 0.82, indicating that they were trustworthy.

Questionnaires completed were coded and entered in a database designed using the Statistical Package for Social Sciences (SPSS V.20). Quantitative data was analyzed by use of frequencies, mean and standard deviation and presented in Tables and Figures. In addition, qualitative data from interview schedules, were thematically classified and arranged before they were reported in narrations and quotations as per the objectives of the research.

Approval to conduct the study was sought from Institutional Research and Ethics Committee (IREC) University of Eastern Africa Baraton. The researchers further sought for authority from the county administration to undertake the study in the area. Written informed consent also sought from the respondents after brief introduction of what the study was all about and further the participation of the respondents was on voluntary basis. Confidentiality was ensured by using collection tools where there were no names of the participants involved. Completed data collection tools were also kept under key and lock.

4. Results and Discussion

The aim of this paper was to establish the occupational hazards among the solid waste collectors in Eldoret CBD. In this study 85 questionnaires were used giving a response rate of 95.5%. To achieve this, the respondents were asked to indicate whether they have had any health-related effects associated with waste handling. Their responses were tabulated and the results are presented in Figure 1.

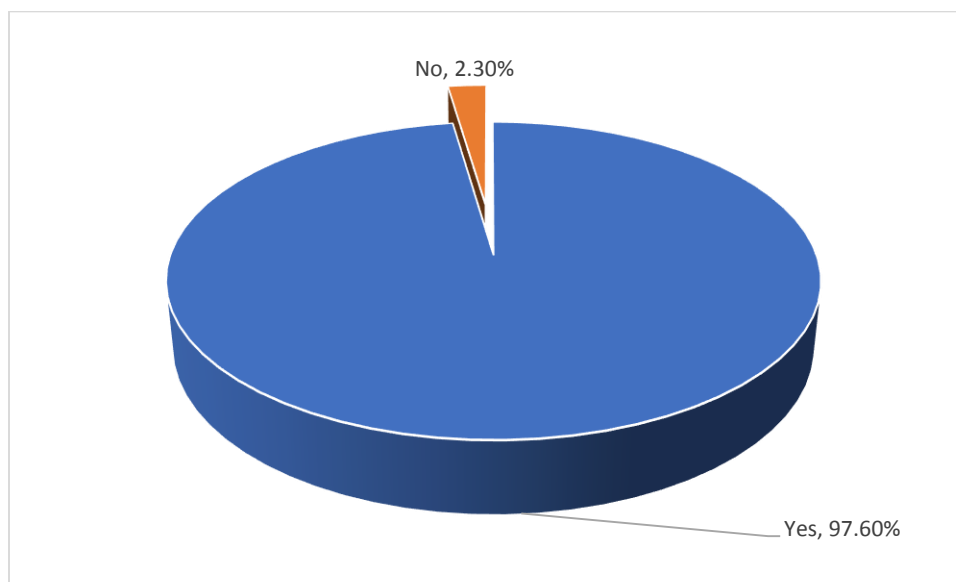


Figure 1: Responses on Whether Waste handlers had any Occupational Hazards

From the Figure 1, 83(97.6%) respondents indicated that they had been affected by waste handling while 2(2.3%) respondents had not been affected by waste handling processes. This shows that a majority (97.6%) of the waste handlers had been injured or suffered occupational diseases associated with waste handling. This is consistent with the findings of a study conducted by Mberu *et al.*, (2020) in Dandora dumpsite Nairobi which indicated that about 69% of the people working in the dumpsite had been injured or fell sick due to the risks associated with waste handling at the dumpsite. This therefore shows that waste handling process is highly associated with hazards.

The respondents who indicated that they had been affected in one way or another by the waste handling process were asked to indicate the health hazards which affected them as a result of waste handling. The responses of the 83 waste handlers were tabulated and the results are presented in Table 1. In this case, multiple responses were allowed since an individual was allowed to indicate all health hazards that she/he had encountered.

Table 1: Occupational Health Hazards associated with Waste Handling in Eldoret CBD

Hazards	Frequency	Percentage
Pricking	81	97.6
Piercing	70	84.3
Cuts	82	98.8
Corrosion	54	65.1
Strain	62	74.7
Musculoskeletal	18	21.7
Dermal injuries	69	83.1

Source: Field Data, 2020

From Table 1, 81(97.6%) of waste handlers had been pricked by sharp objects, 82(98.8%) respondents indicated that they had cuts from sharp objects including metals and broken glasses/bottles, 70(84.5%) respondents indicated that they had been pierced by sharp objects during the waste handling process, 69(83.1%) respondents indicated that they had suffered dermal injuries as a result of being in contact with the solid wastes, 62(74.7%) respondents indicated that they had suffered strain as a result of lifting of heavy wastes and 54(65.1%) respondents indicated that they had corruptions due to contact with wastes and 18(21.7%) respondents indicated that they had suffered some musculoskeletal injuries due to continuous lifting of wastes. The study findings are similar with those of Patil and Kamble, (2017) who found out in their study that waste handlers including collection workers and waste dumpsite managers face particular occupational hazards, including strains from lifting, injuries from sharp objects and contact with pathogens when manually handling the wastes. Furthermore, Suleman *et al.*, (2015) noted that waste handlers are exposed to a wide variety of health hazards, which can occur via skin contact, injection, ingestion and inhalation. Adeyi and Adeyemi (2019) further notes that waste handlers and managers are exposed to hazardous materials present in MSW stream, thus, suffered for various types of injuries associated with the occupational exposure. Some of the reported health problems in waste workers are musco-skeletal pain, cough, chest tightness, diarrhoea, joint pain, skin irritation, cancer, injuries, puncture wounds, damage to eyes and ears.

This study findings were comparable to those of Melaku and Tiruneh, (2020) who found in their study in Ethiopia that most municipal solid waste collectors suffered with different types of health symptoms such as respiratory symptoms, skin symptoms and musculoskeletal symptoms. Similar findings have also been found in Central India, Hebron, Palestine (Patil & Kamble, 2017) and in Kathmandu, Nepal (Marahatta, Katuwl, & Adhikari, 2017). Another study by Vanessa, Carla and Vanessa (2020), in Latin America found that 14.3 percent and 78.8 percent of solid waste collectors, respectively, suffer from respiratory and osteomuscular illnesses. The lack of providing complete body cover PPE, spending more time on duty, and working as municipal waste collectors for extended service years may be the explanation for the higher magnitude in this study than in previous studies stated. However, another study found that the prevalence of respiratory, cutaneous, and musculoskeletal health complaints was higher than this one.

Interviews conducted with the public health officers also pointed that solid waste workers sometimes come in contact with human faeces as a result of nappies which are disposed or open defecation for the homeless people in the streets. This was supported by research findings of Adeyi, and Adeyemi, (2019) who conducted a study in Nigeria and found out that in developing countries, a significant portion of the human waste generated in a city ultimately reaches the solid waste system because of inadequate sanitation systems. The researchers further found out that

due to paucity of sanitation systems, people defecate along roadways and on open lots, night soil is deposited in open drains, and the resulting street and drain cleanings contain faeces and in cases where buckets or bedpans are used, the human waste is often placed in a plastic bag or wrapped in newspaper before discarding it with the solid waste. This could lead to various infections and diarrhoea as indicated by Jerie (2016).

It also emerged that there is dust associated with sweeping of the streets and dust emanating from heaps of solid wastes which endangers the lives of the waste handlers which is found to be in line with the findings of Adipah, and Kwame, (2019) who found out that periodic clearing of the wastes accumulated in open piles is accomplished with wheeled loaders and open trucks, which raise significant dust and bio-aerosol exposure levels.

5. Conclusion and Recommendations

5.1 Conclusions

The paper concluded that the major hazards that were associated with solid waste handling included; cuts from sharp objects including metals and broken glasses/bottles, Piercing, strain as a result of lifting of heavy wastes, corrosions due to contact with wastes and musculoskeletal injuries due to continuous lifting of wastes.

5.2 Recommendation

The paper recommended that there is need for segregation of wastes at the source to reduce mixing of solid wastes which increases the likelihood of an occurrence of hazards among waste handlers. In addition, waste handlers need to adhere to use of PPEs since proper use of PPEs reduces occupational hazards.

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