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Analysis of Waste-Borne Health Hazards of Disaster-Induced Migrants: A Case Study in Khulna City

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ABSTRACT

Bangladesh is a highly vulnerable region to climate-related disasters such as cyclones, flooding, and river erosion. These disasters displace a large population and force them to migrate to urban areas often settling them in informal slums. In these areas, inadequate waste management, poor sanitation and overcrowded living conditions create significant health risks for migrants, particularly through exposure to improperly managed waste. The importance of this study clearly indicates how the improper waste management system and associated factors are liable for the various kinds of health hazards for the disaster induced migrants. This study investigates the inherent factors that causes waste-borne health hazards in migrant communities in Khulna city. To achieve the objective, 400 different surveys were conducted on the migrants using the snowball sampling method in various informal settlements across Khulna city. The snowball technique was particularly useful in identifying migrants from disaster-prone rural areas as they often live in unregistered, hard-to-reach communities. Data were collected through structured interviews and health assessments to understand the direct and indirect impacts of waste exposure on migrant health. These migrants came from the different disaster-prone areas from Khulna district in Bangladesh. According to the findings, 70% of the surveyed migrant population live in areas where waste is improperly disposed of in open spaces which contaminates the environment. The main causes of public health problems in migrant communities are inadequate waste management systems, reliance on contaminated water, poor sanitation and hygiene practices, overcrowding and unhygienic living conditions. This lack of proper waste management infrastructure in these settlements results in severe exposure to hazardous waste materials, including plastics, human waste and industrial pollutants.
***Key words**: Disaster induced migrants, waste management, health hazards, factors, Khulna city*

INTRODUCTION

Khulna is the southwestern region of Bangladesh which has become a focal point for disaster-induced migrants primarily due to its vulnerability to climate change and environmental hazards (Alam & Rabbani, 2021). Natural disasters like cyclones, floods, and saline intrusion have compelled many residents from coastal areas to seek refuge in urban centers like Khulna. This influx has led to the rapid expansion of informal settlements which often lack adequate infrastructure and services including effective waste management systems (Rahman & Akter, 2022). In these densely populated informal settlements waste management is a demanding concern. The absence of organized waste collection and disposal mechanisms results in the accumulation of solid waste in open areas, waterways, and streets (Roy & Mondal, 2019). This improper waste disposal creates breeding grounds for disease vectors such as mosquitoes and rodents, leading to increased incidences of vector-borne diseases like dengue and malaria (Dasgupta & Huq, 2020). Additionally, the decomposition of organic waste in open dumpsites emits harmful gases contributing to air pollution and respiratory problems among residents (Kabir & Chowdhury, 2018). Direct contact with contaminated water from municipal solid wastes cause respiratory symptoms, skin irritations, and other health issues for the migrants (Hasan & Islam, 2019). The challenges of waste management in Khulna's informal settlements are intensified by several factors. Firstly, the rapid and unplanned urbanization due to disaster-induced migration overwhelms the existing municipal waste management infrastructure which is often under-resourced and ill-equipped to handle the increased waste generation (Hossain & Pervin, 2020). Secondly, there is a lack of awareness and education among the migrant population regarding proper waste disposal practices leading to indiscriminate dumping of waste (Satterthwaite & Mitlin, 2020). Thirdly, the informal nature of these settlements means they are frequently excluded from formal waste collection services and

leaving residents to manage waste disposal on their own (Chowdhury & Jahan, 2022).

The health implications of poor waste management in these communities are significant. Exposure to improperly disposed waste can lead to a range of health issues, including gastrointestinal infections, skin diseases, and respiratory ailments (Mahmood & Hassan, 2021). Children are particularly vulnerable, as they are more likely to come into contact with contaminated environments during play (Shamsuzzaman & Alam, 2021). Moreover, the presence of hazardous waste such as medical or industrial waste can introduce toxic substances into the community posing long-term health risks (Rahman & Akter, 2022). The World Health Organization (WHO, 2021) has highlighted that healthcare waste contains potentially harmful microorganisms that can infect hospital patients, health workers, and the general public. Given this context, the objective of this study is to analyze the factors are liable for the waste-borne health hazards faced by disaster-induced migrants residing in Khulna City's informal settlements. The study will assess the causes of health hazards for the lack of proper waste management systems identifying the reliance on contaminated water, sanitation and hygiene practices of the migrants and the selection of living area. It will also examine the health risks associated with poor waste management among the migrant population focusing on the prevalence of waste-related diseases and health conditions (Islam & Sarker, 2022). By addressing the objectives, the study seeks to contribute to a better understanding of the intersection between disaster-induced migration, urban waste management, and the health risks. The findings are expected to inform policymakers, urban planners, and public health officials in developing targeted interventions to improve living conditions and health outcomes for migrant communities in Khulna City. The influx of disaster-induced migrants into Khulna City has strained existing waste management systems particularly in informal settlements. The lack of adequate waste management infrastructure and services in these areas poses significant health risks to residents. This study aims to shed light on the causes of health hazards by the lack of waste management practices in the affected communities.

METHODOLOGY OF THE RESEARCH

This study was conducted using a 400-sample snowball sampling method across various slums and urban fringe areas in and around Khulna City, with a specific focus on communities displaced or migrated due to climate-induced hazards. These hazards included cyclones, flooding, river erosion, water and soil salinity, and the loss of agricultural land, which have significantly disrupted livelihoods in the region. The sample of 400 respondents was not evenly distributed across the sub-districts of Khulna but was instead strategically selected based on the concentration of displaced populations in each area. Among the respondents, 50% were selected from Daulatpur, a sub-district with a high density of displaced individuals, followed by 20% from Khalishpur, 20% from Dighalia, and the remaining 10% from Sonadanga. This sampling strategy ensured that the study captured a representative picture of the most affected communities. The research methodology employed a robust mixed-methods approach, integrating both qualitative and quantitative techniques to provide a comprehensive understanding of the issue. For the qualitative aspect, various methods were utilized, including direct observation, Key Informant Interviews (KII), and Focus Group Discussions (FGD). These qualitative tools were guided by structured checklists to ensure consistency and reliability, offering detailed insights into the waste management practices, challenges, and health concerns of the displaced communities. The KII involved interviews with local leaders, health workers, and other stakeholders, while the FGDs engaged community members in discussions to understand collective experiences and perspectives. For the quantitative aspect, data was collected using a comprehensive questionnaire survey designed to assess the extent of waste-related health hazards in the target communities. The questionnaire covered a range of topics, including waste disposal practices, water usage, sanitation conditions, and associated health risks. The quantitative data was analyzed and interpreted using Python-3 software, which enabled the identification of patterns, trends, and correlations within the data. This rigorous analytical process ensured accuracy and enhanced the study's reliability.

Secondary data was also reviewed to provide additional context and support for the findings. This included an extensive review of literature from books, journal articles, conference papers, and book chapters related to climate-induced displacement, waste management, and health hazards in similar contexts. The integration of primary and secondary data enriched the study's scope and ensured a well-rounded understanding of the challenges faced by the migrant communities. To facilitate data collection, a pre-selected survey instrument was employed. This instrument was carefully designed to align with the study’s objectives and to ensure the collection of relevant and high-quality data. The combination of diverse methods and rigorous analysis allowed the study to comprehensively address the research questions and provide meaningful insights into the causes and implications of waste-related health hazards among displaced populations in Khulna City. To build a strong theoretical and conceptual foundation for the research, sources such as Scopus, Web of Science, and Google Scholar were utilized. These platforms were explored for topics including climate change, migration, natural hazards,

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disasters, and Bangladesh. The comprehensive review of these scholarly sources provided valuable insights and informed the study's framework and objectives. The flow chart of the research methodology is presented in Figure 1 below:

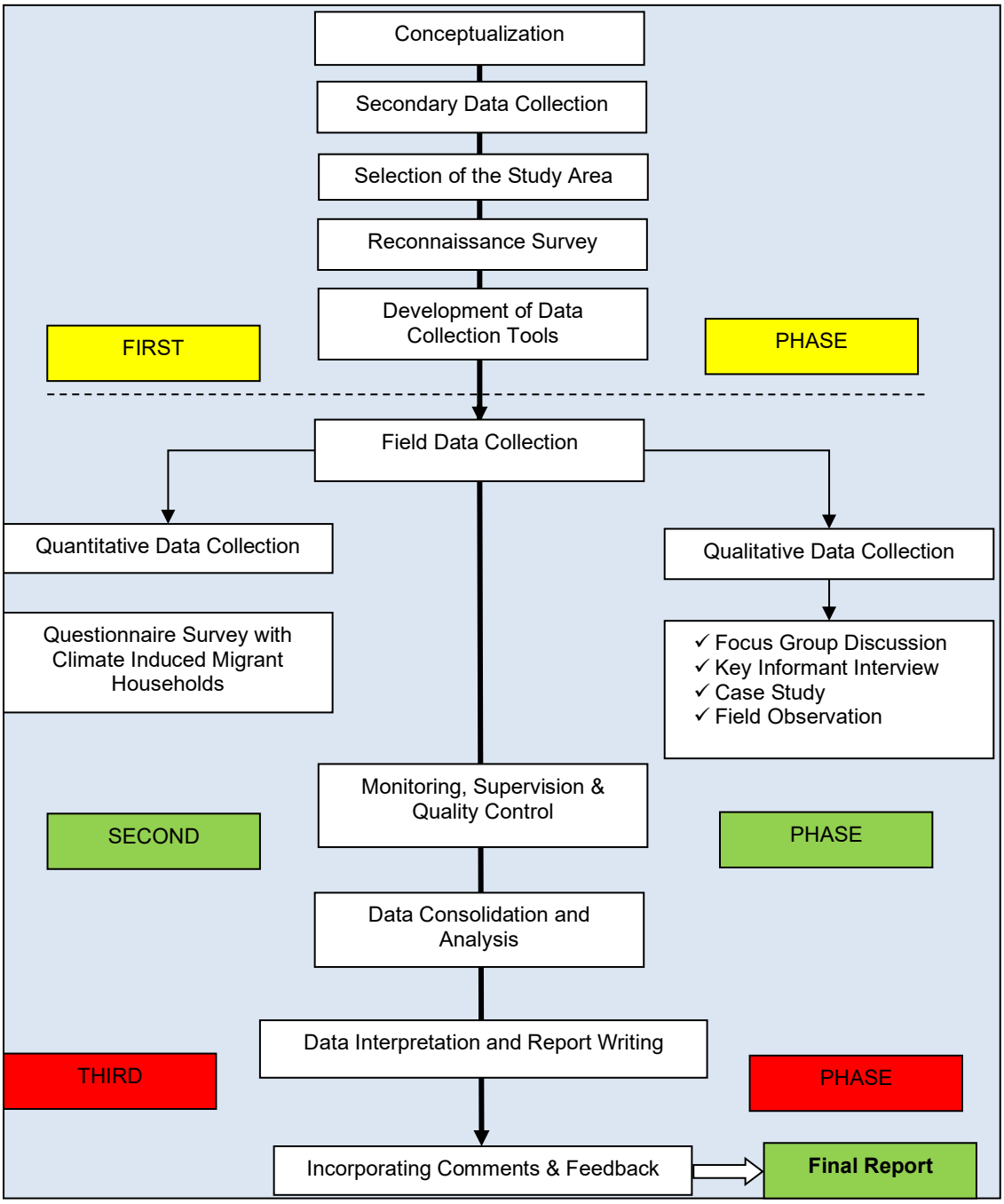

Figure 1 Methodology of the Research

RESULTS AND DISCUSSION

ORIGIN OF THE MIGRANTS

Among the 400 climate migrants, the majority originated from Koyra, Dacope, and Paikgacha, representing the highest percentage of displaced individuals. Other notable areas of origin include Shamnagar, Ashasuni, Vagba, Sagordari, Tala, and Keshobpur Sadar, as illustrated in Figure 2. These locations are highly susceptible to climate-related threats such as cyclones, floods, and storm surges, which have become increasingly frequent. Consequently, residents from these disaster-prone areas are being driven to migrate to urban centers in search of safer living conditions.

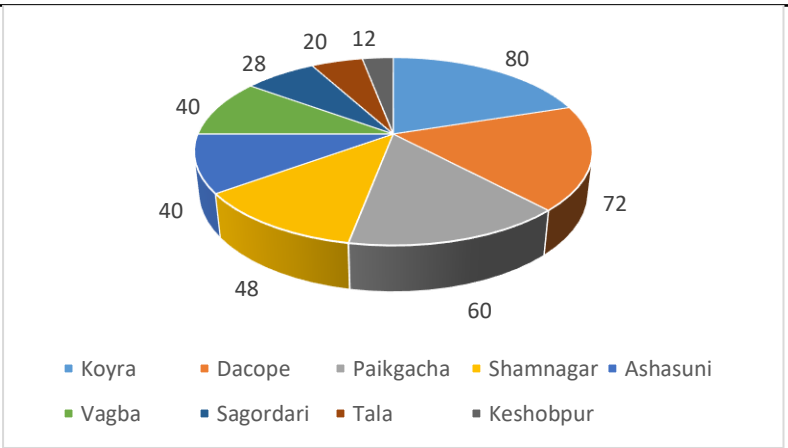

Figure 2 Place of Origin of the Migrants

PATTERN OF MIGRATION

The study revealed that the majority have permanently relocated to the city and have no intention of returning to their place of origin. As shown in Figure 3, 78% of climate migrants have permanently left their origin. In contrast, 14% are seasonal migrants who have moved due to factors such as heavy rain, floods, drought, or other reasons. Additionally, 8% are temporary dwellers who plan to return to their origin once they have gathered sufficient resources.

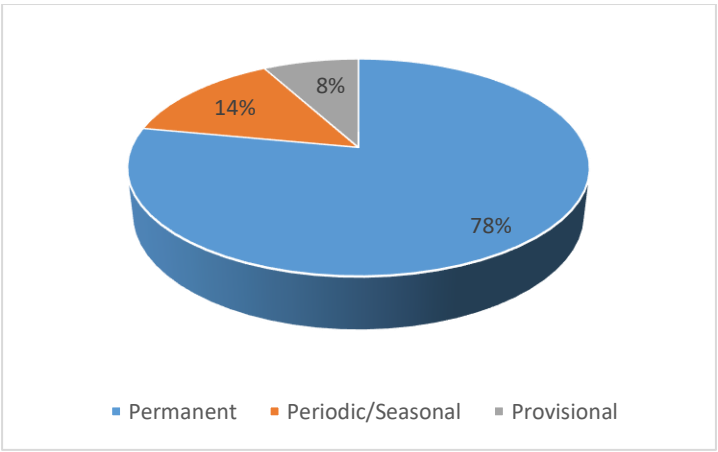

Figure 3 Pattern of Migration

LIVING PLACES OF THE MIGRANTS

As shown in Figure 4, the living conditions of the 400 climate-induced migrants in Khulna City vary significantly in terms of hygiene. A large portion of these migrants specifically 280 individuals or 70% of the total migrant population reside in unhygienic conditions. These areas are characterized by poor sanitation, inadequate waste disposal systems and lack of access to clean water making them highly susceptible to health risks. In contrast, 80 people or 20% live in semi-hygienic conditions where basic sanitation services may be available but are still insufficient to ensure full health safety. These areas have some infrastructure for waste management and access to cleaner water sources, but they still face challenges related to overcrowding and inadequate facilities. Finally, a small proportion of the migrants, 40 individuals or 10% live in relatively hygienic conditions, where proper sanitation, waste disposal and access to clean water are available. However, this group represents only a minor fraction of the total migrant population. The findings highlight a stark disparity in the living conditions of climate-induced migrants in Khulna with a large majority facing significant challenges related to hygiene and sanitation.

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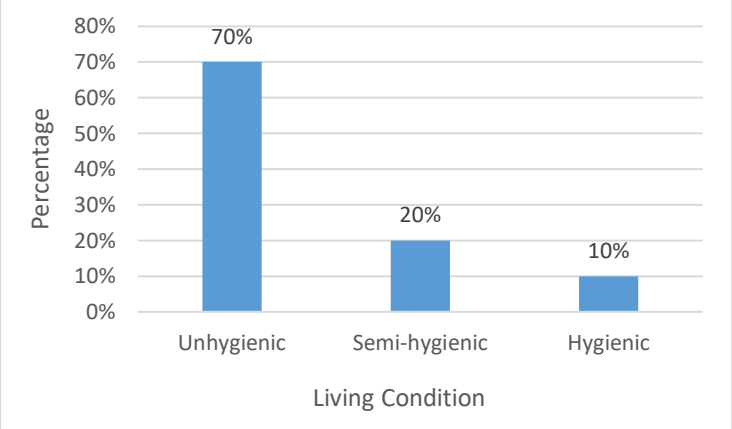

Figure 4 Living Places of the Migrants

CAUSES OF HEALTH HAZARDS OF THE MIGRANTS

INADEQUATE WASTE MANAGEMENT SYSTEM

According to the figure 5 below, the data presented reflects the satisfaction levels for the inadequate waste management system by the climate-induced migrants in Khulna City. According to the findings, 40 individuals or 10% expressed satisfaction with their living conditions, while a significant portion, 270 people or 67.5% reported dissatisfaction. Additionally, 60 migrants or 15% highlighted lack of management as a major issue, while 30 individuals or 7.5% cited lack of planning as a challenge affecting their living conditions. These results indicate that the majority of the migrants face considerable dissatisfaction with issues of management and planning contributing to their poor living standards.

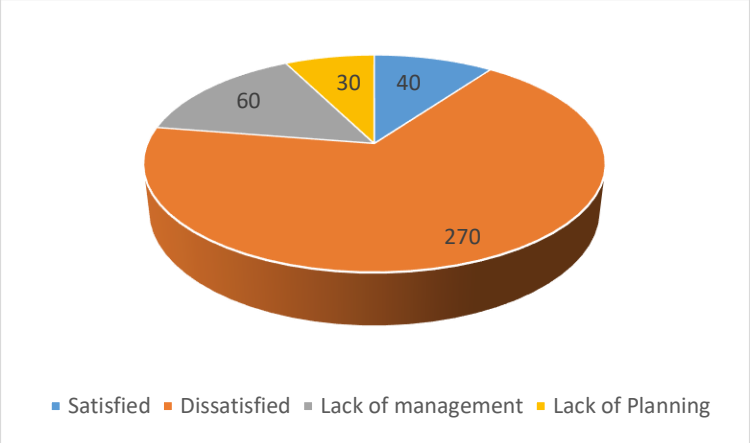

Figure 5 Waste Management System

RELIANCE ON CONTAMINATED WATER

A significant portion of climate-induced migrants in Khulna City rely on contaminated water sources for daily use, further exacerbating health risks. According to the findings, 70 individuals or 17.5% depend on tube-well water. In many cases it is not adequately filtered and may be contaminated by nearby sewage or waste. A much larger group 250 people or 62.5% rely on pond water which is often polluted due to improper waste disposal and a lack of sanitation facilities. 40 migrants or 10% depend on groundwater which although potentially safer, is still vulnerable to contamination from environmental pollutants. Lastly, another 40 individuals or 10% have access to fresh water, although this group represents a small percentage of the total migrant population. The high reliance on contaminated water sources underscores the severe challenges faced by migrants in maintaining basic health and hygiene in these urban fringe areas.

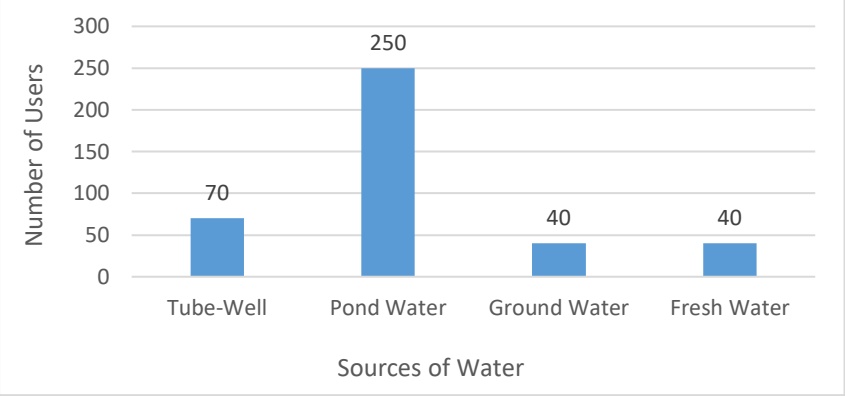

Figure 6 Reliance on Contaminated Water

SANITATION AND HYGIENE PRACTICES

The data on sanitation and hygiene practices among migrants reveals significant disparities in access to proper facilities. A large portion, 45%, or 180 migrants, have no sanitation at all, highlighting a critical gap in basic hygiene services. Poor sanitation is experienced by 120 migrants, comprising 30% of the group, while 60 migrants or 15% have medium sanitation conditions. Only 40 migrants, or 10%, have access to good sanitation practices. This distribution emphasizes the need for improved infrastructure and health interventions to ensure better sanitation and hygiene conditions for the migrant population.

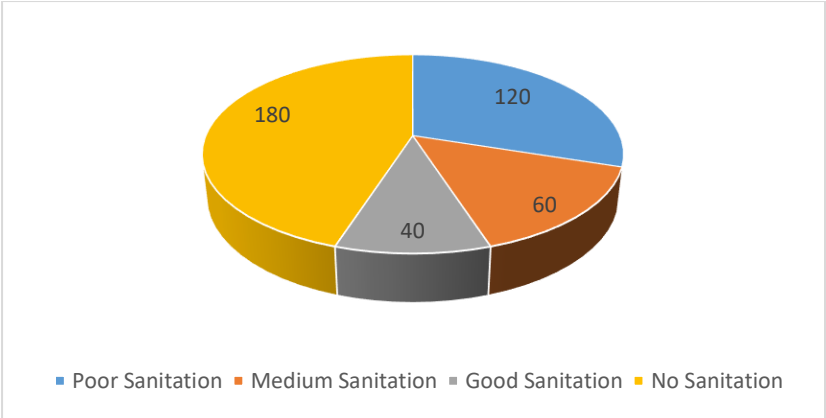

Figure 7 Sanitation and Hygiene Practices of the Migrants

LIVING AREA SELECTION

The living area choices among migrants reflect challenging conditions. A notable 32.5% of migrants, or 130 individuals, select inexpensive living spaces due to cost considerations. Meanwhile 25% of migrants or 100 individuals live in overcrowded areas indicating a lack of space. Additionally, 30% of migrants or 120 individuals reside in unhygienic environments, which can lead to health concerns. Only 12.5%, or 50 migrants, have access to well-organized living spaces highlighting the difficulties many migrants face in securing suitable housing.

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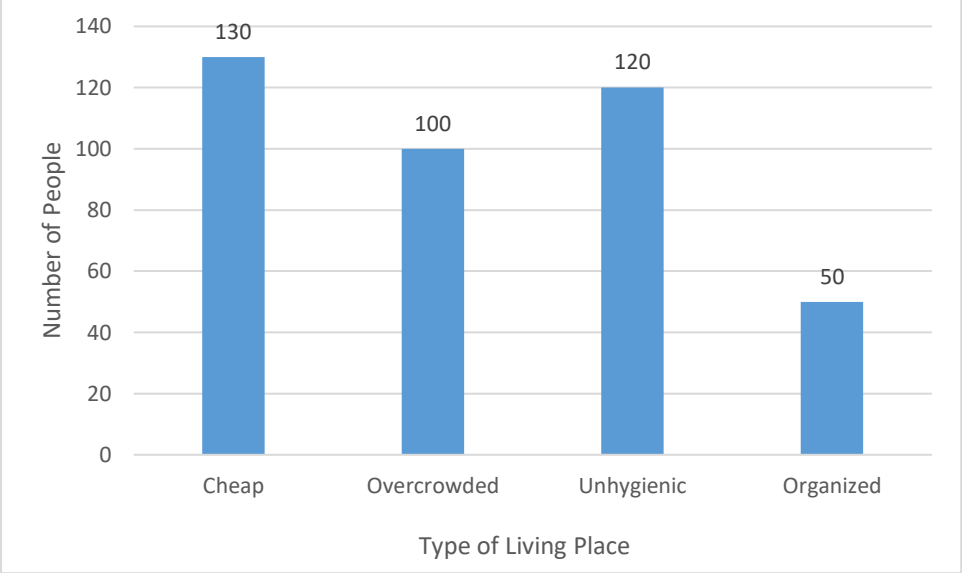

Figure 8 Living Area Selection of the Migrants

CONCLUSION

In conclusion, the health hazards faced by climate-induced migrants in Khulna City are largely driven by significant disparities in waste management, water access, sanitation, and living conditions. The major findings from the research are as follows:

1) A high percentage, 67.5% of migrants express dissatisfaction with the inadequate waste management system, citing poor planning and management as major contributors to their poor living conditions.

2) Regarding water sources, a substantial 62.5% of migrants rely on contaminated pond water, while a smaller 17.5% depend on potentially unsafe tube-well water.

3) Access to clean water is limited, with only 10% of migrants benefiting from fresh water. The sanitation situation is similarly concerning with 45% of migrants having no sanitation facilities and only 10% enjoying good sanitation.

4) In terms of housing 32.5% opt for cheap living areas, often leading to overcrowding and just 12.5% have access to organized and safe living spaces. These findings highlight the urgent need for improvements in waste management, water quality, sanitation, and housing to reduce health risks and improve the living conditions of migrants.

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