

**Health and Safety Challenges facing Household Refuse Workers
in Jordan**

By

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DECLARATION

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Date: 17 September 2012

Dedication

To my parents, family, and friends and to all who supported me in this study.

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I would like to express my gratitude and appreciation, to all who have contributed to the success of this study. My most profound gratitude goes to Prof. M.S.J. Hashmi , for his encouragement, support and advice throughout this work. My thanks go to all Refuse worker and the facilities that deal with Refuse in Jareh and Souf Regions for their participation. I am also very grateful to the Environment and Health Departments in the cities, camps, and villages in Jareh and Souf Regions for their cooperation.

I sincerely hope that this study will be beneficial to the policy makers, strategic planners, and health providers in the sanitary field in all municipalities, camps and villages in Jordan.

List of Contents

	Page NO.
Consents	1
Chapter One	1
1.1 General introduction	2
Objectives of the study	2
1.2 Jaresh Region	5
1.2.1 Geographic location and topography	5
1.2.2 Climate	5
1.2.3 Demography and population	6
1.3 Souf Region	6
1.3.1 Geographical location and topography	6
1.3.2 Climate	7
1.3.3 Demography and population	8
1.4 Economy	8
Chapter Two	10
Introduction	11
2.1 Solid Refuse	13
2.1.1 Introduction	13
2.1.2 Solid Refuse generations	13
2.1.3 Solid Refuse management	14
2.1.4 Types of solid refuse	14
2.2 Household Refuse in Souf Region	15
2.3 Household Refuses in Jaresh Region	15
2.4 Industrial Refuse	16
2.4.1 Industrial Refuse in Souf Region	16
2.4.2 Industrial Refuses in Jaresh Region	16
2.5 Biomedical Refuse	17
2.5.1 Medical Refuse in Souf Region	17
2.5.2 Medical Refuses in Jaresh Region	17
2.6 Occupational health and safety	18
2.6.1 Occupational injuries	18
2.6.2 Occupational diseases	19
2.7.2 Studies in developed countries	20
2.7.3 A study in developing countries	24
A Study conducted in Italy	29
A Study conducted in Netherlands	29
2.7.3 A study in developing countries	31

A study conducted In India	31
A Study conducted in Taiwan	32
Chapter Three ,Methodology	33
3.1 Research design	34
3.2 Population and sampling	34
3.3 Setting	34
3.4 Ethical consideration	34
3.5 Instrument	35
3.6 Data collection	36
2.7 Data analysis	37
Chapter Four ,Results and Discussions	38
Introduction	39
4.1 Results	39
4.2 Presentation of results	39
4.2.1 Subject characteristics	40
4.2.1.1 Demographic characteristics of respondents	40
4.2.1.3 Working conditions of respondents	46
4.2.1.4 Type of work of respondents	48
4.2.1.5 Type of Refuse and collection method	51
4.2.1.6 Use of protective measures	52
4.2.1.7 Personal hygiene	54
4.2.1.8 Work related diseases	55
4.2.1.9 Work related accidents	57
4.2.1.10 Cause of injury	58
4.2.1.11 Health care	60
4.2.1.12 working conditions	63
4.2.1.13 Job satisfaction	64
4.2.1.14 Worker's needs to improve health	64
4.2.1.15 Worker's needs	66
4.3.1 Observations of results	67
4.3.2 Age categories	68
4.3.3 Age and cause of injury	69
4.4 Monthly income	70
4.5 Education levels	70
4.5.1 Education levels and cause of injury	71
4.5.2 Education levels and work related accidents	71
4.5.3 Education levels and health care	71
	73

Chapter Five, Conclusions and Recommendations

5.1 Conclusion	74
5.2 Recommendations	75
5.2.1 Safety at work	75
5.2.2. Education and communications	76
5.2.3. Equipment maintenance	76
5.2.4. Recommendations to do a perfect job	77
5.3Next Step	77
5.4 Long-Term Overview	78
References	80
Appendix	86

List of Tables

Table1.4.2 Distribution of the study sample	40
Table2.4.2 sample distribution with respect to locality	40
Table3.4.2 Sample distribution of Household Refuse workers in relation to age categories.	42
Table4.4.2 Sample distribution of Household Refuse workers in relation to place of permanent residence.	42
Table5.4.2 Sample distribution of Household Refuse in relation education level.	43
Table6.4.2 Sample distribution of Household Refuse workers in relation to monthly income.	44
Table7.4.2 Sample distribution of Household Refuse workers in relation to source of water	45
Table8.4.2 Sample distribution of Household Refuse workers in relation to place of work	46
Table9.4.2 Sample distribution of Household Refuse workers in relation to work shift	47
Table10.4.2 Sample distribution of Household Refuse workers according to type of contract	78
Table11.4.2 Sample distribution of Household Refuse workers in relation to type of work.	49
Table12.4.2 Sample distribution of Household Refuse workers in relation to type of health insurance.	50
Table13.4.2 Sample distribution of Household Refuse workers in relation to type of Refuses and collection method.	51
Table14.4.2 Sample distribution of Household Refuse workers in relation to personal protective measures	53

VIII

Table15.4.2 Sample distribution of Household Refuse workers in relation to personal hygiene	54
Table16.4.2 Sample distribution of Household Refuse workers in relation to incident of diseases and injuries in the last 12 month.	56
Table17.4.2 Sample distribution of Household Refuse workers in relation to type of incident	57
Table18.4.2 Sample distribution of Household Refuse workers in relation to the cause of the injured part of the body in the last twelve months.	59
Table19.4.2 Sample distribution in relation to professional and managerial response to accident, in the last twelve months.	60
Table20.4.2 Sample distribution of Household Refuse workers in relation to work structure.	63
Table21.4.2 Sample distribution of Household Refuse workers concerning the level of satisfaction during work.	64
Table22.4.2 Sample distribution of Household Refuse workers regarding their requirement to improve their safety at work.	65
Table23.4.2 Sample distribution of Household Refuse workers regarding their needs to do a perfect job.	66

List of Figures

Fig 1.2. A picture that shows a potential occupational injury	19
Fig.2.2 Unprotected dumping site	20
Fig. 3.2 Refuse separation and recycling	21
Fig.4.2 Hazards at the dumping site	26
Fig.5.2 Proper equipment and protective clothes	27
Fig.6.4.2 sample distribution with respect to locality	41
Fig.7.4.2 Sample distribution of Household Refuse workers in relation to age categories.	42
Fig.8.4.2 Sample distribution of Household Refuse workers in relation to place of permanent residence.	43
Fig.9.4.2 Sample distribution of Household Refuse in relation education level.	44
Fig.10.4.2 Sample distribution of Household Refuse workers in relation to monthly income.	45
Fig.11.4.2 Sample distribution of Household Refuse workers in relation to source of water	46
Fig.12.4.2 Sample distribution of Household Refuse workers in relation to place of work	47

Fig.13.4.2 Sample distribution of Household Refuse workers in relation to work shift	48
Fig.14.4.2 Sample distribution of Household Refuse workers in relation to type of work.	49
Fig.15.4.2 Sample distribution of Household Refuse workers in relation to type of health insurance.	50
Fig.16.4.2 Sample distribution of Household Refuse workers in relation to type of Refuses and collection method.	52
Fig.17.4.2 Sample distribution of Household Refuse workers in relation to personal protective measures	53
Fig.18.4.2 Sample distribution of Household Refuse workers in relation to personal hygiene	55
Fig.19.4.2 Sample distribution of Household Refuse workers in relation to incident of diseases and injuries in the last 12 month.	57
Fig. 20.4.2 Sample distribution of Household Refuse workers in relation to type of incident	58
Fig.21.4.2 Sample distribution of Household Refuse workers in relation to the cause of the injured part of the body in the last twelve months.	60
Fig.22.4.2 Sample distribution in relation to professional and managerial response to accident, in the last twelve months.	62
Fig.23.4.2 Sample distribution of Household Refuse workers in relation to work structure.	63
Fig.24.4.2 Sample distribution of Household Refuse workers regarding their requirement to improve their safety at work.	65
Fig.25.4.2 Sample distribution of Household Refuse workers regarding their needs to do a perfect job.	67

List of Abbreviations

CO: Carbon Mono Oxide.

Dioxin: Polychlorinated Dibenzo-p-Dioxin.

Furan: Polychlorinated Dibenzo Furans.

GDP: Gross Domestic Product.

GNI :Gross National Income.

GNP: Gross National Product.

ILO :International Labor Organization.

ISWM: Integrated Solid Refuse Management.

NAL: Nasal Lavage

NO_x: Nitrogen Oxides.

OHS: Occupational Health and Safety.

PCB's Poly Chlorinated Biphenyl's.

RC's: Refugee Camps.

SO_x: Sulfur Oxides.

UFC/m³: Refers to the total number of airborne micro-organism counted in a cubic meter of air.

UFU/m³: Refers to the bio-aerosol count in one cubic meter of air.

UNRWA: United Nation Relief Work Agency.

USEIA: United State of Environmental Impact Assessment.

USPHS: United States of Public Health Services..

VOC: Volatile Organic Compound.

WHO: World Health Organization.

Health and Safety Challenges facing Household Refuse in Jordan

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Abstract

The present study is aimed to examine all types of Refuse collected (Households, commercial, industrial, and biomedical) and their potential health hazards for Household Refuse workers in Jordan. It also aimed to examine the ways of collecting Refuse and the safety measures which was taken while collecting Refuse.

A self-designed questionnaire was used to study, and examine the occupational health and safety hazards. The target population was (370) of Household Refuse workers, Refuse drivers, and their direct supervisors. A convenient sample of 207 was taken (no probability sampling).

The study showed that household and commercial Refuses are the most Refuses collected by the Refuse worker at 98.1% is household refuse and 97.1% is commercial refuse, per in mind that same workers deal with deferent type of refuse. It also showed that most Refuse workers do not wear face mask (98.6%), overall (85.5%), rubber boot (78.9%), and protective gloves (45%).

The study also showed that Refuse workers suffered from different types of diseases and symptoms, such as sore throat, cough, and high temperature (55.3%), diarrhea or bloody stool (27.9%), shortness of breath (25%), and skin disease (20.2%). Refuse workers were prone to different injuries, such as hit by any hard or sharp objects (61.1%), lift more than their capacity (37.4%), and fall

XII

while pulling or pushing the Refuse trolley (35.6%). The study also showed that Refuse workers whom were stuck with hard object

(21.6%), pricked by hypodermic needles (20.2%), twisted ankle while on duty (34.1%), and suffered from a muscle tear (22.1%). It showed that (93.8%) of Refuse workers were not vaccinated for tetanus and (85.6%) were not vaccinated for hepatitis.

In conclusion, Refuse workers face a tremendous health challenges. Refuse workers with middle age and with low level of education were at higher risk. Refuse workers should be provided with the necessary protective measures (face mask, protective gloves, overall, and rubber boot). Education and training programs should be provided to all, and routine medical checkup program should be implemented and maintained, to keep them safe and secure.

Chapter One

Introduction

1.1 General introduction

Municipal Refuse is produced as a result of economical productivity and consumption. It includes non-hazardous Refuses from households, commercial establishments, institutions, markets, and industries. Since 1970's, when it became apparent that even controlled landfills were causing significant water pollution, sanitary landfill technology was developed to provide barriers to pollutant migration, as well as to provide leachate and gas management system, Cointreau-Levine S [1].

Objectives of the study

The present study aims to examine:

- Types of occupational injuries associated with the process of Refuse collecting.
- Types of occupational diseases and symptoms associated with the process of Refuse collecting.
- Types of solid Refuses collected and their potential hazard to domestic Refuse workers (households, commercial, industrial, and biomedical).
- Ways of collecting refuses.
- Safety measures taken in collecting refuse.
- To propose solutions to prevent accidents and injuries.

Problem and challenges and difficult situation faced by Refuses collectors

- Refuse workers collect Refuses in all climate conditions; they use dangerous vehicles, contact with sharp objects, pull and push heavy containers, and lift heavier loads, often to higher loading locations
- Based on Health Studies the most commonly experienced diseases among Refuse pickers are, tuberculosis, bronchitis, asthma, pneumonia, dysentery, parasites, and malnutrition.

- Occupational accidents are very frequent among Refuse workers. Based on current knowledge, it appears that risk factor should be considered as an integrated entity, i.e. technical factor (poor accessibility to refuse, design of equipment), may act in concert with high working rate, and perhaps muscle fatigue due to high work load. Musculoskeletal problems are also common among Refuse workers, Poulsen [52]. In Bangalore, Refuse pickers complained of musculoskeletal pain if they were engaged in sorting Refuses in a sitting position and of backaches if they were carrying heavy loads of Refuse Van Eerd [53].
- Increasing public awareness and experience of hazard and unregulated disposal of Refuse have promoted the developed and developing countries to pay attention to the problem of Refuse and adopt strategies for integrated solid Refuse management

Current Refuses collection system.

For the past two decades, occupational health and safety protection has become increasingly regulated to minimize work related risks and labor unions have also successfully changed working condition.

- In many countries, the health-related understandings of solid Refuse management still need to be addressed; even the minimal regulatory framework, which exists for environmental protection and occupational health, and safety, is not enforced.
- Refuse workers in Jordan use old equipment and virtually no dust control or worker protection.
- Collection workers have direct contact with solid Refuse and thus are exposed to more potential particulates, toxic materials and infectious microorganisms.

Occupational and health aspects and safety Issues of the current practice in refuse collection

They are exposed to a wide variety of risks.

- Refuse workers have high occupational health risks, including risk from contact with human fecal matter, papers 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, exhaust fumes of Refuse collection trucks traveling to and from disposal sites, dust from disposal operations, and open burning of Refuse, all do contribute to occupational health problems.
- With the existing management system of solid Refuse, Jordan faces an increasing solid Refuse management problem. Management of solid Refuse at all stages of collection, transportation, and disposal has faced a tremendous challenge due to the shortages of funds.
- The lack of proper system and plans had disabled and prevented solid Refuse from being delivered to the disposal sites, thus, Refuse workers are more potential to inhale the accumulated Refuse fumes, or developed infectious diseases due to direct contact with depredated Refuses.
- Refuse Workers have also more potential to have vehicle accidents during transportation due to the long travel.
- The quantities of solid Refuse generated in urban areas are higher than those generated in rural areas. The per capita solid Refuse generation rates in the Northern Province were estimated from several studies. These studies showed figures in a range of 0.5 to 1.0kg Refuse per capita per day. It is estimated that approximately 500 thousand tons of Household Refuse is generated yearly in the Northern Province, i.e. about 1,370 tons per day, Ghanayem, [2]. These hard working people are working in a hard, dangerous, and poor working conditions, insecure and ignored, and lack of work protection gear. Studying these hard working people is of great value to all.

1.2 Jaresh Region

1.2.1 Geographic location and topography

Jaresh Region is located eight kilometers south of Irbed city, in the southern part of the Northern Province. It is bounded by the Souf Regions to the south and south west, Palestine to the west. The Jaresh Region, with a total area of 575 km², includes within its boundaries the three major municipalities of Jaresh, Kiteh, and Remoon. It also includes 7 smaller municipalities, 29 villages, and two refugee camps, Imseih, [3].

Besides being narrow and small in size, Jaresh Region is characterized by great variation in topography and altitude. The highest elevation of approximately 900 m above sea level is found in the Kiteh area in the west. The eastern parts of the Region are characterized by sharp slopes called the Eastern Slopes, where elevation drops from 900m in Kiteh and 650m in Remoon to 400m below sea level in. The short horizontal distance between highest and lowest elevation is only 25 km.

1.2.2 Climate

Jaresh Region features a climate that ranges from arid to semiarid, with an increase in aridity towards the southern and southeasterndirection in across the Eastern Slopes in the Irbed Desert. This climatevariation is primarily due to the drastic drop in the elevation from thewestern to the eastern part of the Region. While the western parts receivean average of 700 mm of rainfall annually, the eastern proximity receives less than 100 mm, ARIJ, [4].

The rainy season in Jaresh Region starts in the second half of autumn (mid October), and continues until the end of April. Heavy rain, however, is limited to

a less than 50 days, where around 70% of the rain falls during November to February (ARIJ, 1995). The average annual temperature in Jaresh Region is 17°C with an upper limit of 22°C in summer, lower limit of 7°C in winter, and reaches the average temperature of 21-23°C in the lower elevations close to the Dead Sea. The Region's highland is influenced by the Mediterranean Sea breeze around midday. Westerly humid winds blow on the area during autumn and spring, with the mean annual wind speed of 3 meters per second, according to ARIJ's weather station, ARIJ [5].

The average annual relative humidity in the Region is 60% and reaches its highest rate during the months of January and February. In May, humidity levels are at their lowest. Night dew may occur in up to 180 days per year, Benvenisti [6]. Jaresh Region receives an average of seven hours of sunshine a day during winter and thirteen hours during summer. The average solar radiation ranges from 188k/Calories/cm/year Jordan Atlas [7].

1.2.3 Demography and population

The total population of the Jaresh Region is estimated at 132,090, JCBS [8], and 137,286 at the end of 1997 representing 4.7% of the total population of Jordan, Sbeih, [9]. The total population by type of locality is estimated at 45,471 people living in urban areas, 76,056 people living in rural areas, and at 10,563 people living in refugee camps. The projected Mid-Year Population for Jaresh Governorate is estimated at 177,170 people in Mid-Year 2004 and at 226,321 people in Mid-Year 2010 (JCBS, [10]).

1.3 Souf Region

1.3.1 Geographical location and topography

Souf Region is located 36 km south of Irbid City, in the southern part of the

Northern Province. It is bounded by Jaresh Region from the north and by the 1984 ceasefire line from the other directions. Souf Region has a total area of 105,000 hectares with six major land use classes distinguished. These are; Jordanian built-up areas, military areas and bases, nature reserves, forests, and cultivated areas. There are 94 Jordanian built-up areas in the Region, 8 major municipalities, 9 smaller municipalities, 75 villages and 2 camps, Imseih, *et al*, [11].

The Souf Region is characterized by great variation in topography and altitude. The highest elevation of approximately 1011 m above sea level is found in Sakeb area. The eastern part of the Region is characterized by sharp slopes, called the Eastern Slopes, where elevation drops from 1011 to 100 m above sea level. Most of the Jordanian built up areas in the Region is located at elevations between 600 m and 1000 m above mean sea level, ARIJ [12].

1.3.2 Climate

The climate of the Souf Region ranges from arid to semi-arid with an increase in aridity towards the desert in the south and Jordan valley in the west. Souf Region experiences western winds. During autumn and spring seasons, these western winds from the Mediterranean are humid. During the summer, the prevailing winds come from northwest, at an average speed of 10 km/hour during the day, decreasing to 5 km/hour during night and early morning hours. In winter, the winds are most frequently from the south-west, with a wind velocity reaching 35 km/hour. Storms have been observed in winter with wind speed up to 40 km/hour, Kessler, [13]. From late April to mid-June, the Souf Region is often hit by storms known as the Khamaseen, which originates from the Arabian Desert and brings very hot dry winds full of sand and dust to the Region ARIJ [14]. The Souf Region temperature ranges from 7.5-10°C in winter to 22°C in summer. The minimum temperature is -3°C in January and the maximum is 40°C in August. The ground temperature ranges from a minimum

of -5°C in January, to a maximum of 40°C in the summer season, Kessler [15]. The mean range of annual relative humidity is 60-75%.

The relative humidity reaches 40% in mid-day and increases gradually to reach 80-100% as an average at night, Kessler, [16]. The mean annual rainfall, for the period of 1970-1992 at the Souf meteorological station was 588mm/year. The amount of rainfall decreases from 638.4mm at Al- Nahle in the north to reach 383 mm at Alkitech in the south of the Region and 200 mm at the eastern boundaries. During the wet year 1979/80, rainfall reached up to 876 mm and in 1991/1992 reached 1027 mm Kessler [17].

1.3.3 Demography and population

The total population of the Souf Region is estimated at 390,272 people (JCBS, 1999), and 405,664 people at the end of 1997 representing 14% of the total population of Jordan (Awad, 2002). The total population by type of locality is estimated at 261,665 people living in the urban areas, 117,748 people living in the rural areas, and 10,859 people living in the refugee camps. The projected Mid-Year Population for Souf Governorate is estimated at 530,541 people in Mid- Year 2004 and at 691,426 in Mid- Year 2010, JCBS [18].

1.4 Economy

Unfortunately, there are no figures or studies concerning the per capita Gross National Product (GNP) or Gross Domestic Product (GDP) for Jaresh and the Souf Regions. Based on the World Bank official statistics, the overall economy in Jordan is characterized by a per capita GNP of US\$ 1,715 and a GDP of US\$ 1,275 for 1991, World Bank [19].

The findings of the National Accounts at constant prices of the Jordan for the years 2001, shows Substantial decline in the performance of the economy for the years 2001.

The GDP and the GNI estimates have substantially decreased during those years,

as well as their per capita indicators. The GDP per capita was 1,617.2 US\$ in 1999, which declines to 1,203.4 US\$ in 2002, and the GNI per capita was 1,934.9 US\$ in 1999, which was declined to 1,319.3 in 2002 on constant prices (1997 is the base year).

Different economic activities contribute to such decline, such as industrial, agricultural, financial, construction and transport, JCBS, [20].

Chapter Two

Literature Review

Introduction

The standards and norms for handling solid Refuses in industrialized countries have reduced occupational health and environmental impacts substantially.

Most Refuse collection in these countries involves vehicles with low-loading heights and easy to lift plastic containers or bags, Cointreau [47].

All Refuses are required to be fully contained, either in a covered metal or plastic bin, or within a plastic bag. Loading is commonly made as easy and mechanized as possible, thus minimizing occupational health and injury risk.

From 1984 to 1992, the relative risk for musculoskeletal problems among Danish Refuse workers **was (1.9) times more**. Several studies on Refuse collection movements have demonstrated that mechanical loads on the skeleton frequently exceeded maximum acceptance limits recommended; throwing Refuse bags results in high shear forces on the spine, and carrying loads results in excessive torque to the shoulder ,Poulsen [48]. German studies found that the effect of vibration on drivers of landfill equipment is significant. Spinal injuries experienced by landfill equipment operators develop from higher than average degeneration of the vertebrae and intense vibration of hands and arms from operating the equipment levels, Wilhelm [49].

In developing countries, the Refuse sorting activities are typically conducted in micro and small-scale enterprises, with old equipment and virtually no dust control or worker protection. The Refuse collected is seldom stored in a plastic or metal container and covered with a lid. Sometimes, the Refuse 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 by hand. In either case, the Refuse awaiting collection is readily available to insect and rodent vectors and scavenging animals. So, collection workers have significantly direct contact with solid Refuse, and are also exposed to more potential particulates, toxic materials, and

gases and infectious microorganisms.

In El Bolson, an Argentine resort town, an outbreak of hanta virus, a disease spread by contact with rodent droppings or inhaling dust contaminated with rodent urine, killed 120 people in 1996 and devastated the economy for the town's population of 18,000, Sims [50]. Airborne contamination is also one of the greatest threats to solid Refuse workers and Refuse pickers. Air monitoring needs to be regularly conducted at all land disposal and solid Refuse handling facilities. Direct reading instruments which measures methane and oxygen deficiencies are of primary importance, and include combustible gas indicators, flame ionization detectors, and oxygen meters, National Institute for Occupational Safety and Health [51].

Occupational accidents are very frequent among Refuse workers. Based on current knowledge, it appears that risk factor should be considered as an integrated entity, i.e. technical factor (poor accessibility to refuse, design of equipment), may act in concert with high working rate, and perhaps muscle fatigue due to high work load. Musculoskeletal problems are also common among Refuse workers, Poulsen [52]. In Bangalore, Refuse pickers complained of musculoskeletal pain if they were engaged in sorting Refuses in a sitting position and of backaches if they were carrying heavy loads of Refuse Van Eerd [53]. In developing countries, there have been very few data available concerning the health impacts of exposure to Household Refuses and occupational injuries among Household Refuse workers. In Jordan, no studies concerning Household Refuse workers were carried out, hoping this study will be the first step toward the development of health promotions of Household Refuse collection, and in assessing both risk and effects of exposure, permitting better management of domestic Refuse, and in the planning of adequate protective measures. Herein, some scientific studies, which was examined and reported regarding occupational health and safety hazards:

2.1 Solid Refuse

2.1.1 Introduction

All human activities, domestic, commercial, industrial, healthcare, and agriculture generates solid Refuse. The quantity and nature of Refuse vary with the level of technological development in a country, Garg, [21].

Solid Refuses are also defined as all Refuses arising from human and animalactivities that normally solid and are discarded as useless or unwanted (Tchobanoglou *et al* [22]).

Technically, solid Refuses also refer to liquids and gases in containers.

If solid Refuses are not managed properly, they can have an adverse impact on the environment, and public health arising from contamination of oilwater and pollution of air through spread of diseases via vectors living on Refuse, Garg, [23]. The relationship between public health and their improper storage, collection and disposal of solid Refuses is quite clear. The US Public Health Services (USPHS) has published the results of study tracing the relationship of 22 human diseases to improper solid Refuse management, Hack [24]. Increasing public awareness and experience of hazard and unregulated disposal of Refuse have promoted the developed and developing countries to pay attention to the problem of Refuse and adopt strategies for integrated solid refuse management, Hack, [25].

2.1.2 Solid Refuse generations

Municipal solid Refuse is produced as a result of economic productivity and consumption. Countries with higher income produce more refuse per capita and per employee, and their Refuses have higher portion of packing materials and recycling Refuses. In low-income countries, there is

less commercial and industrial activity, as well as less institutional activity, thus resulting in lower generation rates.

2.1.3 Solid Refuse management

Integrated solid Refuse management (ISWM) is a term applied to all activities associated with the management of society's Refuse. The basic goal of ISWM is to manage society's Refuse in a manner that meets public health and environmental concerns and the public's desire to reuse and recycle refuse materials, Palnitkar [26]. An organized program for solid Refuse management in urban areas is essential and an institutional planning is the key to achieving an acceptable and affordable system. The responsibility for Refuse collection in the Jareh and Souf Regions is divided between the municipalities, towns or village councils and UNRWA in the refugee camps. There are common methods for Refuse disposal in the Region. Municipal or village Refuse is disposed in Refuse dumps, or open dump sites, and a large amount of individual Refuse is disposed randomly in nearby open spaces or road sides. Over the past decades, the responsible parties have paid little attention to improve the financial and technical management of their solid Refuse operations and have made no attempt to encourage re-use and recycling of materials. Lack of public cooperation, miss management and awareness in Jordanian cities, towns, villages and the inability of solid Refuse workers to collect Refuse due to the bad road, and lack of public cooperation, are significant obstacles to effective solid Refuse management, and increased the potential to health hazards.

2.1.4 Types of solid refuse

The "Municipal Solid Refuse" includes commercial and residential Refuses generated in municipal or notified areas in either solid or semi-solid form excluding industrial hazardous Refuses but including treated biomedical Refuses, Ministry of Environmental and Forests, India [27].

Household Refuse: It Consists of household Refuse, kitchen, house cleaning, old papers, packing bottles, crockery wares, furniture materials, and garden trimmings, etc. Palnitkar [28]. Commercial Refuse: Refuse generated at business premises, shops, offices, markets, departmental stores, organic, inorganic, and chemically reactive and hazardous Refuse Palnitkar [29] .

Institutional Refuse: Schools, colleges, large hotels, vegetable market, fruits, meat, etc. community halls, religious places, etc. Palnitkar [30].

Street Refuse: It includes uncontrolled throwing, litter by pedestrian and vehicular traffic, stray animals, roadside tree leaves, rubbish from drain cleaning, debris, etc. Palnitkar, 31. Industrial/Trade Refuse: Manufacturing and material processing trade generated Refuse, Palnitkar [32]. Debris or

Construction Rejects: It consists of frequent digging of roads by various utilities comprising earth, brickbats, stones, wooden logs, etc. Palnitkar [33]. Refuse-offal, Dead animals, etc.: Offal Refuse generated from slaughterhouse, food packing institutions and cold storage premises, etc. Palnitkar, [34]. Biomedical Refuse: Refuse generated at hospitals, clinics, medical labs, pharmacies, and medical institutions.

2.2 Household Refuse in Souf Region

Collection of Household Refuse is either the responsibility of the municipality, town and village councils or UNRWA in the refugee camps. The quantity of the generated domestic solid Refuse in the Region of Souf is estimated to be 260 tons/day excluding the refugee camps. According to UNRWA officials, the two camps Gaza and Souf Camps generate close to 10.3 tons/day of Household Refuse, ARIJ [35].

2.3 Household Refuses in Jaresh Region

The quantity of domestic solid Refuse generated in the Jaresh Region is

estimated at 140 tons/day, excluding the two refugee camps, Collection of domestic solid Refuse in the Region has been the responsibility of the municipalities, town and village councils and UNRWA in the refugee camps. According to the UNRWA, the three RC's generate approximately 12 tons/day of domestic solid Refuse, ARIJ [36].

2.4 Industrial Refuse

Industrialization generates huge quantities of unwanted and undesirable toxic Refuses with extremely long-term impacts. Such Refuses are usually a by-product of industrial operations which involve heavy metals, products such as Poly Vinyl Chloride (PVC) and plastics, Refuse products from photocopies, chemicals such as Polychlorinated Biphenyls (PCB's), and by-products such as dioxin and furans which are now recognized as extremely toxic substance affecting all forms of life.

2.4.1 Industrial Refuse in Souf Region

The Souf Region is distinguished in its industrial activities. Quarrying, leather and metallic industries are the core of Souf's Industrial Base. Leather industries including leather tanning, shoe factories constitute approximately 40% of stone cutting factories and quarries constitute approximately 15%, and the metallic industries form about 14% of the total industries in the Region, ARIJ [37].

2.4.2 Industrial Refuses in Jareh Region

A survey conducted by ARIJ, in 1995, estimated that the food, beverage and cigarette industries contribute to approximately 70% of the total of these kinds of industrial Refuses in the Region, generating 3,200 tons of industrial Refuse/year. Construction industry generates 1,150 tons of industrial Refuse/year, while textile industry generates 200 tons of industrial Refuse/year, and the metal industry generates around 60 tons industrial Refuse/year.

2.5 Biomedical Refuse

Biomedical Refuse means any Refuse, which is generated during the diagnosis, treatment or immunization of human being or animal or in research activities pertaining there to or in the production of testing of biological and including human anatomical Refuse, Refuse sharps, discarded medicines and cytotoxic drugs, solid Refuses, liquid Refuse, incineration ash, chemical Refuse, etc. Palnitkkar [39]. Medical Refuses contain pathological Refuse, infectious Refuse, sharp objects, pharmaceutical Refuse, chemical Refuse, aerosols and pressurized containers.

2.5.1 Medical Refuse in Souf Region

The medical Refuse generated in the Souf Region, is a threat to the population of the area, as little of the generated medical Refuse is properly treated before disposal and most ends up with the municipal garbage, none of the medical centers have any special dumps or incinerators for the medical Refuse. Most of the Refuse is disposed and mixed with municipal Refuse. More than 87% of all medical centers surveyed dump sharp objects without any special treatment, ARIJ [40]. This increases the risk of infection, needles prick and injuries to people who are dealing with such objects during collection of the garbage.

2.5.2 Medical Refuses in Jaresh Region

In the Region, there are seven hospitals, one of which has been closed, and 32 community health centers and clinics, ARIJ [41]. Medical institutions generated the following kinds of Refuse: syringes, needles, lancets, sticks, towels, tips, plates, tubes, media used for bacteria cultures urine and stool cups, swaps, curvets, slides and Refuse generated from medical operations. This medical Refuse is either disposed of in municipal Refuse collection containers, on-site

burning facilities, or in the Refuse water collection networks. Only two of the surveyed medical institutions use onsite burning facilities to dispose of their Refuses, ARIJ [42].

2.6 Occupational health and safety

2.6.1 Occupational injuries

It is defined as sudden, anticipated, and unwanted events during work, leading to harm or damage to at least one part of the body, Poulson, et al [43]. Refuse workers collect refuses in all climate conditions; they use dangerous vehicles, contact with sharp objects, pull and push heavy containers, and lift heavier loads, often to higher loading locations. To ensure health and safety for such workers, different definitions and laws were implemented, and local and global strategies were put to decision makers for further investigations and suggestions. In Jordan, the Jordanian 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[44] Jordanian labor law. No.7, 2000.



Fig 1.2. *A picture that shows a potential occupational injury*

2.6.2 Occupational diseases

Despite the continued efforts in improving working conditions and the rapid development of safety and health technologies for the workplace, work-related hazards exist in almost all occupations. The International Labor organization (ILO), in paragraph 6(1) of the afore-mentioned recommendations N0.121 defines occupational diseases as follows; “Each Member should under prescribed conditions, related diseases known to arise out of the exposure to substances and dangerous condition in process, trades, or occupations as occupational diseases”. The protocol of 2002 of the Occupational Safety and Health Convention in 1981, defines occupational disease as any disease contracted as a result of an exposure to risk factors arising from work activity African Newsletter on Occupational Health and Safety [45]. Based on Health Studies of Refuse pickers conducted in India, tuberculosis, bronchitis, asthma, pneumonia, dysentery, parasites, and malnutrition are the most commonly experienced diseases among Refuse pickers conducted in Bangalore, Manohar,

and New Delhi ,Huisman, [46].



Fig.2.2*Unprotected dumping site*

2.7.2 Studies in developed countries

- A study on 667 employees in the Refuse collection company that operates in Copenhagen, in 1993, trying to find out the risk circumstances associated with injuries among Refuse workers. Of the 667 employees at the company, 491 were Refuse workers, 114 (17%) experienced an injury in 1993. The study shows 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 workers. It also explains the reduction of risk experiencing an injury with age, as high age was usually associated with high seniority, Ivens [54].

In a study conducted in 1995, the relative risk for occupational accidents among Denmark's Refuse workers was about 5.6, compared to Denmark's total work force. From 1989 to 1992, the number of occupational accidents in the Danish Refuse collection activity was 95 per 1000 workers per year, compared to only 17 per 1000 nationally for all workers. The most commonly reported accidents for Danish Refuse workers were fractures, sprains, wounds, soft tissue accidents, and chemical burns, Poulsen [55]. In 1995, Poulsen and others conducted a study in Denmark, on Refuse workers. Bio-aerosols were found as high as 106 and 107 cfu/m³ at the loading hopper and that Refuse collector carrying containers to the curb were exposed to only 25% of the bi-aerosol count confronting workers emptying containers into the truck. When the trucks were equipped with a cover over the loading hopper and an exhaust to pull air under the cover, exposure levels dropped substantially to less than 2x10⁴ cfu/m³. The fraction of these bio-aerosols which were molds ranged from 77.5-98.5, Poulsen [56].



Fig. 3.2 Refuse separation and recycling

- Cimino J.A. conducted a study on Refuse workers in New York City in 1975. The study showed that solid Refuse workers experienced 20% times more than that of all U.S.A. workers (148 injuries per 1 million man-hours of solid Refuse work, compared to 7.35 for all U.S.A. industries in 1975 and 29.42 for U.S.A. underground mining). Most injuries among New York solid Refuse workers were experienced during Refuse 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 workers were either standing or bending when they were hurt. In a 20 year work period, the risk among New York workers of suffering a fracture or dislocation was estimated to be about 7 in 10, Cimino [57]. In 1996, the World Health Organization reported that, in USA, 31 health workers who were infected with HIV by contaminate puncture wounds, but none in housekeeping workers. The risk of HIV infection after puncture has been estimated to be about 0.3%. However, 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 Refuse workers in USA are currently estimated to have a risk of contaminated puncture which is roughly 1/1,000th the risk level of hospital nurses ,WHO[58]. In 1983, Gellin has conducted a clinical evaluation of the skin changes and injuries among refuse (Refuse) workers in San Francisco. He found that almost 75% 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 workers sustained work-related injuries each year. Those injuries consisted mainly of sprains, abrasions and lacerations, fractures, and eye injuries, Gellin [59].

- In 1990, Institute of Hygiene and Preventive Medicine at University of Genoa, studied infectious diseases of solid Refuse workers. Clinical examinations were conducted on 1396 solid Refuse employees of Genoa, Italy,

for hepatitis B and D virus markers. Higher prevalence of hepatitis B surface antigen (HBsAG) carriers (2.9%) compared to general population (2%) was reported. Higher prevalence of anti-HBs and anti-HBc positive subjects was 13.8% against general population (11.8%). Data indicated that probability of hepatitis B virus contact increases with working years, Kantiz [60].

- In Netherlands, Wouters and others conducted a study on 47 Refuse workers and 15 controls, to compare respiratory symptoms and upper airway inflammation in Household Refuse workers 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. Fieldwork was performed from June to September 1997. 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. Refuse workers show 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, Wouters [61]. Hildebrandt, Bongers, van Dijk, Kemper and Dul, conducted a study to explore the influence of climatic factors on non-specific back and neck shoulder disease.

Questionnaire data were collected on musculoskeletal symptom; workload and perceptions of climatic conditions of 2030 workers in 24 different occupations were analyzed multi-variantly. About one quarter of the workers related symptoms of the low back and neck shoulders to climatic factors. No seasonal influence on prevalence rates was reported. An association between low-back and neck-shoulder symptoms and for sick leave due to neck-shoulder symptoms with climatic factors was found, Hildebrandt [62].

- Haldal, Halstensen, Thorn, Edward and Halstensen conducted a study on 25 organic Refuse workers, to examine work-associated lower airway inflammation in Refuse workers by induced sputum and correlated with the bio aerosol exposure. Refuse workers underwent induced sputum collection and spirometry before work on Monday and the following Thursday. Personal full shift exposure measurements were performed Monday. The inflammatory response was related to microbial components in the bio-aerosol and was more pronounced for endotoxin than beta (1-3)-glucan exposure, and no associations were found for mold spores or bacteria, Haldal [63].

- Jorgen Thorn, was conducted a study in two household Refuse workers handling composting Refuse. The study aimed to assess exposures to airborne (1→3)-B-D-glucan and endotoxin during different seasons among household Refuse workers handling compostable Refuse. The results show that the amounts of airborne endotoxin were low during the study period. The amount of airborne (1→3)-B-D-glucan was higher during the warm summer, and there was a relationship between exposure levels of (1→3)-B-D-glucan and outdoor temperature, Thorn [64].

2.7.3 A study in developing countries

- Meinel J. has conducted a study in Accra, Ghana, in 1994. He provided some indication of the differences in worker health and safety among solid Refuse workers, versus a group of workers in construction. He found that the solid Refuse workers experienced a higher incidence of sick days, work-related accidents. The number of people reporting sick during the year was 47.6% of the total solid Refuse staff, versus only 33% of the total construction staff. Sick days consumed 0.7% of the total days among solid Refuse staff, but only 0.5%

among the construction staff, Meinel [65].

- At Bombay's open dump sites, Konnoth N. has conducted a study on the working conditions and occupation hazards at the dumping sites of Bombay. He found that 25% of Refuse workers examined had coughs and 26% experienced dyspnea. The majority (73%) complained of aggravated symptoms of coughs and breathlessness during working hours. Abnormal pulmonary function tests were presented in 23% of the dumpsite workers, of which 26% had restrictive patterns. Chest x-rays showed 17.5% had non-specific Shadows like post tuberculosis fibrosis, and about 11% presented reticule nodular shadows. 95 solid Refuse workers reported experiencing continuous backache, neck ache, and wrist/ knee/ ankle joint pain, Konnoth [66]. At the Calcutta's open dumps; about 180 Refuse pickers were studied in 1995. 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 cough and cold was 63%. Eye soreness or redness occurred quarterly in 15% and skin ulcers in 29%, with nearly all rates higher at the largest dumpsite than these averages (Direct Initiative for Social and Health Action, 1996). In the early 1970s, about 1500 solid Refuse samples were analyzed from 33 Indian cities. *Trichuristrichiura* (human whipworm) and *AscarisLumbricoides* (human roundworm) were commonly present. More samples were found to contain these parasites during monsoon season, than during summer or winter season. Stool samples collected from solid Refuse workers and a control group of similar socio-economic background revealed 98% of solid Refuse workers were positive for parasites, while only 33% of the control group was positive Bhide [67].



Fig.4.2 *Hazards at the dumping site*

- In 2001, a study was conducted in Taiwan. The study aimed to assess whether there is an excess of adverse health outcomes among Household Refuse Workers (HWCs) in Taiwan. The subjects were all current employees of the Household Refuse Collection Department in the country of Kaohsiung, Taiwan. The questionnaire was completed by 533 HWCs and 320 office workers. The data indicated that household Refuse 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, Yang[68].



Fig.5.2 *Proper equipment and protective clothes*

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Chapter Three

Methodology

3.1 Research design

A descriptive exploratory design has been used to study, assess and examine the occupational health and safety hazards among Household Refuse workers in Jaresh and Souf Regions. The investigation of health and safety has been studied by using a self-developed questionnaire with help and assistance for staff of Department of public health, Jaresh [69]

3.2 Population and sampling

The targeted population was 370 Refuse workers, which includes all Household Refuse workers, Refuse drivers, and their direct supervisors in Jaresh and Souf Regions. The study sample was 209. Non Probability Sampling Method (convenience sample) was used.

3.3 Setting

The settings used for this study were 3 major municipalities in Jaresh Region; (Jaresh, Kiteh, and Remoon), 2 small municipalities (Al-Sakeb and Nahleh), 2 villages (Angara and Jbarat), and 2 camps (Gaza, Souf).

In Souf Region, 4 major municipalities were studied; (Souf, Sakeb, Anjarah, and AlKhiteh), 2 villages (Al-Manshih and Hadadeh)

3.4 Ethical consideration

A permission letter to conduct this study was sent from the local authority to municipalities, villages and camps councils and officials. On the other hand, consent of the subjects who were informed of the purposes of the study, and the time needed to complete the questionnaire has been taken. Subject were asked personally by the investigator and they were asked to participate voluntarily with a full right to withdraw from the study, and the information they gave was treated in confidentiality and anonymity. No Subject's names were required while filling up the questionnaire.

3.5 Instrument

A questionnaire was used to collect data. The questionnaire includes the demographic characteristics and the personal information, such as the age of Refuse collector, marital status, and place of residence, level of education, monthly salary, position and type of work of Refuse collector. The questionnaire also consists of seven sub scales; the first scale consists of questions related to the type of Refuses collected (ten items), such as household, commercial, industrial, and biomedical. Other questions related to the type of trash vehicle, such as tractor, trolley, truck or trash compacter vehicle Yarmouk University, Irbed [70].

The second scale consists of questions related to protective measures (thirteen items). It includes the use of gloves, rubber boot, overall, face mask, the use of accessories, hand washing and bathing after duty. The third scale related to diseases and injuries the Refuse collector had in the last twelve months (nine items). It includes questions whether the Refuse collector have suffered from skin disease, shortness of breath, sore throat, diarrhea, constipation or had suffered from bloody stool, followed by backache. The fourth scale consists of questions related to the cause of the injured part of the body (eight items) , polytechnic institute Amman [71] ,

It includes whether the Refuse collector have been stuck with hard object or vehicle, fallen down while pulling or pushing the Refuse trolley, hit by any hard or sharp objects, lifted more than his capacity, pricked by hypodermic needles, or had been. In contact with harmful chemicals the fifth scale identifies the types of the injured part of the body (eight items). It includes ankle twisting, joint pain, joint dislocation, lacerated head or arm, muscle tear, scratched, or if ever been fractured. The sixth scale related to technical and organizational (fifteen items). Questions were directed toward identifying whether the Refuse

collector have been sent to hospital, medical center, private clinic, was he seen by specialist? Was he given the right treatment? Was he given sick leave when injured? Was he vaccinated? Does his employer provide him with routine medical checkup? The seventh scale related to place of work (seven items). It includes the availability of staff rest room, drinking water, a place to eat, bathroom, shower, and a clothes changing room. A separate question was included to see if he is satisfied with his job. And at the end, two open questions related to refuse collector requirements (needs) to be safe and satisfy in his job. The questionnaire has been formulated and distributed in Arabic language.

3.6 Data collection

The target group was interviewed personally. Most of the Household Refuse workers were interviewed while they were on duty in streets; some of them were interviewed in their homes, and others were interviewed in the municipalities after duty and after pre-arrangement with the municipal officials. All have been explained the purpose of the study, the consent form which was attached to the questionnaire was read to participants, each questionnaire was completed within the range of 15 to 20 minutes. Data collection was started on 1/7/2010 and completed on 23/7/2010. It was done on daily basis, data was carried out in morning and evening for sometimes. The total population of Household Refuse workers in Jareh and Souf Regions were around 370. of which 209 were non randomly (accidentally) chosen, interviewed and participated in the study, and only 10 Refuse workers refused to participate. Data collection was hard and stressful. Refuse workers start their duty at 5.30 a.m., and go back home as soon as they finished cleaning the assigned area. There is no suitable place for them to gather at the end of duty. Interviewing Household Refuse workers in Jareh and Souf Regions means roaming around in the streets until you find your request. Pre arrangement was difficult except in Aljbarat municipality, were the

investigator was able to interview Refuse workers. During data collection, there were difficulties in traveling from Jaresh to Souf, some areas. Other difficulties were related to some Refuse workers who were scared and frightened from their employers. Such workers were afraid to be fired from job, others were very cooperative and only very few were ignorant and refused to participate. During data collection, Refuse workers were on strike in areas like Jaresh and Kiteh cities. Refuse workers in these cities complained of not been paid for the last two months.

2.7 Data analysis

Descriptive statistical method has been used to describe the demographic characteristics of the sample. The findings were statistically interpreted by using the Statistical Package for Social Science (SPSS). Because most of the questions are at nominal or ordinal levels, non-parametric statistics, to show the difference between the groups (age, place of residence, place of work, educational level, monthly income and Region), in relation to precaution measures, diseases and injuries, the cause of the injured part of the body, professional and managerial action, and work structure.

Chapter Four
Results and Discussions

Introduction

Refuse workers face tremendous challenges while they are on duty in Jaresh and Souf Regions. Lack of support and interest from their employers regarding health and protective measures, put more load on Refuse workers in these Regions. There are many factors that affect health and safety of Refuse workers. Such factors related to the age of the Refuse collector, the educational level, and the monthly income. However, some factors proved to be more significant and more influential than others. In this study, Household Refuse workers with middle age and low level of education, showed more self-reported accidents than young.

4.1 Results

The responsibility for Refuse collection in the Souf and Jaresh Regions is divided between the municipalities, town or village councils and UNRWA in the refugee camps. Out of 217 questionnaires distributed, 95% (207 questionnaires) were answered, and only about 5% (10 questionnaires) were not answered. All items on the questionnaires were answered by participants through direct interviews, and suggestions of how to improve their safety at work, and their needs to do a perfect job at work as requested on the questions 111-112, were summarized, analyzed and presented in the recommendations.

4.2 Presentation of results

The findings of the study were presented and classified according to the following characteristics of respondents; demographic characteristics, socio-economic status, working conditions, type of work, type of Refuse and collection method, use of protective measures, personal hygiene, work related accidents, cause of injury, health care, working conditions, job satisfaction, workers needs to improve health and worker's needs.

4.2.1 Subject characteristics

4.2.1.1 Demographic characteristics of respondents

Table1.4.2Distribution of the study sample

	Type	Frequency	percent
Jaresh Region	City	78	73
	Village	5	5
	Camp	23	22
	Total	106	100
Souf Region	City	77	75
	Village	6	6
	Camp	20	19
	Total	103	100

Table2.4.2 sample distribution with respect to locality

	Frequency	percent
City	155	74.2
Village	11	5.3
Camp	43	20.6
Total	209	100

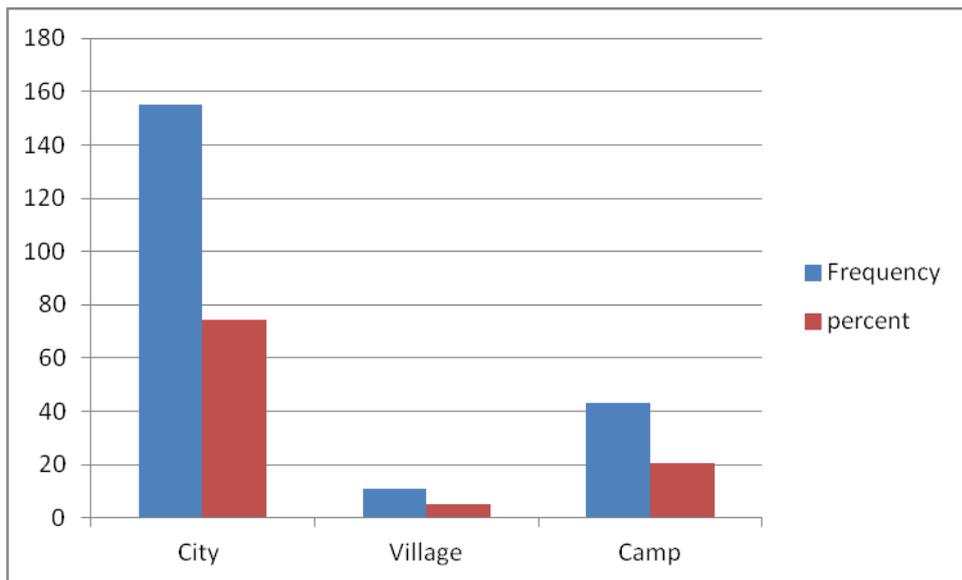


Fig.6.4.2 Sample distribution with respect to locality

Table (2) shows that 155 of Refuse workers were chosen from the cities in Jareh and Souf Regions, 11 from villages and 43 from camps.

All surveyed Household Refuse workers in Jareh and Souf Regions were male. Age ranged between 20 and more than 51 years. Age group between 31 and 40 years represents 44% (n=92) of respondents, while Refuse workers with age group 50 years old and above only represents 7.2% (n=15) (Table 3). The study shows that 47.1% (n=98) of respondents live in cities, 42.8% (n=89) live in camps and only 10.1% (n=21) of respondents live in villages, as shown in (Table 4). Results also shows that 31.7% (n=66) of respondents had finished primary school, 30.8% (n=64) had finished preparatory school, and only 25(n=52) of total respondents finished high school as shown in (Table 5).

Table3.4.2 Sample distribution of Household Refuse workers in relation to age categories.

Age	Frequency	percent
20-30	58	27.9
31-40	92	44.2
41-50	43	20.7
51 and above	15	7.2
Total	208	100

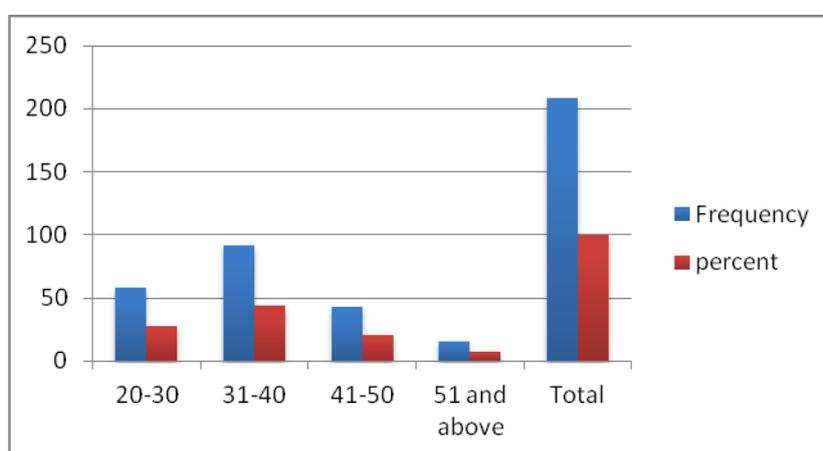


Fig.7.4.2: distribution of Household Refuse workers in relation to age categories.

Table4.4.2 Sample distribution of Household Refuse workers in relation to place of permanent residence.

place of permanent residence	Frequency	percent
City	98	47.1
Camp	89	42.8
Village	21	10.1
Total	208	100

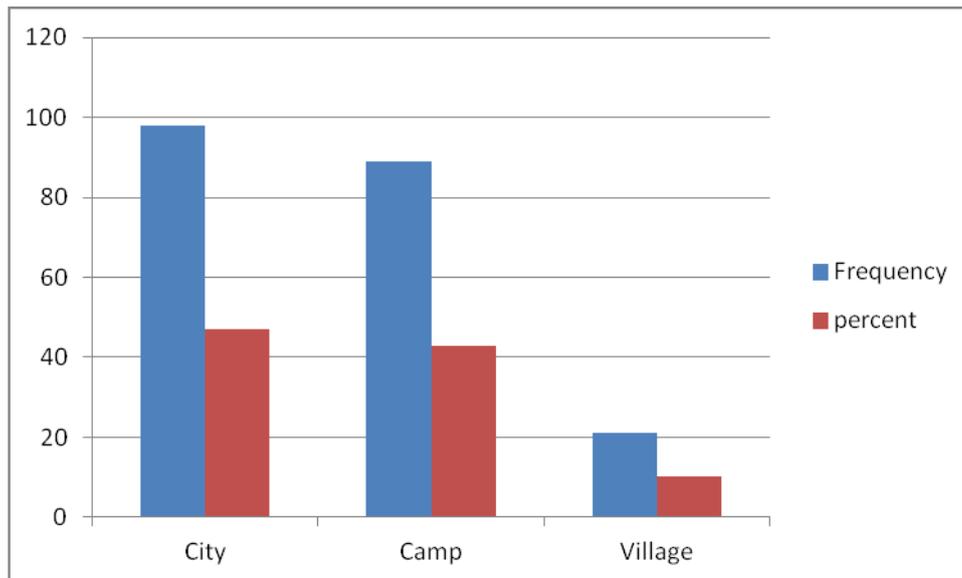


Fig.8.4.2 Sample distribution of Household Refuse workers in relation to place of permanent residence.

Table5.4.2 Sample distribution of Household Refuse in relation education level.

years of education	Frequency	percent
Illiterate	19	9.1
primary	66	31.7
preparatory	64	30.8
High school	52	25
University	7	3.4
Total	208	100

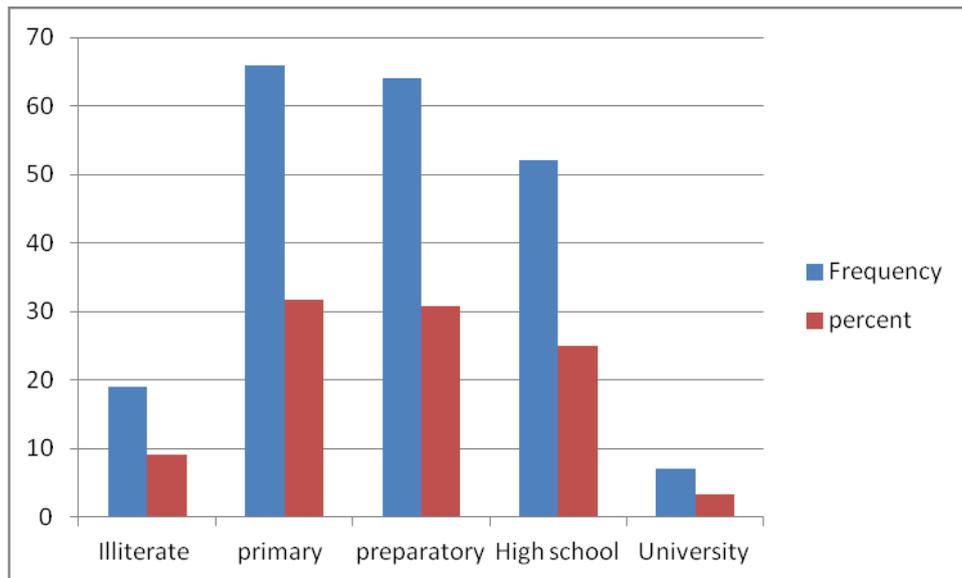


Fig.9.4.2 Sample distribution of Household Refuse in relation education level.

4.2.1.2 Socio-economic status of respondents

Salaries of Household Refuse workers were put in five categories, in a range of 100 and more than 400 Dinar per month. The result shows that 50% (n=104) of respondents had monthly income of 400-500 Dinar, and 31.7% (n=66) of respondents had a monthly income of 300-400 Dinar (table 6).

Table6.4.2 Sample distribution of Household Refuse workers in relation to monthly income.

Monthly Income in dinar	Frequency	percent
100-200	3	1.4
200-300	13	6.3
300-400	66	31.7
400-500	104	50
More than 500	22	10.6
Total	208	100

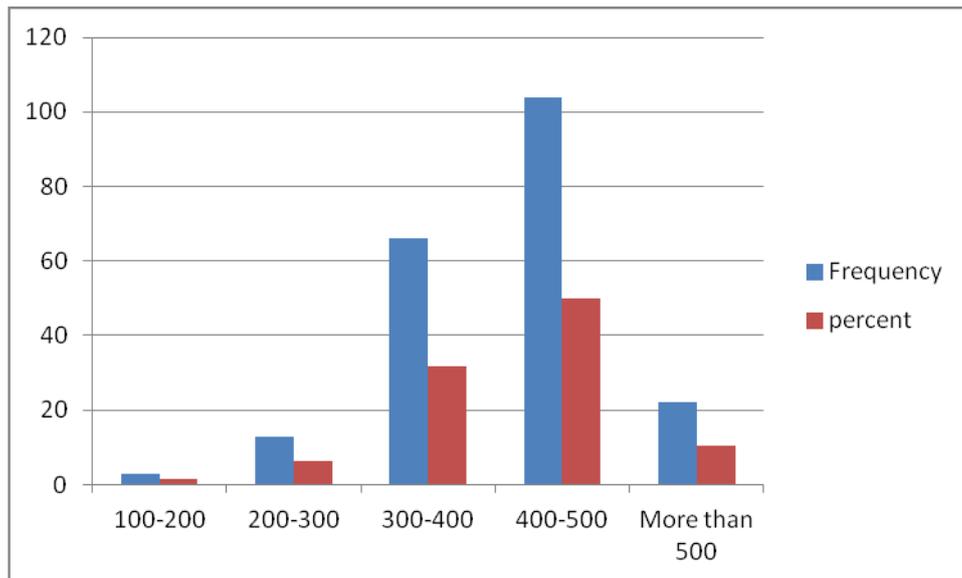


Fig.10.4.2 Sample distribution of Household Refuse workers in relation to monthly income.

Three items were designed to assess sources of water used at home by Household Refuse workers in Jareh and Souf Regions. It shows that 85.4% (176) of respondents used piped water as shown in (table 7).

Table7.4.2 Sample distribution of Household Refuse workers in relation to sources of water.

Source of water	Frequency	percent
water (piped)	176	85.4
well	16	7.8
spring	1	0.5
more than one resources	13	6.3
Total	206	100

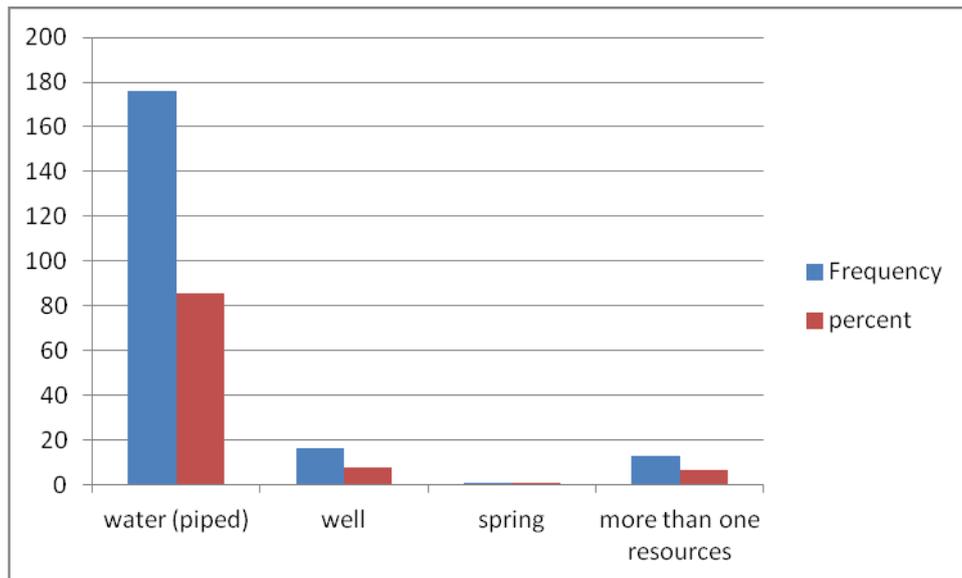


Fig.11.4.2 Sample distribution of Household Refuse workers in relation to sources of water.

4.2.1.3 Working conditions of respondents

The study shows that 78.5% (n=164) of respondents work in cities, and only 15.3% (n=32) of respondents work in camps (Table 8).

Table8.4.2 Sample distribution of Household Refuse workers in relation to place of work

place of work	Frequency	percent
City	164	78.5
Camp	32	15.3
Village	209	100
Total	209	100

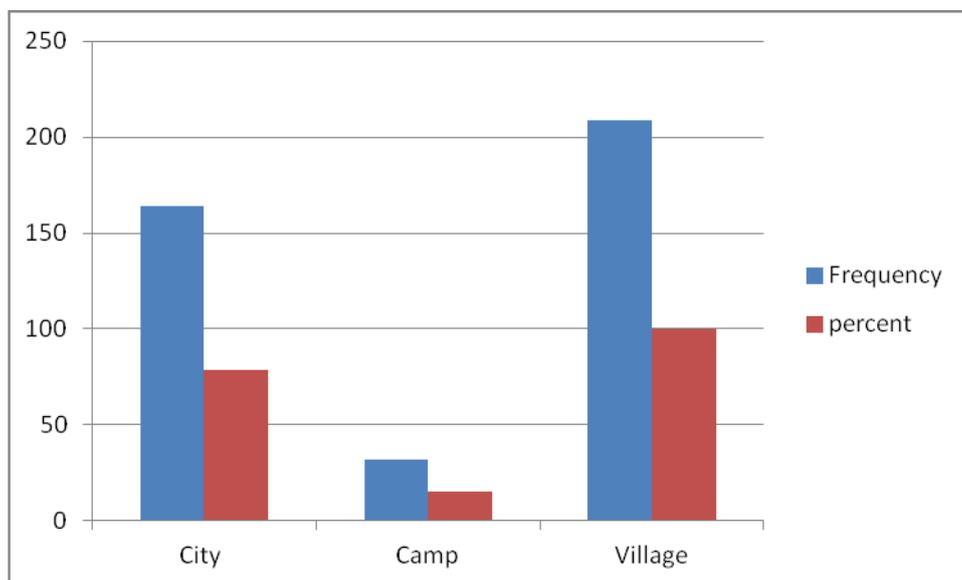


Fig12.4.2 Sample distribution of Household Refuse workers in relation to place of work

The study shows that 97.1% (n=203) of Household Refuse workers in both Regions were working on morning shift (Table 9), 51.4% (n=107) on daily wages contracts, and 37.5% (n=78) on fulltime contracts (Table 10).

Table9.4.2 Sample distribution of Household Refuse workers in relation to work shift

Work shift	Frequency	percent
Morning 6am-2pm	203	7.1
Evening 2pm-10pm	4	1.9
at night 10pm-6am	1	0.5
Total	208	100

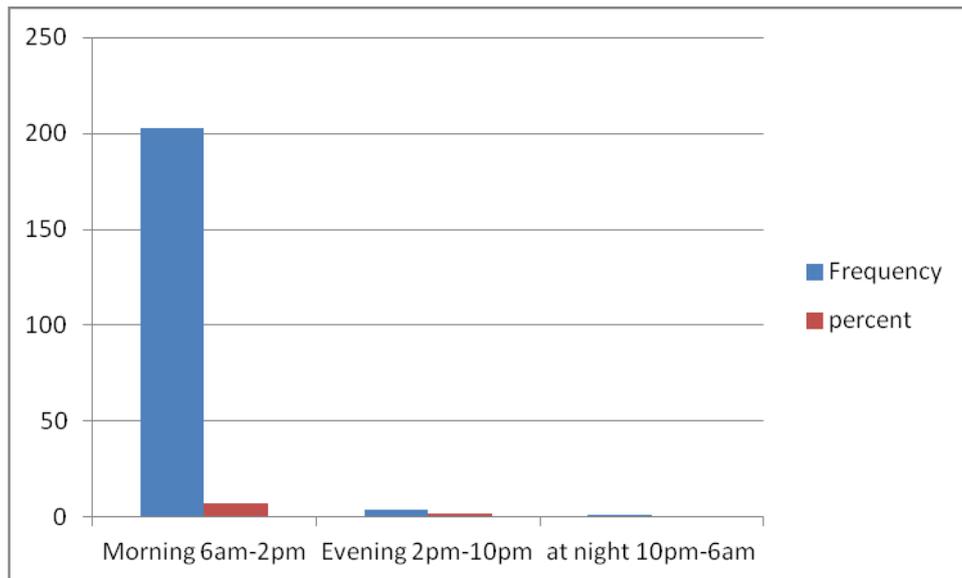


Fig.13.4.2 Sample distribution of Household Refuse workers in relation to work shift.

Table10.4.2 Sample distribution of Household Refuse workers according to type of contract

Type of contract	Frequency	percent
Daily wages	107	51.4
Full time	78	37.5
Other	23	11.1
Total	208	100

4.2.1.4 Type of work of respondents

Four items were used to distinguish between types of work performed by Household Refuse workers in both Regions. The study showed that 65.1% (n=136) were collecting Household Refuse from the streets, and 20.1% (n=42) were caring and lifting Refuse (Table 11)

Table 11.4.2 Sample distribution of Household Refuse workers in relation to type of work.

Type of work	Frequency	percent
Cleaning the street	136	65.1
Driver	17	8.1
caring and lifting	42	20.1
Other (central market and bathrooms)	14	6.7
Total	209	100

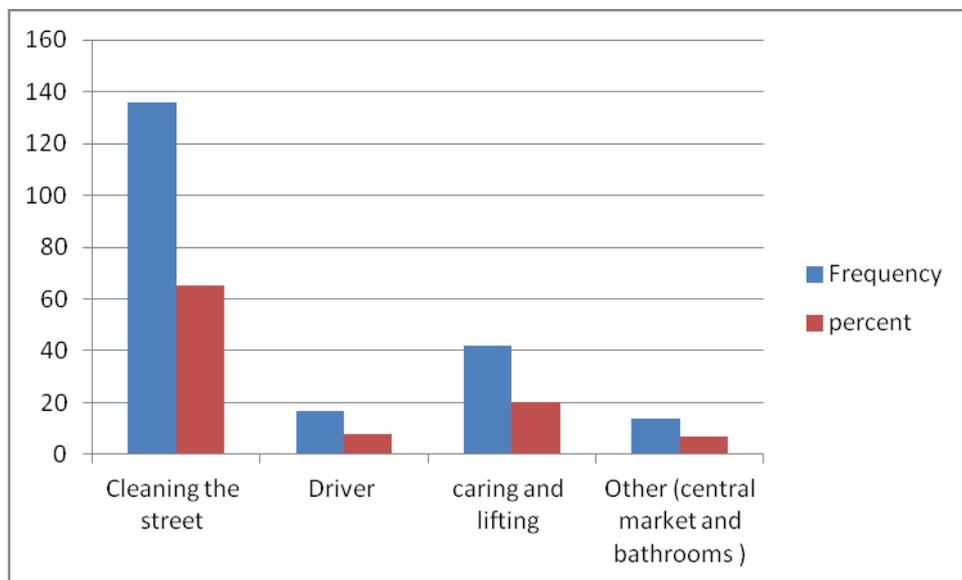


Fig.14.4.2 Sample distribution of Household Refuse workers in relation to type of work.

Table (12) shows that 60.3% (n=126) of Household Refuse workers surveyed in both Regions said that they have health insurance, and 39.7% (n=83) have said that they did not have health insurance. The study also showed that 37.8% (n=79) of respondents have said that they have governmental medical health insurance and 15.8% (n=33) have said that they have been insured by the United Nation Relief Work Agency, while 39.7% (n=83) are not insured by any type of health insurance (Table 12)

Table12.4.2 Sample distribution of Household Refuse workers in relation to type of health insurance.

Type of Health insurance	Frequency	percent
Government	79	37.8
UN	33	15.8
private	2	1
Not Insured	83	39.7
Total	209	100

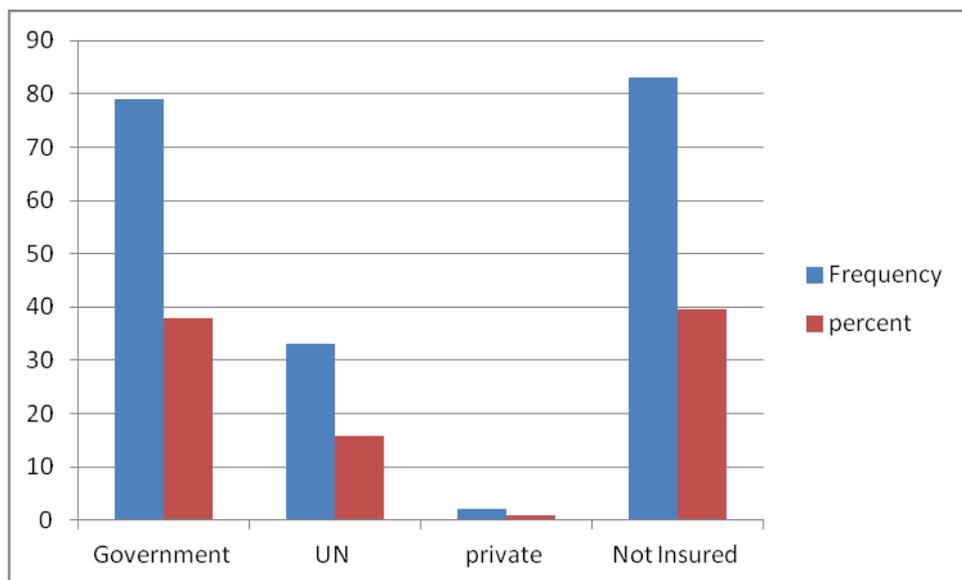


Fig.15.4.2 Sample distribution of Household Refuse workers in relation to type of health insurance.

4.2.1.5 Type of Refuse and collection method

Table (13) shows that 98.1% and 97.1% of respondents respectively said that household and commercial Refuses were the most Refuses collected in the communities surveyed in this study, followed by biomedical Refuses and industrial Refuses. It also shows that 73.4% of Refuses were collected by trolley, and 26.1% were collected by trash compacter.

Table 13.4.2 Sample distribution of Household Refuse workers in relation to type of Refuses and collection method.

Question	Freq.	yes	Freq.	No	Total	Total
	yes	%	No	%	No	%
household Refuse	203	98.1	4	1.9	207	100
Commercial Refuse	200	97.1	6	2.9	206	100
Biomedical Refuse	99	47.8	108	52.2	207	100
Collecting Refuse by tractor	4	1.9	202	98.1	206	100
Collecting Refuse by trolley	152	73.4	55	26.6	207	100
Collecting Refuse by truck	8	3.9	199	96.1	207	100
Collecting refuse by trash compacter vehicle	54	26.1	153	73.9	207	100
Collecting Refuse by Vehicle from mobile bin	27	13	180	87	207	100
Collecting Refuse by vehicle from immobile bin	29	14	178	86	207	100

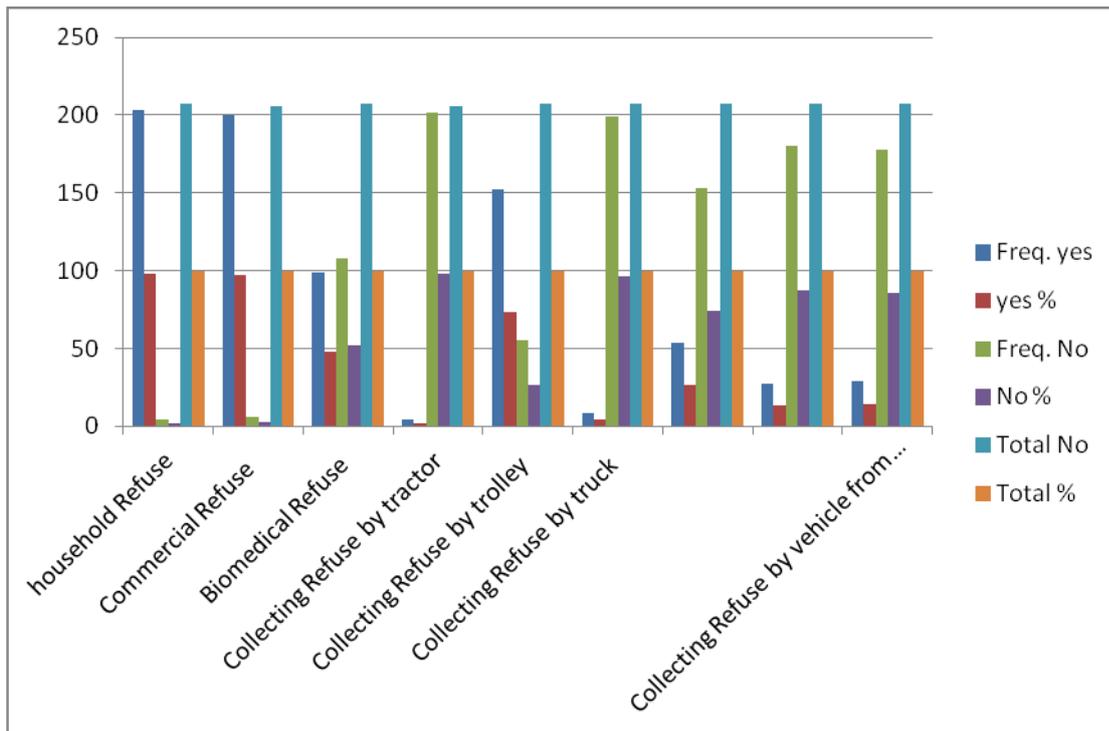


Fig.16.4.2 Sample distribution of Household Refuse workers in relation to type of Refuses and collection method

4.2.1.6 Use of protective measures

Table (14) shows that 98.6% of Refuse workers don't wear face mask, 96.6% don't use shoe covers, 85.5% don't wear overall, 78.9% don't wear rubber boot, and 45% don't wear gloves.

Table 14.4.2 Sample distribution of Household Refuse workers in relation to personal protective measures

Question	Always Freq.	Always %	Som e times Freq	Som e Time %	No Freq.	No %	Total No
Do you wear gloves while on duty ?	66	31.6	49	23.4	94	45	209
Do you wear shoe covers ?	1	0.5	6	2.9	201	96.6	208
Do you wear rubber boot ?	29	13.9	15	7.2	164	78.9	208
Do you wear facemask ?	.....	.....	3	1.4	205	98.6	208
Do wear overall?	12	5.8	18	8.7	178	85	208

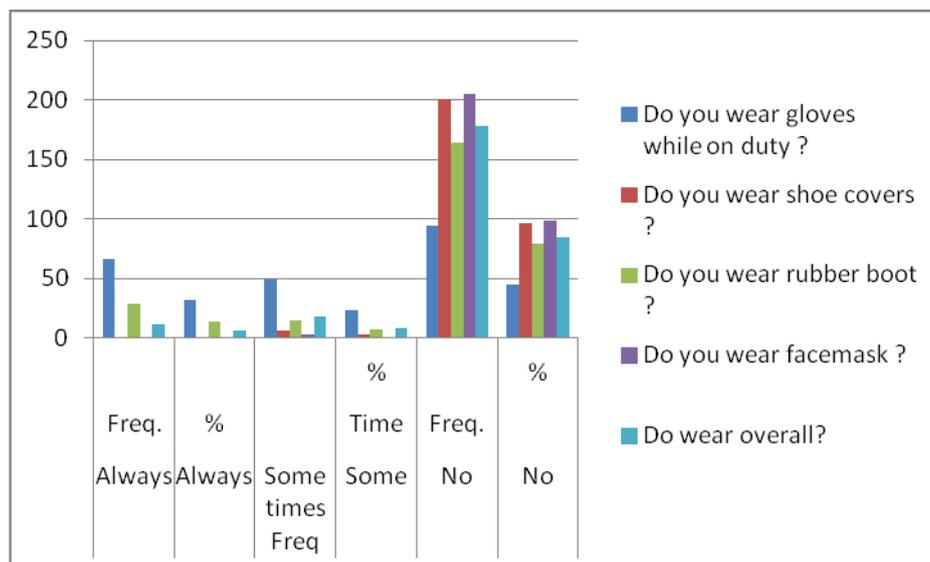


Fig. 17.4.2 Sample distribution of Household Refuse workers in relation to personal protective measures

4.2.1.7 Personal hygiene

Table (15) shows that 73.6% bathe after work, 36.1% always wash their hands thoroughly with antiseptic (soap) and 33.2% wash hands sometimes. It also shows that 97.6% of Refuse workers wash clothes at home, and 93.8% use antiseptic (soap powder) in cloth wash, while 66.7% of Refuse workers avoid using accessories (mobile phone, sun glass, wallet, etc..) while on duty.

Table15.4.2 Sample distribution of Household Refuse workers in relation to personal hygiene

Question	Always Freq	Always %	Sometimes Freq	Sometimes %	No Freq	No %	Total No
Do you wash hands frequently with antiseptics	74	3.6	68	33.2	63	30.7	205
Do you wash work clothes at home?	203	97.6	2	1	3	1.4	208
Do you use antiseptics on clothes wash ?	195	93.8	8	3.8	5	2.4	208
Do eat at work place	22	10.6	74	35.7	111	53.6	207
Do you shake hands with relative while on duty ?	72	34.6	92	44.2	44	21.2	208
Do you use	42	20.3	27	13	138	66.7	207

accessories while on duty ?							
Do you bath after work	153	73.6	51	24.5	4	1.9	208
Do you share protective clothing with colleagues ?	.....	.....	2	1	206	99	208

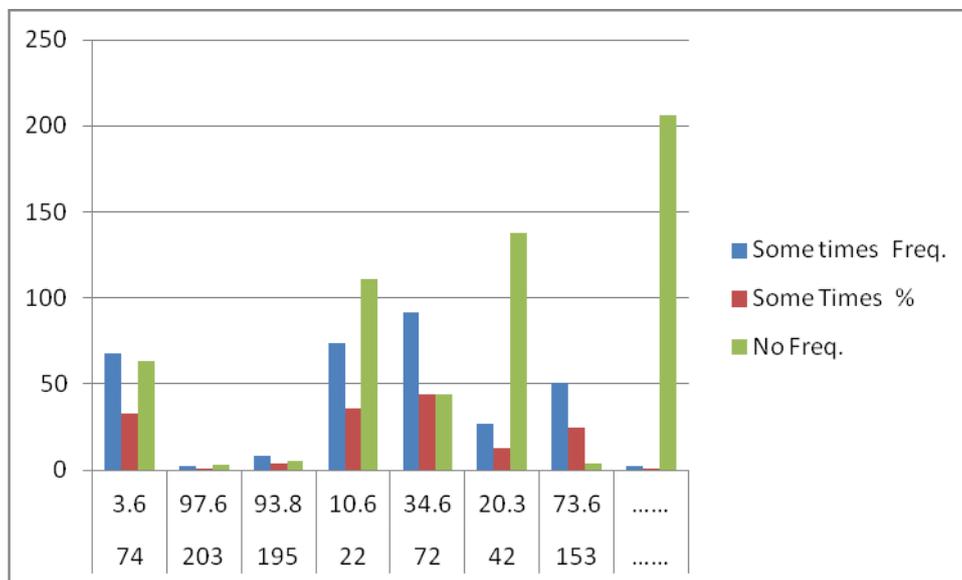


Fig.18.4.2 Sample distribution of Household Refuse workers in relation to personal hygiene

4.2.1.8 Work related diseases

Table (16) shows that in the last twelve months, 44.7% of surveyed Refuse workers have suffered from sore throat, cough, high temperature and 45.7% of backache. It also shows that 27.9% have suffered from diarrhea or bloody stool, 25% have suffered from shortness of breath, and 20.2% have suffered from skin diseases.

Table 16.4.2 Sample distribution of Household Refuse workers in relation to incident of diseases and injuries in the last 12 month.

question	yes Freq.	yes %	No Freq.	No %	Total No.	Total %
Have you suffered from skin diseases ?	42	20.2	166	79.8	208	100
Have you suffered from shortness of breath ?	52	25	156	75	208	100
Have you suffered from sore throat , cough and temperature ?	93	44.7	115	55.3	208	100
Have you suffered from Diarrhea ore blood stool	58	27.9	150	72.1	208	100
Have you exposed to a combusting Refuse ?	19	9.1	189	90.9	208	100
Have you suffered from hearing difficulties	10	4.8	197	95.2	207	100
Dos the movement of trash vehicle bother you ?	28	13.5	180	86.5	208	100
Have you fallen of trash vehicle while on duty ?	12	5.8	195	94.2	207	100
Have you suffered from bakache?	95	45.5	113	54.3	208	100

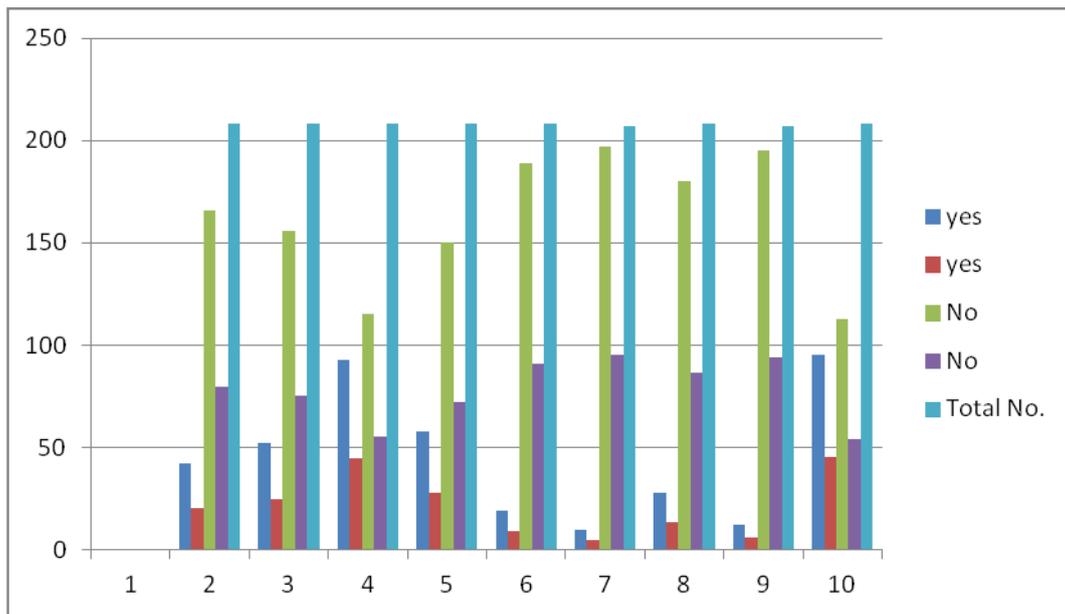


Fig.19.4.2 Sample distribution of Household Refuse workers in relation to incident of diseases and injuries in the last 12 month.

4.2.1.9 Work related accidents

Table (17) shows that 34.1% of Refuse workers have suffered from twisted ankle, 22.1% have suffered from muscle tear, 8.7% have suffered of joint pain and 7.7% have lacerated head, arm, and etc.

Table17.4.2 Sample distribution of Household Refuse workers in relation to type of incident.

Question	yes	yes	No	No	Total	Total
	Freq.	%	Freq.	%	No	%
Have you ever twisted your ankle?	71	34.1	137	65.9	208	100
Have you joint pain?	18	8.7	188	91.3	206	100
Have you joint dislocation?	8	3.8	200	96.2	208	100

Have you ever lacerated your head, arm, etc.?	16	7.7	12	92.3	208	100
Have you ever suffered of muscle tear?	46	22.1	162	77.9	208	100
Have you ever fractured your teeth?	3	1.4	204	98.6	207	100
Have you ever been scratched?	7	3.4	201	96.6	208	100
Have you ever been fractured?	5	2.4	203	97.6	208	100

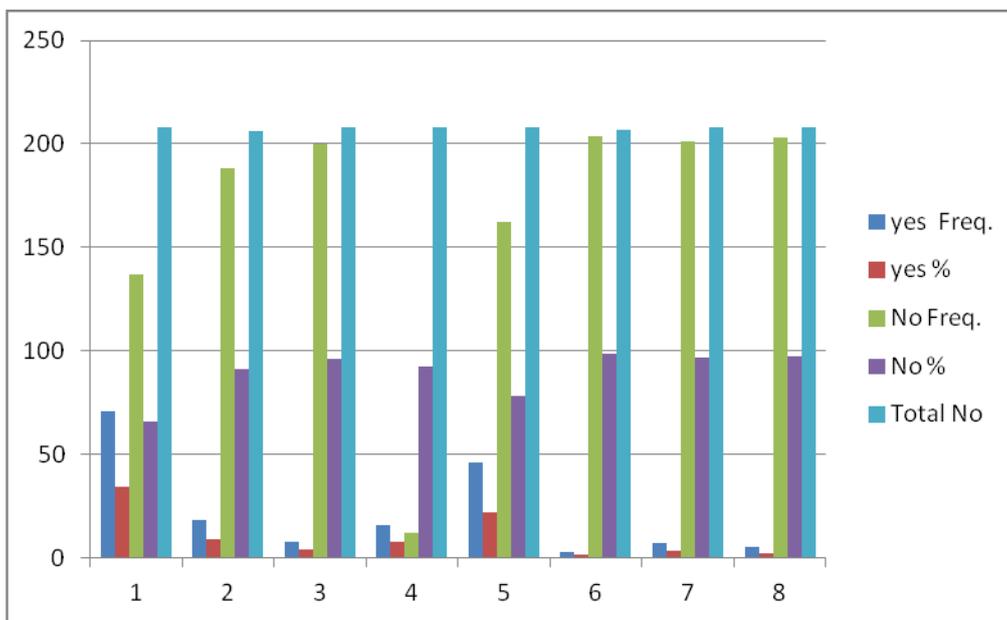


Fig.20.4.2: Sample distribution of Household Refuse workers in relation to type of incident.

4.2.1.10 Cause of injury

Table (18) shows that 61.1% of Refuse workers have been hit by any hard or sharp objects, 37.4% have lifted more than their capacity, 35.6% have fallen down while pulling or pushing the Refuse trolley, 21.6% of Refuse workers have been stuck with hard object and 20.2% have been pricked by hypodermic needles.

Table 18.4.2 Sample distribution of Household Refuse workers in relation to the cause of the injured part of the body in the last twelve months.

question	yes Freq.	Yes %	No. Freq.	No. %	Total No.	Total %
Have you been stuck with hard object, vehicle, etc?	45	21.6	163	78.4	208	100
Have you fallen down while bulling or bushing the Refuse trolley?	74	35.6	134	64.4	208	100
Have you suffered any falls from up high ?	3	1.4	205	98.6	208	100
Have you been hit by any hard or sharp object?	127	61.1	81	38.9	208	100
Have you lifted more than your capacity ?	77	37.4	129	62.6	206	100
Have you been working in conditions with high\ low temperature?	32	15.4	176	84.6	208	100
Have you been pricked by hypodermic needles?	42	20.2	166	79.8	208	100
Have you been in contact with harmful chemicals?	5	2.4	203	97.6	208	100

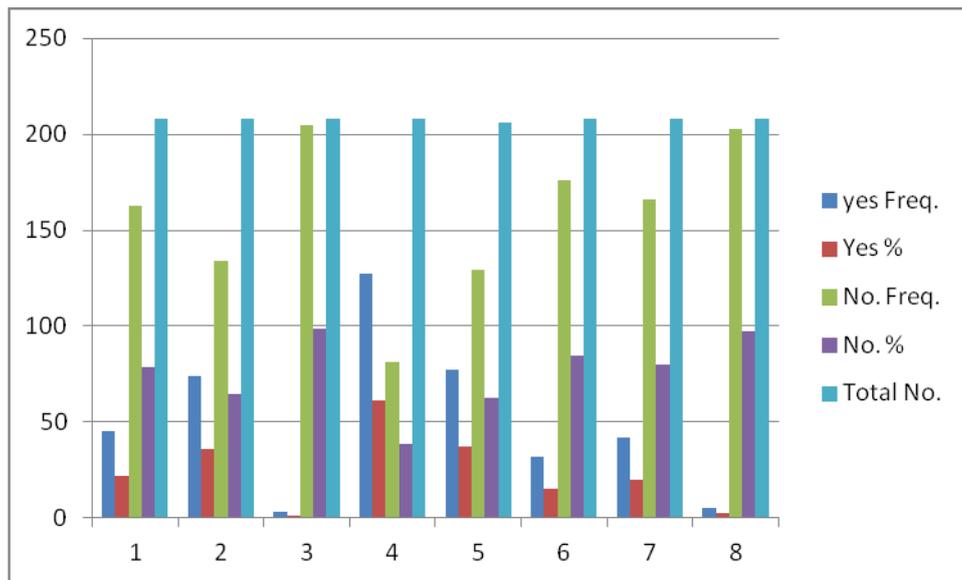


Fig.21.4.2 Sample distribution of Household Refuse workers in relation to the cause of the injured part of the body in the last twelve months.

4.2.1.11 Health care

Table (19) shows that the majority (94.2%) did not receive routine chest X-ray, 90.3% did not receive routine lab tests such as complete blood count CBC, serum electrolytes, stool, urine and sputum analysis, and, and 93.8% and 85.6% were not vaccinated for tetanus and hepatitis respectively. It also shows that 89.6% did not visit a specialist, 65.7% were not given sick leave when injured or diseased, and 62.2% said that the ministry of health was not informed.

Table19.4.2 Sample distribution of Household Refuse workers in relation to professional and managerial response to accident, in case they are occupationally injured or diseased in the last twelve months.

	Question	Yes Freq.	yes %	No. Freq.	No. %	Total No.	Total %
1	Was the ministry of health informed?	76	37.	125	62.2	201	100
2	Were you sent to a private medical center?	122	60.7	79	39.3	201	100
3	Were you sent to a private clinic	47	23.4	154	76.6	201	100
4	Did you visit a specialist?	21	10.4	180	89.6	201	100
5	Were you given the right treatment?	162	82.1	36	17.9	201	100
6	Were you given a sick leave?	69	34.3	132	65.7	201	100
7	Did you do a lab test (blood, urine analysis, stool analysis, or sputum analysis)?	48	23.9	153	76.1	201	100
8	Did you do a chest x-ray?	46	22.9	155	77.1	201	100
9	Did you do routine lab test (CBC, urine	20	9.7	187	90.3	207	100

	analysis, stool analysis, serum electrolytes)?						
10	Did you do a routine chest x- ray?	12	5.8	196	94.2	208	100
11	Were you been vaccinated for hepatitis?	30	14.4	178	85.6	208	100
12	Were you been vaccinated for tetanus?	13	6.2	195	93.8	208	100

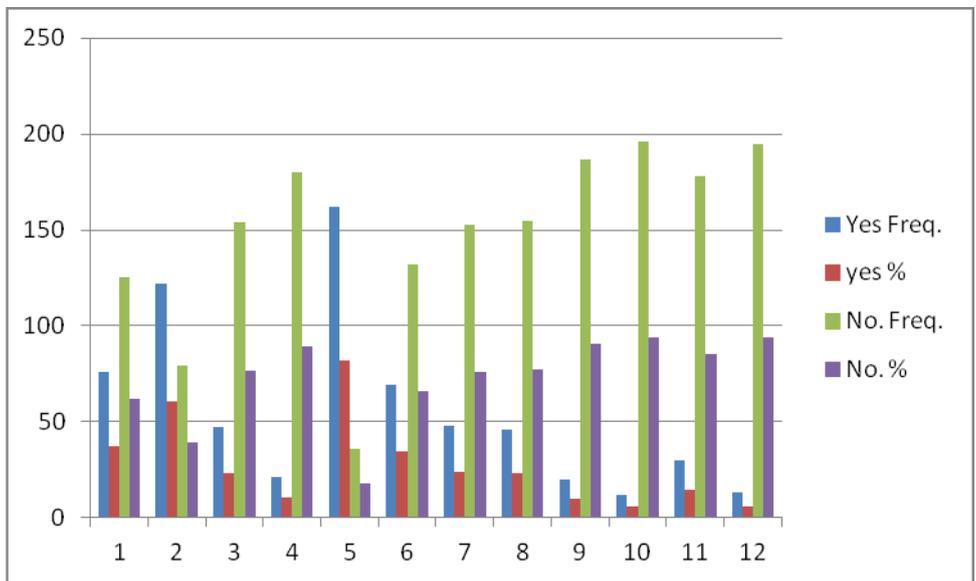


Fig.22.4.2 Sample distribution of Household Refuse workers in relation to professional and managerial response to accident, in case they are occupationally injured or diseased in the last twelve months.

4.2.1.12 working conditions

Household Refuse workers have direct contact with dirty and contagious trash. Refuse workers need a special room to change their clothes before and after duty, a shower to bathe before going back home, a place to rest, eat, and suitable water to drink. Table (20) shows that 90.4% of Refuse workers denied the presence of a shower, 87.6% said that there is no suitable place to eat and 86.6% said that there is no changing room.

Table 20.4.2 Sample distribution of Household Refuse workers in relation to work structure.

	Question	yes Freq.	yes %	No. freq.	No. %	Total No.	Total %
1	Was there a staff rest room?	48	23	160	76.6	209	100
2	If so, was there a suitable place to eat?	8	3.8	183	87.6	209	100
3	Was drinking water available?	33	15.8	158	75.6	209	100
4	Was there a bathroom?	39	18.7	152	72.7	209	100
5	Was there a shower?	2	1	189	90.4	209	100
6	Was there a changing room?	10	4.8	181	86.6	209	100

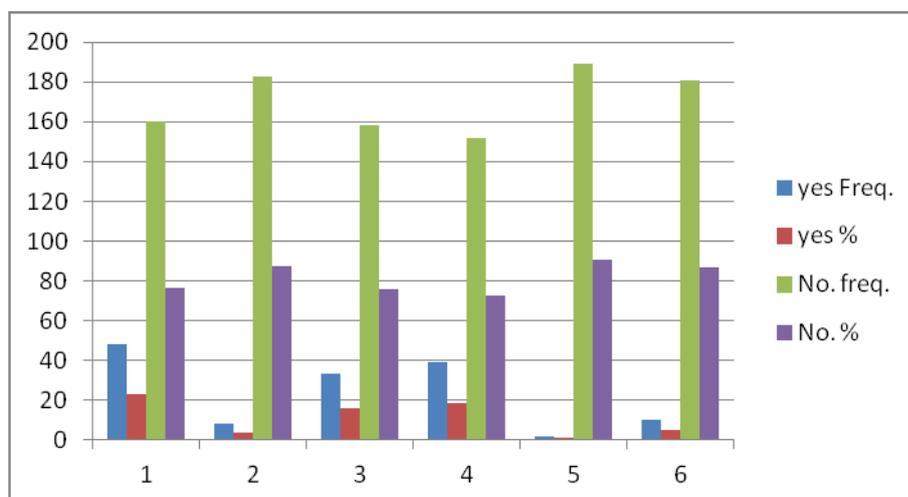


Fig.23.4.2 Sample distribution of Household Refuse workers in relation to work structure.

4.2.1.13 Job satisfaction

Work satisfaction is an important parameter to do a perfect job. Table (21) shows that nearly half of the Refuse workers from all communities (municipalities, camps, and villages), in both Regions (44%) were satisfied with their job and 21.1% were very satisfied of their work, while 17.7% and 14.8% of Household Refuse workers surveyed were not satisfied to absolutely not satisfied, respectively.

4.2.1.14 Worker's needs to improve health

Table 21.4.2 Sample distribution of Household Refuse workers concerning the level of satisfaction during work.

Work Satisfaction	Freq.	Percent
Very satisfied	44	21.1
Satisfied	92	44.0
Not satisfied	37	17.7
Absolutely not satisfied	31	14.8
Total	204	97.6

Household Refuse workers have expressed high desire and interest in wearing protective measures if available. Table (22) shows that 81.8% of Household Refuse workers ask for availability of overall, face mask, gloves, and rubber boot, 50.2% called for vaccination against hepatitis and tetanus, while 41.1% urged the responsible people for routine medical checkup.

Table 22.4.2 Sample distribution of Household Refuse workers regarding their

requirement to improve their safety at work.

	Requirements of Household Refuse workers Frequency Percent	Freq.	percent
1	Protective measures (overall, mask, gloves..)	171	81.8
2	Vaccinated against infectious diseases	105	50.2
3	Routine medical check up every 6 months	86	41.1
4	Routine lab tests every 6 months	7	3.0
5	Washing machine in trash vehicle	11	5.3
6	Monthly vehicle maintenance	16	7.65
7	Replace collection trolley with small tractor	2	0.9
8	Worker respect from officials and media	18	8.6
9	Public awareness	10	4.78
10	Provide drivers with new collection vehicle	9	1.3
11	First aid set	4	1.9
12	Provide workers with trash instruments whenever needed	5	2.4

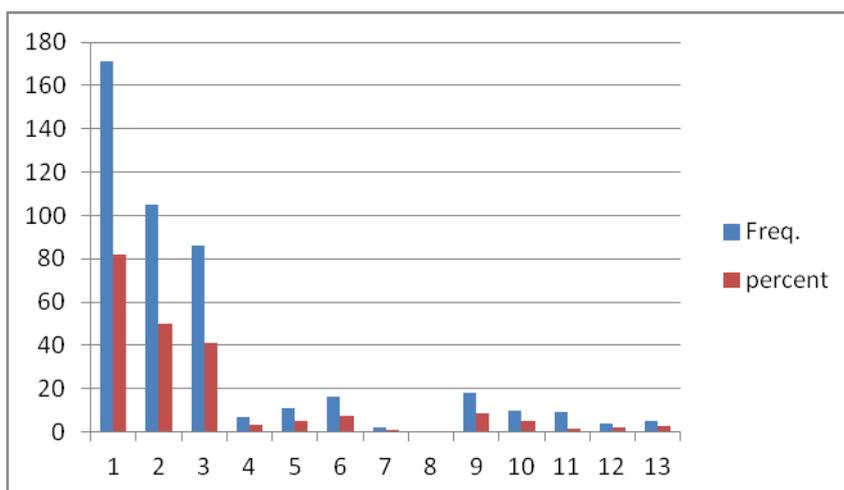


Fig.24.4.2 Sample distribution of Household Refuse workers regarding their requirement to improve their safety at work.

4.2.1.15 Worker's needs

Table (23) shows that 81.4% of salaries of Household Refuse workers surveyed in both Regions were ranged between 400-500 Dinars. These salaries were considered below the monthly acceptable standard level. During collection of data, Household Refuse workers were on strike for four days in two cities (Jareh and Kiteh) in Jareh Region, asking for salary increase and to pay them their salaries for more than three months. 67.9% of respondents had urged responsible people to increase salaries, 38.8% had asked for job security, 31.6% had requested responsible to provide the Household Refuse workers and their families with medical insurance, and 27.3 had urged municipal, village and camp councils to pay them their monthly salary on time.

Table23.4.2 Sample distribution of Household Refuse workers regarding their needs to do a perfect job.

	Needs of Household Refuse workers	Frequency	Freq.	percent
	Percent			
1	Pay monthly salary on time		57	2.3
2	Increase salary according to the standard of living		142	67.9
3	Provide job security		81	38.8
4	Provide hazard pay		10	4.8
5	Provide Civil Service Law		21	10
6	Provide Medical Insurance to worker and his family		66	31.6
7	Provide Pension Fund		2	1

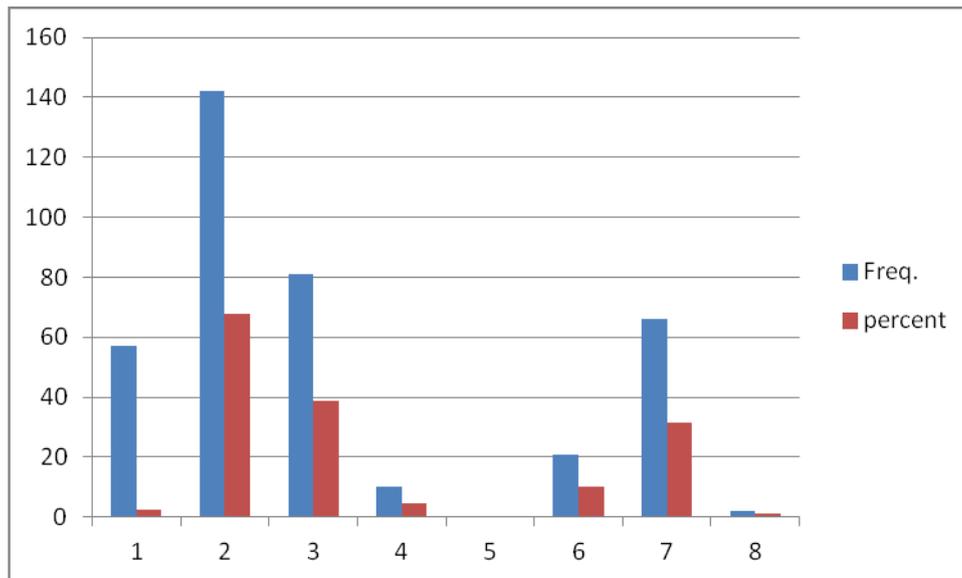


Fig.25.4.2 Sample distribution of Household Refuse workers regarding their needs to do a perfect job.

4.3.1 Observations of results

In this study, Household Refuse workers with middle age and low level of education, showed more self-reported accidents than young, compared to a Danish study, which was carried out by I. Ivens [72]. The Danish study showed that the number of injuries decreased with increasing age.

This is explained by the fact that the majority of Refuse workers who was surveyed in this study were in the middle age. This is due to the socioeconomic and political condition in Jordan. Unemployment rate among Jordanian s 15 years and over was 14% and 29.9% of employed and unemployed ever worked persons were in elementary occupations, Sbieh [73].

Most of Refuse workers have lost their jobs in Israel during the period of late eighty. In addition, jobs are limited in Jordan. Refuse workers with middle age (31-40) consist 44.2% of the population sample. In Denmark, Refuse workers were on permanent contracts, supported by their employers, and insured medically. They were kept in their jobs for long periods of time. So, old age between Danish Refuse workers was considered more senior, and more aware

of the health hazards of Refuses. The Danish study also suggested that better education of the Refuse workers might lower the injury rate. This result is similar to what this study has found out. This study also showed that Refuse workers with higher monthly income have shown a decrease in the number of occupational injuries. This is explained by the fact that good monthly income means better chances of treatment for Refuse workers, good nutrition which means better immunity against diseases, and better chances of buying protective measures which help refuse workers to be less exposure to refuse dust and less contact with Refuse material. In this study, the most commonly reported accidents for Jordanian 's Household Refuse workers in Jaresh and Souf Regions were backache (45.7%), muscle tear (soft tissue trauma) (22.1%), and twisted ankle (34.1%). This result is close to the study which was conducted in Denmark and carried out by Poulsen in 1995. The Danish study reported that fractures, sprains and soft tissue accidents were the most commonly reported accidents for Danish Refuse workers, poulsen [74]. Organic dust is another occupational health hazard which Jordanian Household Refuse workers in Jaresh and Souf Regions suffer from.

This study showed that 44.7% of respondents have experienced sore throat and cough, and 25% have suffered from shortness of breath. This result is higher than that reported in Bombay and carried out by Konnoth in 1991 at 25% regarding sore throat and a similar result regarding the shortness of breath (dyspnea) at 26%, Konnoth N [75].

4.3.2 Age categories

5.2.1 Age and work related diseases using cross tabulation showed that age is a significant parameter in relation to skin disease, sore throat, cough and high temperature. It also showed that age is not significant with the use of protective measures, personal hygiene, and work related accident and health care. The study showed that Refuse workers with middle age are statistically significant at

a chi-square (9.789), with a degree of freedom (3), and a *P*-value (0.020), in relation to suffer from skin disease. It also showed that it is statistically significant at a chi-square (10.587), with a degree of freedom (3), and a *p*value (0.014), that Refuse workers suffer from sore throat, cough and high temperature (Figure 1). Middle age workers are more susceptible to work related diseases, such as skin disease, sore throat, cough and high temperature. They have low level of education (the study showed that only 3.4% have finished university), ignorant and careless in collecting Refuse. Practically, all Refuse workers regardless their age, are prone to work related diseases. They have been seen collecting Refuses with their hands, and no protective measures have been taken. Refuse workers are potential to upper airway inflammation due to exposure to concentration of organic dust as proven in a study conducted in Netherlands, Wouers [76] and by Jorgen Thorn in a study conducted in Sweden, Thorn [77].

4.3.3 Age and cause of injury

Statistically, there was only one cause of injury which was significant with age between other causes discussed in this study. Figure (2) showed that lifting overcapacity was the only significant factor found through cross tabulation at a chi-square (8.4333) with a degree of freedom (3) and at a *p*value (0.038). Refuse workers with middle age; feel that they are strong, with good muscle power, stronger than older ones, and less patience (they want to finish collecting Refuses as soon as possible without delay). The majority of Refuse workers with middle age start their duty early, so they can finish early. For example, instead of doing 10 rounds for in collecting Refuse, they do 3 to 4 rounds by putting more Refuses in the trolley than their tolerance, and the incident of lifting over capacity increases.

4.4 Monthly income

4.3.1 Monthly income and work related diseases Monthly income is another parameter which affects Household Refuse collector's health and safety. Using cross tabulation with protective measures, personal hygiene, work related diseases, work related accidents, cause of injury, health care and working conditions. The study showed that monthly income is statistically significant with shortness of breath and joint twisting. Refuse workers with higher salaries have better chances of buying protective measures. Household Refuse workers can buy face masks to protect themselves from Refuse dust, hand gloves, overalls and rubber boots to protect themselves from direct contact with Refuse material and contagious trash. It also allow them to do routine medical checkup, including visiting a specialist and to do lab tests in case they suffer from work related diseases or accidents. They also can have better nutrition and so better immunity. In Jordan, salaries are ranged between 300-400 Dinar per month. Better salaries mean better chances of treatment and better protection from work related accidents and diseases.

4.5 Education levels

Education level is another parameter which was cross tabulated with protective measures, personal hygiene, work related diseases and accidents, cause of injury, health care and working conditions. There was statistical significant relationship between education levels and hit by sharp object, lacerated head or arm, fractured teeth, foot twisting, bathe after work, wash hands with antiseptics, and the use of accessories. The study showed that Refuse workers with primary and preparatory levels of education; have shown more work related accidents than other levels of education.

4.5.1 Education levels and cause of injury

Refuse workers with higher education seem to be less incident sufferings. They are more aware of the potential hazards and the health impacts related to Refuses collecting methods. this research shows that Refuse workers with primary and preparatory levels of education; have more injuries relating to sharp objects, while Refuse workers with higher education (high school) have shown less contact with sharp objects. Hit by sharp objects was the only significant factor which was found through cross tabulation between education levels and cause of injury (such as stuck with hard objects, fallen down while pulling or pushing the Refuse trolley, lifted overcapacity, pricked by hypodermic needles and contact with harmful chemicals).

4.5.2 Education levels and work related accidents

Education levels were cross tabulated with work related accidents. It showed that some factors are statistically significant, such as twisted ankle at a chi-square (13.587), with a degree of freedom (5), and at a *P*-value (0.018); lacerated head or arm at a chi-square (34.013), with a degree of freedom (5), and at a *P*-value (0.001) and a fractured teeth at a chi-square (15.665), with a degree of freedom (5) and at a *P*-value (0.008).

Refuse workers spent most of the working hours standing on their feet, walking around collecting Refuses, and pulling or pushing the filled trash trolley. Such workers are potential to slip down, lacerate their hands and hurt themselves.

4.5.3 Education levels and health care

Household Refuse workers with higher education are more aware of the health hazards if no personal hygiene is taken. They can bathe after work; wash their hands thoroughly with antiseptics whenever been in touch with Refuse material, and less uses of accessories while on duty. These significant factors allow

Refuse workers to be healthier, more care to their personal hygiene and less transmitting of pathogens and microorganisms to their parents and friends. It is statistically significant at a chi-square (19.553), with a degree of freedom (10), and at a *p*-value (0.034) that Refuse workers with higher education showed more interests and more attentions to their hygiene. So, education factor in this regard plays a positive parameter in relation to hand wash with antiseptics. Bathing after work is another important factor in health and safety protocols. It is statistically significant at a chi-square (38.587), with a degree of freedom (10), and at a *p*-value (0.000). This factor decreases the possibilities of transmitting pathogens and microbes from Refuse workers to their families, parents and friends.

Chapter Five

Conclusions and Recommendations

5.1 Conclusion

Ways of solid Refuse disposal, isolation, separation, collection and disposal of the Refuse need to be re-addressed, evaluated, managed properly and further surveys and recommendations to be carried out. In conclusion, the majority of Refuse workers in Jaresh and Souf Regions were careless, ignorant in relation to personal protective measures (face mask, shoe covers, rubber boot or overall), and not adhered to health and safety protocols. The study findings showed that the majority of Refuse workers have suffered from different types of injuries, diseases and diseases like symptoms. Work related diseases and accidents were analyzed. It showed that Household Refuse workers in Jaresh and Souf Regions have more suffering of sore throat, cough, high temperature, backache, diarrhea and bloody stool, shortness of breath, skin diseases, twisted ankle and a muscle tear. It also showed that Household Refuse workers in both Regions have higher incidence of falling down while pulling or pushing the Refuse trolley, stuck with hard objects and pricked by hypodermic needles. In relation to personal hygiene, work satisfaction and working conditions, the study findings showed that Refuse workers have shown interest in their hygiene. In addition, it showed that nearly half of workers were satisfied in their jobs despite the stressful work conditions (unavailability of rest room, bathrooms, showers, and a place to eat). Using cross tabulation in analyzing the results of the study, the study findings showed that middle age people are more potential to injuries and diseases. Moreover, the Refuse workers with higher salaries and higher education were less suffering of injuries and diseases.

5.2 Recommendations

To ensure health and safety of Refuse workers, this study recommends the following:

5.2.1 Safety at work

1. The employer should provide education about personal hygiene; explain to the Refuse workers the importance of good hand washing technique, and the importance of showering as soon as possible.
2. Provide Refuse workers with protective measures, such as gloves, face masks, overalls, and rubber boots. This was recommended by 81.8% of the surveyed Refuse workers.
3. Provide Refuse workers with rest area, provided with water for drink, toilets, bathrooms to shower before go back home at the end of duty, cloth changing room, and a suitable place to eat. This option was recommended by 35.9% of Refuse workers, who were surveyed in this study.
4. Provide Refuse workers with routine medical checkup every 6 months. This option was requested by 50.2% of the surveyed Refuse workers, and must be reinforced by their employers.
5. Provide Refuse workers with routine laboratory investigations and Chest X Ray exams every 6 months, to ensure collector health and safety.
6. Vaccinate Refuse workers for hepatitis A and B and tetanus. This study showed that 60.8% of surveyed Refuse workers have being hit by sharp objects and 20.1% by hypodermic needles.
7. Refuse workers should ensure that Refuses collected to be lifted manually are as light as possible.
8. The employer should encourage team-lifting techniques to improve lifting of heavy items and decrease over-lifting of Refuses by Refuseworkers. This study showed that 37.4% of Refuse workers have suffered of over-lifting.

9. Development and establishment of registration systems of occupational accidents, diseases and exposures if possible. This study showed that 62.2% of Refuse workers have not informed the ministry of health of work related diseases or accidents.

5.2.2. Education and communications

1. The employer should adopt teaching programs among all levels of management, Refuse workers, supervisors and trash vehicle drivers; to raise awareness about health and safety.
2. Provide training programs at the onset of hiring, and on an ongoing basis to educate all Refuse workers, trash vehicle drivers, and managers about hazards, injuries, and their reduction and prevention
3. Educate Health and Environmental Management Sector in the municipalities, villages and camps about their responsibilities to ensure worker health and safety.
4. Increase public awareness by using video films, health and safety programs, and public health advertisement in participation with private and governmental radios and televisions. This would ensure proper disposal technique, and encourage public commitment in securing Refuses in suitable plastic bags.
5. Encourage participation between governmental health institutions, NGO's, and academic sectors, to do further researches focusing on health and safety among Household Refuse workers.

5.2.3. Equipment maintenance

1. The employer should maintain regular maintenance schedule to trash vehicles, e.g. on monthly basis.
2. Apply mechanical washing equipment at each trash vehicle. This allows washing the trash vehicle after each use, and prevents the necessity of direct contact with cleaning chemicals.

3. Provide the wheeled trolleys with regular maintenance. This would decrease the potential hazard of fallen down while pulling or pushing the Refuse trolley. This study showed that 35.4% of surveyed workers have suffered from fallen down while pulling and pushing the Refuse trolley.

5.2.4. Recommendations to do a perfect job

Refuse workers should feel secure financially. The following recommendations were made by the surveyed Refuse workers in their response to Q112 in the questionnaire

1. Pay monthly salary on time
2. Increase salary according to the standard of living
3. Provide job security
4. Provide hazard pay
5. Provide Civil Service Law
6. Provide Medical Insurance to worker and his family
7. Provide Pension Fund

Next step.

This document is an initial step toward improving occupational and environmental health and safety in domestic waste systems. It provides a broad view of the issues—enough to make it clear that the health and safety risks are compellingly significant. International waste management, health, and Development agencies are recommended to take immediate and serious action. Most importantly, they need to:

- Support studies that would provide more insight on the magnitude of the health and safety problems in developing countries and their causes;
- Ensure that private sector participation through contractual or licensing arrangements in developing countries requires private operators to provide health and safety protection for their workers;

- Establish mechanisms of financial and technical support for municipalities to provide health and safety protection for their workers and encourage national governments to develop a policy framework;
- Finance improved disposal systems, closure of open dumps, provision of health and safety gear, and education on health and safety.

5.3 Suggestion for further work.

- this study should be extended to include other regions.
- Further study should be focused in the soled waist and its impact in the environment.
- It would be very useful to also extend this study to include the effect and health hazards facing the waist pickers and ways to support recycling without impacting on the health of those who make living from waist picking

5.4 Long-Term Overview

A reduction the quantity of solid wastes being generated is a primary way of reducing environmental and occupational health effects of domestic waste management. Education is needed to promote manufacturing technologies and consumer practices that generate less waste.

Source segregation of recyclables leads to the highest recovery of clean and high-grade materials. However, it comes with a relatively high educational requirement to change the public's behavior at the source, as well as with additional collection costs. Collection of recyclables from each household could be made safer if the bins were well designed to ease sorting, or the bags were transparent to enable viewing of sharp metal and glass objects.

If the quality of the incoming waste is not carefully controlled at the source to be free of hazardous wastes, the resulting compost may have heavy metal and organic chemical components which are injurious to soil structure, toxic to plants, and potentially carcinogenic if bio accumulated through the food chain.

To avoid potential toxicity, compost product needs to be analyzed prior to distribution, to be sure that recommended limits for selected constituents are not exceeded.

Pathogens survive in solid waste according to their natural tendency, overall moisture content and temperature of the waste deposit. Some pathogens (such as *Trichuristrichiura*, *Taeniasaginata*, and *Ascarislumbricoides*) can survive at infective stages of their life cycles outside their host for months, even in a land disposal site unless there is open burning or underground fires .

Composting is one way to destroy pathogens, depending on the temperatures achieved and maintained within the composting piles. *Ascaris* eggs are considered the hardiest survivors and are useful for monitoring compost quality. Pathogen larvae tend to move to the cooler parts of the compost pile. Depending on the temperatures achieved and maintained, most insect eggs and larvae are destroyed. Fly larvae cannot survive temperatures above 50oC. For complete pathogen destruction, all parts of a compost waste pile would need to spend several hours at temperatures above 60oC, or between 50oC and 60oC for at least 7 days \33,103\. All land disposal sites that are open dumps or controlled landfills should eventually be closed, and new sanitary landfills implemented (unless there is a market for compost to absorb the incrementally higher cost of composting). It takes a minimum of four years to site, design and implement properly a new sanitary landfill including efforts to involve the public through local consultations. Costs for new landfill facilities typically will increase overall solid waste management costs by 15% to 30%, given that most developing countries currently have no disposal cost because of their open dumping practices.

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Appendix

الرقم	الوزن	
1	A001	التاريخ :
2	A002	المحافظة :
3	A003	مكان التجمع السكاني
4	A004	نوع التجمع السكاني: 1 مدينة 2- قرية 3- مخيم
5	A005	عمر العامل :
6	A006	الجنس : 1- ذكر 2- انثى
7	A007	مكان الإقامة الدائم: 1 مدينة 2- قرية 3- مخيم
8	A008	التحصيل العلمي: 1- غير متعلم 2- ابتدائي 3- إعدادي 4- ثانوي 5- جامعي 6- غير ذلك
		الوضع الاجتماعي والاقتصادي للأسرة
9	B001	دخل الاعمال الشهري
10	B002	مصدر المياه التي تستخدمها في البيت
		ظروف العمل
11	C001	مكان العمل : 1 مدينة 2- قرية 3- مخيم
12	C002	وقت الروام 1- صباحا 2- مساء 3- ليلا 4- غير ذلك
13	C003	كيفية الروام : 1- مياومه 2- دوام جزئي 3- دوام كامل 4- غير ذلك
14	C004	نوع العملك 1- نذافة في الطرقات 2- سائق سيارة 3- تحميل وتنزيل 4- غير ذلك
15	C005	هل ليكتا مينصحي : 1- نعم 2- لا
16	C006	إذا كانت الاجابة نعم حدد نوع التامين؟ 1- حكومي 2- وكالة غوث 3- نامين خاص
17	C007	هل لقامة التتيجمعها قمامة تجارية؟ 1- نعم 2- لا
18	C008	هل لقامة التتيجمعها قمامة صناعية؟ 1- نعم 2- لا
19	C009	هل لقامة التتيجمعها قمامة طبية؟ 1- نعم 2- لا
20	C010	هل تستخدم مكركتور؟ 1- نعم 2- لا
21	C011	هل تستخدم مربة جر؟ 1- نم 2- لا
22	C012	هل تستخدم في جمع القمامة مترك؟ 1- نعم 2- لا
23	C013	هل تستخدم في جمع القمامة مهيارة ضاغطة؟ 1- نعم 2- لا
24	C014	هل تستخدم في جمع القمامة مهيارة ذات حاوية متحركة؟ 1- نعم 2- لا
25	C015	هل تستخدم في جمع القمامة مهيارة ذات حاوية ثابتة؟ 1- نعم 2- لا
		اسئلة تتعلق بوسا نالوقاية
26	D001	هل تلبس قفازات واقية اثناء العمل؟ 1- نعم 2- لا
27	D002	هل تلبس غطاء خاص للرأس؟ 1- نعم 2- لا
28	D003	هل تلبس حذاء خاص؟ 1 - نعم 2- لا
29	D004	هل تلبس قناعا او قناعا للفم؟ 1- نعم 2- لا
30	D005	هل تلبس مريول خاص اثناء العمل؟ 1- نعم 2- لا
31	D006	هل تغسل يديك بمواد مطهرة اثناء العمل؟ 1- نعم 2- لا
32	D007	هل تغسل ملابس العمل في البيت؟ 1- نعم 2- لا
33	D008	هل يتم استعمال مواد مطهرة في تنظيف ملابس العمل؟ 1- نعم 2- لا
34	D009	هل تتناول اطعاما كفيما كان عملك؟ 1- نعم 2- لا
35	D010	هل اذارت شخص خاص عزيز اثناء العمل تصافحه؟ 1- نعم 2- لا
36	D011	هل تستخدم اغراضك الشخصية اثناء العمل (التلفون، نظارة، شنطة)؟ 1- نعم 2- لا
37	D012	هل تستخدم بعد الانتهاء من العمل؟ 1- نعم 2- لا
38	D013	هل تشارك زملاء العمل الاغراض الوقائية؟ 1- نعم 2- لا

			اسئلة تتعلق بالاجابات اوجدت
E001	39	اذا كان الجو ابغى فكم مرة حدث معك ذلك خلال ال 12 شهر الماضية؟	
E002	40	هل شكيت من صعوبة في التنفس خلال ال 12 شهر الماضية؟	
E003	41	اذا كان الجو ابغى فكم مرة حدث معك ذلك خلال ال 12 شهر الماضية؟	
E004	42	هل اشتكيت من السعال او التهاب في الحلق او ارتفاع في درجة الحرارة خلال ال 12 الشهر الماضية؟	
E005	43	اذا كان الجو ابغى فكم مرة حدث ذلك خلال ال 12 شهر الماضية؟	
E006	44	هل شكيت من امراض معوية؟	
E007	45	هل تعرضت لدخان المحار قاتناء عملك؟	
E008	46	هل شكيت من صعوبة في السمع اثناء عملك؟	
E009	47	هل تترجى ان تنزل الارتفاع عن حركه السيارة؟	
E010	48	هل سقطت من السيارة اثناء جمع القمامة؟	
E011	49	هل شكيت من الفيال العمود الفقري؟	
			سبب الاصابة
F001	50	هل حدثت معك ارتطام بجسم صلب؟	
F002	51	هل حدثت معك عشر اثناء العمل؟	
F003	52	هل حدثت معك جرح نتيجة الاتصال بجسم حاد؟	
F004	53	هل حملت اكثر مما تحتمل اثناء العمل	
F005	54	هل تعرضت لدرجة حرارة عالية او منخفضة جدا اثناء العمل؟	
F006	55	هل حدثت معك تلامس مع مواد كيميائية اثناء العمل؟	
			نوع الاصابة
G001	56	هل حدثت معك التواء في القدم في ال 12 الفاتته؟	
G002	57	هل حدثت معك المشد في المفاصل اثناء ال 12 شهر الفاتته؟	
G003	58	هل حدثت معك خلع او انزلاق في المفصل؟	
G004	59	هل حدثت جرح قطع في الراس او الجسك؟	
G005	60	هل حدثت معك تمزق عضل في ال 12 شهر الاخير؟	
G006	61	هل حدثت معك كسر في الاسنان او الفم في ال 12 شهر الاخير؟	
G007	62	هل حدثت معك خدش في ال 12 شهر الاخير؟	
G008	63	هل حدثت لك كسور في ال 12 شهر الماضية؟	
			اسئلة تتعلق بالامور الفنية والادارية
			في حال لاكثر من متل حادث او مرض اثناء عملك خلال ال 12 شهر الماضية كما ورد في الاسئلة السابقة، ارجو الاجابة على الاسئلة التالية .
H001	64	هل تمانى غوزارة الصحة بذلك من خلال لتعبئة استمار خاصة؟	1- نعم 2- لا
H002	65	هل تمانى سالك العلاج جفير مركز طبي خاص؟	نعم 2- لا
H003	66	هل تمانى سالك الى عيادة خاصة؟	1- نعم 2- لا
H004	67	هل تمانى سالك الى طبيب خاص؟	1- نعم 2- لا
H005	68	هل تمانى عطاء العلاج اللازم؟	1- نعم 2- لا
H006	69	هل تمانى عطاء كاجازة مرضية؟	1- نعم 2- لا
H007	70	هل تمانى لفحوصات مخبرية لك؟	1- نعم 2- لا
H008	71	هل تمانى ماصور اشعة لك؟	1- نعم 2- لا
H009	72	هل تمانى تطعيم ضد التهاب الكبد الفيروسي؟	1- نعم 2- لا
H010	73	هل تمانى تطعيم ضد مرض الكزاز؟	1 نعم 2- لا
			اسئلة تتعلق بيئته العمل

هل يتوفر استراحة العمال أثناء العمل؟	I001	
هل يتوفر في مكان الاستراحة مكان خاص للاكل؟	I002	
هل يتوفر في مكان الاستراحة مياه صالحة للشرب؟	I003	
هل يتوفر في مكان الاستراحة مرآة؟	I004	
هل يتوفر في مكان الاستراحة مكان خاص للاستحمام؟	I005	
هل يتوفر في مكان الاستراحة مكان خاص لتغيير الملابس؟	I006	

	Code	No.
Date	A001	1
Province	A002	2
Place of resident	A003	3
Kind of resident is it 1- city 2- village 3.camp	A004	4
Age of worker	A005	5
Sex of worker 1- Male 2- female	A006	6
Place of permanent resident 1- city 2- village 3- camp	A007	7
Level of education 1-not educated 2primary 3- secondary 4- third level 5- university 6- none of them	A008	8
Social and economic statues of the family		
Income monthly	B001	9
Source of water to the house	B002	10
Work condition		
Please of work 1- city 2- village 3- camp	C001	11
Time of work 1- morning 2- evening 3- night 4- none of	C002	12
Way of work 1- casual 2- parte time 3- full time 4- none of	C003	13
Kind of work 1- street cleaning 2- driver 3- -1loading and unloading 4- none of 4	C004	14
Do you have health insurance 1- yes 2- no	C005	15
If answer yes please specify1- private 2- gov. 3- un insurance	C006	16
is the waist commercial 1- yes 2- no	C007	17
is the waist industrial 1- yes 2- no	C008	18
is the waist medical 1- yes 2- no	C009	19
Do you use carton 1- yes 2- no	C010	20
Do you use caret for collection 1- yes 2- no	C011	21
Do you use Turk fogg collection 1- yes 2- no	C012	22
Do you use special brusher car 1- yes 2- no	C013	23
Do you use car with removable pin for collection 1- yes 2- no	C014	24

Do you use car with non removable pin for collection	1- yes	2.no	C015	25
Question regarding was of prevention				
Do you wear cloves	1- yes	2- no	D001	26
Do you wear head cover	1- yes	2- no	D002	27
Do you wear special shoes	1- yes	2- no	D003	28
Do you wear face cover	1- yes	2- no	D004	29
Do you wear overall	1- yes	2- no	D005	30
Do you wash your hand with antiseptic	1- yes	2- no	D006	31
Do you wash work cloths at home	1- yes	2- no	D007	32
Do you wash work cloths with antiseptic	1- yes	2- no	D008	33
Do you eat at work place	1- yes	2- no	D009	34
If you see someone you know do you shack hand with him	1- yes	2.no	D010	35
Do you use your personal belonging like g , mobile at work	1- yes	2.no	D011	36
Do you take a shower after work	1- yes	2- no	D012	37
Do you share your preventive gar with your colleagues	1- yes	2.no	D013	38
questions regarding the answers				
If the answer is yes how many time this happened to you in the last 12 months			E001	39
Do you suffer from breathing difficulties in the last 12 months			E002	40
If the answer is yes how many time this happened to you in the last 12 months			E003	41
Do you suffer from long infection in the last 12 months			E004	42
If the answer is yes how many time this happened to you in the last 12 months			E005	43
Do you suffer from diseases in the last 12 months			E006	44
Do you counter smock at work			E007	45
Have you suffered from hearing difficulties			E008	46
Dos the vibration and noise form cars bothers you			E009	47
Did you fail from care at time of work			E010	48
Have you suffered for back pain ?			E011	49
Cause of injury				

Did you have impact with solid items	F001	50
Did you stumble at time work	F002	51
did you have any injury from a sharp objects	F003	52
Did you carry over load	F004	53
Have you counter extreme heat at time work	F005	54
Did you touch any chemical things at time of work	F006	55
Kind of injury		
Dos it happened to you twisted ankle in the past 12 months	G001	56
Dos it happened to you pain in joint in the past 12 months	G002	57
Dos it happened to you dislocation and brick of joint in the past 12 months	G003	58
Dos it happened to you head injury in the past 12 months	G004	59
Dos it happened to you mussels problems in the past 12 months	G005	60
Dos it happened to you broken tooth in the past 12 months	G006	61
Dos it happened to you twisted ankle in the past 12 months	G007	62
Dos it happened to you bone broken in the past 12 months	G008	63