

**ENVIRONMENTAL STATUS OF SLUM AREA: A CASE STUDY ON
TEJGAON, DHAKA**

NAIMA CHOWDHURY



**DEPARTMENT OF AGROFORESTRY AND ENVIRONMENTAL SCIENCE
SHER-E-BANGLA AGRICULTURAL UNIVERSITY
DHAKA-1207**

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**ENVIRONMENTAL STATUS OF SLUM AREA: A CASE STUDY ON
TEJGAON, DHAKA**

BY

NAIMA CHOWDHURY

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APPROVED BY:

Md. Golam Jilani Helal
Assistant Professor
Supervisor

Dr. Md. Forhad Hossain
Professor
Co-Supervisor

Dr. Jubayer-Al-Mahmud
Chairman
Examination Committee



Department of Agroforestry and
Environmental Science

Sher-e-Bangla Agricultural University

Sher-e-Bangla Nagar, Dhaka-1207

CERTIFICATE

*This is to certify that the thesis entitled, “**Environmental Status of Slum Area: A Case Study on Tejgaon, Dhaka**” submitted to the Faculty of Agriculture, Sher-e-Bangla Agricultural University, Dhaka in partial fulfilment of the requirements for the degree of **Master of Science (MS) in Agroforestry and Environmental Science**, embodies the result of a piece of bona-fide research work conducted by **NAIMA CHOWDHURY, Registration no. 18-09250** under my supervision and guidance. No part of this thesis has been submitted for any other degree or diploma.*

I further certify that any help or source of information, received during the course of this study has been dully acknowledgement by him.

December, 2020
Dhaka, Bangladesh

Md. Golam Jilani Helal
Assistant Professor
Supervisor

**DEDICATED
TO MY
BELOVED PARENTS**

ABBREVIATION AND ACRONYMS

BBS	Bangladesh Bureau of Statistics
BPHC	Bangladesh Population and Housing Census
CDE	Centre for Development and Enterprise
DMA	Dhaka Metropolitan Area
EA	Environmental Assessment
ECV	Extent of Categorized Variables
<i>et al.</i>	And others
FGD	Focus Group Discussion
GO	Government Organization
HIV	Human Immunodeficiency Virus
Max.	Maximum
Min.	Minimum
NGO	Non-government Organization
OE	Oil Equivalent
SD	Standard Deviation
Sig.	Significant
SPSS	Statistical Package for Social Sciences
SVRS	Sample Vital Registration System
TBA	Traditional Birth Attendants
UN	United Nations
WASA	Water Supply and Sewerage Authority
WPR	World Population Review

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The Author

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ENVIRONMENTAL STATUS OF SLUM AREA: A CASE STUDY ON TEJGAON, DHAKA

ABSTRACT

The living status and environs problems of slum dwellers mirror the surrounding conditions of these people which can give a clear idea of separate region of an urban area. Although located within City Corporation, the slum's facilities have limited access to the urban services. Present study was conducted in 2019 at the industrial area and railway station of Tejgaon under Dhaka district on 100 families for identifying their surrounding environmental issues, environmental pollution and homestead cultivation status. Personal interview using interview schedule through random selection was used to carry out the survey. Significant positive ($p < 0.05$) relation was observed on educational qualification, knowledge about environment, source of water, fuel use status and information about cultivation of the respondents showed positive significant relationship with environmental status. Fever is the most common health issue of the slum dwellers. Among the 100 respondents, 46 percent of them belong to the low income. Instead of having small homestead area, 76 percent of them cultivate some vegetables. 96 percent of the respondents were little conscious about their source of water and they collected their water from WASA. 81 percent of the respondents were low conscious in case of their household waste disposal status and they used community dust-ban mostly. On the other hand, 69 percent of the respondents were low concerned about their sanitation and they used mostly community latrine which was very unhygienic in condition.

CHAPTER I

INTRODUCTION

Bangladesh is one of the most densely populated countries in the world. The population (estimated) of the country stood at 162.7 million in 1 July, 2017. The intercensal growth rate of population 2017 by sample vital registration system (SVRS) was 1.37 per annum (BBS, 2018). Dhaka is a diverse and most populous city nestled along the Buriganga River in central Bangladesh. It is not only the country's capital, but also it's the largest city. The population of Dhaka city per square kilometer is 23,234 (WPR, 2021). As of 2016, the Greater Dhaka Area had a population of over 18 million people, while the city itself had an approximate population of 8.5 million (WPR, 2021). Dhaka's population is projected to hit 21,741,090 in 2021. The population of Dhaka was 335,760 in 1950. Since 2015, Dhaka has risen by 735,230, which reflects a 3.50 percent yearly change (WPR, 2021). A cumulative population of 22, 32,114 was enumerated in the 2014 Census of Slum Areas and Floating Population. They make up 6.33 percent of the urban population and 1.48 percent of the country's total population (Population and Housing Census, 2011). In 1997, there were 13, 91,458 people residing in slums. In the 2014 slum census, the annual population growth rate was 2.70%.

Living in a city gives people greater hope and optimism than in the countryside because of all the opportunities and amenities (CDE, 2014). At the same time, cities are considered unsustainable sources of resource consumption and waste production, greenhouse gas emission, and are a key contributor to climate change (Van der Heijden, 2017). However, shelter in a slum is affordable and appropriate for people on low and irregular incomes due to well-location in terms of urban jobs and livelihoods (Turok *et al.*, 2016). Furthermore, the slum is regarded as high-flying for a cost-effective zone for poor communities. Moreover, the slum settlements in urban settings have distinct features across the world. The expedition of urban slums in the developing world is nothing but as a result of informal, illegal and unplanned urban growth. Slum development is fueled by a combination of rapid rural-to-urban migration, spiraling urban poverty, the inability of the urban poor to access affordable land for housing and insecure land tenure (UN-Habitat, 2003). However, rapid urbanization, lack of urban planning and housing policies have led to the creation of slums and informal settlements

in urban areas. Remembering that the United Nations in 2017 calls on governments to “make cities and human settlements inclusive, safe, resilient and sustainable” recognizing the impact of rapid urbanization. More recently, the United Nations adopted a New Urban Agenda, a blueprint for achieving sustainable urbanization, to help tackle this issue with the goal of upgrading slums and granting slum dwellers access to safe and affordable housing with basic services by 2030 (UN, 2017). Upgrading slum settlement is requisite for sustainable urban development. Therefore, there is a need for sustainable housing solutions for the poor in the urban global south. Unfortunately, affordable housing is out of reach for millions of low-income families, as a consequence of their limited incomes, and because of national and local housing policies that fail to reach the urban poor (Ahmed, 2016). Meanwhile, the global community has gradually been started working on upgrading slums and informal settlements.

The variety of morphological characteristics of slum dwellers varies significantly within as well as across cities, common determinants exist. Informal or unplanned settlements in particular, do show similar morphologies over the world. They are characterized mostly by extremely high building densities and small building sizes, irregular arrangement of buildings and street network and are often located at exposed sites (Wurm and Taubenbock, 2018).

As evidenced by bad drainage systems, insufficient or non-existent sanitation, and mountains of uncollected garbage, people living in unhygienic conditions cause higher levels of health problems. Slums do not receive any government services, such as sanitation, drains, sewerage and garbage collection, because of their illegal status (Caldwell and Caldwell, 2002).

The living environment of slum Dwellers in the North Dhaka City Corporation was found low and majorities of the respondents were found having high problems (such as lack of proper waste management system, lack of proper sanitation and drainage system, water crisis than necessary and lack of proper health facilities). (Rokanuzzaman *et al.*, 2013).

The population of urban area increases but the services are not. Although located within City Corporation, the slums facilities have limited access to the urban services. These problems are acute in Dhaka City but some other large metropolitan city has faced the same. These services are basic right for every urbanite, but the slum dwellers are not able to get these services.

The present study was undertaken in Tejgaon slum because this type of work is not done in that area in recent few years. Study on Environmental Status of Slum Area at Tejgaon, Dhaka under Bangladesh conditions is not limited. However, considering the above circumstances, the study was conducted with the following objectives:

- To determine some selected criteria of the slum dwellers of the study area.
- To identify the environmental status of the selected locale.
- To explore the contribution of the selected characteristics of the slum dwellers on their environmental status.

CHAPTER II

REVIEW OF LITERATURE

The purpose of this chapter is to review the past studies conducted by different researchers related to the present study. As far as possible, the researcher tried to review the available literature from different countries related to environmental status of slum dwellers. In the first section, literatures relating to the selected characteristics of Slum Dwellers have been presented. Finally, the second section of this chapter deals with the conceptual framework of the study.

2.1 Age of slum dwellers

Caldwell (2005) stated that in contrast to East and South-east Asia, changes in marriage status have played a small role in reducing fertility in South Asia. While age at marriage for women has risen, it remains early, with the exception of Sri Lanka, and change has been slow. Except in Sri Lanka, the region has shown few signs that there will be a sizable population that will never marry. South Asia's marriage status reflect its cultural context and lesser socio-economic change but their precise effect is not simple or always predictable. The paper examines these issues in Bangladesh, where age at marriage is very early, and Sri Lanka, where it is much later. The study areas, Dhaka city and south-western Sri Lanka, are ones of great economic and social change. A particular examination is made of the way in which changes in the arrangement of marriage affect age at marriage.

Rahman *et al.* (2015) found that the average age of the respondent was 33 years. Among them, 43.3% of the respondents were aged below 30 years, 23.3% of the respondents belonged to age group 30-39 years, 15% was in the age group 40-44 years, 8.3% was in the age range 45-49 years, while 10.0% of the respondents were aged 50 years and over.

According to Kamruzzaman and Hakim (2015) among the total respondents, 65.7% boys while 41.7% belong to the age group of 13 to 15 years.

Alamgir *et al.* (2009) found that the household members aged between 16-55 years constituted the highest 57 percent, which reveals that working age group dominated the slum dwellers.

Latif *et al.* (2016) reported that among 36 male and 32 female respondents, 34.70% were of 21 - 30, 31.1% were of 31 - 40, 18.30% were of 41 - 50 age groups and 10.5% were up to 20 years. Only 5.5% were within 51+ age groups.

Kamruzzaman and Hakim (2016) found that 35.50% slum dwellers were between 20-24 years of age while 52.38% are female and 68.25% married.

Rokanuzzaman *et al.* (2013) showed on their study named Study on Livelihood Status of Slum Dwellers in the North Dhaka City Corporation that majority (43.08%) of the respondents were young in the study area.

2.2 Educational qualification of slum dwellers

Carpenter *et al.* (2004) conducted experiments in urban slums to measure trust and cooperation and to see how behavior varies with demographic factors and associational measures of social capital. Overall, we find high contribution rates among Thai and Vietnamese participants in a voluntary contribution game, and we see that many participants are willing to signal their disapproval of free riding despite it being costly to do so. At the individual level, we find that behavior varies with many demographic factors and with many associational factors. However, these correlations often differ significantly between our two locations, indicating the role of culture, defined broadly.

Rose (2011) assumed that non-government education providers prefer to operate without 'interference' from government. However, in practice, they inevitably need to form relationships. There is also a common view that non- governmental organisations (NGOs) have to choose between service delivery and advocacy. As this article shows, these objectives are often not independent of each other. Drawing on evidence from established national non- government education providers in Bangladesh, India and Pakistan, the article identifies different strategies adopted in balancing their service delivery and advocacy objectives. In all cases, the NGOs find ways to ensure a cooperative rather than conflictual relationship with government to pursue their goals. Strategies vary according to the strength of the national policy context, the formality of

the relationship and the degree of dependence on funding sources, with the latter being most influential.

Kalyanpur (2008) stated that in contrast to the phenomenon of minority overrepresentation in special education in developed countries such as the United States, a paradoxical situation occurs in many developing countries, whereby majority populations are underrepresented in the educational system. The author examines some of the prevailing and traditional societal and political-economic factors specific to India that contribute to this underrepresentation, such as a paucity of resources that affects children from low socioeconomic backgrounds, gender differences in child rearing and educational expectations that affect girls, and negative attitudes toward disability.

Sen (2015) concluded that, the overall socio-economic conditions of slum dwellers in Basirhat Municipal area, West Bengal are not good at all. Socio-economic characteristics such as age, education level, male-female ratio, family size, occupational status, annual income etc were considered in his paper. Education is considered as an important factor of the socio-economic characteristics of the household. In slum areas there are no available formal education facilities for slum dwellers. Maximum slum dwellers have no education but some NGOs and organization try to provide them informal education.

Sinha *et al.* (2016) have identified that, the literacy rate of slum population is a bridge between the literacy rate of rural population and literacy rate of urban population. Since the literate people are more mobile than the illiterate people so higher number of literate persons have migrated from rural to urban area and because of unplanned and haphazard way of urbanization these people are forced to live in sub human conditions of slum areas and this resulted into higher rate of literacy in slum areas in comparison to rural areas.

Rokanuzzaman *et al.* (2013) showed on their study named Study on Livelihood Status of Slum Dwellers in the North Dhaka City Corporation that almost one half (43.07%) of the respondents was illiterate to could sign only.

2.3 Family size of slum dwellers

Hossain *et al.* (2010) examined 'Livelihood Framework' in Dhaka City, Bangladesh concluded that slum people invariably live below the poverty line and have little access

to employment in formal sectors. They have failed to secure a sustainable livelihood in the city despite living for a long period. The poor communities are vulnerable in terms of their physical and social capital. They have little access to the city's social and political structure, which also shows their vulnerable situation. Urban government has little initiative to create opportunities for the poor sections of city's population. The poor communities cope with urban life through 'household strategies' such as: putting more family members into the work force, through petty trading, avoiding many basic goods, which represent luxuries to them, increasing their household size by inducting more relatives, withdrawing their children from education, constructing their own shelter, using kinship as social capital, and establishing patron-client relationships with local leaders.

Frankenberger *et al.* (2000) stated that livelihood approaches are a holistic way of thinking about development goals, scope and expectations that placed individuals and their priorities at the core of their thinking. These livelihood strategies concentrate on empowering the poor by building on their own opportunities, facilitating their access to services, and in the establishment of an enabling institutional and policy climate. The methods found useful by NGOs and donor agencies.

2.4 Annual income of the slum dwellers

Singh (2016) showed on 'Socio-economic conditions of slums dwellers: a theoretical study' that the housing conditions of the slums areas is very poor. They lived in the dilapidated housing structures, lack of cross ventilation; lack of lighting sources affects the health of the slum dwellers. The educational level of the slum dwellers is very low. Most of them belong to the lower socio economic group. Most of places where slum dwellers live are unhygienic to the lives.

Alamgir *et al.* (2009) conducted a study to determine the factors affecting the livelihood of the socioeconomic improvement of migrants and to analyze the causes of rural-urban migration in slum areas. Analysis showed that migration and taking in micro credit were beneficial for the slum dwellers. Due to participation of slum dwellers in NGOs, their economic, social and decision making improved substantially. Finding showed that 56% people migrated to Dhaka city for economic reason. The study recommended that,

there is a need for proper training for sustainable results for slum dwellers in the long run.

Pawar and Mane (2013) have studies about the socio-economic conditions of the slum dwellers and investigated that, the socio-economic status is calculated through explained of the occupation, income, expenditure of the population. Occupation is playing an important role in socio-economic status. It affects other elements like living standard of population, socio-economic status of population and development and progress. The socio-economic status depends upon the living standard of individuals. Living standard also depends upon the income of family. It is a helpful for improvement of good life. Occupations are depended upon education level, family background, employment facilities in their periphery and skills. Slum dwellers performed occupations like tailor, retail shopkeeper, home servant, construction labor, catering, and alcohol retailer and like this other illegal activities, herding of goats, sheep's, hen and cocks etc. These occupations provided very low income in compare the heavy workload. The income is varying from occupation to occupation. Thus slum dwellers do low levels of jobs and get less money, so their socio-economic condition is poor. Authors have also identifies that, modern home assets and amenities also helpful to show the socio-economic status of slum dwellers. T.V. fan, gas, mobile, CD player etc. are used on large scale because there assets are purchasable for slum dwellers income. But fridge, furniture, phone, are used rarely because these assets are so costly for slum dwellers.

Lukeman *et al.* (2014) showed on their study named 'Socio-economic attributes of residents of slum and shanty areas of Lagos State, Nigeria' that majority of the respondents which amounted to 30.2% were involved in petty trading which has direct effect on their daily income and standard of living. It is also discovered that the incomes of about 39.2% of the respondents are meager to cater for their immediate families.

Hossain (2014) examined 'Livelihood Framework' in Dhaka City, Bangladesh concluded that slum people invariably live below the poverty line and have little access to employment in formal sectors. They have failed to secure a sustainable livelihood in the city despite living for a long period of time. The poor communities are vulnerable in terms of their physical and social capital. They have little access to the city's social and political structure, which also shows their vulnerable situation. Urban government

has little initiative to create opportunities for the poor sections of city's population. The poor communities cope with urban life through 'household strategies' such as: putting more family members into the work force, through petty trading, avoiding many basic goods, which represent luxuries to them, increasing their household size by inducting more relatives, withdrawing their children from education, constructing their own shelter, using kinship as social capital, and establishing patron-client relationships with local leaders.

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2.5 Monthly family expenditure of the slum dwellers

Latif *et al.* (2016) conducted a study on Socio-economic and health status of slum dwellers of the Kalyanpur slum in Dhaka city. The study Showed that the slum dwellers work as garments workers (24.2%), household workers (13.7%), rickshaw pullers (19.2%), street hawkers, day laborers, masons etc. The range of household income of slum dwellers was about Tk 6,000 - 10,000 and they spent most of their money on food (61.39% of income). The study finds that poor socio-economic status and inadequacy of urban services has had an immediate effect on urban health specially the slum poor in metropolitan cities in the country.

Verma (2001) indicated that the health status of the slum dwellers of Mumbai is influenced by poor economic status of the household, awareness, availability and accessibility of health facilities etc.

Sajjad (2014) investigated in his article that, there is high rate of unemployment among the slum dwellers. The employment status of the slum dwellers shows that most of the male slum dwellers in notified and non-notified slums were engaged as daily wage earners. They worked as rickshaw pullers, Tonga pullers, industry workers and construction workers. The major businesses run by these slum dwellers are street

vending, hawking, petty shop keeping and selling handicrafts. A few were engaged in services. The higher ratio of domestic women workers in both the notified and non-notified slums is attributed to the greater opportunity of women oriented work in nearby localities. Irregular employment causes insecurity and financial problems which may lead to various social evils and crimes. The bad consequences for individual employees extend out to bad effects on families and communities.

According to Rahman *et al.* (2015) on Socio-economic status of slum dwellers: a case study of Uttara periphery, Dhaka, the average money spend for food and groceries was 44.86% whereas the average monthly house rent including utilities was 32.02% and educational expense of children was 9.03% per month while cost for health care per month was 7.44%. It was observed that they live in unhygienic surroundings. In the slum area, the youngest and adult age group (0-24 years) had morbidity rate of 30.8% followed by population in the age group 35-39 years (17.9%). Morbidity was lowest (5.1%) for the population belonging to age group 30-34 years, followed by morbidity of population aged 40 and above (each group has morbidity rate 12.8%). Slum people were found to be engaged in day laborer, small job services, rickshaw pulling, and little business.

2.6 Respondents knowledge about environment

Seth *et al.* (2005) stated that only 13% (10.6–15.7%) of the study participants were aware of Pap smears, and only 2% (1.1–3.3%) were able to identify all the common signs of cancer. However, 87% (84.4–89.5%) of the study participants knew that tobacco is a risk factor for cancer. Overall, 51% (47.2–54.7%) had some knowledge pertaining to cancer.

Tanni *et al.* (2014) conducted a study on State of the Environment in Slum Area: A Case Study on Khora Slum, Khulna. The results showed that about 80% houses are in such a condition that it is very hard to live in there. The main problem is that these people are not aware of the environment pollution. Sanitation facilities are very poor here. Drinking water is another problem here and color is dark of the water of the tube wells.

Uzma *et al.* (1999) on their study examined the health, nutritional status, and health care seeking behavior of a community based sample of 122 postpartum women from

an urban slum in Dhaka, Bangladesh. It describes a physically impoverished environment in which malnutrition is serious, and non-trivial morbid episodes as a consequence of childbirth are very common. Malnutrition was found to be widespread: about one-quarter of the study mothers were short in stature, measuring 145 cm or less in height; over two-thirds of the women weighed <45 kg; and a similar proportion had a BMI of <20. Based on mid-upper arm circumference, an overwhelming majority (96%) suffered from some degree of malnutrition. During the first 6 weeks postpartum over three-quarters of the women reported a non-trivial illness. The frequency of reported illnesses was significantly associated with both increasing age and parity. Despite severe poverty, most of the women reporting illnesses (71%) received some form of health care from a wide range of western and traditional health care providers, with Traditional Birth Attendants (TBAs) and unqualified western care providers being the most frequently utilized. This study highlights the plight of these women in a precarious environment and shows how their health is compromised by cultural and political constraints. They conclude that while the burden of postpartum morbidity is very high, the incorporation of traditional practitioners and unqualified western care providers into maternal health training programs, together with efforts to empower women, could be effective in improving the health status of mothers in this marginalized and fragmented community. To achieve this outcome, a clearly articulated and integrated approach to development in slum communities is required.

2.7 Toilet use pattern

Kalkoti (2013) suggested that, for a better livelihood, proper sanitation system is one of the basic requirements. In broad term sanitation refers to disposal and management of solid wastes, wastewater, human and cattle excreta etc. It is important for human health which contributes to clean and improved environment, social development and generates significant economic benefits.

Risbud (2003) discussed about the sanitation conditions of urban slums of the Mumbai. Sanitation in slums is very poor as 73 % of slums depend on community toilets provided by the government, 28 % defecate in the open, 0.7 % slums have pay to use toilets managed by NGOs and only 1 % of slums have individual toilets.

Biplob *et al.* (2011) found through the Assessment of Water Supply and Sanitation Facilities for Korail Slum in Dhaka City that the level of hygiene knowledge and practice has been found to be significantly low among the Korail slum dwellers. Majority slum people use tube well water for drinking. Normally Korail slum have pit latrines, which are partially hygienic. The drainage system is the most neglected sector in the slums. Besides, solid waste management and drainage system are very unsatisfactory in the slum area.

Dana (2011) showed on her study titled ‘Unhygienic living conditions and health problems: a study in selected slums of Dhaka city’ that the respondents were uneducated, lived in unhygienic and difficult conditions worked in the informal service sector and consumed a diet low in protein. Diseases such as diarrhea and vomiting, malaria, pneumonia, skin problems (scabies, ringworms) and common colds/coughs are related to the unhygienic living environments, lack of water and inadequate sanitation system cited by the respondents. 1998’s slums those are on private land got their water from municipal water supply from the neighbor houses. The slums that are on public lands usually got water from municipal taps located near buy or bought water. While the water supply coverage in the slums is about 69%, the sanitary latrines coverage is only 48%. The remaining people use unhygienic latrines or practice open defecation - unhygienic pit latrines (without water-seal or connected to pen drains) coverage is 36% and rest 16% people use hanging latrines or practice open defecation. About 59% slums are poorly drained.

Naveed and Anwar (2014) studied on ‘Socio-Economic Condition and Health Status of Urban Slums: A Case Study of Jogo Chak, Sialkot’ and found that education level was very low in the studied area. More than half of the respondents were living in joint family system. 95.2 percent households had toilet facility and out of these, 86.7 percent had flush type toilet. This shows that toilet facility is available in these areas.

2.8 Source of water

Democracywatch (2002) conducted a study on “An Assessment on the Uprooted Slum Dwellers” in some selected slums in Dhaka city. The study was based on survey methodology and case studies. This study discovered the reasons for increasing the slum dwellers of the city and the problems they faced. The study found out that the

slum dwellers are deprived of important fundamental rights like accommodation, pure water supply, education etc. They also showed that the dweller's lifestyle is a barrier for modern urban development and a sound environment.

Goswami and Manna (2013) told that, the people in slums live under the most deplorable conditions, potable water and sanitation facilities.

Rao (2009) investigated that, water is one of the basic requirements for livelihood. But scarcity of water stands as a vital problem for many people all over the world. The slum dwellers of many urban areas throughout the world are having serious water problem. It is also seen in Indian urban centre. It is quite evident that the poorer slum areas are pathetic and that most people are under the serious problem of lack of water.

Prasad and Singh (2009) has discussed about living condition and life style of Mankhurd slum dwellers. The slum dwellers residing in Mankhurd face a variety of problems pertaining to water and sanitation. Around 98 percent slum dwellers had problems pertaining to fetching water while around 97 percent had problems in toilet use.

Risbud (2003) has studied on urban slums of the Mumbai and reported that, about 49 % of slums have access to water supply from shared standpipes, while 38.3 % have a supply from more than one source. Remaining slums get their water from tube wells or community standpipes. Women and children daily spend a lot of time and have to make several trips to collect water. Sanitation in slums is very poor. Inadequate water supply and poor maintenance of the water availability causes unhygienic health condition in the slums of Mumbai.

Hasan *et al.* (2018) showed on their study 'Environmental Impact on Safe Drinking Water and Livelihood in Urban Slum of Barisal Metropolitan City of Bangladesh' that the study area is most vulnerable area to the natural hazards. People's face different problems like natural hazards, lack of safe drinking water and poor knowledge on environmental related factors. The safe drinking water is contaminated by pollution water during rainy season. People suffer from various types of diseases propagated through pollution of water.

2.9 Fuel use pattern

Shrestha *et al.* (2008) conducted a study which examine the energy use status of slum-dwellers in two cities of Thailand, Bangkok and Khon Kaen, the energy expenditures, and the key factors for the high access to electricity and other modern forms of energy. This study finds that almost 100% of the households in the slums of Bangkok and Khon Kaen have electricity connections. Also, a very high percentage of slum-dwellers (about 87% in Bangkok and 86% in Khon Kaen) use LPG for cooking. Slum-dwellers spend about 16% of their monthly income on energy in Bangkok and about 26% in Khon Kaen.

Lipu *et al.* (2016) stated that the energy access status of urban poor in Dhaka is low in spite of being in an urban setting where the physical availability of modern energy like electricity and natural gas is prevalent. A demand-based approach of estimating energy poverty showed that more than one third of population in Dhaka slums are poor and a monthly minimum 2.38 kg OE of useful energy is needed per person to sustain their basic needs. However, the distribution of income and energy poor reveals that not all energy poor are income poor and vice versa, and there are more income poor than energy poor in the community. A closer look at the energy consumption status shows that the energy consumption of both energy and income poor are heavily reliant on traditional energy sources with minimal usage of modern energy. Adequate access to modern energy plays an important role in addressing energy poverty as well as income poverty.

Liza (2014) conducted a study at rural and urban area in Bangladesh which revealed that the urban poor are highly dependent on traditional fuel such as fuel wood, cow dung, charcoal, rice husk, sawdust etc. It is seen that about 43% households use fuel wood as their primary fuel choice; where as in rural area about 49% households use cow dung as their primary fuel for domestic purpose. In urban area 51.4% of energy comes from fuel wood which is locally available in market. It is important to denote that mobile shop play a vital role as energy carrier for urban poor. Here mobile shop is a vehicle that carry chopped wood move from one area to another and sells this fuel from door to door. On the contrary, about 31% of energy comes from cow dung in rural area and 23.8% comes from agricultural residues.

2.10 Household waste disposal status

Reza *et al.* (2019) conducted a study in Sylhet City Corporation in which found that 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.

Uddin (2018) stated that the sustainability of urban development through the livelihood conditions of slum dwellers in Bangladesh. He found that they had scarce and insufficient health, sanitation, water and waste disposal services which are unswervingly impeding to sustainable development in urban areas.

2.11 Drainage facilities

Rokanuzzaman *et al.* (2013) showed on their study named Study on Livelihood Status of Slum Dwellers in the North Dhaka City Corporation majorities (65.37%) of the respondents were found having high problems (such as lack of proper waste management system, lack of proper sanitation and drainage system, water crisis than necessary and lack of proper health facilities).

Islam *et al.* (2015) studied on present situation of water supply and sanitation at Karail Slum, Dhaka. Those results revealed that Poor physical environment with non-existent solid waste disposal system is very common phenomenon in Surveyed slum. Most of the people of the slum live under unhygienic environment. However, the level of hygiene knowledge and practice has been found to be significantly low among the Karail slum dwellers. The study in Karail area of Dhaka city has found that the sanitary and water supply conditions are improving very slowly.

Hossain (2005) conducted a study at Dhaka city in which he found that most of the poor (64.4%) living in the city have no access to drainage facilities. Only 17.8% have access to municipal waste disposal facilities and the rest of them dispose in generally marshy land adjacent to their settlements, which also pose serious challenge to the environment of the neighborhood.

2.12 Prevalence of morbidity of the slum dwellers

Neeraj and Sanjay (2003) have studied about the socio-economic and health status of slum women. Urban slum women are mostly effected by the cultural and behavioral barriers like female illiteracy, poor economic conditions and low level of living slandered. This study also focuses on malnutrition status of urban slum women. Malnourishment is very likely to occur when insufficient incomes co-exist with poor coverage of basic amenities and health services.

Karn *et al.* (2003) examined the relationship between living environment and health status of urban slums in Mumbai. The study showed that polluted drinking water, insanitary living conditions, poor personal hygiene and food cleanliness are contributed to water related diseases among the slum dwellers. The impact of poverty and environmental factors highly pronounced between slums and pavement dwellers. The study revealed that income, literacy, sanitation and personal hygiene have had impact on the morbidity of the people. The study proved the effect of socio-economic and the environmental factors on health status of urban poor.

Gangadharan (2005) studied the socio-economic and health behavior of five social classes, upper class, upper middle, lower middle, upper lower and lower in the utilization of health services in Kannur slum. The study observed that slum area are effected with poor household conditions, educationally backward, high level of diseases, lack of available health services.

Kamruzzaman and Hakim (2016) studied on ‘Socio-economic status of slum dwellers: an empirical study on the capital city of Bangladesh’ and showed that people living in slums had sad tales in living conditions. Owing to bad hygienic condition and health, statuses of households were also not in satisfactory level. The morbidity rate was very high among the studied population and it was concluded that people living with low socio-economic conditions were to face different health and hygiene problems.

Sajjad (2014) concluded that, notified slums of Mumbai have better household environmental conditions than non-notified slums of the areas. All houses of the slum dwellers were over- crowded and poor both in terms of structure and ventilation, thus inviting various diseases and infections.

Goswami and Manna (2013) said that, the living conditions in slums have a direct impact on people's health. Their low socio-economic status, low level of education and high fertility and mortality- all indicate that they need special attention in terms of public health, family planning and reproductive health programs. Rapid slummification has caused wide spread of environmental degradation in the urban city.

Madhiwalla (2007) elaborates that, the growth of cities has always been accompanied by the growth of slums. Ill health conditions due to overcrowding, poor housing and unsanitary environment, coupled with poverty are found in slum dwellers. The relative difference in income and wealth is much starker in urban areas. The higher purchasing power of the rich people drives up the prices of food and healthcare goods, making them unaffordable to the poor. The rich also consume more than their fair share of public goods, for example, water, infrastructure, electricity, which are often subsidized by the state. Poverty and other forms of social disadvantage translate into poorer health status and outcomes for the urban poor.

Singh and Souza (1980) have reported about the water born diseases among the slum dwellers in his book urban poor. The most common diseases in the slums are gastrointestinal diseases, diarrhea, water diseases, parasitic worms/infestation and oral diseases etc.

Nijama (2003) found that due to lack of proper living conditions slum children are vulnerable to diarrhea, typhoid, malaria and other such diseases. To improve the living condition of slum dwellers better facilities pertaining to water, sanitation and health education should be provided.

Sijbesma and Dijk (2006) concluded in that poor hygiene and sanitation, lack of safe drinking water contribute to health problems of the slum dwellers.

2.13 Environmental status of the slum dwellers

Braun and Abheuer (2011) stated that in many megacities of the global south, the combination of rapid population growth and high pressure on space for housing, results in urban growth taking place in areas particularly prone to natural hazards. Dhaka, the capital of Bangladesh, is no exception to this rule. Many marginal settlements or slums are located on low-lying land at high risk of flooding. This paper analyzes the vulnerability of slum dwellers in Dhaka and highlights the major factors behind their

sensitivity to floods and their ability to adapt to the related changes. The empirical findings presented are based on a questionnaire survey covering 625 households in five slum areas of Dhaka. Our data suggests that social capital plays an important role with regard to the ability of slum dwellers to find ways to live with the floods. Regardless of how strongly people are affected, mutual help and support are dominant features in times of crises. While poorly educated and resourced slum dwellers are highly vulnerable to external shocks, they still show a surprising capacity to cope with natural calamities.

Rana (2009) conducted a study on Status of water use sanitation and hygienic condition of urban slums: A study on Rupsha Ferighat slum, Khulna. He found that the level of hygiene knowledge has been found to be significantly high among the slum dwellers, although the practice is low. For lack of sufficient water sources, most people resort to unsafe water sources like ponds, rivers and even ditches which cause sufferings from diseases.

Chowdhury and Amin (2006) carried out a field survey in two slums of Dhaka where infrastructure projects were implemented. In one slum, the EA process was considered in designing and locating infrastructure and in the other it was not. The survey results traced the severe problems that existed in both slums before the implementation of infrastructure improvement projects and reveal that after the intervention the situation has considerably improved in the slum where EA was conducted. In contrast, some problems still persist in the other slum where EA was not considered. To make it worse, the newly built infrastructures have even given rise to a set of new problems. In order to avoid such negative outcomes from development interventions, the paper finally develops the mechanism for integration of EA into slum improvement project.

Dewan *et al.* (2012) stated that the environmental problems associated with the unprecedented urbanization in Dhaka Metropolitan Area of Bangladesh. Analyses revealed that a rapid spatial expansion of the city has been taking place alongside the remarkable rise in urban population, simultaneously putting immense pressure on natural resource-base. Substantial changes that were observed in land use and cover are believed to be a significant factor in elevating the risk of natural hazards, particularly flooding during monsoon. In addition, air, water, and noise quality, have all become acute, and are subsequently posing uncertain liabilities to the inhabitants' health of the

area. Rapid uncoordinated urbanisation gives rise to a spectacular growth of slums and squatters, making 3.4 million slum dwellers in 2006 from only 1.5 million in 1996. Achieving sustainable urban development in the DMA therefore, requires tackling the environmental problems in a rational manner.

Hossain (2014) Investigated 28 years data for 1986-2014 periods on the living standard of slum dwellers of Bangladesh and presented the different forms of their deprivations, sufferings and miseries from basic needs including social, constitutional and economic rights. More specifically, the wretchedness of slum dwellers in housing, drinking water, sanitation, food intake, healthcare, education, employment, income status, social status and security, economic and public assistance has been explored. In addition, poverty scenario and services of social organization among slum people has been focused in this paper.

Jahan (2012) stated that rural urban migration is the principle component of rapid and unplanned growth of towns and cities in the developing countries. Gross disparities in socio-economic opportunity between urban and rural areas and frequent natural disasters in some regions encourage large flow of migrants from rural Bangladesh to the large cities. For various reasons Dhaka is an attractive destination for the rural migrants. Migration to Dhaka, the capital city of Bangladesh, is the focus of this article which identifies the factors contributing to the migration process. The impact of migration is diverse both at the urban destination and at the rural origin. At both ends, there are economic, demographic, environmental and socio-cultural impacts. This paper focuses on the urban end. It examines the overall conditions of the underprivileged, poor migrants and the consequences of migration on the physical and social environment on their choice of destination.

Zanuzdana *et al.* (2013) conducted a study in which they described that Quality of housing plays one of the key roles in a public health research, since inadequate housing may have direct or indirect negative impact on health. Higher satisfaction with housing was shown to be associated with higher income, higher age, a smaller family, higher education, being female and being an owner of a dwelling. The aim of our study is to identify the multiple sources of the satisfaction with housing in population of urban slums and rural areas in Dhaka, Bangladesh. We have used a combined variable “Housing Satisfaction”, containing nine items related to satisfaction with different

types of housing facilities (water, electricity, toilet etc.). Ordinal as well as binary multiple logistic regression models were applied to predict housing satisfaction. Rural residents (with 90 % house ownership) were much more satisfied with their housing than urban slum dwellers. The major findings of the study showed a complex relationship between housing satisfaction and the quality of basic facilities including the reachability of medical care.

Alam and Rabbani (2007) in their study stated that city-based activities contribute significant amounts of greenhouse gases and, simultaneously, are often more vulnerable to the impacts of climate change. Dhaka is now the world's eighth largest city and a significant proportion of Bangladesh's greenhouse gases are generated there although, relative to total emissions worldwide, the contribution is negligible. However, this contribution is likely to increase rapidly with the continuing growth of the city's population, economy and electricity consumption, as well as increased motor vehicle use. At the same time, Dhaka is prone to damaging and costly flooding, both from the rivers that bound it and from rainfall that generates runoff that is beyond the capacity of the drains. In less than 20 years, the city has faced three major floods, each causing huge damage and economic loss. Although the government has taken a number of measures to improve both Dhaka's air quality and its capacity to withstand floods, there are further opportunities in both areas. This paper discusses, in specific terms, the scale of the threats, the measures taken to address them and the potential for more effective action.

Siddique and Pandey (2003) on their study focused that deteriorating environmental quality is the source of a variety of grave problems facing urban residents. This article reports slum residents' perceptions and responses to air and water pollution, noise, garbage, crowding, and traffic. The respondents were 280 male and female slum dwellers in Old Delhi, New Delhi, and Allahabad in India. Results showed that slum dwellers of Delhi reported greater stress compared to the respondents of Allahabad, and they further reported greater helplessness and acceptance in coping with the environmental stressors.

Uddin (2018) stated that the sustainability of urban development through the livelihood conditions of slum dwellers in Bangladesh. The empirical data were collected through interview schedule and FGD from 97 respondents in two slum areas of Bangladesh.

The respondents were selected purposively from the second largest city of Bangladesh namely, Chittagong. The results clearly indicate that there exist significant diversity and differences of sustainability indicators, particularly household and housing characteristics, health, drinking water, waste disposal system and security. More specifically, the finding shows that slum dwellers have been experiencing with a wide range of substandard, overcrowded and unhealthy housing conditions in one hand. Therefore, the findings suggest a holistic approach to address the multi-faceted sustainability issues that affect the livelihoods of slum dwellers within the framework of context-driven development policy of the country.

2.14 Conceptual framework of the study

In scientific research, selection and measurement of variables constitute an important task. Based on review of past times, the present study tried to focus two concepts: first, the selected characteristics of the respondents and second, livelihood, socio-economic and environmental condition. In view of prime findings, the researchers constructed a conceptual framework of the study, which is presented in Figure 1.

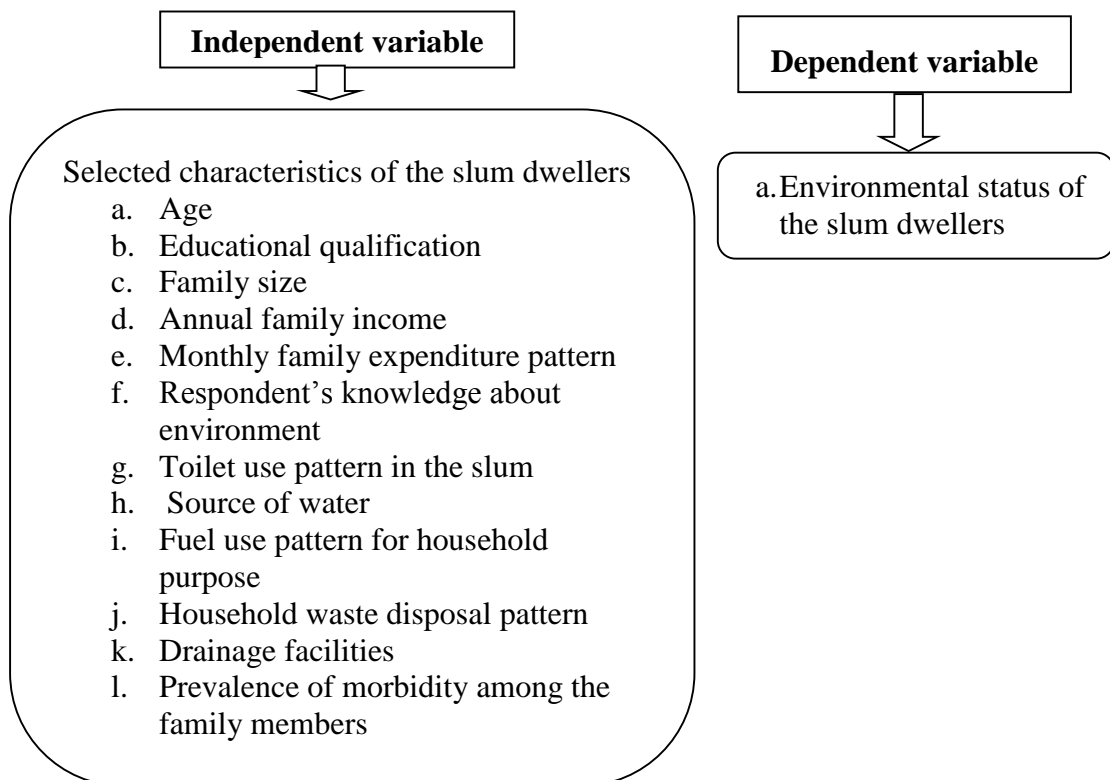


Figure 1. Conceptual framework of the study

CHAPTER III

METHODOLOGY

Methodology refers to the methods and procedures in the research work. In any scientific research, methodology plays an important role and requires a very careful consideration. More appropriate the methodology more accurate the research. The basic materials for conducting any research are the unbiased information and facts.

Methodology should be appropriate so that the researcher will be able to collect necessary data and analyze them in a proper way, which will help him to reach correct decision. Building of research methodology requires a vast knowledge, experience and skill. Considering this, the researchers went through previous studies, obtained from supervisors and experts regarding all aspects of this piece of the study.

A sequential description of the methodologies followed in conducting this research work has been presented in this chapter.

3.1 Design of the study

The present study was a social scientific survey. It was designed to study environmental status of some slum dwellers of Tejgaon industrial area and Tejgaon railway station in Dhaka, Bangladesh.

3.2 Locale of the study and sampling

Tejgaon Industrial Area, a metropolitan thana within Dhaka City North Corporation. The thana occupies an area of 4.77 sq.km. and consists of 1 full and 2 part city wards and 9 city mahallas. The average size of population of each ward and mahalla are 48911 and 16304 respectively (BBS, 2015). The study was conducted at Tejgaon industrial area and railway station of Tejgaon. From the Tejgaon industrial slum, 60 heads and Tejgaon railway station slum, 40 heads were selected randomly. So, the total population stood 100. For the study total population sample was 100. A map of Tejgaon is shown in Figure 2.

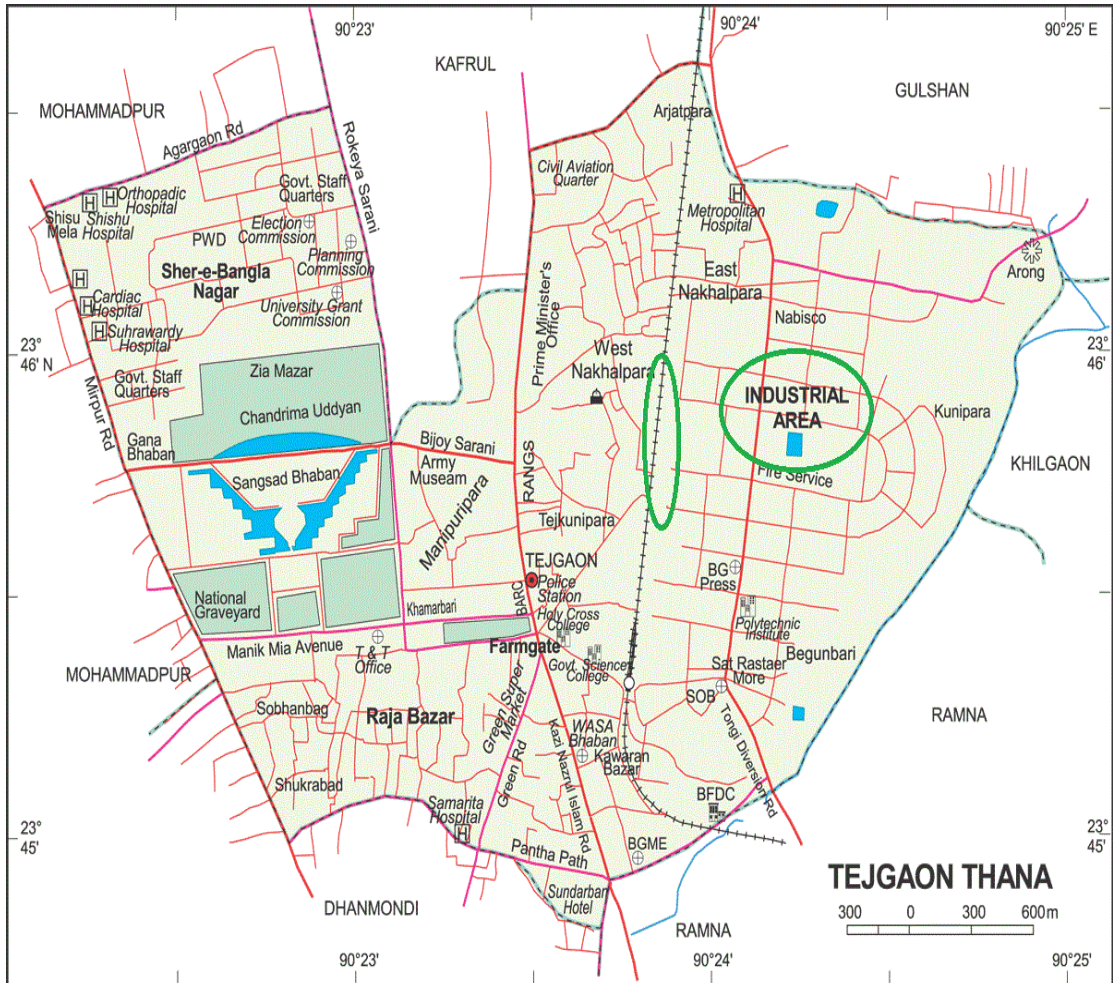


Figure 2. A map of Tejgaon showing the study area

3.3 Preparation of interview schedule

An interview schedule was used as the research instrument in order to collect relevant information from the respondents (slum dweller). The interview schedule was prepared for data collection in English keeping the objectives of the study in view. The interview schedule contained both simple and direct form of questions to collect data on the selected variables. The interview schedule was structural and then multiplied in its final form for collection of data. English version of the interview schedule has been presented in the Appendices.

3.4 Data collection

Two types of data, primary data from the respondents and secondary data from various journals, were collected. Data were collected by the researcher through personal interview using interview questionnaires through randomly selection during 13th August to 22th November in 2019.

3.5 Data processing

After completion of survey all the interview schedules were compiled for data processing. At first all the qualitative data were converted into quantitative form by means of suitable code and score whenever necessary. In several instances, scales were constructed through the simple accumulation of scores assigned to individual or status of attributes. Indices and scales were considered the efficient instrument for data reduction and analysis.

3.6 Selection and measurement of variables

3.6.1 Selection of variables

Fourteen selected characteristics of the respondents were treated as independent variable for this study. The selected characteristics were age, educational qualification, family size, annual family income, monthly family expenditure, status, respondent's knowledge about environment, toilet use status in the slum, source of water, fuel use status for household purpose, household waste disposal status, drainage facilities, prevalence of morbidity among the family members and environmental problems faced by the slum dwellers. Environmental problems faced by the slum dwellers was considered as dependent variable of the study.

3.6.2 Measurement of variables

3.6.2.1 Age of the respondents

The age of a respondent was measured in terms of actual years from his birth to the time of interview on the basis of their response to the interview schedule (Appendices). Based on age, the respondents were classified into following categories as shown in Table 1.

Table 1. Categories of the respondents according to their age

Categories	Score (Year)
Young	≤ 35
Middle aged	36-50
Old	>50

3.6.2.2 Educational qualification of the respondents

The educational qualification of a respondent was measured based on his year of schooling as obtained from his responses to the interview schedule (Appendices). For example, a score of 5 was given to the respondent who passed class v. A score of ‘0’ and ‘1’ also given to those who do not know reading and writing and can sign name respectively. The respondents were classified into following categories based on their educational qualification as shown in Table 2.

Table 2. Categories of the respondents according to their educational qualification

Categories	Score (Year of schooling)
Illiterate	0
Only can sign	1
Primary	1-5
Secondary	6-10
Higher secondary	11-12
Above Higher Secondary (Graduate or Above)	>12

3.6.2.3 Family size of the respondents

The family size of a respondent was measured by the total number of family members who were eating and staying together as ascertained from his responses to the interview schedule (Appendices). Male and female ratio was taken also. Based on family size, the respondents were classified into different categories as shown in Table 3.

Table 3. Categories of the respondents according to their family size

Categories	No of family members
Small sized family	1 – 4
Medium sized family	5-6
Large sized family	>6

3.6.2.4 Annual family income of the respondents

Family income of a respondent was measured on the basis of total yearly earning from day labour, rickshaw pulling, driving, business and other sources by the respondent and other family members as ascertained from his responses to the interview schedule (Appendices). In calculating the family income of a respondent, income of that respondent as well as his family members (earned from different sources) in the year 2020 were added together to obtain total family income of a respondent. The respondents were classified into following categories according to annual family income as shown in Table 4.

Table 4. Categories of the respondents according to annual family income

Categories	Taka (BDT) /Year
Low income	≤ 100000
Medium income	100001 -130000
High income	>130000

3.6.2.5 Monthly family expenditure status

In this study, the monthly family expenditure was computed for each respondent on the basis of food, housing, clothing, education, medical and transport as ascertained from his/her responses to the interview schedule (Appendices).

Based on extension media contact score, the respondents were grouped into four categories as shown in Table 5.

Table 5. Categories of the respondents according to their monthly family expenditure status

Categories	Taka (BDT)
Low expenditure	≤10000
Medium expenditure	10001 -13000
High expenditure	>13000

3.6.2.6 Respondent’s knowledge about living environment

To measure the knowledge about environment of a respondent, 6 questions were included in the interview schedule (Appendices). Irrespective of difficulty of answer, a score of 5 was assigned against each of the questions. Thus, the whole questions comprised of 30 marks. Based on accuracy of the answer, the respondents were given marks. The total score of a respondent was determined by summing up all the scores obtained by the respondent against the selected 6 questions. The possible score of knowledge of a respondent on environment could range from 0 to 30, where 0 indicates no knowledge and 30 indicate the highest knowledge. The respondents were categorized on the basis of their knowledge score on environment as presented in Table 6.

Table 6. Categories of the respondents according to their knowledge about living environment

Categories	Score
No knowledge	0
Low knowledge	1-10
Medium knowledge	11-20
High knowledge	20-30

3.6.2.7 Toilet use pattern in the slum

The toilet use status in the slum score was determined based on their toilet type-community latrine, hanging, sanitary and open space. The score of toilet use status in the slum was computed on the basis of regularly, occasionally and rarely did he/she use

as ascertained from the responses to the interview schedule (Appendices). The score ranges from 4 to 12. On the basis of toilet use status in the slum, the respondents were classified into following categories shown in Table 7.

Table 7. Categories of the respondents according to their toilet use pattern in the slum

Categories	Score
Not concerned at all	4-6
Low concerned	7-9
Well concerned	10-12

3.6.2.8 Source of water

The source of water in the slum score was determined based on their water source- WASA, tube-well and lake. The score of source of water in the slum was computed on the basis of regularly, occasionally and rarely which ranges from 3 to 9; did he/she use as ascertained from the responses to the interview schedule (Appendices). On the basis source of water in the slum, the respondents were classified into following categories shown in Table 8.

Table 8. Categories of the respondents according to their source of water

Categories	Score
Not conscious	3-4
Little conscious	5-6
Well conscious	7-9

3.6.2.9 Fuel use pattern for household purpose

The fuel use status for household purpose in the slum score was determined based on LPG, supply gas, stove and fuel-wood. The score of fuel use status for household purpose ranges from 4 to 12 and was computed on the basis of regularly, occasionally and rarely did he/she use as ascertained from the responses to the interview schedule

(Appendices). On the basis source of fuel use status for household purpose, the respondents were classified into following categories shown in Table 9.

Table 9. Categories of the respondents according to their fuel use pattern for household purpose

Categories	Score
Not affordable	4-6
Little affordable	7-9
Well affordable	10-12

3.6.2.10 Household waste disposal status

The household waste disposal status in the slum score was determined based on community dust-ban, open space and municipal cleaner. The score of household waste disposal status was computed on the basis of regularly, occasionally and rarely did he/she use as ascertained from the responses to the interview schedule (Appendices). The score ranges from 3 to 9. On the basis of source of household waste disposal status, the respondents were classified into following categories shown in Table 10.

Table 10. Categories of the respondents according to their household waste disposal status

Categories	Score
Not conscious at all	3-4
Little conscious	5-6
Well conscious	7-9

3.6.2.11 Drainage facilities

The drainage facilities in the slum score was determined based on open, piped and furrow and the score ranges from 3 to 9. The score of drainage facilities was computed on the basis of severe, moderate and low did he/she use as ascertained from the

responses to the interview schedule (Appendices). On the basis source of drainage facilities, the respondents were classified into following categories shown in Table 11

Table 11. Categories of the respondents according to their drainage facilities

Categories	Score
Not facilitated at all	3-4
Low facilitated	5-6
Well Facilitated	7-9

3.6.2.12 Prevalence of morbidity among the family members

The prevalence of morbidity among the family members in the slum score was determined based on fever, diarrhea, skin disease, cold problem, dysentery, skin disease, cold problem, dysentery, jaundice, typhoid, pneumonia, respiratory problem, malnutrition, mumps and other. The score of prevalence of morbidity among the family members ranges from 12 to 36 and was computed on the basis of severe, moderate and low did he/she use as ascertained from the responses to the interview schedule (Appendices). On the basis source of prevalence of morbidity among the family members, the respondents were classified into following categories shown in Table 12.

Table 12. Categories of the respondents according to their prevalence of morbidity among the family members

Categories	Score
Low	12-19
Medium	20-27
High	28-36

3.6.2.13 Environmental status of the slum dwellers

The environmental status of the slum dwellers score was determined based on congestion, air condition, water condition, noise condition, solid waste condition, residential health condition and odor condition. The score of environmental status of the slum dwellers was computed on the basis of good, moderate and low did he/she use

as ascertained from the responses to the questionnaires (Appendices). The score ranges from 7 to 21. On the basis source of environmental status of the slum dwellers, the respondents were classified into following categories shown in Table 13.

Table 13. Categories of the respondents according to the environmental status of the slum dwellers

Categories	Score
Good	7-11
Moderate	12-16
Poor	17-21

3.6.2.14 Information about agriculture

The information about cultivation of the slum dwellers score was determined based on primarily yes or no question. If the answer was yes, ten types of vegetables were asked them. The score of vegetable cultivation by the slum dwellers was computed on the basis of regularly, occasionally and rarely as ascertained from the responses to the interview schedule (Appendices). The score ranges from 0 to 30. On the basis of vegetable cultivation by the slum dwellers, the respondents were classified into following categories shown in Table 14.

Table 14. Categories of the respondents according to their information about agriculture

Categories	Score
Not at all	0
Low	1-10
Medium	11-20
High	21-30

3.6.2.15 Measurement of extent of some categorized variables

To compare among the statements related to some categorized variables, a calculation was done by the following formula:

$$ECV = N_1 \times 3 + N_2 \times 2 + N_3 \times 1 + N_4 \times 0$$

Where, ECV= Extent of categorized variables

N_1 = No. of the respondents responded regularly/ severe

N_2 = No. of the respondents responded occasionally/ moderate

N_3 = No. of the respondents responded rarely/ low

N_4 = No. of the respondents responded not at all

3.8 Statistical analysis

After collection, data were analyzed and tabulated for interpretation. Statistical treatments such as number, mean, standard deviation, range, rank order etc. were used to interpret data. To explore relationship between any two variables Pearson's product correlation coefficient 'r', Spearman rank correlation and regression analysis were employed. Data were analyzed by using Statistical Package for Social Science (SPSS).

CHAPTER IV

RESULTS AND DISCUSSION

The findings of the study have been presented and discussed under the following sections according to the data collected from the slum dwellers and the data analysis.

4.1 Selected characteristics of the respondents

Behavior of an individual is largely influenced by his characteristics. The selected characteristics of the respondents were age, educational qualification, family size, annual income, monthly family expenditure status, respondent's knowledge about environment, toilet use status in the slum, source of water, fuel use status for household purpose, household waste disposal status, drainage facilities, prevalence of morbidity among the family members, environmental status of the slum dwellers and information about cultivation.

4.2 Age of the respondents

The age of the respondents in the slum dwellers was markedly varied. The mean and standard deviation of age are 40.5 and 13.3, respectively.

Table 15. Distribution of the respondents according to their age

Categories	Score (Year)	Respondent (N=100)		Mean	SD	Range	
		Number	Percentage			Min.	Max.
Young	≤ 35	41	41.0	40.5	13.3	19	80
Middle aged	36-50	40	40.0				
Old	>50	19	19.0				
Total		100	100.0				

Based on age, the respondents in the slum dwellers were classified into different categories are shown in Table 15. Data furnished in the Table 15 reveal that highest proportion (41.0%) of the respondents were young aged as compared to 40.0 percent and 19.0 percent in middle aged and old, respectively.

4.3 Educational qualification of the respondents

The educational qualification score of the respondents in the slum dwellers ranged from 0 to 8 with mean and standard deviation of 1.82 and 1.81, respectively. On the basis of education, the respondents were categorized into six categories as shown in Table 16.

Table 16. Distribution of the respondents according to their educational qualification

Categories	Score (Year of schooling)	Respondent (N=100)		Mean	SD	Range	
		Number	Percentage			Min.	Max.
Illiterate	0	14	14.0	1.82	1.81	0	8
Only can sign	1	51	51.0				
Primary	1-5	31	31.0				
Secondary	6-10	4	4.0				
Higher Secondary	11-12	0	0.0				
Above Higher Secondary	>12	0	0.0				
Total		100	100.00				

Data presented in the Table 16 demonstrate that majority (51%) of the respondents in slum could only can sign followed by primary (31%), illiterate (14%) and secondary (4%) level of education. Above higher secondary level of educated respondent was not found at the studied area. Due to lack of proper education level, most of the respondents of slum areas were not conscious about environmental status and the respondents those who had secondary level of education were most aware of environmental condition.

4.4 Family size of the respondents

Family size (determines family type) of the respondents in the slum dwellers ranged from 2 to 6, with a mean of 4.22 and standard deviation 0.949. Based on their family size scores, the respondent's families were classified into three categories. The distribution of the respondents according to their family size is shown in Table 17.

Table 17. Distribution of the respondents according to their family size

Categories	Score	Respondent (N=100)		Mean	SD	Range	
		Number	Percentage			Min.	Max.
Small sized family	1-4	64	64.0	4.22	0.949	2	6
Medium sized family	5-6	36	36.0				
Large sized family	>6	0	0.0				
Total		100	100.0				

Data furnished in the Table 17 reveal that majority (64%) of the respondents in the slum belonged to small sized family as compared to 36 percent were medium sized family. Large sized family were hardly found at the study area and small sized family were more efficient to maintain their family life.

4.5 Annual family income of the respondents

Annual family income of the respondents in the slum dwellers ranged from below 72000 BDT to 216000 BDT per year with a mean of 129811.2 BDT per year and standard deviation of 28416.9. The distribution of the respondents according to their annual family income is shown in Table 18.

Data of the Table 18 show that 46 percent of the respondents of the slum dwellers belonged to low income, 34 percent medium income and 20 percent high income. High and medium income generating families of the slum areas were more conscious about their living standard than low income generating families and the low income generating families were low conscious about environmental condition.

Table 18. Distribution of the respondents according to annual family income

Categor-ies	Score (BDT)	Respondent (N=100)		Mean	SD	Range	
		Number	Percentage			Min.	Max.
Low income	≤100000	46	46.0	129811.2	28416.9	72000	216000
Medium income	100001-130000	34	34.0				
High income	>130000	20	20.0				
Total		100	100.0				

4.6 Monthly family expenditure status

Monthly family expenditure of the respondents in the slum ranged from below 6000 to 16200 BDT per month with a mean of 9730 BDT per month and standard deviation of 1987.1. The distribution of the respondents according to their monthly family expenditure is shown in Table 19.

Table 19. Distribution of the respondents according to their monthly family expenditure status

Categories	Score (BDT)	Respondent (N=100)		Mean	SD	Range	
		Number	Percentage			Min.	Max.
Low expenditure	≤10000	58	58.0	9730	1987.1	6000	16200
Medium expenditure	10001-13000	38	38.0				
High expenditure	>13000	4	4.0				
Total		100	100.0				

Data furnished in the Table 19 reveal that majority 58 percent of the respondents in slum dwellers expenditure were in low expenditure compared to 38 percent in medium and 4 percent in high expenditure categories. The respondent's family having low expenditure were ample of opportunities to prosper their life style.

4.7 Respondent's knowledge about living environment

The score of respondent's knowledge in slum dwellers about environment ranged 4 to 27 with a mean and standard deviation of 16.6 and 4.8 respectively. The distribution of the respondents based on knowledge about environment is shown in Table 20.

Data presented in the Table 20 demonstrate that majority (59%) of the respondents in slum belonged to medium knowledge, high knowledge 27 percent and low knowledge 14 percent. A noticeable amount of respondents were found less caring about their surrounding environment, but they were willing to improve their surrounding environment. The respondents of high level knowledge were more aware about their living environment and they might have improve the condition.

Table 20. Distribution of the respondents according to their knowledge about living environment

Categories	Score	Respondent (N=100)		Mean	SD	Range	
		Number	Percentage			Min.	Max.
No knowledge	0	0	0.0	16.6	4.8	4	27
Low knowledge	1-10	14	14.0				
Medium knowledge	11-20	59	59.0				
High knowledge	>20	27	27.0				
Total		100	100.0				

4.8 Toilet use pattern in the slum

The score of toilet use pattern in the slum of the respondents ranged from 6 to 9 with mean and standard deviation of 7.01 and 0.81, respectively. On the basis of toilet use status at the slum, the respondents were categorized into three categories as shown in Table 21.

Data presented in the Table 21 show that majority (69%) of the respondents in slum dwellers were low concerned compared to 31 percent who were not concerned at all. Sanitation problem of the slum was markedly noticeable. Though there were

community latrine facility the respondents were less opportunity to utilize it as the population density of that area was high and the respondent's lives in unhealthy environment.

Table 21. Distribution of the respondents according to their toilet use pattern in the slum

Categories	Scores	Respondent (N=100)		Mean	SD	Range	
		Number	Percentage			Min.	Max.
Not concerned at all	4-6	31	31.0	7.01	0.81	6	9
Low concerned	7-9	69	69.0				
Well concerned	10-12	0	0.0				
Total		100	100.0				

4.8.1 Extent of toilet use pattern (rank order) based on individual toilet type

In slum area, among the four selected toilet types; mainly community latrine were used by the slum dwellers. Secondly sanitary, thirdly hanging and fourthly open space were used by the respondents in slum dwellers. They had no scope to use separate toilet, so they suffered different diseases due to unhygienic condition, the toilet type shown in Table 22.

Table 22. Extent of toilet use pattern (rank order)

Sl No.	Toilet Type	Extent			Total (Scale)	Rank
		Regularly (3)	Occasionally (2)	Rarely (1)		
01	Community latrine	100×3	0×2	0×1	300	1 st
02	Hanging	0×3	0×2	90×1	110	3 rd
03	Sanitary	0×3	15×2	85×1	115	2 nd
04	Open Space	0×3	13×2	87×1	113	4 th

4.9 Source of water

The score of source of water of the respondents in slum ranged from 4 to 6 with mean and standard deviation of 5.35 and 0.56, respectively. On the basis of source of water at the slum, the respondents were categorized into three categories as shown in Table 23.

Table 23. Distribution of the respondents according to their source of water

Categories	Score	Respondent (N=100)		Mean	SD	Range	
		Number	Percent			Min.	Max.
Not conscious	3-4	4	4	5.35	0.56	4	6
Little conscious	5-6	96	96.0				
Well conscious	7-9	0	0				
Total		100	100.00				

Data furnished in the Table 23 reveal that 96 percent of the respondents in the slum were little conscious and 4 percent of the respondents were not conscious about their source of water. They had to buy their water for drinking purpose as well. Well conscious respondents were hardly found at the study area.

4.9.1 Extent of source of water (rank order) based on their water source use

In slum area, among the three selected sources; WASA was the first source of water in for slum dwellers followed by tube-well and lake. In study area, there are lack of sources water, so many respondents were gathered for collect water in same time and they were facing unhealthy condition, water sources are shown in Table 24.

Table 24. Extent of source of water (rank order)

Sl No.	Source	Extent			Total (Scale)	Rank
		Regularly (3)	Occasionally (2)	Rarely (1)		
01	WASA	97×3	3×2	0×1	297	1 st
02	Tube-well	3×3	7×2	90×1	113	2 nd
03	Lake	0×3	0×2	100×1	100	3 rd

4.10 Fuel Use pattern for household purpose

The score of fuel use pattern for household purpose of the respondents in slum dwellers ranged from 6 to 8 with mean and standard deviation of 6.76 and 0.65, respectively. On the basis of fuel use pattern for household purpose at the slum, the respondents were categorized into three categories as shown in Table 25.

Table 25. Distribution of the respondents according to their fuel use pattern for household purpose

Categories	Score	Respondent (N=100)		Mean	SD	Range	
		Number	Percentage			Min.	Max.
Not affordable	4-6	36	36.0	6.76	0.65	6	8
Little affordable	7-9	64	64.0				
Well affordable	10-12	0	0.0				
Total		100	100.00				

Data presented in the Table 25 show that majority (64%) of the respondents in the slum dwellers were little affordable where as 36 percent were not affordable. Their annual family income created little support to afford LPG, supply gas and stove.

4.10.1 Extent of fuel use pattern for household purpose (rank order) based on their use

In slum area, among the four selected pattern; fuel-wood was the first position where as LPG in second, supply gas in third and stove in fourth position. Most of the respondents of slum dwellers belonged to low income, so they unable to buy LPG and used fuel wood. Fuel use patter are shown in Table 26.

Table 26. Extent of fuel use status for household purpose (rank order)

SI No.	Status	Extent			Total (Scale)	Rank
		Regularly (3)	Occasionally (2)	Rarely (1)		
01	LPG	10×3	50×2	40×1	170	2 nd
02	Supply Gas	0×3	5×2	95×1	105	3 rd
03	Stove	0×3	0×2	100×1	100	4 th
04	Fuel-wood	90×3	10×2	0×1	290	1 st

4.11 Household waste disposal status

The score of household waste disposal status of the respondents in slum dwellers ranged from 5 to 7 with mean and standard deviation of 5.99 and 0.62, respectively. On the basis of household waste disposal status at the slum, the respondents were categorized into three categories as shown in Table 27.

Table 27. Distribution of the respondents according to their household waste disposal status

Categories	Score	Respondent (N=100)		Mean	SD	Range	
		Number	Percentage			Min.	Max.
Not conscious at all	3-4	0	0.0	5.99	0.62	5	7
Little conscious	5-6	81	81.0				
Well conscious	7-9	19	19.0				
Total		100	100.00				

Data furnished in the Table 27 reveal that majority, 81 percent of the respondents in the slum were little conscious about their household waste disposal status followed by 19 percent who were well conscious. The household waste disposal system was not satisfactory at that place and the respondents had hardly any objections regarding this problem.

4.11.1 Extent of household waste disposal status (rank order) based on their activity

In slum area, among the three selected household waste disposal status; firstly community dust-bean, secondly open space and thirdly municipal cleaner. The household disposal system was not acceptable in slum area, so it created bad odor. Respondents were faced very unhygienic condition. The household disposal status is shown in Table 28.

Table 28. Extent of household waste disposal status (rank order)

SI No.	Displacement Place	Extent			Total (Scale)	Rank
		Regularly (3)	Occasionally (2)	Rarely (1)		
01	Community Dust-bean	80×3	20×2	0×1	280	1 st
02	Open Space	17×3	30×2	53×1	164	2 nd
03	Municipal Cleaner	0×3	0×2	100×1	100	3 rd

4.12 Drainage facilities

The score of drainage facilities of the respondents in the slum ranged from 5 to 7 with mean and standard deviation of 5.45 and 0.58, respectively. On the basis of drainage facilities at the slum, the respondents were categorized into three categories as shown in Table 29.

Table 29. Distribution of the respondents according to their drainage facilities

Categories	Score	Respondent (N=100)		Mean	SD	Range	
		Number	Percentage			Min.	Max.
Not facilitated at all	3-4	0	0.0	5.45	0.58	5	7
Low facilitated	5-6	96	96.0				
Well facilitated	7-9	4	4.0				
Total		100	100.00				

The tabulated data show that most (96%) of the respondents belonged to the low facilitated in the case of drainage facilities and 4 percent to well facilitated. The drainage facilities added extra environmental pollution to that place, so respondents of slum area were facing unhealthy condition.

4.12.1 Extent of drainage use status (rank order) based on their activity

In study area, the drainage status was not satisfactory, this created bad odor and environment pollution. Among the three selected type in slum area; open type was the first. Piped was in second and furrow in third shown in Table 30.

Table 30. Extent of drainage use status (rank order)

Sl No.	Type	Extent			Total (Scale)	Rank
		Severe (3)	Moderate (2)	Low (1)		
01	Open	100×3	0×2	0×1	300	1 st
02	Piped	15×3	43×2	42×1	173	2 nd
03	Furrow	0×3	7×2	93×1	107	3 rd

4.13 Prevalence of morbidity among the family members

The score of prevalence of morbidity among the family members of the respondents in slum dwellers ranged from 16 to 27 with mean and standard deviation of 21.93 and 2.1,

respectively. On the basis of prevalence of morbidity among the family members at the slum, the respondents were categorized into three categories as shown in Table 31.

Table 31. Distribution of the respondents according to their prevalence of morbidity among the family members

Categories	Score	Respondent (N=100)		Mean	SD	Range	
		Number	Percentage			Min.	Max.
Low	12-19	12	12.0	21.93	2.1	16	27
Medium	20-27	88	88.0				
High	28-36	0	0.0				
Total		100	100.00				

Data furnished in the Table 31 reveal that majority (88%) of the respondents in the slum was belonged to medium prevalence of morbidity among the family members followed by 12 percent to low prevalence of morbidity. As the respondents had medium knowledge about their surrounding environment which has found in this study, they were not able to maintain their proper health management personally and collectively.

4.13.1 Extent of prevalence of morbidity among the family members (rank order)

Due to lack of proper education level and unhygienic environment condition, the respondents of slum dwellers suffered from various diseases. Data presented in the table 32 demonstrated that prevalence of morbidity among the respondents in slum dwellers fever was the first among the selected twelve disease, where malnutrition was in second, cold problem in third, skin disease in fourth, diarrhea and dysentery were scored combined in fifth, respiratory problem in sixth, pneumonia in seventh, typhoid in eighth, jaundice in ninth, mums in eleven and others in twelve position shown in Table 32

Table 32. Extent of prevalence of morbidity among the family members (rank Order)

SI No.	Diseases	Extent			Total (Scale)	Rank
		Severe (3)	Moderate (2)	Low (1)		
01	Fever	66×3	29×2	5×1	261	1 st
02	Diarrhea	52×3	7×2	41×1	211	5 th =
03	Skin disease	53×3	14×2	33×1	220	4 th
04	Cold problem	57×3	15×2	28×1	229	3 rd
05	Dysentery	50×3	11×2	39×1	211	5 th =
06	Jaundice	17×3	13×2	70×1	147	9 th
07	Typhoid	30×3	17×2	53×1	177	8 th
08	Pneumonia	45×3	5×2	50×1	195	7 th
09	Respiratory problem	44×3	8×2	48×1	196	6 th
10	Malnutrition	61×3	17×2	22×1	245	2 nd
11	Mumps	19×3	7×2	74×1	145	10 th
12	Others	5×3	10×2	85×1	120	11 th

4.14 Environmental status of the slum dwellers

The score of environmental status of the slum dwellers ranged from 13 to 16 with mean and standard deviation of 14.69 and 0.63, respectively. On the basis of environmental status of the slum dwellers, the respondents were categorized into three categories as shown in Table 33.

Table 33. Distribution of the respondents according to the environmental status of the slum dwellers

Categories	Score	Respondent (N=100)		Mean	SD	Range	
		Number	Percentage			Min.	Max.
Moderate	12-16	0	0.0				
Poor	17-21	100	100.0				
Total		100	100.0				

Data furnished in the Table 33 revealed that all of the respondents facing severe level of environmental status. The environment of the slum area was not in good condition which affected their living style as well as which has been observed in this study.

4.14.1 Extent of environmental status of the slum dwellers (rank order)

In slum area, among the seven selected conditions; congestion ranked second and all other conditions such as air condition, water condition, noise condition, solid waste condition, residential health condition and odor condition were scored same thus ranked combined first position. The environment status was not good in the study area. So respondents of the slum dwellers suffered various diseases. Extent of environmental status of the slum dwellers shown in Table 34.

Table 34. Extent of environmental status of the slum dwellers (rank order)

SI No.	Status	Extent			Total (Scale)	Rank
		Severe (3)	Moderate (2)	Good (1)		
01	Congestion	76×3	5×2	19×1	257	2 nd
02	Air condition	100×3	0×2	0×1	300	1 st =
03	Water condition	100×3	0×2	0×1	300	1 st =
04	Noise condition	100×3	0×2	0×1	300	1 st =
05	Solid waste condition	100×3	0×2	0×1	300	1 st =
06	Residential health condition	100×3	0×2	0×1	300	1 st =
07	Odor condition	100×3	0×2	0×1	300	1 st =

4.15 Information about agriculture

The score of information about cultivation of the respondents in slum dwellers ranged from 0 to 21 with mean and standard deviation of 10.05 and 6.78 respectively. On the basis of information about cultivation, the respondents were categorized into four categories as shown in Table 35.

Table 35. Distribution of the respondents according to their information about cultivation

Categories	Score	Respondent (N=100)		Mean	SD	Range	
		Number	Percentage			Min.	Max.
Not at all	0	24	24.0	10.05	6.78	0	21
Low	1-10	18	18.0				
Medium	11-20	51	51.0				
High	21-30	7	7.0				
Total		100	100.0				

The above tabulated data reveal that 24 percent respondents do not cultivate at all and 76 percent respondents were involved in cultivation among slum dwellers. Among them 51 percent belong to medium extent of cultivation followed by 18 percent low extent

of cultivation and 7 percent high extent of cultivation. The respondents cultivated some of their vegetables to support themselves from buying their vegetables from the local market to reduce their expenditure as well as they got some advices from local NGO's to do so.

4.15.1 Extent of cultivation of vegetables of the slum dwellers (rank order)

In slum area, many respondents cultivated various vegetables so that they got fresh vegetable as well as reduced family expenditure. Data present in Table 36 that among the ten types of vegetables; indian spinach is mostly cultivated vegetable. The slum dwellers also cultivate sweet gourd, red amaranth, bottle gourd, bean, tomato, bitter gourd, brinjal, and okra were scored second, third, fourth, fifth, sixth, seventh, eighth and ninth respectfully, and other crops which were not included in the table were least cultivated vegetables shown in (Table 36) .

Table 36. Extent of cultivation of vegetables of the slum dwellers (rank order)

SI No.	Diseases	Extent			Total (Scale)	Rank
		Severe (3)	Moderate (2)	Low (1)		
01	Red Amaranth	41×3	13×2	22×1	171	3 rd
02	Indian Spinach	48×3	15×2	13×1	187	1 st
03	Bitter Gourd	10×3	7×2	59×1	103	7 th
04	Brinjal	3×3	9×2	64×1	91	8 th
05	Tomato	21×3	10×2	45×1	128	6 th
06	Bottle Gourd	42×3	7×2	27×1	167	4 th
07	Sweet Gourd	49×3	9×2	18×1	183	2 nd
08	Okra	2×3	5×2	69×1	85	9 th
09	Beans	37×3	10×2	29×1	160	5 th
10	Other	2×3	1×2	74×1	82	10 th

4.16 contribution of the selected characteristics of the respondents on their environmental status

This section deals with the relationship between thirteen selected characteristics of the respondent's and their environmental status. To explore the relationships between the selected characteristics of the respondents and their environmental status, Spearman's Product Moment co-efficient of correlation (r) was used. The relationship of the selected characteristics of the respondents with their environmental status appears in Table 37.

Table 37. Multiple regression coefficients of the contributing variables related to environmental status of the respondents

Dependent Variable	Independent variables	B	ρ	R ²	Adj. R ²	F
Environmental Status	Age	0.070	0.540	0.374	0.280	3.959
	Educational qualification	0.272	0.024*			
	Family Size	-0.199	0.084			
	Annual Family Income	0.136	0.621			
	Monthly Family Expenditure	-0.042	0.884			
	Knowledge about Environment	0.253	0.039*			
	Toilet Use Pattern	-0.007	0.962			
	Source of Water	0.245	0.014*			
	Fuel Use Pattern	0.232	0.031*			
	Household Waste Disposal Status	0.079	0.504			
	Drainage Facilities	-0.125	0.485			
	Prevalence of Morbidity	-0.168	0.104			
	Information about Cultivation	0.188	0.044*			

** Significant at $p < 0.01$; *Significant at $p < 0.05$

Table 37, showed that there is a significant contribution of the respondents in environmental status. In this model, the important significant level were educational qualification, knowledge about environment, source of water, fuel use pattern and information about cultivation at the 5% level of significance while coefficients of other

selected variables do not have any contribution on environmental status of the slum dwellers at Tejgaon in Dhaka.

The value of R^2 is a measure of how the variability in the dependent variable is accounted by the independent variables. So, the value of $R^2 = 0.374$ means that independent variables accounted for 37% of the variation in environmental status. The F ratio is 3.959 which is highly significant ($p < 0.000$).

However, each predictor may explain some of the variance in respondent's environmental status. The adjusted R^2 value penalizes the addition of extraneous predictors in the model but the value 0.374 is still showing that variance of environmental status can be attributed to the predictor variables rather than by chance. The suitable model (Table 34). In summary, the model suggest that the respective authority should be considered educational qualification, knowledge about environment, source of water, fuel use status and information about cultivation in this connection. Some predictive importance has been discussed below:

4.16.1 Significant contribution of educational qualification of the respondents to the environmental status

The contribution of educational qualification of the respondents in the environmental status in slum area by testing the following null hypothesis; "there is no contribution of educational qualification of the respondents to the environmental status".

The p-value of the concerned variable was found 0.024. The following observations were made on the basis of the value of the concerned variable of the study under consideration.

- a. The contribution of the educational qualification was at 5% significance level. So, the null hypothesis could be rejected.

Educational qualification of the respondents in slum had positive influence on environmental status. It had the 2nd significant (significant at $p < 0.024$) contribution on environmental status. It could be said that if educational qualification increased by one unit, environmental status of the surroundings of the respondents will be increased by 0.024 units. Considering the effects of all other predictors are held constant.

From the multiple regressions, it was concluded that educational qualification of the respondents had positive contribution to their environmental status. This implies that with the increase of educational qualification of the respondents will increase their environmental status.

4.16.2 Significant contribution of knowledge about environment of the respondents to the environmental status

The contribution of knowledge about environment of the respondents in the environmental status by testing the following null hypothesis; “there is no contribution of knowledge about environment of the respondents to the environmental status”.

The p-value of the concerned variable was found 0.039. The following observations were made on the basis of the value of the concerned variable of the study under consideration.

- b. The contribution of the knowledge about environment of the respondents was at 5% significance level. So, the null hypothesis could be rejected.

Based on the above finding, it can be summarized that by increasing respondent’s knowledge about environment increases the environmental status. So, it can be stated that if respondent’s knowledge about environment increased by one unit, environmental status of the surroundings of the respondents will be increased by 0.039 units. It had the 4th positive significant (significant at $p < 0.039$) contribution on environmental problems. So, knowledge about environment has significantly contributed to the environmental status.

4.16.3 Significant contribution of source of water of the respondents to the environmental status

The contribution of source of water of the respondents in the environmental status by testing the following null hypothesis; “there is no contribution of source of water of the respondents to the environmental status”.

The p-value of the concerned variables was found 0.014. The following observations were made on the basis of the value of the concerned variable of the study under consideration.

- c. The contribution of the source of water was at 5% significance level. So, the null hypothesis could be rejected.

It had the 1st positive significant (significant at $p < 0.014$) contribution on environmental status. So, it can be stated that if source of water of the respondents increased by one unit, environmental status of the surroundings of the respondents will be increased by 0.014 units. Considering the effects of all other predictors are held constant.

Based on the above finding, it can be said that respondents had safer source of water improved their surrounding environmental status.

4.16.4 Significant contribution of fuel use patter for household purpose of the respondents in environmental status

The contribution of fuel use pattern for household purpose of the respondents in environmental status by testing the following null hypothesis; “there is no contribution of fuel use status for household purpose of the respondents in environmental status”.

The p-value of the concerned variables was found 0.031. The following observations were made on the basis of the value of the concerned variable of the study under consideration.

- d. The contribution of fuel use status was at 5% significance level. So, the null hypothesis could be rejected.

Fuel use status of the respondents had positive influence on environmental status. It had the 3rd significant (significant at $p < 0.031$) contribution on environmental status. So, it can be stated that if fuel use pattern of the respondents increased by one unit, environmental status of the surroundings of the respondents will be increased by 0.031 units. Considering the effects of all other predictors are held constant.

Based on the above finding, it can be said that if the respondent’s fuel use pattern increases, environmental status will also be increased.

4.16.5 Significant contribution of information about cultivation of the respondents in environmental status

The contribution of information about cultivation of the respondents in environmental status by testing the following null hypothesis; “there is no contribution of information about cultivation of the respondents in environmental status”.

The p-value of the concerned variable was found 0.044. The following observations were made on the basis of the value of the concerned variable of the study under consideration.

- e. The contribution of information about cultivation was at 5% significance level. So, the null hypothesis could be rejected.

Information about cultivation of the respondents in slum dwellers had positive influence on environmental status. It had the 5th significant (significant at $p < 0.044$) contribution on environmental status. So, it can be stated that if the participation in cultivation of the respondents is increased by one unit, environmental status of the surroundings of the respondents will be increased by 0.044 units. Considering the effects of all other predictors are held constant.

Based on the above finding, it can be said that respondents having more participation in cultivation will increase more environmental status.

4.16.5 Compare between previous and now slum characteristics

The previous reports in some selected characters in slum area were compared with this study in following:

1. Educational qualification

Rokanuzzaman *et al.* (2013) showed on their study named Study on Livelihood Status of Slum Dwellers in the North Dhaka City Corporation that almost one half (43.07%) of the respondents was illiterate to could sign only whereas this study showed majority (51%) of the respondents in slum could only can sign followed by primary (31%), illiterate (14%) and secondary (4%) level of education.

2. Toilet use pattern

Risbud (2003) discussed about the sanitation conditions of urban slums of the Mumbai. Sanitation in slums is very poor as 73 % of slums depend on community toilets provided by the government, 28 % defecate in the open, 0.7 % slums have pay to use toilets managed by NGOs and only 1 % of slums have individual toilets.

Dana (2011) showed on her study titled ‘Unhygienic living conditions and health problems: a study in selected slums of Dhaka city’ that the sanitary latrines coverage is only 48%. The remaining people use unhygienic latrines or practice open defecation - unhygienic pit latrines (without water-seal or connected to pen drains) coverage is 36% and rest 16% people use hanging latrines or practice open defecation. About 59% slums are poorly drained.

Naveed and Anwar (2014) studied on ‘Socio-Economic Condition and Health Status of Urban Slums: A Case Study of Jogo Chak, Sialkot’ and found that 86.7 percent had flush type toilet. This shows that toilet facility is available in these areas.

Whereas this study showed that in slum area; mainly community latrine were used by the slum dwellers. Secondly sanitary, thirdly hanging and fourthly open space were used by the respondents in slum dwellers.

3. Source of water

Goswami and Manna (2013) told that, the people in slums live under the most deplorable conditions, potable water and sanitation facilities.

Rao (2009) investigated that, water is one of the basic requirements for livelihood. The slum dwellers of many urban areas throughout the world are having serious water

problem. It is quite evident that the poorer slum areas are pathetic and that most people are under the serious problem of lack of water.

Prasad and Singh (2009) has discussed about living condition and life style of Mankhurd slum dwellers. Around 98 percent slum dwellers had problems pertaining to fetching water while around 97 percent had problems in toilet use.

Risbud (2003) has studied on urban slums of the Mumbai and reported that, about 49 % of slums have access to water supply from shared standpipes, while 38.3 % have a supply from more than one source. Remaining slums get their water from tube wells or community standpipes. Women and children daily spend a lot of time and have to make several trips to collect water.

In the study area of Tejgaon slum area, slum dwellers mostly collected water from WASA, secondly tube-well and lake in third position. In study area, there are lack of sources water, so many respondents were gathered for collect water in same time and they were facing unhealthy condition.

4. Fuel use pattern

Liza (2014) conducted a study at rural and urban area in Bangladesh which revealed that the urban poor are highly dependent on traditional fuel such as fuel wood, cow dung, charcoal, rice husk, sawdust etc. It is seen that about 43% households use fuel wood as their primary fuel choice; where as in rural area about 49% households use cow dung as their primary fuel for domestic purpose. In urban area 51.4% of energy comes from fuel wood which is locally available in market. Here mobile shop is a vehicle that carry chopped wood move from one area to another and sells this fuel from door to door. On the contrary, about 31% of energy comes from cow dung in rural area and 23.8% comes from agricultural residues.

Whereas in study area of Tejgaon, slum dwellers mostly used fuel-wood. So it was the first position where as LPG in second, supply gas in third and stove in fourth position. Most of the respondents of slum dwellers belonged to low income, so they unable to buy LPG and used fuel wood.

5. Household waste disposal status

Reza *et al.* (2019) conducted a study in Sylhet City Corporation in which found that 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.

And this study showed that, 81 percent of the respondents in the slum were little conscious about their household waste disposal status and 19 percent who were well conscious. The household waste disposal system was not satisfactory at that place.

6. Drainage facilities

Islam *et al.* (2015) studied on present situation of water supply and sanitation at Karail Slum, Dhaka. Those results revealed that Poor physical environment with non-existent solid waste disposal system is very common phenomenon in Surveyed slum. Most of the people of the slum live under unhygienic environment. The study in Karail area of Dhaka city has found that the sanitary and water supply conditions are improving very slowly.

Hossain (2005) conducted a study at Dhaka city in which he found that most of the poor (64.4%) living in the city have no access to drainage facilities. Only 17.8% have access to municipal waste disposal facilities and the rest of them dispose in generally marshy land adjacent to their settlements, which also pose serious challenge to the environment of the neighborhood.

Whereas this study showed that most (96%) of the respondents belong to the low facilitated in the case of drainage facilities, 4 percent who belong to well facilitated.

6. Environmental status of slum dwellers

Rana (2009) conducted a study on Status of water use sanitation and hygienic condition of urban slums: A study on Rupsha Ferighat slum, Khulna. He found that the level of hygiene knowledge has been found to be significantly high among the slum dwellers, although the practice is low. For lack of sufficient water sources, most people resort to unsafe water sources like ponds, rivers and even ditches which cause sufferings from diseases.

Hossain (2014) Investigated 28 years data for 1986-2014 periods on the living standard of slum dwellers of Bangladesh and presented. More specifically, the wretchedness of slum dwellers in housing, drinking water, sanitation, food intake, healthcare, education, employment, income status, social status and security, economic and public assistance has been explored. In addition, poverty scenario and services of social organization among slum people has been focused in this paper.

Siddique and Pandey (2003) on their study focused that deteriorating environmental quality is the source of a variety of grave problems facing urban residents. This article reports slum residents' perceptions and responses to air and water pollution, noise, garbage, crowding, and traffic. Results showed that slum dwellers of Delhi reported greater stress compared to the respondents of Allahabad, and they further reported greater helplessness and acceptance in coping with the environmental stressors.

Whereas this study showed that the environment of the slum area was not in good condition which affected their living style as well as which has been observed in this study. In slum area, among the seven selected conditions; congestion ranked second and all other conditions such as air condition, water condition, noise condition, solid waste condition, residential health condition and odor condition were scored same thus ranked combined first position. So respondents of the slum dwellers suffered various diseases.

CHAPTER V

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 SUMMARY

The study was conducted at industrial area and railway station of Tejgaon under Dhaka district. A number of over 1000 families (slum dwellers) live in these areas. From them 100 heads were treated as population as well as sample for the study through personal interview using an interview schedule during 13th August to 22th November in 2019. Data were collected on some selected characteristics of the respondents.

Highest proportion (41%) of the respondents were young aged as compared to forty and ninety percent were middle aged and old, respectively. Fifty one percent of the respondents could only can sign followed by primary (31%), illiterate (14%) and secondary (4%) level of education. In the case of family size of the respondents majority (64%) of the respondents belong to small sized family as compared to (36%) were medium sized family. (46%) of the respondents belong to low income followed by thirty four percent medium income and twenty percent high income. On the other hand, (58%) of the respondent's expenditure were low compared to thirty eight and four percent were medium and high expenditure categories, respectively. (59%) of the respondents belong to medium knowledge followed by high (27%) and low (14%) knowledge. Sixty nine percent of the respondents were low concerned compared to (31%) who were not concerned at all in the case of toilet use status. Among the four selected toilet types; firstly community latrine followed by sanitary, hanging and open space were used by the respondents. From the study it has found that (4%) of the respondents were not conscious at all and ninety six percent the respondents were little conscious about their source of water. Among the three selected sources; WASA was the first source of water followed by tube-well and lake. Sixty four percent of the respondents were little affordable compared to (36%) who were not affordable in fuel use status for household purpose. Among the four selected status; fuel-wood was the first status of fuel use followed by LPG, supply gas and stove. In the case of household waste disposal status, Eighty one percent of the respondents were little conscious about their household waste disposal status followed by nineteen percent who were well

conscious. Among the three selected status; firstly community dust-bean, secondly open space and thirdly municipal cleaner. Ninety six percent of the respondents belong to the low facilitated in the case of drainage facilities followed by four percent who belong to well facilitated. Among the three selected drainage facilities type; open type was the first followed by pipped and furrow. Eighty eight percent of the respondents were belong to medium prevalence of morbidity among the family members followed by twelve percent who belong to low prevalence of morbidity among the family members. Among the twelve selected diseases; fever ranked first position, diarrhea and dysentery ranked the same fifth position and some other diseases which were not included in the table ranked last position. In this study, all of the respondents facing severe environmental status. Among the seven selected conditions; congestion ranked second and all other conditions such as air condition, water condition, noise condition, solid waste condition, residential health condition and odor condition scored same thus ranked combined first position. Twenty four percent respondents do not cultivate at all and seventy six percent respondents were involved in cultivation. Among them fifty one percent belong to medium followed by eighteen percent low and seven percent high extent of cultivation. Among the ten types of vegetables; indian spinach is mostly cultivated vegetable and other crops which were not included in the table were least cultivated vegetables.

Among the twelve selected characteristics of the respondents, educational qualification, knowledge about environment, source of water, fuel use status and information about cultivation of the respondents showed positive significant relationship with environmental status.

5.2 CONCLUSION

1. Findings of the study show that educational qualification, knowledge about environment, source of water, fuel use status and information about cultivation of the respondents significantly affect the environmental status.
2. As the respondents do not have ample opportunities of the above five mentioned variables, they are facing unhygienic condition and their living standards in perspective of education and family planning is not up to the mark at all.
3. Drainage facilities system and toilet use pattern are not satisfactory in the area.
4. Respondents of the slum area cultivate different vegetables among them indian spinach was mostly cultivated.
5. The environmental status of the respondents also hinders them to live a healthy life as they face air condition, water condition, noise condition, solid waste condition, residential health condition, odor condition and congestion almost equally.

5.3 RECOMMENDATIONS

On the basis of scope and limitations of the present study the recommendations are given below:

- Similar survey studies are required to be carried out in other slum areas in Dhaka under same conditions to compare the findings.
- Comprehensive national policies and plans should be developed to promote the benefits and possibilities of extending basic services.
- The study investigated of certain variables. Further studies should be conducted to explore the other variables might have influenced the environmental status.
- Government should take necessary steps to enhance the environmental status of the slum dwellers.

CHAPTER VI

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APPENDIX

**AGROFORESTRY AND ENVIRONMENTAL SCIENCE
SHER-E-BANGLA AGRICULTURAL UNIVERSITY
DHAKA-1207**

Interview Schedule for the Study of

Environmental Status of Slum Area: A Case Study on

Tejgaon, Dhaka

Sample No:

Date:

Name of the respondent:	
Husband/ Father's Name:	

Community:		Word/Council:	
City Corporation:		District:	
Contact No:		Gender:	Male / Female

Personal Characteristics

Age of the respondent: (Years)			
Educational qualification:	Illiterate	Only Can Sign	Up to Class-

Family size:

How many members do you have in your family?

Total		
Ratio	Male	Female

Please, describe your family members regarding relationship with you according to the following structure:-

Sl. No.	Relationship	Age (year)	Education	Occupation
1.				
2.				
3.				
4.				
5.				
6.				

Annual Income:

SL No.	Sources	Value (Taka)
1	Day Labor	
2	Rickshaw Pulling	
3	Driving	
4	Business	
5	Others	
	Total	

Monthly Family Expenditure Status

SL No.	Expenditure on	Average amount in Taka
1.	Food	
2.	Housing	
3.	Clothing	
4.	Education	
5.	Medical	
6.	Transport	
	Total	

Respondent's knowledge about environment:

Sl. No.	Question	Score assigned	Obtained assigned
1.	What is air pollution?	5	
2.	What is water pollution?	5	
3.	What is solid waste pollution?	5	
4.	What is residential health problem?	5	

5.	Name three health problems related to environment pollution?	5	
6.	What is sanitation?	5	

Toilet use status in the slum:

SL No.	Toilet Types	Regularly(3)	Occasionally(2)	Rarely(1)
1.	Community latrine			
2.	Hanging			
3.	Sanitary			
4.	Open space			

Source of water:

SL No.	Source	Regularly(3)	Occasionally(2)	Rarely(1)
1.	WASA			
2.	Tube-well			
3.	Lake			

Fuel use status for household purpose:

SL No.	Source	Regularly(3)	Occasionally(2)	Rarely(1)
1.	LPG			
2.	Supply Gas			
3.	Stove			
4.	Fuel-wood			

Household waste disposal status:

SL No.	Displacement place	Regularly(3)	Occasionally(2)	Rarely(1)
1.	Community Dust-bean			
2.	Open Space			
3.	Municipal Cleaner			

Drainage facilities:

SL No.	Type of drain	Severe(3)	Moderate(2)	Low(1)
1.	Open			
2.	Piped			
3.	Furrow			

Prevalence of Morbidity among the family members:

SL No.	Diseases	Severe(3)	Moderate(2)	Low(1)
1.	Fever			
2.	Diarrhea			
3.	Skin disease			
4.	Cold problem			
5.	Dysentery			
6.	Jaundice			
7.	Typhoid			
8.	Pneumonia			
9.	Respiratory problem			
10.	Malnutrition			
11.	Mumps			
12.	Others			

Environmental status of the slum dwellers:

SL No.	Status	Severe(3)	Moderate(2)	Good(1)
1.	Congestion			
2.	Air condition			
3.	Water condition			
4.	Noise condition			
5.	Solid waste condition			
6.	Residential health condition			
7.	Odor condition			

Information about cultivation:

Do you cultivate any vegetable in front of or beside your living premises? Answer:

Yes	No
-----	----

If 'yes', mention the vegetable name:-

SL No.	Name of the Vegetables	Frequency		
		Regularly(3)	Occasionally(2)	Rarely(1)
1	Red Amaranth			
2	Indian Spinach			
3	Bitter Gourd			

4	Brinjal			
5	Tomato			
6	Bottle Gourd			
7	Sweet Gourd			
8	Okra			
9	Beans			
10	Other			

(Thank you for your nice cooperation)

Date:

Signature of interviewer



Plate 1. Photograph show data collection from the respondents (I)



Plate 2. Photograph show data collection from the respondents (II)



Plate 3. Photograph show data collection from the respondents (III)



Plate 4. Cultivation scenario of the slum dwellers (I)



Plate 5. Cultivation scenario of the slum dwellers (II)



Plate 6. Cultivation scenario of the slum dwellers (III)



Plate 7. Photograph of toilets used by the slum dwellers (I)



Plate 8. Photograph of toilets used by the slum dwellers (II)



Plate 9. Photograph of toilets used by the slum dwellers (III)



Plate 10. Photograph of water source of the slum dwellers (I)



Plate 11. Photograph of water source of the slum dwellers (II)



Plate 12. Photograph of water source of the slum dwellers (III)



Plate 13. Photograph of the drainage conditions of the study area (I)

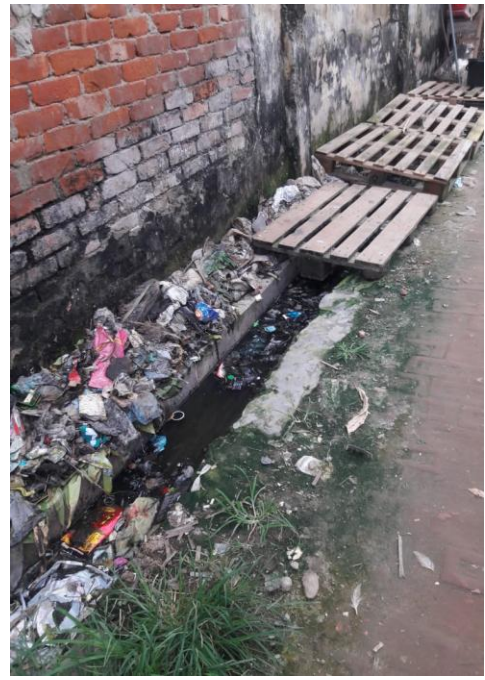


Plate 14. Photograph of the drainage conditions of the study area (II)

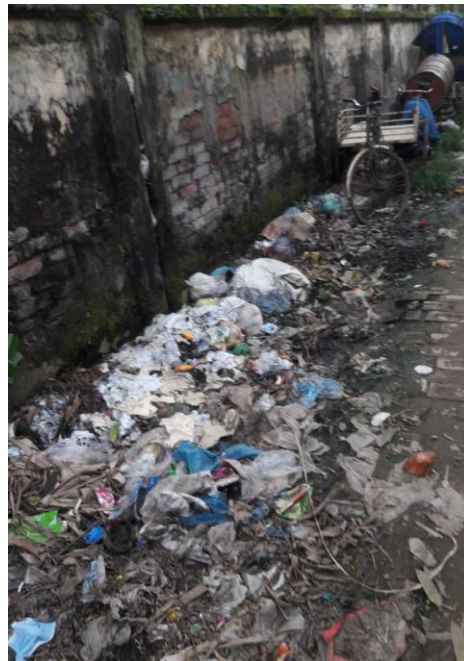


Plate 15. Photograph of the drainage conditions of the study area (III)