CHAPTER– I
INTRODUCTION

1.1 Background of The Study

Occupational health should aim the promotion and maintenance of the highest degree of physical, mental and social well-being of departures from health causes by their working conditions the protection of workers in their employment from risk resulting from factors adverse to health the placing and maintenance of the worker in an occupational environment adapted to his physiological and physiological equipment and summarize the adaptation of work to man and each man to his job. (ILO/WHO, 1950)

Technically, solid wastes also refer to liquids and gases in containers. If solid wastes are not managed properly, they can have an adverse impact on the environment, and public health arising from contamination of oil water and pollution of air through spread of diseases via vectors living on waste (Garg, 2002). The relationship between public health and the improper storage, collection and disposal of solid wastes is quite clear. The US Public Health Services (USPHS) has published the results of a study tracing the relationship of 22 human diseases to improper solid waste management (Hack, 1967).

All human activities, domestic, commercial, industrial, healthcare, and agriculture generate solid waste. The quantity and nature of waste vary with the level of technological development in a country (Garg, 2002). Solid Wastes are also defined as all wastes arising from human and animal

activities that normally solid and are discarded as useless or unwanted (Tchobanoglous *et. al*, 1993).

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), 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, 2002). Based on Health Studies of waste pickers conducted in India, tuberculosis, bronchitis, asthma, pneumonia, dysentery, parasites, and malnutrition are the most commonly experienced diseases among waste pickers conducted in Bangalore, Manohar, and New Delhi (Huisman, 1994).

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, 1995). Waste collectors collect wastes 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.

Municipal solid waste is produced as a result of economic productivity and consumption. Countries with higher income produce more waste per capita and per employee, and their wastes have higher portion of packing materials and recycling wastes. In low-income countries, there is less commercial and industrial activity, as well as less institutional activity, thus resulting in lower generation rates.

Integrated solid waste management (ISWM) is a term applied to all activities associated with the management of society's waste. The basic goal of ISWM is to manage society's waste in a manner that meets public health and environmental concerns and the public's desire to reuse and recycle waste materials (Palnitkar, 2000). An organized program for solid waste management in urban areas is essential and an institutional planning is the key to achieving an acceptable and affordable system. The responsibility for waste collection in the Biratnagar Municipality is divided between the municipalities, towns or village councils and UNRWA in the refugee camps. There are common methods for waste disposal in the district. Municipal or village waste is disposed in waste dumps, or open dump sites, and a large amount of individual waste 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 waste operations and have made no attempt to encourage re-use and recycling of materials. Lack of public cooperation is significant obstacle to effective solid waste management, and increased the potential to health hazards.

The "Municipal Solid Waste" includes commercial and residential wastes generated in municipal or notified areas in either solid or semi-solid

form excluding industrial hazardous wastes but including treated biomedical wastes (Ministry of Environmental and Forests, India, 2000).

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 Nepal, the health-related understandings of solid waste management still need to be addressed; even the minimal regulatory framework, which exists for environmental protection and occupational health, and safety, is not enforced.

Waste collectors in Nepal use old equipment and virtually no dust control or worker protection. Collection workers in Nepal have direct contact with solid waste and dusts are exposed to more potential particulates, toxic materials and infectious microorganisms. They are exposed to a wide variety of risks. Waste collectors 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 waste collection trucks traveling to and from disposal sites, dust from disposal operations, and open burning of waste, all do contribute to occupational health problems.

The estimated increase in the amount of emissions uses the WHO standards amounts to 0.1573kg of Carbon Mono Oxide (CO), 0.0162kg of (Sulfur Oxide (SOx), 0.0178kg of Nitrogen Oxide (NOx), and 0.0223kg 0f Volatile Organic Carbon (VOC) per kilometer driven. The quantities of solid waste generated in urban areas are higher than those generated in rural

areas. The per capita solid waste generation rates in the West Bank were estimated from several studies. These studies showed figures in a range of 0.5 to 1.0kg waste per capita per day. It is estimated that approximately 500 thousand tons of domestic waste is generated yearly in the West Bank, i.e. about 1,370 tons per day (Ghanayem, 2001).

Municipal waste is produced as a result of economical productivity and consumption. It includes non-hazardous wastes 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 leach ate and gas management system (Cointreau, 2004).

During the period of unification of modern Nepal "Marata Policy" was implemented to protect the family of those soldiers whom dead in the war (Bhatrai 178) after establishment of the democratic system in Nepal 2007 B.S. Governments wanted to improve policy on civil servant. The first civil servant Act, 2013, was implemented which is the milestone of modern civil servant field in Nepal. That act determined so many provisions on the interest of civil servant. After 2046 B.S. reestablished democratic system changed civil servant act 2049 and civil service rule 2050 is implemented.

Finally there is lack of such kinds of studies focusing on the occupational health of civil servant. In order to motivate and protect their occupational health and safety such kind of study is essential similarly in light of the conditions described above the need to study, understand and learn about these civil servant's special health problem that hardly need to be emphasized.

1.2 Statement of The Problem

Solid waste collector are continuously engaging in one or more risk factors such as wearing short-sleeved-shirts, shirt with no sleeves, no gloves, no rubber boots and limited face, neck and eye protection. The majority of studies that have been conducted show that workers are easily exposed to more potential particulates, toxic materials and infectious micro-organisms. If unprotected, which is routinely seen workers could suffer health effects such as skin aging tuberculosis, bronchitis, and malnutrition. Due to these reasons I would like to research on the topic entitled, "Investigation of Occupational Health and Safety Hazards among Solid Waste Collectors in Biratnagar Municipality".

1.3 Objectives of The Study

Following are the specific objectives of this study:

1. To identify the types of occupational injuries associated with the process of waste collecting
2. To assess occupational disease and symptoms associated with the process of waste collecting.

1.4 Significance of The Study

There have been very little researches on occupational health of civil servants in Nepal and designing of protective and preventing equipment for them. In our country, there is lack of the study on occupational health and safety in civil service sector. Hence this study is challenging one. Following are the significances of the study:

1. This study is helpful to these students who are involved in studying the current health status and situation of solid waste collectors.
2. It will be helpful to the public administration and health education student.
3. It will be helpful to the Government of Nepal ministry of General administration, civil servants unions, lawyers and other related fields or sectors.
4. To create the awareness of occupational health and safety in the work places.
5. Environmental and occupational hazards to the civil servants should be addressed.
6. Encouraged them to solve this problem by making and implementing plan of action.
7. It gives new vision about occupational health and safety in civil service in Nepal.
8. Its positive and Negative effect on their health status.

1.5 Delimitations of The Study

This study is subjected to the following delimitations:

1. This study is limited with in the Biratnagar municipality; it is a small and specific area, so its finding may not be generalized in national level.
2. This is mainly concentrated on the socioeconomic position and occupational health status on relation to solid waste collector workers, of Biratnagar municipality.
3. This data is based on the study among the population of general civil servants excluding the population working in solid waste management sector.

4. The secondary data are not tasted so it may affect the whole study.
5. This study is limited with common occupational health Hazards of the whole civil servant and it does not study the specific problems.

1.6 Definition of The Terms Used

Environmental sanitation: It means the control of these factors in man's surrounding which cause or may cause adverse effects on his health items like office human excreta disposal; drainage drinking water, garden surrounding the office refuse disposal etc. are included in environmental sanitation.

Fungus: Fungus is the various types of plants without leaves or lowers and containing no green coloring fungi usually grow on the other plants or in the cold and old age room.

Health status: Current health status of civil servant.

Health service: It refers to all those personal and community health services including primary care medical care and health education.

Healthful environment: The promotion maintenance surroundings organization of day experience and planned learning procedures to influence favorable emotional, physical and social health.

Job stress: Stress refers to an individual's reaction to a disturbing factor in the environment. Stress is defined as an adaptive response to an external situation that results in physical, psychological and behavioral deviations for organizational participants.

Occupational health: Occupational health is concerned with health in its relation to the working environment.

Occupational injuries: Deaths, personal injuries and disease resulting from work accidents, (ILO year book of labor statistics 1989).

Occupational environment: Occupational environment is meant the sum of external conditions and place of work and which have a bearing on the health of the working population.

Public employees: Organization means any organization, however, composed, the purpose of which is to further and defined the interests of public employee.

Social security: The concept of human dignity and social justice. It refers to a genuine and rational economy of human resources and values. The most common contingencies, which are covered by schemes of social security, like sickness, maternity, employment injury, unemployment, old age or death. The benefits provided by social security program to meet these contingencies.

CHAPTER – II
REVIEW OF RELATED LITERATURE

In this section of the study, the investigator reviewed some opinions, principles, studies and their findings, conclusion and recommendations which will be referential (contemporary) to the present study this section is divided into three parts. The related literature is studied in term's theoretical literature, empirical and conceptual framework.

2.1 Theoretical Literature

In developing countries, the waste sorting activities are typically conducted in micro and small-scale enterprises, with old equipment and virtually no dust control or worker protection. The waste collected is seldom stored in a plastic or metal container and covered with a lid. Sometimes, the waste is placed on the ground directly, thus requiring being shoveled by hand, or it is left in an open carton or basket to be picked by hand. In either case, the waste awaiting collection is readily available to insect and rodent vectors and scavenging animals. So, collection workers have significantly direct contact with solid waste, 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, 1996). Airborne contamination is also one of the greatest threats to solid waste workers and

waste pickers. Air monitoring needs to be regularly conducted at all land disposal and solid waste handling facilities. Direct reading instruments which measures methane and oxygen deficiency are of primary importance, and include combustible gas indicators, flame ionization detectors, and oxygen meters (National Institute for Occupational Safety and Health, 1985).

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, 1989).

All wastes are required to be fully contained, either in a covered metal or plastic pin, 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 waste collectors was. Several studies on waste collection movements have demonstrated that mechanical loads on the skeleton frequently exceeded maximum acceptance limits recommended; throwing waste bags results in high shear forces on the spine, and carrying loads results in excessive torque to the shoulder (Poulsen, *et al,* 1995).

Occupational accidents are very frequent among waste collectors. Based on current knowledge, it appears that risk factor should be considered as an integrated entity, i.e. technical factor (poor accessibility to waste, 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 waste collectors (Poulsen *et al*, 1995). In

Bangalore, waste pickers complained of musculoskeletal pain if they were engaged in sorting wastes in a sitting position and of backaches if they were carrying heavy loads of waste (van Eerd, 1995). In developing countries, there have been very few data available concerning the health impacts of exposure to domestic wastes and occupational injuries among domestic waste collectors.

In Nepal, no studies concerning domestic waste collectors were carried out, hoping this study will be the first step toward the development of health promotions of domestic waste collection, and in assessing both risk and effects of exposure, permitting better management of domestic waste, and in the planning of adequate protective measures.

Herein, some scientific studies, which was investigated and reported regarding occupational health and safety hazards:

The standards and norms for handling solid wastes in industrialized countries have reduced occupational health and environmental impacts substantially. Most waste collection in these countries involves vehicles with low-loading heights and easy to lift plastic containers or bags (Cointreau, 2004).

Livens, Lassen, Kaltoft and Skov conducted a study on 667 employees in the waste collection company that operates in Copenhagen, the capital of Denmark, in 1993, trying to find out the risk circumstances associated with injuries among waste collectors. Of the 667 employees at the company, 491 were waste collectors, 114(17%) experienced an injury 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 collectors. It also

explains the reduction of risk experiencing an injury with age, as high age was usually associated with high seniority (Ivens, *et al*, 1997).

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

In 1995, Poulsen and others conducted a study in Denmark, on waste collectors. Bio-aerosols were found as high as 106 and 107 cfu/m^3 at the loading hopper and that waste collector carrying containers to the curb were exposed to only 25% of the bi-aerosol count confronting collectors 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/m^3. The fraction of these bio-aerosols which were molds ranged from 77.5-98.5 (Poulsen, *et al*, 1995).

Cimino J.A. conducted a study on waste workers in New York City in 1975. The study showed that solid waste workers experienced 20% times more than that of all U.S.A. workers (148 injuries per 1million man-hours of solid waste 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 waste workers were experienced during waste loading (60%) and driving (30%), with over 60% of all injuries occurring during the latter part

of the work shift suggesting a fatigue factor. Injury reports indicated that nearly 50% of the New York collectors were either standing or bending when they were hurt. In a 20 year work period, the risk among New York collectors of suffering a fracture or dislocation was estimated to be about 7 in 10 (Cimino, 1975).

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 waste 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, 1996). In 1983, Gellin has conducted a clinical evaluation of the skin changes and injuries among refuse (waste) collectors 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 collectors sustained work-related injuries each year. Those injuries consisted mainly of sprains, abrasions and lacerations, fractures, and eye injuries (Gellin, 1985).

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 waste collectors, versus a group of workers in construction. He found that the solid waste 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 waste staff, versus only 33% of the total construction staff. Sick days consumed 0.7% of the total days among

solid waste staff, but only 0.5% among the construction staff (Meinel, 1994).

In 1990, Institute of Hygiene and Preventive Medicine at University of Genoa, studied infectious diseases of solid waste workers. Clinical examinations were conducted on 1396 solid waste 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 *et al*, 1991).

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 waste 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 reticulondular shadows. 95 solid waste workers reported experiencing continuous backache, neck ache, and wrist/ knee/ ankle joint pain (Konnoth, 1991). At the Calcutta's open dumps, about 180 waste 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 waste samples were analyzed from 33 Indian cities. Trichuris trichiura (human whipworm) and Ascaris Lumbricoides (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 waste collectors and a control group of similar socio-economic background revealed 98% of solid waste collectors were positive for parasites, while only 33% of the control group were positive (Bhide *et al*, 1984).

In Netherlands, Wouters and others conducted a study on 47 waste collectors and 15 controls, to compare respiratory symptoms and upper airway inflammation in domestic waste collectors and controls, and to find the association between measures of upper airway inflammation on the one hand and exposure concentrations of organic dust or respiratory symptoms on the other hand. Fieldwork was performed from June to September 1997. All subjects filled out a health questionnaire and underwent Nasal Lesage (NAL), before and after the work shift at the beginning and at the end of the week. Waste collectors show signs of increased upper airway inflammation and respiratory symptoms compared with control exposure to organic dust probably underlies the inflammation mediated by Europhiles that result in respiratory symptoms (Wouters, *et al.*, 2002).

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-veritably. 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 *et al*, 2002).

Heldal, Halstensen, Thorn, Edward and Halstensen conducted a study on 25 organic waste collectors, to examine work-associated lower airway inflammation in waste collectors by induced sputum and correlated with the bio-aerosol exposure. Waste collectors underwent induced sputum collection and pyrometer 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 end toxin than beta (1-3) glucan exposure, and no associations were found for mould spores or bacteria (Heldal, *et al*, 2003).

In 2001, a study was conducted in Taiwan. The study aimed to assess whether there is an excess of adverse health outcomes among Household Waste Collectors (HWCs) in Taiwan. The subjects were all current employees of the Household Waste Collection Department in the country of Kaohsiung, Taiwan. The questionnaire was completed by 533 HWCs and 320 office workers. The data indicated that household waste collection presents a risk for the development of chronic respiratory symptoms (cough, phlegm, wheezing, and chronic bronchitis), musculoskeletal symptoms (low back pain and elbow/wrist pain), and injuries caused by sharp objects (Yang, *et al*, 2001).

Jorgen Thorn, was conducted a study in two household waste collectors handling composting waste. The study aimed to asses exposures to airborne (1–›3)-B-D-glucan and antitoxin during different seasons among household waste collectors handling computable waste. The results show that the amounts of airborne end toxin 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, 2001).

2.2 Empirical Literature

A study entitled “How occupational health problems are handled in China” by change in 1980 illustrates that free and cheap cost health services are the core concern of china. Preventive medicine, regular health examination and industrial hygiene are the main focus areas.

Koirala (1986) studied in “Spatial” Distribution of waste polluted locations in Pokhra Municipal area. The distribution of waste was affected by the less understanding of the municipal dwellers to their less valuable materials in the roadside. The distribution of waste was not only in the low caste communities but it was also found in market area. The municipal government must think about the education for the low caste people and health facilities should be provided to them.

Puta (1994), in his study entitled “Occupational Health, safety and Gender” Illustrated that in Zambia, found high incidence of occupational disease and injury workplace illness can be exacerbated by infections and parasitic disease that are not occupational related. Socio-economic problems such as hunger poverty and lack of knowledge also impact on the nature and expect of occupational injury and disease, worldwide one

worker dies every three minute of an occupational injury or illness investigator mentions that workers are injured at the rate of 3 workers per second.

Dhakal, Som Nath (1995) in his study "A case study on solid waste Management in the context of urbanization of Bhaktapur municipality" has illustrated that the major problem created by the solid waste affect the environment of the municipality. The result of this is because of the lack of the people's awareness, in creating population and inadequate scientific technology for solid waste management.

Gauchan, (1999) pointed out that a survey conducted on – Status of women workers in carpet industry" has found that majority of workers had health problems such as headache, body pain, fever, gastric, cheats infections etc. The main causes were dust congested and lack of ventilation room and over work. Thapa (2001), on her study, entitled" Occupational health status of labor in B.I.D." illustrated that any occupational health hazards can be prevented with the proper and sufficient use of safety devices but all the labors not aware of its and all of them do not seem the necessary of using it. She found that mask is the most using device and the most need one too. There was not found the use of earmuffs but highly demand if it.

Bista (2000) attempted to study on ," Study of Carpet industry" found that the nature of employment of the carpet workers were temporary. The efficient and skilful labors were found in very limited number and such labors were favored by the owners and only such workers were found working in the same factory for long time.

Thapa (2002) has done “solid waste management of Dharan Municipality” She has done everything in excess became a problem. The same is the case with the waste management system. There should be restrictions and limitations impasse on waste management. The rapid growth of urbanization has attributed largely to the accumulation of waste and its improper management. But the fault also lies in the habits of the people. It is the people who generate the waste solid should be the people themselves who should take proper case of it.

Shrestha (2004) “Sanitary Facilities and their management and practice in the Secondary School of Bharatpur Municipality.” He said the types of daily waste products found in these schools included mainly papers leaves, wood, stones, bricks, plastic, etc. beside, send dust etc. are also found in these schools. The methods uses in these schools for refuse disposal are found in generation, dumping putting out the refuse by the help of municipality.

Various above studies have shown different findings regarding to the health hazards of labors. The problem can be reduced by giving necessary health facilities including rehabilitation and compensation as well. Good relation between employers can raise productivity. For this employers should provide regular health check-up, safety devices and others. In this study, the researcher tried to find out the health hazards of labors by the help of their self of worker, manager of the industry and other personnel of the industry.

In context of Nepal, the organization “Occupational security and health project in Nepal” has been working in the related field. Despite of the existence of “Ministry of labor” and labor court” of the preservation and

promotion of labors right, there are various drawbacks the due to the lack of formation of appropriate programs, rules, and regulations and their continuity as well.

This research has been carried out by feeling the necessity of improvement and finding this matter as a suitable for study. Moreover, from the glance of the previous studies done in occupational health, it was cleared that it is one of the changing matter in Nepal, where neither effective supervision nor special care has been given for improving the health conditions of labors that to make deep study and research in this subject.

2.3 Conceptual Frame-Work

There are no more literatures in the field of occupational health and safety. Different writers have referred different types of conceptual framework in the field of occupational health, environments and related literature and studies that investigator would like motioned the following conceptual framework according to the objectives of the study. In the above conceptual framework the employee or worker is the central concern of the study, therefore the main aspects the civil servants (employee) are should in the center in the framework. To maintain the sound occupational environment in office there six factors described above can play vital role to encourage and motivate the workers works in the office. These six factors are influences the occupational health environment of worker, which are interrelated in the following paragraphs.

2.3.1 Socio-Economic Factors

Socio-economic factors are the most important variables for the occupational health. Civil servants income level and his occupation can influence positively I these are relatively role to create the good relation between employer-employee, employee. Good remuneration, Housing facility of treatment support his economic condition. Thus good play, facility of treatment support his economic condition Thus good pay, housing facility medical treatment, relation between employer-employee, good family, relation indirectly support the civil servants occupational health.

2.3.2 Biological Factors

The other variables are biological factors workers may be exposed to infective and parasitic agents at the place of work. Unsafe drinking water in the cause of bacteriological agents, fungal infections, virus and a host of others are the biological factors of occupational health of civil servants.

2.3.3 Physical Factors

The physical factors are main factors of workers who work in office heat and cold. Light, ventilation, voice and vibration and electricity are main variable of working place. However, the work of Rao (1952, 1953) and Mukherjee et al. (1953) indicate that a corrected effective temperature of 69 to 80 degree F is the comfort zone in this country and temperatures above 80 deg. F. cause discomfort.

The worker may be exposed to the risk of poor illumination or excessive tightness. The acute effects of poor illumination are eyestrain, headache eye pain, Lachrymation, and congestion around the cornea and eye fatigue. Noise is a health hazard. The effects of noise are auditory and non-auditory, some governments office so noisy because of crowed If the working place should be well ventilation facility is another variable of physical factors.

2.3.4 Psychosocial Factors

Psychosocial variables are health safety education, social security job satisfaction, emotional tension and frustration, timely promotion reward and punishment, job security and good human relationship which may undermine both physical and mental health of workers. The capacity to different working environments is influenced by many factors such as education, culture background, family life, social habits and what the worker expects from employment.

The effects of psycho social hazards are aggressiveness anxiety, depression, tiredness, drug abuse sickness absenteeism, fatigue, headache, pain in the shoulders and neck and back peptic ulcer, hypertension, heart disease rapid aging.

2.3.5 Mechanical Factors

Generally in the government offices harmful and heavy machines are not used. Mechanical variables are distance between machine to machine structure and boundary of machine, electrical safety, and knowledge about

machinery and poor maintenance. Motor vehicles, copying machine, electrical and mechanical equipment and electromagnetic machinery. Motor vehicles are the greatest number of injuries. Mechanical hazards associated with electrical and mechanical equipment include poorly designed equipment, electrical shock and electronics well as chemical exposures.

2.3.6 Chemical Factors

The chemical variables are dusts gasses, metal and their compounds, ingestion and aerosol. In our government office dust is the most problematic variable. Dusts are finely divided soil particles with size ranging 0.1 to 150 microns. They are released into the atmosphere during crushing, grinding, branding, loading and unloading operations. Dusts particles larger than 10 microns settle down from the air rapidly while the smaller ones remain suspended indefinitely. Dust particles smaller than 5 microns are directly inhaled into the lungs and are retained there. Dust is mainly responsible for pneumoconiosis.

Ingestion of chemical substances such as Lead, Mercury, Zinc, Arsenic Chromium, Cadmium, Phosphorus etc. substances are swallowed in minute amounts through contaminated hands, food or cigarettes.

In aggregate, on the basis of above mentioned occupational frame work, it is regarded that all the variables are interrelated with each other which influence occupational health of the civil servants of Nepal. To maintain sound occupational environment in office these six factors described above can play vital role to encourage motivate the workers working to the office.

CHAPTER–III
RESEARCH METHODOLOGY

3.1 Research Design

A descriptive exploratory design has been used to study, assess and investigate the occupational health and safety hazards among domestic waste collectors in Biratnagar Municipality aiming at qualitative analysis using primary data.

3.2 Population

The targeted population was 350 waste collectors, which includes all domestic waste collectors, waste drivers, and their direct supervisors in Biratnagar Municipality. The study sample was 105. Non Probability Sampling Method (convenience sample) was used.

3.3 Sampling Procedure and Sample Size

Due to constraint of time and budget factors 30 offices were selected from 85 offices. The size of sample was 105 in this study. This size was taken from major municipalities, small municipalities and from camps. The sampling was done after preparing list of waste collectors. The list of waste collectors obtained from the Biratnagar Municipality. The numbers of employee were determined from “post registered book”. All employees were numbered, than employees were selected by lottery.

3.4 Tools of Data Collection

Interview schedule was used as tools and instruments for data collection. Interview schedule was used to collect necessary data from the employers and it was prepared including questions on different headings concerning occupational health and safety. The interview schedule includes the demographic characteristics and the personal information, such as the age of waste collector, marital status, and place of residence, level of education, monthly salary, position and type of work of waste collector.

3.5 Validation of Tools

The interview schedule was submitted to the Health and Population Education Department, according to the suggestion given by the supervisor and Department of employee welfare section, some questions were modified. Then the prepared tool was pre-tested in koshi zonal hospital in Biratnagar Municipality. On the basis of pretest, the tools were improved and finalized.

3.6 Data Collection Procedure

The target group was interviewed personally. Most of the domestic waste collectors 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.

3.7 Method of Data Analysis and Interpretation

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 our questions are at nominal or ordinal levels, we have used non parametric statistics like Chi-Square, to show the difference between the groups (age, place of residence, place of work, educational level, monthly income and district), 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-IV
ANALYSIS AND INTERPRETATION OF DATA

4.1 Introduction

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

4.1.1 Categories of Population

The data based on field survey reveals that out of 30 offices 88 male and 17 female altogether 105 respondents. The least number of population falls in the range 50 and above years of age are (n=8) 9.09% male and (n=2) 11.76% female.

Table 1: Sample distribution of solid waste collectors in relation to age categories

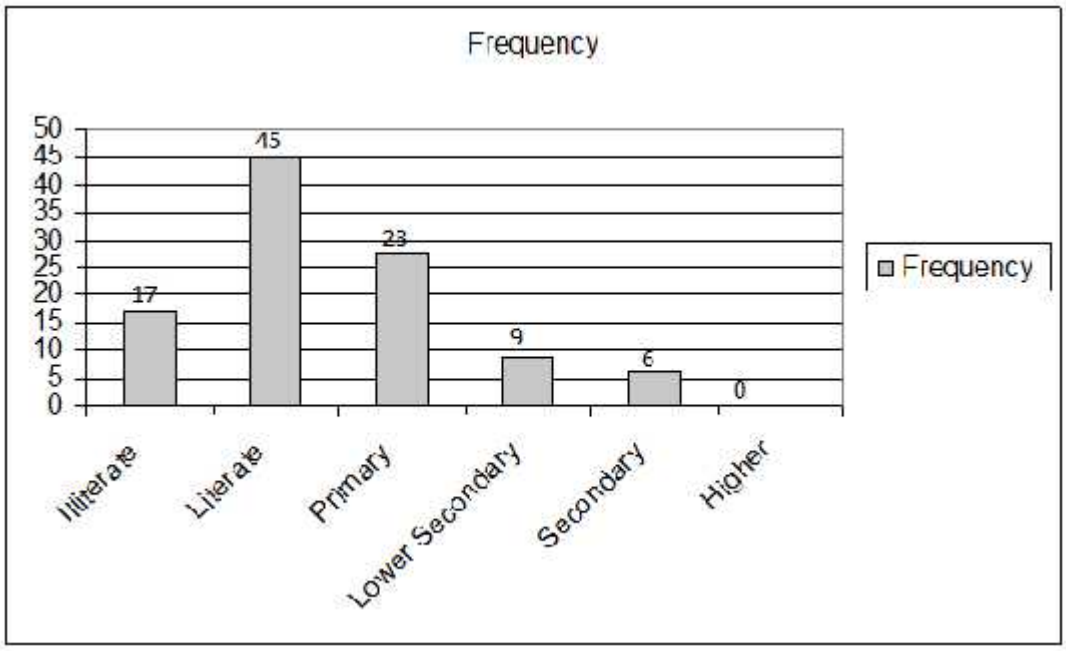
Age	Male		Female	
	Frequency	Percent	Frequency	Percent
20-30	42	47.73	9	52.95
30-40	23	26.14	4	23.53
40-50	15	17.04	2	11.76
50 & above	8	9.09	2	11.76
Total	88	100	17	100

In this study, domestic waste collectors 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 in 1993. The Danish study showed that the number of injuries decreased with increasing age. This is explained by the fact that the majority of waste collectors who was surveyed in this study were in the middle age. This is due to the socioeconomic and political condition in Nepal.

4.1.2 Education Level

Waste collectors with higher education are more aware of health hazards if no personal hygiene is taken. They can bathe after work; wash their hands thoroughly with antiseptics whenever in touch with waste materials, and less uses of accessories while on duty. These significant factors allow waste collectors to be healthier and more care to their personal hygiene.

Fig. No.1: Sample distribution of solid waste collectors in relation to Education level



The data shows that- 42.86% (n-45) of respondents were literate, 26.66% (n=28) had finished primary school, 8.5% (n=9) had finished lower secondary school and only 5.7% (n=6) of total respondents finished secondary school.

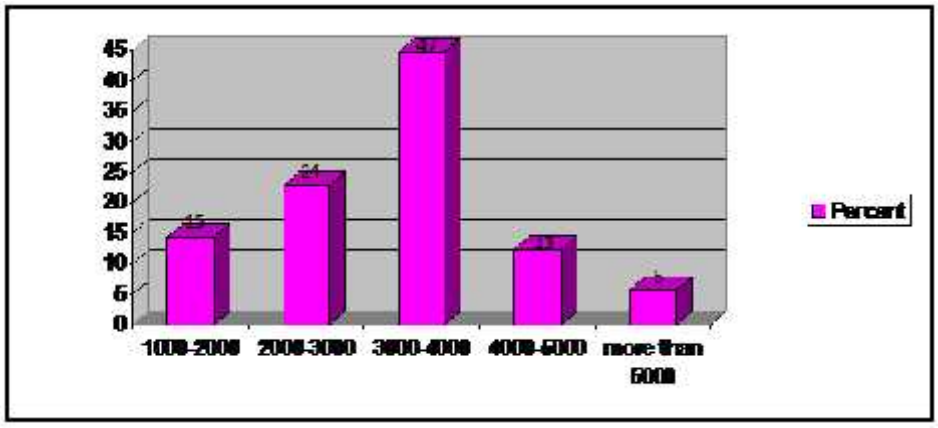
Education level is another parameter which was cross tabulated with protective measures, personal hygiene, work related diseases and accidents, cause of injury, health care and working conditions. There was statistical significant relationship between education levels and hit by sharp object, lacerated head or arm, fractured teeth, foot twisting, bathe after work, wash hands with antiseptics, and the use of accessories.

The study showed that waste collectors with literate and primary levels of education, have shown more work related accidents than other levels of education.

4.1.3 Socio-Economic Status of Respondents

Unfortunately there are no figures or studies concerning the per capita gross national product or gross domestic product for Biratnagar Municipality. Based on the World Bank official statistics, the overall economy in Nepal is characterized by a per capita GNP of $ 240 per year.

Fig No.2: Sample distributions of solid waste collectors in relation to monthly income



Salaries of solid waste collectors were put in five categories in a range of 1000 and more than 5000 Rupees per month. The result shows that 44.76% (n=47) of respondents had monthly income 3000-4000 rupees, 12.38% (n=13) of respondent had a monthly income of 4000-5000 and only 5.7% (n=6) of total respondents had a monthly income more than 5000 rupees per month.

Monthly income is another parameter which affects domestic waste 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.

Waste collectors with higher salaries have better chances of buying protective measures. Domestic waste collectors can buy face masks to protect themselves from waste dust, hand gloves, overalls and rubber boots to protect themselves from direct contact with waste 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. Better salaries mean better chances of treatment and better protection from work related accidents and diseases.

4.1.4 Sources of Water

Water needs for human beings for different purpose in different amount. In office water is used for drinking as well as cleaning purpose. There are different sources of water which we use daily such as rain water, river water, river, spring, well, tap etc.

Table 2: sample distribution of solid waste collectors in relation to sources of water

Sources of water	Frequency	Percent
Water piped	35	33.33
Tube well	70	66.67
Total	105	100

Two items were designed to assess sources of water used at home by solid waste collectors in Biratnagar Municipality. It shows that 66.7% of respondents use tube well water and 33.33% of respondents use water piped water as shown in table 2.

The quality water which we use daily determines our health condition. A sufficient supply of wholesome drinking water is one of the basic requirements in all community. In Nepal only 37% of the populations use safe drinking water. In the same way, much more prevalence of health problems arises due to lack of SDW. No people can be healthy without safe drinking water. So provision of safe drinking water supply in office is necessary.

4.1.5 Working Condition of Respondents

In Denmark, waste collectors 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 waste collectors was considered more senior, and more aware of the health hazards of wastes. The Danish study also suggested that better education of the waste collectors might lower the injury rate. This result is similar to what this study has found out.

Fig. No.3: Sample distributions of solid waste collectors in relation to work Shift

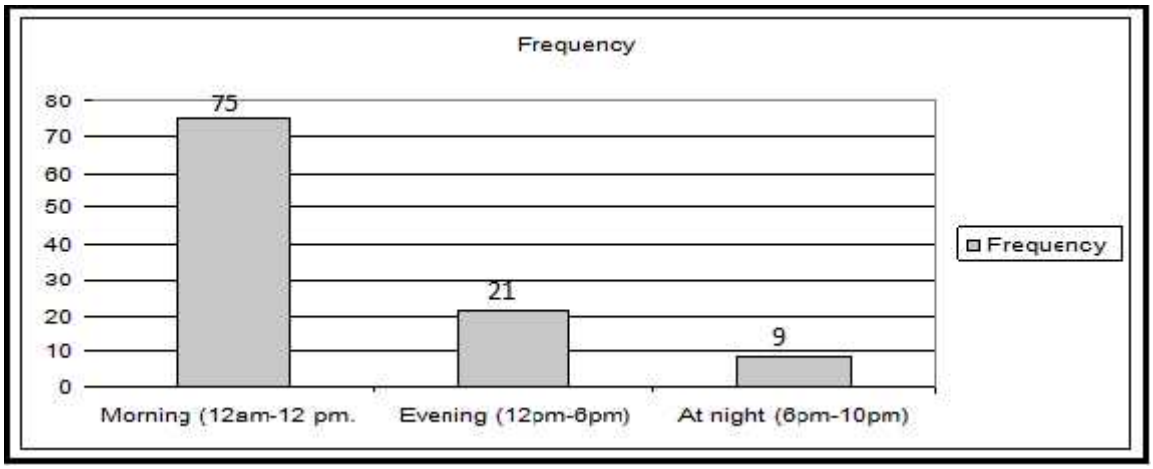


Table 3: Sample distribution of solid waste collectors is according to type of contract

Type of contract	Frequency	Percent
Daily wages	85	8.95
Full time	15	14.28
Other	5	4.77
Total	105	100

The study shows that 71.42% (n=75) of solid waste collector in Biratnagar municipality were working on morning shift, 20% (n=21) were working on evening shift, 80.95% (n=85) on daily wages condition and 14.28% (n= 53) on full time contracts.

4.1.6 Type of Work of Respondents

Collection workers in Biratnagar Municipality have direct contact with solid waste and thus are exposed to more potential particulates, toxic

materials and infectious microorganisms. They are exposed to a wide variety of risks. Waste collectors have high occupational health risks including risk from contact with human fecal matter, papers that may have become saturated with residue pesticides and solvents, needles and bandages from hospitals, and batteries containing heavy metals, exhaust fumes of waste collections trucks traveling to and from disposal sites, dust from disposal operations, and open burning of waste, all do contribute to occupational health problems.

Table 4: Sample distributions of solid waste collectors in relation to type of work

Type of work	Frequency	Percent
Cleaning the street	64	60.95
Driver	25	11.45
Caring and lifting	12	23.80
Other	4	3.80
Total	105	100

Four items were used to distinguish between types of work performed by solid waste collectors in Biratnagar municipality. The study showed that 60.95% (n=64) were collecting domestic waste from the streets 11.42% (n=12) were driver, and 23.80% (n=25) were caring and lifting waste.

Collection workers in Biratnagar Municipality have direct contact with solid waste and thus are exposed to more potential particulates, toxic materials and infectious microorganisms. They are exposed to a wide variety of risks. Waste collectors have high occupational health risks including risk from contact with human fecal matter, papers that may have become saturated with residue pesticides and solvents, needles and bandages from hospitals, and batteries

containing heavy metals, exhaust fumes of waste collections trucks traveling to and from disposal sites, dust from disposal operations, and open burning of waste, all do contribute to occupational health problems.

4.1.7 Type of Waste and Collection Method

Table 5: Sample distribution of solid waste collectors in relation to type of waste and collection method

Type of Wastes	Freq. yes	Yes%	Freq. No.	No.%	Total No.	Percent
House hold wastes	86	81.90	19	18.09	105	100
Commercial wastes	74	70.47	31	29.52	105	100
Industrial wastes	35	33.33	70	66.66	105	100
Collecting waste By tractor	85	80.95	20	19.04	105	100
Collecting waste by Vehicle from immobile bin	45	42.85	60	57.14	105	100
Biomedical waste	66	62.85	39	37.14	105	100

The data shows that 81.90% and 70.47% of respondents respectively said that House hold and commercial wastes were the most wastes collected in the communities surveyed in this study, followed by biomedical wastes and industrial wastes. It also shows that 80.95% of wastes were collected by tractor, and 42.85% were collected by vehicle from immobile bin.

Middle age collectors are more susceptible to work related diseases, such as skin disease, sore throat, cough and high temperature. They have low level of

education, ignorant and careless in collecting waste. Practically, all waste collectors regardless their age, are prone to work related diseases. They have been seen collecting wastes with their hands, and no protective measures have been taken.

4.1.8 Use of Protective Measures

It shows that 97.14% of waste collectors don't wear face mask, 93.4% don't use shoe covers 79.05% don't wear over all, 83.80% don't wear rubber bolt and 42.86% don't wear gloves.

Personal protective equipments play a significant role to protect workers from possible short –term and long-term health hazards. PPEs such as goggles, earplug, mask, and gloves, hard hat, steel-toe shoes, apron must be used throughout the work hour as demanded by the nature of work.

Table 6: Sample distribution to waste collectors in relation to type of protective measures

Protective Measures	Always freq.	Always %	Sometimes freq.	Sometimes %	No. Freq.	No. %	Total No.
Wear Gloves	27	25.71	33	31.42	45	42.86	105
Wear Shoe Covers	2	19	5	4.76	98	93.4	105
Wear Rubber Boot	6	5.71	11	10.47	88	83.80	105
Wear Face Mask	-	-	3	2.85	102	97.14	105
Wear Over All	9	8.57	13	12.38	83	79.05	105

4.1.9 Personal Hygiene

In relation to personal hygiene, work satisfaction and working conditions, the study findings showed that waste collectors have shown interest in their hygiene. In addition, it showed that nearly half of collectors were satisfied in their jobs despite the stressful work conditions (unavailability of rest room, bathrooms, showers, and a place to eat).

Table 7: Sample distributions of solid waste collectors in relation to personal hygiene

Hygiene	Always freq.	Always %	Sometimes freq.	Sometimes %	No. Freq.	No. %	Total No.	Perc
Washing Hands Frequently With Antiseptics	15	14.29	27	25.71	63	60	105	10
Washing Work Clothes at Home	94	89.52	3	2.86	8	7.61	105	10
Use of Antiseptic in Cloth Wash	91	76.52	9	8.57	5	4.76	105	10
Eating at Work Place	7	6.67	16	15.23	82	78.09	105	10
Use of Accessories While on Duty	22	20.95	17	16.19	66	62.86	105	10
Bathe After Work	95	90.47	4	3.80	6	5.71	105	10
Sharing Protective Clothing With Colleagues			3	2.85	102	97.14	105	10

The study shows that 90.47% both after work 14.29% always wash their hands thoroughly with antiseptic (soap) and 25.71% of waste collectors wash clothes as home and 86.76% use antiseptic (soap powder) in cloth wash, while 62.86% of waste collectors avoid using accessories (mobile) phone, sun glass, wallet etc. while on duty.

4.1.10 Work Related Disease

Table 8: Sample distribution of solid waste collectors in relation to incident of diseases and injuries in the last twelve months

Diseases and Injuries	Freq. yes	Yes%	Freq. No.	No%	Total No.	Percent
Skin Disease	21	20	84	80	105	100
Shortness of Breath	26	24.76	79	75.24	105	100
Sore Throat-Cough	36	34.25	69	65.71	105	100
Diarrhea or Bloody Stool	58	55.24	47	44.76	105	100
Hearing Difficulties	5	4.76	100	95.24	105	100
Backache	44	41.90	61	58.09	105	100

The study shows that in the last twelve months 34.25% of surveyed waste collectors have suffered from sore throat, cough, high temperature and 41.90% have suffered from backache. It also shows 55.24% have suffered from diarrhea or bloody stool, 24.76% have suffered from shortness of breath and 20% have suffered from skin disease.

In this study, the most commonly reported accidents for Nepalese domestic waste collectors in Biratnagar Municipality were backache, muscle tear, Diarrhoea

and twisted ankle. 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 ported accidents for Danish waste collectors (Poulsen *et al*, 1995). Organic dust is another occupational health hazard which Palestinian domestic waste collectors in Biratnagar Municipality suffer from.

4.1.11 Work Related Accidents

Waste collectors collect wastes in all climate conditions; they use dangerous vehicles, contact with sharp objects, pull and push heavy containers and lift heavier loads often to higher locations as an accident that happens to worker during works.

Table 9: Sample distributions of solid waste collectors in relation to type of accident

Type of Accidents	Freq. yes	Yes%	Freq. No.	No%	Total. No.	Percent
Twisted Ankle	17	16.19	88	83.81	105	100
Joint-Pain	11	10.48	94	89.52	105	100
Joint Dislocation	6	5.71	99	94.29	105	100
Muscle Tear	26	24.76	79	75.24	105	100
Fractured Teeth	2	1.98	103	98.09	105	100
Scratched	7	6.67	98	93.33	105	100
Fractured	5	4.76	100	95.24	105	100

It shows that 16.19% of waste collectors have suffered from twisted ankle, 24.76% have suffered from muscle tear, 10.48% have suffered of joint pain and 6.67% have lacerated head, arm and etc.

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

4.1.12 Cause of Injury

Occupational injury is defined as sudden anticipated and unwanted events during work, leading to harm or damage to at least one part of the body. (Poulsen, et. al. 1995)

Table 10: Sample distribution of waste collectors in relation to the causes of the injured part of the body in the last twelve months

Types of Injuries	Freq. yes	Yes%	Freq. No.	No%	Total. No.	Percent
Struck With Hard Object, Vehicle etc.	8	7.62	97	92.38	105	100
Falling Down While Pulling or Pushing The Waste Trolley	3	2.86	102	97.14	105	100
Suffering Falls From Up High	2	1.90	103	98.1	105	100
Hitting by Hard or Sharp Objects	27	25.71	78	74.29	105	100
Lifting More Than Capacity	17	16.19	88	83.81	105	100
Pricked by Hypodermic Needles	37	35.24	68	64.76	105	100
Contact With Harmful Chemicals	7	6.67	98	93.33	105	100

The study shows that 25.71% waste collectors have been hit by any hard or sharp objects, 16.19% have lifted more than their capacity, 2.86% have fallen down while pulling or pushing the waste trolley, 7.62% of waste collectors have been struck with hard object and 35.24% have been pricked by hypodermic needles.

Statistically there were some significant causes of injury which were significant with age and education level discussed in this study. Waste collectors with middle age; feel that they are strong, with good muscle power, stronger than older ones, and less patience. Waste collectors with higher education seem to be less incident sufferings. They are more aware of the potential hazards and the health impacts related to wastes collecting methods. Waste collectors with literate and primary levels of education; have more injuries relating to sharp objects, while waste collectors 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 struck with hard objects, fallen down while pulling or pushing the waste trolley, lifted overcapacity, pricked by hypodermic needles and contact with harmful chemicals).

4.1.13 Health Care

Continuous exposure with different kinds of solid waste materials, chemicals and machinery parts of the industries may result chronic disease of the workers. Therefore timely health check up off workers must be maintained. Labour act 2048 has prescribed for health check up of workers once a year by the clinician licensed from HMG (His Majesty Government).

Table 11: Sample distribution of waste collectors in relation to professional and management response to accident in case they are occupationally injured or diseased in the last twelve months

Types of Helps	Freq. yes	Yes%	Freq. No.	No.%	Total No.	Percent
Information to The Ministry of Health	5	4.76	100	95.24	105	100
Sending to Private Medical Center	3	2.86	102	97.14	105	100
Sending to a Private Clinic	7	6.67	98	93.33	105	100
Visit to a Specialist	-	-	105	100	105	100
Right Treatment	9	8.57	96	91.43	105	100
Sick Leave	35	33.33	70	66.67	105	100
Lab Test	11	10.48	94	89.52	105	100
Chest X-Ray	13	12.38	92	87.62	105	100
Routine Lab Test	2	1.9	103	98.10	105	100
Routine Chest X-Ray	-	-	105	100	105	100
Vaccination For Hepatitis	26	24.76	79	75.24	105	100
Vaccination For Tetanus	27	16.19	88	83.90	105	100

It shows that the majority of 100% did not receive routine chest x-Ray, 98.1% did not receive lab tests such as complete blood count count-CBC, serum electrolytes, stools, urine and sputum analysis, 83.90% and 75.24% were not vaccinated for tetanus and hepatitis respectively. It also shows that 100% did not visit a specialist, 66.67% were not given sick leave when injured or diseased, and 95.24% said that the ministry of health was not informed.

Domestic waste collectors 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 waste material, and less uses of accessories while on duty. These significant factors allow waste collectors to be healthier, more care to their personal hygiene and less transmitting of pathogens and microorganisms to their parents and friends.

4.1.14 Working Condition

Waste collectors have direct contact with dirty and contagious trash. Waste collectors 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 12: Sample distribution of solid waste collectors in relation to work structure

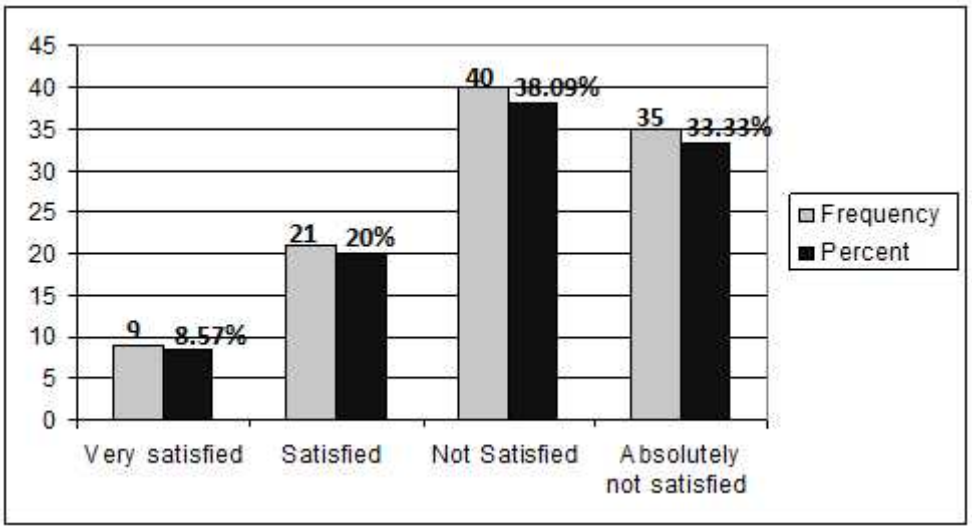
Facilities	Freq. yes	Yes%	Freq. No.	No.%	Table No.	Total
Staffroom	5	4.76	100	95.24	105	100
Place to Eat	2	1.90	103	98.10	105	100
Bathroom	16	15.24	89	84.76	105	100
Shower			105	100	105	100
Changing Room	10	9.52	95	9.52	105	100
Drinking Water	95	90.48	10	9.52	105	100

It shows that 100% of waste collectors denied the presence of a shower, 98.10% said that there is no suitable place to eat, 95.24% said that there is no staff room, 9.52% said that there is no availability of drinking water and 90.48% said that there is no changing room.

4.1.15 Job Satisfaction

The person who joins the civil servant is hunger of pay, prestige, promotion, and responsibilities. Promotion is doubled-edged weapon. It handled carefully; it contributes to employee satisfaction and motivation. If mishandled, it leads to discontentment, frustration, skepticism and bickering among the employees and culminates in high rate of Labour turnover.

Fig.No.4: Sample distribution of solid waste collectors concerning the level of satisfaction during work



Work satisfaction is an important parameter to do a perfect job. Table (16) shows that nearly half of the waste collectors from all communities in Biratnagar municipality 20% were satisfied with their job and 8.57% were satisfied of their work, while 38.09% and 33.33% of waste collectors surveyed were not satisfied to absolutely not satisfied, respectively.

4.1.16 Requirement of Waste Collectors

Waste collectors face a tremendous health challenges. Waste collectors with middle age and with low level of education were at higher risk. Waste collectors 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.

Table 13: Sample distribution of solid waste collectors regarding to their requirement to improve their safety at work

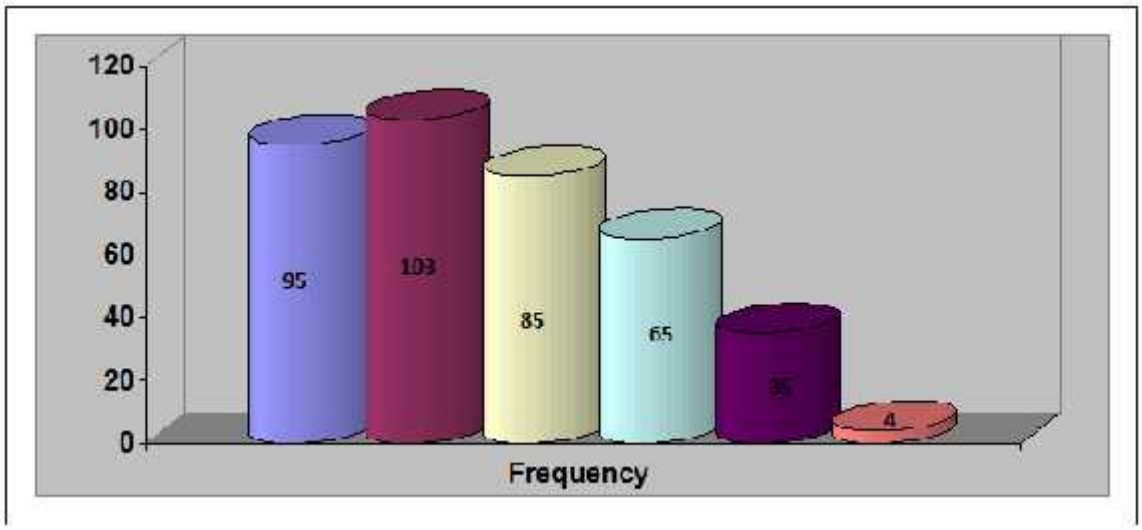
Requirement of waste collectors	Freq.	Percent	Total No.	Percent
Vaccinated against infection	16	15.24	105	100
Routine medical checkup every	15	14.28	105	100
Routine lab taste every 6 month.	9	8.57	105	100
Monthly vehicle maintenance	3	2.85	105	100
Worker respect from official	5	4.76	105	100
Public awareness	10	9.52	105	100
First aid set	2	1.90	105	100

Waste collectors have expressed high desire and interest in wearing protective measures if available. Table (17) shows that 42.86% waste collectors ask for availability of overall face mask, gloves, and rubber boat, 15.24% called for vaccination against hepatitis and tetanus, while 14.28 % urged the responsible people for routine medical checkup.

4.1.17 Worker's Needs

Monthly income is another parameter which affects domestic waste 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.

Fig. No.5: Sample distributions of solid waste collectors regarding to their needs to do a perfect job



It shows that 98.09% of respondents had urged responsible to increase salaries, 80.95% had asked for jobs security, 61.90% had requested responsible people to provide the solid waste collectors and their families with medical insurance and hard pay and 90.48% had urged municipal to pay them their monthly salaries on time.

CHAPTER-V
SUMMARY, FINDINGS, CONCLUSION AND RECOMMENDATION

5.1 Summary

The main purpose of this study was to assess the socioeconomic status and occupational health hazard of the solid waste collectors and to evaluate the present occupational health policy and provisions.

The study results one based on primary data which were collected from the 105 respondents, 88 males and 17 females, The respondents were taken from major municipalities, small municipalities and from camps, They were selected through convenience sampling method from 30 offices of Biratnagar Municipality.

A questionnaire was prepared with open ended and structured questions. It was pre-tested in Koshi Zonal Hospital areas government offices and the tool was finalized on the basis of pre-test.

The data were collected from the respondents with the help of research tool. The data have been tabulated and analyzed according to the objectives of the study. Simple statistical techniques have been used in analysis and interpretation of data and to draw findings e.g. frequency count mean table, diagrams, percentage etc.

5.2 Findings

The major findings of this research are as follows:

1. Majority (47.737%) of male waste collectors and majority of (52.95%) female respondent were in 20-30 age groups.
2. Income level of the waste collectors is very low which is insufficient to fulfill their basic needs
3. The study shows that 80-95% (n=85) of waste collectors were working on daily wages contracts, and 14.28% (n=15) on full time contracts.
4. The study showed that 60.95% (n=64) were collecting solid waste from the streets, 11.42% (n=12) were carrying & lifting waste.
5. In this study it is found that 42.86% (n=45) of respondents were literate and only 5.71% (n=6) of total respondents finished secondary school.
6. The study shows that 80.95% wastes were collected by tractor, and 42.85% were collected by of vehicle from immobile bin.
7. In this study it is found that 97.14% of waste collectors do not wear face mask and 42.86% don not wear gloves.
8. In this study, the most commonly reported accidents for Nepalese solid waste collectors in Biratnagar Municipality were backache (14.90%) muscular tear (soft tissue trauma) 24.76% and twisted ankle (16.9%).
9. This study showed that (34.25%) of respondents have experienced sore throat and cough, and 24.76% have suffered from shortness breathe.
10. In this study it is found that 25.71% of the respondents were hit by any hard of sharp objects and 35.24% have been pricked by hypodermic needles.
11. Sent percent did not receive routine chest x-ray, 83.90% and 75.24, were not vaccinated for tetanus and hepatitis respectively.

12. It shows that 100% of waste collectors denied the presence of a shower, 98.10% said that there is no suitable place to eat and 90.48% said that there is no dress changing room.
13. Only 20% were satisfied with their job, while 38.09% were not satisfied.
14. The study showed that 42.86% of waste collectors ask for availability of overall, face mask, gloves and rubber boots.
15. 15.24% of the respondent called for vaccinated against hepatitis and tetanus, while 14.28% urged the responsible people for routine medical checkup.
16. Most of the respondents had urged responsible people to increase salaries, had asked for job security had requested responsible to provide the solid waste collectors and their families with medical insurance.

5.3 Conclusion

Ways of solid waste disposal, isolation, separation, collection and disposal of the waste need to be re-addressed, evaluated, managed properly and further surveys and recommendations to be carried out. In conclusion, the majority of waste collectors in Biratnagar Municipality 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 waste collectors have suffered from different types of injuries, diseases and diseases like symptoms. Work related diseases and accidents were analyzed. It showed that domestic waste collectors in Biratnagar Municipality 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 domestic waste collectors in both districts have

higher incidence of falling down while pulling or pushing the waste 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 waste collectors have shown interest in their hygiene. In addition, it showed that nearly half of collectors 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 waste collectors with higher salaries and higher education were less suffering of injuries and diseases.

5.4 Recommendations

To ensure health and safety of waste collectors, this study recommends the following:

5.4.1 Recommendation for General

1. The employer should provide education about personal hygiene; explain to the waste collectors the importance of good hand washing technique, and the importance of showering as soon as possible.
2. Provide waste collectors with protective measures, such as gloves, face masks, overalls, and rubber boots.
3. Provide waste collectors 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.

4. Provide waste collectors with routine medical checkup every 6 months. This option was requested by 50.2% of the surveyed waste collectors, and must be reinforced by their employers.
5. Provide waste collectors with routine laboratory investigations and Chest X-Ray exams every 6 months, to ensure collector health and safety.
6. Vaccinate waste collectors for hepatitis A and B and tetanus.
7. Waste collectors should ensure that wastes 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 wastes by waste collectors.
9. Development and establishment of registration systems of occupational accidents, diseases and exposures if possible.
10. The employer should adopt teaching programs among all levels of management, waste collectors, supervisors and trash vehicle drivers; to raise awareness about health and safety.
11. Provide training programs at the onset of hiring, and on an ongoing basis to educate all waste collectors, trash vehicle drivers, and managers about hazards, injuries, and their reduction and prevention.
12. Educate Health and Environmental Management Sector in the municipalities, villages and campus about their responsibilities to ensure worker health and safety.
13. 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 wastes in suitable plastic bags.
14. Encourage participation between governmental health institutions, NGO's, and academic sectors, to do further researches focusing on health and safety among domestic waste collectors.

5.4.2 Recommendation for Further Studies

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 waste trolley. This study showed that 35.4% of surveyed collectors have suffered from fallen down while pulling and pushing the waste trolley.
4. Pay monthly salary on time.
5. Increase salary according to the standard of living.
6. Provide job security.
7. Provide hazard pay.
8. Provide Civil Service Law.
9. Provide Medical Insurance to worker and his family.
10. Provide Pension Fund.

REFERENCES

Lehtinen L. edt. (2002) "*Occupational Health and Safety*" *African Newsletter on Occupational Health and Safety, Vol. 12*: 32-34.

Applied Research Institute-Jerusalem (1995) "*Environmental Profile for the West Bank",* Volume 1; Bethlehem District, June.

Applied Research Institute- Jerusalem (1995) " *Environmental Profile for the West Bank",* Volume 3; Hebron District, October. Cartas, Jerusalem, 1985

Benvenisit, M. (1986) " *The West Bank Data Base Project- Report on demographic, economic, legal, social and political development in the West Bank"* Report, WBDBP, Jerusalem.

Bhide A D, Sundaresan B B. (1984) "*Street Cleansing and Waste Storage and Collection in India"*, In: Holmes J R, editor, Managing Solid Wastes in Developing Countries, John Wiley and Sons, Ltd.

Cimino J A. "*Health and Safety in the Solid Waste Industry"*, American Journal of Public Health, January, 1975.

Cointreau-Levine S. (2004), "*Occupational and Environmental Health Issues of Solid Waste Management"*. Adopted from World Wide Web: http:/www.ilsr.org/recyling/other/dctransfer/ochealth.

.

Garg R. K. (2002*),* ***"****Hazardous Waste Management Policy and Implementation"*, The Indian Experience. *NSWAI Newsletter, Vol. 6*, pp. 1.

Gellin GA. **(1985),** *" Dermatoses acquired by solid- waste handlers", American Journal of Industrial Medicine 13*. 469-499.

Ghanayem M., Qattosh N., Filkin B. (2001), *" Israelis double standard towards environmental protection",* Applied Research Institute-Jerusalem.

Hack T. G. (1967), *"Solid waste/ disease relationships",* US Department of Health, Education and Welfare Solid Wastes Program, Publication SW- 1 c. Cincinnati, OH.

Heldal KK, Halstensen AS, Thorn J, Eduard W, Halstensen TS. (2003), *"Airway inflammation in waste handlers exposed to bioaerosols assessed by induced sputum", Eur. Respiratory J, April,* 3456-51.

Huisman M. (1994), *"The position of Waste Pickers in Solid Waste Management"*, In: Baud I, Schenk H. Solid Waste Management: Modes, Assessment, Appraisals, and Linkages in Bangalore, Manohar, New Delhi.

Ivens U, Lassen J.H., Kaltoft B.S., and Skov T. (1998)**,** *" Injuries among Domestic Waste Collectors", American Journal of Industrial Medicine*.

Kantiz S, Franco Y, Roveta M, Patroone V, Raffo E. (1991), *"Sanitary Land filling",* Occupational and Health Hazards, Proceeding of Sardinia 91,Third International Landfill Symposium.

Konnoth N. (1991), The Forum for Environmental Concern, *"Your Clean City at Whose Cost",* A Study on the Working Conditions and Occupation Hazards at the Dumping Sites of Bombay. Pluses annexes.

Meinel J. (1994), "*A comparison Review of Solid Waste Workers and Construction Workers"*, Unpublished information of the accra, Ghana Waste Management Department, Health Statistics.

Ministry of Environment and Forests. Notification on , "*Municipal Solid Wastes (Management and Handling) Rules"*. India, 2000.

National Institute for Occupational Safety and Health, Occupational Safety and Health Administration, US Coast Guard and US Environmental Protection Agency (1985*), "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities"*, October, 1985.

Palnitkar S. (2000), *"Manual on Solid Waste Management"*, AIILSG, Mumbai.

Poulsen OM, Breum NO, Ebbehoj N, Hansein AM, Ivens UI, van Lelieveld D, malmros P, M atthiasen L, Nielsen BH, Schibye B, Skov T, Stenbaek EL, Wilkins KC. (1995), "*Collection of domestic waste"*, Review of occupational health and their possible causes. *Sci Tot Environ 170*:1-19.

Sims C. (1996), *" Fear of a Virus, and Fear Itself, Stunt a Resort Town"*, The New York Times.

Tchobanoglous G., Theisen H. and Vigil S., (1993), *"Integrated Solid Waste Management"*, McGraw Hill Inc., New York.

Thorn J. (2001).“*Seasonal Variations in Exposure to Microbial Cell Wall Components among Household Waste Collectors”* Ann. Occupational Hygiene. British Occupational Hygiene Society.

Van Eerd M. (1995). “*Gender Related Labor Market Fragmentation in Informal Recycling Sector”,* A study in Banglore, India. Mcs, Thesis. University of Amsterdam.

Wilhelm V. (1989). “*Occupational Safety at Landfills, Proceeding of Sardinia 89”*, Second International Landfill Symposium.

World Bank (1993). *“ Developing the Occupied Territories, an Investment in peace”***.** Volume 1, **: Overview.** The World Bank, Washington D.C.

World Health Organization (1996). *“Draft book on Hospital Waste Management”*.

Wouters IM, Hilhorst SKM, Kleppe P, Douwes J, Peretz C, Heederik D. (2002). *“ Upper airway inflammation and respiratory symptoms in domestic waste collectors*”. *Occp. Environ Med; 59*:106112.

Yang Chun-Yuh, Chang Wen-Tzong, Chuang Hung-Yi, Tsai Shang-Shyue, Sung Trong-Neng and Fung-Chang (2001). “ *Adverse Health Effects among Household Waste Collectors in Taiwan***”.** Environmental Research.

APPENDIX –I

INTERVIEW SCHEDULE

Please answer the question clearly and honestly. The importance of this study depends on your valuable answer. The information obtained from you will be used only for this study your answers will be kept confidentially.

(A) General Questions

1. Respondent's name: Age: Sex: Male/Female
   Education: Marital Status:
   Occupation: Work Description:

(B) Type of wastes collected

2. Do you know what type of solid waste are generate?
   (a) Toxic (b) Non Toxic (c) Do not know
3. Do you know what solid waste means?
   (a) Yes (b) No
4. Do you know about commercial waste?
   (a) Yes (b) No
5. Do you know what the institutional waste is?
   (a) Yes (b) No
6. What type of waste is produced on the street?
   (a) Leaves (b) Rubbish from drain (c) Debris

7. How often is the waste being taken way?

(a) Regularly (b) Sometimes (c) Neither

(C) Personal Protective Equipment

8. Do you think PPE are necessary for solid waste collectors?

(a) Yes (b) No

9. If yes, what types of PPF facilities provided?

(a) Goggles (b) Rubber boo (c) Gloves

(d) Hard hat (e) Mask

10. Do you use the PPE facilities?

(a) Yes (c) No

11. Is there safety place for the dispose of solid wastes and garbage?

(a) Yes (b) No

12. Do you have hand washing and bathing facility after duty?

(a) Yes (b) No

(D) Diseases and Injuries

13. Have you suffer from any injury?

(a) Once (b) More than once (c) Never

14. Specify the events if you are injured?

(a) 1^{st} (b) 2^{nd} (c) 3^{rd} (d) 4^{th}

15. Do you have any health problems related to you work?

(a) Yes (b) No

16. If yes, what are the problems?

(a) Pain in limbs (b) Back Pain

(c) Eye Pain (d) Joint Exhaustion.

17. Which of the following dietary are you suffering from?

(a) Skin disease (b) Shortness of Breath

(c) Diarrhea (d) Constipation

18. Have you suffered from skin disease?

(a) Yes (b) No

19. Have you suffered from shortness of breath?

(a) Yes (b) No

20. Have you suffered from Diarrhoea or Bloody stool?

(a) Yes (b) No

21. Have you suffered from backache?

(a) Yes (b) No

22. Have you ever twisted your ankle?

(a) Yes (b) No

23. Have you joint pain?

(a) Yes (b) No

24. Have you ever lacerated of your head, arm?

(a) Yes (b) No

25. Have you ever fractured your teeth?

(a) Yes (b) No

26. Have you ever been scratched?

(a) Yes (b) No

27. Have you ever been fractured?

(a) Yes (b) No

28. Have you been stuck with hard object, vehicle?

(a) Yes (b) No

29. Have you fallen down while pulling or pushing the waste trolley?

(a) Yes (b) No

30. Have you been hit by any hard of sharp objects?

(a) Yes (b) No

31. Have you lifted more than your capacity?

(a) Yes (b) No

32. Have you been working conditions with high/low temperature?

(a) Yes (b) No

33. Have you been in contact with harmful chemicals?

(a) Yes (b) No

(E) Health Coverage

34. Do you have a first aid/kit/center on site?

(a) Yes (b) No

35. What do you do if the workers have on site emergency?

(a) Health Center (b) Government Center (c) Their Own

36. Who pays for the cost?

(a) Worker (b) Company (c) Other

37. Do you have insurance package?

(a) Yes (b) No

38. Have you had any worker died at home or work place?

(a) Yes (b) No

39. Is sick leave given when injured?

(a) Yes (b) No

40. Does his employer provide him with routine medical checkup?

(a) Yes (b) No

41. Are they vaccinated?

(a) Yes (b) No

(F) Availability of Facilities and Salty Devices

42. Is there a facility of staff rest room in your working place?

(a) Yes (b) No

43. Is there a facility of canteen in your working place?

(a) Yes (b) No

44. Which type of drinking water do you use in your working place?

(a) Mineral (b) Filtered

(c) Boiled (d) Rain

45. Do you have the facility of break time during your duty?

(a) Yes (b) No (c) Rest is not necessary

46. Do you have the facility of bath room in working place?

(a) Yes (b) No

47. Do you have the facility of clothe changing room after duty?

(a) Yes (b) No (c) Not Necessary

48. Was the ministry of health informed?

(a) Yes (b) No

49. Were you sent to a private clinic?

(a) Yes (b) No

(G) Incentives

50. How well informed are your workers about OHS?

(a) Well informed (b) Do not care (c) Not well informed (d) Careless

51. Do you provide incentives for injury free work hours?

(a) Yes (b) No

52. Do you fill the necessity of separate division to care and supervise the civil servant's health and safety?

(a) Yes (b) No (c) Legal Provision and safety