Sweepers and Scavengers in Third World Cities

A STUDY ON OCCUPATIONAL HEALTH PROBLEMS OF SWEEPERS AND SCAVENGERS OF KATHMANDU, NEPAL

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Dedicated to my mum Laxmi, the strongest defender of my happiness.
I lost her love and defense forever when I was writing this thesis in Oslo.

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ABBREVIATION

BS:	Bikram Sambat (Nepali Calendar Year: about 57 years older than AD)
CBS:	Central Bureau of Statistics
COPD:	Chronic Obstructive Pulmonary Disorder
CWIN:	Child Workers in Nepal Concerned Centre
ENPHO:	Environment and Public Health Organization
GIS:	Geographic Information System
GTZ:	German Development Cooperation
HMG/N:	His Majesty's Government of Nepal
KMC:	Kathmandu Metropolitan City
KMCol:	Kathmandu Medical Collage (Hospital)
KV:	Kathmandu Valley
KVMP:	Kathmandu Valley Mapping Program
KVUDD:	Kathmandu Valley Urban Development Department
MLD:	Ministry of Local Development
MOPE:	Ministry of Population and Environment
NGO:	Non-Government Organization
NRs:	Nepalese Rupees (equivalent to about 0.1NOK at the date)
NTC:	Nepal Tuberculosis Center
PM 10:	Particulate Matter of Respirable Size (<= 10 micro-meter)
RESTUC:	…….
SPSS:	Statistical Package for Social Science
SWMRMC:	Solid Waste Management and Resource Mobilization Center
TB:	Tuberculosis
TSP:	Total Suspended Particulates
UNCHS:	United Nations Centre for Human Settlement (HABITAT)
VDC:	Village Development Committees
WB:	World Bank
WHO:	World Health Organization

CHAPTER ONE - Introduction

The unplanned urbanization process in Kathmandu has resulted in various environmental problems. Deteriorating air quality, polluted rivers, open sewerage, piled up garbage and open dumping sites, inadequate water supply and poor sanitation are few of the characteristics of Kathmandu. All of these are causing serious health implications on all urbanities of Kathmandu but the risks are highest among those who work directly with solid waste management in the city. Sweepers and scavengers, though they perform essential tasks for city dwellers, remain an utterly neglected section in Kathmandu. Their work is traditionally regarded as 'degrading' and 'defiled' and the society has always kept them at a distance, despite their ubiquity and the importance of the work they do. In the present context, sweepers work in streets where heavy polluting vehicles are plying and the scavengers are working informally at open dump and waste transport depot on their own risk. The material sorting techniques used by scavengers are primitive and unhygienic and equipment they use is outdated and inefficient. Worker protection system does not exist. Scavengers who face accidents while working in waste transfer depot and dumping site get no compensation. The work environment of sweepers and scavengers are likely to cause acute health risks among them. In this context, the present study explores the actual situation of health problems of sweepers and scavengers of Kathmandu.

Waste is a product of economic growth and consumption. Its amount increases with the increase in living standard. Cointreau (1982) found that low-income countries having below US$ 300 per-capita income generate around 0.5-kg waste, where as the middle income group of US$ 300 to US$ 3500 and the high income group with more than US$ 3500 generate about 1.5 kg and up to 4 kg waste per day respectively. Cointreau's findings are likely to reflect the situation of Kathmandu since all income groups are concentrated there, ranging form high to low. In the case of Kathmandu, per capita waste generation is increasing with the course of urbanization. Lohani and Thanh (in KVMP/KMC 2001c) found 0.25 kg/person/day waste generated in Kathmandu in 1978 however the waste generation increased to 0.4 kg/person/day in 1985 (Sharma 1985 in KVMP/KMC 2001c) and 0.565 kg/person/day in 1990 (Rai 1990 in KVMP/KMC 2001c). Recent studies such as Khanal (in KVMP/KMC 2001c) and RESTUC (in KVMP/KMC 2001c) estimated that per capita daily waste generation in Kathmandu is 0.46 kg and 0.48 kg respectively. In this background,

Kathmandu Metropolitan City (KMC) has estimated that Kathmandu Valley (KV) generates 0.45 kg per capita waste per day (KVMP/KMC 2001c). This high amount of per capita waste generation in KV is due to the increase in waste generation at commercial and industrial sectors. Restaurants, institutions, retail shops of KV generate 6.33 kg waste per enterprises, and industries generate 40 kg per industries. However, domestic per capita waste generation of Kathmandu Valley is 0.32 kg /person/day (HMG/N 2000). Gautam (2000) also estimated that households in core Kathmandu generated only 0.25 kg /person/day waste in 1999. Most recent estimation of KMC reveals that per capita waste generation in the Kathmandu Valley, including suburb is 0.42 kg per day (KMC, Environment Department 2003). According to Cointreau-Levine (…) amount of waste generation varies with the size of the city. Small cities generate small amount of waste and vice versa. In this regards, Kathmandu probably generates large amount of waste because it is the capital city with a large population concentration. Composition of waste also changes with the course of economic development and modernization. Kathmandu is experiencing the change in waste composition (appendix: I).

In Kathmandu, waste is piled on the street corner or dumped on ground directly, both of which are either shoveled or picked up by bare hands by waste workers. Hazardous wastes are not separated and waste handling and disposal practice do not meet environmental protection standards. Sanitary landfills are absent and collected wastes are buried in riverbanks (for the last 2 years, significant amount of municipal waste is being buried in the banks of Bishnumati and Bagmati Rivers in Kathmandu) that might have severe environmental implications.

1.1. Problem

Standards of waste handling practice in industrialized countries have reduced occupational health problems and environmental impacts significantly (Cointreau-Levine…). Contrary to that, the situation of developing countries is completely different than those of developed ones. The covered landfill site was more than three decades old method of waste disposal in industrial country. Since the last 2 decades, developed countries established sanitary landfills and started to use sophisticated machineries while handling waste to reduce health problems and environmental risk. Nevertheless, survival economies still cannot dump waste in controlled landfills and most of handling practices are labor intensive.

In the whole cycle of solid waste management, from waste generation to collection-transport-dump to recycling or composting, both occupational groups and urban dwellers are suffering from varieties of health risk in Kathmandu. The numbers of garbage collectors in KV find their livelihood through sorting of secondary materials from the piles of solid wastes. They collect recyclable materials and sell them to wholesale buyers. These poor waste pickers have high health risk while collecting recyclable materials but are paid low. On contrary to that, wholesale buyers and recycle companies are making large profits with less health risk but are neglecting the health of the scavengers completely. Despite the substantial contribution of the scavengers to solid waste management, they are poorly protected from injury, infection and abuse. Moreover, even governing body like KMC is not acknowledging the quintessential roles of these workers in solid waste management.

In Nepal, there are no provisions for handling special/hazardous[1] wastes separately. Such wastes are mixed in municipal solid waste[2]. In this situation, sweepers and scavengers are exposed to potentially more harmful wastes such as toxic materials, gases and infectious microorganisms. Sweepers and scavengers working at solid waste transfer depots and dumpsites do not undertake any protective measures and they live in proximity to the dumpsites. Hospital wastes, human and other animal feces promote the multiplication and spread of parasites and pathogenic microorganisms. Metals like broken glass and sharp objects mixed in municipal waste can cause physical injury to these occupational people. Industrial waste may contain many hazardous chemicals and some of these are rendered more toxic by chlorination. In these circumstances, these occupational workers probably have the highest health risks. However, no thorough studies have been carried out so far in this issue.

1.2. Objectives and Research Questions

This research focuses on the occupational health problems of solid waste workers like sweepers and scavengers. It is noteworthy that health risks vary with the waste management and handling practices. A review of this situation may help to figure out differences on health

[1] Special/hazardous wastes include wastes containing toxic, inflammatory, reactive, explosive material and infectious microorganisms like heavy metals in batteries, pesticides and infectious medical wastes.
[2] Municipal solid waste includes non-hazardous waste generated in household, commercial institutions and industries.

problems between these two groups. It also may help in determining the causes behind the findings. Therefore, specific objectives of this study are:

- To explore the health problems of sweepers and scavengers.
- To analyze the role of place and activity in health problems of sweepers and scavengers.

In order to fulfill these objectives, this study sets following research questions:

- How is the existing situation of solid waste management and material recovery system in Kathmandu?
- What sort of policies and plans exist in Kathmandu for solid waste management and its health implications?
- How and why do sweepers and scavengers enter into sweeping and scavenging occupation?
- What types of health problems are the sweepers and the scavengers experiencing?
- Are there any spatio-activity wise differences in health problems?

1.3. Rationale

Sweepers and scavengers in Kathmandu are working in health threatening environment for survival. Both sweepers and scavengers are experiencing numerous health problems. Municipal wastes include both organic and inorganic wastes. Mixture of inorganic wastes in municipal waste and labor-intensive waste handling practice results in many physical injuries among occupational workers. Skin and eye infections are common. Dust in the air at dumpsites can cause breathing problems. Flies breed on uncovered piles of rotting garbage and spread diseases like diarrhea, dysentery, typhoid, hepatitis, and cholera. Mosquitoes transmit many types of diseases like malaria. Dogs, cats and rats living around refuse carry a variety of diseases including plague and flea born fever. Therefore various intestinal, respiratory, parasitic and skin diseases are common in workers engaged in collecting refuse.

Policies in waste management and working environment are inadequate and there is a wide gap between policy and practices. All these factors have significant health implications. The section ‘problem’ of this chapter illustrates the existing problems related to solid waste management. It is essential to search the answers to the issues raised in objectives and

research questions. One of the important causes behind conducting this study is my personal interest in this field.

Sweeping is the lowest in the categories of job and scavenging is the occupation chosen after exhausts of all the optional ways in labor markets. Health has significant impact on a person's economy. By calculating the human capital costs of lost production from premature death and from foregone value of absence from gainful employment owing to illness, we can measure the economic importance of health that helps to understand the burden of environmental health hazard. Sweepers and scavengers of Kathmandu are experiencing various health problems and losing numbers of working days. This has reduced daily income on the one hand and has increased daily expense on the other. This situation further pushes these poor to poverty trap. Findings of this study are expected to help in reviewing the waste management policies and practices to reduce health impacts on occupational workers.

1.4. Limitations

Solid waste management has wide environmental and occupational health risks. Study of only a certain area like occupational health problems (current study) will not be able to manifest all kinds of environmental problems related to solid waste. Consequently, this study is limited within the health problems of solid waste management in these occupational people. In addition, resource and time frame available for present study cannot cover the whole Kathmandu Valley that has more than two thousand solid waste staff and hundreds of waste pickers. The result of this study is only the reflection of 61 sweepers and 60 scavengers (details of surveyed sweepers and scavengers are given in chapter III). Solid waste management policies and practices are reviewed only to get the general idea about the existing system and to support the findings of present study.

Qualitative information used in this study is not developed in a tabular form. To sort out this difficulty, some information is categorized and some of the others are interpreted as individual cases. Being a prototype classification of diseases, some diseases names and symptoms may not match with medical science. Moreover, some diseases have certain degree of similar syndromes and some may not be directly related to working environment. But in the context of broad categories of diseases, similarities found in some other literature

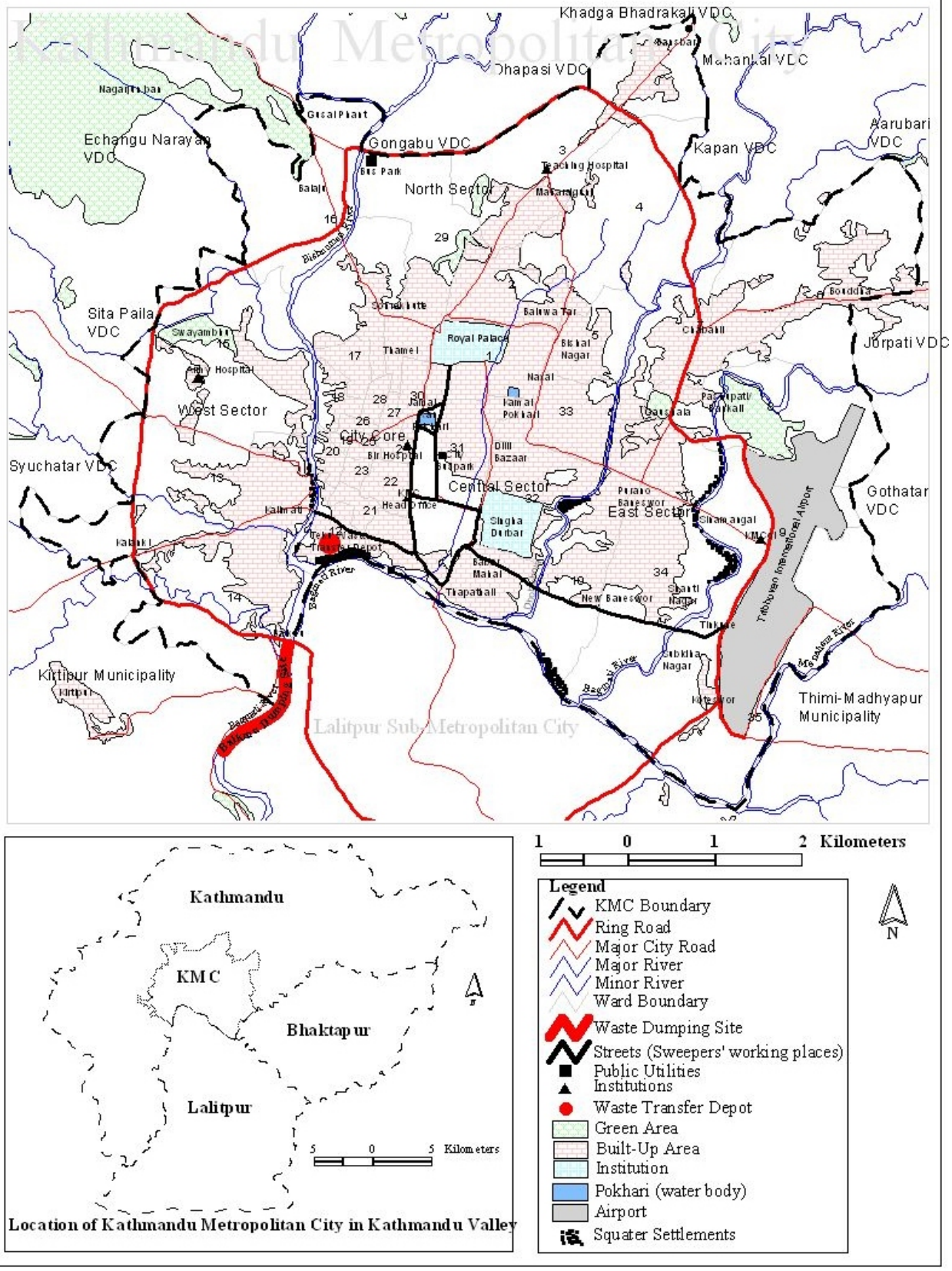
for example, Birley and Lock (1999), Koda et al. (1997), Poulsen et al. (1995a/ 1995b), and Cointreau-Levine (...) give the validity of the findings of this research.

1.5. Background of the Study Area

Kathmandu Valley covers upper Bagmati River basin and the Valley floor is above 1350m from mean sea level. The Valley is bowl shaped with centripetal drainage pattern and consists three districts namely Kathmandu, Lalitpur and Bhaktapur. There are five municipalities and ninety-nine Village Development Committees (VDCs) in the Valley. Kathmandu Valley occupies an area of about 714sq. km {calculated from Geographic Information System (GIS) data}. The present study covers only KMC, (hereafter Kathmandu). Kathmandu is the capital and largest city in Nepal in terms of population and economic activities. Kathmandu is located in between the geographic grid of 27º 32' 13'' to 27º 49' 10'' North and 85º 11' 31'' to 85º 31' 38'' East (figure 1.1) and covers an area of 50.76 sq. km (calculated from GIS data). Kathmandu is home for 671846 people with population density of 13586.37 people per squire kilometer excluding floating population (CBS 2002). Kathmandu has US$ 430 per year capita income in contrast to national average of only US $ 210 per year, almost five hospital-bed for each 1000 persons in contrast to national average of 1 hospital-bed for 4600 persons, hundred percent of electricity coverage and eighty percent coverage of telephone service (KMC/WB 2001)

Kathmandu is prominent for population concentration, energy/resource consumption and economic activities, and also for waste production and pollution. Urbanities of Kathmandu are breathing in the air where the concentration of particulate matter (PM 10) is 399 $\mu g/m^3$ (at Putali Sadak station measured on 2004/04/16 MOPE, appendix: II for details). Water supply and sewerage service does not reach more than sixty percent of Kathmanduities (KMC/WB 2001). Estimated daily waste generation in Kathmandu is about 315 metric tons (KVMP/KMC 2001c). Despite the better healthcare facilities than in countryside, the KV has a higher infant mortality rate of 66.78/1000 (KMC/WB 2001) compared to the country's average of 64.1/1000 (CBS 2002). Many experts reason that degraded environmental conditions is culpable for this figure in infant mortality.

Figure - 1.1: Kathmandu Metropolitan City: Study Area



Today's any environmental problems faced by the inhabitants of the earth, and its causes are directly or indirectly linked to urban areas (WRI 1996-97). In this context, Kathmandu is probably the best place in Nepal to observe urban environmental crises. The world's cities occupy less than 2 percent of the earth's land surface, but house almost half of human population and use more than 75 percent of the resources taken from the earth (Harrison and Pearce 2000). Although the Kathmandu Valley occupies only about 0.5 percent of the country's land, it houses more than 8 percent of the kingdom's population, that is1645000 individuals (CBS 2002).

Though the population of Nepal is still predominantly rural (about 86 percent), the country is facing rapid urban population growth rate of about 6 percent per year. In 1961 the urban population of the country was only 3.6 percent, which increased to 9.2 percent in 1991 and 14.2 percent in 2001 (MOPE 2001, CBS 2002). KV has the annual population growth of 4.82 percent per year compared to the national average of 2.27 percent. This indicates that KV has the most intense urbanization process and higher environmental impact of urbanization. Due to a rapid population growth, KV faces urban generated waste disposal problem, which has great impact on the health of urban residents. Urban Population Survey found unmanaged waste disposal as the main cause of the environmental problem in the urban areas of Nepal (in Mishra and Kayastha 1998) and the KV has the most critical situation among all urban areas of Nepal. At present all efforts of municipalities are concentrated only in solving the problem by moving solid waste from where it is created to a different site, which is not a sustainable solution because biological system become over-loaded to absorb such amount of waste generated in Kathmandu.

1.6. Structure of the Thesis

This thesis consists of eight different chapters. The first chapter introduces problems, objectives and research questions, rationales of the study and background of study area. Chapter two reviews concepts and theories to direct this study and build a conceptual framework. In this chapter, health is seen from a different angle. An overview of urban environmental health, review of different approaches in medical geography, health and sustainability, working environment and health, socio-political structure and health, and solid waste management and health are the major fields that chapter two covers. Chapter three explains the methods used to compile information and its analysis and interpretation.

Chapter four to seven are the analytical sections. Chapter four reviews the existing situation of waste management and material recovery practice and existing policies in waste management practice in Kathmandu. Chapter four analyzes socio-economic background of sweepers and scavengers. Chapter five provides general scenario of health problems among sweepers and scavengers. The chapter makes comparisons of existing health problems between sweepers and scavengers. Furthermore, Chapter five analyzes the underlying causes of differences in health problems between these groups. Chapter six is the in-depth study of sweepers. This chapter deals with the role of different activities in health problems. Chapter seven elaborates on the situation of scavengers. This chapter helps to understand the spatial variation in health problems among the scavengers working at different locations. In this chapter, health problems concerning different groups of scavengers (based on place) are compared. Finally, Chapter eight is the concluding chapter summing up all the findings.

CHAPTER TWO Conceptual Considerations

As this thesis is an attempt in Health Geography, it involves a framework constructed through the review of different concepts and theories from medical geography, welfare geography and urban environmental management. The second chapter includes the review of all those concepts and theories.

2.1. Overview of Urban Environmental Health

Endeavor of economic restructuring, a socially balanced environment and ecological sustainability are some of the main factors that contribute to urban management. Ever increasing urban population on one hand and failed authorities of urban management on the other, result in innumerable problems, especially in the third world cities. Environmental management is an intensely political task. However, political instability and insufficient financial resources in the third world cities have retarded the organizational and social capacity to deal with urban problems. Lack of safe collection and disposal of human and household wastes, provision of safe, adequate water supply, good sanitation and affordable housing have become characteristics in these exhausted cities. The solutions to urban environmental problems depend on good local governance and locally driven knowledge of the state of environment within each city. However, environmental policies in developing countries are influenced by the policies of developed countries. In the third world cities where water borne diseases, environmental health problems related to garbage and indoor air pollution are much more serious, just like in the cities of the developed countries, the problems created by ambient air quality and chemical contamination are given greater priorities instead of areas like water supply and sanitation. Half of the urban population in Asia, Africa and Latin America is suffering from one or more of the main diseases associated with inadequate water supply and sanitation (WHO, in Hardoy et al. 2001). Sadly developing countries are not prioritizing in those areas, as environmental strategies there are merely replications of existing environmental policies of the developed countries.

Social insecurity, instability and alienation can be summarized as urban stress. These are the characteristics of the dark side of city life. As cities develop, the degree of social inequality, cultural conflict and political fragmentation experienced within urban boundaries (Marcotullio 2001). Most of the environmental problems in cities are byproducts of

economic and political causes. From the environmental point of view, a place can be considered as a container whose character depends upon what is contained within its recognized boundary. The existence of diverse things in small places like in urban areas, the surrounding environment of such places become more complex, and if not properly managed, become unhealthy places (Fitzpartrick and LaGory 2000).

Health depends on environmental conditions. According to WHO, (WHO in Pugh 2000) poor environmental quality is estimated to be directly responsible for a quarter of preventable ill-health in the world today, with diarrhoeal diseases and acute respiratory infections heading the list. Some 66% of preventable illnesses due to environmental conditions occur among children and this is especially significant in developing countries (Pugh 2000). Urban environments are often hostile to children since children do not have healthy places for growing up. Most premature births and low birth weights occur in developing countries. These are directly or indirectly linked to environmental conditions (Swaminathanan, in Pugh 2000). Similarly, Wildavsky (in Jørgensen 1985) also claims that about 90 percent of diseases in general depend upon the environment.

Absence of basic infrastructures and services for sewers, drainage, drinking water and regular service of waste collection and its safe disposal, create numbers of disease causing agents. As the uncollected waste accumulate near home and work places, city dwellers come in contact with waste and they have high health risks. Leakage from uncollected waste seeps into the drinking water supply system and results in chronic health problem for the city dwellers. It pollutes the sewer system and even results in land and air pollution. Lack of public space makes children vulnerable to various health risks as it compels them to play in unhealthy places and thus come into contact with hazardous materials and disease vectors. The low-income urban poor including sweepers and scavengers suffer highly from neighborhood health problems since the hazardous sites are the only places where they can build or rent shelters. Moreover, their high health risks works expose them more too various work-place-related health hazards.

A city is a mosaic of social and resource spaces where prosperity and poverty co-exist. Someone’s health status and economic status has two-way cause and consequence relation. As said earlier, lack of safe drinking water and provisions for sanitation has resulted in serious problems of water related diseases in the third world cities. Significant numbers of

urban population (described in Hardoy et al. 2001) in third world cities rely upon open defecation, 'warp and throw' latrine, bucket latrine, and other non-sanitary toilets. In this way, human excrements easily come in contact with drinking water system and food chain contaminating them in the process. In the concept of urban environmental health, a home is more than a shelter that can protect from number of diseases. Lack of housing or crowded housing increases the risk of transmission of infectious diseases. UNCHS (in Hardoy et al. 2001) claims that the risk of multiple infections and the risk of severe infection usually are in high rate in over-crowed home environment. Consequently, the urban poor who cannot afford minimum standard of housing suffer most. In the past, authorities neither accepted informal settlement nor took the responsibility of service delivery. But when such settlements were accepted, authorities got new challenges to manage informal settlements. Most environmental problems of third world cities are multidimensional, interconnected, interactive and dynamic. These situations make appropriate actions difficult for conventional government structure (Stren, in Hardoy et al. 2001). However, it always hits the low-income urban poor. Thus it can be said that urban environmental problems and poverty have significant relationship. Sound service provision might be a solution of this problem, but cost recovery is the center of challenge. Because of cost recovery problem, many service providers want to work only for profitable sectors. Poor can work harder if they are healthy and have more time for work. Therefore lowering the expense for basic services, reduction in physical efforts and the protection of low-income urban households' assets can reduce the poverty to some degree.

2.1.1. Approaches in Medical Geography

Health is the central concept used throughout this thesis. As defined by WHO, (in Gatrell 2002) health is 'a state of complete physical, mental and social well-being'. According to Gatrell (2002), illness is a subjective experience. Etiology of disease is often complex. It is not surprising that non-literate people in the different parts of the world seldom agree on the origin of any particular form of disease. According to primitive views, the major causes of illness are either caused by external factors such as malefic object or spirit in the environment or by internal causes such as a person breaking a taboo or offending gods and deities. Moreover, breach of taboo is a cause of sickness (Tuan 1980).

Health determines being physically and mentally 'fit' and capable of functioning effectively for the good of the wider society. Health can be seen as a commodity that can be lost or gained, sold or bought, or invested. In other words, health is someone's physical and mental situation that can be transformed into economy. To the scholar-official, illness signifies an imbalance between an afflicted organism and cosmic forces whereas the cure is in restoring the balance. However, for the common folks, causes of diseases are more specific and personalized like ancestors, ghost, demon or spirit. Where disease is endemic, it seems as an implacable power that becomes an awesome supernatural being (Tuan 1980). Psychological feeling has great influence in health. Seale and Pattison (Seale and Pattison in Gatrell 2002) state that when a healthy middle-aged man visits general physician for health check-up and if he is diagnosed with high blood pressure, he may have arrived as a healthy man but leaves as a patient. The non-western health care practices like osteopaths, acupuncturists and homeopaths emphasize the link between mind and body in a holistic approach to illness. It means diseases are example of the influence of psychology in health problem and its cure. A person may fall ill because of the loss of soul (Tuan 1980).

According to Jørgensen (1985), health is a result of welfare. Lower welfare can produce bad health and bad health may hinder realization of higher welfare. Different approaches have different explanations about health. *Positivist* approach, probably the foremost approach in the field of medical geography is mostly applied in medical geographic researches. According to this approach, physical proximity is a main mean of disease spread. This approach is to direct areal pattern or to model the way in which disease incidents vary spatially. People with diseases only appear as numbers, which compose spatially varying diseases rates. This approach has many characteristics of naturalistic approach to investigation. *Positivists* claim that physical proximity matters in diffusion of diseases. Diseases drive in large part by the extensive daily commuting fields (Gould and Wallace in Gatrell 2002).

Social interactionist approach in health geography explains health as an outcome of individual's characteristics or social variables. This approach is also known as *social constructionist* approach, where meanings are constructed out of the interaction of day-to-day life. *Structuralist* approach in medical geography is derived from Marxist theories. According to this approach, underlying causes of diseases are embedded in political and

economic system. Existing inequalities in society, social structure, human activities and access to health care affect health. Explanations of this approach are not to be sought at the individual level but in broader social contexts. For Turshen (Turshen in Gatrell 2002) as for others, the causes of diseases are not rooted in individual's lifestyle and behaviors. In the same way, Arnold (Arnold, in Gatrell 2002) reveals that the infrastructure imposed by colonialism, new trade routes, and communication networks added the spread of microorganisms and disease vectors that transmitted other diseases.

In the broader sense, *Structuralist* approach deals with conflicts in society. *Structuralists* want to see wide-ranging conflict or power relations, whether this be between social or ethnic groups, between men and women, between owning the means of production and those employed as laboring classes, or between societies (Gatrell 2002). According to Ferguson (Ferguson in Gatrell 2002):

> Capitalist health care system gives emphasis to curative medicine rather than preventive ones. Since poverty is a main cause of ill-health and poverty results from capitalism, there are little incentives among those controlling and working in, the health care system to attack these root causes. More money is to be made from providing medical cures than reducing poverty and preventing diseases and ill-health in the place. …medicine serves to perpetuate social inequalities and widen the gap between rich and poor….according to political economist, medicine does nothing to reduce disparities.

2.1.2. Health and Sustainability

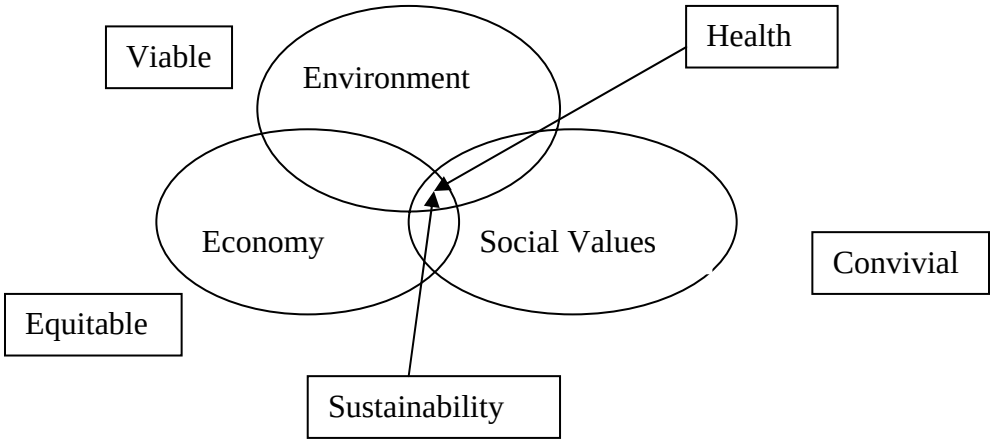
Although human beings are active agents, ill health presents them differently. Therefore human health is a central challenge for sustainability. The "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" is the widely accepted definition of sustainable development given by Brundtland Commission Report (1987). According to WHO, (WHO in Pugh 2000) healthy city is sustainable city. The dual goal of sustainable development is health and sustainability. Sustainable development can only be achieved by considering three components: environment, economy and social value (Figure: 2.1). This can be achieved through a convivial, viable and equitable mix of environment, economy and social values.

The idea behind the sustainable cities includes not only the idea of ecological balance but also sound economy, health and eradication of poverty. Sustainable city depends on the

country's urban environmental policy, practice and performance. The environmental policy, practice and performance of a city are dynamic and alter with the change in population size, urbanization level, consumption pattern and technology. Moreover, sustainability of a city depends on the relationship and interaction between the city and its periphery. City's relationship with national settlements and urban systems, the role-play by the city in national socio-economic and political decision-making process also has significant role for the sustainability of a city (White and Burton 1993). More than 600 million urban dwellers in developing countries are surviving in health threatening environment (Mitlin et al. 1992). Therefore, it is essential to make sustainable cities by controlling or limiting the harmful impact of human activities on the environment.

The concept of healthy cities initiated by WHO emphasizes for close interrelationship between health and urban environment. The concept attaches great value of participatory interventions at neighborhood level. The environment as a major cause of illness is not only a modern thinking but has been an idea potent from ancient times. In ancient times, distant stars and terrestrial environments were thought to influence human wellbeing. However, most modern medical scientist, insofar as they trace a disease to the physical environment, look not to the heaven but to the earth, i.e. pollutants in the air and water (Tuan 1980). Here, the idea behind the WHO's healthy city concept is 'health for all' in urban areas (Pugh 2000) that emphasizes for healthy physical environment. This notion implies for equity in urban health too.

Figure - 2.1: Conceptual Diagram in Sustainability and Health



Source: WHO, 1997 (in Pugh 2000).

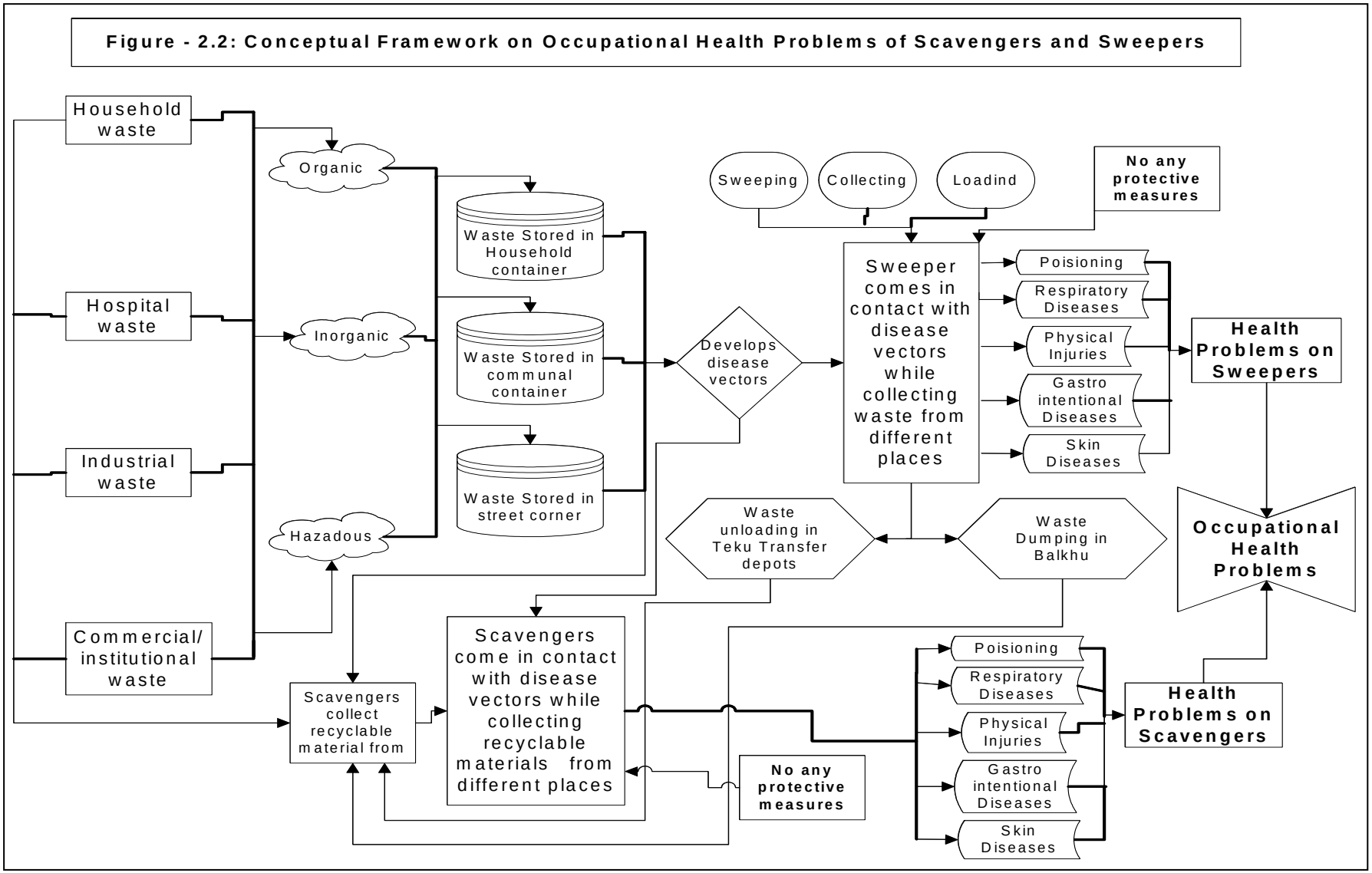
2.1.3. Working Environment and Health

As introduced in Chapter I, the major research questions of this thesis is to answer the question 'in what level the scavengers and sweepers are suffering from health problems associated with the working environment?' This question aims to investigate the health problems of sweepers and scavengers and health problems among this working class is directly associated with their working environment. For sweepers and scavengers, waste is a resource for livelihood in the cost of their health.

Numbers of studies on the health problems of solid waste worker and scavenger (Birley and Lock 1999, Pugh 2000, Hardoy et al. 2001, Atkinson 1999, Cointreau-Levine …, and Stephens 1999) indicated working environment as major cause for illness. Environment at work place is often ignored in developing countries (Phoolchund 1995). Poor working conditions and lack of worker protection systems make health problems including injuries and accident rate among the waste workers and waste pickers significantly higher in developing countries. Environmental hazards at work places due to least adequate provision for basic infrastructures and services are the major causes of ill-health, injury, and premature death on the lower income groups of the urban centers of Asia, Africa and Latin America (Cointreau-Levine…).

Working with rotten waste is a way of life for scavengers and sweepers in third world cities. Waste waiting for collection develops diseases vectors (Birley and Lock 1999). The poor sweeper and scavengers of third world cities have no choice and they live and work in such a disease vector prone areas. On the one hand, not separating the hazardous/special wastes at the source of origin makes not only working environment unhealthy but also encourages multiplication and spread of parasites and pathogenic microorganisms (Birley and Lock 1999). On the other hand, mixture of organic and inorganic materials including sharp objects can cause occupational injuries to workers. Sweepers and scavengers are to exposed to such unhealthy working environments and have high health risks. Figure 2.2 describes the way that sweepers and scavengers suffer from high health problems.

Figure - 2.2: Conceptual Framework on Occupational Health Problems of Scavengers and Sweepers



2.1.4. Place and Health

One of the major research questions of this study is to analyze the place specific variation in the health problems on scavengers. In the concept of geography, health is a result of a 'place'. A place can be a healthy or unhealthy or good or bad for health. According to Fitzpartrick and LaGory (2000) a place matters for human health. The things happening in one place may have negative, even drastic consequences for those living both nearby and at a considerable distance (Gatrell 2002). Geographical location affects the nature of sickness. This concept is as old as about 450 B.C. in Chinese medicine. In this context Tuan (1980) gives an example how a geographical location effects an individual's health. For instance, the *yang*, the warm air from the south gives rise to fever and inflammation and the *yin*, the cold air from the north is responsible for the chills. People in the east eat fish and crave for salt, salt causes thirst, taking too much salt injures blood ultimately causing ulcers in many.

Places have different characteristics. A place's characteristics are determined by surrounding environment. Hazards are unevenly distributed and a place with higher concentration of hazards has higher health risks. The dwellers with the most limited resources have the greatest exposure to hazard. Krieg (in Fitzpatrick and LaGory 2000) noted that communities with reduced access to economic opportunities are vulnerable to, and are more accepting of, the health and environmental costs of hazard placement. As noted by Harvey (in Fitzpatrick and LaGory 2000), the location of toxic waste dumps in the US is the geographical concentration of people of low-income and color. Minority population, particularly African American and Hispanic in America are at risk for exposure to high level of environmental contaminants because of the place where they live and work (Fitzpatrick and LaGory 2000). The health of low-income residences in the cities of the world has been challenged by environmental hazards produced by unregulated polluting industries.

In this study, the concept of a place is used as physical space. It focuses on spatial differences on health problems of scavengers rather than the role of place in determining their health. Different characteristics of different places have different influence in human health. The characteristics of different places covered by present study are different in terms of waste composition. Such different characteristics might produce different health problems among the scavengers.

2.1.5. Socio-Political Structure and Health

This thesis is also concerned about the question of whether the socio-political structure of country causes people to take up jobs as scavengers and sweepers. Regarding this question, an attempt has been made to understand the underlying causes behind people entering sweeping and scavenging occupations. The relationship of scavengers with wholesale buyers and the scavengers' control over determining the price of collected goods are also covered in this research.

Health of poor groups is linked with nutrition, poverty, unemployment, deteriorating housing, violence, and loses of service. As mentioned earlier, *structuralist* approach claims ill health is a product of socio-political structure. Diseases are the result of social conditions for a long period. Poor living condition in early childhood and stressing life-events in earlier phases of life can predispose for disease and early death.

2.1.6. Solid Waste Management and Health

Historically all wastes were recycled in traditional system and used as compost in peri-urban and rural areas (White and Whitney 1992). However, with the industrial development and modernization, the proportion of non-biodegradable waste has significantly increased. Over-population concentration in cities generated huge amount of waste. As a result, surrounding environment started failing to maintain the balance between waste supply and waste degradation. With the course of modernization, countryside started to use chemical fertilizer. The heavyweight organic composts produced from waste become uneconomical to transport for use in agricultural production. These situations resulted in high concentration of waste in urban areas. At present, to solve waste accumulation in cities, wastes are being dumped either in open space or in water bodies. Such improperly disposed wastes are creating uncountable environmental health problems.

Solid waste is one of the main problems of urban health in developing countries. In the cities of developing countries, waste management is labor intensive. Waste collectors lift heavier loads; often to higher loading location and traffic conditions with significantly more dust and diesel exhaust pollution (Cointreau-Levine…) result higher health problems. While managing solid waste, back and joint injuries from lifting heavy waste filled containers, respiratory illness from ingesting particulates and dust suspended in air, infections from

direct contact with contaminated materials, dog and rodent bites, or eating of waste fed animals, nausea, headache or tetanus, hepatitis infection can be occur to waste worker (Cointreau-Levine…).

2.2. Summing-Up

The urban environmental health problems in developing world are enormous and are magnifying each day. Study of these health problems is complex because health is affected by an individual's daily life style. Multiple factors like physical, socio-economic and cultural factors including pollution, working environment, eating habits, smoking as well as drinking habits of individuals affect individuals' health. The urban economic development and environment have two-way interdependence cause and consequences relation. It is therefore imperative to view the health problems of an area in reference to multiple physical and socio-economic factors.

General explanation behind this research is that a large number of people in urban areas are experiencing the problems generated by environmental pollution. General urbanities are suffering from varieties of health problems indirectly. However, occupational people are directly suffering from number of occupational health problems because they work in waste management sector. The scavengers and the sweepers who works for solid waste management of the city are gaining their livelihood through waste economy nevertheless they are directly suffering from various health consequences. Primarily this research follows *structuralist* approach, however it mixes-and-matches with other approaches to certain degree. Due to lack of proper infrastructures and policy-programs, problems connected with solid waste have not improved even after lunching numerous large projects in Kathmandu (Tuladhar 1996). Feudal structure of society, political, economic and social structure of the country is making disparities in the distribution of opportunities and risks and these are the root causes of various maladies among sweepers and scavengers of Kathmandu. As health is a physical, mental and social wellbeing and determined by social welfare, physical and social environment and individual's behavior and psychology, this study will try to analyze complex interactions of these multiple factors in the context of sweepers and scavengers in Kathmandu.

CHAPTER THREE Research Methods

This study explores the existing health problems among the sweepers and scavengers and differences in health problems between these two working groups. Furthermore, it explores the activity-wise differences in health problems of sweepers and the place-wise differences in the health problems of scavengers. This chapter focuses on different methods used to compile and analyze information and interpret the result. Based on the nature of research questions, this study applies both quantitative and qualitative methods.

Primarily this study is based on *structuralist* approach. It investigates the underlying mechanisms and structures of policies and practices. The research questions of this study such as reasons of entering into sweeping or scavenging occupations, health awareness and health practices of occupants and policy-practice gap were answered through *structuralist* approach. *Structuralist* approach is based on Marxism grand theory. The questions like whether poor sweepers and scavengers are exploited, who decides the price of collected goods, how are the prices determined, are the political, social or economic structures responsible for being a sweeper or scavenger, have also been answered based upon this approach.

Some questions have been formulated in order to understand variations in health problems between sweepers and scavengers, waste management practices and gaps in policy-practices. These questions begin with ‘what’, ‘where’, ‘who’, ‘why’, and ‘how’. Answers of the questions ‘what’ and ‘who’ are descriptive in nature and provide descriptive answers. The types of health problems among the sweepers and scavengers and access or right of these occupational groups to decide the price of collected goods provide descriptive answers. The question ‘where’ is related with occupational space of sweepers and scavengers. It is explanatory in nature and spatial in character. It explains the relational aspect of home, work places and treatment places. In the same manner, the question ‘why’ attempts to understand the underlying causes behind choosing sweeping or scavenging as occupations, specific working site, specific treatment institution; high health risk and the cause of policy-practice gap. All these questions are offered analytical answers. The last question, ‘how’ captures the information on livelihood of sweepers and scavengers.

3.1. Sample Size

There is no official record on the number of scavengers working in Kathmandu Valley. Three different groups of scavengers, based on their work place, scavengers of Teku (waste transfer depot), scavengers of Balkhu (dumping site) and scavengers of Open Kathmandu (scavengers working around the residential and commercial areas of whole Kathmandu Valley) were visited during the field survey. All three places have different characteristics and possibly produce different health problems. To understand the spatial differences in health problems, about 17 scavengers from Balkhu, 18 scavengers from Open Kathmandu and 25 scavengers from Teku were sampled in the survey. The number of scavengers picked at Teku for the survey is relatively higher compared to other two places. In the case of Open Kathmandu, it was difficult to access scavengers since they randomly moved according to their own will. In the case of Balkhu, it was very difficult to conduct interviews with scavengers because of dirty and smelly environment in which they worked. In my opinion, the small difference in sample sizes will not influence the overall result or make it bias. Altogether 60 scavengers were randomly surveyed from three places.

KV has five municipalities and for the detail investigation of sweepers, KMC has been chosen for the study. KMC is divided into 35 wards[1] and each ward is responsible for managing solid waste in its territory. KMC has about 2000 solid waste workers (sweepers). Sweepers perform three different types of works (a) sweeping streets and public places (b) collecting and piling the garbage in certain locations and (c) loading such piled garbage on trucks, tractors and trippers. Based on their specific work type, sweepers are categorized in three groups namely sweepers, collectors and loaders. Since the nature of works of these different groups is different, health impacts might be different too. Normally sweepers and collectors are posted in different wards for ward level work. Some sweepers and collectors are assigned to work directly under KMC head office. They work around major city-road and public spaces. Similarly, all loaders of KMC work directly under KMC head office. The total number of sweepers (including collectors and loaders) working directly under KMC head office is about 200.

[1] Ward is the smallest administrative unit.

Sweepers, collectors and loaders who are working directly under KMC were selected as sample group. Altogether 61 respondents were randomly surveyed. To understand the activity related health problems, 30 sweepers, 17 collectors and 14 loaders were surveyed. Here the number of surveyed sweeper is relatively higher than those of collectors and loaders. This is because the total number of collectors and loaders is less than sweepers in employment structure. Though I have taken a small sample size due to various constraints, I have tried to cover views and ideas of respondents from different places and activities. This may help to represent the actual condition of occupational health problems on sweepers and scavengers of Kathmandu. Work sites of these groups are shown in Figure 1.1.

3.2. Methods Used in Information Compilation

The findings of this study are primarily based on the information collected from the field survey. This study uses questionnaires, field observation and interviews with key informants to obtain primary information. The primary information is complemented by literature reviews and other existing sources of secondary information. Field survey was carried out in the months of June, July and August 2003.

3.2.1. Questionnaire Survey

Questionnaire survey is the primary method of data compilation for this study. Based on the reviewed literatures and through discussions with medical health practitioners, diseases and associated symptoms were listed. Two sets of structured questionnaires, one for sweepers and other for scavengers were constructed before the field visit (appendix III). Questionnaires include questions related to daily schedule of the respondents, existing health problems and annual occurrences of different types of illnesses to respondents. Information on variables such as income, age, health awareness and health practices, drinking /smoking habits and occupational history are also compiled in order to understand interlinks of health problems with these variables.

Both open-ended and closed questions are included in the questionnaire. According to Kitchin (Kitchin and Tale, 2000), questionnaire survey usually seeks a mix of descriptive and analytical answers. As this research needs both descriptive and analytical answers, questionnaire has been used. Owing to high health risk and unhealthy working environment, some researchers (Shrestha 1998) in the past felt that it was impossible to get information

through questionnaire for this kind of research. However, it is essential to get first hand information on the actual conditions of these worksites despite the high health risk this kind of study poses to the researcher. Hence for high response rate and to obtain authentic, first hand information, questionnaire survey has been chosen. Moreover, the field visit has been very useful in gaining insights into specific details through my personal observation.

Inventory of diseases is the most difficult aspect of this study. For this research, inventory of diseases are not based solely on medical science but also rely upon social and cultural aspects. Numbers of diseases show similar symptoms whereas symptoms may also vary person to person because of complex environment, social and biological phenomena. In such cases, it is difficult to draw distinct boundaries between diseases. Therefore I considered the symptoms found in respondents as a base to categorize diseases. To sort out such difficulties, the concept of prototype categorization is applied here. Prototype categorization is based on similar symptoms. The detail symptoms of different health problems are given in questionnaire (appendix: III). As noted earlier, this inventory does not solely follow the medical science but also includes social and cultural aspects. Expertises from medical and socio-cultural backgrounds were consulted for this inventory.

3.2.2. Field Observation

Working environments of sweepers and scavengers were observed to obtain first hand information on occupational health issues. Composition of waste, type of tools used by sweepers and scavengers, the work clothes and other safety measures opted during work were few of the many aspects observed in the field. Also all those aspects were photographed. The settlements of sweepers and scavengers were observed during the field survey too. On-site services like water supply, housing, rooms, ventilation, and light as well as neighborhood tidiness were also observed.

3.2.3 Interview with Key Informants

Numbers of key persons from different related sectors were interviewed in order to identify existing gaps in policies and practices in waste management. Two engineers from KMC and SWMRMC, one doctor from NTC, three wholesale buyers from different locations and one NGO personnel (*Sath-Sath*) were interviewed. Also the leader of scavengers of Teku Transfer Depot and assistant officer of Environment Department at KMC were interviewed.

The topics and issues to be covered in those interviews were specified in advance in an outlined form beforehand.

3.2.4. Secondary Sources of Information

Secondary sources of information were used to understand issues such as existing situation, temporal change and policy-practice gap in solid waste management. Numbers of existing literatures such as research reports, policy guidelines and strategic and annual plans were reviewed. Documents like City Development Strategy 2001, *Kathmandu Upatyakako Dirghakalin Vikash Abadharana* 2002 (Long-term Development Concept of Kathmandu Valley), *Rastriya Abas Niti* 1995 (National Housing Policy), Strategic Role and Responsibilities of Ministry of Population and Environment (MOPE) Environment Component 1999 and *Aspatal Phohor Byabasthapan Nirdesika* 2001 (Hospital Waste Management Guidelines) were reviewed. Similarly, *Fohor Maila Prabandha Tatha Shrot Parichalan Ain 2044* BS (Solid Waste Management and Resource Mobilization Act), *Aoudhyogik Byabasaya Ain 2046* BS (Industrial Management Act), *Batabaran Samrakshan Ain, 2053* BS *and Batabaran Samrakshan Niyamawali 2054* BS (Environmental Conservation Act and Legislation) and *Sthaniya Swayatta Shasan Ain 2055* BS (Local Governance Act) were also reviewed.

3.3. Analysis

This study tries to identify the differences in health problems between and among sweepers and scavengers. Information obtained through primary and secondary sources are compiled, categorized and analyzed for the research.

3.3.1. Compilation and Tabulation

Research process consists of two steps: acquiring information and interpreting it (Aase 1997). After obtaining information, all information was entered in Statistical Package for Social Science (SPSS) database form and percentile of respondents experienced different health problems were calculated through using same software. Meantime, mean, and standard deviation of socio-economic factors like age, working years, income, smoking and drinking habits were calculated through using SPSS. There may not be exact English translations for some of the expressions used by respondents since the survey used the local language, which

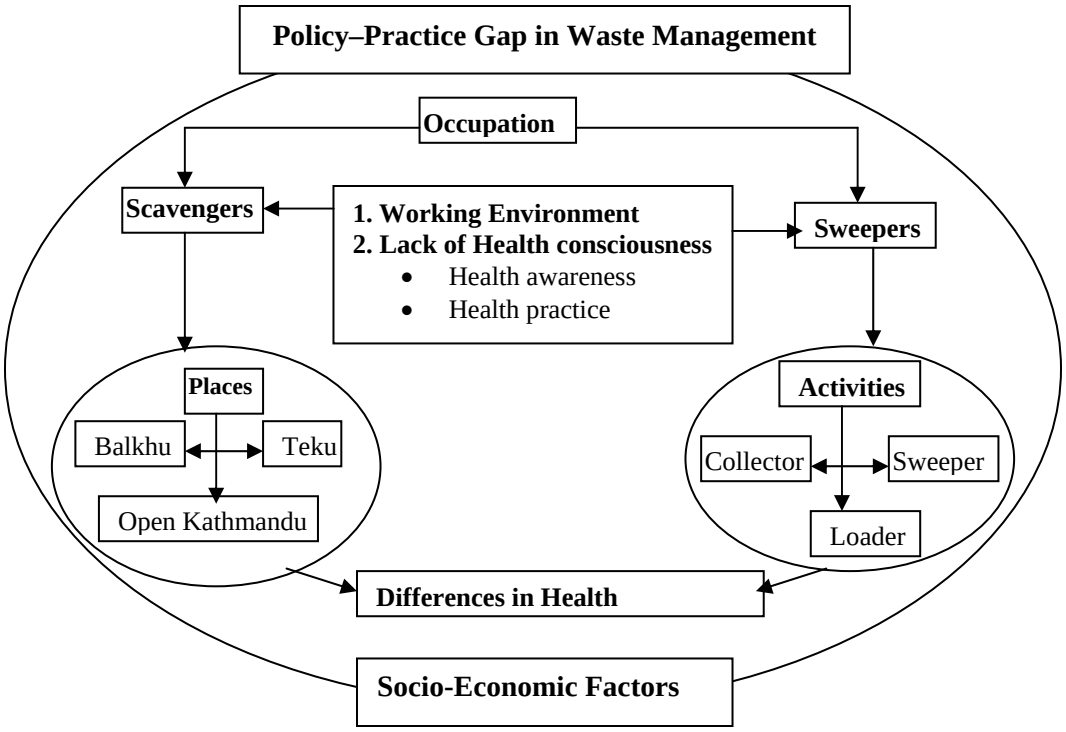
is Nepali. Nevertheless, information has been translated in English as much as possible to represent such expressions.

3.3.2. Analysis

Although this study applies both qualitative and qualitative methods, descriptive approach has been widely used for result interpretation. Through comparing the percentiles of respondents experienced different health problems, differences in health problems between and among the groups and sub-groups were described. To make findings communicable between scientists and to get cumulative growth in knowledge, concepts used throughout the study need to be formalized (Aase 1997). Also analysis and final report writing is another part of research where it is necessary to make comparisons with other studies.

First of all, different diseases found among sweepers and scavengers were tabled. Sweepers are sub-categorized as sweepers, collectors and loaders based on the activities they perform and each sub-group are compared to each other to analyze activity-wise differences in health problems among the sweepers. Scavengers are also sub-categorized according to their workplaces and compared in order to figure out spatial differences in health problems among the scavengers. Figure 3.1 below provides clearer picture of the analysis process and steps undertaken to analyze the differences in health problems among sweepers and scavengers. Graphs and charts have been used for effective illustrations of those results. Since the result of this study is derived through the sampled groups of sweepers and scavengers in Kathmandu, it may not be appropriate to apply the outcome of this study to other cities and towns in Nepal.

Figure – 3.1: Analytical Framework of Health Problems among and between the Sweepers and Scavengers and its link with Socio-Economic Factors



3.4. Some Experiences

While conducting this research, a number of problems were encountered, especially during compilation of information. Since the objectives of this study are rather complex, working in the field was complex and challenging too. The foremost challenge was researching in the unhygienic working environments of sweepers and scavengers. The hesitations and unwillingness of respondents to answer questions, language constraint, time constraint for questionnaire administration (it was due to business of respondents and lengthy questionnaire) and unfavorable weather conditions were few of the other problems confronted in the field survey. On top of it, bureaucracy of Nepali Government hampered compilation of secondary information.

Since, working environment of scavengers and sweepers are full of health risks, though I had keen interest to work with them, I was sort of intimidated by health risks it might pose to myself. Therefore I took precautionary measures provided by medical doctors before I visited the study area. As prescribed by a doctor, I took fifteen-day doses of multivitamins

(Vitamin B complex, C and E). I took daily shower with medicated soap after work and washed everything used in the field each day. Despite my precautionary measures, I suffered from skin allergy, skin rashes and irritations and occasional headaches. Some of my colleagues who helped me with during my initial fieldwork also suffered from skin rashes and irritations, headaches and nausea, after which they were hesitant to help me. My skin allergy continued till October 2003, even though I took fifteen-day doses of anti-allergy medicine after completing the field survey.

In the field, I had to put up with dreadful smell and excessive number of flies and insects. As I could not use mask while conducting the survey, there were many incidents where flies and other insects entered into my mouth. After a day in the field, it was difficult for me to travel in public transport or enter to any restaurant/fast-food centers because of my dirty clothes and emanating body odor. The tight schedule did not permit me to bathe or change clothes twice a day before lunch and before dinner during my field visits. I therefore missed my lunch during all those days that I worked at Teku and Balkhu. I usually visited these sites after breakfast and returned home for dinner.

Interviewing scavengers (especially male adults) was problematic since they were normally drunk even during the working hours. Street children at Durbar Marg, who work as scavengers, asked for money to answer my questions. They were in a group of about 25 with ages ranging from 6 to 30 years. I could not interview them individually as I could not pay them. I managed only one questionnaire for the whole group.

Questionnaire posed a lot of problem too in the field. First of all, the questionnaire was relatively long, full of medical terminologies and demanded further explanations to respondents. Each questionnaire normally took more than one hour to complete. Secondly, when sweepers and scavengers were at work, they asked me to wait until they finished their work. However, afterwards they were either busy to go to home or have meal. Some scavengers asked me to come in the late evening for interviews when they are relaxing. However, when I visited them in the evening I found most of them were intoxicated and acting insane.

Weather also posed relative amount of problem. As June, July and August are rainy seasons in Kathmandu, heavy rain on one hand cancelled scheduled interviews thereby adding tasks of rescheduling another interviews and on the other hand, disrupted ongoing interviews.

In the squatters of Sinamangal, I faced the problem of language while interviewing scavengers. It had a large number of scavengers from South India who spoke Telegu, a language from South India, which does not even resemble Nepali language remotely. One of the ladies, who could speak bits of Nepali and Hindi languages, informed me that there were about 2000 Telegu speaking immigrants from South India who were living in squatters in Kathmandu Valley for past 10 years. It was interesting to know that almost all scavengers who came from India reported that they have nice house and enough property in their hometowns in India. The household members in such squatters were not only working as scavengers but also as *Jyotisi* (astronomer who predict ones future by palm reading and natal charts) and *Kawadi* (salesman who buys recyclable material from house, hotel/restaurants and commercial complexes). Thus middle-aged literate male worked as *Jyotisi,* young illiterate males worked as *Kawadi* and the rest of households-members including women and children worked as scavengers in those squatters.

I faced numerous problems interviewing sweepers. It was quite difficult to find time with loaders because they moved frequently from one place to another with garbage transporting vehicles. I met them while they were at office to report their attendance, but the time was very short hence I could not make more than one interview each day. When they were in a group, it was difficult to conduct another interview because they normally escaped by saying 'everything is same as the previous one'. Sometimes sweepers refused to give interview as a sign of dissatisfaction with municipal administration. A three-day long strike of sweeper to fulfill their demands disrupted my work for almost a week. Almost all sweepers have negative attitude toward public authorities as well as researchers since they have provided a numbers of interviews in the past but nothing has improved so far for them. This applies for the scavengers too.

It is shameful that I could not get a permission to enter into Singha Durbar, the official seat of Nepalese government, where a numbers of Ministries are located. Despite my three attempts, nobody in Ministry of Population and Environment would meet me. In the first attempt, security personnel did not allow me to go inside because he said no one could go in

before two in the afternoon. In second attempt, I could not meet responsible personnel because there was no one responsible personnel at work in the Ministry after two in the afternoon. In the third attempt, I requested the Police to allow me to get inside before two, but he refused saying I could not enter the compound without identity from His Majesty's Government. This barred me to enter Singha Durbar and take an interview with any officer of MOPE.

Plate - 3.1: Scavengers with their sacks at Balkhu (A drunk scavenger looking to camera)

Plate - 3.2: Wholesale buyers shop at Teku, recyclable material ready to send to recycle company

Plate – 3.3: Scavengers resting after work at Balkhu

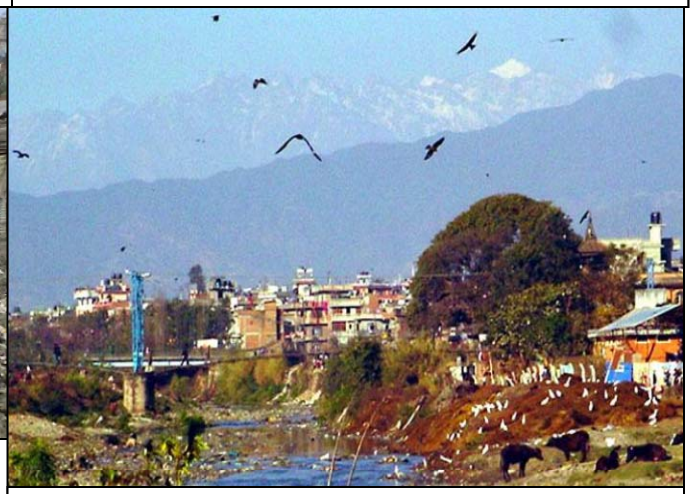


Plate – 3.3: Cows and Birds around dumping site (Photo: Mercantile Communication Pvt.)

CHAPTER FOUR Existing Situations

Previous chapters dealt with the problems, concepts and methods of this study. This chapter intends to answer the research questions linked with existing material recovery and waste management systems. The major areas for investigation are reasons behind sweepers and scavengers taking up sweeping and scavenging occupations, kinds of supports sweepers and scavengers are being provided by different sectors and existing policies for solid waste management and material recovery practice, and working environment. All these queries are intended to be foundations upon which the occupational health problems of latter chapters are based.

4.1. The Sweepers and the Scavengers: Who are they?

Castes are ranked endogamous divisions of society in which membership is hereditary and permanent (Berreman, 1972). Caste has been known as an element in the social structure of the Kathmandu Valley since the Licchavi period (A.D.300 - ca. 879). The Newar caste system has had its own development apart from the caste system of the *Parbatya* (peoples of hills) castes and that of the Indian plains. According to popular belief and various historical sources, Jayasthiti Malla first codified the Newar caste system in the *Nepalarastrasastra* in the l4th century. Since the times of Jayasthiti Malla, there have been great changes in the demography of Kathmandu Valley and since 1768 after the advent of Shah Dynasty, Newar have become integrated into larger multiethnic Nepali society. However, there has always been one principle, which is closely related to a caste's standing in the hierarchy, not only in Kathmandu Valley but throughout Nepal: namely, the more a caste by tradition works with polluted things, the lower its rank will be. This way, sweepers have always been ranked as one of the lowest castes in the hierarchy of castes. Sweeping profession has been traditionally allocated for certain castes like *Pode, Chyame*. A person born under such caste is perceived as sweeper even though he or she is unemployed. Historically these castes were not allowed to stay in the city. According to Regmi (Regmi 1993 in Larsen 2003) King Gunakamadev in the year 724AD founded Kathmandu city, which was surrounded by a protective wall. People belonging to lower castes called *achhut* (untouchable) like *Pode, Chyame, Kullu* and *Harahuru* were not allowed to live inside of the city wall. In the regime of Surendra Bikram Shah (1904-1938 BS) *Muluki Ain* (civil code) also strictly restricted to

these castes to reside inside city wall. They were not allowed to roof their homes by *Jhigati* (tile). From the long history, *Pode* and *Chyame* are working as sweepers and making their housing near garbage dumping sites. Being poverty-stricken and working in the lowest paid jobs, city dwellers had a tradition that sweepers were given remaining food. When municipalities got responsibilities to keep city clean, these *Pode* and *Chyame* got jobs in municipal authorities as 'sweepers'. In this study, the term 'sweeper' refers to municipal cleaning staffs whose job is entitled '*Kuchikar'* officially.

The person whose livelihood runs through collection of recyclable materials from the waste is known as 'scavenger'. Poor and socially disadvantaged individuals primarily carry out scavenging in Kathmandu valley, like everywhere else in the world. Poor flocking from remote Nepali villages and from some of the Indian States are currently working as scavengers in Kathmandu. This study identified numbers of people from India working in Kathmandu as scavengers. The scavengers are chronic urban poor, not only in terms of economy, but also in terms of service accessibility, health and social status. Many entered city in search of better income opportunities but being unskilled were forced to work in wage labor. Therefore whenever they do not find wage labor, out of desperation they rely upon scavenging for survival. Thus, scavenging is the last resort for these desperate people.

There is a considerable difference between sweepers and scavengers and it is highlighted throughout this study. The occupation of sweepers is based upon social hierarchy of caste system but scavenging is based upon economic need. Sweepers belong to a certain caste but scavengers in Kathmandu do not belong to any specific caste.

4.2. Sweepers and Scavengers: Their Socio-Economic Background

Health is an outcome of multiple factors. Numbers of socio-economic factors like age, sex, income, occupational history, dietary habit, access to health services as well as power structure have direct or indirect effect on a person's heath. It is difficult to separate these factors from each other as all of them are entwined. Therefore, it is not possible to analyze health problems properly through a single variable. Socio-economic background presented here helps to understand the causal factors of bad health in sweepers and scavengers in Kathmandu.

4.2.1. Age

Human body's immunity (preventive capacity) differs with age and different age groups are susceptible to different diseases. Age of surveyed sweepers is range from 20 to 42 years with mean age of 27.92 years and standard deviation of 5.628 years. Similarly, the ages of scavengers range from 6 to 62 years with mean age of 28.3 years and standard deviation of 14.262 years. The range of ages in scavengers of Kathmandu is wider than scavengers of Vietnam where ages of scavengers are found to lie between 10 to 52 years with average age of 29 years (Nguyen et al….). Sweeping is formal employment and therefore it has age related restrictions (need to be18 to enter to the job and retire at 58 years). Therefore, age range in sweepers is smaller than those of scavengers.

4.2.2. Sex

Gender based concepts developed in different cultural settings perceive women as more susceptible to occupational health hazards than men. However, feminist advocates claim that this opinion is made only to exclude women from work. Discourse between cultural believes and feminist approaches are both strong in their points. It is not clear yet whether women or men are more susceptible to occupational diseases, but unhealthy working environment has significant health impacts on both sexes. Anna Baetjer (…) claims that except in some special circumstances like pregnancy and maternity related issues, men and women are equally susceptible to diseases. This study surveyed equal proportion of men and women from both sweeping and scavenging groups. Although this study does not present sex-wise health problems, this generalized observation could not find notable differences in health problems between male and female scavengers. Though some differences are observed between male and female sweepers, it is difficult to claim whether such differences resulted due to difference in sexes. The nature of work for male sweeper is different than that of female sweepers (see chapter VI) and household roles also differ between them. Therefore health problems between sexes should be attributing more external factors rather than difference in sex.

4.2.3. Smoking and Drinking Habits

It is widely accepted that smoking and drinking habits cause severe health damages. Present study figured out that about 54 percent sweepers and 43 percent scavengers smoke. Sweepers

smoke 17.5 cigarettes per day in average, ranging from 3 cigarettes per person/day to 30 cigarettes per person/day. In the case of scavengers, the average is 18.5 cigarettes per day, ranging from 2 cigarettes per day to 40 cigarettes per day.

Abuse of alcohol is a serious problem in Nepali community, especially in low-income groups. Most of the wage labors spend significant share of their daily income in alcohol. Some drink to relax after long strenuous day of physical labor and some drink to relieve mental stress. Out of the total surveyed sweepers, 39 percent had drinking habit. They consumed about 935ml alcohol per week in average. This amount varies from 250 to 3500ml per week with person. The proportion of scavengers with drinking habit is almost similar as sweepers. However their weekly average consumption of alcohol is more than double than that of sweepers. Mean weekly alcohol consumption level of scavengers is about 2070ml and ranges from 500ml per person to 5000ml per person.

Although there might be severe health impact of smoking and drinking habit, due to lack of clinical examination, this study does not find significant differences in health problems between smoking and non-smoking, and drinking and non-drinking groups.

4.2.4. Economic Conditions

Economic conditions have health implications because they affect eating habits, clothing, housing, preventive/protective measures and treatment methods. Being poverty-stricken and socially ostracized, sweepers live in poor housing and sanitary conditions. Waste pickers work informally at open dumps and typically live adjacent to the dumpsite in poor housing condition without minimum basic infrastructure for clean water and sanitation. Total income of surveyed sweepers ranges from about 31 US$ to 68 US$ [1]per month with mean income of 46 US$ and standard deviation of 6.342 US$. Similarly, monthly income of scavengers ranges from 13 US$ to 130 with mean income of 54 US$ and standard deviation of 26.779 US$. Extremely unequal income distribution pattern was seen among the scavengers. Although about 75 percent sweepers and scavengers of Kathmandu reported that their current income levels have become better than what it was when they entered in these occupations, average income level is not enough to fulfill basic needs.

[1] 1 US$ = about 75NRs at the date

The scavengers reported in the field survey that if they did not suffer from serious health problems, they would earn more. However there are some exceptions. There are some scavengers who are making better income despite their frail health. Scavengers seldom invest for better health. Single scavengers, who have no household or family responsibility, ignore work when they fall sick and earn only what is enough for their daily living.

4.2.5. Occupational History

Occupational history provides evidences of exposure to various health risk factors. The duration of work in an unhealthy environment determines how much a person's health is at risk. The long twenty years working period of waste workers of New York City revealed that 70 percent of them suffered from fracture or dislocation (Cointreau-Levine…). Within the first eighteen months of working a materials recovery plant in Denmark in 1886, eight cases of *bronchical asthma* developed among fifteen exposed workers (Malmros in Cointreau-Levine…). The present study collected information on the health problems experienced within last one year only. In this respect, present study may not be effective in comparing health status between the new and old sweepers/scavengers. Sweepers have occupational history of one to twenty years with mean 9.33 years and standard deviation of 3.802 years. Similarly, scavengers' working history was one to twenty-five years with 8.38 mean of years and standard deviation of 6.134 years.

According to sweepers and scavengers, they are more likely to face health problems if they entered newly into the profession, which is not true. Although they think they have conquered all diseases as they work for many years, little they know that each day's exposure is building up in their bodies to cause severe health damages later on in their life. After some years of work with waste, they (especially the scavengers) cope with such unhealthy environment and accept all kinds of health problems as a daily routine. Same disease that was perceived as a serious problem in the earlier phase of scavenging is perceived as a normal problem later on. This lack of awareness makes them overlook some of the health problems until they became acute. Scavengers' saying *Rog sabai sathi bhaya, aushadhi khanu pardaina* (all diseases have became friends so we do not need to take medicine) is a good example that they have already accepted the health problems as routine of their survival.

4.2.6. Health Consciousness

Being ignorant about health risks and necessary preventive measures, sweepers and scavengers have high public health concerns as health risks are not limited only to them and to their family members, but also to rest of the city dwellers. As they move throughout the city, there are chances that they spread diseases vectors. Although consciousness about health is not enough to prevent all types of health risks while working with waste, it can significantly reduce health risks. Sweepers and scavengers have a very low literacy rate in Kathmandu. Although 44 percent sweepers and 62 percent scavengers in our study are literate, none of them have completed primary education. Ignorance and illiteracy makes them more vulnerable to diseases as they are less aware of preventive measures and precautions they could take. Personal hygiene is another issue here. Although each sweeper gets two sets of uniforms, including shoes, gloves and masks each year from KMC, they seldom use gloves and masks. KMC had initiated monitoring of the health status of sweepers but it was not regulated properly. Neither KMC has launched awareness programs nor have sweepers demanded for effective health-monitoring programs. Most of the scavengers eat at working sites (plate 4.1). Scavengers at Teku eat food picked out of the waste[2]. It is not surprising that some on-site vendors have set food stalls around dumping sites. Let alone bathing after work, they do not even consider washing hands before eating. On top of it, they do not think that it is necessary to wash contaminated working clothes daily.

Although private medical shops and clinics are providing medical facilities throughout the country, sweepers and scavengers do not think it is necessary to visit them each time they feel something is wrong. They perceive most of health problems as nothing apart from normal and consider being treated. KMC has one health center especially for sweepers but sweepers seldom go there for health check-ups. Only when fever, headaches, stomachaches, dysentery and diarrhea become acute, they visit treatment facilities. Most of them just buy medicines from drug stores without physical examination. Some NGOs like *Sath-Sath*, *Shahara*, and *Shantishewa* are dedicated to provide primary health and other services to urban poor including scavengers, but very few scavengers know that such facilities exist. Many resort to drinking to relieve physical pains. Most of male sweepers and scavengers

[2] Remaining food (pack lunches produced for flight catering, seminars, conference and from the hotels) found on hotel waste.

drink alcohol each evening and some scavengers are drinking even when working. All these factors are some of the outcomes of poor awareness among our study groups.

4.3. Existing Material Recovery (Scavenging) System

In Nepal scavenging has not been established as an occupation institutionally. Waste in Kathmandu consists of thirty-nine percent of recyclable materials (HMG/N 2000) but scavengers sort only about seven to nine percent recyclable materials (KMC, Environmental Department). Since manual material sorting technique is slow, it is not commercially viable. Normally materials with high resale value like beer bottles, metals, papers and even plastics are already sorted in households, shops, restaurants and hotels. Therefore sorting recyclable material from municipal waste using manual sorting technique can support livelihoods of only few individuals. Normally entry in scavenging occupation is free though few informal restrictions exist. It is not possible to work as scavenger at Teku waste transfer depot without the consent of the leader of scavengers as KMC keeps heavy machineries around there. If it is not restricted, there might be chances that some scavengers might steal equipment or parts of equipment. Secondly the number of scavengers has to be controlled because; crowd of scavengers may disturb equipment operators at waste transfer depot and increase the risk of traffic accidents. Once KMC tried to ban scavenging at Teku but since most of scavengers have been working there since SWMRMC established compost plant about 20 years ago, they refused to leave their work place.

Scavengers of Teku also prohibit new scavengers from entering the waste transfer depot. It is because if there are many scavengers, each scavenger will have smaller quantity of materials recovered from the waste. Secondly if any of KMC's equipments stored are missing, the existing scavengers of Teku are likely to be blamed. Therefore to block unknown scavengers entering Teku depot, scavengers of Teku have a gang.

There are no restrictions at Balkhu dumping site. However, some scavengers claim that they have to pay about 0.13 US$ each day to the guard of dumping site to be permitted inside although the guard denies that allegation. Though any individuals can start scavenging according to ones own will in Kathmandu excluding Teku depot, work group or gang is essential for safety. If someone is away from the gang, probability of being beaten or robbed

is high. Larsen (2003) identified such gang behavior in street children and as many of them grow up and get into scavenging, this type of gang prevails.

Table 4.1 shows the ways of entering into scavenging as occupation. Many scavengers either do not know or would not share the story of how they entered into this occupation. However, most of them entered through the help of friends, relatives and family members. Household economic hardships usually push not only the adults but also the children into this occupation.

Scavengers of Kathmandu carry large plastic sack and use bare hands and sometimes an iron hook to rummage materials through garbage (plate 4.2 a, b and c). They put recyclable materials inside that sack and carry on their back. When sack becomes either full or heavy to carry, most of them go to wholesale buyers. There, scavengers on supervision of wholesale buyers sort collected material. Sometimes they can sell without separating. If scavengers sell without separating, they will be paid less. They sell their daily collection in each evening. However, some scavengers of Teku sundry collected materials and sell it once a week to reduce moisture content in collected items. If they are not sun dried, wholesale buyers subtract significant proportion of weight as moisture and soil contents. Many scavengers complained that the wholesale buyers usually subtracted higher proportion of weight in the name of soil and moisture content that what is normally contained in collected materials. To sundry materials, the scavengers of Teku occupy some space at waste transfer depot. Sun drying brings in more money to scavengers for similar pieces of goods from those that are not. Table 4.2 lists price of some of the collected materials. Prices differ with the quality of collected goods and the quality depends upon wholesale buyers' *dharma* (ethics). Sometimes scavengers sell their materials without weighting (especially in Balkhu) and they are paid according to wholesale buyers' ethic.

Almost all scavengers reported that they have no control over the price. More than eighty percent of the respondents reported that wholesale buyers determine the price of collected goods. Only single respondent reported that he is able to negotiate the price of collected goods. Nevertheless, all scavengers complain about not getting fair price. Most of them reported that price rate has remained the same since last 5-6 years and in rainy season it goes down. However, market price of consumer goods is almost doubled. According to scavengers, wholesale buyers make more than double profit. The wholesale buyers on the

other hand reported that they only get 10 to 20 percent of profit from recycle companies. The profit depends on the quality of materials. According to wholesale buyers, prices of collected material offered to scavengers are based on the prices they are getting from recyclable companies. We see here that since policy is lacking in the pricing of recovered material, there is the monopoly of whole sellers and recycling companies in determining the price of recovered materials. Table 4.3 shows how prices are determined.

Table - 4.1: Ways to Enter in Scavenging Occupation

	Number	Percent
No response	50	83
By the help of known friend	1	2
Came through a person who works here	2	3
Maternal aunty helped to start	2	3
Came through the help of leader	2	3
Through mother	1	2
Through relative	1	2
By paying RNs. 10, per day to guard	2	3
Just start to collect plastic	1	2
Total	60	100

Source: Field survey, 2003

Table- 4.2: Price list of collected goods

Collected goods	Price in NRs./kg (according to scavengers)
Black plastic	4-5
Milk pack white plastic	5-10
Aluminum	80
Iron/Zink	4-5
Plastic dolls and plastic utensils	10-18
Copper	120

Source: Field survey, 2003

Plate - 4.1: Scavengers eating their lunch at work site

Plate - 4.2a: Scavengers collecting materials at Balkhu

Plate - 4.2b: Scavengers collecting materials at Teku

Plate - 4.2c: Scavengers collecting materials openly (Photo: CWIN)

The present study identifies poverty and unemployment as two major causes of choosing scavenging as an occupation. Multiple issues compel urban poor into scavenging occupation and Table 4.4.a and 4.4.b list some of those issues. As unskilled workforce, these scavengers have difficulty being hired to work elsewhere in the labor market. Even if they are hired, low pay scale including employee's plundering and harassment in labor market compel them to be self-employed as scavengers. For some, it is the family occupation. Overall, scavengers are the deprived urban population without connections in other job markets. A study conducted on the waste pickers of Vietnam also identified similar causes of taking up scavenging (Nguyen et al…). Almost all causes listed in Table 4.4.a and 4.4.b are embedded in socio-economic and political structure of the country. Although the causes are not analyzed in reference to age factor, age plays a crucial role. For children, parental pressure is the main cause behind entering this profession but for adults, employees' dictatorship, plundering, harassment and low payment at other labor market in contrast to free flexible working hours and better income in scavenging are the main causes. Most of these adults, grew up as street children and therefore enjoy the autonomy that scavenging offers. Economic hardships due to unproductive fragmented agricultural plots and lose of the principle breadwinner in family are few other causes for the choice of scavenging as occupation.

Table- 4.3: Price Determination Process

	Number	Percent
Wholesale buyer-scavengers' negotiation	1	2
Don't know	9	15
Wholesale buyer	50	83
Total	60	100

Source: Field survey, 2003

Table - 4.4a: First Causes of Choosing Scavenging Occupation

	Number	Percent
Better income then other jobs	4	6
Did not get better job with good income	5	8
Did not get job	12	20
Did not get job, do not need to invest	1	2
Did not get job, low pay, need source	2	3
Did not get other job, free entry here	4	6
Due to lack of food for pig farm	5	8
Due to poverty /lack of agriculture land	16	27
Freedom and flexibility	1	2
KMC not allowing street vending	1	2
Parents are working /can make good money	7	12
Started since early age and profited	2	3
Total	60	100

Source: Field survey, 2003

Table - 4.4b: Second Causes of Choosing Scavenging Occupation

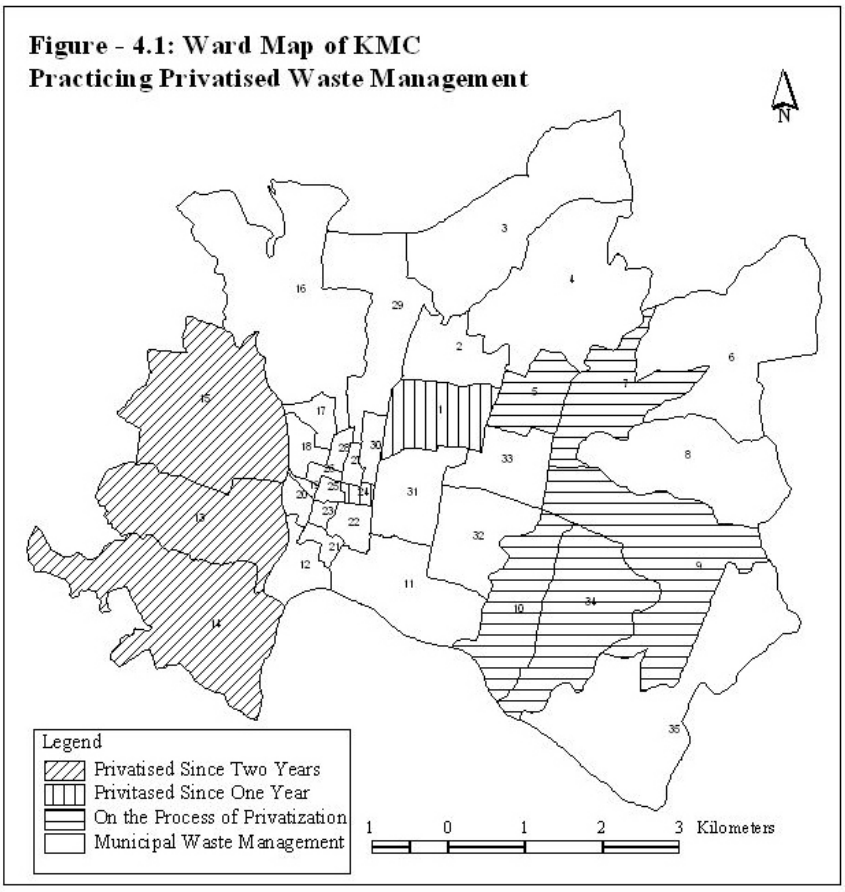
	Number	Percent
No response	29	48
No permission required to enter the occupation	1	2
Can't be a porter	1	2
Could not get other job	1	2
Husband not working/Could not manage the HH expense	2	3
Did not get better paying job	6	10
Poverty	5	8
Expensive pig food to buy from hotel	5	8
Freedom and better income	4	7
None to comply to and less abuse, Flexibility in time and work duration	2	3
Got info. Nepali making good money so.	2	3
Mother working and therefore asked to work	1	2
Do not need to wait for monthly payment	1	2
Total	60	100

Source: Field survey, 2003

4.4. Existing Solid Waste Management System

In Kathmandu, solid waste is stored in plastic bags, plastic or metal bins or bamboo basket at household levels. Such wastes are collected either by cleaning staff from private sectors or by

community waste workers. Recently KMC has stopped to collect solid waste at household levels. No waste collection containers are in the city now. Private sectors and communities are getting involved in wastes collections at household levels. Since last few years, KMC is practicing privatized waste management in some wards (Figure 4.1. and plate 4.3.). As privatized waste management system is yielding better results, KMC plans for further expansion of privatized waste management. In some small communities, sweepers themselves are collecting household waste informally. Wastes are collected in handcarts, tractors, and trucks from source of origin and transported to waste transfer depots (plate 4.4). Sweepers of KMC are sweeping streets, public utilities and collecting accumulated wastes lying in streets and public spaces. Majority of male sweepers are involved in uploading and unloading wastes in vehicles, pulling *rickshaw* (plate 4.3 and 4.5) and driving vehicles loaded with wastes. On the other hand, majority of women sweepers are involved in sweeping and collecting wastes (plate 4.6).



All collected wastes are transported to Teku Waste Transfer Depot using mini-trucks, tractors and *rickshaws*. Wastes generated at commercial areas are piled in street corners at late night or early morning and are collected either by municipal or private waste transporting vehicles. Small waste transporting vehicles unload wastes at Teku and larger waste loads carried by trucks unload directly at Balkhu Dumping Site. Waste collected at Teku are again loaded in trucks and compressors and sent to Balkhu. Wastes at Balkhu are unloaded in ditches alongside the riverbanks in Kathmandu. Thereafter, a layer of soil covers fill ditches.

Plate - 4.3: Household waste collector carrying waste in rickshaw

Plate - 4.4: Teku waste transfer depot

Plate - 4.5: Sweeper collecting waste in rickshaw at Jamal (experiencing irritating)

Plate - 4.6: Sweeper at work

All types of wastes, ranging from hazardous to non-organic matters to fecal matters and construction/demolition materials are found in municipal solid waste in Kathmandu. Based on weight, the solid wastes in Kathmandu comprise 69 percent organic, 9 percent plastic, 9 percent paper, 3 percent clothes, 1 percent metal, 3 percent glass, 1 percent rubber, 2 percent

construction material and remaining 3 percent plastic packaging. Out of the total weight, moisture content is about 45 percent. (KMC, Department of Environment, 2003). Waste loads also include hospital wastes, which are not separated from other municipal wastes.

Kathmandu does not practice technically feasible, socially acceptable, economically sustainable and environmentally sound solid waste management system. Waste collection and transport is carried out during the busy traffic hours in the congested roads in the city. This not only results in worse traffic congestion but also foils the city's aesthetic beauty. Recycling of wastes as resources is not only thoughtful but also essential as it minimizes significant amount of waste to be buried at the landfill site. As wastes of Kathmandu consist of 39 percent recyclable material, the scavengers working at Teku claim that if they had ample time to sort materials from waste, the amount of waste for disposal will reduce by half. Waste of Kathmandu has 45 percent compostable waste (HMG/N 2000). However, the city does not have a single composting plant. If KMC could reduce the proportion of waste through composting and material recovery, only 16 percent waste would remain to be disposed, which will not only reduce amount of waste but also will cut down on the cost of waste management and minimize environmental implication of waste mismanagement such as waste being buried in riverbanks (Plate 4.7, 4.8). Solid waste management in Kathmandu Valley is very complex largely because of 'the politics' in waste management. The conflict among different interest groups has shelved a sanitary landfill site proposed a decade earlier.

Plate 4.7: Bagmati River, ditch making at the bank and pile of waste ready to bury

Plate – 4.8 Ditch filled by waste at Balkhu

4.5 Existing Policies Related to Waste Management and Environmental Health

No provisions or regulations pertaining to hazardous waste in solid waste management could be found. Numbers of laws and legislations like *Fohor maila prabandha tatha shrot parichalan ain 2044* (Solid Waste Management and Resource Mobilization Act), *Audhuogik byabasaya ain 2046* (Industrial Management Act), *Batabaran samrakshan Ain, 2053 and Batabaran samrakshan niyamawali 2054* (Environmental Conservation Act and Legislation) and *Sthaniya swayatta shasan ain 2055* (Local Governance Act) have set very few legal provisions for the management of hazardous waste in the country. *Audhuogik byabasaya Ain, Batabaran samrakshan Ain* and *Batabaran samrakshan niyamawali* have set some provisions for safe disposal of industrial hazardous waste but these documents too remain silent about treatment and safe disposal processes. These laws and legislations only impose responsibility to municipal bodies and hospitals/research centers in managing such wastes but do not deal with their treatment or safe disposal. The politics in waste management has largely contributed to failures in hazardous waste management. Each institution just tries to flee from its responsibility blaming another institution. Numbers of problems namely political instability in the country and over emphasized bureaucracy, hinder efficient enforcement of existing laws and legislations, which resulted waste mismanagement. Therefore, hazardous waste generated in Kathmandu is inappropriately discharged to open dumps as well as in rivers.

For better management of hazardous hospital waste, there were some bleak efforts. The use of covered bins, plastic bags, waste separation, practice of color-coding system, proper storage, collection, transport and dispose separately were recommended by one-day workshop organized by KVMP/KMC (KVMP/KMC 2001b). The workshop also recommended autoclaving and incinerator for hospitals waste management. The workshop concluded that it was not so costly after all to separate and treat small amount of such hazardous waste in Kathmandu. After numbers of workshops, KVMP/KMC developed a Hospital Waste Management Guidelines (KVMP/KMC 2001a), which classified hospital waste and set guidelines to manage such wastes within the hospital through probable treatment procedures and proper disposal. The guideline specified different responsibilities at local and national level as well as specified institutional responsibilities. According to KVMP/KMC (KVMP/KMC 2001a) guidelines, first priority should be given to separation of

hazardous waste because about 80 percent of waste generated in hospitals is not hazardous. Mixing remaining 20 percent hazardous hospital waste makes not only to whole hospital waste hazardous but also makes municipal wastes hazardous. This guideline emphasizes to separate hazardous waste at the source of origin, its safe handling and disposal. This guideline is yet to be enforced.

CHAPTER FIVE Health Problems on Sweepers and Scavengers

This chapter deals with health problems in sweepers and scavengers. Waste piled up for collection, waste dispersed by rodents and insects, seepage of waste into water supply system and food chain, poor composting and unsanitary dumping sites have direct effect on public health of third world cities (Hardoy et al. 2001). Human and hospital waste when combined in municipal waste render multiplication of pathogens. Birley and Lock (1999) stated that poor quality of composting may not destroy pathogens such as nematode eggs and poor solid waste management creates breeding sites for the mosquito vectors of *dengue* and *filariasis*, the house fly vectors of various pathogens, rodents and rodent fleas. Among different health problems, this study covers namely physical injuries, dermal ailments, allergic reactions, poisoning, respiratory tract problems and gastrointestinal problems.

5.1. Health Problems on the Sweepers and the Scavengers

The proportion of sweepers and scavengers affected by environmental pollution is relatively higher than other city dwellers because of their direct contact with wastes. These occupational classes are poor, politically powerless and ostracized by society. The mainstream environmentalism does not include issues of sweepers and scavengers. Although there is a serious gap in policy and practice pertaining to working environment of sweepers and scavengers, none of the organization is voicing against it. As an example, an incinerator was constructed near to Teku Waste Transfer Depot a year ago. After the protest by socio-politically powerful local residents, the incinerator was closed. However, if the incinerator had been located at the site where sweepers live, that might have been operational since sweepers neither voice against it nor authorities normally listen their complaints.

Social phenomena and cycle of poverty have forced sweepers and scavengers to live alongside health hazards. Sweepers in Kathmandu have serious health threats since they work with wastes and live in unventilated, crammed dirty houses situated nearby dumping sites. As they also eat stale food given to them by the city dwellers and drink excessively, they are more likely than anyone else to have health problems.

Rural poor migrate to urban areas in search of better economic opportunities. Hardoy (Hardoy et al. 2001) remarks that poverty has shifted from rural to urban phenomenon.

Health problems in sweepers and scavengers of Kathmandu are byproduct of this economic transition. The health problems are embedded in politico-economic system and social structure of society as s*tructuralist* approach claims. The researchers claim that political-economic-social factors shaped the diseases and health of Sierra Leone in nineteenth century (Frenkel and Western in Gatrell 2002). Similarly, health of the indigenous population deteriorated in colonial rule as a result of economic transformations brought by colonialism and capitalism in Tanzania (Turshen in Gatrell 2002).

5.1.1. Physical Injuries

The term physical injuries include cuts, bruises and ruptures in the body, back pain, joint pain, elbow injury, wrist pain and other physical pains and aches. The proportions of sweepers and scavengers experiencing physical injuries are listed in Table 5.1. Out of all respondents, apart from cuts and ruptures in skin, the rates of other physical injuries were higher in scavengers than in sweepers. Sweepers use sweeping brush (plate 4.6), bamboo basket and spades (plate 5.1) for their work and avoid touching waste (including sharp objects) as much as possible. These measures somehow protect them from being injured. However, scavengers of Teku and Balkhu rush to the pile of garbage and collect as much material as possible without any precautions (plate 4.2a, b and 4.4). Such carelessness results in higher rate of cuts and bruises among them. Although actual causal factors behind relatively higher proportion of sweepers than scavengers having back pain, waist pain, elbow injury and joint pain are unknown, differences in the nature of their work may be the major cause. Figure 5.1 provides a clear picture of those differences.

Table - 5.1: Physical Injuries among Sweepers and Scavengers

	Back and waist pain	Elbow injury	Wrist injury	Cut and broke	Joint pain	Total Cases
Respondent	Percent	Percent	Percent	Percent	Percent	Number
Sweepers	89	72	77	64	69	61
Scavengers	78	60	75	95	47	60

Source: Field Survey, 2003

Figure - 5.1: Physical Injuries among Sweepers and Scavengers

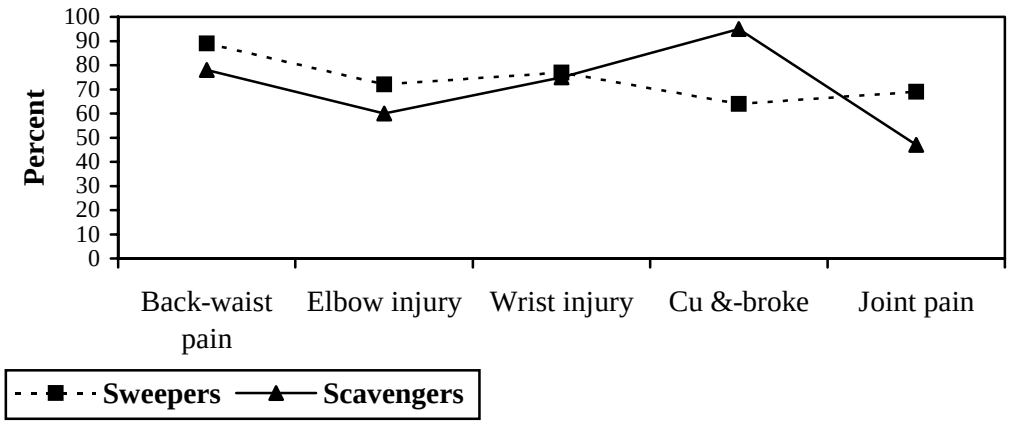


Plate - 5.1: Collectors using bamboo basket including spade and hand cart to collect swept waste

Plate - 5.2: Volunteer working in waste management (Photo: Mercentile communication Pvt.Ltd.)

Unsorted organic and inorganic wastes including sharp objects and labor-intensive waste handling practices are lead causes of high rate of physical injuries in sweepers and scavengers in Kathmandu. Poor protective measures and absence of first aid in time of injury intensify the problem. Sweepers and scavengers of Kathmandu seriously suffer from back pains, waist pains, elbow injuries, wrist injury and joint pains (Table5.1). In similar study conducted in Japan, Betsinger, Brosseau and Golden (2000) and Koda et al. (1997) also found significant physical hazards such as wrist, elbow and back injuries and low back pain among workers in solid waste management. Another study in Denmark by Poulsen et al. (1995a and b) also identified muscle aches, joint pains and frequent occupational accident

among waste collectors there. The case of Kathmandu and examples provided in other studies indicate that overall waste workers have higher health risks anywhere in the world.

During the survey, question was asked whether sweepers and scavengers find any sharp objects, broken glasses mixed in solid waste and if so, if they were injured by them. Ninety seven percent of sweepers and hundred percent of scavengers said that they were. Therefore I feel that just by separating inorganic waste and sharp objects from municipal waste, rate of cut and bruises can be reduced by significant level. As wastes are sorted out in developed countries, problem of cuts and bruises is less frequent there. Moreover, mechanized waste handling practice also reduces physical injuries to a large extent in developed countries, contrary to cities like Kathmandu.

5.1.2. Allergies

Allergies are serious health problems among the sweepers and scavengers in Kathmandu. Symptoms like skin rashes, itching, irritations, swelling lips or eyelids, eye irritations are few of the allergies reported in the study. The findings in this survey reveal that more than fifty percent of respondents in both groups have various allergic reactions at work (Table 5.2). A study by Poulsen and others (Poulsen et al. 1995a and b) also identified skin irritation and eye irritation in the waste collectors of Denmark. A study by German Technical Cooperation (GTZ) also states that scavengers of Kathmandu had higher rate of eye irritations after getting into the occupation of scavenging. (GTZ, in Cointreau-Levine ...). In the same manner, skin diseases were prevalent among the scavengers in Metro Manila (Adan et al. in Cointreau-Levine ...).

Table - 5.2: Allergic Problems among Sweepers and Scavengers

	Skin rashes	Irritation	Swelling	Eyelid burning	Total Cases
Respondent	Percent	Percent	Percent	Percent	Number
Sweepers	51	57	28	49	61
Scavengers	50	58	33	42	60

Source: Field survey, 2003

Obviously working with waste results in number of allergic reactions but poor protective measures and lack of personal hygiene worsens it furthermore. As shown in Table 5.3, annual frequency of allergies is relatively higher in scavengers than in sweepers. None of the

sweepers suffered from chronic allergy. However, some scavengers suffer from one or more chronic allergic problems. About fifty percent of scavengers reported that they experienced two or more types of allergies at the same time. The scavengers come in contact with waste more than sweepers as they sort materials from waste using hands. Also scavengers do not care much for personal hygiene, which makes scavengers more susceptible to longer lasting and more frequent rate of allergic problems.

Lack of personal hygiene brings intense allergic problems in these working classes. Cost and availability of water influences the quantity of water use. Limited quantity of water directly affects washing, bathing, washing foods, cooking and washing dishes and utensils used in cooking. Diseases like eye and ear infections, skin diseases, scabies, lice and fleas are very difficult to control without adequate supply of water (Hardoy et al. 2001). However, water scarcity is a serious problem of Kathmandu, not only for sweepers and scavengers but all urbanities of Kathmandu. The sweepers and scavengers who live in poor service areas are compelled either to use groundwater or water from streams for bathing and washing (sometimes even for cooking and drinking). Water collected from such sources is of very low quality. A significant proportion of sweepers and scavengers reported lack of water as major cause of bad personal hygiene.

Table - 5.3: Allergic Problems frequency among Sweepers and Scavengers

		Frequency per year									
Respondent		A week	%	1 month	%	3 months	%	Half year	%	Year round	%
Sweepers	Skin rashes	12	20	1	2	6	10	6	10	0	0
	Irritation	6	10	9	15	9	15	2	3	0	0
	Swellings	6	10	6	10	5	8	1	2	0	0
	Eyelid burning	16	26	9	15	9	15	5	8	0	0
Scavengers	Skin rashes	11	18	1	2	10	17	10	17	2	3
	Irritation	5	8	12	20	2	3	15	25	2	3
	Swellings	7	12	4	7	7	12	0	0	2	3
	Eyelid burning	12	20	7	12	2	3	1	2	2	3

Source: Field survey, 2003

More than fifty percent scavengers change and wash their working-clothes once a week only. It is not surprising that about twenty three percent scavengers do not change their working clothes for three weeks. Some of them wear same clothes even for longer period (see Table-5.4). Similarly, around eighty percent scavengers do not bathe daily. About twelve percent wait more than a week to bathe (Table- 5.5). Huisman (Huisman in Cointreau-Levine…) in

his study states that most of women waste pickers in India prepare food immediately after returning from waste picking, without washing or bathing. This practice encourages transmitting disease vectors to other family members too. GTZs study (GTZ in Cointreau-Levine…) also reveals that some scavengers of Kathmandu wait more than a week for bathing or changing clothes. More than sixty five percent do not change their clothing daily.

Table - 5.4: Working-clothes Changing/washing Habit among Sweepers and Scavengers

	Clothes change frequency								
	In a month	In a 3 weeks	In a 2 weeks	Weekly	2 times in a week	3 times in a week	Four times in a week	Daily	Total case
Respondent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	
Sweepers	0	0	0	74	10	8	8	0	61
Scavengers	3	23	10	27	15	7	7	8	60

Source: Field survey, 2003

Table - 5.5: Bathing Habit among Sweepers and Scavengers

	Weekly	2 times in a week	3 times in a week	Four times in a week	Daily	Total case
Respondent	Percent	Percent	Percent	Percent	Percent	Number
Sweepers	7	25	41	16	11	61
Scavengers	12	22	23	23	20	60

Source: Field survey, 2003

The frequencies of bathing and cloth washing/changing are relatively better among the sweepers since they have two sets of working-clothes given by KMC. Almost all sweepers bathe and wash their working-clothes at least once a week. As shown in Table 5.5, about sixteen percent sweepers bathe four times in a week. About eleven percent of them shower daily. The proportion of sweepers who bathe once a week is only seven percent. These personal hygiene practices might be the underlying causes of differences in the rate of allergies between sweepers and scavengers though both groups experience allergies.

5.1.3. Poisoning

Working with rotten wastes results in number of poisoning. Although the problems like headache, nausea, fatigues and fits might be the outcome of other factors, they are perceived as symptoms of poisoning in this study. The finding of this study reveals that ninety percent sweepers and eighty five percent scavengers have frequent headaches. About eighty four percent sweepers and seventy three percent scavengers feel of nauseous. The respondents

said that when they were away from working sites, they felt normal again. Some sweepers also believed that headaches were caused by intense heat and nausea and fatigue was due to weakness. Table 5.6 shows the proportion of sweepers and scavengers getting headache, nausea and fatigues. This study did not find notable differences in the proportions of sweepers and scavengers experiencing symptoms of poisoning.

Dumping site conflict, sweepers' strikes and other political issues frequently disrupts organized collection of garbage in Kathmandu. Garbage waiting for collection and wastes dumped in non-sanitary dumping (plate 4.7 and 4.8) emit poisonous gases. Not separating toxic materials and container of poisonous gases from wastes create poisoning problems among the sweepers and scavengers of Kathmandu. According to Birley and Lock (1999), methane emitted from dumping site can cause poisoning.

Table - 5.6: Poisoning among Sweepers and Scavengers

	Headache	Nausea	Faintingness	Fits	
Respondent	Percent	Percent	Percent	Percent	Total case
Sweepers	90	84	38	23	61
Scavengers	85	73	43	17	60

Source: Field survey, 2003

Although it is difficult to claim that poisoning is correlated to poisonous containers in waste, it is true that waste of Kathmandu is mixed with poisoning containers. As shown in Table 5.7, more than three among four scavengers said that they found used containers of poisonous material in waste. This might explain higher rate of poisoning. Sweepers normally do not care about mixed wastes but scavengers do because they sort recyclable materials, namely plastic or metal containers using bare hands. The use of mask might help to reduce the poisoning problems but both sweepers and scavengers do not do so.

Table - 5.7: Weekly frequency of Poisonous Container found in Waste

	4 times or more	2-3 times	Once a week	Sometime	
Respondent	Percent	Percent	Percent	Percent	Total case
Sweepers	0	0	39	28	61
Scavengers	78	2	8	0	60

Source: Field survey, 2003

5.1.4. Upper Respiratory Tract Diseases

There are number of diseases that can disturb respiratory tract. A significant proportion of sweepers and scavengers of Kathmandu show symptoms of upper respiratory tract diseases. The finding of this study is listed in Table 5.8. Five kinds of diseases namely *rhinitis, sinusitis, pharyngitis, tonsillitis* and *bronchitis* are categorized as upper respiratory tract diseases. Significant proportions of both groups show symptoms of upper respiratory tract diseases and differences in the proportions between two groups are minimum (Figure 5.2). Fever, sneezing, headaches, running nose and nasal congestion occur in three out of four sweepers and scavengers of Kathmandu. These symptoms are recognized as symptoms of *rhinitis* and *sinusitis*. Symptoms like cough, sputum, fever, headache, sore throat or throat-ache, which are accepted as the symptoms of *pharyngitis,* were found in sixty four percent sweepers and fifty two percent scavengers respectively.

Respiratory tract diseases are not typical only in the sweepers and scavengers of Kathmandu. Chest tightness, flu-like symptoms, itching eyes, itching nose, and sore or itching throat are significantly higher among the garbage-handling workers of Denmark (Sigsgaard et al. 1994). A previous study (in 1986) by GTZ (in Cointreau-Levine...) also found that the symptoms of cold became severe in scavengers after they took up the occupation. Symptom like sore throat is also common symptoms of *tonsillitis*. In the same manner, the *bronchitis* that develops numbers of similar symptoms related to other upper respiratory tract diseases including breathlessness and chest pain were found in thirty eight percent respondents. Coughing, chest-tightness, chills, fever and an increased risk of pulmonary disorders are high among the waste collectors of Denmark (Poulsen et al. 1995a and 1995b). Adan et al.'s study (in Cointreau-Levine...) in Metro Manila's scavengers also found significant proportion of respiratory ailments in surveyed scavengers.

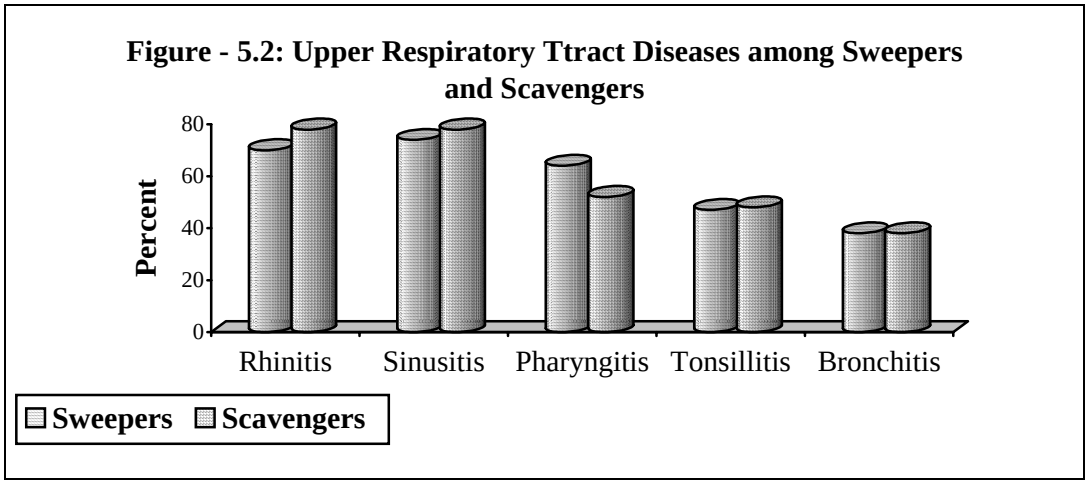
Table - 5.8: Upper Respiratory Tract Diseases among Sweepers and Scavengers

	Rhinitis	Sinusitis	Pharyngitis	Tonsillitis	Bronchitis	
Respondent	Percent	Percent	Percent	Percent	Percent	Total case
Sweepers	70	74	64	47	38	61
Scavengers	78	78	52	48	38	60

Source: Field survey, 2003

The annual occurrences of *rhinitis* and *sinusitis* were frequent in both groups. About twenty six percent sweepers and twenty three percent scavengers reported that the symptoms of *rhinitis* and *sinusitis* occurred at least three months in a year. No sweepers reported such symptoms to be chronic. Twenty to thirty percent of sweepers reported occurrences of *rhinitis* and *sinusitis* for at least a month in a year. Eighteen percent sweepers suffered from *pharyngitis* for at least a month in a year. Similarly, about three percent sweepers are experience the symptoms of *pharyngitis* for at least three months in a year. Many symptoms of *tonsillitis* and *bronchitis* are also found frequently on sweepers (Table 5.9).

Figure - 5.2: Upper Respiratory Ttract Diseases among Sweepers and Scavengers



The situations of scavengers are somehow different than that of sweepers. Some scavengers suffered from *rhinitis* and *sinusitis* chronically. About one tenth of them suffered for at least three months in a year. Twenty five percent suffered from symptoms related to *rhinitis* and *sinusitis* at least one month in a year. Ten percent of scavengers suffered from *pharyngitis* longer than 3 months in a year. About three percent of scavengers suffered from the symptoms of *pharyngitis* all year long. About forty seven percent scavengers suffered from the symptoms of *tonsillitis* and thirty eight percent from *bronchitis* one or more times in a year (Table 5.9).

Table - 5.9: Upper Respiratory Tract Diseases frequency among Sweepers and Scavengers

	Annual frequency															
Health Problems	1		2		3		4		1 month		3 months		6 months		Throughout the year	
Sweepers	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%
Rhinitis	0	0	1	2	2	3	10	16	12	20	16	26	2	3	0	0
Sinusitis	0	0	2	3	4	7	9	15	14	23	14	23	2	3	0	0
Pharyngitis	3	5	13	21	5	8	5	8	11	18	2	3	0	0	0	0
Tonsillitis	8	13	16	26	3	5	1	2	0	0	1	2	0	0	0	0
Bronchitis	4	7	10	16	8	13	1	2	0	0	0	0	0	0	0	0
Scavengers																
Rhinitis	4	7	13	22	6	10	11	18	6	10	5	8	0	0	2	3
Sinusitis	4	7	3	5	15	25	9	15	10	17	5	8	0	0	2	3
Pharyngitis	11	18	6	10	4	7	4	7	0	0	4	7	0	0	2	3
Tonsillitis	14	23	12	20	2	3	0	0	1	2	0	0	0	0	0	0
Bronchitis	17	28	3	5	3	5	0	0	0	0	0	0	0	0	0	0

Source: Field survey, 2003

5.1.5. Lower Respiratory Tract Diseases

Pneumonia, *tuberculosis*, *Chronic Obstructive Pulmonary Disorder (COPD)* and *asthma* are lower respiratory tract diseases. Breathlessness, chest pain, cough, fever and sputum with sneezing, headache, running nose, nasal congestion are few of the associated symptoms of lower respiratory tract ailments in sweepers and scavengers of Kathmandu (Table 5.10).

Lower respiratory tract diseases are relatively less serious than upper respiratory tract diseases. However they are difficult to identify without clinical examination and their symptoms develop slowly and have long-term impact. Probably this is why this study traced lower occurrences of lower respiratory tract diseases among the sweepers and scavengers. The symptoms of lower respiratory tract diseases are slightly higher among scavengers than in sweepers.

Table - 5.10: Lower Respiratory Tract Diseases among Sweepers and Scavengers

	Pneumonia	TB	COPD	Asthma	
Respondent	Percent	Percent	Percent	Percent	Total case
Sweepers	0	3	3	15	61
Scavengers	12	7	2	10	60

Source: Field survey, 2003

5.1.6. Upper Gastrointestinal Diseases

A large proportion of sweepers and scavengers of Kathmandu have serious gastrointestinal problems. Diseases like *malnutrition, dysphagia, heartburn, regurgitation, dyspepsia, flatulence, vomiting, water brash, anorexia,* and *gastritis* are upper gastrointestinal diseases. Among these, symptoms of *malnutrition, dysphagia, flatulence, vomiting* and *anorexia* are marked among the sweepers and scavengers of Kathmandu (Table 5.11). Except for *malnutrition, dysphagia,* and *anorexia,* higher proportion of sweepers than scavengers reported occurrences of the symptoms associated with upper gastrointestinal diseases. This is a bit surprising because the work conditions of scavengers are worse than those of sweepers.

During the survey, a number of scavengers naively asserted that after some months of work with waste, they adjust with working environment and they do not suffer much from diseases. However, the present study does agree with their claim. As noted in chapter four, many scavengers have accepted health problems as the routine events of their lives and choose to ignore the symptoms of gastrointestinal ailments. This might be the main cause why they are not so much aware about the symptoms of such diseases.

Table - 5.11: Upper Gastrointestinal Diseases among Sweepers and Scavengers

	Respondent			
	Sweepers (61)		Scavengers (60)	
Diseases	Number	Percent	Number	Percent
Malnutrition	2	3	5	8
Dysphagia	10	16	16	27
Heart burn	33	54	12	20
Regurgitation	43	70	25	42
Dyspepsia	35	57	6	10
Flatulence	10	16	3	5
Vomiting	18	30	11	18
Water brash	37	61	12	20
Anorexia	4	7	14	23
Gastritis	28	46	17	28

Source: Field survey, 2003

Figure - 5.3: Upper Gastrointestinal Diseases among Sweepers and Scavengers

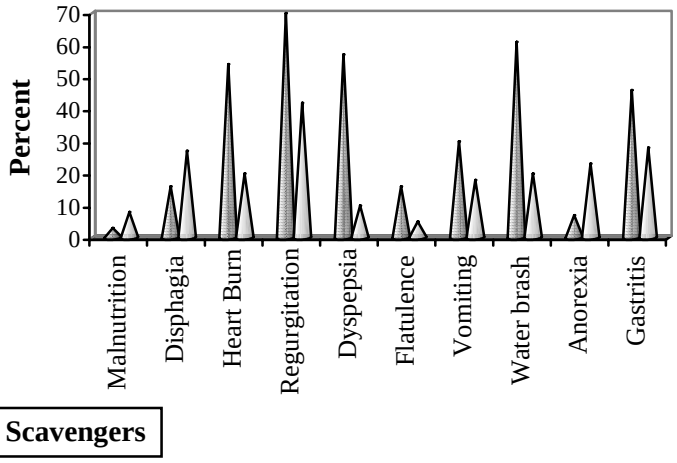


Table - 5.12: Upper Gastrointestinal Diseases frequency among Sweepers and Scavengers

	Annual Frequencies															
Disease	1		2		3		4		5-12 times		13-24 times		25-50 times		More than 50 times	
Sweepers	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%
Dysphagia	0	0	3	5	7	11	0	0	0	0	0	0	0	0	0	0
Heart burn	0	0	4	7	7	11	6	10	9	15	6	10	1	2	0	0
Regurgitation	2	3	6	10	11	18	4	7	16	26	6	10	0	0	0	0
Dyspepsia	3	5	7	11	9	15	2	3	9	15	3	5	1	2	1	2
Flatulence	0	0	3	5	2	3	3	5	2	3	0	0	0	0	0	0
Vomiting	0	0	2	3	7	11	2	3	7	11	0	0	0	0	0	0
Water brash	0	0	4	7	10	16	5	8	13	21	3	5	1	2	1	2
Anorexia	0	0	2	3	0	0	0	0	0	0	0	0	1	2	1	2
Gastritis	1	2	8	13	5	8	5	8	7	11	0	0	1	2	1	2
Scavengers																
Dysphagia	0	0	1	2	4	7	3	5	5	8	2	3	1	2	0	0
Heart burn	0	0	2	3	0	0	0	0	5	8	0	0	4	7	1	2
Regurgitation	0	0	3	5	6	10	7	12	3	5	2	3	2	3	0	0
Dyspepsia	1	2	2	3	3	5	0	0	0	0	0	0	0	0	0	0
Flatulence	1	2	0	0	2	3	0	0	0	0	0	0	0	0	0	0
Vomiting	0	0	5	8	4	7	0	0	1	2	0	0	1	2	0	0
Water brash	0	0	3	5	8	13	1	2	0	0	0	0	0	0	0	0
Anorexia	0	0	5	8	5	8	4	7	0	0	0	0	0	0	0	0
Gastritis	1	2	4	7	3	5	3	5	4	7	0	0	2	3	0	0

Source: Field survey, 2003

The sweepers and scavengers, who have spent longer durations working with waste, have serious gastrointestinal problems. They are exposed to number of diseases vectors and contract gastrointestinal diseases. This is not only the crisis of Kathmandu but also of other cities in the world. Poulsen (Poulsen et al. 1995a and b) pointed frequent gastrointestinal problems among waste collectors of Denmark. GTZ study also identified increased stomach complaints among the waste pickers of Kathmandu (in Cointreau-Levine…).

5.1.7. Lower Gastrointestinal Diseases

A number of lower gastrointestinal diseases occur in sweepers and scavengers of Kathmandu. Health problems like *peptic ulcer, food poisoning, giardiasis, worm infestation, ameobiasis, dysentery, cholera, typhoid,* and *diarrhoea* are some of the lower gastrointestinal diseases in them. A significant proportion of sweepers and scavengers show symptoms of *diarrhoea, ameobiasis, dysentery, giasdiasis* and food poisoning. As shown in Table 5.13 *diarrhoea* among the sweepers and scavengers is very high. Three among four sweepers and scavengers suffer from *diarrhoea*. Except for *diarrhoea* that is found at equal proportions in respondents of both groups, other lower gastrointestinal diseases occur more frequently in scavengers. *Peptic ulcer* and *worm infestation* are so serious in both groups. GTZ study also found the occurrences of *diarrhoea,* parasitic disease and *dysentery* very frequent in scavengers of Kathmandu (GTZ in Cointreau-Levine…). *Diarrhoea* and *dyspnoea* occur very frequently in the waste worker of Denmark too (Poulsen et al. 1995 a, b).

Table - 5.13: Lower Gastrointestinal Diseases among Sweepers and Scavengers

	Respondent			
	Sweepers (61)		Scavengers (60)	
Diseases	Number	Percent	Number	Percent
Peptic ulcer	0	0	1	2
Food poisoning	22	36	28	47
Giardiasis	15	25	26	43
Worm infestation	2	3	6	10
Ameobiasis	13	21	29	48
Dysentery	11	18	24	40
Cholera	17	28	18	30
Typhoid	9	15	13	22
Diarrhea	47	77	45	75

Source: Field survey, 2003

The frequencies of occurrences of lower gastrointestinal diseases conflict with the frequencies of occurrences of upper gastrointestinal diseases. Proportions of scavengers

experiencing number of lower gastrointestinal health problems is higher than those of sweepers (listed in Table 5.14). In about six percent scavengers, symptoms of *food poisoning* occurred more then twenty five times annually. About ten percent acknowledged occurrence of *ameobiasis* and another six percent acknowledged occurrences of *diarrhoea* up to twenty five times in a year.

Figure - 5.4: Lower Gastrointestinal Disease Problems among Sweepers and Scavengers

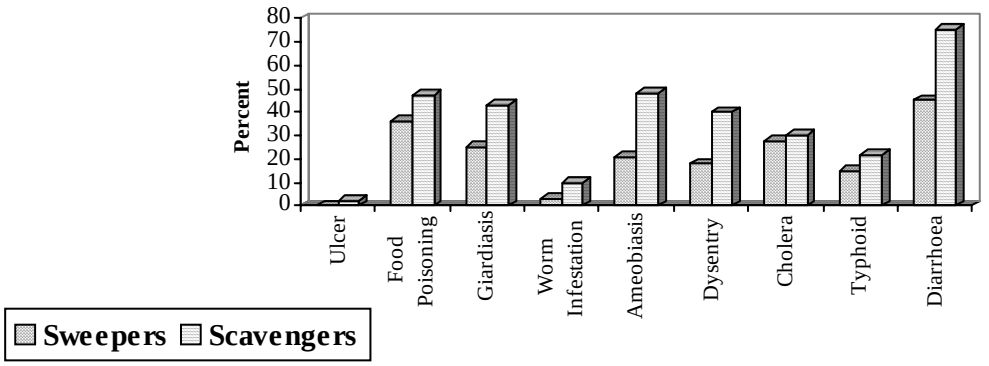


Table 5.14: Lower Gastrointestinal Diseases frequency among Sweepers and Scavengers

	Annual frequencies															
Disease	1		2		3		4		5-12 times		13-24 times		25-50 times		More than 50 times	
Sweepers	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%
Food poisoning	2	3	5	8	1	2	3	5	4	7	6	10	0	0	0	0
Giardiasis	2	3	5	8	3	5	3	5	2	3	0	0	0	0	0	0
Worm infestation	1	2	1	2	0	0	0	0	0	0	0	0	0	0	0	0
Ameobiasis	0	0	7	11	4	7	1	2	1	2	0	0	0	0	0	0
Dysentery	0	0	7	11	3	5		0	1	2	0	0	0	0	0	0
Cholera	11	18	4	7	2	3	0	0	0	0	0	0	0	0	0	0
Typhoid	6	10	1	2	2	3	0	0	0	0	0	0	0	0	0	0
Diarrhea	2	3	28	46	13	21	2	3	2	3	0	0	0	0	0	0
Scavengers																
Peptic ulcer	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Food poisoning	1	2	8	13	5	8	5	8	3	5	0	0	2	3	2	3
Giardiasis	2	3	5	8	8	13	4	7	4	7	3	5	0	0	0	0
Worm infestation	3	5	3	5	0	0	0	0	0	0	0	0	0	0	0	0
Ameobiasis	9	15	4	7	6	10	1	2	3	5	4	7	2	3	0	0
Dysentery	3	5	3	5	8	13	5	8	4	7	0	0	1	2	0	0
Cholera	8	13	8	13	2	3	0	0	0	0	0	0	0	0	0	0
Typhoid	4	7	1	2	5	8	1	2	2	3	0	0	0	0	0	0
Diarrhea	8	13	2	3	9	15	5	8	18	30	2	3	2	3	0	0

Source: Field survey, 2003

CHAPTER SIX – Activity-wise Differences on Health Problems of Sweepers

The chapter five dealt on the health problems found among the sweepers and scavengers. This chapter intends to see the activity-wise differences in health problems of sweepers. As with other factors, nature of works has health implications. In the context of this chapter, sweepers are of three types i.e. sweepers, collectors and loaders. They perform different responsibilities in waste management practice. Hence in this chapter the term 'sweepers' refer only to the person who sweep the streets rather to all the sweepers as used in other chapters. While performing different activities, these different sub-groups might have different types of health problems. For instance, sweepers might encounter respiratory diseases since they sweep the street with a brush and face intense dust particles, and heavy gasoline emission. Meantime, loaders might have relatively higher physical injuries because they have to lift heavy load while up loading waste in trucks. Sigsgaard et al. (1994) found differences on health problems among the workers of paper shorting plants, garbage handling workers and water-supply workers. A study reveled that solid waste workers of New York City experienced twenty times more injuries than that USA's general workers and ten times higher than that of other industrial workers. Out of total injuries incidents, sixty percent occurred while waste loading and the thirty percent in driving. Similarly, out of total injuries, fifty percent cases were related to hurt (in Cointreau-Levine…). These studies suggest that health problems differ according to the nature of work.

6.1. Physical Injuries

While working with waste, sweepers are suffering from number of physical injuries in Kathmandu. Waste collection work in Nepal characterized by sweeping dusty street (plate 4.7), collecting swept dust and other garbage and loading waste in waste carrying vehicles, which have high injury risks. Injuries are not only because of labor-intensive work but also because of mixture of all kinds of wastes.

Table 6.1 presents the activity-wise differences on physical injuries among the sweepers. In this table, elbow injury and wrist pain are found on relatively lower proportion of loaders than those of collectors and sweepers. Sweepers sweep street and they do not have time to rest. This also applies for collectors in terms of taking rest while working. Continue sweeping using traditional brush causes high elbow and wrist pain to sweepers. Out of total surveyed loaders,

about 43 and 56 percent got elbow injury, and wrist pain, respectively. However, corresponding proportions of collectors experiencing these problems are about 64 and 76 percent. Moreover, the proportions of sweepers experiencing elbow injury, and wrist pain are about 90 and 87 percent, respectively. In the same manner, the problem of cut and broke is found in lower proportion among sweepers i.e. 47 percent, than those of collectors and loaders. Corresponding proportions of collectors and loaders experiencing cut and broke are about 76 and 86 percent, respectively. These differences show direct role of activity in the cut and broke problem. Collectors and loaders use their feet to push spade into the pile of garbage. Sometimes they wipe waste and put it in spade using feet or hand. While doing so, the probability of facing the cut and broke is high. Similarly, probability of falling broken glass and metals down while uploading waste is high. Such falling materials can injure loaders on one hand and uploading heavy load on trucks can develop dislocations problems to them on the other hand. This is why the highest proportion of loaders is suffering from the problems of cut and broke. Although causal factors are unknown, fatigue is found on significant proportions of respondents of each group with the highest influence on collectors. Some other injuries experienced by waste workers of Kathmandu are low back pain and musculoskeletal disorder on neck, shoulders and arms.

Plate - 6.1: Political conflict and its environmental implication (photo: Mercantile communication Pvt. Ltd.)

Plate - 6.2: Swept waste ready to collect by collectors to pile at certain location

Although the highest proportion of loaders is experiencing cut and broke, weekly frequency of each injury problem is relatively lower to them. As shown in Table 6.2, about 67 and 65 percent sweepers and collectors are experiencing physical injuries four or more than four times a week, respectively. Corresponding figure for loaders is 43 percent. Problems of physical

injuries are not only the problems of the waste workers of Kathmandu but also of other cities of the world. Problem of musculoskeletal disorder are found 4 times higher among the waste workers than among general laborer in US, (Poulsen et al. 1995b).

Table - 6.1: Physical Injury among Sweepers

	Activities					
Diseases	Collectors (17)	Percent	Loaders (14)	Percent	Sweepers (30)	Percent
Fatigue	15	88	10	71	19	63
Wrist injury	13	76	8	56	26	87
Elbow injury	11	64	6	43	27	90
Joint pain	11	64	10	71	21	70
Back and waist pain	13	76	12	86	29	97
Cut and broke	13	76	12	86	14	47

Source: Field survey, 2003
(Note: Numbers in parenthesis are total number of respondents)

Figure - 6.1: Problem of Physical Injuries among Sweepers

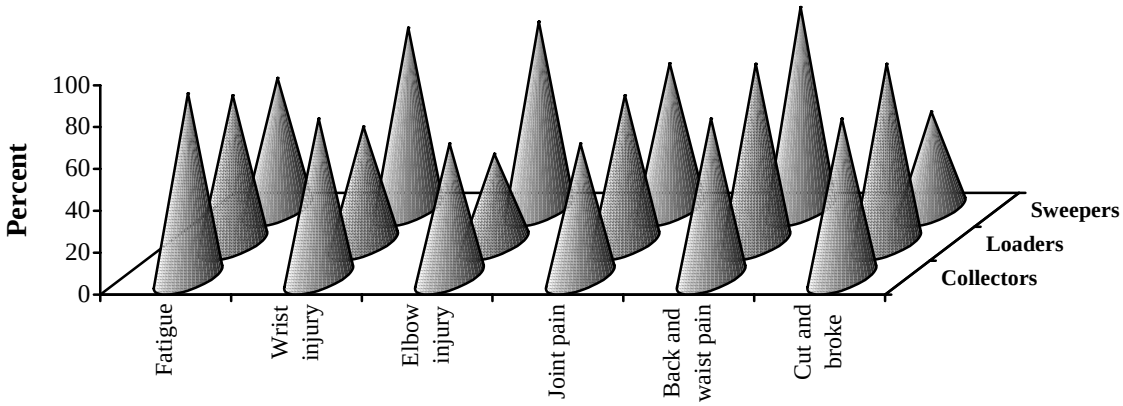


Table - 6.2: Physical Injury frequencies among Sweepers

	Frequency of any types of physical injuries							
Work type	4 or more than 4 times a week	Percent	2-3 times a week	Percent	Once a week	Percent	Less than once a week	Percent
Sweepers	20	67	6	20	1	3	3	10
Collectors	11	65	0	0	2	12	2	12
Loaders	6	43	0	0	4	29	4	29

Source: Field survey, 2003
(Note: Numbers in parenthesis are total number of respondents)

6.2. Allergies

In the case of allergic problems, except the problem of swelling, which is observed in significantly higher proportion of sweepers, the problem of skin rashes and irritation are found in higher proportion of collectors and eyelid burning is found on higher proportion of loaders (Table 6.3). The problem of swelling is found on 43 percent of sweepers. Corresponding proportions of collectors and loaders experiencing the same problem are only 12 and 14 percent, respectively. Among the different health problems categorized as allergic diseases, most notable difference is found in the case of swelling. Although it is difficult to claim but the cause of this difference might be the outcome of gender differences. Sweeping occupation is predominantly women activity and they are of reproductive age. Long walk on street while sweeping and complex and dynamic body condition related to reproduction might have some implication on swelling. Similarly, problems of skin rashes and irritation are found in 53 and 65 percent of collectors, 43 and 57 percent of loaders, and 53 percent of sweepers, respectively. The case of eyelid burning is found in about 57 percent loaders, 50 percent sweepers and 41 percent collectors.

Allergic diseases are intense due to lack of enough water for proper sanitation. It is already said that water scarcity of Kathmandu is well-experienced problem of Kathmandu (see chapter 5). Human and animal excreta are always present in municipal waste of Kathmandu. Leakage of waste-tips dissolved in the water or disease vectors and pathogens come to home from clothes and body parts of sweepers. Lack of water has impact on personal and neighborhood sanitation. These situations have created serious health problems on sweepers. As Cointreau-Levine (Cointreau-Levine…) noted, outbreak of cholera during the early 1990's in Conakry, Guinea occurred largely in settlements within the immediate vicinity of the dumpsite and believed that was associated with contaminated water from dump. Kathmandu could suffer from severe disease epidemics at any time due to lack of safe water.

Table - 6.3: Allergic Problems among Sweepers

	Activities					
Diseases	Collectors (17)	Percent	Loaders (14)	Percent	Sweepers (30)	Percent
Skin rashes	9	53	6	43	16	53
Irritation	11	65	8	57	16	53
Swelling	2	12	2	14	13	43
Eyelid burning	7	41	8	57	15	50

Source: Field survey, 2003
(Note: Numbers in parenthesis are total number of respondents)

Figure - 6.2: Allergic Problems among Sweepers

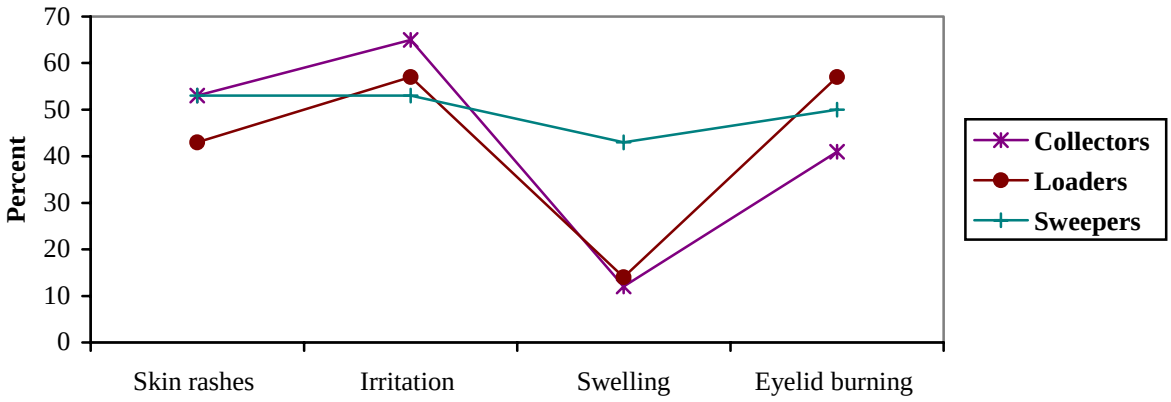


Table 6.4 shows annual frequencies of allergic diseases in waste workers. Some activity-wise differences on the frequencies of different allergies are observed. About 18 percent collectors reported that they are experiencing the problem of skin rashes for almost half a year. Corresponding proportions of loaders and sweepers experiencing same problem for same time are 14 percent and 3 percent, respectively. Highest proportion of collectors followed by sweepers and loaders are experiencing frequent irritation problem. About 29 percent collectors are experiencing irritation longer than 6 months where corresponding proportions of sweepers and loaders experiencing similar problem for similar time are 20 and 14 percent, respectively. Despite relatively lower proportion of loaders is experiencing the problem of swelling, they are experiencing for longer period than the sweepers and collectors. In the same manner, problem of eyelid burning is more frequent among collectors and followed by sweepers and loaders (Table 6.4).

Table - 6.4: Allergic Problems frequency among the Sweepers (percentage)

		Frequency per year							
Respondent		A week	%	1 month	%	3 months	%	Half year	%
Sweepers (30)	Skin rashes	6	20	3	10	6	20	1	3
	Irritation	1	3	4	13	5	17	6	20
	Swelling	10	33	3	10	0	0	0	0
	Eyelid burning	2	7	6	20	6	20	1	3
Collectors (17)	Skin rashes	6	36	0	0	0	0	3	18
	Irritation	4	24	2	12	0	0	5	29
	Swelling	2	13	0	0	0	0	0	0
	Eyelid burning	1	6	1	6	2	12	3	18
Loaders (14)	Skin rashes	1	7	3	21	0	0	2	14
	Irritation	1	7	5	36	0	0	2	14
	Swelling	0	0	1	7	0	0	1	7
	Eyelid burning	4	28	2	14	1	7	1	7

Source: Field survey, 2003 (Note: Numbers in parenthesis are total number of respondents)

6.3. Poisoning

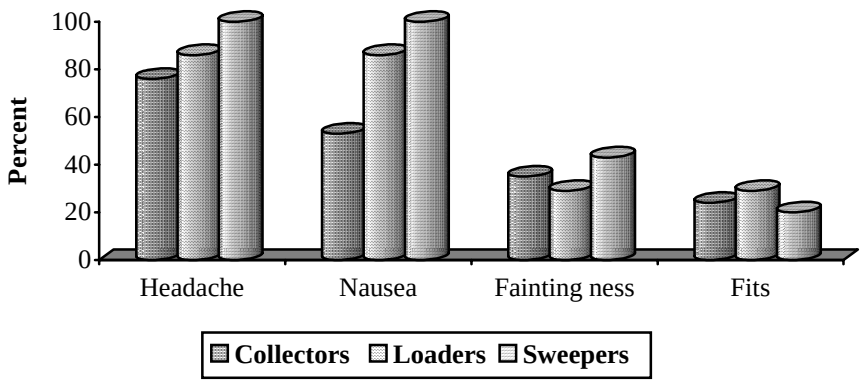
While observing poisoning problems among the collectors, loaders and sweepers (Table – 6.3) problems of headache and nausea are found more intense among sweepers. All sweepers reported that they are suffering from headache and nausea. These problems found in about 76 and 53 percent of collectors, and 86 percent of loaders. The problem of headache is found relatively lower in collectors and loaders. Although the causal factors of this difference are unknown but sweepers claimed that long working hours in sunny days further help to raise the headache problems. The proportions of respondents experiencing the problem of faintingness are not much different among the sweepers, loaders, and collectors (Table 6.5). Moreover, the problem of fits is found in about 29 percent loaders, and 24 percent collectors. Corresponding proportion of sweepers experiencing the problem of fits is about 20 percent.

Table - 6.5: Poisoning Diseases among Sweepers

	Activities					
Diseases	Collectors (17)	Percent	Loaders (14)	Percent	Sweepers (30)	Percent
Headache	13	76	12	86	30	100
Nausea	9	53	12	86	30	100
Faintingness	6	35	4	29	13	43
Fits	4	24	4	29	6	20

Source: Field survey, 2003 (Note: Numbers in parenthesis are total number of respondents)

Figure - 6.3: Poisoning Diseases among Sweepers



6.4. Upper Respiratory Tract Diseases

This study found acute problem of upper respiratory tract disease more among sweepers than among collectors and loaders. Out of total surveyed sweepers, 87 percent is experiencing fever combined with sneezing, headache, running nose, and nasal congestion. Such symptoms are found in 70 and 43 percent of collectors and loaders. Based on present categorization of diseases, more than 80 percent of sweepers have reported *pharyngitis* that has symptoms like cough, sputum and fever with headache, and sore throat. Corresponding proportions of collectors and loaders experiencing similar symptoms are 41 and 57 percent, respectively. Similarly, symptoms of *tonsillitis* and *bronchitis* are found on highest proportion of collectors and loaders, respectively. The proportion of collectors suffering from *tonsillitis* is 59 percent. Corresponding proportions of loaders and sweepers are about 43 percent. *Bronchitis,* which has symptoms like breathlessness, chest pain, cough, sputum, and fever with sneezing, headache, running nose, nasal congestion, sore throat or throat ache is found on 57 percent of loaders. Proportions of collectors and sweepers experiencing the symptoms of *bronchitis* are relatively lower than the sweepers (Table 6.6).

Present study found notable differences in the proportion of sub-groups of sweepers who are experiencing the symptoms of upper respiratory tract diseases. The differences are noted not only in the proportion of respondents experiencing the symptoms but also in the frequencies of different diseases. Annual frequencies of all types of upper respiratory tract diseases are found highest in loaders. Out of total surveyed loaders, 14 percent are experiencing the symptoms of *rhinitis* and *sinusitis* up to 6 months in a year. Similarly, about 28 percent and 7 percent

loaders are experiencing the symptoms of *pharyngitis*, and *tonsillitis* up to one month in a year. In terms of annual frequencies of *pharyngitis*, and *tonsillitis*, sweepers and collectors rank as second and third suffering groups (Table 6.7).

Although it is difficult to justify the underlying causes that resulted these differences among the sub-groups, but still poor quality of air around the working environment may be the major cause of overall respiratory diseases problem. In Kathmandu, vehicular emission exceeded the minimum standard and plying such vehicles in dusty roads makes air quality very bad (for instance, PM10 was observed 461 µg/m³ on 13.06.03, 339µg/m³ on 16.04.04, and 294 µg/m³ on 07.05.04 at Putalisadak station on 16.04.04: MOPE regular air quality monitoring data. See appendix II for details). The concentration of TSP and PM10 are the major causes of air pollution in Kathmandu rather than concentration of gaseous pollutant (Pandey 1997). Underlying causes of higher upper respiratory tract disease problem is probably related to gender. As stated earlier, sweeping is female dominated activity and they have a responsibility of household cooking. They do not use protective measures (mask). Sweeping the dusty streets and vehicular exhaust in busy road result to higher concentration of TSP, and PM10 around sweepers. While sweeping, these levels rise up to more than the concentration found in normal time. Moreover, poor ventilated housing and spending significant time in kitchen is probably adding respiratory problems on sweepers.

Sweepers of Kathmandu are exposed to such air quality everyday. They come to contact with numbers of pathogenic and nonpathogenic microorganism. Due to such situations, sweepers of Kathmandu are suffering from numbers of respiratory tract diseases. Some other studies made in developed countries have also found poor air quality around working environment as a cause of serious health problems to waste workers. Waste collectors of Geneva as well as Denmark were highly exposed to bio-aerosols (Poulsen et al. 1995b). In the USA's waste recovery facilities, airborne bacteria and fungi concentrations were measured significantly higher inside the facilities with the varieties of pathogenic and nonpathogenic organism (Roy et al. in Cointreau-Levine…). Similar result was also found in Finland's waste recoveries with two to twenty time higher airborne bacteria and fungi concentrations than that of background concentration. These airborne microorganisms could cause infection if human resistance is below normal (Rahkonen in Cointreau-Levine…). In this regards, including other factors,

different resistance power of individuals in different sub-groups of sweepers might create differences on health problems.

Table - 6.6: Upper Respiratory Tract Diseases among Sweepers

	Activities					
Diseases	Collectors (17)	Percent	Loaders (14)	Percent	Sweepers (30)	Percent
Rhinitis	11	65	6	43	26	87
Sinusitis	13	76	6	43	26	87
Pharyngitis	7	41	8	57	24	80
Tonsillitis	10	59	6	43	13	43
Bronchitis	4	24	8	57	11	37

Source: Field survey, 2003
(Note: Numbers in parenthesis are total number of respondents)

Figure - 6.4: Upper Respiratory Tract Diseases among Sweepers

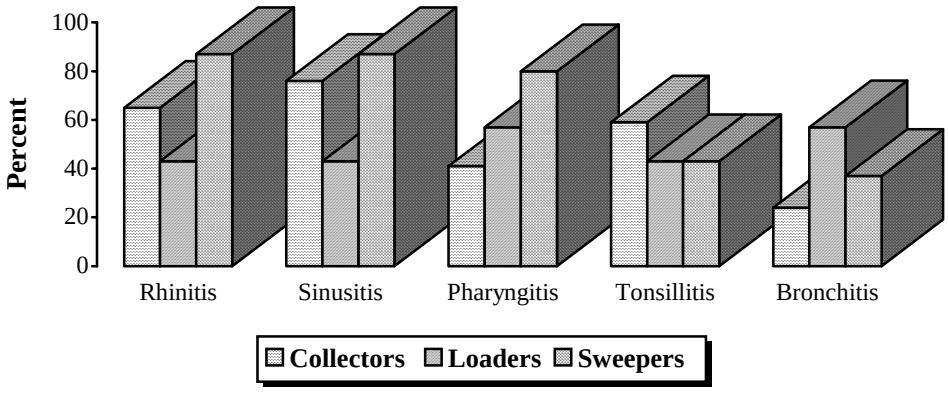


Table - 6.7: Upper Respiratory Tract Diseases frequency among Sweepers (percent)

Diseases	Rhinitis						Sinusitis						Pharyngitis						Tonsillitis					Bronchitis			
Annual frequencies	2	3	4	1 month	3 months	6 months	2	3	4	1 month	3 months	6 months	1	2	3	4	1 month	3 months	1	2	3	4	3 months	1	2	3	1 month
Sweepers (30)	3	0	20	54	3	3	3	0	20	54	7	10	10	30	13	0	27	0	20	23	0	0	0	13	13	10	0
Collectors (17)	0	12	12	41	0	0	6	24	6	41	0	0	0	18	6	18	0	0	12	35	12	0	0	0	12	12	0
Loaders (14)	0	0	14	14	0	14	0	0	14	14	0	14	0	7	0	14	28	7	0	21	7	7	7	0	29	21	7

Source: Field survey, 2003 (Note: Numbers in parenthesis are total number of respondents)

6.5. Lower Respiratory Tract Diseases

Because of higher exposure to dust, problems like breathlessness, cough, fever, and chest pain, sputum, with sneezing, headache, running nose, and nasal congestion are found only in sweepers. These are common symptoms of *tuberculosis*, *COPD* and *asthma*. Out of total

surveyed sweepers, about 30 percent are experiencing the symptoms of *asthma*. Similarly, about 7 percent are experiencing the symptoms of *TB*, and *COPD*. Activity-wise differences in health problems are clearly observed in the coverage of lower respiratory tract diseases. Sweeping activities under existing working condition of Kathmandu result not only upper respiratory tract diseases but also lower respiratory tract diseases. Experience of Denmark also gives similar result. Respiratory tract diseases' symptoms such as chest tightness and toxic alveolitis were found on the waste workers of Denmark. Some were experiencing the symptoms of *asthma* (Sigsgaard 1999).

Table - 6.8: Lower Respiratory Tract Diseases among Sweepers

	Activities					
Diseases	Collectors (17)	Percent	Loaders (14)	Percent	Sweepers (30)	Percent
Pneumonia	0	0	0	0	0	0
TB	0	0	0	0	2	7
COPD	0	0	0	0	2	7
Asthma	0	0	0	0	9	30

Source: Field survey, 2003
(Note: Numbers in parenthesis are total number of respondents)

6.6. Upper Gastrointestinal Diseases

Diseases related to gastro intestine and the proportions of respondents experiencing the symptoms of such diseases are shown in Table 6.9. As found with the upper respiratory tract diseases; upper gastrointestinal diseases are also acute among sweepers than among collectors and loaders. Among these groups, highest proportions of collectors are experiencing the symptoms of 3 different kinds of diseases namely *malnutrition, dysphagia* and *anorexia*. In the same manner, the highest proportion of loaders is experiencing the symptoms of *gastritis*. However, highest proportions of sweepers are experiencing the symptoms of *heartburn, regurgitation, dyspepsia, flatulence, vomiting* and *water brash*.

Out of total, 83 percent sweepers, 71 percent loaders and 47 percent collectors are experiencing the symptoms like effortless return of gastric content into mouth. This symptom is termed *regurgitation*. The *dyspepsia*, which has symptoms like upper abdominal pain, heartburn, nausea, vomiting, and loss of appetite is found in 77, 43 and 35 percent of sweepers, loaders and collectors, respectively. Similarly, the problem of *water brash* that has similar symptoms of *regurgitation* is found among the 73 percent sweepers, 57 percent loaders, and 41 percent collectors.

Table - 6.9: Upper Gastrointestinal Diseases among the Sweepers

	Activities					
Diseases	Collectors (17)	Percent	Loaders (14)	Percent	Sweepers (30)	Percent
Malnutrition	2	12	0	0	0	0
Dysphagia	4	24	2	14	4	13
Heart burn	9	53	4	29	20	67
Regurgitation	8	47	10	71	25	83
Dyspepsia	6	35	6	43	23	77
Flatulence	0	0	0	0	10	33
Vomiting	4	24	4	29	10	33
Water brash	7	41	8	57	22	73
Anorexia	2	12	0	0	2	7
Gastritis	7	41	8	57	13	43

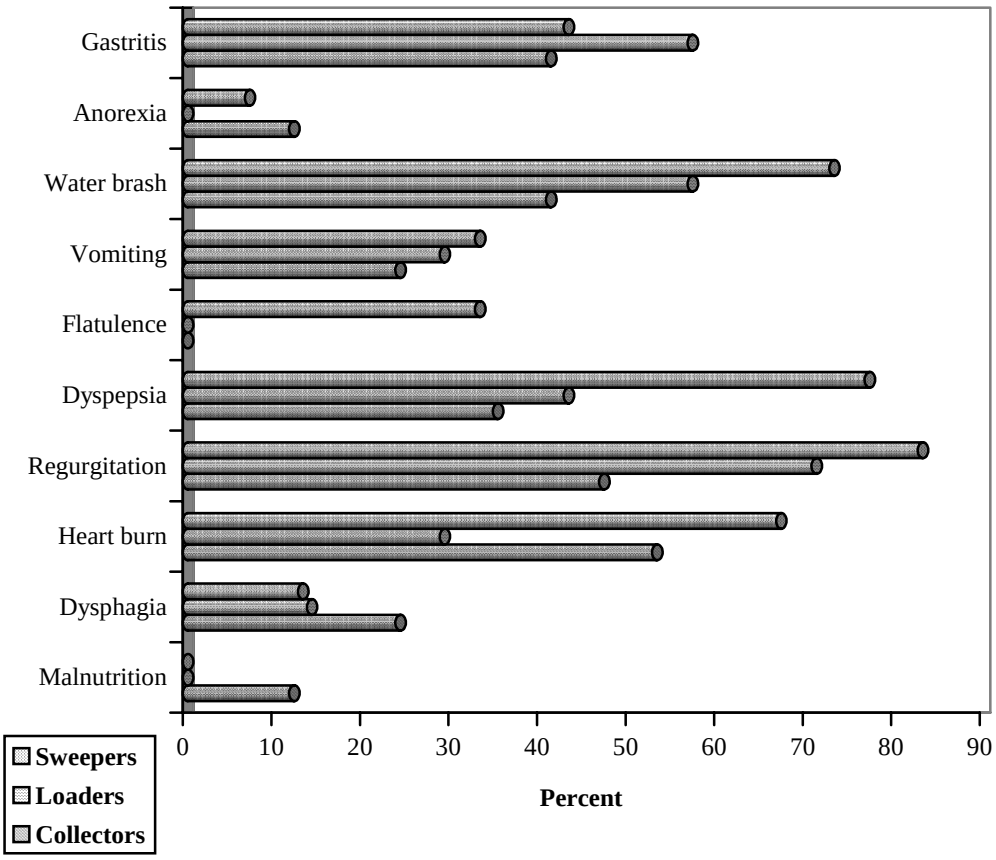
Source: Field survey, 2003
(Note: Numbers in parenthesis are total number of respondents)

In the same manner, 67 percent sweepers, 53 percent collectors, and 29 percent loaders are experiencing the symptoms of *heartburn*. The symptoms of *flatulence* are found only in sweepers and only the collectors express that they are experiencing the symptoms of *malnutrition.* Moreover, problem of loss appetite that is termed as *anorexia* is found only in collectors and sweepers. Out of the total surveyed collectors, 24 percent is experiencing difficulty in swallowing that is perceived as *dysphagia*. Corresponding proportions of loaders and sweepers suffering from the same symptom are 14 and 13 percent, respectively. The problem of *vomiting* is found in 33 percent sweepers, 24 percent collectors and 29 percent loaders. Symptoms of *gastritis* are found in 57 percent loaders. Corresponding proportions of collectors and sweepers experiencing the symptoms of *gastritis* are 41 and 43 percent, respectively (Table 6.9). Among these three sub-groups of sweepers, sweepers are the most suffering group followed by loaders and collectors. Nevertheless, the proportions of respondents experiencing these diseases are significantly high in all sub-groups.

Not only higher proportions of sweepers are experiencing the problems of different upper gastrointestinal diseases but also the frequencies of these diseases are found higher among them. Around one-fourth of surveyed sweepers are experiencing the symptoms of *heartburn* 5 to 12 times in a year where one-tenth is experiencing up to 24 times annually. Similarly, proportion of sweepers frequently experiencing the symptoms of *regurgitation*, *dyspepsia*, and *flatulence* is higher than those of collectors and loaders. Frequencies of *dysphagia*, *dyspepsia*, *vomiting*, *anorexia* and *gastritis* are found higher in collectors. In the same way, higher proportion of loaders is frequently experiencing the symptoms of vomiting. Some collectors

are experiencing the symptoms of *dyspepsia, water brash, anorexia, and gastritis* round the year (Table – 6.10).

Figure - 6.5: Upper Gastrointestinal Diseases among Sweepers



Gastro intestinal diseases are the product of parasitic infection and pathogenic microorganisms (Birley & Lock 1999). In general, parasitic infections are most serious problem among the solid waste workers of third world cities and Kathmandu is not an exception. A study made during the 1970s in 33 Indian cities showed 98 percent of solid waste collectors had positive symptoms of parasitic infection (Bhide and Sundaresan in Cointreau-Levine…). In Kathmandu too, most of the sweepers are facing similar type of problems.

Table – 6.10: Upper Gastrointestinal Disease frequency among Sweepers (percent)

	Annual Frequencies															
Disease	1		2		3		4		5-12 times		13-24 times		25-50 times		More than 50 times	
Sweepers (30)	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%
Dysphagia	0	0	1	2	2	7	0	0	0	0	0	0	0	0	0	0
Heart burn	0	0	3	10	4	13	2	7	8	26	3	10	0	0	0	0
Regurgitation	2	7	4	13	4	13	0	0	12	40	3	10	0	0	0	0
Dyspepsia	3	10	4	13	8	27	0	0	8	26	0	0	0	0	0	0
Flatulence	0	0	3	10	2	7	3	10	2	6	0	0	0	0	0	0
Vomiting	0	0	2	7	3	10	2	7	3	10	0	0	0	0	0	0
Water brash	0	0	1	3	5	17	3	10	12	40	1	3	0	0	0	0
Anorexia	0	0	2	7	0	0	0	0	0	0	0	0	0	0	0	0
Gastritis	0	0	4	13	5	17	3	10	1	3	0	0	0	0	0	0
Collectors (17)																
Dysphagia	0	0	3	18	0	0	0	0	0	0	0	0	0	0	0	0
Heart burn	1	6	3	18	2	12	2	12	2	12	0	0	1	6	1	6
Regurgitation	0	0	0	0	3	18	2	12	3	18	0	0	0	0	0	0
Dyspepsia	0	0	0	0	1	6	1	6	2	12	0	0	1	6	1	6
Flatulence	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vomiting	0	0	0	0	2	12	0	0	2	12	0	0	0	0	0	0
Water brash	0	0	1	6	2	12	2	12	0	0	0	0	1	6	1	6
Anorexia	0	0	0	0	0	0	0	0	0	0	0	0	1	6	1	6
Gastritis	1	6	2	12	0	0	1	6	1	6	0	0	1	6	1	6
Loaders (14)																
Dysphagia	0	0	0	0	2	14	0	0	0	0	0	0	0	0	0	0
Heart burn	0	0	0	0	0	0	2	14	2	14	0	0	0	0	0	0
Regurgitation	0	0	2	14	4	29	2	14	2	14	0	0	0	0	0	0
Dyspepsia	0	0	3	21	0	0	1	7	1	7	1	7	0	0	0	0
Flatulence	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vomiting	0	0	0	0	2	14	0	0	2	14	0	0	0	0	0	0
Water brash	0	0	2	14	3	21	0	0	2	14	1	7	0	0	0	0
Anorexia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gastritis	0	0	2	14	0	0	1	7	5	36	0	0	0	0	0	0

Source: Field survey, 2003
(Note: Numbers in parenthesis are total number of respondents)

6.7. Lower Gastrointestinal Diseases

Study on lower gastrointestinal diseases' symptoms among the collectors, loaders and sweepers show some differences in the proportion of suffering respondents. Among these three sub-groups, the highest proportion of sweepers is experiencing the symptoms of 3 different diseases. Similarly, the highest proportion of loaders is experiencing the symptoms of other 5 diseases. However, not a single disease has highest influence over collectors. Among the

diseases of lower gastro-intestine, problem of *diarrhea* is found very serious. Largest proportions of respondents in each group are experiencing the problem of diarrhea. About 93 percent sweepers, 65 percent collectors, and 57 percent loaders are experiencing the symptoms of *diarrhea*. Coverage of *cholera* is found in 40 percent sweepers. Cholera's influence is found on comparatively lower proportions of collectors and loaders. Similarly, the symptoms of food poisoning is characterized by symptoms like vomiting, diarrhea, and pain abdomen, are found in the highest proportion among sweepers, and followed by among collectors and loaders.

Table - 6.11: Lower Gastrointestinal Diseases among Sweepers

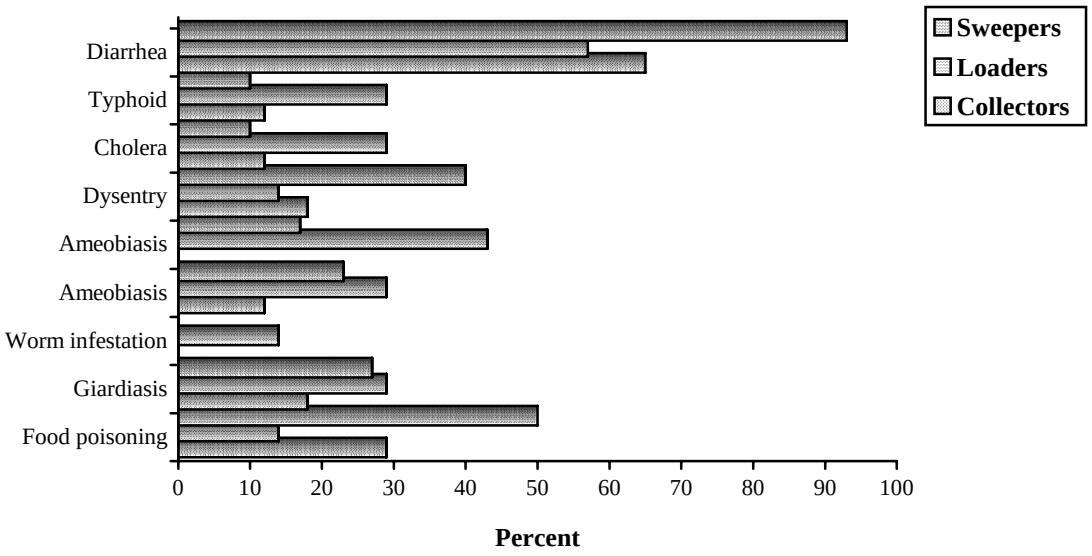
	Activities					
Diseases	Collectors (17)	Percent	Loaders (14)	Percent	Sweepers (30)	Percent
Peptic ulcer	0	0	0	0	0	0
Food poisoning	5	29	2	14	15	50
Giardiasis	3	18	4	29	8	27
Worm infestation	0	0	2	14	0	0
Ameobiasis	2	12	4	29	7	23
Dysentery	0	0	6	43	5	17
Cholera	3	18	2	14	12	40
Esthetic fever or typhoid	2	12	4	29	3	10
Diarrhea	11	65	8	57	28	93

Source: Field survey, 2003
(Note: Numbers in parenthesis are total number of respondents)

On the contrary, higher proportion of loaders than those of collectors and sweepers is experiencing the symptoms like loose motion, stool with mucous and pain abdomen, which is considered as *giardiasis*. *Worm infestation*, *ameobiasis* and *typhoid* are also serious in loaders than in collectors and sweepers. Similarly, about 29 percent loaders are experiencing loose motion, vomiting, gastritis, dehydration, and watery stool. These are the symptoms of *ameobiasis*. Corresponding proportions of collectors and sweepers experiencing similar symptoms are 12 and 23 percent, respectively. The problem of *worm infestation* is found only in loaders. Influence of *dysentery*, which is characterized by fever, loose motion, stool with mucous and blood, pain abdomen, and dehydration to patient is found on 43 percent loaders, and 17 percent sweepers. Present study does not find any case of *dysentery* among the collectors. *Typhoid* characterized with high fever, pain abdomen and occasional loose motion is found in 29 percent loaders, 12 percent collectors, and 10 percent sweepers. *Giardiasis* is a gastrointestinal disease that develops loose motion, stool with mucous, and pain abdomen is

found in 29 percent loaders. Corresponding proportions of collectors and sweepers suffering from similar symptoms are 18 and 27 percent, respectively.

Figure - 6.6: Lower Gastrointestinal Diseases among Sweepers



Although lower proportions of collectors are experiencing the problems of most of lower gastrointestinal diseases, they are experiencing these problems more frequently than sweepers and loaders (Table 6.12). The proportion of collectors experiencing the problem of *cholera* up to 3 times annually is about 12 percent. Similarly, about 12 percent collectors are experiencing the problem of *diarrhea* up to 12 times in a year. However, not a single sweepers and loaders is suffering form these diseases that frequently. Problems of *worm infestation*, *dysentery* and *typhoid* are found more frequent in loaders. Moreover, the problem of *food poisoning* is found more frequently among sweepers.

Table: 6.12: Lower Gastrointestinal Disease Frequency among Sweepers (percent)

	Food poisoning						Giardiasis					Worm infestation						Dysentery			Cholera			Typhoid			Diarrhea				
	1	2	3	5 to 12	13 to 24	25 to 50	1	2	3	4	5 to 12	1	2	2	3	4	5 to 12	2	3	5 to 12	1	2	3	1	2	5 to 12	1	2	3	4	5 to 12
Sweepers (30)	7	13	0	10	10	10	0	7	7	10	3	0	0	20	3	0	0	10	7	0	27	13	0	10	0	0	7	43	43	0	0
Collectors (17)	0	6	6	18	0	0	12	6	0	0	0	0	0	0	12	0	0	0	0	0	6	0	12	12	0	0	0	41	0	12	12
Loaders (14)	0	0	0	0	0	7	0	14	7	0	7	7	7	7	7	7	7	29	7	7	14	0	0	7	7	14	0	57	0	0	0

Source: Field survey, 2003 (Note: Numbers in parenthesis are total number of respondents)

CHAPTER SEVEN - Spatial Differences on Health Problems of Scavengers

Places have different characters. Working environments of scavengers of different places are different and the findings of this chapter represent the impact of working environment on health. Scavengers of each place reported that they come in contact with feces, bandages and sanitary pads, blood, broken glass, needles, sharp objects, vehicular exhaust and fumes, mice/rats, intense flies and mosquitoes, stray animals and animals' carcasses. However, frequency of contact is different in different places. Although information on loss of life of scavengers due to occupational accidents and waste-slide in Kathmandu is not available, however, numbers of studies show that waste pickers of third world cities are not only suffering from health problems but also loosing their life while working in waste. A number of occupational accidents took hundreds of lives in third world cities who were either scavengers or the chronic urban poor who built their shelter in the vicinity of dump site (Hardoy et al. 2001). The open dump of Istanbul got a large displacement and slide of waste mass in 1993 engulfing 11 homes and killing 39 people (Kocasoy and Curi in Cointreau-Levine …). Similarly, one person was killed and 250 residents were evacuated in O Portino, Spain in 1994 (Associated Press in Cointreau-Levine …). In 1992, two children were buried in Kolkata's open dump. Similar accident occurred in Tangra, India in 1997 (Bonnerjee in Cointreau-Levine …). In Vietnam too, two waste pickers were buried beneath the garbage that was unloaded by the truck and one death was cited (Nguyen et al. …). Apart from these facts, a large number of scavengers are experiencing varieties of health problems (chapter V). This chapter intends to explore if there is any spatial differences in health problems.

7.1. Physical Injuries

Scavengers have numbers of health problems, which are associated with their occupation. Most common injuries experienced by scavengers of Kathmandu are given in Table 7.1. Apart from these problems, scavengers of Kathmandu are experiencing muscle cramp, shoulder pain due to carrying load for long working hours, and calf pain due to walking long distance (especially among the scavengers of Open Kathmandu). Other complains that scavengers reported are animal bites (dog and rat).

Present study found that scavengers of all places are seriously suffering from different types of physical injuries. Constant bending motion that requires while searching material

attributed them back pain. Table 7.1 shows spatial variation on physical injuries. During the survey, all scavengers of Balkhu and Open Kathmandu reported that they are experiencing the problem of cut and broke. Meantime, proportion of scavengers of Teku experiencing cut and broke is also very high i.e. 88 percent.

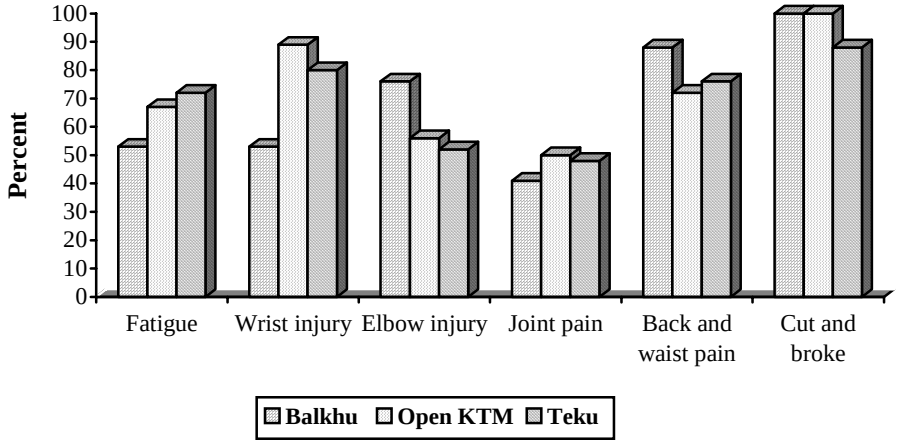
Table - 7.1: Physical Injury among Scavengers

	Places					
Diseases	Balkhu (17)	Percent	Open Kathmandu (18)	Percent	Teku (25)	Percent
Fatigue	9	53	12	67	18	72
Wrist injury	9	53	16	89	20	80
Elbow injury	13	76	10	56	13	52
Joint pain	7	41	9	50	12	48
Back and waist pain	15	88	13	72	19	76
Cut and broke	17	100	18	100	22	88

Source: Field survey, 2003
(Note: Numbers in parenthesis are total number of respondents)

The highest proportion of scavengers of Balkhu is experiencing the problems of elbow injury, and back and waist pain. Similarly, the highest proportion of scavengers of Open Kathmandu is experiencing the problems of wrist injury and joint pain. The highest proportion of scavengers of Teku is experiencing the problem of fatigue. The proportion of scavengers of Balkhu and Open Kathmandu experiencing the problem of fatigue is relatively lower than that of Teku. Out of total surveyed scavengers of Balkhu, 76 and 88 percent have reported that they are experiencing the problem of elbow injury and back and waist pain respectively. Similarly, 56 and 72 percent scavengers of Open Kathmandu, and 52 and 76 percent scavengers of Teku are experiencing the similar problems. The problems of wrist injury and joint pain are found in 89 and 50 percent of scavengers of Open Kathmandu, respectively. Corresponding proportion of scavengers of Balkhu experiencing elbow injury is 53 percent, and experiencing back and waist pain is 41 percent. In the same manner, proportions of scavengers of Teku experiencing elbow injury, and back and waist pain are 80 and 48 percent, respectively. Figure 7.1 gives better illustration of spatial differences of physical injuries among the scavengers.

Figure 7.1: Physical Injury among Scavengers



Some other studies have also found similar health problems on scavengers of other cities in the world. Two-third of waste pickers of Kolkata are experiencing cut, pinprick, and eye injury. Almost half received dog and rat bites (in Cointreau-Levine …). Proportion of waste pickers of Bangkok experiencing different injuries from glass, needles, bamboo, and metal is significantly high (Kungskulniti in Cointreau-Levine …). A previous study of scavengers of Kathmandu's dumpsite stated that more than 80 percent got wounds on leg and about 70 percent got on hand (GTZ in Cointreau-Levine …). Nguyen's study (Nguyen et al. …) on Vietnamese scavengers also found the problems of joint pain, back pain, bruise, muscle soreness, animal bites, and bone fracture as well as prevalent of vehicular accidents. Single time clinical examination of child waste pickers of Metro Manila found wounds among the 17 percent (Torres in Cointreau-Levine …). Similarly, waste pickers in Bangalore, India complained about musculoskeletal pain and backache. More than two-third waste pickers of Kolkata's dump suffered from chronic backache (in Cointreau-Levine…), and the problem of continuous backache, neck-ache and wrist/knee/ankle joint pain were found in significantly higher proportion of waste pickers of Mumbai's waste dumping (Konnoth in Cointreau-Levine…).

Among scavengers, minor injuries occur almost every day. While doing survey, about 88 percent scavengers of Balkhu (100 percent among the injured one) reported that they are experiencing one or more than one kind of injuries more than 4 times in a week. Corresponding proportions of scavengers of Teku and Open Kathmandu are 76 and 67 percent, respectively. This shows some spatial variation in the frequency of physical injured

(Table 7.2). The place Balkhu is the dumping site, which receives waste from Kathmandu Metropolis and Lalitpur Sub-Metropolis. Obviously the waste is mixed. Scavengers of Balkhu need more strength to sort material because waste used to be on the way to bury.

Table - 7.2: Weekly frequency of Physical Injury among Scavengers

	Places					
Diseases	Balkhu (17)	Percent	Open Kathmandu (18)	Percent	Teku (25)	Percent
4 or more times	15	88	12	67	19	76
2-3 times	0	0	1	6	1	4
One time	0	0	3	17	1	4
Less than one	0	0	2	11	0	0

Source: Field survey, 2003
(Note: Numbers in parenthesis are total number of respondents)

7.2. Allergies

Allergic problems are intense among the scavengers of Kathmandu. Among the allergic diseases, the problems of swelling and eyelid burning are observed in higher proportions of scavengers of Open Kathmandu than those of Balkhu and Teku. Scavengers of Open Kathmandu work in different environment. They are facing number of environmental problems in different places. They cover long distance each day while working. This might be the reason cause that higher proportion of scavengers of Open Kathmandu is experiencing the problems of eyelid burning and swelling. Proportion of suffering scavengers from similar problem in Balkhu is not much different than that of Open Kathmandu. However, only about 28 and 24 percent scavengers of Teku are experiencing the problems of swelling and eyelid burning. Among the different allergic diseases, skin rashes and irritation are found in significantly higher proportion of scavengers of Balkhu (Table 7.3). It is because Balkhu gets more rotten and mixed waste where scavengers sort materials. Being a relatively fair working environment, relatively lower proportions of scavengers of Open Kathmandu and Teku are suffering from the problems of skin rashes and irritation. About 22 and 50 percent scavengers of Open Kathmandu, and about 48 and 56 percent scavengers of Teku are experiencing the problems of skin rashes and irritation. Observation of Table 7.3 shows some spatial differences in the proportion of scavengers experiencing different allergic problems. This might be an outcome of place because the places included in this study receive different composition of waste and the composition of waste determines the working environment. However, these places do not have similar response in each health problems. Although there

are some spatial variations in proportions of respondents who are experiencing different health problems, but present study does not find the consistency in these differences.

Table - 7.3: Allergic Problems among Scavengers

	Places					
Diseases	Balkhu (17)	Percent	Open Kathmandu (18)	Percent	Teku (25)	Percent
Skin rashes	14	82	4	22	12	48
Irritation	12	71	9	50	14	56
Swelling	6	35	7	39	7	28
Eyelid burning	9	53	10	56	6	24

Source: Field survey, 2003
(Note: Numbers in parenthesis are total number of respondents)

These allergic diseases are not typical only to the scavengers of Kathmandu. Other studies have also found serious allergic problems among the scavengers of other cities of the world. Eye soreness or redness, and skin ulcers occurred quarterly among the scavengers of Kolkata (in Cointreau-Levine …). Skin symptoms are more frequent among garbage recycling workers compared to other blue-collar workers in Denmark (Sigsgaard 1999). In the similar manner, Konnoth's study (Konnoth in Cointreau-Levine …) on the scavengers of Mumbai's open dump site revealed that most of scavengers made complain of eye burning, diminished vision and redness, itching, and watering. The problem of skin infections or allergies, orthopedic ailments and skin lesions are found on significant proportion of scavengers of Mumbai open dump (Konnoth in Cointreau-Levine …). Torres (Torres et al. in Cointreau-Levine …) also found higher rate of skin diseases like, skin rashes, hypopigmentation, fungal infection or boils among the child scavengers (below 16 yrs) of Metro Manila. Rash/pruritis, irritated skin, scabies, laceration, and unclear vision are some allergy related problems that are experienced by waste pickers of Vietnam (Nguyen et al. …).

The highest proportion of scavengers of Balkhu is suffering from skin rashes, and irritation. Annual frequency of these diseases are also found higher at Balkhu and follow by Teku. More than 60 percent scavengers of Balkhu are experiencing skin rashes for more than a half-year. However, only about 6 and 4 percent scavengers of Open Kathmandu and Teku are suffering from same problem that long. Out of total surveyed scavengers of Balkhu, about 59 percent is suffering from irritation for more than 6 months. Corresponding proportion of scavengers at Teku is only about 28 percent. On the contrary, none of scavengers of Open Kathmandu is experiencing the problem of irritation that long. Problem of eyelid burning is

found more frequent in the scavengers of Open Kathmandu. In terms of eyelid burning, Open Kathmandu ranks as the first unhealthy place (Table 7.4).

Figure - 7.2: Allergic Problems among Scavengers

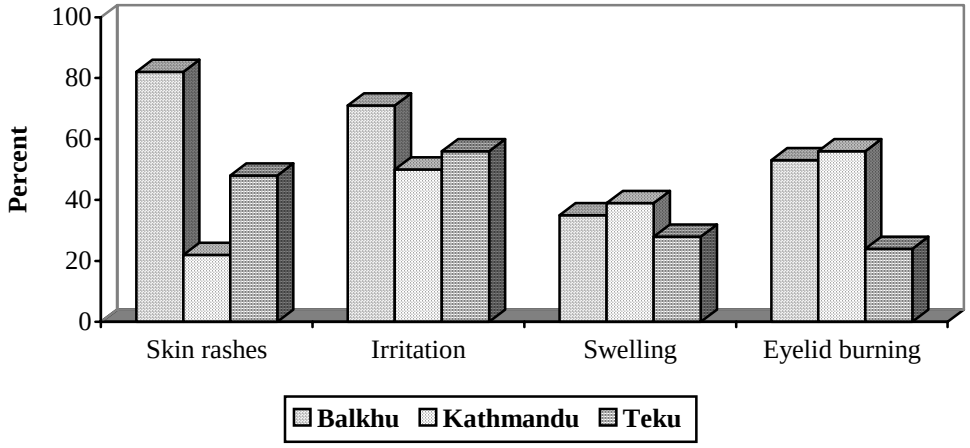


Table - 7.4: Allergic Problems frequencies among Scavengers

		Places					
Diseases	**Annual frequency**	Balkhu (17)	Percent	Open Kathmandu (18)	Percent	Teku (25)	Percent
Skin rashes	All year round	2	12	0	0	0	0
	Up to half year	8	47	1	6	1	4
	Up to 3 months	3	18	2	11	6	24
	Up to one month	0	0	1	6	3	12
	Up to a week	1	6	0	0	2	8
Irritation	All year round	2	12	0	0	0	0
	Up to half year	8	47	0	0	7	28
	Up to 3 months	1	6	6	33	0	0
	Up to one month	1	6	3	17	5	20
	Up to a week	0	0	0	0	2	8
Swelling	All year round	2	12	0	0	0	0
	Up to half year	0	0	0	0	0	0
	Up to 3 months	3	18	2	11	3	12
	Up to one month	1	6	5	28	2	8
	Up to a week	0	0	0	0	0	0
Eyelid burning	All year round	2	12	0	0	0	0
	Up to half year	0	0	1	6	0	0
	Up to 3 months	2	12	1	6	0	0
	Up to one month	3	18	6	33	5	20
	Up to a week	0	0	1	6	1	4

Source: Field survey, 2003
(Note: Numbers in parenthesis are total number of respondents)

7.3. Poisoning

There is no information available about air quality of dumping site of Kathmandu. But general air quality of Kathmandu Valley is unhealthier (appendix: II). Present study found serious poisoning problems among the scavengers of different places. Low level of oxygen, mixture of poisonous materials in waste, and breathlessness in working environment might be the causes of high level of poisoning diseases in the Kathmandu. Birley & Lock (1999) claim that major causes of poisoning is due to the landfill gases concentration and lower level of oxygen and mixing poisonous material or its container in waste. Table 7.5 shows some spatial differences in poisoning problems. Each type of poisoning diseases' coverage is highest in the scavengers of Balkhu than those of Open Kathmandu and Teku. In Balkhu, out of total surveyed scavengers, problems of headache, nausea, and faintingness are found on 88 percent respondents. This is probably due to landfill gas concentration around dumping site. Headache is the serious problem that is found in significant proportion of scavengers working at Vietnam's landfill site too (Nguyen et al. …).

Table - 7.5: Poisoning Diseases among Scavengers

	Places					
Diseases	Balkhu (17)	Percent	Open Kathmandu (18)	Percent	Teku (25)	Percent
Headache	15	88	14	78	22	88
Nausea	15	88	11	61	18	72
Fainting ness	15	88	6	33	5	20
Fits	6	35	0	0	4	16

Source: Field survey, 2003
(Note: Numbers in parenthesis are total number of respondents)

In the same manner, problem of fits is found in 35 percent of scavengers of Balkhu. Corresponding proportion of scavengers of Open Kathmandu experiencing the fits problem is zero while among the scavengers of Teku is 20 percent. Out of total, 88 and 72 percent scavengers of Teku are experiencing the problems of headache, and nausea, respectively. Corresponding proportions of scavengers of Open Kathmandu experiencing similar problems are about 78 and 61 percent, respectively. This means in terms of poisoning diseases, Balkhu is the most unhealthy place, and Teku and Open Kathmandu rank second and third, respectively.

7.4. Upper Respiratory Tract Diseases

Number of scavengers of Balkhu, Teku and Open Kathmandu are encountering with fever, sneezing, running nose, nasal congestion, cough, sputum, sore throat, throat ache, breathlessness, and chest pain. Prevalence of upper respiratory tract diseases among the scavengers is intense in each place with some spatial differences. Among these 5 diseases, symptoms of *pharyngitis* and *tonsillitis* are found in the highest proportion of scavengers of Balkhu. Similarly, symptoms of *rhinitis*, *sinusitis*, and *bronchitis* are found in the highest proportion of scavengers of Open Kathmandu. Proportions of scavengers of Balkhu and Teku suffering from fever, with sneezing, headache, running nose, and nasal congestion that are recognized as the symptoms of *rhinitis* and *sinusitis* are about 76 and 68 percent, respectively. Similarly, 29 and 36 percent scavengers of Balkhu and Teku respectively are experiencing the problems like breathlessness, chest pain, cough, sputum, and fever with sneezing, headache, running nose, nasal congestion, sore throat as well as throat ache. These symptoms are perceived as the symptoms of *bronchitis* (Table 7.6).

Table - 7.6: Upper Respiratory Tract Diseases among Scavengers

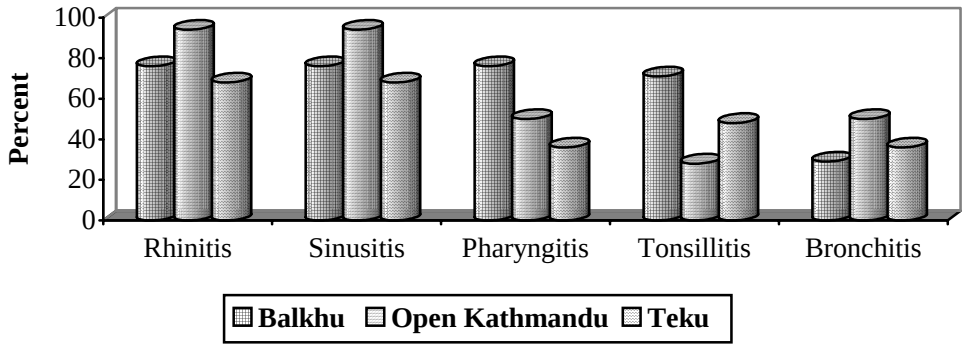
	Places					
Diseases	Balkhu (17)	Percent	Open Kathmandu (18)	Percent	Teku (25)	Percent
Rhinitis	13	76	17	94	17	68
Sinusitis	13	76	17	94	17	68
Pharyngitis	13	76	9	50	9	36
Tonsillitis	12	71	5	28	12	48
Bronchitis	5	29	9	50	9	36

Source: Field survey, 2003
(Note: Numbers in parenthesis are total number of respondents)

Health problems related to respiratory tract are serious problems not only to the scavengers of Kathmandu but also to the scavengers to third world cities. *Bronchitis* is the most commonly experienced disease among the waste pickers of Bangalore (Huisman in Cointreau-Levine …). Symptoms of chronic cough and jaundice were found in significant proportion of scavengers of Kolkata. Quarterly incidents of fever, cold and cough were found in more than 2 third of surveyed scavengers of Kolkata (in Cointreau-Levine …). Nath (Nath et al. in Cointreau-Levine …) also found higher prevalence of respiratory disease among the waste pickers than those of farmers who use organic solid waste as fertilizer. In the similar manner, problems of cough and shortness of breath are found in the scavengers of Vietnam (Nguyen et al. …). Konnoth's study (Konnoth in Cointreau-Levine …) of Mumbai's open

dump showed the problem of respiratory ailments on more than 70 percent scavengers.

Figure - 7.3: Upper Respiratory Tract Diseases among Scavengers



Some scavengers of Balkhu are experiencing the symptoms of *rhinitis, sinusitis,* and *pharyngitis* through out the year. About 12 percent scavengers of Balkhu are never free from the symptoms of these health problems. The proportion of scavengers experiencing the symptoms of *sinusitis* is not much different than that of *rhinitis* since both have similar symptoms and difficult to separate each other without clinical examination. Although the proportions of respondents experiencing the symptoms of *rhinitis* and *sinusitis* frequently are the highest in Balkhu and followed by Open Kathmandu and Teku, frequencies are found significantly higher in all places compared to other upper respiratory tract diseases. About 29 percent scavengers of Balkhu and 12 percent scavengers of Teku are experiencing the symptoms of *rhinitis* up to 4 times in a year. Corresponding proportion of scavengers of Open Kathmandu is about 17 percent. Problem of *tonsillitis* is found more than 2 times annually among the 53 percent of scavengers of Balkhu. Corresponding proportions of scavengers of Teku and Open Kathmandu are only 12 and 17 percent, respectively. The positive symptoms of *tonsillitis* are found in 18 percent scavengers of Balkhu once a year. The corresponding proportions of the scavengers of Teku and Open Kathmandu are 36 and 11 percent, respectively. Similarly, the symptoms of *bronchitis* are found in 35 percent of scavengers of Balkhu more than 2 times in a year. Nevertheless, corresponding proportions of scavengers of Teku and Open Kathmandu experiencing similar symptoms for the same period are only 8 and 6 percent, respectively. Observation of annual frequency of *bronchitis* shows that out of total surveyed scavengers, 44 percent of Open Kathmandu, 28 percent of

Teku, and 12 percent of Balkhu are experiencing its symptoms at least once a year (Table 7.7).

Table - 7.7: Upper Respiratory Tract Diseases frequency among Scavengers

		Annual frequency													
		1		2		3		4		Up to 1 month		Up to 3 months		Through out the year	
Place	**Health Problems**	No	%	No	%	No	%	No	%	No	%	No	%	No	%
Balkhu (17)	Rhinitis	0	0	5	29	0	0	5	29	1	6	5	29	2	12
	Sinusitis	0	0	3	18	2	12	2	12	4	24	5	29	2	12
	Pharyngitis	1	6	2	12	2	12	3	18	3	18	4	24	2	12
	Tonsillitis	3	18	7	41	2	12	0	0	0	0	0		0	0
	Bronchitis	2	12	2	12	1	6	0	0	0	0	0		0	0
Teku (25)	Rhinitis	0	0	8	32	3	12	3	12	3	12	0	0	0	0
	Sinusitis	0	0	0	0	10	40	4	16	3	12	0	0	0	0
	Pharyngitis	6	24	0	0	1	4	1	4	1	4	0	0	0	0
	Tonsillitis	9	36	2	8	0	0	0	0	1	4	0	0	0	0
	Bronchitis	7	28	1	4	1	4	0	0	0	0	0	0	0	0
Open Kathmandu (18)	Rhinitis	4	22	0	0	3	17	3	17	7	39	0	0	0	0
	Sinusitis	4	22	0	0	3	17	3	17	7	39	0	0	0	0
	Pharyngitis	4	22	4	22	1	6	0	0	0	0	0	0	0	0
	Tonsillitis	2	11	3	17	0	0	0	0	0	0	0	0	0	0
	Bronchitis	8	44	0	0	1	6	0	0	0	0	0	0	0	0

Source: Field survey, 2003
(Note: Numbers in parenthesis are total number of respondents)

As found in the prevalence of other health problems, Balkhu is found as the unhealthiest place in terms of the occurrence of upper respiratory tract diseases. Although, Teku is the second unhealthy place, but differences between Teku and Open Kathmandu are minimum in terms of the proportions of respondents experiencing different symptoms of upper respiratory tract diseases and their frequencies.

7.5. Lower Respiratory Tract Diseases

Lower respiratory tract diseases are not found that much widely among the scavengers of different places as upper respiratory tract diseases. Lower respiratory tract diseases like *pneumonia, tuberculosis, COPD,* and *asthma* are found on some scavengers of different places. Problems of breathlessness, chest pain, cough, sputum, and fever are the major symptoms of lower respiratory tract diseases with sneezing, headache, running nose, nasal congestion, and sore throat. The proportion of scavengers suffering from such symptoms is

found relatively lower. This might be due to lack of identification of diseases since this study could not make clinical examinations to identify the diseases properly.

About 24 percent scavengers of Balkhu are experiencing the symptoms of *pneumonia* and *TB*. The corresponding proportions of scavengers of Open Kathmandu and Teku suffering from *pneumonia* are only 11 and 4 percent, respectively. Only a single scavenger from Open Kathmandu reported that she/he is suffering from the symptoms of *COPD*. However, the problem of *asthma* is found in about 22 percent scavengers of Open Kathmandu and 12 percent scavengers of Balkhu (Table 7.8). Although present study did not find much serious situation of lower respiratory tract diseases among scavengers, but some other studies conducted in other cities in the world indicated that the scavengers are commonly experiencing number of health problems related to lower respiratory tract. According to Huisman (in Cointreau-Levine …) *TB, asthma, pneumonia* are common diseases among the waste pickers. The problems of chronic cough, chronic phlegm production, wheezing and residual or minimally active pulmonary tuberculosis are found among child scavengers of Metro Manila (Torres et al. in Cointreau-Levine …).

Frequencies of lower respiratory tract diseases are low. About 17 and 22 percent scavengers of Open Kathmandu are experiencing the symptoms of *pneumonia* and *COPD* 2 or more than 2 times a year, respectively. Similarly, symptoms of *pneumonia* are found once a year in 24 and 4 percent scavengers of Balkhu and Teku, respectively.

Table - 7.8: Lower Respiratory Tract Diseases among Scavengers

	Places					
Diseases	Balkhu (17)	Percent	Open Kathmandu (18)	Percent	Teku (25)	Percent
Pneumonia	4	24	2	11	1	4
TB	4	24	0	0	0	0
COPD	0	0	1	6	0	0
Asthma	2	12	4	22	0	0

Source: Field survey, 2003
(Note: Numbers in parenthesis are total number of respondents)

7.6. Upper Gastrointestinal Diseases

Although present study could not make clinical examination and laboratory tests, number of studied cited below show parasitic infections as the major cause of gastrointestinal diseases. Stomachache is common symptom of most of gastrointestinal diseases, which is experienced by almost all scavengers of Kathmandu. Within the gastrointestinal diseases, this study

classifies it in two groups namely upper and lower gastrointestinal diseases. Upper gastrointestinal disease includes *malnutrition, dysphagia*, *heartburn, regurgitation, dyspepsia, flatulence, vomiting, water brash, anorexia,* and *gastritis*. Some spatial differences are observed in the influence of upper gastrointestinal diseases. Upper gastrointestinal diseases have intense influence on the scavengers of Open Kathmandu. Out of 10 diseases falling in this group, 8 diseases such as *dysphagia, regurgitation, dyspepsia, flatulence, vomiting, water brash, anorexia,* and *gastritis* are found in the highest proportions of scavengers of Open Kathmandu. Only the symptoms of *malnutrition* and *heartburn* are found in the highest proportion of scavengers of Balkhu and Teku with the coverage on 47 and 28 percent respondents, respectively. Corresponding proportions of scavengers of Open Kathmandu experiencing similar symptoms are 28 and 17 percent, respectively. Similarly, symptoms of *heartburn* are found in about 24 percent scavengers of Balkhu. However, symptoms of *malnutrition* are found only in 8 percent scavengers of Teku (Table 7.9).

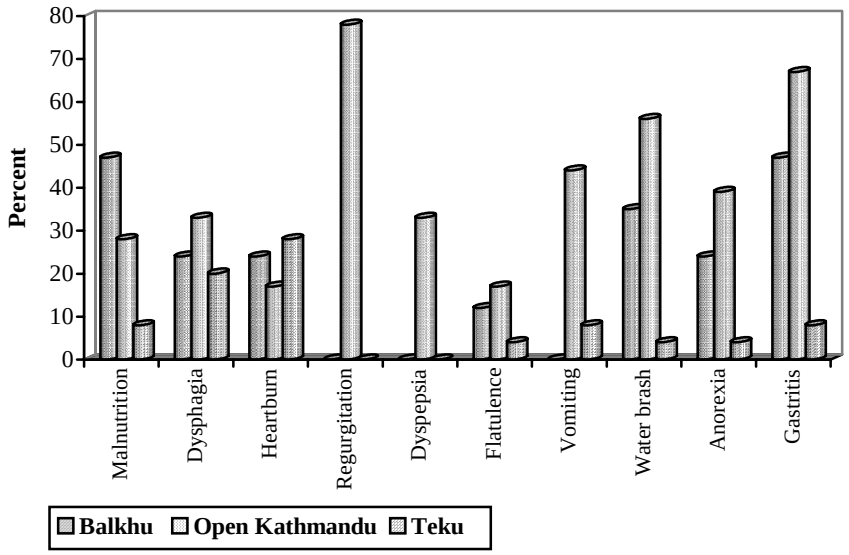
About 33 percent scavengers of Open Kathmandu are experiencing difficult in swallowing that is the symptom of *dysphagia.* Corresponding proportions of scavengers of Balkhu and Teku experiencing such symptoms are 24 and 20 percent, respectively. Similarly, the symptoms of *regurgitation* are found only in the scavengers of Open Kathmandu. Upper abdominal pain, heartburn, nausea, vomiting, and loss of appetite are the symptoms of *dyspepsia.* Such symptoms are found only in the scavengers of Open Kathmandu. The proportion of scavengers of Open Kathmandu suffering from *flatulence* is 17 percent. The corresponding proportions of scavengers of Balkhu and Teku experiencing similar symptoms are 12 and 4 percent, respectively. In the same manner, the problem of *vomiting* is found in 44 percent of scavengers of Open Kathmandu and 8 percent scavengers of Teku. However, none of scavengers of Balkhu has reported this problem. Table 7.9 shows that about 39 percent scavengers of Open Kathmandu, 24 percent of Balkhu, and only 4 percent of Teku are experiencing loss of appetite. Symptoms of *gastritis* are found on 67 percent scavengers of Open Kathmandu, 47 percent of Balkhu, and 8 percent of Teku. Figure 7.4 gives better illustration of these differences.

Table - 7.9: Upper Gastrointestinal Diseases among Scavengers

	Places					
Diseases	Balkhu (17)	Percent	Open Kathmandu (18)	Percent	Teku (25)	Percent
Malnutrition	8	47	5	28	2	8
Dysphagia	4	24	6	33	5	20
Heart burn	4	24	3	17	7	28
Regurgitation	0	0	14	78	0	0
Dyspepsia	0	0	6	33	0	0
Flatulence	2	12	3	17	1	4
Vomiting	0	0	8	44	2	8
Water brash	6	35	10	56	1	4
Anorexia	4	24	7	39	1	4
Gastritis	8	47	12	67	2	8

Source: Field survey, 2003
(Note: Numbers in parenthesis are total number of respondents)

Figure - 7.4: Upper Gastrointestinal Diseases among Scavengers



Stool sample of Kolkata's waste pickers showed mucous in the stool in all sampled stool of waste pickers (in Cointreau-Levine …). It is not surprising that the most of the waste pickers of Bangkok dumpsite were infected by one or more parasites (Kungskulniti et al. in Cointreau-Levine …). Stool sample of waste pickers of Metro Manila and Kolkata also showed parasitic infection on most of the waste pickers (Torres et al. in Cointreau-Levine…). Almost all respondents of Olinda squatters that used to be a dump previously also experienced parasitic infection (de Coura Cuentro and Dji Malla Gadji in Cointreau-Levine …). These studies are the evidences that gastrointestinal problems are serious health problems of the waste pickers of third world cities.

Table - 7.10: Upper Gastrointestinal Diseases frequency among Scavengers

	Annual Frequency															
		1		2		3		4		5-12 times		13-24 times		25-50 times		More than 50 times	
	Disease	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%
Balkhu (17)	Dysphagia	0	0	0	0	4	24	2	12	0	0	2	12	0	0	0	0
	Heartburn	0	0	0	0	0	0	0	0	0	0	0	0	4	24	0	0
	Regurgitation	0	0	0	0	0	0	0	0	0	0	0	0	4	24	0	0
	Dyspepsia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Flatulence	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Vomiting	0	0	0	0	1	6	0	0	1	6	0	0	0	0	0	0
	Waterbrash	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Anorexia	0	0	4	24	4	24	0	0	0	0	0	0	0	0	0	0
	Gastritis	0	0	0	0	0	0	2	12	2	12	0	0	0	0	0	0
Teku (25)	Dysphagia	0	0	1	4	0	0	0	0	0	0	0	0	1	4	0	0
	Heartburn	0	0	2	8	0	0	0	0	2	8	0	0	0	0	1	4
	Regurgitation	0	0	1	4	1	4	1	4	2	8	2	0	0	0	0	0
	Dyspepsia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Flatulence	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Vomiting	0	0	1	4	0	0	0	0	0	0	0	0	0	0	0	0
	Waterbrash	0	0	1	4	1	4	0	0	0	0	0	0	0	0	0	0
	Anorexia	0	0	0	0	0	0	1	4	0	0	0	0	0	0	0	0
	Gastritis	0	0	0	0	0	0	1	4	0	0	0	0	0	0	0	0
Open Kathmandu (18)	Dysphagia	0	0	0	0	0	0	1	6	5	28	0	0	0	0	0	0
	Heartburn	0	0	0	0	0	0	0	0	3	17	0	0	0	0	0	0
	Regurgitation	0	0	2	11	5	28	6	33	1	6	0	0	0	0	0	0
	Dyspepsia	1	6	2	11	3	17	0	0	0	0	0	0	0	0	0	0
	Flatulence	1	6	0	0	2	11	0	0	0	0	0	0	0	0	0	0
	Vomiting	0	0	4	22	3	17	0	0	0	0	1	6	0	0	0	0
	Waterbrash	0	0	2	11	7	39	1	6	0	0	0	0	0	0	0	0
	Anorexia	0	0	1	6	3	17	3	17	0	0	0	0	0	0	0	0
	Gastritis	1	6	4	22	3	17	0	0	2	11	0	0	2	11	0	0

Source: Field survey, 2003

(Note: Numbers in parenthesis are total number of respondents)

Annual frequencies of upper gastrointestinal diseases among scavengers of different places are shown in Table 7.10. Frequencies of *dysphagia*, *heartburn* and *regurgitation* are higher among the scavengers of Balkhu than those of Open Kathmandu and Teku. About 24 percent scavenger of Balkhu is experiencing the symptoms of *heartburn* and *regurgitation* 13 to 24

times in a year. However, none of the scavenger of Teku and Open Kathmandu is suffering from similar problem that long (see Table 7.10 for detail).

7.7. Lower Gastrointestinal Diseases

Findings of the study of lower gastrointestinal diseases among the scavengers of different places are shown in Table 7.11. Significant proportion of scavengers of Balkhu is experiencing the symptoms like loose motion, vomiting, gastritis, dehydration, fever, pain abdomen and stool with mucous and blood. Out of the total surveyed scavengers of Balkhu, 59 and 47 percent have reported that they are experiencing the symptoms of *ameobiasis* and *dysentery*, respectively. Similarly, 39 and 11 percent scavengers of Open Kathmandu and 32 and 28 percent scavengers of Teku are encountering similar symptoms. Among the 9 diseases categorized as lower gastrointestinal diseases, higher proportion of scavengers of Open Kathmandu than Balkhu and Teku are suffering from the symptoms of 4 diseases namely, *peptic ulcer*, *food poisoning*, *worm infestation* and *typhoid*. Out of the total respondent of Open Kathmandu, 61 and 72 percent are experiencing the symptoms of *peptic ulcer* and *food poisoning* (vomiting, diarrhea, pain abdomen and distention of abdomen), respectively. Corresponding proportion of scavengers of Balkhu experiencing similar symptoms is 47 percent. However, only 4 and 36 percent of scavengers of Teku reported that they are experiencing the symptoms of *peptic ulcer* and *food poisoning*, respectively. In the same manner, 72 and 89 percent scavengers of Open Kathmandu are experiencing the symptoms of *worm infestation* and *typhoid*, respectively. Corresponding proportions of scavengers of Balkhu suffering from positive symptoms of *worm infestation* and *typhoid* are 47 and 76 percent, respectively. In the case of Teku, symptoms of these diseases are found only in 8 and 28 percent scavengers respectively (Table 7.11).

On the contrary, higher proportions of respondents of Teku than those of Open Kathmandu and Balkhu are experiencing the symptoms of *giardiasis*, *cholera*, and *diarrhea*. Out of total respondents, 20 percent of Teku, 18 percent of Balkhu, and only 6 percent of Open Kathmandu are experiencing the symptoms like loose motion, stool with mucous, and pain abdomen. These symptoms are recognized as the symptoms of *giardiasis*. Similarly, the proportions of scavengers suffering from *cholera* that develops symptoms like loose motion dozens of times with severe dehydration are about 32, 17, and 18 percent at Teku, Open Kathmandu, and Balkhu, respectively. About 64 percent respondent of Teku, 61 percent of

Open Kathmandu, and 47 percent of Balkhu are experiencing the problem of *diarrhea*. In general, present study found some spatial differences in the proportions of scavengers experiencing different health problems related to lower gastrointestinal diseases. Figure – 7.5 better illustrates these differences. These differences are outcome of unhealthy places' characteristics including the other numbers of factors.

Problems of lower gastrointestinal diseases are found not only among the scavengers of Kathmandu but are also common health problems of the scavengers of other cities of developing countries. *Dysentery* and parasites are commonly experienced by the waste pickers of Bangalore (Huisman in Cointreau-Levine …). Quarterly incidents of diarrhea found in more than 80 percent scavengers of Kolkata (cited in Cointreau-Levine …). Stomachache, diarrhea and bloody stool are the common gastrointestinal problems, which were found in waste pickers of Vietnam (Nguyen et al.…). Nath (Nath et al. in Cointreau-Levine …) also found higher prevalence of diarrhea, and protozoal and helminthic infestation in waste pickers than those of farmer who use organic solid waste as fertilizer. In the similar manner, Konnoth's study (Konnoth in Cointreau-Levine…) on the scavengers of Mumbai open dumpsite reveals that most of waste workers complained in gastrointestinal diseases. Out of total surveyed and examined scavengers, 51 percent had gastrointestinal ailments.

Table - 7.11: Lower Gastrointestinal Diseases among Scavengers

	Places					
Diseases	Balkhu (17)	Percent	Open Kathmandu (18)	Percent	Teku (25)	Percent
Peptic ulcer	8	47	11	61	1	4
Food poisoning	8	47	13	72	9	36
Giardiasis	3	18	1	6	5	20
Worm infestation	8	47	13	72	2	8
Ameobiasis	10	59	7	39	8	32
Dysentery	8	47	2	11	7	28
Cholera	3	18	3	17	8	32
Esthetic fever or typhoid	13	76	16	89	7	28
Diarrhea	8	47	11	61	16	64

Source: Field survey, 2003
(Note: Numbers in parenthesis are total number of respondents)

Frequencies of lower gastrointestinal diseases among the scavengers of different places are given in Table 7.12. Based on the frequencies of different diseases, Balkhu recognized as unhealthiest place and the Open Kathmandu ranks the second. Out of total scavengers, about

12 percent of Balkhu is experiencing the symptoms of *food poisoning* more than 25 times in a year. However, none of the scavenger in Teku and Open Kathmandu is experiencing similar problem that long. About 28 percent scavengers of Open Kathmandu are experiencing the symptoms of *giardiasis* up to 3 times in a year. None of scavenger of Teku has reported that long. But about 29 percent scavengers of Balkhu are experiencing the symptoms of *giardiasis* up to 3 times in a year. The proportions of scavengers experiencing the problem of *worm infestation* up to 2 times annually are 6, 6, and 4 percent in Balkhu, Open Kathmandu, and Teku, respectively.

About 24 percent scavengers of Teku are suffering from *ameobiasis* more than 13 times in a year. About 8 percent scavengers of Teku are suffering from the same problem, even more than 25 times annually. However, not a single scavenger of Balkhu and Open Kathmandu is experiencing that long from the same disease. Nevertheless, proportions of scavengers suffering from *ameobiasis* up to four times annually are 48, 56, and 8 percent in Balkhu, Open Kathmandu, and Teku, respectively (Table 7.12). Based on the problems and frequencies of *dysentery*, *cholera*, and *diarrhea*, Balkhu is with the highest risk and Open Kathmandu and Teku rank second and third risky places, respectively.

Figure - 7.5: Lower Gastrointestinal Diseases among Scavengers

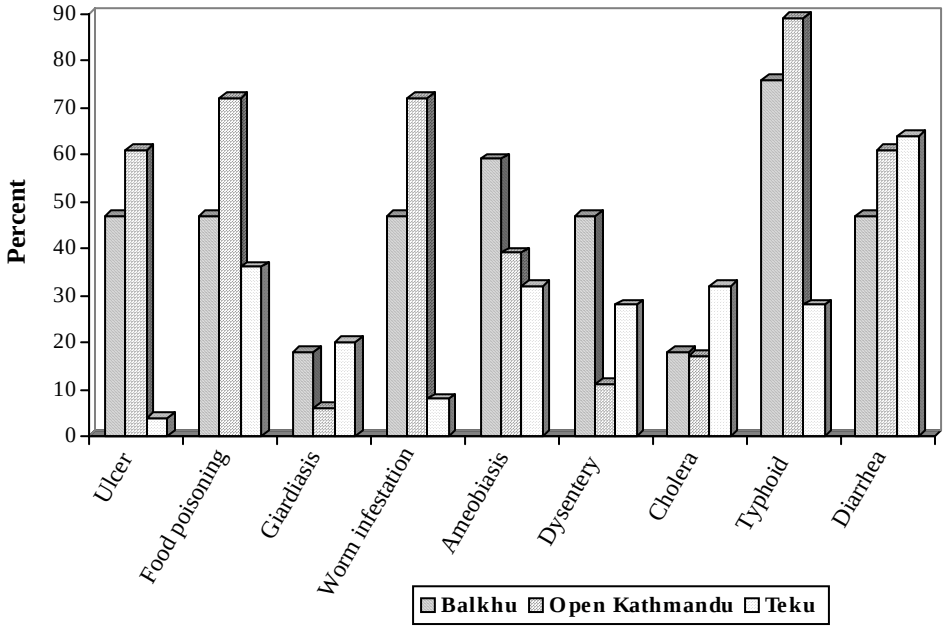


Table – 7.12: Lower Gastrointestinal Diseases frequency among Scavengers

	Annual frequency														
		1		2		3		4		5-12 times		13-24 times		25-50 times	
	Diseases	No	%	No	%	No	%	No	%	No	%	No	%	No	%
Balkhu (17)	Peptic ulcer	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Food poisoning	1	6	4	24	2	12	0	0	0	0	0	0	2	12
	Giardiasis	2	12	1	6	5	29	0	0	0	0	0	0	0	0
	Worm infestation	2	12	1	6	0	0	0	0	0	0	0	0	0	0
	Ameobiasis	4	24	2	12	2	12	0	0	0	0	0	0	0	0
	Dysentery	0	0	3	18	4	24	1	6	2	12	0	0	0	0
	Cholera	6	35	2	12	0	0	0	0	0	0	0	0	0	0
	Typhoid	1	6	0	0	0	0	0	0	2	12	0	0	0	0
	Diarrhea	6	35	2	12	2	12	0	0	0	0	2	12	0	0
Teku (25)	Peptic ulcer	1	4	0	0	0	0	0	0	0	0	0	0	0	0
	Food poisoning	1	4	4	16	0	0	2	8	1	4	0	0	0	0
	Giardiasis	0	0	3	12	0	0	0	0	2	8	0	0	0	0
	Worm infestation	1	4	1	4	0	0	0	0	0	0	0	0	0	0
	Ameobiasis	1	4	0	0	1	4	0	0	0	0	4	16	2	8
	Dysentery	3	12	0	0	2	8	1	4	0	0	0	0	1	4
	Cholera	2	8	4	16	2	8	0	0	0	0	0	0	0	0
	Typhoid	0	0	2	8	5	20	1	4	0	0	0	0	0	0
	Diarrhea	2	8	0	0	4	16	1	4	9	36	0	0	0	0
Open Kathmandu (18)	Peptic ulcer	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Food poisoning	0	0	0	0	3	17	3	17	4	22	1	6	0	0
	Giardiasis	0	0	1	6	5	28	4	22	2	11	3	17	0	0
	Worm infestation	0	0	1	6	0	0	0	0	0	0	0	0	0	0
	Ameobiasis	4	22	2	11	3	17	1	6	3	17	0	0	0	0
	Dysentery	0	0	0	0	2	11	3	17	2	11	0	0	0	0
	Cholera	0	0	2	11	0	0	0	0	0	0	0	0	0	0
	Typhoid	3	17	0	0	0	0	0	0	0	0	0	0	0	0
	Diarrhea	0	0	0	0	3	17	4	22	8	44	0	0	1	6

Source: Field survey, 2003

(Note: Numbers in parenthesis are total number of respondents)

CHAPTER EIGHT Conclusions

8.1. Conclusion

"Health is essential for social and economic development of a country" (WHO in Nguyen et al…). This study explains the health problems related to waste management. Exploration of health problems based on activities and places illustrates the role of activities and places in occupational health.

Municipal, community based, as well as privatized waste management practices are in practice in Kathmandu. Waste handling practice is typically manual. Standards of waste handling practice in industrialized countries have reduced occupational health and environmental impacts significantly (Cointreau-Levine…). But hazardous and inorganic wastes of Kathmandu are still mixed in municipal waste. Through separating inorganic and hazardous waste from municipal waste, by mechanized waste handling and material recovery practice, severity of health problems among sweepers and scavenges can be reduce in significant level. However, neither authorities are enforcing, nor Kathmanduities are separating waste at the source of origin. Thus Kathmandu is not practicing technically feasible, socially acceptable, economically sustainable, and environmentally sound waste management system. Politics in waste management is making this issue more complex. On the one hand, policy lacking is observed in waste management, material recovery, environmental health and working environment and on the other hand existing policies are inadequate and have wide gap between policy and practices. Due to country's political instability, weak and irresponsible bureaucracy, existing policies are not being implemented properly. Efforts made for better management of hazardous hospital waste are to be practiced. This situation resulted in inappropriate discharge of hazardous waste at open dumps and rivers. All these situations are responsible for unhealthy working environment but any policy for acceptable/standard working environment does not exist there. Meantime political conflict of the country has been making environment worse. Due to such conflict not only the occupational class but also all urbanities have direct health effect (photos in appendix IV).

Sweeping profession is an outcome of historical labor division system and that is embedded in social structure. Major way to enter to sweeping occupation is through social structure/

caste system. There are multiple and complex causes that force poor in scavenging occupation. Scavenging is the ultimate symbol of poverty and degraded social welfare. The sweepers and the scavengers are the vulnerable groups who spend their day-to-day life around the waste. They are the actors of lowest level of waste economy. Their working environment has acute health risks. They are working in health threatening environment for survival. Regrettable politico-economic system and miserable social welfare of the country is limiting alternative ways to run livelihoods of poor. Being economically poor, socially excluded, and politically powerless groups, sweepers and scavengers are experiencing environmental injustices. Entry in scavenging occupation is free; nevertheless own group or gang is needed to be safe in working place. Major ways to enter to scavenging occupation are through the help of friends, relatives, and family members.

Because of numbers of factors, sweepers and scavengers of Kathmandu are experiencing range of health problems. These problems are ranging from very small like pin-bite to chronic respiratory tract and gastrointestinal and sometimes even traffic accidents. Most of the physical injuries related problems have higher influence on sweepers. Similarly, very high proportions of respondents of both groups are experiencing allergic diseases like skin rashes, irritation, swelling and lips or eyelids burning. Some scavengers are suffering from one or more than one kind of allergic problem through out the year. The poisoning diseases are also acute in both groups with minimum differences on the proportions of respondents experiencing poisoning diseases.

Significant proportions of sweepers and scavengers are experiencing the symptoms of respiratory tract diseases. Some scavengers are experiencing the symptoms of respiratory disease throughout the year. Diseases associated with gastro intestine are also common among the sweepers and scavengers. Upper gastrointestinal diseases are acute among the sweepers and lower gastrointestinal diseases are acute among the scavengers. Annual occurrence of most of gastrointestinal diseases is higher among scavengers.

Among the sub-groups of sweeper, some differences in the proportion of respondents experiencing different health problems and their frequencies are observed. Elbow injury and wrist pain are found in relatively higher proportion of sweepers than those of collectors and loaders. However, the problem of cut and broke is found in higher proportion of loaders than those of collectors and sweepers. Although higher proportion of loaders is experiencing cut

and broke, weekly frequency is relatively lower among them. The problem of swelling is observed in significantly higher proportion of sweepers. Similarly, skin rashes, and irritation are found in higher proportions of collectors. The problem of eyelid burning is found in higher proportion among loaders. Problems of skin rashes, irritation, and eyelid burning are more frequent in collectors and followed by sweepers and loaders. Almost one-third collectors are experiencing the problem of irritation longer than 6 months in a year. There are notable differences in the proportions of respondents experiencing the symptoms of upper as well as lower respiratory tract diseases and their frequencies. The highest proportion of sweepers is experiencing the symptoms of respiratory tract diseases. These differences are also product of gender because women encounter with dust and smoke in the streets as well as in kitchen.

Working environment varies according to places because a place has specific characteristics. Composition of waste that determines physical environment of working place of scavengers is different in different places of present study. Although some spatial differences in terms of the proportions of scavengers experiencing different health problems are observed, all the places covered by this study are full of health risk. The scavengers of all places are seriously suffering from different types of health problems. Frequencies of physical injuries are so high to most of scavengers of each place and they got some types of injuries more than 4 times in a week. Annual frequencies of most of allergic diseases are higher at Balkhu where almost two-third scavengers are experiencing skin rashes and irritation for longer than half-year duration in a calendar year. In the same manner, scavengers of Balkhu have acute poisoning problems and follow by Teku. Problems of respiratory tract diseases are also severe to the scavengers of each place with some spatial differences. Stomachache is common symptom of most of gastrointestinal diseases and it is experienced by most of the scavengers of Kathmandu. Some spatial differences are observed in the occurrence of different gastrointestinal diseases. Upper gastrointestinal diseases are found more frequently among the scavengers of Open Kathmandu and most of the lower gastrointestinal diseases are found frequently in higher proportion of scavengers of Balkhu.

Adverse physical health conditions have become a fact of life for sweepers and scavengers of Kathmandu. Even though sweeping and scavenging give stable income to them, but they meet an unhealthy lifestyle that goes with many health risks. Living safe while working with

waste where risks and hazards are concentrated is a task like that of a soldier who is struggling to survive in the open battlefield. To work as sweepers or scavengers is beyond their control and is often their only choice. Health has significant economic importance. It helps to understand the burden of environmental health hazard in economy. Long days without work and loosing numbers of working days because of illness reduce daily income on the one hand and extra burden of expenditure for treatment results further poverty to sweepers and scavengers. Because of severe economic pressure scavengers are working to earn more through ignoring the vulnerable health problems. They rarely invest for better health. All these situations trap these poor in vicious circle of poverty.

Health is an outcome of multiple factors. Although different variables like age, sex, income, fooding, drinking, smoking habits, occupational history all have different level of health risk, however, it is difficult to separate these factors from each other while studying the health problems. General pollution of city affects to the health of urbanities. Moreover, greater exposure to environmental pollution because of nature of work, living in poor sanitation and over crowded conditions, inadequate nutrition, social stress, and their poor access to health care makes sweepers and scavengers sick and remains them sick for long time. Both sweepers and scavengers are uneducated and have little knowledge about health risks. Moreover, their protective measures are miserable. They ignore most of the health problem until it becomes very acute. Most of them are seeking relief from physical pain and mental stress through smoking and drinking alcohol.

In recent decades environmental justice is bringing significant change in the environmental condition of marginalized groups in first word. Nevertheless, sweepers and scavengers of Kathmandu are forced to live near by dumping site and work with waste. Neither any appropriate occupational health standard is adopted nor has any organization showed up yet to raise this issue. Although laws and legislations do not ban sweepers to make voice against pollution and health problem, and they are not restricted to work in other field, but such laws and legislations are seldom practiced in existing social structure. This social structure created social inequality since long past and has compelled to perceive that sweepers have no right to make voice against environmental iniquity. As shown in figure 3.1, overall health problems of sweepers and scavengers of Kathmandu are the product of complex interaction of social structural and politico-economic system. This is alike what the s*tructuralist* approach claims.

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Appendixes:

Appendix I: Composition of waste in Kathmandu

	% of the waste (By weight						
Components	1976[1]	1982[2]	1985[3]	1988[4]	1995[5]	1999[6]	2003[7]
Organic material	67.5	60.0	67.5	58.1	65.0	67.5	69.0
Paper	6.5	19.3	6.0	6.2	4.0	8.8	9.0
Plastics	0.3	3.6	2.6	2.0	5.0	11.4	12.0
Glass	1.3	3.4	4.0	1.6	1.0	1.6	3.0
Metals	4.9	3.4	2.2	0.4	1.0	0.9	1.0
Textile	6.5	5.3	2.7	2.0	3.0	3.6	3.0
Rubber and lather	0.0	0.0	0.0	0.4	1.0	0.3	1.0
Wood	2.7	1.6	0.0	0.5	3.0	0.6	NA
Dust/construction debris	10.0	3.4	15.0	28.9	17.0	5.3	2.0

Appendix II: Ambient Air Quality for Kathmandu Valley, Monthly Average of PM10, 2003

	Station	µg/m³				
Month	Putalisadak	Matsyagaun	Kirtipur	Bhaktapur	Patan Hospital	Thamel
January	316	NA	134	278	277	273
February	252	66	102	211	NA	198
March	239	66	115	200	225	178
April	253	88	120	191	239	200
May	270	86	116	175	237	NA
June	220	69	80	101	179	122
July	116	23	26	36	122	62
August	125	22	29	39	117	65
September	126	24	32	44	127	69
October	135	32	45	66	119	104
November	181	51	75	102	168	162
December	285	46	87	129	214	207

Good	< 60
Moderate	61-120
Unhealthy	121-350
Very Unhealthy	351-425
Hazardous	> 425

National Ambient Air Quality Standard: 120 microgram per cubic meter
Source: http://www.mope.gov.np/pollution.html (Accessed on 16.05.04)

[1] Mean value of two sample taken at Thamel on 30.07.76 and at Bhonsiko Street on 03.08.76 (Tabasaran 1976 in KVMP/KMC 2001c)
[2] Tabasaran and W. Bidlingmaier's report on possibility of composting municipal waste in Kathmandu Valley (Mutz 1990 in KVMP/KMC 2001c)
[3] Survey on waste generation in households and small shops in Kathmandu and Patan (Mutz 1990 in KVMP/KMC 2001c)
[4] Survey of waste from six sites in Kathmandu conducted in May 1988 (Mutz 1990 in KVMP/KMC 2001c)
[5] Survey conducted by NESS (Thapa nad Devkota 1999 in KVMP/KMC 2001c)
[6] Average of samples from seven sites (RESTUC 2000 in KVMP/KMC 2001c)
[7] Department of Environment, KMC 2003

Appendix –III: Questionnaire

Questionnaire for Municipal solid waste worker: **Question code: ……**

1. Respondent's personal Information:
   Age: Sex: M F Working site:
   Work type:
   Education: Normal wage/Salary:
   Extra Income:
   Smoking and drinking habit:
3. What do you know about the health risk of working with waste?
   a.
   b.
   c.
   d.
4. How often do you take bath? (After work, before work)……..
5. How often do you change/wash cloths? (After work, before work)…….
6. What are the problems in taking bath and washing cloths regularly?
   a.
   b.
   c.
7. Do you take bath or wash hand after work and before making or having food?
8. Are you using soap while taking bath and washing hand after work?
9. Since when did you start this job?
10. What was your previous occupation?
11. **If not the same occupation**, why did you change your occupation?
12. How is your economic condition now comparing to the past?
    Better of: more worse: no any notable change:

If become better off or worse, how it became? (follow with why question and try to go deep)
   a.
   b.
   c.
   d.
13. Where do you go if you become sick?
14. For what kind of sickness you are going to a doctor?
15. Do you see or come in contact with human feacel matter in solid waste?
    If yes, how often? Where? In what condition? More detail…
16. Do you see or found used bandages or sanitary pads in solid waste?
    If yes, how often? Where? In what condition? More detail…
17. Do you see or found hospital/clinic waste mixed in solid waste?
    If yes, how often? Where? In what condition? More detail…
18. Do you see or found any quantity or used container of poisonous material mixed in solid waste?
    If yes, how often? Where? In what condition? More detail…
19. Do you see or found any sharp object, broken glass mixed in solid waste?
    If yes, how often? Where? In what condition? More detail…
20. Are you injured (cut, break) while on work within last one year?
    If yes, what and how had happened? Detail story
21. Are you suffering from: Back injury: Joint pain:
    Elbow injury: Wrist injury: Other:

If yes, since when? What type of treatment did you did? Do you have medical report? (Try to obtain a copy of medical report)

22. Are you suffered from following infection?

Tetanus: Hepatitis A: Typhoid: Fatigue:
Other:

If yes, since when? What type of treatment did you did? Do you have medical report? (Try to obtain a copy of medical report)

23. Did you take following Vaccine?

Tetanus: Hepatitis A: Typhoid: Rabbis:

If yes, before the infection or after? And who paid for that?

24. Are you suffered from poisoning while on work due to gaseous pollution?

Headache: Nausea : Fainting ness: Fits:

If yes, when? How often? In what type of working situation? What type of treatment did you did? Do you have medical report? (Try to obtain a copy of medical report)

25. Are you suffering from following lung diseases?

Upper respiratory tract

- **Rhinitis: Fever;** Sneezing, Headache, Running nose, Nasal congestion…….
- **Sinusitis**: **Fever;** Sneezing, Headache, Running nose, Nasal congestion…….
- **Pharyngitis**: **Cough, Sputum, Fever;** Headache, Sore throat, Throat ache…….
- **Tonsilitis: Throat ache;** Sore throat, Throat ache…….
- **Brochitis: Dyspaoea----Breathlessness, Chest pain, Cough, Sputum, and Fever;** Sneezing, Headache, Running nose, Nasal congestion, Sore throat, Throat ache……..

If yes, since when? What type of treatment did you did? Do you have medical report? (Try to obtain a copy of medical report)

Lower RespiratoryTract

- **Pneumonia**—chest infection: **Dyspaoea----Breathlessness, Chest pain, Cough, Sputum, Fever;** (May be Sneezing, Headache, Running nose, Nasal congestion, Sore throat, Throat ache)……
- **Tuberculosis**: **Dyspaoea----Breathlessness, Chest pain, Maemoptysis---Blood in sputum, Cough, Sputum, Fever; Loss of appetite, Weight loss, Sweating, Weakness, Fatigue.** (May be Sneezing, Headache, Running nose, Nasal congestion, Sore throat, Throat ache)……
- **COPD**—Chronic Obstructive Pulmonary Disease: **Dyspaoea----Breathlessness, Chest pain, Cough, Sputum, Fever, Mainly in smokers, old age after 40/45 yrs…….**
- **Bronchical Asthma**: **Mainly hereditary, due to allergy, Dyspaoea----Breathlessness, Cough, Fever;** (May be Sneezing, Headache, Running nose, Nasal congestion)…….
- Filariasis……
- Japanese Encephalitis……
- Other respiratory infections…

If yes, since when? What type of treatment did you did? Do you have medical report? (Try to obtain a copy of medical report)

26. Are you suffering from any or more types of following allergies? If yes, how often?

Skin rashes: Irritating: Swollen: lips or eyelids burning:

If yes, how often? What might be the cause? Do you have medical report? (Try to obtain a copy of medical report)

27. Are you suffering from any types of following gastro intestinal diseases? (Pain abdomen, Loss of weight due to anorexia and malabsorbtion, Symptoms of anemia, Diarrhoea---loose motion)

- Mouth—Stomatitis: Malnutrition, Vitamins deficiency…….

Disease of Desophagus

- **Disphagia**: ---Difficulty in swallowing…….
- **Heart burn**:---burning sensation……

- **Regurgitation**:---effortless return of gastric or oesophagal content into the mouth……..
  Disease of Stomach: Symptoms of gastric diseases
- **Dyspepsia**:---upper abdominal pain, regurgitation, heart burn, nausea, vomiting, loss of appetite, distension of abdomen……..
- **Flatulence**:---……..…….
- **Vomiting**:---…….
- **Water brash**:--- effortless return of gastric or oesophagal content into the mouth…….
- **Loss of appetite** (anorexia)…….
- **Gastritis**……
- **Peptic ulcer:---**ulcer in the lower oesophagus, stomach, duodenum, jejunum (small intestive)……
- **Food poisoning**:---Vomiting, diarrhoea, pain abdomen, distention of abdomen…….
- **Giardiasis/ Giardia lamblia**:---loose motion, stool with mucos, pain abdomen. ……..
- **Worm infestation**: Ascaris (round worm), Whip worm, Tape worm (Taenic solium):---Pain abdomen, distension of abdomen, loss of appetite, occasional loose motion, malabsorsion, weight loss, gastritis……
- **Amoebiasis / Entamoeba hystolitics**:---loose motion, vomiting, gastritis, dehydration (loose of water from body), watery stool…….
- **Dysentery**:---fever, loose motion, stool with mucose & blood, pain abdomen, dehydration……
- **Cholera:---**loose motion many times i.e. more than 30/40 times a day, sever dehydration, highly infectious……
- **Etesic fever or typhoid (**salmonella typhi, salmonella paratyphi):---fever high grade more than 102oF, pain abdomen, occasional loose motion……..
- **Others:…….**

If yes, how often? What might be the cause? Do you have medical report? (Try to obtain a copy of medical report)

28. Are you suffering from any other illness then mentioned here?
    If yes, detail of illness, symptom and treatment…(try to get more information about it)
29. Did your sickness disturbed in your work?
    If yes, how long? How many days in last year?
30. If you became sick, how do you do your treatment? (Medical facilities and treatment process)…
31. If you could not go to work, how do you manage your household expenses?
32. Do you get any medical facilities from your employee? Detail…
33. What do you do to be safety in work? (Safety measures…)
34. Give your suggestion to make healthy working environment in your field of work?
35. Do you have something to tell about your occupation, health and any others?

……

Questions only for scavengers **Question code:**

……

1. Respondent's personal Information:

Age:	Sex:	M	F	Working site:
Work type:				
Education:				Normal wage/Salary:
Extra Income:				Resident site:

2. How do you interred in this job? If some one wants to work in this field, how he/she can inter? (Process to interring in scavenging)
3. Location of collection and place to sale collected material.
4. How long do you work each day, and in a week?
5. Who decides the price of good that you collected? And how?
6. What type of materials and how much do you collect each day?
7. Do you know the price different between yours and wholesale buyers' selling price? (If yes, how much difference is there in per kg of specific good)
8. Do you think you are getting fair price of your collected goods?
   Yes / No, describe how?
9. Do you get any other facilities from wholesale buyers, recycle companies, municipality or from any other organization?
10. Smoking and drinking habit
11. What do you know about the health risk of working with waste? (**Try to get more information about** respondents' risk awareness, their perception and knowledge about the name and characteristics of different diseases).
    a.
    b.
    c.
    d.
12. How often do you take bath? (After work, before work)……..
13. How often do you change/wash cloths? (After work, before work)…….
14. What are the problems in taking bath and washing cloths regularly?
    a.
    b.
    c.
15. Do you wash your hand and take bath after the work and before making or having food?……
16. Do you use soap while taking bath and washing hand after work?……
17. Since when did you start this job?……
18. What was your previous occupation?…….
    If not the same occupation, why did you change your occupation?
19. How is your economic condition now comparing to the past?
    Better of:……more worse:…….no any notable change:……
    If become better off or worse, how it became? (follow with why question and try to go deep)
    a.
    b.
    c.
    d.
20. Where do you go if you become sick?……..
21. For what kind of sickness you are going to a doctor?……
22. Do you see or come in contact with human feacel matter in solid waste?
    If yes, how often? Where? In what condition? More detail…
23. Do you see or found used bandages or sanitary pads in solid waste?
    If yes, how often? Where? In what condition? More detail…
24. Do you see or found hospital/clinic waste mixed in solid waste?
    If yes, how often? Where? In what condition? More detail…
25. Do you see or found any quantity or used container of poisonous material mixed in solid waste?
    If yes, how often? Where? In what condition? More detail…
26. Do you see or found any sharp object, broken glass mixed in solid waste?
    If yes, how often? Where? In what condition? More detail…
27. Are you injured (cut, break) while on work within last one year?

If yes, what and how had happened? Detail story

28. Are you suffering from: Back injury: Joint pain:
Elbow injury: Wrist injury: Other:

If yes, since when? What type of treatment did you did? Do you have medical report? (Try to obtain a copy of medical report)

29. Are you suffered from following infection?
Tetanus: Hepatitis A: Typhoid: Fatigue:

If yes, since when? What type of treatment did you did? Do you have medical report? (Try to obtain a copy of medical report)

30. Did you take following Vaccine?
Tetanus: Hepatitis A: Typhoid: Rabbis:
If yes, before the infection or after? And who paid for that?

31. Are you suffered from poisoning while on work due to gaseous pollution?
Headache: Nausea : Fainting ness: Fits:

If yes, when? How often? In what type of working situation? What type of treatment did you did? Do you have medical report? (Try to obtain a copy of medical report)

32. Are you suffering from following lung diseases?

Upper respiratory tract

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- Sinusitis: **Fever;** Sneezing, Headache, Running nose, Nasal congestion…….
- Pharyngitis: **Cough, Sputum, Fever;** Headache, Sore throat, Throat ache…….
- Tonsilitis: **Throat ache;** Sore throat, Throat ache…….
- Brochitis: **Dyspaoea----Breathlessness, Chest pain, Cough, Sputum, and Fever;** Sneezing, Headache, Running nose, Nasal congestion, Sore throat, Throat ache……..

If yes, since when? What type of treatment did you did? Do you have medical report? (Try to obtain a copy of medical report)

Lower RespiratoryTract

- Pneumonia—chest infection: **Dyspaoea----Breathlessness, Chest pain, Cough, Sputum, Fever;** (May be Sneezing, Headache, Running nose, Nasal congestion, Sore throat, Throat ache)……
- Tuberculosis: **Dyspaoea----Breathlessness, Chest pain, Maemoptysis---Blood in sputum, Cough, Sputum, Fever; Loss of appetite, Weight loss, Sweating, Weakness, Fatigue.** (May be Sneezing, Headache, Running nose, Nasal congestion, Sore throat, Throat ache)……
- COPD—Chronic Obstructive Pulmonary Disease: **Dyspaoea----Breathlessness, Chest pain, Cough, Sputum, Fever, Mainly in smokers, old age after 40/45 yrs…….**
- Bronchical Asthma: **Mainly hereditary, due to allergy, Dyspaoea----Breathlessness, Cough, Fever;** (May be Sneezing, Headache, Running nose, Nasal congestion)…….
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34. Are you suffering from any types of following gastro intestinal diseases? (Pain abdomen, Loss of weight due to anorexia and malabsorbtion, Symptoms of anemia, Diarrhoea---loose motion)

- Mouth—Stomatitis: Malnutrition, Vitamins deficiency…….

Disease of Desophagus

- **Disphagia**: ---Difficulty in swallowing…….
- **Heart burn**:---burning sensation……
- **Regurgitation**:---effortless return of gastric or oesophagal content into the mouth……..

Disease of Stomach: Symptoms of gastric diseases

- **Dyspepsia**:---upper abdominal pain, regurgitation, heart burn, nausea, vomiting, loss of appetite, distension of abdomen……..
- **Flatulence**:---……..…….
- **Vomiting**:---…….
- **Water brash**:--- effortless return of gastric or oesophagal content into the mouth…….
- **Loss of appetite** (anorexia)…….
- **Gastritis**……
- **Peptic ulcer:---**ulcer in the lower oesophagus, stomach, duodenum, jejunum (small intestive)……
- **Food poisoning**:---Vomiting, diarrhoea, pain abdomen, distention of abdomen…….
- **Giardiasis/ Giardia lamblia**:---loose motion, stool with mucos, pain abdomen. ……..
- **Worm infestation**: Ascaris (round worm), Whip worm, Tape worm (Taenic solium):---Pain abdomen, distension of abdomen, loss of appetite, occasional loose motion, malabsorsion, weight loss, gastritis……
- **Amoebiasis / Entamoeba hystolitics**:---loose motion, vomiting, gastritis, dehydration (loose of water from body), watery stool…….
- **Dysentery**:---fever, loose motion, stool with mucose & blood, pain abdomen, dehydration……
- **Cholera:---**loose motion many times i.e. more than 30/40 times a day, sever dehydration, highly infectious……
- **Etesic fever or typhoid (**salmonella typhi, salmonella paratyphi):---fever high grade more than 102oF, pain abdomen, occasional loose motion……..
- **Others:…….**

If yes, how often? What might be the cause? Do you have medical report? (Try to obtain a copy of medical report)

35. Are you suffering from any other illness then mentioned here?
    If yes, detail of illness, symptom and treatment…(try to get more information about it)
36. Did your sickness disturbed in your work?
    If yes, how long? How many days in last year?
37. If you became sick, how do you arrange your treatment? (Medical facilities and treatment process)…
38. If you could not go to work, how do you manage your household expenses?
39. Do you get any medical facilities from your employee? Or from any where (Detail…)
40. From what types of difficulties you are encountering in this type of work?
41. What do you do to be safety in work? (Safety measures…)
42. Give your suggestion to make healthy working environment in your field of work?

43. Do you have something to tell about your occupation, health and any others problems or do you think something that I should have asked?

Appendix - IV: Some photos of political conflict and brick kilns those encouraging air pollution in Kathmandu

Plate 7.1: Tear gas at street

Plate 7.2: Tire burning in street

Plate 7.3: Tear gas front of Bir Hospital

Plate 7.4: Fire in Government vehicle

Plate 7.5: Tire burning in street

Plate 7.6: Tear gas front of ASCol.

Plate 7.7: Brick kilns in Kathmandu Valley

Photos of this page are from www.nepalnews.com (Mercantile communication Pvt. Ltd.)