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Assessment of Occupational Health and Safety Measures among Municipal Solid Waste Workers in UNRWA Sanitation in Gaza Governorates

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Assessment of Occupational Health and Safety Measures among Municipal Solid Waste Workers in UNRWA Sanitation in Gaza Governorates

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Jerusalem- Palestine

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بسم الله الرحمن الرحيم

(ظهر الفساد في البر والبحر بما كسبت أيدي

الناس ليذيقهم بعض الذي عملوا لعلهم يرجعون)

صدق الله العظيم
سورة الروم – آية 41

Dedication

To my family, especially my parents, my life partner and my beloved kids Hala and Dana for their continuous encouragement and unlimited support, to all those who enliven my days and brighten my ways, I dedicate this work.

Jehad Ibrahim Abu lebda

Declaration

I herby declare that this thesis submitted for the degree of Master of Public Health is the results of my own research, except where otherwise acknowledged, and that this thesis or any part of the same has not been submitted for a higher degree to any other university or institution.

Name: *Jehad I. Abu lebda*
Signature: *Jehad*
Date: *June, 2010*

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Abstract

Background: Solid waste handling is of great importance due to its potentials hazards to workers, public health and the environment. Health impacts of solid waste on workers were studied worldwide. However, no previous published research was reported about occupational health and safety measures among municipal solid waste workers in Gaza Governorates. This study was aimed to assess health problems and safety measures among municipal solid waste workers working at UNRWA Sanitation Department serving refugee camps.

Methodology: Through a cross sectional study, a sample of 158 solid waste workers in the Gaza Governorates were asked to complete a questionnaire about knowledge and practices towards safety measures, and associated self-reported health symptoms and work injuries.

Results: The mean age of workers was 45.1±8.1 years. The mean work duration was 14.0 ± 7.8 years. High level of workers knowledge was generally found on hazards of solid waste on environment 144 (91.1%), workers themselves 140 (88.6%), residents nearby containers 113 (71.5%) and on general population 98 (62.0%). In addition, 149 (94.3%) and 104 (65.8%) workers reported that medical waste is more dangerous than domestic waste and safety tools can protect from risks of solid waste, respectively. Only 16 (10.1%) workers reported that safety tools are available throughout the year. Practices of workers towards safety measures showed that the use of gloves, hat, goggles and masks during work were distributed as 29 (18.4%), 27 (17.1%), 8 (5.1%) and 7 (3.8%), respectively. Workers who were practicing smoking, drinking and eating during work had been distributed as 67 (42.4%), 120 (75.9%) and 89 (56.3%), respectively. The most frequently self reported symptom was back pain 81 (51.3%). Forty four (27.8%) workers reported headache and the same percentage reported complaining from conjunctivitis. Other symptoms included dermatitis 38 (24.0%), dyspepsia 37 (23.4 %) and dyspnea 33 (20.9%). The most common injuries were wounds 65 (69.9%), needle sticking 47 (50.5%) and slipping 32 (34.4%). About two thirds of workers 105 (66.5%) did not attend training courses about risks of solid waste. Workers who attended training courses reported less symptoms and less injuries ($p=0.043$ and 0.044, respectively) than their counterparts. Self-reported symptoms increased with the increase of working years. Workers who used gloves, goggles and masks during work reported less symptoms than who did not ($p=0.002$, $p=0.009$ and $p=0.041$, respectively). However, more symptoms were reported among workers who drunk during work ($p=0.040$).

Conclusion: The present study revealed that the use of safety measures including safety tools and personal habits was poor. Lack of training and awareness courses, and vaccination were recorded among workers. Provision of training and awareness courses on health hazards of solid waste, ensuring the availability safety measures, and monitoring the health status of the workers are highly recommended.

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List of Abbreviations

AIDS	Acquired Immune Deficiency Syndrome
ATSDR	Agency for Toxic Substances and Disease Registry
DIFSHA	Direct Initiative for Social and Health Action
EPA	Environmental Protection Agency
GAFTC	German Agency for Technical Cooperation
HIV	Human Immunodeficiency Virus
HBV	Hepatitis B Virus
HWCs	Household Waste Collectors
Jica	Japan International Cooperation Agency
MEnA	Ministry of Environmental Affairs
MOH	Ministry of Health
MSW	Municipal Solid Waste
NIOSH	National Institute Office of Safety and Health
PCBS	Palestinian Central Bureau of Statistics
SEHP	Special Environmental Health Program
SPSS	Statistical Package for Social Sciences
UNEP	United Nations Environmental Program
UNRWA	United Nations Relief and Work Agency
USA	United States of America
WHO	World Health Organization

CHAPTER 1

INTRODUCTION

1.1 Research title

Assessment of occupational health and safety measures among municipal solid waste workers in UNRWA sanitation in Gaza Governorates.

1.2 Introduction

Municipal solid waste (MSW) is an important public health issue that has concern in many countries in the world. Current technological development, increase in the population and change in life style of people led to increase in the amount of disposable materials. In other words, there are huge quantities of municipal solid waste produced. These quantities raise the danger and have heavy burden on waste management process (MOH, 2002).

In most developing countries including Gaza Governorates, the capabilities and efficiency of governments are very low to deal with increasing quantities of solid waste. In many of these countries, infectious medical wastes and toxic industrial wastes are not segregated from domestic waste. The active contact between MSW and workers makes them exposed to infectious diseases and injuries from glasses and metals (UNEP, 2003). In addition, leachate of MSW causes biological and chemical contamination of soil and groundwater which is the main source of drinking water in Gaza strip (Gaza Environmental Profile, 1995).

Misunderstanding and inadequate disposal of municipal solid waste cause a public health problem and bad effect on the environment (Barhoum, 2004). Most occupational health and injury problems could be reduced by awareness programs and simple safety procedures that cost little. Lack of awareness on associated health hazards, not using protective equipment including gloves, lack personal hygiene and immunization, and poor work conditions contributed to many symptoms and diseases among solid waste workers (Scarlett et al., 1990; Malkin et al., 1992; Varly and Bendahmane, 1997; Tiwari, 2008 and Mochungong, 2009). In addition, training of workers on safe handling of solid wastes and establishing immunization programs would minimize health hazards associated with solid wastes (Pruess et. al. 1999 and Nasr, 2009).

Most studies that related to health of municipal solid waste workers indicated many symptoms and diseases including chronic respiratory symptoms, musculoskeletal symptoms, headaches, gastrointestinal problems eye irritation, dyspnea, dizziness, throat burning, and skin irritation (Zuskin et al., 1993; Croen, 1998; Yang et. al., 2001; Perez et al., 2006 and Mehrdad et al., 2008). The reported work injuries among workers were musculoskeletal injuries, needles stick, fractures, wounds, soft tissue accidents and chemical burns (Poulsen et al., 1995; Ivens et al., 1998; Kuijer and Dresen, 2004; Adams and David 2007 and Shinee et al., 2008).

The present study is the first one to assess occupational health and safety measures among municipal solid waste workers in UNRWA sanitation in Gaza Governorates. The outcome of the study is expected to protect and improve the health status of workers, increase their productivity, improve the work conditions and to achieve a healthy environment.

1.3 Study area and UNRWA services

Gaza Strip is a part of historical Palestine located on the South West of it. Gaza Strip area is 378 square kilometers, with a length of 46 kilometers and width of 5-12 kilometers. Gaza strip is divided geographically into five Governorates: Northern, Gaza, Mid Zone, Khan Yunis, and Rafah. Gaza Governorates have five towns and eight refugee camps and fourteen villages. The eight refugee camps named Jabalia, Beach, Bureij, Nuseirat, Maghazi, Der El Balah, Khan Yunis and Rafah camps (Annex 1). UNRWA provides essential environmental health services in the refugee camps including solid waste collection and disposal. The capacity of UNRWA with regard to solid waste management has gone through a long time. In 1950, solid waste removal was done by merely the use of animal drown carts and open communal collection points (uncontained). After that, it was necessary to construct ultimate disposal sites within close proximity of populated areas in the refugee camps. Proper handling of wastes was ensured through anaerobic composting in sealed pits. Later, tractor-trailers were introduced to cope with increasing quantities of waste being generated. After 1967, with the increase of urbanization, dumping sites were built far from refugee camps, which developed as a system of refuse removal, using skip lift trucks and containers. This system was developed to using smaller containers and crane trucks. Gaza Governorates is one of UNRWA's five fields of operation. The majority of Gaza Governorates population is refugees. Most of them live in eight camps as a result of Nakpa in 1948. The total population of refugee camps is estimated to be 190,272 living in

an area equal to 6,626,473 m² with high population density of 28.7/1000 m² (UNRWA, 2008). The amount of municipal solid waste generated from refugee camps in year 2008, was 56000 tons (UNRWA, 2009). High population density and Israeli occupation are the main causes of environmental degradation in Gaza strip (MOH, 2002). The main environmental problems in Gaza Governorates include groundwater scarcity and pollution (Yassin et al., 2006), waste water treatment problem (Yassin et al., 2008), solid waste generation management issue and noise and air pollution.

1.4 Aim

The aim of the study is to assess occupational health and safety measures among municipal solid waste workers in UNRWA sanitation in Gaza Governorates.

1.5 Objectives

- To evaluate knowledge of workers about harmful effects of MSW.
- To assess the applications of safety measures.
- To record symptoms, diseases and injuries among MSW workers.
- To provide adequate recommendations to managers to take suitable health care and safety measures for MSW workers.

1.6 Research questions

* How can we protect the health of MSW workers and improve the work?
* What are the main diseases and injuries of workers related to MSW collection and disposal?
* Are the MSW workers receive training courses about dealing with MSW?
* Are the safety and protection measures applied during the work?
* Are there any incentives for applying the safety measures?

1.7 Importance

This study is the first to demonstrate health status and safety measures for MSW workers in UNRWA sanitations in Gaza Strip. It will make baseline data for managers and decision makers to take more attention and to conduct strategic plans for health and safety to increase workers' productivity and improve their work conditions.

1.8 Justification

Throughout my work in UNRWA sanitation and direct contact with sanitation workers, many bad habits and behaviors among workers in collection and disposal of municipal solid waste were observed, in addition to unimplementation of safety measures. For example, one sanitation worker ate a sandwich by one hand and collected the waste by the other hand. A second case, a worker smoked a cigarette by one hand and collect the waste by another. These cases and many others like them driven me to conduct this study to highlight the occupational health of sanitation workers and focus on this wide strip of forgotten employees to protect them from diseases and injuries, to improve their life quality and to increase their productivity. On the other hand, many workers are suffering from diseases and pains, especially back pains. Many accidents have occurred as a result of the lack of knowledge of dangers associated with their work. In addition, there is a lack of data in this regard.

CHAPTER 2

LITERATURE REVIEW

Workers and waste pickers handling solid waste throughout the world are exposed to occupational health and accident risks related to the content of the materials they are handling, emissions from those materials, and the equipment being used. Because of inadequate understanding of the magnitude of the problem and poor financial resources, the risks are still largely unmanaged in most developing countries. To protect those countries, characterized by inadequate waste management that is still dominated by open dumping, laborers that are work without safety measures or work at bad conditions must be supported by external financial assistance (Poulsen et al., 1995). Generation and management of solid waste is one of the important environmental problems in Gaza Governorates. It has a significant potential for human health, safety risks and environmental contamination (MEnA, 2000).

2.1 Definition of municipal solid waste

Solid waste is material, which is not in liquid form, and has no value to the person who is responsible for it and "garbage", "trash", "refuse", and "rubbish" are terms used as synonyms terms for solid waste (Zurbrugg, 2003). Municipal solid waste defined to include refuse from household, non-hazardous solid waste from industrial, commercial and institutional establishment including hospitals, market waste, yard waste and street sweepings. Semisolid waste such as sludge and night soil are considered to be responsibility of liquid waste management system (Japan International Cooperation Agency, 1994). The concept of waste is easy to know but there are many definition of waste (Environment Protection Agency, 2001).

According to the United Nation Environmental Programming (UNEP) wastes are substances or objectives, which are disposed, or are intended to be disposed of, or are required to be disposed of by the previous of national law (UNEP, 1989). Environmental Protection Agency (EPA) in the United States defines MSW as: include wastes such as durable goods, containers and packaging, food scraps, yard trimmings, and miscellaneous waste from residential, commercials institutional and industrial sources (EPA, 2001).

According to Palestinian Environmental Law in 1999, Ministry of Environmental Affairs defines municipal solid waste as a refuse from households, commercial, agricultural, non-hazardous industrial waste and semi solid waste (sludge) from waste water treatment plant (MEnA, 1999). Municipal solid waste varies in composition in both seasonally and geographically from country to another (World Bank, 2001). Composition of municipal solid waste and its content can also vary from facility to facility and from day to day (Tchobanoglous et al., 1993).

2.2 Solid waste composition

Knowing the types and sources of solid waste and information of its composition helps us in design and operation of solid waste management (WHO, 1993). The comparison waste in different areas is very difficult issue. In North Europe, there are too much paper and plastic and low putrescible content in waste, but in Southern Europe higher ratio of organic material and lower ratio of light combustible substances are present (Barhoum, 2004).

Waste composition is largely affected by two factors: (1) income level of the country; and (2) extent of industrialization. Income level affects the main contents in solid waste, particularly the level of packaging (i. e., paper, plastic, carton, cans, and bottles). Income level also affects the extent of containment that is affordable at the household level (i. e., covered bins, plastic bags, cartons, open piles), which in turn affects the amount of soil and ash within the waste and the moisture content. Because there is less organic matter in the solid waste of high-income countries, the resulting moisture content of the waste is low and the calorific value is relatively high. But, the wetter waste of developing countries does not have sufficient calorific value to self-sustain incineration, soil need to additions of fuel for incineration.

The data from 1960 in the USA showed that the amount of plastic and metal in mixed municipal solid wastes has dramatically changed over time (in percent by total weight). The quantity of metals was 12.3% in 1960, but only 7.7% in 1996; whereas plastics was only 0.4% in 1960, and increased to 9.4% in 1996. Furthermore, yard trimmings (garden wastes) decreased from 22.7% in 1960 to 13.4% in 1996 (EPA, 1998).

In Gaza Governorates, solid waste generated from refugee camps tend to be characterized by a relatively low calorific value, high organic and moisture content (especially during the wet winter season), and high content of inert materials, like sand. The main source of sands was from unpaved streets and roads. Table 2.1 shows the analysis of solid wastes constituents in refugee camps of Gaza Governorates.

Table 2.1: Analysis of solid waste constitutes in refugee camps of Gaza Governorates

Constitute	Organic matter	Sand	Plastic	Carton	Cloth	Metal	Liquid	Glass	Other materials
Percentage	67.8	11.1	5.9	4.4	3.6	3.0	1.9	1.4	0.9

Density of solid waste varies for household bins at 0.30 - 0.35 kg/L, at the containers 0.40 - 0.45 Kg/L, and at the body of crane truck 0.50 - 0.55 kg/L. Quantity of solid waste generated per capita in the eight refugee camps are increasing (UNRWA, 2007).

2.3 Solid waste generation

Socioeconomic condition and industrialization degree play an important role in the rates of waste generation. The greater economic and higher urban population produce large quantities of solid wastes (Cunningham and Saigo, 1999). The external factors affect in waste composition are the geographical location and the life style of population. In general the waste of high income countries contain low ratio of organic materials and the waste of low income countries contain high ratio of organic materials and higher moisture content and lower papers. Ash and organic matter represent nearly 60-70% of total waste in low income countries (Dulac, 2001).

Municipal solid waste is produced as a result of economic productivity and consumption. Countries with higher incomes produce more waste per capita and per employee, and their wastes have higher portions of packaging materials and recyclable waste. In low-income countries, there is less commercial and industrial activity, as well as less institutional activity, thus resulting in lower waste generation rates. In countries where personal incomes are low, there is, of necessity, extensive recycling at the source (Barhoom, 2004).

In Gaza Governorates, a total solid waste generation from the eight refugee camps increased from 38,057 tones in 1996 to 69,626 tones in 2006. Solid waste generation per capita within the camps was approximately 0.7 kg per capita per day in 2006 (UNRWA, 2007).

2.4 Hazardous materials

Although the present study focused on the municipal solid waste, the hazardous waste can't be ignored. Hazardous materials have potential effects on solid waste workers and environment. Solid waste workers may be subjected to chemical exposures which are

similar to hazardous solid waste. Developed countries conducted regulations which deal with segregated source and separated management in security procedures start from collection to disposal facilities (Cointreau- Levine, 1998).

In developing countries the hazardous waste can be observed in municipal solid waste because the lack of regulation and enforcement system. Medical waste of bloodied bandages, cotton swathes, and syringes from hospitals discarded into municipal solid waste. Also many of dangerous solvents, plating materials, adhesive and pesticides disposed with municipal solid waste (Cointreau- Levine, 1998).

In addition, in developing countries, more than 30% of the industrial wastes were inappropriately discharged to open dumps and controlled landfills. Similarly, hazardous healthcare waste as was being co-disposed with general municipal solid waste in open dumps and controlled landfills, seldom in sanitary landfills with adequate protective measures (de Koning et al., 1994).

A hazardous waste survey performed in 21 Latin American countries reported that the most of dangerous medical waste disposed with municipal solid waste. This problem is still found in many developing countries and laws to restrict this issue are needed (de Koning et al., 1994).

Al- Hamaidi, (2002) stated that municipal solid waste in Gaza governorates produced from houses constituted nearly 40-50% from the general solid waste. Industrial wastes which considered mostly as hazardous wastes constituted about 20-25% and the remaining types 25-30%.

2.5 Solid waste management

Various methods are suggested to deal with big quantities of waste that are produced in the world. The methods vary from country to country according to their needs and economic and environmental conditions. Generally many procedures were conducted including source reduction, recycling, composting, landfilling, and waste -to- energy (Keep America Beautiful Inc., 1996).

UNRWA play a big role in solid waste management in Gaza Governorates since it is responsible of collecting waste from the eight refugee Camps in Gaza Governorates. UNRWA give very important assistant to municipalities in Gaza Governorates through providing them with equipment, machines and others (UNRWA, 2000). Special Environmental Health Program (SEHP) in UNRWA is implemented solid waste collection in refugee camps from shelters, roads and markets using labor force and push carts.

UNRWA's service is given free of charge. This activity requires good organizational capacity, and, from what was observed in the field, the entire operation functions very well without major shortcomings and achieves the goal of moving solid waste out of the camps.

2.6 Solid waste collection system

Municipal solid waste in developing countries mostly is collected depending on labor force, sometimes using hand or animal drawn carts. The waste discharged for collection randomly in open areas. More typically, the waste is placed on the ground directly, thus requiring being shoveled by hand; or it is left in an open carton or basket to be picked up by hand. In either case, accumulation of waste is readily available to insect and rodent vectors and scavenging animals.

Collection workers in developing countries have significantly more direct contact with solid waste than their counterparts in developed countries, who often handle sealed plastic bags and covered dustbins. Because hazardous wastes are not separated at the source for separate collection and disposal, collection workers in most developing countries are more likely to encounter potentially toxic materials and gases, and infectious microorganisms (Poulsen et al., 1995).

In Gaza Governorates, the system of solid waste collection in refugee camps is by means of strategically or centrally placed communal at all camps, to which the community members transport and deposit their refuse. When mechanized UNRWA service began in 1985, large truck-mounted skips were the norm; these were of the bucket type with completely open tops. Skips are longer used in refugee camps except in Jabalia, and the current communal refuse containers are used with smaller capacity of approximately 1 m^3 capacity. Social factors play an important role in change to smaller containers.

Children are mostly responsible for the disposal of garbage from a family residence. Many of these children could not reach over the high-sided skips to deposit the waste. The result is the accumulation of discarded rubbish on the ground around the skips (which are emptied every two days). This garbage quickly becomes widely strewn around the area by both animals and wind action, thus defeating the purpose of collection and many of health risks are appeared.

Sweeping the asphalted roads also is activity carried out at all refugee camps. All the collected refuse is disposed into skip-lift containers ($8m^3$ capacity) or into the smaller crane truck containers ($1m^3$ capacity). The refuse is transported by UNRWA's trucks to the assigned landfills outside the camps. The skip-lift containers are only utilized in Jabalia camp while the crane truck system with refuse containers of one cubic meter capacity are utilized in the other camps. The skip lift trucks system was recently replaced (as from June 1997) by crane trucks system at Khan Yunis and Rafah camps (UNRWA, 2007). The truck bodies and the containers were designed by international consultants and manufactured locally by UNRWA.

2.7 Solid waste disposal system

In developing countries, probably less than 25% of collected wastes are deposited in controlled landfills, and probably less than 15% are deposited in modern sanitary landfills. The rest is discharged to open dumps, most of which are open and have hazardously steep side slopes. In low-income countries, nearly all of collected wastes are deposited within open dumps. The cost and resources required to implement waste technologies are often too high coast. In most developing countries, hazardous waste facilities have not yet been implemented and hazardous wastes are mixed for disposal with municipal solid wastes, despite laws to the contrary (EPA, 1998).

In Gaza Governorates, in the past, UNRWA operated their own open dump sites for some camps and utilized municipal sites for others. UNRWA now is dumping the collected wastes exclusively at municipal dumping sites. The official dumping sites are located at Gaza town, Dair Al-Balah and Rafah. The cost of using all landfills used by UNRWA is $3.5 per tone. UNRWA uses municipal Gaza dumping site for solid waste removed from Beach and Jabalia camps, Dair Al-Balah landfill for solid waste removed from Middle and Khan Yunis camps and Rafah landfill for solid waste removed from Rafah camp (UNRWA, 2007).

2.8 Labor force in UNRWA

The labor force is not adequate for sanitation activities. The existing number of laborers actually worked in solid waste collection and disposal is 182. Recently, this number was increased to 257 after hiring 75 of new labors, but the labor needed according to UNRWA norm is 565 labors at the rate of 1.4 sanitation laborers per 1000 persons registered in refugee camps (UNRWA, 2007). This means that 45.5% of the norm is applied at UNRWA

refugee camps. Some of camps such as Jabalia use 9 from sanitation laborers in operating water plants and water net works control. In addition, a large number of sanitation workers are transferred to the others UNRWA divisions without replacing them with new permanent laborers. However, this number does not cover the laborers shortage in refugee camps which lead to additional load on the rest of sanitation labor forced and affect the work productivity in refugee camps. In the last few years, the labor shortage compensated with temporary labors but they have low productivity and efficiency.

2.9 Awareness and safety measures among municipal solid waste workers

In most developing countries including Gaza Governorates, the capabilities and efficiency of governments are very low to deal with increasing quantities of solid waste. In many of these countries, infectious medical wastes and toxic industrial wastes are not segregated from domestic waste. This will expose the waste collectors to a wide array of risks including risk from contact with human fecal matter, paper that may have become saturated with toxic materials, bottles with chemical residues, metal containers with residue pesticides and solvents, needles and bandages (containing pathogenic organisms) from hospitals, and batteries containing heavy metals.

Most occupational health and injury problems could be reduced by awareness programs and simple safety procedures that cost little. Swatz (1998) found that the number of injuries among the private waste company workers (18-19 injuries for every 100 employees) dropped to below 10. The saving of claims was reported to have more than covered the cost of the safety initiatives. Most workers in developing countries need to wear protective gear, particularly gloves and face masks. There appears to be a global relationship between exposure to solid waste and increased health and injury risk.

A clinical evaluation of the skin changes and injuries among refuse (waste) collectors in San Francisco was conducted (Gellin, 1985). Almost 75% of workers had palmar calluses, a result of repeated pressure and friction. Those workers who protected their hands with gloves had practically normal skin, with minor or absent calluses.

The Environmental Protection Agency and the Agency for Toxic Substances and Disease Registry in their study in 1988 revealed that the levels of contaminants at an incinerator site did not pose a significant threat to workers if they wore their proper protective equipment (EPA/ATSDR, 1988).

In his study on the role of air monitoring techniques in hazardous waste site personnel protection and surveillance strategies, Levine (1990) reported that the use of protective equipment by solid waste industry workers reduced associated negative health outcomes. He also reviewed the consequences of lack of knowledge, for both the on-site workers and the surrounding community. Scarlett et al. (1990) found that gloves decreased the risk of detectable levels of urinary promutagens for incinerator workers.

A study of incinerator workers in New York City found that individuals tended to wear protective gear either "always" or not (Malkin et al., 1992). The study proposed that within the industry there are workers who are careful and take precautions in their work, and another group that had no concern for these issues. Wearing of a personal protective device was found to minimize the work hazards among workers.

The risk is greatest in developing countries where the contact between the solid waste workers and waste is greatest and the level of protection is least. To complicate the exposure risk to workers and pickers, their personal hygiene is often inadequate. Washing facilities are not typically provided for these people to use at the work place. In order to clean themselves before going home. To some extent, this is due to inadequate education on hygiene and health relations. Study by US agency for International Development indicates that cost–effective investment in sanitation requires hygiene promotion and education to achieve successful morbidity reductions (Varly and Bendahmane, 1997).

According to Pruss et. al. (1999), safety measures to protect staff focus on their topics: training of staff on handling medical wastes to avoid accidents, provision of protective clothing and equipment, and establishing immunization programs or protocols. In his study on occupational health hazards in sewage and sanitary workers, Tiwari (2008) recommended that regular awareness program should be conducted to impart education regarding safer work procedures and use of personal protective devices.

Mochungong (2009) presented the pitiable working conditions of clinical waste pickers in hospitals in the Northwest region in Cameroon and associated exposure to health hazards. He found that lack of immunization, protective equipment, and poor work postures, absence of support groups and lack of awareness on associated health hazards contributed to the current plight of clinical waste pickers in Cameroon. Improving hospital infrastructure and equipment is prioritized over safety and management of risks faced by the clinical waste pickers. It was concluded that clinical waste pickers in Cameroon certainly work in poor conditions which in danger their health and those of their families. There is an

urgent need for the implementation of health and safety protocols together with an overhaul of equipment in use.

A study on evaluation of medical waste management in 11 non-governmental hospitals in Gaza Governorates was carried out (Nasr, 2009). High level of health workers' knowledge was found on medical waste hazards, their impact on public and their separation from regular waste. Only 4.1% of the workers have taken training courses related to medical waste management hazards.

2.10 Occupational health among municipal solid waste workers

Most of studies that related to health of MSW workers focused on a cute diseases, not chronic diseases, because there are no long term studies and the lack of follow up. Chronic disease data are almost none existed. Solid waste collectors subjected to high risk injury and disease because collection of solid waste has the greatest hazards more than other management stages. The Bureau of labor statistics reported that the collectors of garbage have the seventh dangerous job in the nation; 111 garbage collectors were killed while working in the US form the year 1992 to 1996 (Fleming et al, 2000).

The norms and standards of solid waste handling in developed countries have minimized occupational health and environmental hazards substantially. Most waste collection in these countries contains vehicles with low-loading heights and easy to lift plastic containers or bags (Cointreau, 2004). In many developing countries, waste pickers find their livelihood sorting and recycling of secondary materials. They have high occupational health risks, including risk from contact with human fecal matter, paper that may have become saturated with toxic materials, bottles with chemical residues, metal containers with residue pesticides and solvents, needles and bandages from hospitals, and batteries containing heavy metals (Cointreau, 2006).

In Palestine especially in UNRWA refugees in Gaza Governorates, no studies concerning municipal solid waste workers were implemented. The present study will be the first to asses occupational health and safety measures among municipal solid waste workers in UNRWA sanitation in Gaza Governorates. This study will help in improving work conditions, promoting of safety measures and implementing health technologies for the work place, and work related diseases and injuries among workers.

2.10.1 Occupational symptoms and diseases among municipal solid waste workers

The international labor organization, in paragraph 6 (1) of the afore-mentioned recommendations No.121 defines occupational diseases as follows; "Each member should under prescribed conditions, related diseases known to arise out of the exposure to substances and dangerous conditions in process, trades, or occupations as occupational diseases". The protocols of 2002 of the Occupational Safety and Health Convention in 1981, defines occupational diseases as any disease contracted as a result of an exposure to risk factors arising from work activity (African Newsletter on Occupational Health and Safety, 2002).

At many dumpsites in developing countries, waste pickers reported having headaches, including 23% of the pickers in Katmandu and 36% of waste pickers and surrounding dumpsite residents in Bangkok (German Agency for Technical Cooperation, 1986).

At the Bombay, India open dumpsites, 95 solid waste workers were surveyed and examined (Konnoth, 1991). Of all landfill workers surveyed, 80% had eye problems, 73% had respiratory ailments, 51% had gastrointestinal ailments, 40% had skin infections or allergies, and 22% had orthopedic ailments. Based on clinical examination, 90% had decreased visual acuity. Most workers complained of eye burning, diminished vision, redness, itching, watering. Clinical examination showed 27% had skin lesions, of which 30% were determined to be directly occupation related.

Respiratory symptoms and ventilatory capacity were studied in a group of 74 waste collectors in Zagreb, Croatia (Zuskin et al, 1993). The prevalence of chronic respiratory symptoms was higher in workers than in controls, particularly for chronic cough (range: 41.9-46.2% vs. 14.3%), chronic phlegm (range: 38.7-46.2% vs. 14.3%), chronic bronchitis (range: 32.3-42.3% vs. 8.6%), and chest tightness (range: 29.0-53.8% vs. 0%). Eye irritation, dyspnea, dizziness, throat burning, and skin irritation were also reported. In addition, some sulfur odors emitted from volatile organic compounds in waste can elicit respiratory and gastrointestinal symptoms from occupational exposure (Anderson et al, 1992, Wilkins, 1994).

Based on health studies of waste pickers conducted in India, tuberculosis, bronchitis, asthma, pneumonia, dysentery, parasites, and malnutrition are the most commonly experienced diseases among waste pickers conducted in Bangalore, Manohar, and New Delhi (Huisman, 1994).

Direct Initiative for Social and Health Action, Calcutta, with Center for Occupational and Environmental Health Society for Participatory Research in Asia, New Delhi, and Center for Study in Man and Environment, Calcutta (1996) conducted a study on 180 waste pickers at the Calcutta, India open dumps. During the course of one year, 40% had chronic cough, and 37% had jaundice. The average quarterly incidence of diarrhea was 85%, of fever was 72%, of coughs and colds was 63%. Eye soreness of redness occurred quarterly in 15% and skin ulcers in 29%., with nearly all rates higher at the largest dump site than these averages.

The Romanian Institute of Hygiene, Public Health Services and Management Unit, compiled and statistically analyzed occupational health data on waste handlers and control groups (Cucu et al., 1996). The study covered 168 Romanian cities, representing 65% of the country's urban centers. The incidence of acute diarrhea was consistently higher among waste handlers than for the general population, by a relative risk factor over 10 times in some areas. In Bucharest, waste handles were 25 times more likely to experience acute diarrhea than the general population. Waste handlers were had 1.7 times more relative risk of physical injuries. There was no statistical difference in the dermatological disease incidence between waste handlers and control groups.

A critical review of the North American literature indicated that headaches, wheezing, sleepiness, narcotic symptoms and mood disorders occur among residents living proximal to a landfill (Croen, 1998).

In developed countries, they concern with infectious healthcare wastes in the transmission of HIV, which causes AIDS, or hepatitis A and B, from injuries caused by syringe needles (and other sharps) contaminated with blood and other body fluids. The USA reported 31 health care workers who were infected with HIV by contaminated puncture wounds, but none in housekeeping workers. The risk of HIV infections after puncture has been estimated to be about 0.3%. But, the risk of hepatitis B virus infection from a comparable injury was estimated to be at least 10 times higher, or 3% or more. Solid waste workers in the USA are estimated to have a risk of contaminated puncture that is roughly $1/1000^{th}$ of the risk level of hospital nurses (Pruess et al., 1999).

Yang et. al. (2001), conducted a study aimed to assess whether there is an excess of adverse health outcomes among Household Waste Collectors (HWCs) in Taiwan. The questionnaire was completed by 533 HWCs and 320 office workers. The data indicated that household waste collection presents a risk for the development of chronic respiratory

symptoms (cough, phlegm, wheezing, and chronic bronchitis), musculoskeletal symptoms (low back pain and elbow /wrist pain), and injuries caused by sharp objects.

Wouters et al., (2002) carried out a study in Netherlands on 47 waste collectors and 15 controls, to compare respiratory symptoms and upper airway inflammation in domestic waste collectors and controls, and to find the association between measures of upper airway inflammation on the one hand and exposure concentrations of organic dust or respiratory symptoms on the other hand. All subjects filled out a health questionnaire and underwent Nasal Lavage (NAL), before and after the work shift at the beginning and at the end of the week. Waste collectors showed signs of increased upper airway inflammation and respiratory symptoms compared with control exposure to organic dust probably underlies the inflammation mediated by neutrophils that result in respiratory symptoms.

Ray et al., (2005) examined the respiratory and general health of municipal solid waste workers in India. Health data was obtained from questionnaire surveys, clinical examination and laboratory investigations. Lung function was evaluated by spirometry. Workers had significantly higher prevalence of both upper and lower respiratory symptoms, and they suffered more often from diarrhea, fungal infection and ulceration of the skin, burning sensation in the extremities, tingling or numbness, transient loss of memory and depression. Spirometry revealed impairment of lung function in 62% of workers compared to 27% of the controls. Erythrocytes with target cell morphology were abundant in 42% of workers. Toxic granulation in neutrophils, an indication of infection and inflammation, was recorded in 94% of workers.

The prevalence of hepatitis B virus (HBV) markers among municipal solid waste workers in keratsini (Greece) was evaluated (Dounias, et al., 2005). It was reported that older employees had significantly higher prevalence of anti-Hbc (+). Municipal solid waste workers who were anti-Hbc (+) were less educated than non-exposed employee. Logistic regression analysis has shown that the exposure to waste is possibly associated with the anti-Hbc positively.

Perez et al., (2006) found a strong association between waste handling workers and gastrointestinal problems. In addition Waste collectors subjected to high ratio of fungi and bacteria in Europe showed bad effects of nausea, diarrhea and upper respiratory tract (Lavoie et al, 2006).

A study on hepatitis B and C virus seroprevalence was conducted on municipal solid waste workers in Italy (Squeri et al., 2006). Blood samples from 327 workers were analyzed. It was found that 32.4% of all subjects showed previous exposure to hepatitis B

virus (HBV) substantiates the need to proceed with compulsory HBV vaccine prophylaxis in this category of workers.

Hernando et al., (2006) assessed health effects associated with organic dust exposure during the handling of municipal solid waste. They suggested that there was an association between the performance of job tasks involving the handling of municipal solid waste and various respiratory, dermatologic and gastrointestinal health effects. According to the study, more and detailed characterization of organic dust exposure experienced by MSW workers is necessary in order to both improve understanding of resultant health effects and develop strategies to improve occupational health.

Mehrdad et al., (2008) evaluated musculoskeletal disorders among municipal solid waste workers in Tehran, Iran. A total of 65% (n=142) of participants reported that they had been troubled with musculoskeletal symptoms in one or more of the 9 defined body regions during the last 12 months. Prevalence of symptoms in low back, knees, shoulders, upper back and neck were 45, 29, 24, 23 and 22% respectively. Foreign workers reported more musculoskeletal symptoms in all body parts than Iranian workers. The differences between prevalence of symptoms between two groups were significant in all parts of body except knees. The study found that solid waste workers have more musculoskeletal disorders than general population. Meanwhile these symptoms were more common among foreign workers. The risk of disease was increased with the increasing year of working as solid waste worker and smoking.

2.10.2 Occupational injuries among municipal solid waste workers

Waste workers collect waste in different climate conditions; they use dangerous waste vehicle, contact with sharp coins and glasses, pull and push heavy containers, and lift heavier loads, often to higher loading locations. To define health and safety for such workers, different definitions and laws were conducted, and local and global strategies were delivered to decision makers for further assessment and explanation.

Poulson et. al. (1995), defined occupational injuries as sudden, anticipated, and unwanted events during work, leading to harm or damage to at least one part of the body. In Palestine, the Palestinian labor law, has defined the work injury in section one, chapter 1, article 1, as an accident that happens to worker during work, because of work or while going to or returning from work, it is considered as one of the vocation diseases specified by the system (Ministry of labor, 2002; Palestinian labor law. No. 7, 2000).

A study on waste workers in New York City was conducted (Cimino, 1975). It was shown that solid waste workers experienced 20% times more injuries than that of all USA workers (148 injuries per 1 million man-hours of solid waste work, compared to 7.35 for all USA industries, and 29.42 for USA underground mining). Most injuries were experienced during waste loading (60%) and driving (30%), with over 60% of all injuries occurring during the later part of the work shift suggesting a fatigue factor. Injury reports indicated that nearly 50% of the New York collectors were either standing or bending when they were hurt. In a 20 year work period, the risk among New York collectors of suffering a fracture or dislocation was estimated to be about 7 in 10.

A clinical evaluation of the skin changes and injuries among waste collectors in San Francisco was performed (Gellin, 1985). Almost 75% of workers had palmary calluses, as a result of repeated pressure and friction compared to those workers who wear protected gloves (normal skin, with minor or absent calluses). The majority of collectors sustained work-related injuries each year. Those injuries consisted mainly of sprains, abrasions and lacerations, fractures, and eye injuries.

A study which was conducted in Amsterdam showed that, from the total municipal waste workers, the incident of disability due to musculoskeletal disorders was the wide range in waste collectors (verbeek et al., 1993). Several studies on waste collection movements have demonstrated that mechanical loads on the skeleton frequently exceeded maximum acceptance limits recommended; throwing waste bags results in high shear forces on the spine, and carrying loads results in excessive torque to the shoulder (Poulsen et al., 1995).

Poulsen et al., (1995) also reported that the relative risk for an occupational accidents among Denmark's waste collectors were about 5.6 compared to Denmark's total work force, From 1989 to 1992 the number of occupational accident in the Danish waste collection activity was 95 per 1000 workers per year, compared to only 17 per 1000 nationally for all workers. The most commonly reported accident for Danish waste collectors were fractures, sprains, wounds, soft issue accidents, and chemical burns.

Ivens et al., (1997) conducted a study on 667 employees in the waste collection company that operates in Copenhagen, the capital of Denmark, trying to find out the risk circumstances associated with injuries among waste collectors. Of the 667 employees at the company, 491 were waste collectors, 114 (17%) experienced an injury. The study showed that the number of injuries was decreased with increasing seniority. This may be due to the more awareness of possible hazards in the working environment of more senior collectors.

It also explains the reduction of risk experiencing an injury with age, as high age was usually associated with high seniority.

The U.S. Department of labor reported that solid waste collectors had the seventh most dangerous job in the USA. They reported that the relative risk of waste collectors being killed was 10 times greater than other worker's risk, and that 81% of mortalities resulted from vehicular accidents. Waste collectors had a fatality rate of 48.8 per 100000, based on 1996 nationwide statistics. Between 1992 and 1996, 111 waste collectors were killed in the USA. The U.S. National Traumatic Occupational Fatalities Surveillance System indicated that 36% of fatalities between 1980 and 1992 occurred when the collection worker slipped or fell from a refuse collection vehicle or was run over by the refuse collection vehicle; and 18% of these occurred when the collection vehicle was backing up (NIOSH, 1997).

Ivens et al. (1998), found that the most repeated injuries of solid waste collectors was back (15%), knee (12%) and hand (12%). Dorevitch and Marder (2001) reported occupational hazards among municipal solid waste workers. They had a risk of fatal occupational injuries that is much higher than for the general work force. Among workers non-fatal injuries were mainly musculoskeletal. Other common injuries were fractures, ocular truma, and bites, and diseases included skin and gastrointestinal disorders. The burden of morbidity due to occupational exposure to bioaerosols and carcinogens among municipal solid waste workers was unknown.

Many studies on waste collectors in many countries indicated that risk was increased for musculoskeletal complaints. Solid waste collectors usually deal with great heavy lifting, pushing and lifting of garbage containers. The most affected area in the body is low back, other affected body organ are shoulders, knee and neck depending on the method of waste collection (Kuijer and Dresen, 2004).

Adams and David (2007) reported on initiatives launched to remove needles from solid waste and refuse handling operation to prevent the high rate of employee injuries and potential transmission of disease. Sharps containers were purchased to diabetics in Indiana to return once full for proper disposal. The sharps program provides needle users a safe way to dispose of their equipment. Other efforts to remove needles from the refuse and recycling stream are detailed. It has been estimated that as many as 3 billion used needles or syringes are generated in homes and others unregulated sites throughout the United States. Current needle disposal regulations apply only to health care setting, such as a doctors, offices and hospitals, leaving family members and solid waste collection workers exposed to the

possibility of injuries. Needle and syringe disposal is a hot issue and concern for the following reasons: 1) needle stick injuries are common hazards, 2) with a predicted 165 percent increase in American diagnosed with diabetes over the next 50 years, the problem of improper syringe disposal will get worse and 3) used needles can transmit diseases such as HIV and hepatitis B and C. In addition, the World Health Organization estimated in 2000 that injection with contaminated syringes caused 21 million hepatitis B infection, 2 million hepatitis C infection and 260000 HIV infection (Shinee et al., 2008).

CHAPTER 3

METHODOLOGY

3.1 Study design

The present study is a cross sectional study

3.2 Setting of the study

The study was conducted in the eight sanitation offices that are located in the refugee camps in the Gaza Governorates. The refugee camps were Jabalia, Beach, Bureij, Nuseirat, Maghazi, Dair El Balah, Khan Yunis and Rafah camps (Annex 1).

3.3 Study population

The estimated total number of workers in UNRWA who worked in the sanitation offices within the eight refugee camps in the Gaza Governorates was 282 workers (Field Sanitation Engineer, UNRWA, 2009). However, the actual number of sanitation workers who engaged in municipal solid waste collection and transportation was 182 workers (Camp Sanitation Officers, 2009). Out of them, 158 were permanent workers. Therefore, the study population was 158 permanent municipal solid waste workers in UNRWA Sanitation in the eight refugee camps in the Gaza Governorates.

3.4 Inclusion criteria

* Workers who engaged in municipal solid waste handling in UNRWA sanitation in the eight refugee camps in Gaza Governorates.
* All permanent workers who had work duration more than two years.

3.5 Period of the study

The study was conducted through the years 2009/2010. The proposal was approved by the school of Public Health-Al Quds University in May 2009. Administrative approval from the chief of Environmental Health Division in UNRWA and ethical approval from Helsinki committee were obtained in June 2009. However, the actual data collection commenced in November, 2009. Data analysis was completed by January 2010 and the final results were available by March 2010.

3.6 Ethical and administrative measures

The study respected the research ethical principles. Before starting the study, the researcher obtained the necessary approval from School of Public Health-Al Quds University and Helsinki Committee (Annex 2). An official letter of request for approval sent to the chief of special environmental health program in UNRWA (Annex 3). In addition, every questionnaire was attached with an explanatory letter which explain the aim and objectives of the study and overview some ethical remarks to help in filling questionnaire completely (Annex 4). Participation in the study was optional and the given information were confidential.

3.7 Questionnaire interview

A meeting interview was used for filling in the questionnaire. The questionnaire was validated by six specialists in the fields of water quality, microbiology, environment and public health. All interviews were conducted *face-to-face* by the researcher himself who was familiar with most of sanitation workers. Most questions were one of two types: the yes/no question, which offers dichotomous choice; and the multiple choice question which offers several fixed alternatives (Backestrom and Hursh-Cesar, 1981). The questionnaire included questions relating to the following: (1) personal profile of the study population, such as age, marital status and level of education; (2) Employment aspects of the study population, such as work place, type of job and work duration; (3) Knowledge of the workers about hazards of solid waste on environment, workers themselves, residents nearby containers and on general population, and protective effect of safety tools; (4) Attitudes of workers regarding separation of medical waste from domestic waste, training need, availability of safety tools and safety of work conditions; (5) Use of safety tools including overall, safety shoes, gloves, hat, goggles and respiratory mask; (6) practice of personal habits including smoking, drinking and eating; (7) work conditions on solid waste collection and collection tools; (8) Self reported symptoms among the study population; (9) Injuries among the study population; and (10) Vaccination, first aid, training and incentives of the workers. The questionnaire was administered in Arabic language (see Annex 5).

3.8 Pilot Study

A pilot study was done prior to the beginning of data collection. Twelve solid waste workers were interviewed. At the end of the pilot study, a comprehensive revision of the questionnaire was made and modified as necessary to improve reliability. The pilot subjects were included in the study.

3.9 Data collection

Data collection depended on field survey questionnaire. Questionnaire interview was answered by all UNRWA Sanitation workers involved in municipal solid waste handling. Questionnaire have a various advantages like facilitating analysis, wide coverage, keep confidentiality, saving resources and limiting researcher effect on the study (polit and hungler, 1999). The collected questionnaires were checked and overviewed for completeness, then were entered into the computer for statistical analysis.

3.10 Data management

3.10.1 Data coding and data entry

Filled questionnaires were checked and overviewed again. Questionnaires were coded numerically in different numbers from serial number so as to enable the researcher to enter the data systematically and efficiency. After that, data was entered into the computer using SPSS software version 13 to be analyzed. After finishing the data entry process, data cleaning was done to guarantee that all data were entered accurately and in appropriate way. Data cleaning was conducted through selecting and checking out a random number of the filled questionnaires and also through operating frequencies for most variables.

3.10.2 Data analysis

After collecting and revising the filled questionnaires, the coded questionnaires were entered into the computer by the researcher with a help of a supervisor and statistical advisor, then quantitative statistical analysis for the questionnaire was done using SPSS version 13.

Simple distribution of the study variables and the cross tabulation were applied. Chi-Square (x^2) was used to identify the significance of the relations and associations

among various variables. The relations in all results were accepted as statistically significant when the P-value less than 5% (P-value <0.05).

3.11 Limitations of the study

* Target population distribution in different areas consumed more time and effort.
* Many diseases and injuries might not be documented or classified as occupational disease.
* Constrains of data and availability of references for making research completely.

CHAPTER 4
RESULTS

4.1 Personal characteristics of the study population

Table 4.1 gives the personal profile of the study population (municipal solid waste workers in UNRWA sanitation in Gaza Governorates). The age of the workers ranged between 21 to 60 years old with the mean of 45.1±8.1 years. The highest number of workers 66 (41.8%) was 41-50 years old. One hundred and fifty four workers were married and 4 (2.5%) were single. Analysis of the educational status of the study population showed that 9 (5.7%) had a university degree, 51 (32.3%) had finish secondary school, 52 (32.9%) had finished preparatory school, 27 (17.1%) had passed primary school, and 19 (12.0%) were illiterate.

Table 4.1: Personal profile of the study population (n =158)

Personal profile	No.	%
Age (year)		
≤40	49	31.0
41-50	66	41.8
>50	43	27.2
Mean	45.1±8.1	
(range)	(21-60)	
Marital status		
Single	4	2.5
Married	154	97.5
Education		
University	9	5.7
Secondary school	51	32.3
Preparatory school	52	32.9
Primary school	27	17.1
Illiterate	19	12.0

4.2 Employment aspects of the study population

Employment aspects including work place, type of job and work duration of the study population are illustrated in Table 4.2. The number of workers relatively varies in the eight refugee camps in Gaza Governorates with the highest number in Rafah camp 31 (19.6%)

and the lowest in Dair El Balah camp 8 (5.1%). Regarding type of job, 124 (78.5%) workers were cleaner, 24 (15.2%) were vehicle workers and 10 (6.3%) included storekeeper and maintenance workers. The work duration ranged between 2-39 years with mean of 14.0 ± 7.8 years. Sixty two (39.2%), 57 (36.1%) and 39 (24.7%) workers engaged in their work since ≤10, 11-20 and >20 years, respectively.

Table 4.2: Employment aspects (work place, type of job and work duration) of the study population (n =158)

Employment aspect	No.	%
Work place (camp)		
Jabalia	17	10.8
Beach	19	12.0
Bureij	16	10.1
Nuseirat	22	13.9
Maghazi	17	10.8
Der El Balah	8	5.1
Khan Yunis	28	17.7
Rafah	31	19.6
Type of job		
Cleaner	124	78.5
Vehicle worker	24	15.2
Others*	10	6.3
Work duration (year)		
≤10	62	39.2
11-20	57	36.1
>20	39	24.7
Mean	14.0±7.8	
(range)	(2-39)	

* Others included storekeeper and maintenance workers

4.3 Knowledge of the study population on hazards of solid waste and safety tools

Table 4.3 shows knowledge of workers on hazards of solid waste and safety tools. A total of 144 (91.1%) workers knew that solid waste do affect environment. Regarding hazard of solid waste on workers; 140 (88.6%) workers reported that solid wastes constitute hazards on them. The hazardous contents were needles 130 (92.9%), glasses 125 (89.3%), sharp coins 124 (88.6%), chemical cans 110 (78.6%), leachate 92 (65.7%), kitchen waste 45 (32.1%) and cartons and cans 18 (12.9%). One hundred and thirteen (71.5%) and 98

(62.0%) workers said that solid waste do affect residents nearby containers and general population, respectively. A total of 149 (94.3%) workers knew that medical waste is more dangerous than domestic solid waste. The majority of workers 104 (65.8%) knew that safety tools can protect them from risk of solid waste.

Table 4.3: Knowledge of workers on hazards of solid waste and safety tools (n=158)

Hazards of solid waste	No.	%
Impact of solid waste on environment		
Yes	144	91.1
No	14	8.9
Hazards of solid waste on workers		
Yes	140	88.6
No	18	11.4
Hazardous contents		
Glasses	125	89.3
Sharp coins	124	88.6
Leachate	92	65.7
Needles	130	92.9
Cartons and cans	18	12.9
Kitchen wastes	45	32.1
Chemical cans	110	78.6
Hazards of solid waste on residents nearby to containers		
Yes	113	71.5
No	45	28.5
Hazards of solid waste on general population		
Yes	98	62.0
No	60	38
Do you know that medical waste is more dangerous than domestic solid waste?		
Yes	149	94.3
No	9	5.7
Safety tools can protect from risk of solid waste		
Yes	104	65.8
No	54	34.4

4.4 Attitude of the study population

The attitude of the municipal solid waste workers is illustrated in Table 4.4. Most of workers 133 (84.2%) had the opinion that medical waste should be separated from

domestic waste. One hundred twenty one (76.6%) workers think that there is a need for training and awareness programs on risks of solid waste. Only 16 (10.1%) workers said that safety tools are available throughout the year, whereas 142 (89.9%) had the opposite opinion. A total of 70 (44.3%) workers think that work condition were safe, whereas 88 (55.7%) were against.

Table 4.4: Attitude of municipal solid waste workers (n =158) in UNRWA sanitation in Gaza Governorates

Attitude	No.	%
Separation of medical waste from domestic waste		
Yes	133	84.2
No	25	15.8
Training and awareness need on solid waste risks		
Yes	121	76.6
No	37	23.4
Availability of safety tools throughout the year		
Yes	16	10.1
No	142	89.9
Safety of work conditions		
Yes	70	44.3
No	88	55.7

4.5 Practice of study population towards safety measures

Table 4.5 lists the different delivered safety tools and practice of workers towards such tools during work. High percentage of workers claimed that delivered safety tools were overall 151 (95.6%), safety shoes 155 (98.1%), gloves 143 (90.5%) and hat 147 (93.0%), whereas only 10 (6.3%) and 14 (8.9%) workers claimed that goggles and respiratory mask were delivered to them. Regarding practice towards such safety tools, the use of overall, safety shoes, gloves, hat, goggles and respiratory mask during work was 67 (42.4 %), 136 (86.1 %), 29 (18.4%), 27 (17.1%), 8 (5.1%) and 7 (3.8%), respectively.

Table 4.5: Delivered safety tools and practice of municipal solid waste workers (n=158) in UNRWA sanitation in Gaza Governorates towards such tools

Safety tool	Delivered safety tools		Using of safety tools	
	No.	%	No.	%
overall				
Yes	151	95.6	67	42.4
No	7	4.4	91	57.6
safety shoes				
Yes	155	98.1	136	86.1
No	3	1.9	22	13.9
gloves				
Yes	143	90.5	29	18.4
No	15	9.5	129	81.6
hat				
Yes	147	93.0	27	17.1
No	11	7.0	131	82.9
goggles				
Yes	10	6.3	8	5.1
No	148	93.7	150	94.9
respiratory mask				
Yes	14	8.9	7	3.8
No	144	91.1	151	96.2

Table 4.6 presents supervisor communication and workers' need of safety tools. The majority of workers 149 (94.3%) admitted that their supervisor follow up dressing of safety uniform. A total of 129 (81.6%) workers mentioned that they call their supervisor during emergency. Workers need of safety tools was relatively high 116 (73.4%). The most needed safety tools reported by workers were respiratory mask 81 (69.8%), goggles 58 (50.0%) and gloves 48 (41.4%).

Table 4.6: Supervisor communication and workers' need of safety tools

Item	No.	%
Follow up of safety uniform dressing by supervisor		
Yes	149	94.3
No	9	5.7
Calling supervisor during emergency		
Yes	129	81.6
No	29	18.4
Worker' need of safety tools		
Yes	116	73.4
No	42	26.6
Safety tools needed		
Safety cloths	24	20.7
Safety shoes	17	14.7
Gloves	48	41.4
Helmet	8	7.0
Goggles	58	50.0
Respiratory mask	81	69.8

Table 4.7 shows personal habits of workers during work. Sixty seven (42.4%) workers admitted smoking during work. Workers who reported drinking, eating and chewing gum during work were 120 (75.9%), 89 (56.3%) and 9 (5.7%).

Table 4.7: Personal habits of municipal solid waste workers (n=158) in UNRWA sanitation in Gaza Governorates during work

Personal habit	No.	%
Smoking		
Yes	67	42.4
No	91	57.6
Drinking		
Yes	120	75.9
No	38	24.1
Eating		
Yes	89	56.3
No	69	43.7
Chewing gum		
Yes	9	5.7
No	149	94.3

4.6 Work conditions and other practice aspects towards solid waste collecting tools

Work conditions and practice of workers towards solid waste collecting tools are illustrated in Table 4.8. One hundred and seven (67.7%) workers said that, the collecting point was near solid waste containers. Most of workers 146 (92.4%) mentioned that the height of solid waste container was suitable. The majority of workers 140 (88.6%) reported that the cart used for solid waste collection was comfortable. Ninety four (59.5%) of workers admitted that they asked for assistance during emptying solid waste bin, and 117 (74.1%) workers disposed medical waste with domestic waste.

Table 4.8: Work conditions and other practice aspects of municipal solid waste workers (n=158) towards solid waste collecting tools

Item	No.	%
Distance between collecting point and solid waste containers		
Near	107	67.7
Far	51	32.3
Height of container		
Suitable	146	92.4
High	12	7.6
Cart used		
Comfortable	140	88.6
Uncomfortable	18	11.4
Emptying heavy bin		
Self empty	27	17.1
Ask assistance	94	59.5
Divided into two stages	37	23.4
Disposal of medical waste with domestic waste		
Yes	117	74.1
No	41	25.9

4.7 Self reported symptoms among the study population

Table 4.9 lists self reported symptoms among municipal solid waste workers. The most common symptom was back pain 81 (51.3%). Forty four (27.8%) workers reported headache and the same percentage reported conjunctivitis. Other symptoms included dermatitis 37 (23.4%), dyspepsia 37 (23.4%) and dyspnea 33 (20.9%).

Table 4.9: Self reported symptoms among municipal solid waste workers (n=158) in UNRWA sanitation in Gaza Governorates

Symptom	Yes		No	
	No.	%	No.	%
Chronic cough	16	10.1	142	89.9
Dyspnea	33	20.9	125	79.1
Bleeding per rectus	9	5.7	149	94.3
Headache	44	27.8	114	72.2
Diabetes mellitus	11	7.0	147	93.0
Hepatitis	2	1.3	156	98.7
Rheumatoid arthritis	26	16.5	132	83.5
Conjunctivitis	44	27.8	114	72.2
Recurrent tonsillitis	24	15.2	134	84.8
Dyspepsia	37	23.4	121	76.6
Renal colic/dysurea	20	12.7	138	87.3
Anxiety	31	19.6	127	80.4
Hernia	8	5.1	150	94.9
Dermatitis	38	24.0	120	76.0
Back pain	81	51.3	77	48.7
Others*	21	13.3	137	86.7
Have 2 or more symptoms	85	53.8	73	46.2

*Others included disk, hypertension

4.8 Injuries of the study population

Work injuries among municipal solid waste workers are illustrated in Table 4.10. A total of 93 (58.9%) workers reported work injuries. Injuries were wounds 65 (69.9%) which mostly caused by glasses and sharp pieces, needle stick 47 (50.5%) from medical wastes and slipping 32 (34.4%) caused mostly by wet and unpaved roads. Poisoning represented 8 (8.6%) of injuries and most likely caused by needles stick and pesticides spraying. Fractures constituted 7 (7.5%) of injuries and mostly related to slipping, traffic and solid waste vehicles accidents. Other injuries included muscle strain and burning.

Table 4.10: Work injuries among municipal solid waste workers (n=158) in UNRWA sanitation in Gaza Governorates

Work injury	Yes		No	
	No.	%	No.	%
Had work injury	93	58.9	65	41.1
Type of injury				
Wounds	65	69.9	28	30.1
Fractures	7	7.5	86	92.5
Poisoning	8	8.6	85	91.4
Slipping	32	34.4	61	65.6
Needle stick	47	50.5	46	49.5
Traffic accident	8	8.6	85	91.4
Vehicle accident*	5	5.4	88	94.6
Others**	3	3.2	90	96.8

* Solid waste vehicle

** Others included muscle strain and burning

4.9 Vaccinations, first aid and training of the study population

Table 4.11 clarifies vaccination, first aid, training and incentives of workers. Only 7 (4.4%) of workers had vaccination against health risks of solid waste. Most workers 116 (73.4%) reported that first aid was not available. One hundred eleven workers (70.3%) received advices on safety handling of solid waste. About two thirds of workers 105 (66.5%) did not attend training courses concerning with risk of solid waste. When they asked about the organized body, most workers 48 (92.3%) reported that such training courses were organized by health department of UNRWA (not shown data). The majority of workers 143 (90.5%) claimed that there were no incentives for workers who commitment to safety measures.

Table 4.11: Vaccination, first aid, training and incentives of municipal solid waste workers (n=158) in UNRWA sanitation in Gaza Governorates

Item	No.	%
Vaccination		
Yes	7	4.4
No	151	95.6
Availability of first aid		
Yes	42	26.6
No	116	73.4
Receiving advices on safety handling of solid waste		
Yes	111	70.3
No	47	29.7
Attending training courses		
Yes	53	33.5
No	105	66.5
Existence of incentives for workers commitment to safety measures		
Yes	15	9.5
No	143	90.5

4.10 Sight of people to municipal solid waste workers and workers suggestions

When workers asked about sight of people towards them, most of workers 120 (75.9%) said that people sight to them was negative whereas 38 (24.1%) reported that people sight was positive. The negative sight was represented in the bad treatment received from people and nominated them as Zabbal. Suggestions of most workers included frequent need to safety tools such as gloves, goggles and respiratory mask. The delivered safety tools were not suitable in size and quality and tore rapidly.

4.11 Workers' knowledge in relation to their education and safety measures

Table 4.12 shows the relation between education level of municipal solid waste workers and their knowledge. In general, workers with higher education level had more knowledge about impact of solid waste on environment and on workers themselves. The education level varied with workers' knowledge on hazards of solid waste on residents nearby containers and on general population. Workers who had higher education level knew more that medical waste is more dangerous than domestic waste and that safety tools can protect from solid waste risks. The association between education level of workers and various aspects of their knowledge was not significant ($p>0.05$).

Table 4.12: Education level of municipal solid waste workers (n=158) in relation to their knowledge

Knowledge about	Diploma or University (n=9) No. (%)	Secondary school (n=51) No. (%)	Preparatory school (n=52) No. (%)	Primary school (n=27) No. (%)	Illiterate (n=19) No. (%)	P-value
Impact of solid waste on environment*(n=144)*	9 (100)	48 (94.1)	48 (92.3)	25 (92.6)	14 (73.7)	0.067
Hazards of solid waste on workers *(n=140)*	9 (100)	46 (90.2)	48 (92.3)	23 (85.2)	14 (73.7)	0.165
Hazards of solid waste on residents nearby to containers *(n=113*)	6 (66.7)	35 (68.6)	38 (73.1)	19 (70.4)	15 (78.9)	0.923
Hazards of solid waste on general population *(n=98)*	6 (66.7)	35 (68.6)	31 (59.6)	15 (55.6)	11 (57.9)	0.778
Do you know that medical waste is more dangerous than domestic solid waste? *(n=149)*	9 (100)	51 (100)	48 (92.3)	25 (92.6)	16 (84.2)	0.101
Safety tools can protect from risk of solid waste *(n=104)*	9 (100)	48 (94.1)	48 (92.3)	25 (92.6)	14 (73.7)	0.237

Use of safety tools by municipal solid waste workers in relation to their knowledge is illustrated in Table 4.13. Workers who used safety tools during work had more knowledge on impact of solid waste on workers themselves and general population than those who did not. Also, workers who used safety tools knew that medical waste is more dangerous than domestic waste and safety tools can protect from solid waste risk more than those who did not. However, the relation between use of safety tools and knowledge was not significant ($p>0.05$) except for hazards of solid waste on residents nearby solid waste containers ($p=0.037$).

Table 4.13: Use of safety tools by municipal solid waste workers (n=158) in relation to their knowledge

Knowledge about	Not use safety tools (n=61) No. (%)	Use safety tools (n=97) No. (%)	P-value
Impact of solid waste on environment *(n=144)*	56 (91.8)	88 (90.7)	0.529
Hazards of solid waste on workers *(n=140)*	54 (88.5)	86 (88.7)	0.585
Hazards of solid waste on residents nearby to containers *(n=113)*	49 (80.3)	64 (66.0)	0.037
Hazards of solid waste on general population *(n=98)*	34 (55.7)	64 (66.0)	0.131
Do you know that medical waste is more dangerous than domestic solid waste? *(n=149)*	57 (93.4)	92 (94.8)	0.483
Safety tools can protect from risk of solid waste *(n=104)*	39 (63.9)	65 (67.0)	0.410

Table 4.14 correlates the practice of personal habits among municipal solid waste workers to their knowledge. Workers who practice personal habits (smoking, drinking and eating) during work had more knowledge about impacts of solid waste on workers themselves, residents nearby the solid waste container and on general population than those who did not. Also, workers who practice personal habits knew more that medical waste is more

dangerous than domestic waste compared to those who did not. However, the association between practice of personal habits and knowledge of workers was not significant ($p>0.05$) except for safety tools that can protect from risk of solid waste ($p=0.025$).

Table 4.14: Personal habits of municipal solid waste workers (n=158) during work in relation to their knowledge

Knowledge about	Practice habits* (n=129) No. (%)	Not practice habits (n=29) No. (%)	P-value
Impact of solid waste on environment *(n=144)*	116 (89.9)	28 (96.6)	0.229
Hazards of solid waste on workers *(n=140)*	116 (89.9)	24 (82.8)	0.213
Hazards of solid waste on residents nearby to containers *(n=113)*	96 (74.4)	17 (58.6)	0.073
Hazards of solid waste on general population *(n=98)*	81 (62.8)	17 (58.6)	0.414
Do you know that medical waste is more dangerous than domestic solid waste? *(n=149)*	122 (94.6)	27 (93.1)	0.518
Safety tools can protect from risk of solid waste *(n=104)*	80 (62.0)	24 (82.8)	0.025

* Personal habits included smoking, drinking and eating during work
* $p>0.05$: not significant, $p<0.05$: significant

4.12 Attitude of workers in relation to their education

Table 4.15 gives the relation between the level of education of workers and their attitude. Workers' attitude towards separation of solid waste, training and awareness need, availability of safety tools and safety of work conditions was generally varied with different level of their education. The interaction between education level and attitude of workers was not significant ($p>0.05$).

Table 4.15: Education level of municipal solid waste workers (n=158) in relation to their Attitude

Attitude toward	Diploma or University (n=9) No. (%)	Secondary school (n=51) No. (%)	Preparatory school (n=52) No. (%)	Primary school (n=27) No. (%)	Illiterate (n=19) No. (%)	P-value
Separation of medical waste from domestic waste *(n=133)*	8 (88.9)	45 (88.2)	47 (90.4)	19 (70.4)	14 (73.7)	0.102
Training and awareness need on solid waste risks *(n=121)*	8 (88.9)	39 (76.5)	39 (75.0)	20 (74.1)	15 (78.9)	0.912
Availability of safety tools throughout the year *(n=16)*	1 (11.1)	5 (9.8)	4 (7.7)	3 (11.1)	3 (15.8)	0.902
Safety of work conditions *(n=70)*	3 (33.3)	23 (45.1)	21 (40.4)	15 (55.6)	8 (42.1)	0.699

4.13 Self reported symptoms in relation to work duration and attendance of training courses, and safety measures

Table 4.16 clarifies the relation between self reported symptoms among workers and work duration and attendance of training courses concerning solid waste risks. The number of workers reported symptoms according to their work duration were 5 (38.5%) worked for ≤5 years, 25 (49.0 %) worked for 6-11 years and 55 (58.5%) worked for >11 years i.e. self reported symptoms were increased with increasing work duration. However, this relation was not significant (p=0.281). Regarding training courses, workers who did not attend training courses 67 (63.8%) had more symptoms than those who did 18 (34.0%), p=0.043. This significant relationship reflects the important of training courses about risks of solid waste in minimizing symptoms among workers.

Table 4.16: Self reported symptoms of workers (n=158) in relation to work duration and training courses attending about solid waste risks

Item	Have symptoms* (n=85) No. (%)	P-value
Work duration (year)		
≤5 *(n=13)*	5 (38.5)	
6-11 *(n=51)*	25 (49.0)	0.281
>11 *(n=94)*	55 (58.5)	
Attending training courses		
Yes *(n=53)*	18 (34.0)	0.043
No *(n=105)*	67 (63.8)	

*worker reported 2 or more symptoms

The relation between the use of safety tools by workers and self reported symptoms is illustrated in Table 4.17. In general, workers who use safety tools during work had less symptoms than those who did not. The interaction between the use of safety tools and self reported symptoms was significant for using gloves (p=0.002), goggles (p=0.009) and respiratory mask (p=0.041).

Table 4.17: Use of safety tools by workers (n=158) in relation to their self reported symptoms

Safety tools	Have symptoms* (n=85) No. (%)	P-value
Wear overall		
Yes *(n=67)*	32 (47.8)	0.069
No *(n=91)*	53 (58.2)	
Wear safety shoes		
Yes *(n=136)*	79 (58.1)	0.427
No *(n=22)*	6 (27.3)	
Wear gloves		
Yes *(n=29)*	15 (51.7)	0.002
No *(n=129)*	70 (54.3)	
Wear hat		
Yes *(n=27)*	11 (40.7)	0.263
No *(n=131)*	74 (56.5)	
Wear goggles		
Yes *(n=8)*	1 (12.5)	0.009
No *(n=150)*	84 (56.0)	
Wear respiratory mask		
Yes *(n=7)*	1 (14.3)	0.041
No *(n=151)*	84 (55.6)	

* Workers reported 2 or more symptoms

Table 4.18 verified practice personal habits by workers in relation to their self reported symptoms. In general, workers practiced habits including smoking, drinking and eating during work had more symptoms than those who did not. However, the interaction between practiced habits and self reported symptoms was significant only for drinking (p=0.040).

Table 4.18: Practice of personal habits by workers (n=158) in relation to their self reported symptoms

Personal habit	Have symptoms* (n=85) No. (%)	P-value
Smoking		
Yes *(n=67)*	40 (59.7)	0.486
No *(n=91)*	45 (49.5)	
Drinking		
Yes *(n=120)*	74 (61.7)	0.040
No *(n=38)*	11 (28.9)	
Eating		
Yes *(n=89)*	56 (62.9)	0.148
No *(n=69)*	29 (42.0)	

* Workers reported 2 or more symptoms

4.14 Injuries of workers in relation to work duration and attendance of training courses, and safety tools

The relation between injuries of municipal solid waste workers with work duration and attendance of training courses concerning solid waste risks is illustrated in table 4.19. The number of workers who reported injuries according to their work duration were 7 (53.8 %) worked for ≤5 years, 22 (43.1%) worked for 6-11 years and 36 (38.3%) worked for >11 years i.e. workers' injuries were decreased with increasing work duration. This inverse relation was not significant (p=0.779). Regarding training courses, workers who did not attend training courses 52 (49.5%) had more injuries than those who did 13 (24.5%). The interaction between attending of training courses and workers' injuries was found to be significant (p=0.044). This reflects the important of training courses about solid waste risks for minimizing the injuries of workers.

Table 4.19: Work injuries of municipal solid waste workers (n=158) in relation to work duration and training courses attending about solid waste risks

Item	Have injuries (n=65) No. (%)	P-value
Work duration (year)		
≤5 *(n=13)*	7 (53.8)	
6-11 *(n=51)*	22 (43.1)	0.779
>11 *(n=94)*	36 (38.3)	
Attending of training courses		
Yes *(n=53)*	13 (24.5)	0.044
No *(n=105)*	52 (49.5)	

Table 4.20 presents the use of safety tools by workers in relation to their injuries. Workers who did not use safety tools during work had more injuries than those who did. This indicates that safety tools contributed more or less in preventing work injuries. However, the relation between use of different safety tools and injuries was not significant (p>0.05).

Table 4.20: Use of safety tools by workers (n=158) in relation to their injuries

Safety tools	Have injuries (n=93) No. (%)	P-value
Wear overall		
Yes *(n=67)*	38 (56.7)	0.379
No *(n=91)*	55 (60.4)	
Wear safety shoes		
Yes *(n=136)*	80 (58.8)	0.587
No *(n=22)*	13 (59.1)	
Wear gloves		
Yes *(n=29)*	16 (55.2)	0.403
No *(n=129)*	77 (59.7)	
Wear hat		
Yes *(n=27)*	16 (59.3)	0.570
No *(n=131)*	77 (58.8)	
Wear goggles		
Yes *(n=8)*	0 (0.0)	NA*
No *(n=150)*	93 (62.0)	
Wear respiratory mask		
Yes *(n=7)*	0 (0.0)	NA
No *(n=151)*	93 (61.2)	

* Not applicable

CHAPTER 5
DISCUSSION

Occupational health and safety measures among municipal solid waste workers are of major public health concern. This study is the first one to assess safety measures and health impact associated with dealing of municipal solid waste on workers. The study described knowledge, attitude, practice towards safety measures; self reported symptoms and injuries among municipal solid waste workers of UNRWA sanitation in the eight refugee camps in the Gaza Governorates.

5.1 Personal characteristics of the study population

All the study population was male workers. This reflects the Palestinian tradition and culture which considered working in solid waste collection is not suitable for woman. Most of workers were married and the majority of them aged more than 40 years old indicating their engagement in their profession as solid waste workers for long period. This was supported by the finding that most workers engaged in their work for more than 10 years with mean work duration of 14.0±7.8 years.

A low level of illiteracy was recorded among municipal solid waste workers, reflecting a well educated community. This may give the impression that the high rate of educated municipal solid waste workers is a result of them not getting another job because of the bad economic situation and unemployment crisis in the Gaza Strip. Giacaman et al., (2009) pointed out that 52% of families (40% in the West Bank and 74% in the Gaza Strip) were living below the poverty line of US$3.15 per person per day in 2007. In addition, it was reported that unemployment in Gaza is close to 40% and is set to rise to 50% (Palestinian Central Bureau of Statistics, 2007).

The present study targeted all municipal solid waste workers in UNRWA sanitation in the eight refugee camps in the Gaza Governorates. This will no doubt provided representative and reliable results. The finding that more than two thirds of workers were cleaners implies direct contact of them with solid waste through collection and transportation. This will put threat on workers unless they used safety measures.

5.2 Awareness and Safety measures among workers

5.2.1 Knowledge of workers

Knowledge of municipal solid waste workers of UNRWA sanitation in Gaza Governorates about hazards of solid waste on environment, workers themselves, residents nearby containers and on general population was relatively high. This finding was in agreement with that reported in the study of Nasr (2009) about evaluation of medical waste management in non governmental hospitals in Gaza Governorates. He reported that 92.7% of health care workers had good knowledge about the effects of medical waste on environment. In another study about the assessment of current situation and management strategy of municipal solid waste in Rafah, Barhoum (2004) pointed out that solid waste caused negative effective on environment and public health.

The present results showed also that most of workers knew that medical waste is more dangerous than domestic waste and safety tools can protect from risk of solid waste. This Knowledge stemmed from the familiarity of municipal solid waste workers to syringes, sharps and needles present in medical waste. This was confirmed by the result that more than two thirds and half of the workers experienced wounds and needle stick, respectively during work. Also, the attitude of most workers towards separation of medical waste from domestic waste was positive. Halbwachs (1994) identified hazardous categories to include sharps, drugs, needles and dangerous infectious waste. Nasr (2009) reported that 93.2% of health care workers in Gaza Governorates had good knowledge about medical waste hazards.

When related to education, workers' knowledge about hazards of solid waste on environment, workers themselves, residents nearby containers and on general population was generally higher among more educated workers. Knowledge on solid waste separation and protective effect of safety tools had the same trend. However, workers' education had no significance influence on their knowledge. This indicates that education had a minor contribution in raising workers' knowledge. Therefore, conduction of training courses would be more effective.

Regarding safety tools, workers who wore overall, safety shoes, gloves, hat, goggles and respiratory mask had more knowledge on solid waste hazards particularly on residents nearby to containers than those who did not. This implies that knowledge had influence on practice. For personal habit practice, higher knowledge on solid waste hazards was found among workers who smoke, drink and eat during work than those who did not. In this case knowledge does not reflect practice, which could put workers at high risk of

health consequences. Sanitation requires education on hygiene and health relations to achieve morbidity reduction (Varly and Bendahmane, 1997). Practicing of personal habits may be due to workers careless, low level of workers' knowledge on the impact of such habits on their health and lack of inspection system and warning for practicing such habits.

5.2.2 Attitude of workers

Data presented here showed that most of municipal solid waste workers had the opinion that medical waste should be separated from domestic waste and that there is a need of training and awareness courses on solid waste risks. Similar result was reported by Nasr (2009) in his study about evaluation of medical waste management in non governmental hospitals in Gaza Governorates. He found that 92.7% of health care workers believed that medical waste must be separated from regular waste and 93.6% of workers had positive attitude toward the need of training and awareness courses relating to medical waste management. In addition, Atyani (1996) documented a strong positive attitude towards training of health-care workers on medical waste management in the West Bank.

Despite such positive attitude, medical waste is still handled and disposed of together with domestic waste in many countries including Gaza Strip. This was obvious in the present study when the majority of workers admitted that they disposed medical waste with domestic waste. Such practice does not reflect attitude and will create great health risk to health-care workers, municipal workers, the public and the environment (Dasilva et al., 2005). Improper waste collection, when the infectious waste is mixed with general waste can render all the waste potentially infectious and hazards (Chaerul and Tnaka 2008).

Disposal of medical waste with domestic waste is mainly due to lack of separation system of waste or special system for medical waste management in the Gaza Governorates (Massrouje, 2000). Therefore, decision makers in the Ministry of Health and UNRWA must be cooperated to set up such that system of medical waste management to protect waste workers, public and environment.

Workers attitude towards the availability of safety tools throughout the year was negative. This rendered more than half of workers to believe that work condition is unsafe. Such situation put the workers in danger cycle and caused to them many diseases and injuries. So, the decision makers must make the safety tools available for all workers in periodical times throughout the year to improve their health status and protect them form diseases and injuries.

When related to education, workers' attitude towards separation of medical waste from domestic waste and the need of training and awareness courses was generally more positive among the more educated workers. However, this relation was not significant indicating that workers' education seems not to affect their attitude. On the other hand, workers' attitude towards availability of safety tools and safety of work condition was varied with education level.

5.2.3 Practice of workers towards safety measures

5.2.3.1 Practice of workers towards safety tools

Although overall, gloves and hats were delivered to workers by the sanitation offices, small number of them used such tools during work. Other safety tools including goggles and respiratory mask were rarely to be delivered and consequently their use was poor. This was confirmed by the result that most workers are in need for safety tools particularly respiratory mask and goggles. Nevertheless, the overall finding is that the use of safety tools was poor whether they delivered or not. Similar result was found by Gellin (1985) who stated that although gloves were provided to all collection of solid waste workers surveyed, many refused to wear them. As reported by the workers, the reasons for not using safety tools included carelessness, discomfort particularly for safety shoes and overall or bad quality of safety tools like overall, gloves and hat.

The available literature reports that there is a significant protective effect with the use of personal protective or safety tools. The Environment Protection Agency (EPA) and the Agency for Toxic Substances and Disease Registry (ATSDR) revealed that the levels of contaminants at an incinerator site didn't pose a significant threat to workers if they wore their proper safety tools (EPA and ATSDR, 1988). Levine (1990) assumed that use of protective tools by solid waste workers reduce associated negative health outcomes.

When related to symptoms, workers who used safety tools during work had less symptoms than those who did not. This relationship was significant for gloves, goggles and respiratory mask implying that such safety tools are effective in limiting symptoms among workers. Sabde and Zodpey (2008) reported that street sweepers in India were subjected to respiratory problems when they didn't use protective tools.

Although there was no significant relation between use of safety tools and work injuries, workers used safety tools had less injuries than those who did not. Therefore, decision makers must provide safety tools with good quality and quantity to all workers on

every time of the year to protect them from many injuries and diseases. Heavy gloves protected workers from skin diseases and injuries (Gellin, 1985).

5.2.3.2 Practice of personal habits

As depicted from the present data, the majority of workers practiced personal habits particularly drinking and eating during work. Such habits would cause potential hazard impacts on workers health. Washing facilities are not typically provided for workers to use at work place (Personal observation). This is an alarming issue to different UNRWA, governmental and non governmental bodies that necessitates an urgent campaign represented by introducing seminars and frequent health professional visits. Such action would alleviate hazards exposure among workers

Sanitation requires education on hygiene and health relations to achieve morbidity reduction (Varly and Bendahmane, 1997). A study from Nepal revealed that 73% of waste collectors didn't use soap to wash their hands, 88% didn't use soap to wash their feet, and more than 65% didn't change their clothing daily (German Agency For Technical Cooperation, 1986). Another study about waste picking families in India, women reported preparing meals immediately after returning home form waste picking, without washing hands (Huisman, 1994).

Workers who practiced personal habits including smoking, drinking and eating during work had more symptoms than those who did not. However, this relationship was significant for drinking implying that such practice could contribute largely to symptoms among workers. Again this result necessitates hygiene promotion and health relations to achieve morbidity reduction (Varly and Bendahmane, 1997).

5.3 Occupational health among workers

5.3.1 Self reported symptoms among workers

The present data revealed that the most frequent self reported symptoms among municipal solid waste workers in Gaza Strip were back pain, headache, conjunctivitis, dermatitis, dyspepsia and dyspnea. Many studies on solid waste collectors in many countries indicated that risk was increased for musculoskeletal complaints. The most affected area in the body is low back, other affected body organ are shoulders, knee, neck and hand depending on the method of waste collection (DIFSHA et al., 1996; Konnoth, 1991; Ivens et al. 1998 and Kuijer and Dresen, 2004). Back pain reported in the present study could be associated with work-related lifting and forceful movements. This coincide with the result recorded here

that around fifth of the workers emptied the waste bin by themselves, more than half of workers asked assistance and about quarter of workers emptied the bin into two stages. Poulsen et al., (1995) demonstrated that mechanical loads on the skeleton frequently exceeded maximum acceptance limits recommended; throwing waste bags results in high shear forces on the spine, and carrying loads results in excessive torque to the shoulder.

According to the study results, 27.8% of workers reported headache. At many dumpsites in developing countries, waste pickers reported headaches, including 23% of the pickers in Katmandu and 36% of waste pickers and surrounding dumpsite residents in Bangkok (Kungskulniti et al., 1991 and GAFTC, 1986). A critical review of the North American literature indicated that headaches, wheezing, sleepiness, narcotic symptoms and mood disorders occur among residents living proximal to a landfill (Croen, 1998).

Conjunctivitis among solid waste workers represented the same percentage as headache. Lack of delivered or/and not use of goggles reported here made this result to be expected. During the course of one year study, 15% of waste pickers (n=180) had eye soreness of redness quarterly (DIFSHA et al., 1996). Of 95 Indian solid waste workers, 80% had eye problems, 73% had respiratory ailments, 51% had gastrointestinal ailments, 40% had skin infections or allergies, and 22% had orthopedic ailments. Based on clinical examination, 90% had decreased visual acuity. Most workers complained of eye burning, diminished vision, redness, itching, watering (Konnoth, 1991).

According to the present results 24% of solid waste workers in Gaza Strip reported dermatitis. Similar results was obtained in Indian solid waste workers by Konnoth (1991) who found that 27% of workers had skin lesions, of which 30% were determined to be directly occupation related. Anther study registered a percentage of 29% workers skin ulcers (DIFSHA et al., 1996). Active contact between solid waste and collectors may contribute to many skin problems particularly in our case where small number of workers wore gloves. Streptococci and enterobacteria and other micro organisms on hands and clothing of waste workers were detected (Fleming et al, 2000).

As depicted here dyspepsia was frequently encountered in municipal solid waste workers in the Gaza Strip. This finding is in agreement with that reported by other authors who registered gastrointestinal disturbance and diarrhea among waste collectors (Anderson et al, 1992; Wilkins, 1994; Ivens et al., 1997 and Lavoie et al., 2006). In addition, strong association was found between waste handling workers and gastrointestinal problems (Perez et al., 2006).

Dyspnea was also reported among municipal solid waste workers in the Gaza Strip. Similar results were demonstrated among Danish municipal solid waste workers (Hansen et al., 1997). Higher prevalence of respiratory problems, lung function decrement and wide range of general respiratory problems was linked to waste workers (Ray et al., 2005). Many studies pointed out that waste pilling in composting and wastes spreading in land filling generate particulate emissions, including airborne pathogens that caused respiratory problems (Malmros et al., 1992; Rylander and Bergstrom, 1993 and Poulsen et al., 1996).

As discussed previously, self reported symptoms among workers was inversely related to practice of safety measures. In contrast, self reported symptoms were increased with increasing work duration. This positive relationship means that increasing work duration leads to increase workers exposure to solid waste and thus put their health in a higher risk. Poulsen et al., (1996) reported that workers having long work duration would be the group at the highest risk for disease and symptoms. Regarding training courses, workers who did not attend training courses had significantly more symptoms than those who did. It was indicated that sanitation workers required hygiene training and awareness education to achieve successful morbidity and mortality reduction (Varley and Bendahmane, 1997).

5.3.2 Injuries among workers

The major work injuries reported by solid waste workers were wounds, needle shock and slipping. This coincides with the study of (Poulsen et al., 1995) who mentioned that the most commonly reported injuries for Danish waste collectors were fractures, sprains, wounds, soft issue accidents and chemical burns. In our study, wounds was reported to be caused mostly by glasses and sharp pieces. This probably stemmed from low workers' knowledge on hazardous contents of solid waste.

Needle stick is the second common injury reported by solid waste workers. They mentioned that such injury caused mainly by medical wastes. This was reflected by their high knowledge that needles are hazardous contents of solid waste and medical waste is more dangerous than domestic waste. Disposable needles are commonly hidden inside garbage bag and may puncture the skin when handled by collectors causing some infectious diseases. Male dumpsite pickers in Bangkok were tested for human immunodeficiency virus (HIV) and hepatitis B antibody which related to needle stick. Result showed that 5% of workers were positive for HIV and 24% were positive for hepatitis B (Kungskulniti et al., 1991).

Around one third of the workers reported slipping, which mostly mentioned to be caused by wet and unpaved roads. Such accidents were mentioned by Poulsen et al., (1995) among Danish waste collectors. To avoid or decrease slipping, the employer must provide collection workers slip-resistance shoes.

As discussed previously, workers who did not use safety tools during work had more injuries than those who did. When related to work duration, injuries were decreased with increasing work duration. This finding could be attributed to the idea that younger and less experienced workers are at greater risk of work injury than older ones who had more experience and are usually more aware of possible hazards of their working environment (Ivens et al., 1998). Regarding training courses, workers who did not attend training courses had significantly more injuries than those who did. Again attendance of training courses about safety of solid waste handling is proven to be effective in alleviating both work-related symptoms and injuries. This result in combination with the finding that only one third of the workers claimed attending training courses do necessitate urgent need of such training courses. It was assumed that many work injuries could be prevented or become less serious if training and education were increased especially for young and/or inexperienced workers (Ivens et al., 1997 and 1998).

5.4 Vaccination, first aid and training courses as safety aspects, and incentives of workers

The present results revealed that only 7 (4.4%) workers had vaccination against health risks of solid waste. This finding should urge the Health Department of UNRWA to provide effective medical examination and vaccination for all workers to protect them from many diseases and to improve their health. First aid was claimed to be available by quarter of workers and only one third of workers attended training courses on safety of solid waste handling. This was expressed in training and awareness need of most workers on solid waste risks. Therefore, first aid and training courses must be provided. As discussed previously, administration of training courses is valuable as they are effective in alleviating both work-related symptoms and injuries. Regarding incentives, most workers claimed that there were no incentives for workers who commitment to safety measures. This will not encourage workers' motivation to use safety measures. So, incentives would reflect a preventable behavior. The USA National Institute Office of Safety and Health (1997) produced a series of detailed recommendations in term of training and education to prevent waste collectors from injuries and death.

CHAPTER 6

CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

* Most of workers were cleaner and engaged in their work for more than 10 years with mean work duration of 14.0±7.8 years.

* Workers' knowledge about hazards of solid waste on environment, workers themselves, residents nearby containers and on general population; danger of medical waste over domestic waste; and the protective effect of safety tools was relatively high. Such knowledge was generally higher among more educated workers.

* The use of safety tools including overall, safety shoes, gloves, hat, goggles and respiratory mask among the workers was poor, whether they delivered or not. The majority of workers practiced personal habits particularly drinking, and eating during work.

* Workers who used safety tools had more knowledge on solid waste hazards than those who did not, indicating that knowledge had influence on practice. For personal habit practice, higher knowledge was found among workers who smoke, drink and eat during work than those who did not implying that knowledge does not reflect practice.

* Most workers had the opinion that medical waste should be separated from domestic waste and that there is a need of training and awareness courses on solid waste risks. Workers attitude towards the availability of safety tools throughout the year was negative. When related to education, workers' attitude was generally more positive among the more educated workers.

* The most frequent self reported symptoms among workers were back pain, headache, conjunctivitis, dermatitis, dyspepsia and dyspnea. Workers who used safety tools had less symptoms than those who did not. On the other hand, workers who practiced personal habits particularly drinking, and eating during work had more symptoms than those who did not. Self reported symptoms were increased with increasing work duration. Attending training courses was inversely related to self reported symptoms

* The major work injuries reported by solid waste workers were wounds, needle shock and slipping. Workers who used safety tools had less injuries than those who did not. Such injuries were decreased with increasing work duration. Attending training courses was inversely related to work injuries.

* Lack of vaccination against health risks of solid waste, first aid, attendance of training courses and incentives was reported.

6.2 Recommendations

* Training and awareness courses on health hazards of solid waste and safety measures including safety tools and personal habits are highly recommended
* Provide workers with effective safety tools throughout the year.
* Implementation of waste segregation and separate collection of hazardous and health care wastes from municipal waste.
* Frequent monitoring the health status of the workers and providing them with vaccination and first aid.
* Encouragement of workers to be committed to safety measures through promotion of incentive system.

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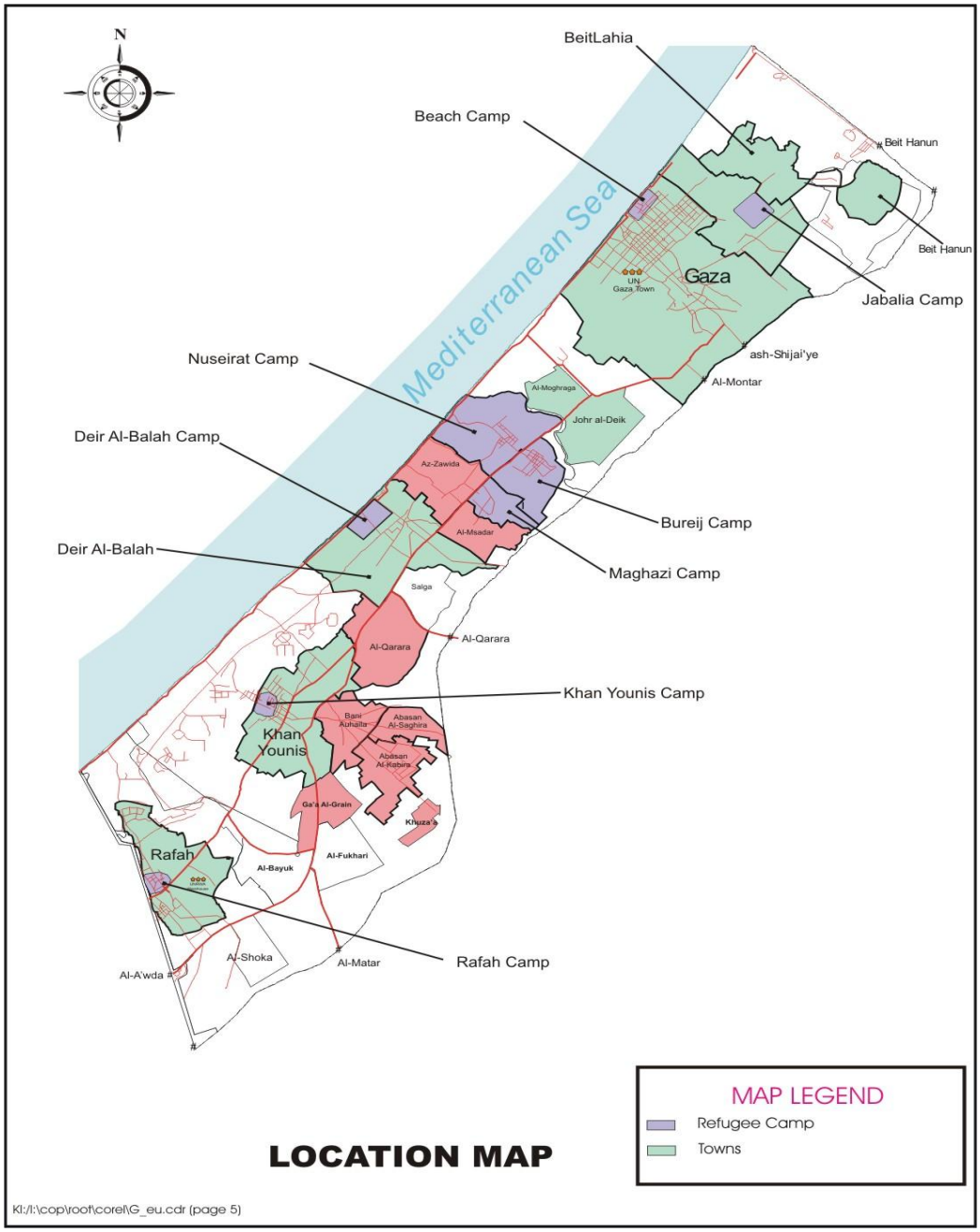
Annex 1



Source: Environmental Health Report in Gaza Field, UNRWA 2007

Annex 2

Helsinki committee approval letter

Palestinian National Authority
Ministry of Health
Helsinki Committee

السلطة الوطنية الفلسطينية
وزارة الصحة
لجنة هلسنكي

التاريخ2009/6/3

Name:

الاسم: جهاد إبراهيم محمد أبو لبدة

I would like to inform you that the committee has discussed your application about:

نفيدكم علماً بأن اللجنة قد ناقشت مقترح دراستكم حول:-

Occupational Health and Safety Among Municipal Solid Waste Workers in UNRWA Sanitation in Gaza Strip

In its meeting on June 2009
and decided the Following:-
To approve the above mention research study.

و ذلك في جلستها المنعقدة لشهر 6 2009

و قد قررت ما يلي:-

الموافقة على البحث المذكور عاليه.

Signature
توقيع

Member
عضو

Member
عضو

Chairperson

Conditions:-

- Valid for 2 years from the date of approval to start.
- It is necessary to notify the committee in any change in the admitted study protocol.
- The committee appreciate receiving one copy of your final research when it is completed.

Annex 3

بسم الله الرحمن الرحيم

اليوم / الاثنين
التاريخ/ ١٧-٣-٢٠٠٩

السيد/ مدير البرنامج الخاص بصحة البيئة بوكالة الغوث الدولية بغزة **المحترم.**

تحية طيبة وبعد"

الموضوع/ المساعدة على إجراء البحث الخاص برسالة الماجستير

أود إحاطة سيادتكم علما بأن عنوان رسالة الماجستير التي أقوم بتحضيرها في كلية الصحة العامة بجامعة القدس هو:

"Assessment of Occupational health and safety measures among municipal solid waste workers in UNRWA sanitations in Gaza Governorates"

لذا نتمنى من سيادتكم الموافقة بالإيعاز لذوي الاختصاص بتوفير التسهيلات و المعلومات اللازمة للخروج بهذا البحث إلى حيز الوجود من أجل خدمة مخيمات اللاجئين والمحافظة على صحة عمال النظافة و سلامتهم .

مع خالص الشكر،،

لا مانع

جهاد إبراهيم أبو لبدة
كلية الصحة العامة
جامعة القدس

UNRWA-GAZA

Annex 4

Explanatory letter

Occupational Health and Safety Questionnaire

Dear participant

This study is a part of the requirement for the Master Degree which prepared in Public Health, Al-Quds University. I thank you for participation to accomplish this study.

This study aims to evaluate and know the diseases and injuries to which you exposed during your work and safety measures which follow up.

I will know from the questionnaire your personal performance during work and your suggestions.

The study results will be useful to you, protect your health and provide you with safe work conditions.

So, I hope to take 10 minutes of your time.

Write of name is not a condition and please answer for all questions as you can.

Your answers will be kept confidential and they will be used for the scientific research purposes only.
The research finance by researcher only.

Sanitation offices in refugee camps and decision makers in the main UNRWA office will be provided with the results for improvement your occupational health and safety.
Thank you for cooperation.

Researcher: Jehad Abu Lebda
E-mail: jehadmer@yahoo.com

Serial No: ( )

OCCUPATIONAL HEALTH AND SAFETY QUESTIONNAIRE

Please put circle around appropriate answer:

1- Personal information

Sex: 1- Male 2- Female

Age: ……

Level of education: ……

1- University 2- Secondary 3- Preparatory 4- Primary 5- Illiterate

Marital status: ……..

1- Married 2- Single 3- Widow 4- Divorce

2- Occupation:

1- clean worker 2- vehicle worker 3- pesticide worker 4- others..

3- Work area:

1- Jabalia 2- Beach 3- Bureij 4- Nuseirat 5- Maghazi

6- Dair Al-Balah 7- Khan Yunis 8- Rafah

4- Years of experience: ……..

>> Knowledge

5- Do you know that solid waste is harmful to the environment?

1- Yes 2- No

6- Do you know that solid waste is harmful to you?

If the answer is yes, what are the constitutes of solid waste which cause hazard. (You can choose more than answer)

1- Glasses 2- Sharp coins 3- Leachate 4- Syringes and needles

5- Carton, empty cans 6- Kitchen waste 7- Chemical cans 8- Others….

7- Municipal Solid waste cause hazards for: (you can choose more than answer)

1- Clean workers 2- Residents nearby containers 3- General population 4- Others...

8- Do you know that medical waste is more dangerous than domestic waste?

1- Yes 2- No

9- Do you know that available of safety tools can protect you from risk of solid waste?

1- Yes 2- No

>> Attitudes

10- Do you believe that collection and disposal of medical waste must be separated from municipal solid waste?

1- Yes 2- No

11- Do you think that you have need awareness and training coures on solid waste risks?

1- Yes 2- No

12- Do you believe that safety tools are available throughout the year?

1- Yes 2- No

13- Do you think that work conditions are safe and healthy for workers?

1- Yes 2- No

If the answer is No, what are the reason?.....

>> Practices

14- What are the available safety tools during your work? (you can choose more than answer)

1- Overall 2- Safety shoes 3- Gloves 4- Hat 5- Goggles

6- Masks 7- Others

15- Do you wear during work: **(If the answer is no, mention the reason)**

- Overall 1- Yes 2- No - Reason: ……....
- Safety shoes 1- Yes 2- No - Reason: ……
- Gloves 1- Yes 2- No - Reason: ……....
- Hat 1- Yes 2- No - Reason: ……
- Goggles 1- Yes 2- No - Reason: ……
- Masks 1- Yes 2- No - Reason: ……

16- Is there any follow up of safety uniform dressing by supervisors?

1- Yes 2- No

17- Do you need any additional unavailable safety tools?

1- Yes 2- No

If the answer is yes, mention it ……

18- Do you smoke during the work?

1- Yes 2- No

19- Do you eat during the work?

1- Yes 2- No

20- Do you drink during the work?

1- Yes 2- No

21- Do you chew gum during work?

1- Yes 2- No

22- Communication with your supervisor in emergency through:

1- Mobile 2- Telephone 3- No communication

23- How many carts of solid waste have you transported/day?.....

>> Injuries and Symptoms

24- Do you have work injuries during solid waste handling?

1- Yes 2- No

If the answer is Yes, the injuries were: (you can choose more than one answer)

1- Wounds 2- Fractures 3- Poisoning 4- Burning

5- Slipping 6- Traffic accident 7- Others……

Mention the reasons …….

25- Do you have any of the following Symptoms as a result of solid waste handling?

- Chronic cough 1- Yes 2- No - Dyspepsia 1- Yes 2- No
- Dyspnea 1- Yes 2- No - Renal colic/dysurea 1- Yes 2- No
- Bleeding per rectus 1- Yes 2- No - Anxiety 1- Yes 2- No
- Headache 1- Yes 2- No - Hernia 1- Yes 2- No
- Diabetes mellitus 1- Yes 2- No - Dermatitis 1- Yes 2- No
- Hepatitis 1- Yes 2- No - Back pain 1- Yes 2- No
- Rheumatoid arthritis 1- Yes 2- No - Re current tonsillitis 1- Yes 2-No
- Conjunctivitis 1- Yes 2- No - Other …..

>> Work conditions

26- The distance between collecting point and solid waste container

1- Far 2- Near

27- Height of solid waste container

1- High 2- Suitable

28- If the solid waste bin is heavy:

1- empty by myself 2- Ask assistant 3- Divided into two stages

29- The cart which used in Solid waste collection and transportation

1- Comfortable 2- Uncomfortable

30- Do you dispose medical waste with municipal solid waste?

1- Yes 2- No

31- Do you take vaccination?

1- Yes 2- No

32- Are their any incentives or rewards for workers commitment to safety measures?

1- Yes 2- No

33- Are their first aid in solid waste vehicle or in work sites?

1- Yes 2- No

>> Training and awareness

34- Did you receive advices on safety of solid waste handling from your supervisors?

1- Yes 2- No

35- Did you attend training courses on solid waste hazards and handling?

1- Yes 2- No

If the answer is yes, who was implemented those courses?

>> General questions

36- What is the sight of people to municipal solid waste worker?

1- Positive sight 2- Negative sight

If the answer is negative sight, explain?

37- Do you have others suggestions or opinions related to your work?

Annex 5

استبيان حول الصحة و السلامة المهنية لعمال النفايات الصلبة المنزلية في UNRWA

الرقم المسلسل / _____.

رقم الكود / _____.

أخي الموظف :

- إن هذه الدراسة هي جزء من رسالة الماجستير التي أقوم بإعدادها في كلية الصحة العامة بجامعة القدس، وإنني أكون شاكرا لسيادتكم على مشاركتكم في إتمام هذه الدراسة.
- إن هذه الدراسة تهدف إلى تقييم ومعرفة الأمراض و الإصابات التي تتعرضون لها أثناء العمل و كذلك إجراءات الوقاية و السلامة المتبعة لديكم .
- نتعرف من هذا الاستبيان على أدائكم الشخصي أثناء العمل و مقترحاتكم.
- إن النتائج المرجوة من هذه الدراسة ستعود بالفائدة عليكم وذلك بالحفاظ على صحتكم و توفير بيئة عمل آمنة لكم.
- لذا نرجو بأن نأخذ عشر دقائق من وقتكم الثمين لتعبئة هذا الاستبيان.
- يرجى العلم بأنه لا يشترط كتابة الاسم على الاستبيان ويرجى الإجابة على جميع الأسئلة بقدر استطاعتكم.
- الإجابة على الأسئلة سرية حيث إنها من اجل البحث العلمي فقط.
- البحث ممول من قبل الباحث فقط.
- سيتم تزويد مكاتب صحة البيئة بمخيمات اللاجئين ومتخذي القرار في مكتب ال UNRWA الرئيسي بنتائج البحث حال الانتهاء منها و ذلك بهدف تحسين الصحة و السلامة المهنية لكم.

نشكر لكم تعاونكم معنا,,

مع فائق الاحترام والتقدير,,

الباحث

جهاد إبراهيم أبو لبدة

الرقم المسلسل :

رقم الكود :

استبيان

ضع دائرة حول الإجابة التي تراها مناسبة:

1- معلومات شخصية:

الجنس : 1- ذكر 2- أنثى

العمر :-------

المستوى التعليمي : 1- جامعي **2-** ثانوي **3-** إعدادي **4-** ابتدائي **5-** غير متعلم

الحالة الاجتماعية :

1- متزوج 2- أعزب 3- أرمل 4- مطلق

2- المهنة

1 - عامل نظافة 2- عامل سيارة 3- عامل رش مبيدات 4- أخرى (حدد) ----

3- منطقة العمل:

1- مخيم جباليا 2- مخيم الشاطئ 3- مخيم البريج 4- مخيم النصيرات

5- مخيم المغازي 6- مخيم دير البلح 7- مخيم خانيوبس 8- مخيم رفح

4-عدد سنوات الخدمة في هذا العمل : ----

>> **<u>قسم المعرفة</u>**

5- هل النفايات الصلبة ضارة بالبيئة ؟

1- نعم 2- لا

6- هل يوجد خطورة عليك عند التعامل مع النفايات الصلبة المنزلية ؟

1- نعم 2- لا

إذا كانت الإجابة نعم , فما هي محتويات النفايات الصلبة التي تشكل خطورة ؟ (يمكن اختيار أكثر من إجابة)

1- قطع الزجاج 2- القطع المعدنية الحادة 3- عصارة النفايات 4- إبر, سرنجات

5- أوراق كرتون, علب فارغة 6- نفايات مطبخ 7- علب مواد كيماوية 8- أخرى

7- النفايات الصلبة المنزلية تسبب ضررا لكل من : (يمكن اختيار أكثر من إجابة)

1- عمال النظافة 2- السكان بالقرب من الحاويات 3- الناس بصورة عامة 4- أخرى (حدد)

8- هل تعتقد أن النفايات الطبية أشد خطورة من النفايات الصلبة المنزلية ؟

1- نعم 2- لا

9- هل تعرف أن أدوات الوقاية و السلامة المتوفرة لك تحميك من أضرار النفايات الصلبة ؟

1- نعم 2- لا

<< <u>قسم الاتجاهات</u>

10- هل تعتقد أنه يجب جمع و التخلص من النفايات الطبية (نفايات العيادات) بشكل منفصل عن النفايات الصلبة المنزلية؟

1- نعم 2- لا

11- هل تعتقد أنك بحاجة إلى تدريب وتوعية حول خطورة النفايات الصلبة والتعامل معها ؟

1- نعم 2- لا

12- هل تعتقد أن عدد مرات توزيع أدوات الوقاية و السلامة كافية أثناء العام؟

1- نعم 2- لا

13- هل تعتقد أن ظروف العمل آمنة و صحية للعمال؟

1- نعم 2- لا

إذا كانت الإجابة لا , أذكر السبب؟----------

<< <u>قسم الممارسات</u>

14- ما هي أدوات السلامة والوقاية المتوفرة لك أثناء العمل ؟ (يمكن اختيار أكثر من إجابة)

1- أبرهول 2- حذاء الأمان 3- كفات 4- طاقية 5- نظارات واقية 6- كمامات 7- أشياء أخرى

15- هل ترتدي أثناء عملك: (إذا كانت الإجابة لا , أذكر السبب؟)

- الأبرهول 1- نعم 2- لا السبب:

- حذاء الأمان 1- نعم 2- لا السبب:

- الكفات 1- نعم 2- لا السبب:

- الطاقية 1- نعم 2- لا السبب:

- النظارات الواقية 1- نعم 2- لا السبب:

- الكمامات 1- نعم 2- لا السبب:

16- هل يتم التركيز على ارتداء الزي الخاص بالعمل من قبل المسئولين ؟

1- نعم 2- لا

17- هل تعتقد أنك بحاجة لأدوات أخرى غير متوفرة من أدوات السلامة و الوقاية؟

1- نعم 2- لا

إذا كانت الإجابة نعم , أذكرها ؟

18- هل تمارس التدخين أثناء عملك؟

1- نعم 2- لا

19- هل تتناول الطعام أثناء عملك؟

1- نعم 2- لا

20- هل تتناول المشروبات أثناء عملك؟

1- نعم 2- لا

21- هل تتناول العلكة أثناء عملك؟

1- نعم 2- لا

22- يتم الاتصال مع مسئولك في حالة حدوث طارئ عن طريق:

1- الجوال 2- التليفون 3- لا يوجد اتصال

23– كم عدد نقلات النفايات التي تنقلها أثناء عملك يوميا؟----------

>> **<u>قسم الإصابات و الأعراض</u>**

24- هل تعرضت لإصابات أثناء العمل نتيجة للتعامل مع النفايات الصلبة ؟

1- نعم 2- لا

إذا كانت الإجابة نعم, هل كانت الإصابات ؟ (يمكن اختيار أكثر من إجابة)

1- جروح 2- كسور 3- تسمم 4- حروق

5- تزحلق 6- حوادث سيارات 4- غير ذلك (حدد) -----

أذكر السبب ؟----------

25- هل تعاني من أحد الأعراض التالية نتيجة التعامل مع النفايات الصلبة؟

- سعال مزمن	1- نعم	2- لا	**- التهاب اللوزتين المتكرر**	1- نعم	2- لا
- ضيق تنفس	1- نعم	2- لا	**- سوء هضم متكرر**	1- نعم	2- لا
- نزيف شرجي	1- نعم	2- لا	**- صعوبة التبول أو مغص كلوي**	1- نعم	2- لا
- نوبات صداع أو دوار متكرر	1- نعم	2- لا	**- أمراض عقلية أو عصبية**	1- نعم	2- لا

- سكري	1- نعم	2- لا	**- فتق**	1- نعم	2- لا
- التهاب الكبد الوبائي	1- نعم	2- لا	**- حساسية في الجلد**	1- نعم	2- لا
- روماتزم و التهاب المفاصل	1- نعم	2- لا	**- آلام في الظهر**	1- نعم	2- لا
- التهاب و حساسية في العين	1- نعم	2- لا	**- أعراض أخرى (حدد)----**		

>> <u>قسم ظروف العمل</u>

26- المسافة بين مكان عملك و حاويات النفايات :

1- بعيدة 2- قريبة

27- ارتفاع حاوية النفايات الصلبة:

1- مرتفع 2- مناسب

28- إذا كانت وعاء النفايات الذي أنقله ثقيل :

1- أفرغه بنفسي في الحاوية 2- أطلب المساعدة من عامل آخر 3- أقسمه وأفرغه على مرحلتين

29- العربة التي تستخدمها في جمع ونقل النفايات :

1- مريحة 2- غير مريحة

30- هل تتخلص من النفايات الطبية (نفايات العيادات الصحية) مع النفايات المنزلية ؟

1- نعم 2- لا

31- هل أخذت تطعيمات ؟

1- نعم 2- لا

32- هل يوجد حوافز و مكافآت للعمال الملتزمين بإجراءات الحماية و الأمان أثناء العمل ؟

1- نعم 2- لا

33- هل يوجد مواد للإسعافات الأولية في سيارات النفاية و أماكن العمل؟

1- نعم 2- لا 3- لا أعرف

>> <u>قسم الإرشادات و الدورات</u>

34- هل تلقيت أي نصائح و إرشادات من مسئوليك بخصوص الجمع والنقل الآمن للنفايات الصلبة ؟

1- نعم 2- لا

35- هل سبق أن شاركت في دورات تدريبية عن أخطار النفايات الصلبة و كيفية التعامل معها ؟

1- نعم 2- لا

إذا كانت الإجابة نعم , فمن الجهة التي نفذت هذه الدورات؟

>> <u>قسم الأسئلة العامة</u>

36- ما هي نظرة الناس إلى عامل النظافة ؟

1- نظرة إيجابية 2- نظرة سلبية

إذا كانت الإجابة نظرة سلبية (وضح) : ----------

37- هل لديك أي اقتراحات أو آراء أخرى بخصوص عملك؟

Annex 6

ملخص الدراسة

تقييم الصحة و السلامة المهنية لعمال النفايات الصلبة البلدية لدى مكاتب صحة البيئة في UNRWA في محافظات غزة

التعامل مع النفايات الصلبة هي واحدة من أهم المشاكل الصحية نظرا لأنها تشكل خطرا ليس العمال فحسب وإنما على الصحة العامة و كذلك على البيئة بشكل عام. و من الواضح أنه لا يوجد أبحاث منشورة أو دراسات سابقة تتعلق بالصحة و السلامة المهنية لعمال النفايات الصلبة في محافظات غزة. لذلك فإن هذه الدراسة تهدف لتقييم المشاكل الصحية و إجراءات السلامة المهنية لعمال النفايات الصلبة العاملين لدى مكاتب الأنروا المنتشرة في مخيمات اللاجئين في محافظات غزة.

طريقة البحث

لقد تم توزيع 158 استبيان على عمال النفايات الصلبة العاملين بالأنروا, وقد تناولت الأسئلة معرفة العمال بأخطار ومكونات النفايات الصلبة و كذلك الممارسات وإجراءات السلامة المهنية أثناء العمل, و قد شملت أيضا أهم الأمراض و الإصابات التي يتعرضون خلال عملهم.

النتائج

لقد تبين أن متوسط أعمار العمال كان 45 ±8.1عاما, و قد كان معظم العمال متعلمين, و متوسط فترة العمل كانت 14±7.8. و قد ظهر من النتائج أن91.1% من العمال لديهم مستوى مرتفع من المعرفة حول أخطار النفايات الصلبة على البيئة, و 88.6% منهم قالوا بان النفايات تشكل خطرا على العمال, 62.0% اعتبروا بأن النفايات تسبب ضررا للناس بصورة عامة. و قد أوضح 94.3% من العمال أن النفايات الطبية أكثر خطورة من النفايات المنزلية.

لقد ظهر أن 65.8% من العمال رأوا أن أدوات السلامة و الوقاية المتوفرة لا تحميهم من أخطار النفايات, و أن 10.1% من العمال فقط يعتقدون أن أدوات السلامة و الوقاية المتوفرة لهم كافية أثناء العام, و قد تبين أن الالتزام باستعمال أدوات السلامة و الوقاية كان منخفضا. و لقد كان 42.4% من العمال يمارسوا التدخين, و 75.9% يتناولوا المشروبات, و 56.3% يتناولوا الطعام أثناء العمل.

وقد وجد أن 51.3% من العمال يشكون من آلام الظهر, و 27.8% يشكون من الصداع, 27.8% يعانون من التهاب و حساسية العينين, و24.0% يعانون من حساسية في الجلد, و 23.4% يشكون من سوء هضم متكرر, و 20.9% يشكون من ضيق تنفس. و قد أصيب 69.9% من العمال بالجروح, و 50.5% أصيبوا بوخز الإبر الطبية, و تعرض 34.4% منهم لأخطار التزحلق.

لقد اتضح أن 66.5% من العمال لم يتلقوا أي دورات تدريبية تتعلق بالأخطار الصحية للنفايات الصلبة و كذلك كيفية التعامل معها. و قد وجد أن هناك علاقة إحصائية بين الإصابات لدى العمال و الدورات التدريبية التي يتلقونها, و كذلك

وجدت علاقة إحصائية بين الأمراض و الدورات التدريبية, حيث تبين أن نسبة الإصابات و الأمراض كانت أقل بين العمال الذين تلقوا دورات تدريبية تتعلق بأخطار النفايات. و قد وجد أن فترة العمل تتناسب طرديا مع الأمراض, و تتناسب عكسيا مع الإصابات لدى العمال.

و قد بينت الدراسة أن عدم استخدام أدوات السلامة و الوقاية يؤدي إلى زيادة ظهور الأمراض لدى العمال, حيث كانت هناك علاقة إحصائية بين عدم استخدام الكفات و النظارات الواقية و كذلك الكمامات بالنسبة إلى ظهور الأمراض.

التوصيات

لوحظ من الدراسة أن هناك نقص في أدوات السلامة و الوقاية و كذلك قلة استخدام المتوفر منها, و أن هناك ممارسة للعادات الشخصية من تناول للطعام و الشراب و التدخين أثناء العمل, و أن نسبة قليلة فقط من العمال قد تم تدريبهم أو إعطاءهم تطعيمات صحية للوقاية من الأمراض التي قد يتعرضون لها أثناء العمل. و قد تم تسجيل العديد من الأمراض و الإصابات لدى العمال. لذلك فإن الدراسة توصي بإعطاء العمال تدريبات خاصة و دورات توعية حول الأخطار الصحية للنفايات الصلبة و إجراءات الوقاية و السلامة الواجب إتباعها, و كذلك توصي الدراسة بإجراء الفحوصات و المراقبة الصحية المستمرة للعمال.