

Occupational Risks among the Municipal Solid Waste Collectors in Khartoum Locality

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Abstract— Background: A solid waste collection workers is a group of workers known as garbage collectors responsible for collecting garbage to the final disposal point or recycling. They are exposed to many risks while they are collecting waste such as bad odors, sharp materials, dust, harsh flies and they get dirty easily even when they using protective clothing. **Objectives:** The aim of this study to assess the occupational hazard and risk among solid waste collection workers and to determine the prevention methods for these possible hazards and risks. **Methods:** A descriptive cross-sectional study was conducted in Khartoum locality among 280 solid waste collection workers, 2017. Multistage sampling technique methods were performed. The data was collected through a structured questionnaire and observation checklists and analyzed by using SPSS version 16. **Results:** The study revealed that 76% of workers were not educated While, 67.1% injured at work. All workers (100%) were not had been subjected to the pre and periodic medical examination, did not have the personal protective equipment, not vaccinated against tetanus, HBV and HCV, and not trained in health practices and the safe handling of the waste. The study found statistically significant between lack of training on the safe handling of the waste and being injuries and accidents ($p. value < 0.05$). **Conclusion:** Solid waste collection workers are more at risk during their work. However, they do not have the lowest levels of protection to perform their duties without risk. Therefore, all workers should be subjected to the pre and periodic medical examination, raise awareness, and provide training and personal protective equipment.

Keywords— Solid waste; Hazards; Occupational health; Risk; Khartoum locality.

I. INTRODUCTION

Occupational Health is the promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations settings by preventing impairment of health, controlling risks and the acclimatization of work to people, and people to their jobs. (WHO, 2007).

Occupational injuries contentious to be serious problem affecting workers at different work settings and industries. It is poorly documented in both developed and developing countries. The magnitude of the problem worldwide as documented by the International Labor Organization showed

250 million workers sustain occupational injuries and 330,000 fatalities annually, Developing countries have more fatal accidents than industrialized nations, emphasizing the need for health and safety education programmes that focus on prevention. (Anan, 1997).

Refuse collection is a hazard laden job, hazards include injuries from sharp objects such as broken glasses, serrated edges of tin cans, knives protruding as bags are lifted or swung and hypodermic needles. These needles might be carrying other people's blood possibly contaminated with a number of viruses (Kuijjer, et al., 2004).

Solid waste collection workers are expose to increasing risk of respiratory, skin, and gastrointestinal diseases. These are attributed to the microbial agents that they are expose to in the course of discharging their duties (Wouters et al., 2002).

Standard operation procedures in handling Municipal Solid Wastes (MSW) in developed countries have reduced occupational and environmental impacts significantly. However, the risk levels are still very high in low income countries because of poor public health practice. In low-income countries, solid waste collection workers have low socio-economic status expressed in variety forms such as poverty, lack of education, poor housing conditions, and poor nutrition. Farther more, such group of workers is exposed directly and without adequate personal protection to municipal solid waste (MSW) which includes hazardous materials. (Sarkar P, 2003).

Solid wastes: Define as: are all the wastes arising from human and animal activities that are normally solid and discarded as useless or unwanted substances. (Takele Tadesse, 2004).

Types of solid waste: Solid waste can be categorized into different types depending on their generation source.

Municipal solid waste consists of household waste, construction remaining materials, debris, sanitation residue, and waste from streets. This garbage is generated mainly from domestic and commercial areas. As a result of rising urbanization, change in lifestyle and food habits, the quantity

of municipal solid waste has been increasing rapidly and its composition changing.

Garbage: has four broad categories such as organic waste: kitchen waste, vegetables, leaves, fruits, Toxic waste: expired medicines, paints, chemicals, lamps, spray cans, fertilizer and pesticide containers, batteries, shoe polish., Recyclable: paper, glass, metals, plastics and Soiled: hospital waste such as cloth spotted with blood and other body fluids.

Solid wastes collection: This is the removal of rubbish from collection points to final disposal site. It includes collecting or picking up of solid waste from the several sources, taking the collected wastes to the location where it is generated, and unloading of the collection truck .(Takele Tadesse, 2004).

Solid wastes collectors: Are also referred to as refuse collectors or trash collectors. These all refer to those that use vehicles to collect garbage to the final sites of disposal or recycling on various routes as assigned. (California occupational Guide, 2002).

Occupational health :Occupational health deals with all aspects of health and safety in the work settings and has a strong focus on primary prevention of threats. (WHO, 2007).

Occupational health risks: Solid waste collection workers handling solid waste, worldwide are exposed to occupational hazards and accident risks related to the content of the materials they are handling, emissions from those materials, and the equipment being used. (Cointreau Sandra, 2006).

Health risks from waste are caused by several factors, including: The nature of raw waste and its composition (e.g., Toxic, allergenic and contaminated substances), and its components (e.g., gases, dusts, leachates, sharps materials), the character of waste as it decomposes in form of Gases, dusts, leachates, particulate matter sizes and their change in ability to cause a poisonous, allergenic or infectious health response, the handling of solid waste such as working in transportation, shoveling, lifting, equipment vibrations, accidents, the processing of wastes as odor, noise, vibration, emissions, air and leachates, emissions, residuals, explosions, fires and the final disposal of solid wastes such as odor, noise, vibration, stability of waste piles, air, leachates, emissions, explosions, fires. (Cointreau Sandra, 2006).

There are many occupational hazards associated with waste handling such as Skin and blood infections resultant from direct contact with waste and from infected wounds, Respiratory and eye infections resulting from exposure to infected dust and gases especially during landfill operations, zoonosis resulting from bites by wild or wandering animals feeding on wastes, Enteric infections transmitted by flies feeding on wastes and chronic diseases inform of Incinerator operators are particularly at risk of chronic respiratory diseases, including cancers resulting from exposure to dust and hazardous substances.

Exposure to solid waste hazards may cause accidents and injuries: Musculoskeletal disorders resulting from handling heavy containers, wounds, most often infected, resulting from contact with sharp materials, poisoning and chemical burns resulting from contact with small amounts of hazardous waste mixed with domestic waste, Injuries and burns and other risks resulting from occupational accidents at waste. (UNEP, 1996),

Refuse collection is a hazard-laden job. Such hazards include injuries from sharp objects such as broken glasses, serrated edges of tin cans, knives protruding as bags are lifted or swung and hypodermic needles. These needles might be carrying other people’s blood likely contaminated with a number of viruses (Kuijer et al., 2004), Solid waste collection workers are exposed to increasing risk of respiratory and gastrointestinal tract diseases. These are attributed to the microbial agents they are exposed to in the course while they are performing their duties.

Violence from members of the community is another form of hazard. This might be as a reaction to the waste trucks blocking the roads. The violence could be demonstrated in many ways from verbal abuse to spitting and even physical violence in most cases. They are also exposed to hazard of hearing loss and musculoskeletal disorders which has to do with back, shoulder and arm injuries. (Wouters, et al. 2002).

The study aimed to assess the occupational hazards and risk among solid waste collection workers at Khartoum Locality, to identify the working conditions and possible hazards and risks linked to the collection of solid waste and to determine the prevention methods applied for these possible hazards.

II. MATERIALS AND METHODS

Study Area: Khartoum is the national capital of Sudan, which is consist of seven localities. Khartoum locality is one of these localities which include eight administrative units, namely are; Khartoum North, Khartoum East, Khartoum center, Alsog Almarkazi and Soba, Alshafa and Gabra, Buri, Alshagera, Khartoum.

Study design: A cross-sectional descriptive study was conducted among 943 solid waste collection workers in the state.

Sampling techniques: The sample size was calculated by using the following sample formula;

$$n = \frac{N}{1+N(e)^2} = \frac{943}{1+943(0.05)^2} = 280$$

Where:

n= sample size

N= Total

e= error allowable (0.05)

$$n = \frac{N}{1+N(e)^2} = \frac{1463}{1+1463(0.05)^2} = 280$$

A multi-stage sampling technique was used to select the sample size. We divided the locality into eight clusters (administrative unit) and the sample size was proportionately distributed as the following table:

Sector	No. of worker	% of workers	Sample
Khartoum North	133	14	39
Khartoum East	164	17.5	49
Khartoum center	179	19	53
Alsog Almarkazi and Soba	132	14	39
Alshafa and Gabra	114	12	34
Buri	60	6.5	18
Alshagera	86	9	25
Khartoum West	75	8	23
Total	943	100	280

Data Collection: Data was collected by using a questionnaire designed as a close-ended questions including personal information data such as the gender, age, educational level, type of waste collected, the source of waste collected, working duration, types of hazards exposing to, pre and periodic medical examination, working hours per day, knowledge about health risk at working place, the existence of personal protective equipment, the injuries during working hours, the vaccination against tetanus, the waste handlers were identified and questioned on the site where they are working.

Data analysis: Data was analyzed by using (SPSS-16) software and excel-10. Chi-square test was used to examine the association between injuries at work and other risk factors.

III. RESULTS AND DISCUSSION

Table (1) Educational level- of solid waste collection’s workers in Khartoum Locality, 2017.

Educational level	Frequency	Percent
Illiterate	212	75.7%
Primary	44	15.7%
Secondary	24	8.6%
Total	280	100%

Table (2) Distribution of worker’s knowledge about health hazards – Khartoum Locality, 2017.

Worker’s knowledge	Frequency	Percent
Yes	236	84.3%
No	44	15.7%
Total	280	100%

Table (3) Workers Knowledge regarding the type of hazards at working place – Khartoum Locality, 2017.

Type of hazards	Frequency	Percent
Injury	232	82.9%
Fracture	37	13.2%
Burns	11	3.9%
Wounds	0	0.0%
Total	280	100%

Table (4) Responder’s injuries at working place – Khartoum Locality, 2017.

Injuries at working place	Frequency	Percent
Yes	188	67.1%
No	92	32.9%
Total	280	100%

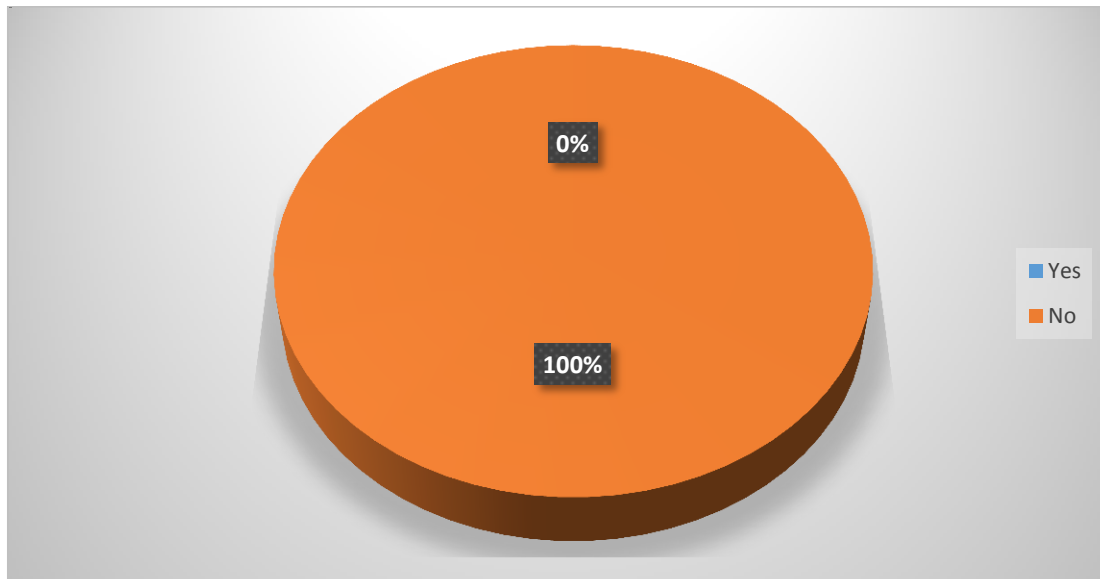


Figure (1): Availability of personal protective equipment for workers – Khartoum Locality, 2017.

Table (5) Types of injuries-among responders- Khartoum Locality, 2017

Types of injuries	Frequency	Percent
Fracture	3	1.1%
Acupuncture	74	26.4%
Wounds	109	38.9%
Other	94	33.6%
Total	280	100%

The present study revealed that three quarter of workers (76%) not educated, that context increasing the number of workers who at risk of occupational hazards, this is agreed with the Sarak P who stated that" the risk levels are still very high in developing countries because of poor public health practice. In low-income countries, solid waste collectors have low socio-economic status expressed as such as poverty, lack of education.

All workers (100%) had not been subjected to the pre-medical examination; this is not agreed with the that stated by (Benjamin O. ALLI): Surveillance of worker’s health in the form of medical screening or regular medical examinations often leads to the identification of occupational hazards or diseases. It has been revealed that special prescriptive surveys to detect health hazards among the workers generally prove more rewarding in terms of avoiding or controlling hazards than a series of medical tests done at a later stage to identify or confirm suspected occupational diseases.

Also the study showed that all workers (100%) have not been subjected to the periodic medical examination, this is not agreed with the (Mfrekemfon P. Inyang) who stated: need for periodic medical screening to detect early signs of disease and also monitor their work ability.

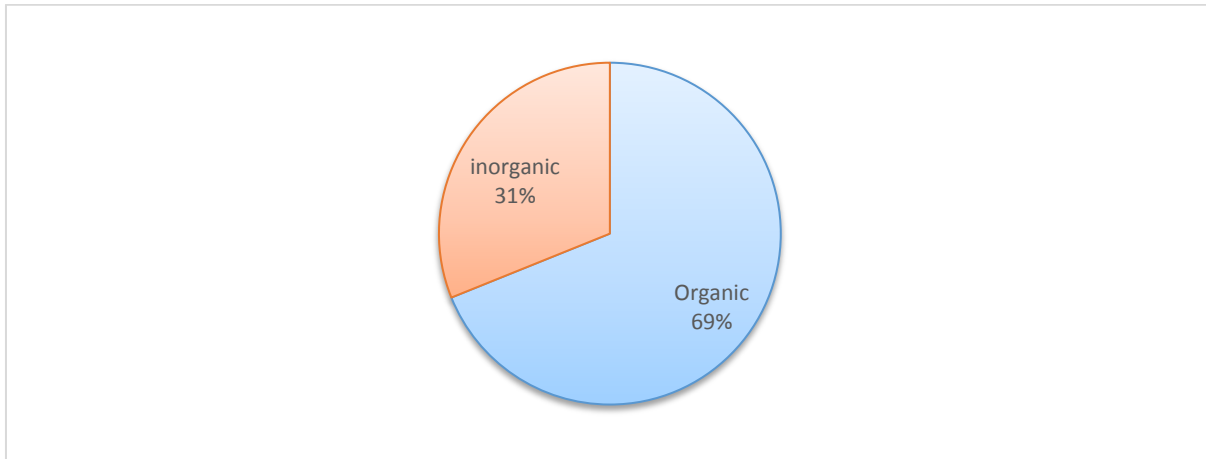


Figure (2): The type of solid waste collected – Khartoum Locality, 2017.

The majority of workers (84.3%) know the health risks that may be exposed to at work. Also the study illustrated that the majority of workers (82.9%) were known the injuries as a hazards.

All workers (100%) do not have personal protective equipment, this is not agree with the statement of (Kuijer et al.) who stated: Such hazards include injuries from sharp objects such as broken glasses, serrated edges of tin cans, knives protruding as bags are lifted or swung and hypodermic needles, need to use PPE., and not in line with the results of the study carried out in Addis Ababa showed that, only 43.6% of the solid waste collectors were using Personnel Protective Equipment while they are on working duty and of these, only 22.5% of them reported as not using it regularly while they are on duty.

The present study illustrated that more than two third of workers (67.1%) were injured while in working, that result in match with the statement of D. Silveira who stated “work-based injuries during the past year, were reported in 56% solid waste collection workers were highly exposed to occupational accidents because of the character of their work which obligate them to work in the open environment (Da Silveira et al., 1998). That might be explained by the direct contact with wastes while using no protective means. Regarding the workers training and handling of waste it was noticed that lack of training on safe handling of waste was identified statistically significant, as was established by a Chi square test of association between training on waste handling and injuries and accidents encountered ($p=0.00<0.005$). The major safety intervention was the provision of PPE which is actually the last line of defense.

The study showed that all workers (100%) have not vaccinated against tetanus., HBV or HCV, which expose them to get infected as results of contact with contaminated materials. The present study showed the relation between workers using personal protective means and their health problems, the present study findings clarified that there were statistical significance between using personal protective means and their health problems as injures and dust hazards ($p\leq 0.05$).

IV. CONCLUSION

The present study concludes that the solid waste collection workers are exposed to different types of hazards and at risk to be infected with the diseases related to solid waste. All workers have not been subjected to the pre and periodic medical examination. The personal protective equipment (PPE) was not available for all workers, more than two third of workers injured at work, All workers haven't vaccinated against tetanus, HBV &HCV.

The study further suggest that All workers should be subjected to the pre and periodic medical examination with provision of immunization against the tetanus, HBV & HCV and provide them with personal protective equipment. Raise the awareness of workers about the occupational hazard & risk related to solid waste collection.

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