COMPARATIVE STUDY OF WASTE MANAGEMENT IN CHITWAN HOSPITAL AND BHARATPUR HOSPITAL OF CHITWAN DISTRICT

A Thesis Submitted to

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Submitted By

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RECOMMENDATION LETTER

This is to certify that **Mrs. Gita Mahato** has been prepared this thesis entitled "Comparative study of solid waste management in Chitwan hospital and Bharatpur Hospital of Chitwan District " under my guidance and supervision. I am satisfied with the thesis in terms of research methodology, presentation and declaration of data. This is the forwarded for examination .I recommendation this thesis for approval and acceptance.

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Krishna Prasad Gyawali

(Thesis Supervisor)

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ABSTRACTS

This study is entitled “Comparative study of solid waste management in Chitwan hospital and Bharatpur Hospital of Chitwan District ". This research is a descriptive type. This study is mainly based on primary data as well as secondary data. Out of total respondents 80 respondents were selected randomly. Solid-waste management is associated with controlling the generation, storage, collection, transfer and transport, processing, and disposal of solid waste in a manner that is in accordance with the best principles of health, economics, engineering, conservation, aesthetics, and other environmental considerations, and that is also responsive to public attitudes. In its scope, solid-waste management includes all administrative, financial, legal, planning, and engineering functions involved in the solutions to all problems of solid waste.

The study shows that 18.75 percent respondents had negative attitude on solid waste and 81.25 percent respondent had shown their responsibility on management of solid waste. Among them 77.5 percent respondents disposed their waste in a dustbin, 17.7 percent of the respondents their waste by themselves and 5 percent respondents were throw their wastes on the corner randomly. Out of total 97.5 percent respondents separate decomposable and non-decomposable waste before throwing it out whereas 2.5 percentage of respondent do not separate waste according to their nature. The study show that 56.25 percent respondents knew to re- used the waste whereas remaining 43.75 percent respondents did not know or neglect the process of reusing waste. Out of total 88.75 of the respondents gain profit from the waste whereas 11.25 percent of the respondents although know about earning from the waste were found careless enough to store their wastes and sell to the scrap dealers.

This study show that 92.5 percent respondents are satisfactory on waste disposal management system of hospitals and 7.5 percent respondents were not satisfactory on disposal management system of hospitals. Out of 80 respondents 55 percent respondents disposed their waste twice in a day 38.75 percent disposed waste daily and 6.25 percent disposed waste weekly of the hospitals. The study concludes that the waste management system in CH and Bharatpur Hospital is poor. The segregation, collection, transportation, storage and disposal practice of the hospital waste was found unsatisfactory. The mixing of general, hazardous and sharps wastes were might be due to lack of proper training and instruction about waste segregation system. It was also due to carelessness of patients, visitors and staffs. Even hospital administration, doctors, nurses and other staffs had not given due priority to effective waste management.

TABLE OF CONTENT

LIST OF ACRONYMS / ABBREVIATION

BH	:	Bharatpur Hospital
CH	:	Chitwan hospital
DDC	:	District Development Committee
EIA	:	Environmental Impact Assessment
EPA	:	Environmental Protection Agency
EPA	:	Environmental Protection Agency
EPR	:	Environment Protection Rules
GO	:	Governmental Organization
HCW	:	Health Care Waste
HMG	:	His Majesty Government
INGO	:	International Non- Governmental Organization
ISWM	:	Integrated Solid Waste Management
IUCN	:	International Union for Conservation of Nature
KTM	:	Kathmandu
MoE	:	Ministry of Environment
MSW	:	Municipal Solid Waste
NGO	:	Non- Governmental Organization
NTV	:	Nepal Television
SWM	:	Solid Waste Management
SWMB	:	Solid Waste Management Board
SWMP	:	Solid Waste Management Project
SWMRMC	:	Solid Waste Management and Resource Mobilization Center
UDLE	:	Urban Development through Local Efforts
UNESCO	:	United Nation Educational Scientific and Cultural rganization
VDC	:	Village Development Committee
WGR	:	Waste Generation Rate
WHO	:	World Health Organization

CHAPTER – I
INTRODUCTION

1.1 Background of the Study

Solid-waste management is a major challenge in urban areas throughout the world. Without an effective and efficient solid-waste management program, the waste generated from various human activities, both industrial and domestic, can result in health hazards and have a negative impact on the environment. Understanding the waste generated, the availability of resources, and the environmental conditions of a particular society are important to developing an appropriate waste-management system.

Solid-waste management may be defined as the discipline associated with controlling the generation, storage, collection, transfer and transport, processing, and disposal of solid waste in a manner that is in accordance with the best principles of health, economics, engineering, conservation, aesthetics, and other environmental considerations, and that is also responsive to public attitudes. In its scope, solid-waste management includes all administrative, financial, legal, planning, and engineering functions involved in the solutions to all problems of solid waste. The solutions may involve complex interdisciplinary fields such as political science, city and regional planning, geography, economics, public health, sociology, demography, communications, and conservation, as well engineering and materials science. For instance, if waste is wet or has a low heating value, it would not be possible to incinerate it without adding supplemental fuel. If a portion of the waste stream consists of organics and can be easily separated from other waste materials, bioconversion of the waste may become a viable strategy. On the other hand, the waste generated by industrialized countries may be different from those generated by non-industrialized countries. Non-industrialized societies may have more organic waste than those generated by industrialized countries. If this is the

case, composting or anaerobic digestion may be more suitable for organic waste management.

The activities associated with managing solid waste from the generation point to final disposal normally include generation, reduction, reuse, recycling, handling, collection, transfer and transport, transformation (e.g., recovery and treatment), and disposal. Depending on site specific conditions, a sound waste-management program can be established by combining some of the necessary activities into integrated solid-waste management. On the other hand, legislative efforts and effective implementation are vital for the safe management and disposal of solid waste. Incentives may be provided for the development and practice of safe treatments, harmless manufacturing processes, and methods for converting solid waste into valuable resources by recycling and reuse. On the part of industry, industrial waste-management is also indispensable from the viewpoint of both the social responsibility of business corporations and ISO 14000, which will influence their survival in global markets.

1.2 Statement of the Problem

The World Health Organization (WHO) defines healthcare waste as all wastes generated by healthcare establishments, research facilities and laboratories. This definition also includes waste that originates from ‘‘minor’’ or ‘‘scattered’’ sources, such as wastes produced in homes, where there is patient care (dialysis, insulin injections, etc.). With the steady increase in the number of health care institutions in Nepal, the amount of health care waste, (HCW) generated is also increasing. In addition to increasing quantity, the composition of HCW is also rapidly changing, affecting its sound management. The improper management of HCWs generated in health care facilities can adversely affect the health of health care providers, patients, waste handlers and individual members of the community. It also has adverse impacts on the

environment. Hospital Waste Management is part of hospital hygiene and maintenance activities. This involves management of a range of activities, which are mainly engineering functions, such as collection, transportation, operation/ treatment of processing systems, and disposal of waste. However, initial segregation and storage activities are the direct responsibility of nursing personnel in the hospital. If the infectious components get mixed with the general non-infectious waste, the entire mass becomes potentially infectious. This study focuses on the following four headings as need, status, impact and legislation regarding the health care waste management in Nepal.

Health care institutions in the recent times have increased tremendously in number and capacity with increasing number of hospital beds. There are eight central, five regional, ten zonal, 65 district hospitals, and 209 primary heath care centers, 676 health posts and 3129 sub health posts under government health services that are continuously providing preventive and curative health services to the people.4 In addition, 184 private hospitals with more than 25 bed capacities are providing health services. Actual data of below 25 bedded hospitals, polyclinics, clinics are not included in government reporting system. Most of the private hospitals on business ground are concentrated in the urban areas but the health services in rural communities are inadequate to fulfill the demand of health care services. There is an increasing load of medical waste generation with the increase in health care institutions especially owing to the increased use of disposable materials, lack of onsite separation practices, proper disposing system, and least attention on scientific medical waste management practice by HCIs.

Only limited information is available on health care waste management practices in Nepal. ENPHO (2011) has reported an average health care waste generation of 1.7 kg/person/day and 0.48 kg/person/day of Health care risk waste (HCRW) at an average bed occupancy rate of around 65%.5 Out of 24 HCIs studied, information on amount of waste generation is available only

from 3 HCIs (Patan Hospital, National Kidney Center and Koshi Zonal Hospital). Patan has reported an average 594.0 kg waste production per day of which 377 (63.5%) is general, 165 (27.8%) is hazardous and 52 (8.8%) is sharps. Similarly, National Kidney Center has reported 28 kg waste generated per day out of which 14 (50%) is general, 5 (17%) is hazardous and 9 (33%) is sharp waste and in average 441.14 kg waste is generated from Koshi Zonal Hospital that includes 302 (68.4%) general, 125 (28.4%) hazardous and 14 (3.1%) sharp waste. The hospital has bed occupancy rate 60.7±20.8 percent.6 Waste segregation and collection are the most important process during the process of HCWM that minimizes the volume of waste as well as separates nature of medical waste generated from HCIs. Health care institution can simply segregate waste on the basis of nature of waste as prescribed on health care waste management guideline but few of hospitals have adapted the process.6-7 Most of HCIs, governmental or non-governmental have not done systematic segregation of waste at the place of generation. The system in which the level of color coding or labeling of waste containers bags has been adopted strictly followed by the color coding system issued by national guideline of health care waste management which is not in practical in almost all hospitals. In some cases, infectious waste has been mixed with municipal waste. Waste have been collected in larger bins loaded on a trolley in most of large HCIs, but in most cases, the waste have been transported by the sweepers (cleaners) to the central storage facility, either in plastic bags or in the waste collection bucket . A research has also shown about 33.3% (n=24) HCIs use transportation trolley and the rest HCIs have transferred the waste manually using buckets. In most of HCIs locations of the temporary storage are not satisfactory and are close to the municipal waste storage or near water bodies or premises of hospital. The temporary storage location, storage containers and storage management have a direct impact on the resulting environmental and health risks at the hospital, which must be well sanitized and secured for access only to authorized personnel. Though, very few hospitals of Nepal have used containers as guided by guidelines of Nepal government. The training protocol and education

mechanism in most of the hospitals have not been functioned though it has committed to apply legislation. In conclusion, there is not proper scientific mechanism applied by most of the health care institutions of Nepal for disposing medical wastes.

Risk due to improper health care waste management on human health and surrounding environment is immeasurable. World health organization has estimated 21 million people are suffered from hepatitis B, two million from hepatitis C and at least 260,000 from HIV infection with contaminated syringes. In March 2009, 240 people in Indian state of Gujarat contracted hepatitis B with previously used syringes those were later discovered to have been acquired through the black market trade of unregulated health care waste. The practice of uncovered health care waste risk implies an obvious risk for spreading infection via easily exposed numerous animals and scavengers. Till now in most of health institutions, incinerators like small brick kilns are used that do not meet the common international standards which operates at low temperatures and have low stack height. It emits most dangerous chemicals like dioxin and furans, and causes impairment of the immune, nerve, endocrine and reproductive system in human body. Most of the general infectious waste generated at health care facilities has dumped untreated at the river bank together with other types of wastes. The organic part of the waste will flow down either to the ground water or to surface water. As the waste is dumped so close to the river, there is a risk that the infectious waste gets mixed into the river when the water level rises, hence spreading infectious agents in the river stream. This eventually can contaminate the drinking water system of nearby inhabitants. In addition, scavengers (including street children) picking recyclable materials from the uncovered waste at the dumpsite may carry millions of pathogens with them and vulnerable to various diseases. They can also transmit infectious diseases to other individuals as well. There are no sanitary landfills sits in Nepal with any protection mechanism of ground water. Occupational health is still a neglected area for healthcare workers. In fact, six

out of ten most populous countries (China, India, Brazil, Pakistan, Bangladesh and Nigeria) are found to be facing HCWM burdens with an approximately 50% or more of the current global population at an environmental, occupational and public health risk.

Public services system also finds itself struggling to keep pace with the rate of urban growth. Pressure of increased-population and the lack of satisfactory management system have made the city vulnerable to environmental crisis of solid waste disposal. The problem of solid waste management in the study area is not only because of inadequate systems of garbage collection and its final disposal but also due to low level of public awareness. The Bharatpur Sub-Metropolitan cooperation has been adopting various strategies for a long for the safe disposal of solid waste. There has been a little effort to set up a permanent landfill site to dump the wastes accumulated in the area. The dumping site was closed because the site could no longer take in the garbage that was dumped in it. And the local population also suffered from environmental hazard due to mismanagement of the dumping site.

Bharatpur being one of the important Medical city, industrial and commercial centers has grown as a catering place to caravan traders with limited infrastructure facilities located as a core of central development region. Thousands of people from others parts of the country, foreign visit Bharatpur city for the purpose of medical checkup, business, temporary residence, residence, entertainment etc. Thus, this will try to find out answer related to the problems of solid waste its different aspects such as knowledge, attitude and practice among hospital practice proper management of solid waste.

1.3 Objective of the Study

The general objective of this study is to analyze the solid waste management of Chitwan Hospital and Bharatpur hospital. The specific objectives are as follows:

- To find out the source and volume of solid waste in the study area.
- To identify the solid waste management system of the study area.
- To identify the problems and issue on waste disposal management of the study area.

1.4 Significance of the Study

The concept of waste disposal management is a very recent development in our country. Only a very few studies have been done with the help of foreign researcher. The limiting factor is the lack of money to carry out the control measures in controlling environmental pollution. It limits the cleaning of body, house and adjusting areas, limits the use of non-polluting fuels for kitchen limits the maintaining capacity of vehicles and other machinery instruments, and limits the use of safe drinking water and proper sewage management. Therefore, to understand such problems in depth, the study on pollution due to waste disposal and public participation in this control would be helpful and of significance. According to environment point of view, the study consists of its own significance, which is concerned to the following points:

1. The study will be helpful to know about the problems of pollution faced by the people due to improper waste management.
2. The study will be able to provide information on source and types of solid waste generated in the hospital and their effects on human health.
3. The study will be helpful for the further researcher to study in this area as a secondary source of data.
4. The study will be useful to mobilize the human participation in the need of controlling pollution due to solid waste.
5. The study will be helpful to develop concept on “reduce, reuse & recycle" of the solid waste (‘3R’).

1.5 Limitation of the Study

Every study has its limitation due to the limited time and resources constraints. This study is limited only to Chitwan Hospital and Bharatpur Hospital and is unable to cover all the hospitals and its effect on health, pollution being a vast topic. The present study had delimited to the following areas.

1. The study is delimited to the vicinity of Chitwan Hospital and Bharatpur Hospital of Bharatpur .
2. The study is focused on waste management of the hospitals.
3. The study is delimited only hospital activities and respondents awareness, knowledge and practice.

CHAPTER - II
LITERATURE REVIEW

2.2 Theoretical Review

Theoretical review that examines the various concepts and theories that has been put forward such review gives insight into the issue being examined. In this study above two methods was use and published and unpublished documents related to subject was reviewed.

2.1.1 Concept of Waste Management

Waste Management is defined as the discipline associated with control of generation, storage, collection, transport or transfer, processing and disposal of waste materials in a way that match with the best principles of public health, conservation, economics, aesthetic, engineering and other environmental considerations. In its scope, solid waste management includes planning, administrative, financial, engineering and legal functions in the process of solving problems arising from waste materials. The solutions might include complex inter-disciplinary relations among fields such as public health, city and regional planning, political science, geography, sociology, economics, communication and conservation, demography, engineering and material sciences.

Solid waste management practices can differ for residential and industrial producers, for urban and rural areas, and for developed and developing nations. Management of non-hazardous waste in metropolitan areas is generally the job of local government authorities; on the other hand management of non-hazardous waste materials is typically the job of the generator, subject to local, national and even international authorities. The main goal of solid waste management is reducing and eliminating adverse impacts of waste materials on

human health and environment to support economic development and superior quality of life (Pokheral,2015).

2.1.2 Functional Elements of Waste Management System

There are mainly 6 functional elements of waste management system which include:

Waste generation

Waste generation refers to activities involved in identifying materials which are no longer useable and are either gathered for systematic disposal or thrown away.

1 Onsite handling, storage and processing

Onsite handling, storage and processing are the activities around the waste generation points to facilitate easier collection. Normally, to store wastes, waste bins are placed around the places which generate sufficient waste.

2 Waste collection

Waste collection**,** a very important phase of waste management, includes the activities such as placing waste collection bins, collecting wastes from those bins and gathering the wastes in the location where the collection vehicles are emptied. Although collection phase involve a bit of transportation from point of waste generation, this is not main phase of waste transportation.

3 Waste transfer and transport

Waste transfer and transport are the activities involved in transferring wastes from the smaller waste storage facilities to the waste disposal sites using larger waste transport vehicles and equipment's.

4 Waste processing and recovery

Waste processing and recovery refers to the facilities, equipment and techniques employed both to recover reusable or recyclable materials from the waste stream and to improve the effectiveness of other functional elements of waste management.

5 Waste disposal

Waste disposal is the final stage of waste management. It involves the activities aimed at systematic disposal of waste materials. After collection and transportation, wastes are systematically disposed in landfills (SWMRMC 2014).

2.1.3 Integrated Solid Waste Management (ISWM)

Integrated Solid Waste Management **(**ISWM) is a very popular term in the field of waste management. It is defined as the selection and use of appropriate management programs, technologies and techniques to achieve particular waste management goals and objectives. According to US Environmental Protection Agency (EPA), ISWA is composed of waste source reduction, recycling, waste combustion and landfills. These activities can be done in either interactive or hierarchical way. Integrated waste management is a frame of reference for designing and implementing new waste management systems and for analyzing and optimizing existing systems. Integrated waste management is based on the

concept that all aspects of a waste management system (technical and non-technical) should be analyzed together, since they are in fact interrelated and developments in one area frequently affect practices or activities in another area. An integrated approach is an important element of sound practice because:

1. Certain problems can be more easily resolved in combination with other aspects of the waste
2. System than on their own. Also, development of new or improved waste handling in one area can disrupt existing activities in another area unless changes are handled in a coordinated manner.
3. Integration allows for capacity or resources to be optimized and, thus, fully utilized; there are
4. Frequently economies of scale for equipment or management infrastructure that can be reached only when all of the waste in a region is managed as part of a single system.
5. An integrated approach allows for participation of public, private, and informal sector participants, in roles appropriate for each.
6. Some waste management practices are more costly than others, and integrated approaches facilitate the identification and selection of low-cost solutions. Some waste management activities cannot bear any charges, some will always be net expenses, while others may produce an income. An integrated system can result in a range of practices that complement each other in this regard.
7. Failure to have an integrated system may mean that the revenue-producing activities are “skimmed off” and treated as profitable, while activities related to maintaining public health and safety fail to secure adequate funding and are operated at low or insufficient levels ((SWMRMC 2014).

2.1.4 Methods for integrating a waste management system

Planners can work toward integrated systems in a number of ways. The first task is to consider all aspects of the formal part of the waste system within one framework and to produce a plan based on the objectives of the entire system. One of the foundations of the framework for modern, integrated solid waste management systems is the solid waste management hierarchy, which specifies the precedence that should be given to key waste management activities that affect waste generation, treatment, and disposal. Second, in terms of jurisdictional and staffing issues, is putting all waste-related functions under the same division or agency, which is an important means of achieving integration. A third way of facilitating coordination and assessing trade-offs among all aspects of a waste management system is to create integrated financial structures that, for example, use disposal fees to finance materials recovery or public education. More broadly, it is important to assess all MSWM system costs, as well as identify opportunities for generating revenues (Nippon,2005)).

2.1.5 Legislation and Policies relevant to Municipal Solid Waste Management in Nepal

1. Solid Waste Management National policy, 2053 (1996)

Solid Waste Management National Policy is another important legal documents concerned with the solid waste sector. The policy has the following objectives

1. To make management work of the solid wastes simple and effective.
2. To mobilize the solid waste as resources
3. To minimize environmental pollution caused by the solid wastes and adverse effect thereof to the public health
4. To privatize the management work of the solid wastes
5. To obtain public support by increasing public awareness in sanitation works

The strategy adopted by the policy for achieving its objectives is the promotion of the public participation, technology, resource mobilization and privatization. The policy points out national and local level institutions responsible for the management of solid waste and describes the responsibilities and legal authority of these institutions. According to the policy, a national level institution should be formed by His Majesty's Government Nepal for the management of solid waste. In the case of local institutions, the policy mentions the Mahanagarpalika, Nagarpalika and Village Development Committees (VDC) as responsible for the management of solid waste and related activities (MoE,1996).

2 Environment Protection Act, 2053 (1997)

Although no direct provision relating to the solid Waste Management exists in the Environmental Protection Act, 2053, it has provisions relevant to the management of solid waste. In section 3 and 4 of the act, there are provisions for carrying out of Environmental Impact Assessment (EIA) or Initial Environmental Examination (IEE) and prohibition on Implementation of proposal requiring IEE or EIA without approval. This is particularly significant for the operation of few facilities like land fill sites, dumping sites etc. Section 7 of the act emphasizes the prevention and control of pollution. In accordance to the provisions of sub section under the section 7 nobody shall create pollution in such a manner as to cause significant adverse impacts on the environment or likely to the hazardous to public life and people's health. In case any person commits, any acts under the act or the rules or guidelines framer under the act, the prescribed authority can close down such acts immediately and punish the offender according to the degree of offence, with a line up to fifty thousand rupees. (MoE,1997).

Segregation and Management of Solid Waste

1. The Local Body shall, while fixing segregation at least of organic and non-organic solid waste at its source under Section 6, have to make management and segregation of harmful or chemical waste separately. If it is prescribed as above, the individual, organization or agency generating such solid waste, shall have to make segregation as prescribed.
2. The responsibility of managing the chemical or harmful solid waste under Sub-Rule (1) shall be of concerned generator.
3. The Local Body shall conduct programs for increasing people's awareness in relation to applying appropriate technology for making segregation through reduction of generation of solid waste at its source and management under Sub-Rule (1).

Discharge and Management of Health Institution Related Waste

1. The health institution shall make processing and management of the health institution related waste generated and discharged by itself segregating at its source Regarding procedures and technology to be applied, and management site for purification, processing and management of health related waste, the permission from the Local Body shall be obtained.
2. The Local Body shall, while issuing the permit, ascertain whether the procedure, technology submitted along with the application for the permission request and the management site meets or not the standard set by the Government of Nepal.
3. The health institution, which has obtained permission under Sub Rule (2), shall itself undertake the task of processing, purification and management of related activities of health institution related waste.
4. In case of the inability of the health institution for processing, purification and management by itself under Sub-Rule (3), the health institution may request the Local Body for processing, purification and management. The

Local Body may, if such request is made, carry out the processing, purification and management by itself or cause to carry out in its coordination.

5. After processing and purification of general solid waste and health institution related harmful waste generated and discharged from the health institution, the Local Body may, charging a service fee to the related health institution, make arrangement for the disposal of including such wastes.
6. Whether the complete purification of health institution related infectious waste has been completely done or not, should be tested by a recognized laboratory and certified to that effect.
7. The health institution, generating harmful waste, shall completely abide by the prevailing environmental law and the set standard concerning the management of such solid waste (MoE,2013).

Mobilization of Non-Governmental Organization in the Solid Waste Management Works

1) The Local Body, for the purpose of Sub-section (5) of the Section 15 of the Act, may empower the company, organization and agency, producing solid wastes, for segregating, reducing the solid wastes at its source, reuse and recycling use solid wastes and mobilize community and non -governmental organization for creating awareness for the management of the solid waste.

2) The Local Body, shall for the works under Sub-Rule (1), prepare a list of community and non-governmental organizations working in the area of management of solid waste.

3) The process of mobilizing after preparing lists of community and non-governmental organization under Sub-Rule (1), shall be according to the prevailing law (MoE,2013).

The Responsibilities, Duties and Powers of the Council

The responsibilities, duties and powers of the council, in addition to the responsibilities, duties and powers mentioned under Section 24 of the Act shall be as follows.

1. To make policy decisions on subjects related to the solid waste management.
2. To create required mechanism and structure so as to foster coordination between the agencies related to the solid waste management.
3. To demarcate the jurisdictions of various mechanisms established for the solid waste management. (MoE, 2013).

7. Constitution of Nepal, 2072 (2015)

The Constitution of Nepal, 2072 has made a notable provision in the field of environmental protection. The constitution states that the state shall give priority to the protection of the environment and also to the protection of its further damage due to physical development activities by increasing the awareness of the general public about environmental cleanliness. Article 26 (4) imposes substantial political obligations upon the State in the sense that environmentally concerned citizens and interest groups can utilize this provision to command public attention on the environmental performance of the national government.

2.1.6 History of Waste Management in Nepal

The waste which has become a problem for now was a source of income generation. 40 years ago a tin (tin in Nepal is usually referred to a metal box in which oil was filled initially. When the oil was used the tin was used for other purposes) of waste could be sold for 40 paisa (smallest unit of Nepalese currency) but now one family has to spend about 40 rupees to manage the waste . Waste management was not a problem in Nepal initially. The cities or

the houses built in Kathmandu usually had a common courtyard. These court yards were normally used for social gathering or for defending settlements from forays. These courtyards were later changed into the common dumping site for the waste as the population increased. Wastes from these courtyards were collected between time intervals and this was the responsibility of all the surrounding households. But nobody concerned about the public cleaning .

People managed to have some piece of land where the people themselves used the waste as compost. With time, population and the eating habits of the people also changed and with this also increased the waste. Chandra Shamsher the then Rana Prime minister realizing the problem of waste started 'SafaiAdda' (sanitary office) to manage the waste. Kuchikars (cleaners and considered as low caste people) were given the responsibility to collect and dispose the waste. According to another source, in older days people used to have 'saaga' and 'nauga'. Saga is a common pit used for collecting the waste by the whole community and nauga is the pit dug underneath the stairs in the ground floor. Waste from kitchen, urine and sometimes even night waste were collected here. The waste collected in both Saaga and Nauga were turned to compost and thus used in the yards or sold to farmers. SafaiAdda was renamed as Municipality office in 1931. But the changes in the name did not change the work of the people.

The establishment of the office and the cleaning works handed to a certain group of people led the people to think that waste was not their problem and they did not have the responsibility to manage it anymore. Making a certain group work as cleaners changed the habit of the people and it also broke the trend of people managing their waste themselves .Prior to 1970, the solid waste in municipal areas was locally managed. Almost all the waste was of organic nature. Only little of the waste was disposed and almost everything were reused, recycled or assimilated into the soil. The organic waste easily biodegradable was either used as animal feed or widely recycled into the

compost manure. Every household had a pit to dump the waste which is not continued in the modern time. Thus, we can assume that there are two basic reasons for the growing quantity of solid waste generation in the municipalities in Nepal (Tuladhar, 2007).

2.2 Empirical Literature Review

IUCN 1991 on urban waste management has pointed out sources and composition of solid waste. It has focused on different aspect of pollution along with land pollution mainly caused by solid waste. It has focused on different accept of pollution along with land pollution mainly caused by solid waste. This review pointed that from last decade Katmandu City is experiencing a dramatic increasing population and increase in volume of solid waste but the waste management function poorly. According to the review, street, sweeping currently accounts for 27% of the current spending on the centers solid waste management budget, largely the result of inadequate this disposal practicing .The review for the concludes that the lack of awareness among the urban people is the main case of problems. Shaky found that the respondent i.e. 62 percent of the study was involved in their own type of business. Although 53. 4 percent of the respondent had negative attitude towards waste and 27. 8 percent of the respondent throws the waste of the roadside. Majority of the respondents think solid waste management as a concerned and responsibility of sweepers and the municipality but not the responsibility of local people which and results into the problem of pollution due to solid waste.

Tuladhar 1995, traditional values, superstition and practice help to keep house's and surrounding areas reasonably clean in the past as said if house and surrounding keep dirty, the owners have to bear the wrath of Nag-raj. But know the increasing the modern population in Katmandu valley led to rise in volume of solid waste because they have such traditional attitude that the waste management being the job only lower caste people (chyames, pore) has continued to remain for a long time. Throw accumulated water in place where

no collection takes place collection is often haphazard or incomplete and transported in uncovered containers to transform to landfill filter.

RESTUC2000, has revealed that the municipalities are limited to only collection and transfer of solid waste to transfer station at Teku and ultimately at dumping site, whereas, NGO/Private sector are involved in collection of waste, using organic waste for composting, paper cycling and crating income generation activities through waste management. This shows that municipality lacks the strategy of reusing the waste.

Koirala 2004, Hospital waste management in Pokhara sub metropolitan city. He found that total solid waste generated by the hospital in Pokhara is 724 kg/day out of which 155 kg/ day is hazardous waste the total hospital waste generated per personal per day is 1.20 kg. Similarly, the infectious waste generated per person per day is 0.20 kg. The combination of the hospital waste in Pokhara is 21 percent hazardous 1 percent sharps and 78 percent general waste. Cointreau has mentioned that the amount of solid waste produced per person per day is strongly related to standard of living. The low - income countries produce less waste product than middle and high income countries. Low- income countries having per. Capita income below us $ 300 generate around 0.5 kg. waste per person per day. As it was categorize the middle range per capita income US $ 300 to US $ 3500 there are found about 1.5 kg. of waste per person per day and at least, the high rate of per capita above US $ 3500 produce 2.75 Kg. to 4.0 kg. Waste per person per day.

JICA 2005, shows that appropriate solid waste management could not be always functioned well because of lack of common consciousness, frequent communication and technical knowledge and skill in addition to the existence of a kind of the territorial imperative. However, through the study, it can be set a high valuation on the fact the all concerned especially Technical Working

Group (TWG) and Task Force (T/F) members could stand up and work together for proper management of solid waste.

Spreen2005, analyzed that the waste production is the result of urbanization and Industrialization. Migration from rural to urban areas and improved medical care, combined with birth rates, led to an enormous growth of urban population a development, which of course, increased waste volume greatly. Industrial development has led to the manufacture of many new inorganic substances. He concluded that, since, these substances cannot decompose; the natural process of waste transformation does not absorb these substances.

Katyal and Satake 2008, have assessed about the solid waste management system, comparing developed and the developing countries, while in the developed countries high technology are used for resource recovery, in many cities in developing countries garbage is sorted out by hand for reuse. Developed countries like Japan, UK, and USA are in the vanguard of waste utilization. On the other hand though several materials are recycled and reused, but by and large waste utilization has still not taken roots in the developing countries.

Gautam, 2010 Solid Waste Management System in Kathmandu Metropolitan City" presented the solid waste management situation in ward 27 of Kathmandu Valley. He has also mentioned the involvement of NGOs at that area and conflict arose between local people, kuchikars and ward representatives. He also describes that the solid waste in the study area are residential and commercial which consists of both organic and inorganic. The daily waste production in the study area ranges from 0.17 kg/head /day in Tyouda to 0.25 kg in Ason. 58.3percent of the households use plastic bag to collect solid waste which has retarded for effective SWM. So, he suggests adopting alternative tools such as basket for collecting the wastes.

Cointreau 2011, analyzed the effectiveness of waste collection in the developing countries. He concluded that waste collection differs rather strongly and priority is usually given to commercial areas, main streets and more prosperous neighbors. In addition, many of urban poor live in unplanned and unauthorized areas and are, therefore, not eligible for municipal service. Most municipal solid waste management schemes spend 90% of their budget on collection and transportation of waste, but only 50% to 70% of the waste the generated is collected and less than 50% of the population is served.

Asnani 2012 has made a study on solid waste management in the city of Ahmedabad in which he describes about the beauty of the historic city being marked by Garbage sites all over the city. His paper draws attentions to the World Bank assistance to tackle the problems and modernization plan for better understanding. Besides, the paper also hopes that the system' introduced by municipal cooperation of Ahmedabad would be able to provide a much healthier environment to the citizens by keeping the city clean.

Biswokarma 2012 Presented the report "Salutation condition and its effect on Health in Dalit community of Kirtipur Municipality. He found 28.86 percent respondents used to manage in the manure pit and burn their waste about 23.71 percent, 16.9 percent used to throw anywhere only 11.34 percent used to dump their waste in the certain place from were collection the Municipality tractor used to collect.

Garg 2012, studied about the Management and Handling of .solid waste in India. Further, they have mentioned about the Municipal solid wastes (Management and Handling) Rules, 2000 notified by Ministry of Environment and Forest (India) on 27th September, 2000 to regulate the management and handling of the municipal solid waste. This is an attempt to provide a set of rules and responsibilities for all the municipal solid waste in a scientific manner.

Thapa and Devkota 2013,carried out the study of Waste Management System in Kathmandu and have categorized management system of solid waste into three categories primary or household, secondary and tertiary level of management. They assessed that if these three levels of waste management go systematically then obviously there will be appropriate solid waste management. But there is dissatisfaction in each and every level of management due to which the service has been inadequate and ineffective and urban people are facing problems.

Miller 2013, has discussed about the 3 major ways to deal with solid waste: throw away output approaches, resource recovery output approaches and input approaches. He said that the throw away output approaches on which we primarily rely should be shifted to a sustainable earth or low-waste approach. With this approach most of what we throw away would not be viewed as solid waste but as wasted solids, which should be reused, recycled or burned to provide energy. He further adds, this resource recovery output approach can be coupled with input approaches designed to produce less solid waste.

Bhattarai 2014 Study on Solid Waste of Hospital and some Nursing Homes of Kathmandu mentions the importance of proper waste management system to avoid environmental pollution and thereby to provide hygiene living condition for the people. Again it focus that solid waste has been a major problem in Kathmandu city and so the improper handling of solid waste create potential hazards to health and environment.

Gupta 2014 has mentioned that waste generation has a strong relationship with consumption, linked to per capita income. As per capita income rises, more savings are spent on goods and services. According to him, waste can be wealth as it has immense potential not only for generating livelihoods for the urban poor but also enrich the earth through composting and recycling.

Pandey 2014 Studied about the health problem among the waste workers. He concluded that the waste workers suffer highly from neighborhood health problems since dumping sites are the only places where they can reside. He has highlighted the waste workers of KMC who are suffering from different health problems like physical injuries such as cuts, bruises and ruptures in the body and physical pains and aches and poisoning problems can also occur while handling rotten wastes. Allergies are serious health problems among the waste workers such as skin rashes, itching, irritations and eye irritations etc. There are also other diseases such as respiratory tract diseases and gastrointestinal diseases from which the waste worker suffers.

Pradhan 2014 discussed that increase in the volume of solid-waste generation is directly related to the rapidly growing population, change in consumption pattern and social behavior. He further adds that the rapid urbanization and industrialization has added to the heaping of solid waste which is the most visible problem in the country and its management is becoming a problem day by day.

Thapa 2014 Made a study on the solid waste management of Dharan Municipality. The study has been divided into two zones in order to show the spatial analysis of waste production: - fringe area, those areas extended to the municipality boundary and core area, those wards that do not extend to the municipality boundary. According to her, core zone produce higher amount of waste because the main market center of the municipality lie in this zone and are well served by the waste management activities. On the other hand, in the fringe zone waste production is least as compared to the core areas.

Shrestha 2015 report on solid waste management practice in Kathmandu cited the problem in locating landfill site at Gokarna with the increase in urbanization and population. The study on Gokarna landfill site mention that

the local people opposed for land filling when they realized that they were not involved when their locality was selected for the purpose of land filling. The detailed study on Gokarna landfill site indicate that the frequent opposition from the local people was also because SWMRMC/KMC were unable to provide them the total amount of money that was to be provided for as per the agreement made for the village development works.

Sharma, 2015 has made study on the impact of domestic and industrial wastes on river pollution in Kathmandu. The study was based on the two year monitoring exercise. According to the study, the daily per capita waste generation in the Kathmandu valley is 400 gm. The density of waste was estimated to be 350-400gm/cm^3.the domestic sewage and industrial effluents are discharged directly into the Bagmati and Bishnumati rivers and other streams in Kathmandu. The major industries discharging into rivers in Katmandu are Banswari Tannery, The Balaju Industrial District, a number of carpet factories, The Jawalakhel Distillery and The Patan Industrial District. The bacteriological study of the sample showed the total number of caliform bacteria per 100 ml of effluents on Bagmati river was more than 4800.A chemical study of the effluent and the river water showed high conductivity of 9.73 µs/cm, BOD was 420mg/l and chloride 396 mg/l which indicates the maximum bacterial activities and it also indicates the presence of large amount of organic substance.

Spreen, 2015 in the article 'Solid Waste Management with people's participation' describes the urban SWM project in Katmandu valley and shows the appropriate approaches that can provide successful solution. The article concludes that urban waste management has the crucial task to provide the urban poor with proper sanitary living conditions. The financial and technical resources generally available in the third world are totally inadequate to cope with this issue. Lastly it focus that, urban change must not mean copying modern life style from the so called developed world. Traditional ways of life

should be enhanced. They proved to be sustainable for centuries and should be given proper consideration in urban programming.

Thapa and Ringeltaube, 2015 in the article, ‘The need for a system to Solid Waste Disposal and Collection’ mentions that the waste management system needs active co-operation and participation of all citizens. It describes that the method of collection of waste from streets and its transfer to community sins and from there to vehicles need to be modified so that the waste is carried out more effectively and the chances of adversely affecting the health of workers reduced. Equipment will have to be designed which satisfy the typical local problems and give economical operations.

CHAPTER -III
RESEARCH METHODOLOGY

3.1 Research Design

The present study was based on descriptive type of survey method which is most commonly used for research work. It is mainly focus obtained information existing conditions on solid waste disposal, its proper management of the hospital.

3.2 Nature and Source of Data

The present study is based on primary and secondary data which is collect from field survey of the selected area. The primary data included the data collected from key informants and interview schedule to collect the necessary data. The various methods of data collection techniques has been used and the secondary sources of data was collected by the help of related books, journals, magazines, pamphlets and published and unpublished master's thesis articles and many more reference related to the topic of the study.

3.3 Sample Size and Sampling Procedure

Out of total respondents 80 respondents has been selected by simple random sampling method. Among them 40 respondents were Chitwan Hospital and 40 respondents were Bharatpur hospital were selected.

3. 4 Techniques and Tools of Data Collections

This researcher was conducted by applying various methods for data collection. Both primary as well as secondary data has been used. The researcher himself

collects the primary data with the help of following techniques from the respondents.

3.4.1 Interview Schedule

Pre-structured question will be used for getting the real and accurate data from HHs survey of respondents.

3.4.2 Key Informant interview

The primary data was collected through the key informants using the semi or unstructured interview method. The interview is taken as cross checking for data obtained from questionnaire. To collect relevant information from key informant like hospital management committee, worker leader were interview.

3.5 Validation of the Tools

Questionnaire presented to the respondents before finalization. Necessary revision made on the draft tools after trial testing it; both formal and informal interviews carried out to take the primary data from the key informants.

3.6 Data Analysis

Data analysis is the most crucial constituent of any research work in this study after completion of data collection both sources were processed manually. Simple statistical tools are used for data analysis. Quantitative analysis is taken by the means of measures of central tendency. Analyzed data presented by pie–charts, bar diagram. Qualitative data is analyzed descriptively.

CHAPTER-IV

ANALYSIS AND INTERPRETATION OF RESULTS

This chapter deals with analysis and interpretation of the data that were collected from the field survey. The data were tabulated and kept in sequential order according to the purpose of the study. Then the data were analyzed on the basis of percentage and ratios. The analysis and interpretation of the study has been presented under the following main sections.

4.1 Socio- Demographic Status of the Respondent

Socio demographic status means age and sex composition, Educational status, Caste / Ethnic composition, occupational status of the respondents. This section deals with analysis and interpretation of this topic**.**

4.1.1 Age and Sex Composition of the Respondents

There are group of the respondents has been classified into 5 groups with 5 years age interval i.e. (30-34 yrs0, (40 - 44 years), (45-49 years) (50 + years) to make the study easier.

Table No. 4.1 Age Sex Composition of the respondents

S.N	Age Group	CH	Percentage	BH	Percentage	Total	Percentage
1	20-25	7	17.5	2	5	9	11.25
2	26-30	17	42.5	13	32.5	30	37.5
3	31-35	10	25	10	25	20	25
4	36-40	5	12.5	9	22.5	14	17.5
5	41+	1	2.5	6	15	7	8.75
	Total	40	100	40	100	80	100

According to the presented table no.4.1, the respondent of the age group (20-25) years was 11.25 percent followed by (26-30) years was 37.5 percent (31-35) years are group was 25 percent (36-40) years age group was 17 .5 and (above 41) years was 8.75 percent workers were questioned about the condition of the solid wastes management.

4.1.2 Caste/ Ethnic Composition of the Respondents

People belong to different caste and ethnic live together maintaining harmony in a community according to national census 2058 more than 100 castes found in Nepal living together. The given table shows the cast, ethnic composition of the respondents.

Table No. 4.2 Caste / Ethnic Composition of respondents

S. N	Caste	CH Respondents	BH Respondents	Total	Percent
1	Newar	9	7	16	20
2	Gurung	8	3	11	13.75
3	Chhetri	6	8	14	17.5
4	Brahmin	5	3	8	10
5	Magar	6	9	15	18.75
6	Kami	3	-	3	3.75
7	Tamang	2	10	12	15
8	Kumal	1	-	1	1.25
Total		40	40	80	100

Above given table no.4.2 show that out of 80 respondents16 percent respondents were Newar, 8 percent respondents were Brahmin,17.5 respondents were Chhetri 13.75 percent respondents were Gurung, 18.75 percent respondents were Magar , 1.25 percent respondents were Kumal, 3.75 percent respondents were Kami and 15 percent respondents were Tamangwas found.

4.1.3 Residential Type of the Respondents (Workers)

Migration affects the population size of any area people migrate from one part to another part of the country where various infrastructures of development are made available. People live as temporary resident till they meet their requirement and get back to their original place but some temporary residential become the permanent resident of the place as they meet their basic requirements. Here, the temporary and the permanent residential type have been studied in table

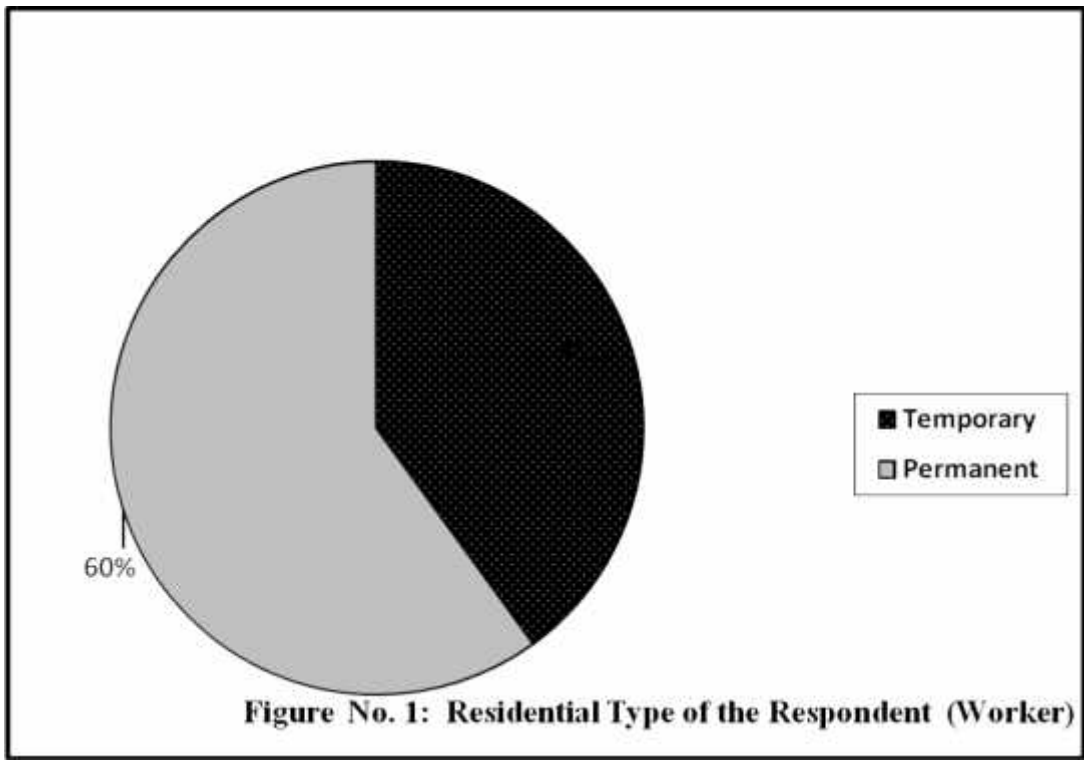

Figure No. 1: Residential Type of the Respondent (Worker)

The figure no 1shows that out 80respondents,60 percent respondents were found living as permanent resident and 40 percent respondents were found living as temporary resident. People with permanent residence had down their keen interest on the cleanliness of their surrounding and support the programs conducted by Hospital that is collection of waste in a green plastic buckets and regular payment for waste management etc. whereas other people as temporary

residence are found to be knowingly less concerned to the management of solid waste.

4.2Attitude on Waste Management of the workers

As the study is concerned to the waste management its proper management is also studied. In general we understand waste as those things which are of no use or to be thrown whether be decomposable or non-decomposable. The waste can be used again in various way but we don't care about it which shows the negative of people towards waste management. Instead of throwing waste at once randomly its nature should be checked, if there is decomposable waste it can be converted into manure and if there is non- decomposable waste it can be reused or recycled according to their type and nature. Some of the respondent does so. The respondents have their own view on waste management which is shown in the given table

Table No. 4.3Attitude on Waste Management

S.N	Views of the respondents	CH	BH	Total Respondents	Percent
1	Positive	35	30	65	81.25
2	Negative	5	10	15	18.75
Total		40	40	80	100

Table 4.3 shows that most of the respondent 18.75 percent had negative attitude on solid waste and 81.25 percent respondent had shown their responsibility on management of solid waste. Although most of the respondents were educated still there was a need to raise awareness among the people to develop positive attitude towards the waste management.

4.2.1 Types of Solid Waste Produced by the Hospitals

There are so many private hospitals in Chitwan but large in sizes which serve the majority of people due to little fees. Among them Chitwan Hospital (CH) is prime which contains 1000 beds along with 19 wards recently. It serves 1000-1200 residents and 500-1000outdoor patients per day. The total HCW generation rate of CH is 1.4-1.5 tons/day and 0.94 kg/bed/day. Within the ward CH appointed workers and ayahs collect and discharge through the corner to ground floor and their numbers is 60-70. CH uses 4-5 categories of color coding drums for source separation and temporary storage of Hospital Collection Waste which are provided by Department of Health. But discharging time they mix up. To collect Hospital Collection Waste from discharging point and handle to dustbin a private company along with 130 workers is assigned by CH. It performs floor cleaning, collection, segregation and discharging Hospital Collection Waste to dustbin regarding activities. But during survey it was found that some workers and staffs were involved in selling recyclable Hospital Collection Waste at BDT 20-50/kg to shop and making open fire to reduce waste volume through illegal way. The workers both of them segregate and collect HCW manually without wearing any protective gears hardly seen using simple instrument. None of them provide any training to workers regarding to HCW handling and management along with associated risk. All of the operational instrument and a few instruments are seen to reuse through disinfecting by boiling water, autoclave and sterilization

4.2.2Waste Generation Rate at Chitwan Hospital

There are so many private hospitals in Bharatpur but large in sizes which serve the majority of people due to little fees. Among them Chitwan Hospital (CH) is prime which contains 1000 beds along with 19wards .The number of private Hospitals in Bharatpur is comparatively high than public .Waste generation rate is shown in the given table.

Table No. 4.4: Waste Generation Rate at Chitwan Hospital

Ward Name	**WGR (Kg/ward/day)**	**Average number of (Patient/ward/day)**
Gyne	80	50
Dental	68	45
Pediatric	65	30
Dermatology	58	40
Medicine	55	100
Emergency	19	100
Surgery	37	36
Orthopedics	15	95
ENT	8	12
Total	**405**	**508**

The table 4.4 shows that 80 WGR produced by Gyne, 68 WGR produced by Dental,65 WGR produced by Pediatric,58 WGR produced by Dermatology,55 WGR produced by Medicine,19 WGR produced by Emergency, 37WGR produced by surgery,15 WGR produced by Orthopedics and 8 WGR produced by ENT.

4.2.3Waste Generation Rate at Bharatpur Hospital

Bharatpur Hospitalis the largest which contains 200 beds along with 15 wards. It serves 200-250 residents and 300-550 outdoor patients per day. The total HCW generation rate is 250-300 kg/day and 1.52 kg/bed/day along with 45 workers and who collect and handle their generated waste. They separate HCW into two categories such as general and clinical waste using color coding drums. They separately store sharp waste in box and sometimes burn or directly discharge to nearby dustbin mixing with non-hazardous waste without any pretreatment.

Table No. 4.5: Waste Generation Rate at Bharatpur Hospital

Ward Name	WGR (Kg/ward/day)	Average number of (Patient/ward/day)
Medicine	70	150
Gyne	65	165
Pediatric	39	95
Surgery	35	70
Orthopedics	28	60
Emergency	22	55
ENT	11	33
Skin	5	19
Dental	3	25
Total	278	672

The table 4.5 shows that 70 WGR produced by Medicine, 65 WGR produced by Gyne, 39WGR produced by Pediatric,35WGR produced by Surgery ,28 WGR produced by Orthopedics ,22 WGR produced by Emergency, 11 WGR produced by ENT ,5 WGR produced by Skin and 3WGR produced by Dental of the Bharatpur Hospital.

4.2.4Comparison of Waste Generation Rate of Hospitals

Hospital waste refers to all waste generated, discarded and not intended for future use in the hospital. The risks are not only connected to the handling of the waste, both inside and outside the health care facilities but also the environmental risk connected to the treatment and disposal of the waste. Waste generation rate of CH and Bharatpur Hospitals shown in the given table.

Table No. 4.6: Comparison of Waste Generation Rate at CH and Bharatpur Hospital

Ward Name	WGR (Kg/ward/day) of CH	Average number of (Patient/ward/ day	WGR (Kg/ward/day) of B.H	Average number of (Patient/ward/ day
Gyne	80	50	70	150
Dental	68	45	65	165
Pediatric	65	30	39	95
Dermatology	58	40	35	70
Medicine	55	100	28	60
Emergency	19	100	22	55
Surgery	37	36	11	33
Orthopedics	15	95	5	19
ENT	8	12	3	25
Total	**405**	**508**	**278**	**672**

The table 4.6 shows that waste generation rate and average number of Patient is significant difference in Chitwan Hospital and Bharatpur Hospital. 405 WGR produced by Chitwan hospital per day and 278 WGR produced by Bharatpur Hospital per day.

4.2.4 Way of Disposing Waste by the Hospitals

Improper management of the waste is one of the biggest problems of municipality. Due to the lack of proper management of waste by municipality, people collect both organic and inorganic waste in a same plastic and container. Plastic bags are thrown along the waste which is a major environmental issue and an example of mismanagement of the solid waste. Most of the people are dependent on municipality for the waste disposal. Some people manage their

waste themselves by making compost but are unable to continue the process for a longer time.

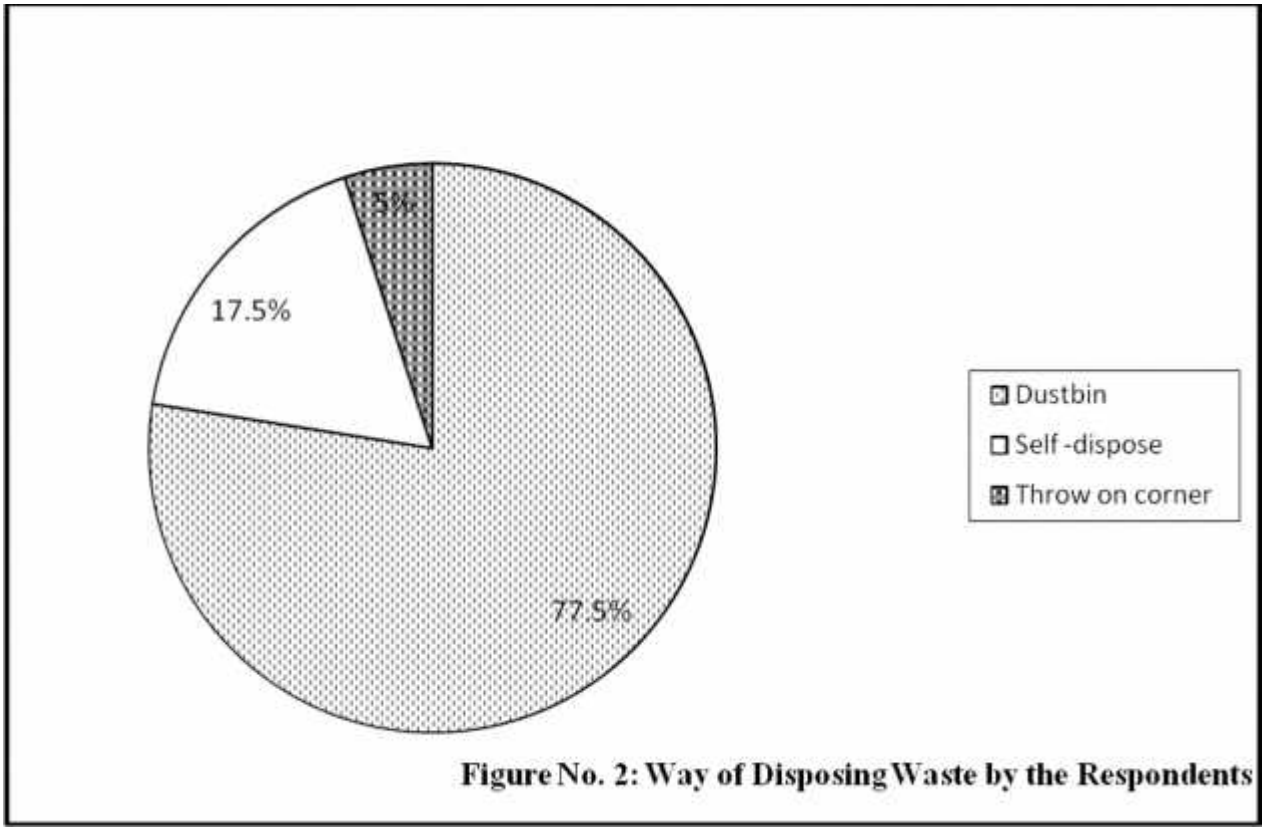

Figure No. 2: Way of Disposing Waste by the Respondents

The given figure no.2 shows that 77.5 percent respondents disposed their waste in a dustbin ,17.7 percent of the respondents their waste by themselves and 5 percent respondents were throw their wastes on the corner randomly. The study had shown still there was practice of throwing out wastes randomly which should be discouraged.

4.3 Practice of Waste Separation

Decay able and non-decay able waste thrown together results in to mismanagement of the waste. As decay able get rot, non-decay able waste remain same for a longer time causing environmental pollution so it should be separated according to its nature before throwing it out randomly. The

respondents were questioned on practice of waste separating from their hospital levels. The respondent's data is given in below table no 4.8.

Table No. 4.7 Practice of Waste Separation

S.N	Responses	CH	BH	Total	Percent
1	Yes	40	38	78	97.5
2	No	-	2	2	2.5
Total		40	40	80	100

The table 4.7, shows that 97.5percent respondents separate decomposable and non-decomposable waste before throwing it out whereas 2.5 percentage of respondent do not separate waste according to their nature. Most of the respondents of the study area were busy enough that they have no time for the waste separation.

4.3.1Knowledge of Reusing the Waste

Different types of waste can be used again according to their nature instead of increasing the volume of waste. For instance: plastic bags can by separately used for marketing, Iron can be used .Reuse of the waste help to reduce population of the environment to some extent.The respondents were asked about their knowledge on reusing the waste; the response are shown in below-given figure no.3.

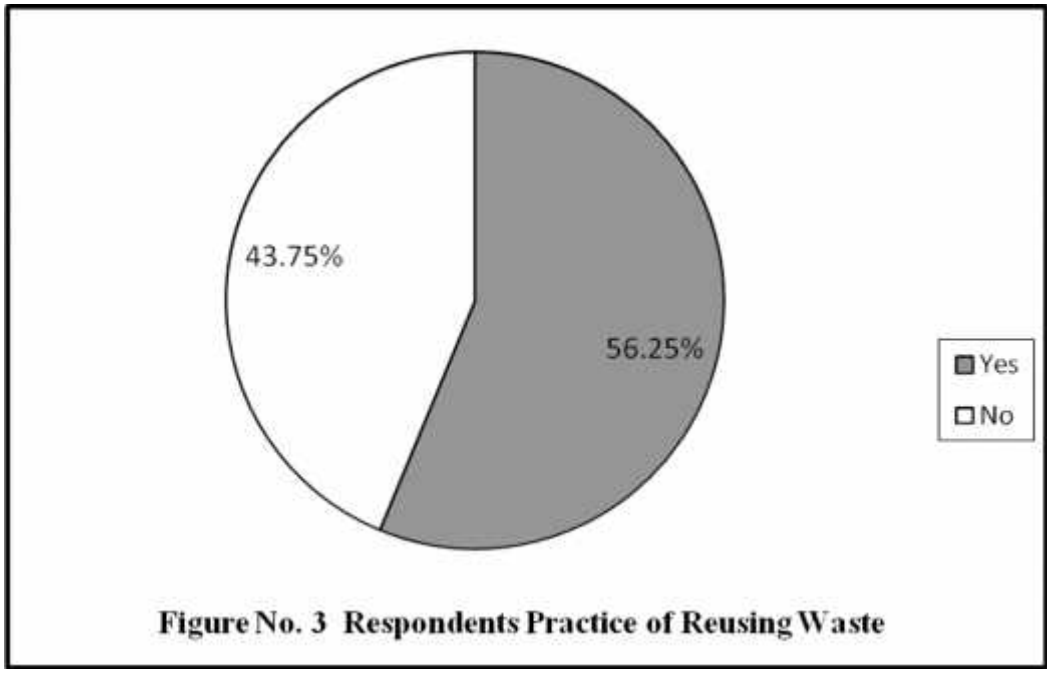

Figure No. 3 Respondents Practice of Reusing Waste

The figure no. 3shows that 56.25 percent respondents knew to re- used the waste whereas remaining 43.75 percent respondents did not know or neglect the process of reusing waste. As the data sows higher no of the respondent follow reusing waste, it was hard to find in their behavior.

4.3.2 Practice of Selling Inorganic Waste

The respondents were asked practice of selling inorganic waste, the response are shown in below- given table no.4.8.

Table No.4.10 Practice of Selling inorganic waste

S.N	Respondents'	CH	BH	Total	Percent
1	Yes	33	38	71	88.75
2	No	7	2	9	11.25
Total		40	40	80	100

According to above giving table no 4.8 shows 88.75 of the respondents gain profit from the waste whereas 11.25 percent of the respondents although know about earning from the waste were found careless enough to store their wastes

and sell to the scrap dealers. They prefer getting rid of waste as far as possible rather than earning from the wastes.

4.4 People's participation

Proper waste management has strike as a severe problem in the city. Most of the local people help in collecting waste in proper time and place still the city appears filthy due to littering of the waste on the road-sides, around the dumping containers etc. the main reason for such unselective waste in the street are generated due to the lack of time of the business holder, office holder and the people who stay at rent. Especially they are the main source of waste generation at wrong site and time as they are busy in care of patient they do not have much time to manage waste according to the schedule of the workers. However, local people participate in collecting waste by giving to the waste collectors or by collecting in a container are appreciable. Improper way of waste collection and collection sites, irregular street sweeping, regularly occurring strikes (Nepal Bandh) are the most common problems of solid waste management. Other major problems of solid waste collection and its disposal are given in table no. 4.9

Table No.4.9 Problems Related to the Solid Waste Management

S.N	Responses	No. of respondents	Percent
1	Solid waste management taken as a concerned and responsibility of sweepers and the hospital but not the responsibility of the Management committee.	25	31.25
2	Irregularity of sweeping the streets by the sweepers and the collection services not made feasible to all parts of the Hospital	16	20
3	Lack of cover over the drainage because	20	25

	of which people throw their waste nuisance and blockage of the sewerage during raining season due to uncollected solid waste.		
4	No strict system to penalize people throwing waste at wrong place and time.	16	20
Total		80	100

The above given table explains the problem of the solid waste 31.25 of the respondents agreed waste management as the responsibility. Among them 20 percent respondents were said Irregularity of sweeping the streets by the sweepers and the collection services not made feasible to all parts of the Hospital. Similarly 25 percent of the respondent agreed that Lack of cover over the drainage because of which people throw their waste nuisance and blockage of the sewerage during raining season due to uncollected solid waste and 20 percent respondents said that no strict system to penalize people throwing waste at wrong place and time.

4.5 Waste disposal Management System

Researcher observed the overall waste disposal management condition of hospitals and asked the question to the respondents about it. To know the views of the respondents about waste management system, it was categorized in to two levels only yes or No. The information collected by researcher is presented below:

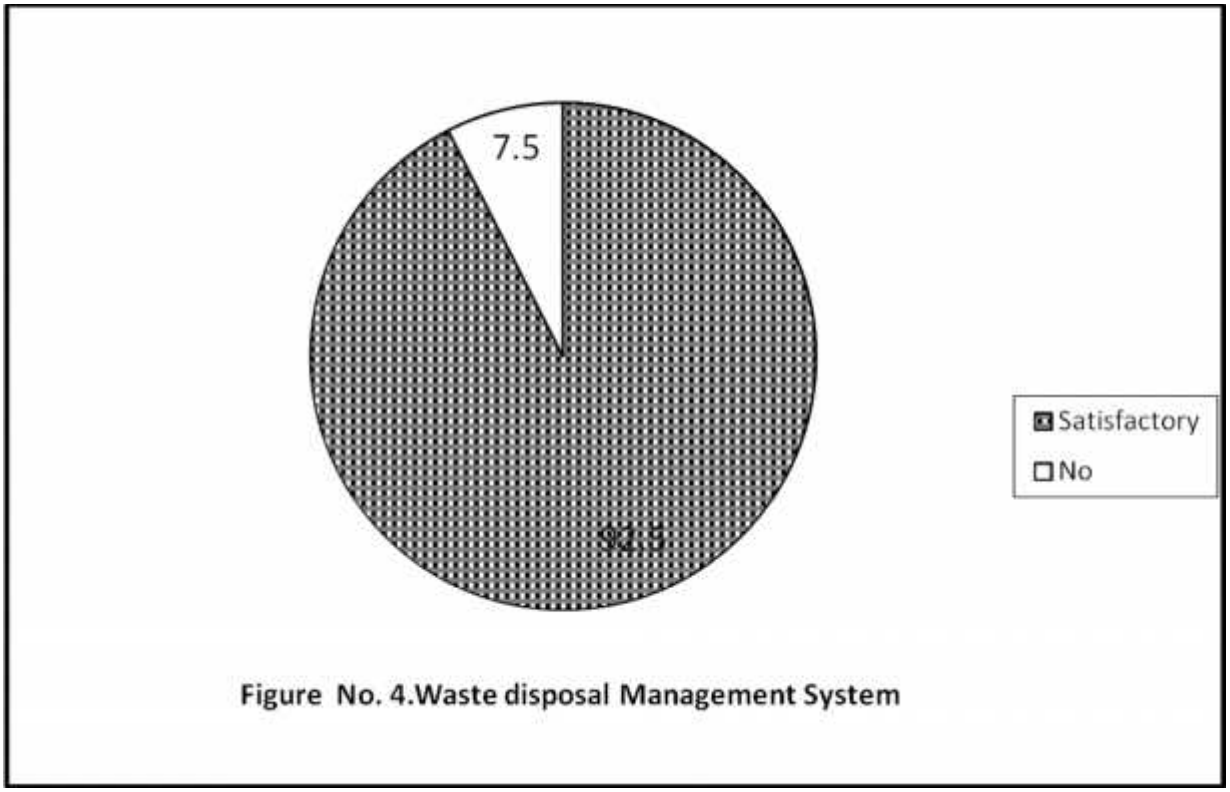

Figure No. 4.Waste disposal Management System

The figure no.4 reveals that overall waste disposal management system of hospitals seems to be satisfactory. The date described that 92.5 percent respondents are satisfactory on waste disposal management system of hospitals and 7.5 percent respondents were not satisfactory on disposal management system in hospitals.

4.6 Consequence of Improper Waste Management on Health.

Health of an individual depends upon the environment where he/she is brought up. If a person grows in a dirty environment we cannot expect a good health and a good work from him for the prosperity of his own family. Whereas, a person brought up in a healthy environment is able to build up his family in a healthier way.

Table No. 4.11 Consequence of Improper Waste Management on Socioeconomic Health

S.N	Respondents	No. of respondents	Percent
1	Filthy appearance	17	21.25
2	Contamination of drinking wastes	11	13.75
3	Spread of nuisance	8	10
4	Spread of diseases	32	40
5	Social harmony degrades	5	6.25
6	Economic loss	7	8.75
Total		**80**	**100**

The environment gets dirtier because of improper waste disposal as well as invites a number of communicable diseases. The respondents of the study area also face problems related to health due to random waste disposal. According to the study, 21,25 percent respondent agreed the filthy appearance of the area especially during rained season the sewerage get filled up and carries other unwanted wastes thrown like plastic, animals excreta, remaining food stuffs etc which gives a dirtier look to the study area. 13.75 percent respondents agreed drinking water source gets contaminated because of which the disease like diarrhea, dysentery, malaria, typhoid etc spread easily. Similarly 10 percent respondents said Spread of nuisance of the study area. Among them 40 percent respondents said that Spread of diseases, 6.25 percent respondents said that economic loss of the hospitals.

4.7 Respondents Practices of Waste Disposal

Disposing waste in time helps to maintain surrounding clean. People should pay high attention towards management of their households waste. Mainly the times of disposing waste depends on the number of family members and their habits.

Figure No. 5Respondents Practices of Waste Disposal

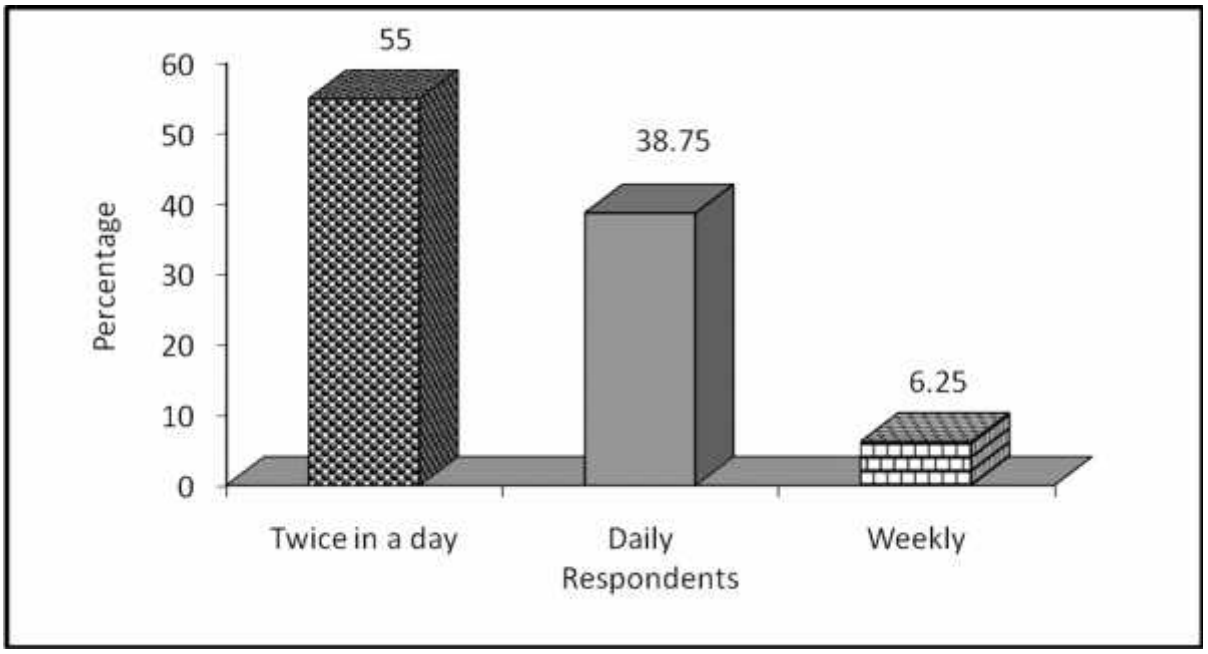

Figure No. 5 reflects that out of 80 respondents 55 percent respondents disposed their waste twice in a day 38.75 percent disposed waste daily and 6.25 percent disposed waste weekly of the hospitals.

4.7.1 Feeling of Responsibility for the Management of Waste

Researcher was curious to know about the views of respondents, either they feel or do not feel the responsibilities for the management of the waste of their surrounding

Table No. 4.12 Feeling of Responsibilities

S.N	Feeling responsible	No. of respondents	Percent
1	Yes	71	88.75
2	No	9	11.25
Total		80	100

The above table 4.12 shows that 88.75 percent respondents felt responsibilities for the management felt responsibilities for the management of waste and 11.25 percent respondents did not feel the responsibilities.

4.7.2 Practice of selling inorganic Waste

The study collected the information that indicates the practices of selling in organic waste at CH and BH. The data which are collected is presented in the table given below:

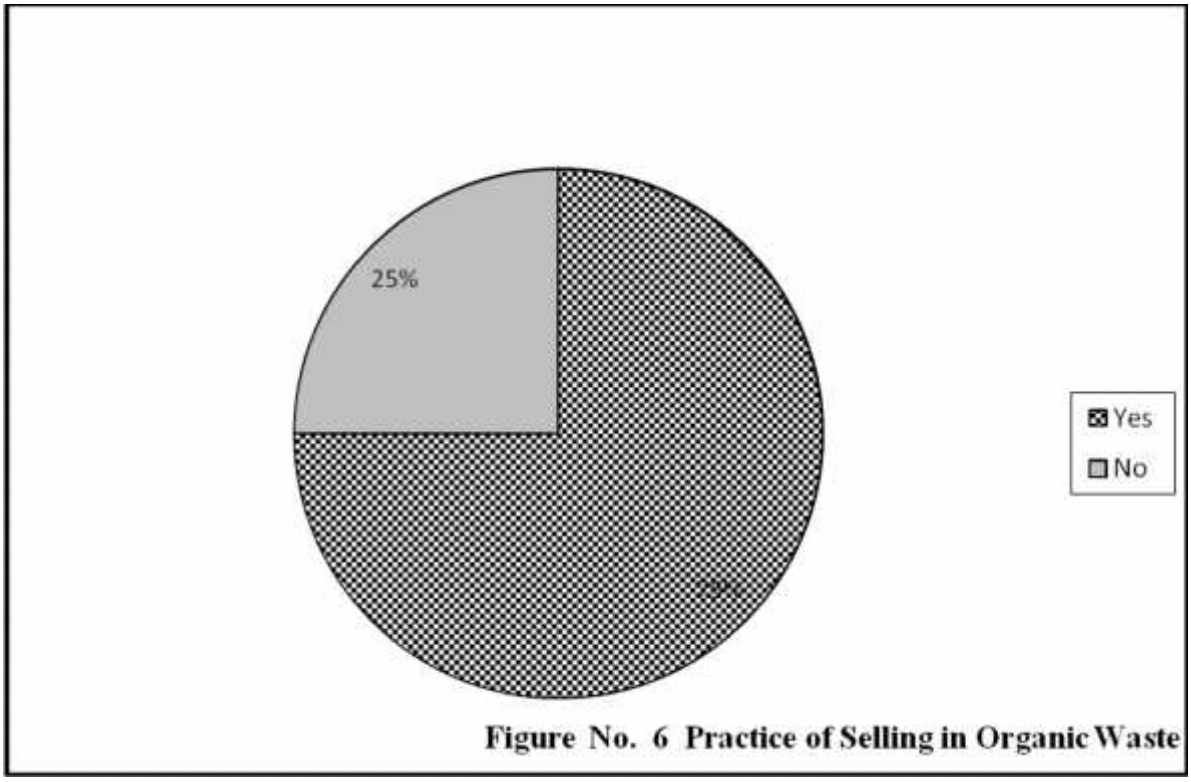

Figure No. 6 Practice of Selling in Organic Waste

The figure No. 6 shows that 75 percent respondents said inorganic waste to the scrap dealers and 25percent respondents did not practice to sell the scrap dealers.

CHAPTER-V
SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Summary of the findings

Human activities create waste, which are the outcomes by the households in course of their time. It is the way these waste are handled, stored, collected and disposed of, which can pose a risk to environment and to the public health. Where intense human activities concentrate, such as in urban centers, appropriate and safe solid waste management are of utmost importance to allow healthy living conditions for the population. This fact has been acknowledged by the most governments; however, many municipalities are struggling to provide even the most basic services. The major findings of the study is based on the data collected from the respondents of the study area has been summarized below.

1. The respondent of the age group (20-25) years was 11.25 percent followed by (26-30) years was 37.5 percent (31-35) years are group was 25 percent (36-40) years age group was 17 .5 and (above 41) years was 8.75 percent .
2. Out of 80 respondents 16 percent respondents were Newar, 8 percent respondents were Brahmin,17.5 respondents were Chhetri 13.75 percent respondents were Gurung, 18.75 percent respondents were Magar , 1.25 percent respondents were Kumal, 3.75 percent respondents were Kami and 15 percent respondents were Tamang was found.
3. Out 80 respondents, 60 percent respondents were found living as permanent resident and 40 percent respondents were found living as temporary resident.

4. The study shows that most of the respondent 18.75 percent had negative attitude on solid waste and 81.25 percent respondent had shown their responsibility on management of solid waste..
5. Among them 77.5 percent respondents disposed their waste in a dustbin , 17.7 percent of the respondents their waste by themselves and 5 percent respondents were throw their wastes on the corner randomly.
6. Among them 97.5 percent respondents separate decomposable and non-decomposable waste before throwing it out whereas 2.5 percentage of respondent do not separate waste according to their nature.
7. Out of total 56.25 percent respondents knew to re- used the waste whereas remaining 43.75 percent respondents did not know or neglect the process of reusing waste.
8. Out of total 88.75 of the respondents gain profit from the waste whereas 11.25 percent of the respondents although know about earning from the waste were found careless enough to store their wastes and sell to the scrap dealers.
9. Among them 92.5 percent respondents are satisfactory on waste disposal management system of hospitals and 7.5 percent respondents were did not satisfactory on disposal management system of hospitals .
10. out of 80 respondents 55 percent respondents disposed their waste twice in a day 38.75 percent disposed waste daily and 6.25 percent disposed waste weekly of the hospitals.
11. Among them 88.75 percent respondents felt responsibilities for the management felt responsibilities for the management of waste and 11.25 percent respondents did not feel the responsibilities.
12. Out of total 75 percent respondents sold inorganic waste to the scrap declares and 25 percent respondents did not practice to sell the scrap dealers.

5.2 Conclusion

The study concludes that the waste management system in CH and Bharatpur Hospital is poor. The segregation, collection, transportation, storage and disposal practice of the hospital waste was found unsatisfactory. The mixing of general, hazardous and sharps wastes were might be due to lack of proper training and instruction about waste segregation system. It was also due to carelessness of patients, visitors and staffs. Even hospital administration, doctors, nurses and other staffs had not given due priority to effective waste management. Manual transportation by using uncovered plastic buckets was practiced that may cause splitting of waste and maybe hazardous to human health. Health care waste should be transported within the hospital and other facility by means of wheeled trolleys, containers or carts that are not used for any other purposes. There was no storage facility and separate room for the storage. All types of wastes were stored haphazardly inside the toilet when sweepers were absent for long time, which was not safe practice. Central storage facility should be located within the hospital premises close to the incinerator. The area should be large enough to contain all the hazardous wastes, produced by the hospital. In-charges of different departments of the hospital, nurses, other health workers and sweepers were unaware about the storage of hazardous wastes. Open incineration was practiced for the treatment of health care waste in the hospital. Placenta and body parts were burned separately which was a good practice where as other general, hazardous and sharps were piled up together for long days, and then openly burned and buried. An incinerator was provided, which was used for the treatment of placenta in the past. But now the incinerator has not been used for the treatment of any hazardous waste. There was no regular treatment and disposal practice followed by the hospital. The wastes were disposed in the absence of a special health care waste treatment facility. Such unsafe disposal practices. Hospitals should develop health care waste management plan strictly following the

National HealthCare Waste Management guideline. Training package for waste management should be developed for all hospital staffs including sweepers.

5.3 Recommendations

5.3.1 Policy related recommendations

a. Government of Nepal were included the policy of waste management but the implementation aspect is weak; the government should emphasis to promote waste management system in hospitals.
b. The government has included the law regarding legal aspect of solid waste management in hospital but the implementation aspect is weak,so government should emphasis implementation.

5.3.2 Future researcher

a. The present study has small sample size and the further research can be taken a large sample size adopting other sampling methods.
b. The present study is fully descriptive so, it may not be represent the actual phenomena of waste management . Therefore, analytical study can do for the future research issue.
c. The future study can be carried on comparatively between Private and Private hospital.
d. The upcoming researcher can study on this in more problems of waste management.
e. The future study also can be done showing the relationship between solid waste and disease.

5.3.3 Improvement level

1. Hospital should conduct various awareness programs to raise their knowledge on 3R (reduce, re-use & re-cycle) strategy of the waste management.

2. Number of containers should be increased at various places so that the people from every part of the wards can easily reach to the containers to dispose their waste.
3. Sewerage should be covered properly and where- ever there is no cover over the drainage pipe line should be placed on time and should be cleaned up at least once in a month.
4. Use of more plastic bags should be discarded. Instead of plastic bags, paper bags or cloths bags should be encouraged. One should contribute to make his/her society plastic free society.
5. To solve the problem of solid waste the topic solid waste should be included in school and campus curriculum. Knowledge on solid waste management should be disseminated through formal and non-formal education to the grass- root level to raise the public participation.
7. Hospital should make the dumping site in proper place .
8. While collection the wastes, the collector should use some blankets of other else to cover the wastes that may prevent the drop of wastes from the road while cycling the tricycle.
9. Training classes should be conducted to the collectors and the supervisors from time to time so that they are well informed about the service and can convey the message to public effectively.
10. More waste means more loss of resources. So, the amount of waste should be reduced, waste should be reused (e.g. Polythene bags, glass bottles, PET bottles etc) and recyclable materials (e.g. Metals, glass, paper, plastic etc) should be separated and given or sold to others as far as possible

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Appendix: A

Interview schedule

Date:

Respondent No : -

Name of Hospital :-

Educational Status: -

Address:-

Position : -

Sex:

1.How much waste generates from this hospital per day ?

……

2.Which size of bucket you are using for waste collection?

……Liter

3.In what way should the waste be collected?

Daily ( ) Alternate day ( ) Once a week ( )

4.In what time should the waste be collected?

Morning ( ) Day ( ) Evening (

5.Do you practice segregation of organic and inorganic waste generating from hospital.

Yes ( ) No ( )

6. If yes then how do you segregate them?

a) Use different buckets
b) Use different bag
c) Use different pit

7. Which approach is the best to manage solid waste in Hospital ?

a) Composting
b) recycle
c) reuse
d) Burial
e) Don't know

8.How do you manage organic waste?

a) Excellent practice

b) Good practice

c) Satisfactory practice

d) Poor practice

9.How do you manage inorganic waste?

a) Excellent practice

b) Good practice

c) Satisfactory practice

d) Poor practice

10.If you are selling inorganic wastes,then how much do you earn monthly from it.

Nrs……..

11. Under whose responsibility the waste management falls in ?

a) Hospital personnel
b) Patients and waiters
c) Joint efforts for all

12What are the problems of solid waste management?

……

13. Do you have any suggestions regarding solid waste management system?

……

14. Do all visitors show eco-friendly behavior ?

a. Yes b.No

15 Is municipality cooperating well waste management?

a.Yes b.No

Observation Checklist

a. Amount of buckets

1. Sufficient
2. Less than required

b. Litter around the premises

1. Not seen
2. seen in negligible amount
3. scattered

c. Dumping site

1. well managed
2. open

d. Burial system

1. thrown but not covered
2. waste is covered with soil

e. Cleaning staff

1. Stand by
2. Indifferent