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Sanitation Status and Waste Disposal Pattern in the Slum Area of Sylhet City Corporation

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Authors' contributions

This work was carried out in collaboration among all authors. Author NR initiated and perceived the idea, performed data collection from the field. Author RA wrote the manuscript. Authors ZA, SB and SYA revised the manuscript. All authors read and approved the final manuscript.

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ABSTRACT

Aims: Majority of slum people are living in poor quality housing where the absence of basic amenities is a significant issue. The primary aim of the study was to determine the present status of sanitation and waste disposal patterns of the selected slum areas of Sylhet City Corporation (SCC).
Study Design: Both descriptive and analytical methods were applied to reach the final outcome.
Methodology: To conduct the study, 355 samples were collected from five different wards through a constructive questionnaire survey. Key Information Interview (KII), field observation, and focus group discussion (FGD) were also used to collect data.
Results: While the slum people are always struggling to ensure their basic needs, they don't give emphasis on the sanitary, hygiene, health condition, etc. About 80.4% of slum dwellers defecate in an unhygienic place which may cause various diseases and lead to water pollution by pathogenic microbes. Only 54.9% of people dispose of their waste in a proper way and the others are accountable for environmental pollution by disposing of waste here and there. This study also reveals the socioeconomic condition, health issues, and other water-related challenges of the slum dwellers.

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Conclusion: Due to lack of education and knowledge about health and hygiene, unwillingness, poverty, etc. are the possible reasons behind the deterioration of the situation of slum inhabitants. Thus, several remedial measures need to be taken for the improvement of sanitation and waste disposal system.

Keywords: Sylhet, slum; sanitation; waste.

1. INTRODUCTION

Sylhet is a developing city of Bangladesh with an estimated population of 0.6 million and a high migration rate especially a population growth rate of 4% per annum [1] in comparison to the annual average growth rate of 2.01% in Bangladesh [2]. In developing countries generally, poor people migrate from rural to urban areas for a better job to improve their disadvantageous position [3]. The socioeconomic condition of the northeast region of Bangladesh is different due to the presence of hill tracts, tea gardens, forests, and mineral resources as well as for natural calamities [4]. The rapid growth of industries, lack of financial resources, inadequately trained manpower, inappropriate technology, and lack of awareness of the community are the major constraints of waste management [5]. The sanitation condition of the low-income slum areas of Sylhet city is miserable [6]. About 49.8% of workers of the total population in Sylhet city are living in the slum areas [7]. Slum is a problem in the modern world because the condition of the slum is poor, congested housing, disorganized families, low literacy rate, deviant behaviour, and high population density, etc. [4] Almost no latrines or urinals can be observed here and the inhabitants often defecate at open spaces, hedges, drains and bushes [4]. Only about 16% of the slum dwellers of the city have access to use sanitary latrines [8]. Sanitation, pure drinking water, and reproductive health facilities are scarcely available for the women in that area [9]. Moreover, the water they use for drinking and other domestic purposes is exceeded the permissible water quality standard which is 1×10^3 CFU/mL for Total Viable Count (TVC) [10]. As a result, many kinds of diseases spread by water, soil, flies, mosquitoes, air, etc. The deteriorated sanitation situation causes severe environmental degradation in Sylhet city [4]. The health improvements are extremely difficult within the provision of water and sanitation technology along without changes of hygienic behaviour of the people [11]. Anthropogenic activities generate waste, and the way these wastes are handled, stored, collected, and disposed of at the designated area can pose a potential risk to the environment and to public health [12]. More than 200-250 tons of waste is getting generated in Sylhet city on a regular basis [13]. Typically, one to two-thirds of the solid waste generated is not collected [14]. As a result, the uncollected waste, which is often also mixed with human and animal excreta, is dumped indiscriminately in the streets and in drains, so contributing to flooding, breeding of insects, rodents, and vectors and also outspread fatal diseases [15]. Most of the municipal solid waste in the Sylhet city area is collected from the land in a more or less uncontrolled manner. A considerable portion of wastes, 40-60%, are not properly stored, collected or disposed of in the designated places for ultimate disposal [16]. Such inadequate waste disposal creates serious environmental problems that affect the health of humans and animals and furthermore, cause serious economic and other welfare losses [14]. The specific objectives of this study are to investigate the sanitation system and waste disposal patterns in the study area.

1.1 Research Hypothesis

This study is based on the hypothesis that the condition of sanitation and waste disposal system of slum dwellers is very poor. It also tested two research assumptions.

- Due to poor sanitation and unplanned waste disposal pattern, the ambient environmental condition may be polluted and its effect on the health of slum dwellers.
- Lack of proper management of domestic waste.

1.2 Study Area

Sylhet City Corporation, which is established in 1867 is running from the period of the British Government. It consists of 27 wards and a huge population of nearly 500,000. It is located at the 24º53′N latitude and at 91º52′E longitude with an area of 26.5 square kilometers [17]. For this study, five wards (ward number 2, 7, 9, 15, 17) have selected among 27 wards. Puratan Medical

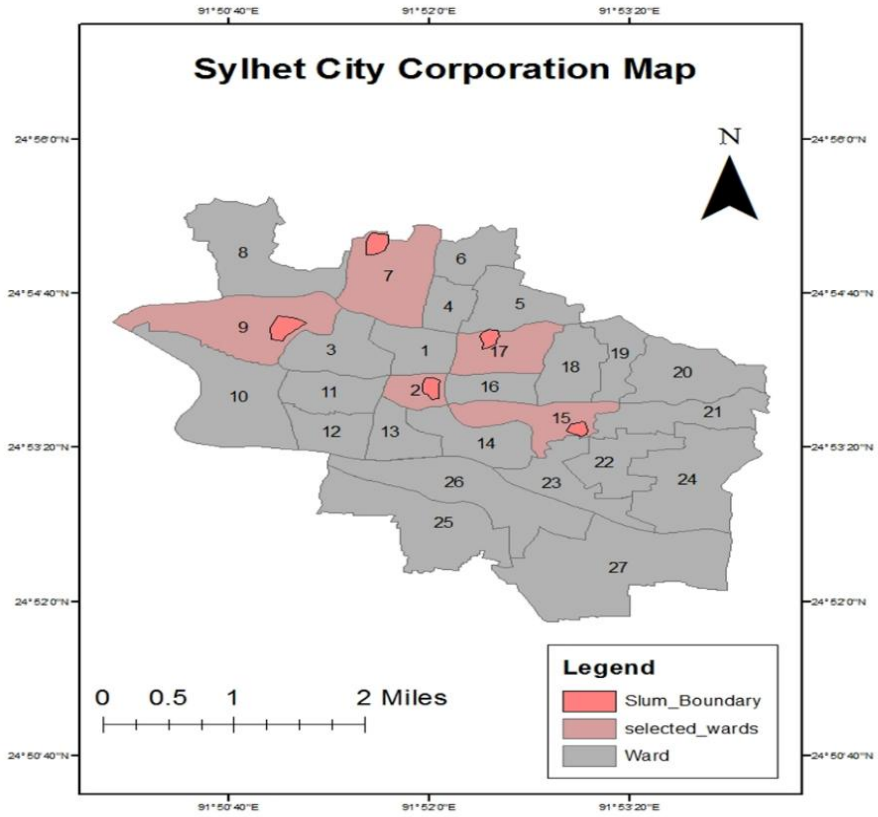

Fig. 1. Location of the study area
Source: Developed from LGED district map using Arc GIS

Colony, Khetri Para, Bamkala Para, Madina Market, Jatarpur, Kazitula areas were selected on the basis of having a large number of slum dwellers found after doing a pilot survey. The location of the study area is shown in Fig. 1.

2. RESEARCH METHODOLOGY

In this research, the descriptive method and the analytical method both are applied to find out the result. The data were collected from the dwellers of the study areas by questionnaire survey. Secondary data were collected from the Sylhet City Corporation (SCC), related reports, and research papers. A structured questionnaire, key information interview (KII), field observation, and focus group discussion (FGD) method were used to collect data from people in the study area. From the wards, individual houses were selected randomly to collect the primary data. The total research design was shown in Table 1. Respondent was selected purposively and randomly from the study area. Age and gender issues were seriously considered throughout the survey work.

Table 1. Sample design and methods

Steps	Sampling technique	Description	Area
1.	Purposive Sampling	To study the sanitation status and waste disposal practice of slum people in Sylhet city.	Sylhet City Corporation
2.	Simple Random Sampling	2, 7, 9, 15, 17 number wards have been selected purposively for questionnaire survey among the slum dwellers.	Five wards among 27 wards of the SCC.

Table 2. Selected wards and sample holdings

Identity	Ward number	Location	Total population	No of sample taken	Sample size
Zone 1	Ward 2	Puratan medical Colony, Khetri Para	1250	141	$n = \frac{N}{1+Ne^2}$
Zone 2	Ward 7	Bamkala Para	725	82	
Zone 3	Ward 9	Madina Market	400	45	$=\frac{3145}{\{1+3145\times(0.05)^2\}}$
Zone 4	Ward 15	Jatarpur	450	51	
Zone 5	Ward 17	Kazitula	320	36	=355
		Total	3145	355	355

In order to collect the data in a significant way, 355 holdings were selected at 5% significance level among 3145 holdings of the study area. During the survey, the holdings were selected by the simple random procedure. The Sample size is determined based on the following equation 1 and 2. Details of the sampling technique are shown in Table 2.

$$\text{Sample size, } n = \frac{N}{1+Ne^2} \quad (1)$$

Where, N= Total Number of Population and e= Level of Significance

$$\text{Sample fraction, } \frac{n}{N} = \frac{355}{3145} = 0.11287 \quad (2)$$

2.1 Data Analysis

Analysis of the data was done according to the objectives and the guidelines of the research. Different types of data collected through a questionnaire survey were analyzed using SPSS and Excel software. Descriptive statistics such as frequency, percentage, average and cross tabulation are used to analyze the socioeconomic condition, sanitation condition & pattern, hygiene condition, waste generation quantity, waste disposal system, preferred disposal site, disposal area of the city and then give suggestions about the waste disposal system and some other relevant categorical data.

3. RESULTS OF THE STUDY

The determinations of the study resulting from the detailed survey were examined, processed, and provided through tables and figures. The Analysis was done by SPSS 16.0 and Microsoft Excel 2013. These sections include the analysis of socioeconomic conditions, existing water source, sanitary situation, and waste management of the existing systems as well as an overall scenario of the selected slum areas.

3.1 Socioeconomic Condition

Most of the slum dwellers are living under the poverty limit. They are illiterate and poor. They can hardly fulfil their basic needs with monthly income below to Tk (Taka—Bangladeshi currency) 6000 or about US $70.98. Maximum children in slum areas are involved in low-income work at an early age. They have no capability or willingness to spend money on sanitation, health issues, education, hygiene, water purification, etc. Fig. 2 shows the monthly income level of slum dwellers.

3.2 Source of Water

Most of the slum dwellers were used to tap water supplied by the Sylhet municipality for the purpose of drinking, bathing, toileting, cooking, and household needs. Both men and women used the open slab and the condition of the bathroom was very unhygienic. The maximum number of people used the tap water and tube well water in all zones except zone 2 and 3. In these two zones, a significant number of people have to depend on pond /“Chara” (small hilly canals) without any treatment process which is very unhygienic. Such types of practices should lead to a dangerous health hazard. Fig. 3 depicts the source of water in the slum area.

3.3 Practices of Water Purification

The slum dwellers preserved drinking water from the supply water in pitchers or any kind of pots as they can’t afford any other purification system. Table 3 indicates most of the inhabitants (83.9%) did not boil drinking water. Only 16.1% slum dwellers boiled water for drinking purpose. As their economic condition was not so good and fuel for cooking was expensive, so they thought that boiling water for drinking is an extravagance to them. Slum dwellers would suffer from different waterborne diseases if the condition has not to be improved.

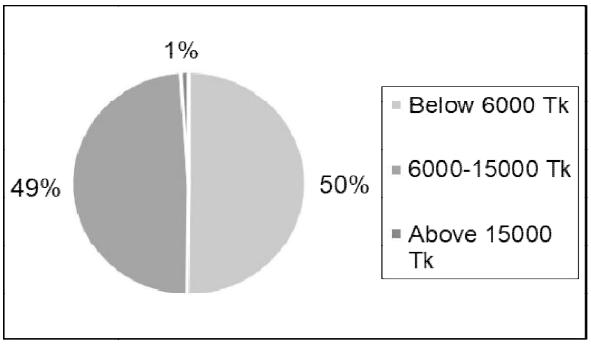

Fig. 2. Monthly income level of slum dwellers. Conversion rate -1 US $ = 84.53 Tk (approximately)

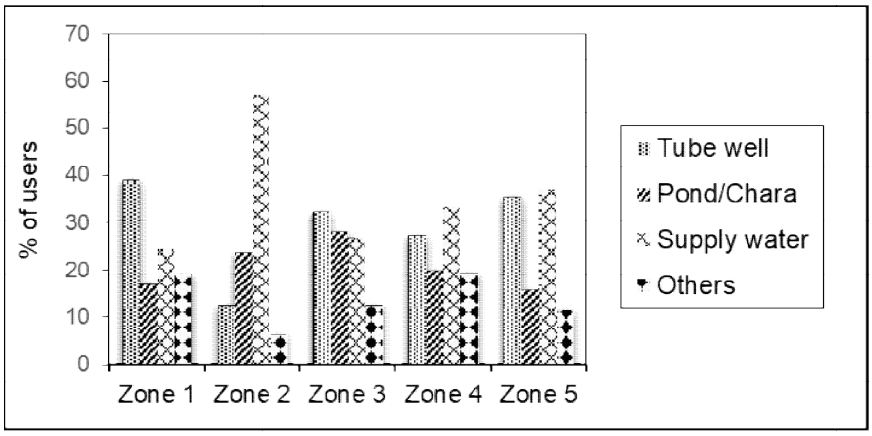

Fig. 3. Sources of water

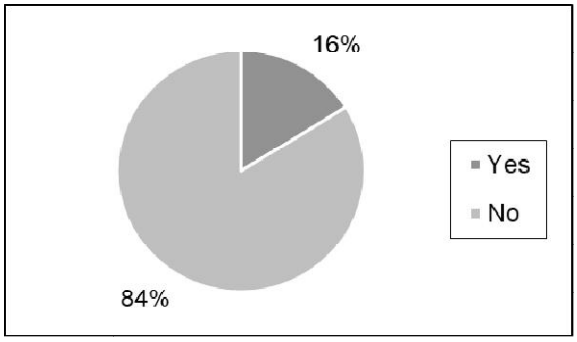

Fig. 4. Practices of boiling drinking water

3.4 Types of Latrine

As there is always a high density of population in the slum areas and for being poor, living conditions of the slum dwellers are generally unhealthy. For a large number of slum dwellers, there was a limited number of the latrine. The majority of the households used unhygienic latrines. Only 19.6% of people used the sanitary latrine, 61.7% people used the unhygienic latrine and 18.7% people used an open place or chara to defecate. Open defecation leads to water pollution via pathogenic microbes when it is mixed with water or rain flushes. The defecation type is shown in Fig. 5. Unhygienic latrines spread waterborne diseases such as cholera, dysentery, diarrhea, etc.

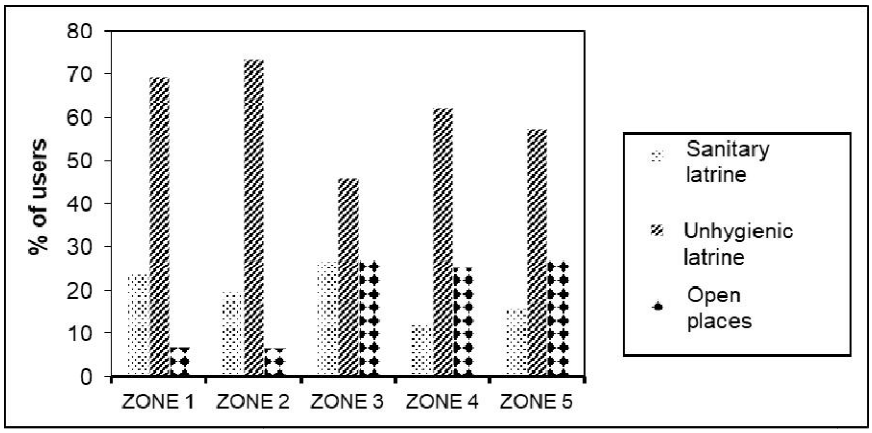

Fig. 5. Latrine types

Table 3. Materials for washing hands after urinating/ defecating

Name of materials	Frequency	Percentage (%)
Only Water	13	3.7
Soap	278	78.3
Ash	19	5.4
Mud or Soil	45	12.6
Total	355	100

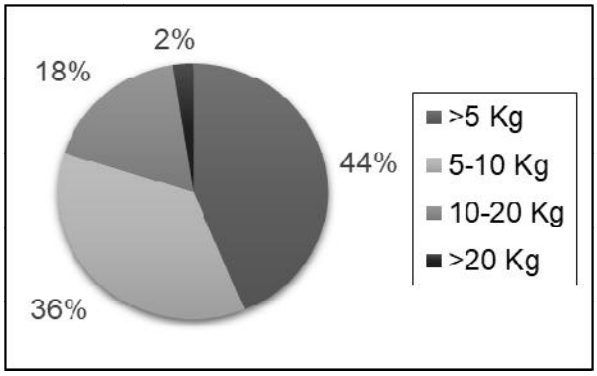

Fig. 6. Daily waste generation

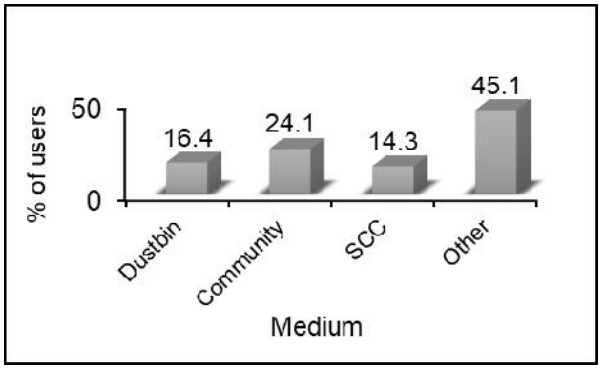

Fig. 7. Dispose of waste

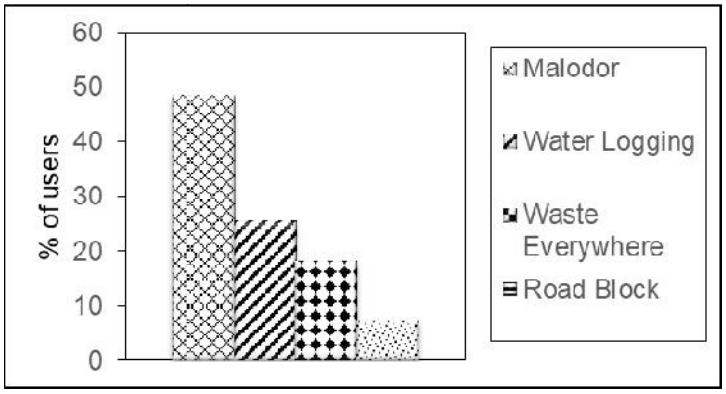

Fig. 8. Problems for unplanned waste disposal

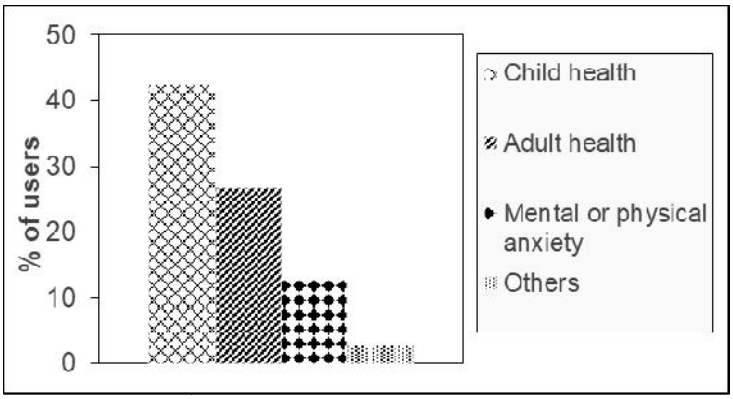

Fig. 9. Impact on human health

3.5 Materials to Wash Hands after Urinating/ Defecating

Table 3 shows that most of the slum residents (78.3%) used soap for washing hands after urinating/ defecating. Only 3.7% of inhabitants wash hands only by water after it. Though the health condition of the people has been improved, some dwellers have remained under the health risk.

3.6 Waste Generation, Management, and Disposal Stations

A perfect waste disposal system maintains the city's daily generated waste to be disposed of perfection in a specific way. This study shows that 44% of people generate approximately 5-6 kilograms of solid waste per day. The quantity of waste generated in a single day is represented in Fig. 6. In those slum areas, the amount of dustbin is not sufficient. Only 54.9% of people dispose of their waste in a proper manner. Either they use dustbin or take services from SCC or other community. The SCC collects waste and sometimes local colony/community did the job from door to door. Fig. 7 shows that 16.4% of people disposed of their waste by themselves in dustbins, 14.3% of peoples used the facility of SCC directly and 24.1% people used their community services. The rest 45.1% of people dispose of wastes in nearby water bodies, open-fields or on roadsides. This can cause waterlogging, road and drain blockage, malodor, water and air pollution in the surrounding areas. Maximum people preferred the dustbin should be closed as it causes many problems. Achieving a controlled, engineered landfill with a minimal level of environmental pollution and health risk to the public (here defined as a "sanitary" landfill), can be a step to step process depending on the financial situation of the authorities [18].

3.7 Impact of Unplanned Waste Disposal

Fig. 8 shows that malodor is the main problem because of unplanned waste disposal. About 25% of slum dwellers agreed that water logging

has been happening for unplanned disposal of waste. For not having a particular dumping zone, wastes spread everywhere. It obstructs the mobility of people by blocking the road.

3.8 Impact on Human Health

From the survey, it was found that unplanned waste disposal causes many types of pollution, which have much impact on the health of slum dwellers. Fig. 9 shows that 42.32% of people thought unplanned waste disposal does harm to child health. Waterborne diseases, mainly affect children because of their weak immunity. Besides 12.63% of people believed that unplanned waste disposal was a big reason for the mental and physical anxiety of the urban people and 2.89% people thought it can harm all ages of people.

4. DISCUSSION

The study conducted on five wards of SCC reveals the sanitary condition and waste disposal of slum dwellers. While the slum people are struggling to ensure their basic needs from being under the poverty limit, they didn't construct sanitary latrines as seriously as they should. Open defecation predisposes water and food to fecal contamination and may cause diarrhea and other fecal-oral diseases [19]. In the study area, the majority of people were used to unhygienic defecation which was the main sources of spreading diarrheal and other sanitation-related diseases. Untreated water may cause several diseases such as cholera, typhoid, amoebic, bacillary dysentery and other diarrheal diseases [20]. For drinking purposes, the majority of the people in slum used tap water which may cause several waterborne diseases. Though major people have a good practice of washing hands with soap, some of them also rubbing their hands with soil or mud. Malodor from the wastes creates an unhygienic ambience for everyone such as Bronchitis, respiratory, etc. Unplanned disposal of waste is a big threat to slum people's health [21]. Severe odor and unpleasant aesthetic problems were found in many of the existing latrines in slum areas. Most of these uncollected wastes which are often mixed with animal and human excreta are usually thrown in an indiscriminate manner in both the streets and drains which contribute to flooding, insect breeding, rodent vectors and the ultimate spread of diseases [22]. Maximum people didn't use community service for waste transportation and disposal, they throw their household wastes on the drain or open places which may lead to environmental pollution. The people of these areas were facing problems like malodor and mental anxiety.

5. CONCLUSION

Due to rapid urbanization, people gradually migrate from rural to the urban area expecting to get better opportunities. Typically poor citizens, migrants from the rural areas are the inhabitants of the slums. The study accompanied at five different wards in Sylhet city found that the deteriorated sanitation scenario and waste disposal system causes severe environmental degradation. Obviously, the improvement of the environmental condition of Sylhet City mostly depends on the improvements in the sanitation condition and waste disposal pattern of the slum areas. This study found that sanitary and waste disposal condition is very poor. As much as 67% of slum people are used to supply water for drinking purposes. Only 19.6% of slum people use the hygienic sanitary latrine and the defecation type of the rest is unhygienic. Open defecation led to water pollution causing various excreta-related diseases. Only 54.9 % of slum dwellers dispose of their waste in a proper manner. So the unplanned waste disposal has been degrading the environment. Lack of education and knowledge, not having awareness about health and hygiene, unwillingness, poverty, etc are also responsible for the worsened situation of slum people. Slum people are fighting against poverty and trying to improve their economic condition and standard of living. These problems of the slum can be solved by themselves with little support from the Government and NGOs. Additionally, organizing health education, counselling services for the slum dwellers to make them aware of different diseases, basic knowledge on water, proper sanitation, and waste disposal services provided by the govt. and NGOs should be implemented in the slum areas.

6. RECOMMENDATIONS

According to the respondents the following steps should be taken to improve the quality of service in this area:

- Quality of sanitation facilities needed to be improved.
- Hospital and more health care centers should be established in the locality.
- The reduced price of medicine so that slum people can afford it.

- Distribution of iron and vitamin tablet by the Government in the locality is needed.
- Government and non-government organizations should work in increasing awareness of different health issues.
- Established sufficient dustbin in the area.
- Proper garbage cleaning facility by City Corporation.
- Regular spraying to controlling mosquito in the locality.
- To manage the total waste, SCC has to increase its manpower.

CONSENT AND ETHICAL APPROVAL

This study was approved by the local responsible authority. All participants were free to refuse the interview at any time before, during or after the interview. Interviews were conducted privately and study team members maintained the confidentiality of subjects.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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