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# Health status assessment of people adjacent to temporary waste disposal sites in Khulna city, Bangladesh

Afra Tanjim Shammi [a], Nazia Hassan [a], Md Rony Golder [b,*], Hriday Molla [c], Shikder Saiful Islam [b]

[a] Environmental Science Discipline, Khulna University, Khulna-9208, Bangladesh
[b] Fisheries and Marine Resource Technology Discipline, Khulna University, Khulna-9208, Bangladesh
[c] Urban and Rural Planning Discipline, Khulna University, Khulna-9208, Bangladesh

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ABSTRACT

Despite rapid population growth, urbanization, and economic development in Bangladesh, there is a lack of evidence to measure the impact of dumpsites on human health and the environment. This study sought to assess the health impact of temporary disposal sites in Khulna city on residents living nearby. Data was collected through self-administered questionnaire surveys surrounding the dumpsite areas. Altogether 180 households were surveyed by random sampling approach from >50 m (close to the dumpsites, CD) and 50–300 m radius (away from the dumpsites, AD) of the dumpsite. The participants were mostly employed with low income (<US $185.54 per month) and living more than 10 years in the community. This study found that the main concern for residents in both communities was the odor emanating from the dumpsites, with 74% of respondents identifying this as their primary concern. Approximately 18% of respondents claimed that the smoke from burning waste had the most severe impact on their health. The most common health problems reported by participants were dysentery, diarrhea, pulmonary diseases, asthma, and allergies. Diarrhea was reported by most of the respondents in both communities, such as 32.1% in the CD community and 22.8% in the AD community. Whereas chest-related illness (16.98%) and asthma (11.32%) were reported more frequently in the CD community. Participants living close to the dumpsites were found to be statistically significant victims of health problems, water pollution and unpleasant odor. However, the results did not show a significant effect of proximity to the dumpsite on causing waterborne and airborne diseases among those with higher incomes and better employment. This study suggests conducting a more comprehensive investigation in the study area to unravel the specific impacts of dumpsites on human health. The city corporation authority should follow sustainable municipal solid waste management practices and consider green energy production from waste using cutting-edge technologies.

## 1. Introduction

Rapid urbanization and population growth in Bangladesh have resulted in a notable rise in the production of municipal solid waste,

* Corresponding author.
*E-mail address:* ronygolderku@gmail.com (M.R. Golder).

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which poses a considerable hazard to public health and the environment [1,2]. The daily household waste generation rate in the major cities of Bangladesh ranged from 0.421 to 5.81 kg/day with an average of 1.917 kg/day, and it is 0.476 kg/capita/day only in Khulna city [3]. The major sources of municipal waste are 85.87% from residential staff, 11.60% commercial areas, 1.02% industrial facilities, 0.55% street cleaning, and 0.96% from other areas. Approximately 50% of the total generated waste is dumped into dumpsites daily, and the rest remain uncollected and unmanaged [4].

Dumpsites are associated with many environmental problems, such as contamination of ground and surface water by leaching of inorganic and organic matter [5], air pollution due to suspension of particles covering a wide range of diameters from <0.1 μm to 100 μm [6,7], spreading unpleasant smells and toxic gases by spoilage and harmful bacteria [8], ecological imbalances, spread of toxic substances and heavy metals in the agricultural fields, and human and animal health hazards due to the radioactive radiation coming from the dumpsite areas [9–11]. Values of properties and houses having a significant negative impact within the closer periphery of the dumpsites are likely to have a significant reduction of property values depending on the actual distance from the landfill [12]. Nuisances such as flies, odors, smoke, and noise are frequently cited reasons people do not want to live near landfills [13,14].

Public health issues are recent concerns among people living close to dumpsites, including the spread of water and airborne diseases (i.e., diarrhea, typhoid and cholera, dengue, tetanus, cholera, eczema and dysentery) [15–17], constant exposure to chemicals, inhalation of toxic fumes, and dust from dumpsites severely affecting the health of the nearby inhabitants [18]. Direct contact with water, contaminated by municipal solid wastes, may cause respiratory symptoms, irritation of the skin, nose, and eyes; bowel problems, fatigue, headaches, psychological problems, and allergies [19–21]. A dumpsite is a favorable environment for the proliferation of disease-carrying organisms (i.e., rats, flies, cockroaches, and mosquitoes) that can be carriers for serious human pathogens [22–24]. Sensitivity index of different physic-chemical parameters surrounding the dumpsite areas can characterize the management status of dumpsites in risk-based approaches and recommend improving the management strategies through a decision tool [25].

Although the negative consequences of dumpsites have become increasingly common in recent times, there has been no study conducted on the health and environmental impacts experienced by individuals residing in the vicinity of the municipal waste dumpsites situated in Khulna city, Bangladesh. A recent study described heavy metal contamination in the soil at the dumping areas of

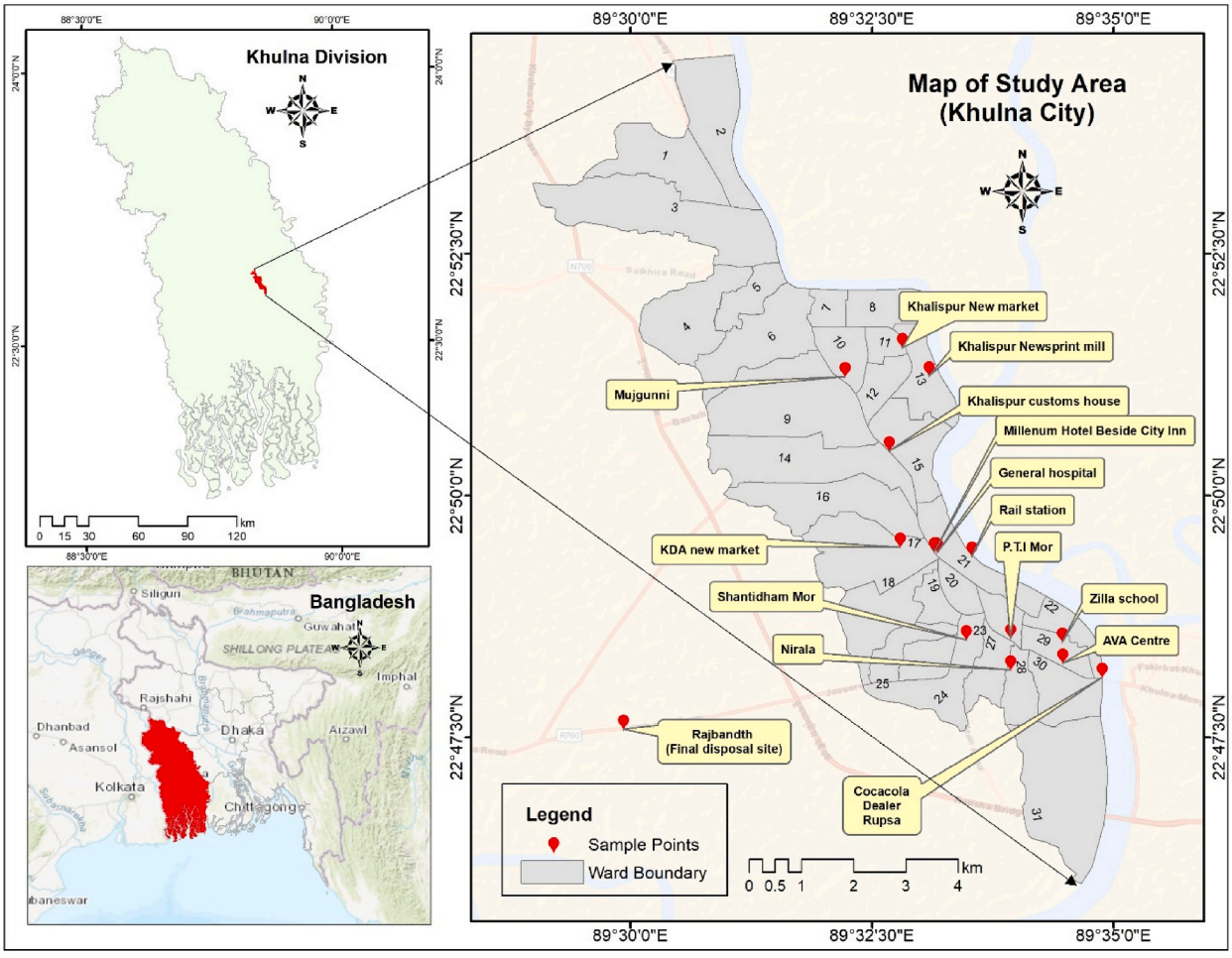


**Fig. 1.** Map of Khulna City Corporation (KCC) indicating the study area.

Khulna city, and warned that Fe, Cr and Cd have already exceeded the human health safety limit [26]. However, this study did not consider the health status of the residents living surrounding the dumpsite and those who lived far from the dumpsite in Khulna City. This study aims to investigate the health impact of people living near the primary waste disposal site of Khulna city and to categorize the pollution impact on adjacent residents of the primary disposal site.

## 2. Methods

### 2.1. Study area

There are 14 primary disposal sites and one final disposal site in Khulna city (Fig. 1). This study was carried out in all dumpsites. These dumpsites are situated near the residential areas, approximately 50–100 m away. These dumpsites were selected following the World Bank criteria to check the impact on residential land use due to landfill operations [27]. Details of the dumpsites are in Table 1.

### 2.2. Data collection methods

A primary survey was conducted around the dumpsite to get an idea about the number of residential dwellings and other operational establishments. The final questionnaire was developed afterwards with necessary adjustments. Questionnaire interviews were on existing waste types, the effect of waste on the environment and public health, disease outbreaks within households, and possible

**Table 1**
Location and visual or sensory environmental conditions of the dumpsites.

| Dumpsite station | Coordinate | Visual environmental condition |
|---|---|---|
| Khalispur Newsprint Mill, BIDC Road | 22°85'39.9″ N<br>89°55'01.5″ E | Human activities: Residential area<br>Waste type: Kitchen waste<br>Pollution: Air pollution, water pollution, unpleasant odor |
| Khalispur New Market, Khalispur New market Road | 22°85'88.2″ N<br>89°54'69.1″ E | Human activities: Market<br>Waste type: Market waste<br>Pollution: Air pollution, water pollution, unpleasant odor |
| Khalispur Customs House, Old Jessore Road | 22°84'10.3″ N<br>89°54'46.1″ E | Human activities: Residential area<br>Waste type: Kitchen waste<br>Pollution: Air pollution, water pollution, unpleasant odor |
| Mujgunni Residential Area, Road no. 6 | 22°85'38.6″ N<br>89°53'70.1″ E | Human activities: Residential area, slum area<br>Waste type: Kitchen waste, garbage<br>Pollution: Water pollution, air pollution, unpleasant odor |
| KDA New Market, KDA Approach Road | 22°82'44.5″ N<br>89°54'64.7″ E | Human activities: Residential area, restaurants, market<br>Waste type: Kitchen waste, market waste, food waste<br>Pollution: Air pollution, water pollution, unpleasant odor |
| Hotel Millennium, Majid Sarani Road | 22°82'36.1″ N<br>89°55'24.1″ E | Human activities: Residential area, market<br>Waste type: Kitchen waste,<br>Pollution: Water pollution, air pollution, unpleasant odor |
| Khulna General Hospital, Sadore Hospital Road | 22°82'35.7″ N<br>89°55'29.3″ E | Human activities: Hospital, residential area<br>Waste type: Medical waste, food waste, kitchen waste<br>Pollution: unpleasant odor, Water pollution, air pollution |
| Khulna Railway Station, Old Railway Road | 22°82'02.9″ N<br>89°55'88.9″ E | Human activities: Railway station, market<br>Waste type: Waste from market and rail station (vegetables, fruits, paper).<br>Pollution: Noise pollution, air pollution, Water pollution, unpleasant odor |
| Shantidham More, Khan Jahan Ali Road | 22°80'84.5″ N<br>89°55'79.1″ E | Human activities: Market, clinic<br>Waste type: Paper, garbage<br>Pollution: Water pollution, air pollution, unpleasant odor |
| NiralaMore, Sher-E-Bangla Road | 22°80'33.1″ N<br>89°56'55.2″ E | Human activities: Residential area, market<br>Waste type: Kitchen waste, market waste<br>Pollution: Water pollution, air pollution, unpleasant odor |
| Primary Teacher's Training Institute More, Khan Jahan Ali Road | 22°80'87.2″ N<br>89°56'55.1″ E | Human activities: Residential area<br>Waste type: Garbage, food waste, kitchen waste<br>Pollution: Water pollution, air pollution, unpleasant odor |
| Khulna Zilla School, Zilla School Road | 22°80'80.5″ N<br>89°57'44.3″ E | Human activities: Residential area<br>Waste type: Garbage, food waste, kitchen waste<br>Pollution: Unpleasant odor, water pollution, air pollution |
| CSS AVA Centre, Rupsha, Rupsha Strand Road | 22°80'44.8″ N<br>89°57'44.9″ E | Human activities: Residential area<br>Waste type: food waste, kitchen waste<br>Pollution: unpleasant odor, Water pollution, air pollution |
| Cocacola Dealer, Rupsha Strand Road | 22°80'20.1″ N<br>89°58'13.1″ E | Human activities: Residential area<br>Waste type: Garbage, household waste<br>Pollution: Water pollution, air pollution, unpleasant odor |
| Rajbandth, Khulna-Satkhira Road | 22°79'30.7″ N<br>89°49'87.8″ E | Human activities: Residential area<br>Waste type: Household waste<br>Pollution: Water pollution, air pollution, unpleasant odor |

waste management strategies. Ethical approval for this study was obtained from the Ethical Clearance Committee of Research and Innovation Centre (RIC), Khulna University, Khulna. Written informed consent was obtained from all participants prior to their inclusion in the study. Data were collected from the households within the perimeter between the radius of <50 m and 50–300 m from the dumpsites. The households living closer to the dumpsite (<50 m) were identified to be 53, whereas those residing away from the dumpsite (50–300 m) were 127. Then, the study's participants were selected strategically by considering the length of time they have been residing in the community. It was a descriptive cross-sectional study and simple random sampling among residents surrounding the dumping site.

### 2.3. Statistical analysis

Data collected from the questionnaires were coded and entered into a database. Statistical Package for Social Sciences (SPSS) version 23 was used for analysis. Categorical variables were presented as frequency and percentage. The *chi*-square test was conducted to identify the relationship between the household's location (distance from the dumpsite) and the different types of problem. A *t*-test was conducted to determine whether there were any significant differences between the two communities.

## 3. Results and discussion

The social and economic characteristics of both communities (50 m and 50–300 m) were analyzed by identifying the social and demographic traits of the participants. The results indicated that in both communities, the number of female participants (60.4%) exceeded than that of male participants (39.6%), which was approximately 21% higher (Table 2). A recent study reported about 52.5% women participation, which was only 5% higher than men, took part in a questionnaire survey on the assessment of urban sanitation status and management gap in the Chattogram city in Bangladesh [28]. This may be attributed to the higher willingness of female

**Table 2**
Social and demographic features of respondents.

| | Living close to the dumpsites (CD)(<50 m) | | Living away from the dumpsites (AD) (50–300 m) | |
|---|---|---|---|---|
| | Number | Percentage (%) | Number | Percentage (%) |
| **Gender** | | | | |
| Male | 21 | 39.62 | 46 | 36.22 |
| Female | 32 | 60.38 | 81 | 63.78 |
| **Total** | 53 | 100 | 127 | 100 |
| **Age** | | | | |
| 18–30 | 4 | 7.54 | 5 | 3.94 |
| 31–55 | 44 | 83.02 | 108 | 85.04 |
| >55 | 5 | 9.44 | 14 | 11.02 |
| **Total** | 53 | 100 | 127 | 100 |
| **Education** | | | | |
| No schooling | 8 | 15.09 | 9 | 7.1 |
| Primary | 24 | 45.28 | 43 | 33.9 |
| SSC | 16 | 30.19 | 60 | 47.2 |
| HSC | 5 | 9.44 | 14 | 11 |
| Graduate | 0 | 0 | 1 | 0.8 |
| **Total** | 53 | 100 | 127 | 100 |
| **Employment** | | | | |
| Self-employed | 0 | 0 | 1 | 0.79 |
| Employed | 24 | 45.28 | 72 | 56.69 |
| Unemployed | 8 | 15.09 | 22 | 17.32 |
| Farmer | 0 | 0 | 27 | 21.26 |
| Day labour | 20 | 37.74 | 5 | 3.94 |
| Retired | 1 | 1.89 | 0 | 0 |
| **Total** | 53 | 100 | 127 | 100 |
| **Income** | | | | |
| < US$185.54 per month | 36 | 67.92 | 90 | 70.9 |
| >US$185.54 per month | 17 | 32.08 | 37 | 29.1 |
| **Total** | 53 | 100 | 127 | 100 |
| **Household size (family members)** | | | | |
| 1–3 | 1 | 1.9 | 3 | 2.36 |
| 4–6 | 41 | 77.4 | 121 | 95.28 |
| >6 | 11 | 20.7 | 3 | 2.36 |
| **Total** | 53 | 100 | 127 | 100 |
| **Length of stay in the area (years)** | | | | |
| <1 | 0 | 0 | 4 | 3.2 |
| 1–5 | 0 | 0 | 1 | 0.8 |
| 5–10 | 26 | 49.06 | 38 | 29.9 |
| >10 | 27 | 50.94 | 84 | 66.1 |
| **Total** | 53 | 100 | 127 | 100 |

respondents to take part in this study, or because of their less engagement in the family income that made them more available to take part in this study. Women in the urban areas of Bangladesh still have lower participation in labour market, working and family income [29]. Women's working hours are higher than men, but most of their activities comprise personal and domestic works and taking care of children compared to working for income [30].

Participants aged from 31 to 55 years were the most dominant in both communities. Most of the participants were used to going to school for primary education in CD community and mostly completed secondary school certificate or level 10 (SSC) in AD community. The participants were mostly employed (45% and 57% in the CD and AD community, respectively) with low income (<US$185.54 per month) with a significant proportion as day labour (38%) in the CD community and agriculture (21%) in the AD community. This study indicated that more employed people are living in the AD community compared to CD community, and day labours either with no education or only primary education are living to the proximity of the dumpsite areas. Most of families (77%) comprised 4–6 family members having 2–4 children and living ≥10 years in the community. A possible explanation of the higher percentage of high-income people living in the CD community for a long time might be due to their permanent settlement. Recent socio-economic condition, high living and property expense, and huge material costs might challenge their life to move away from the dumpsite areas.

### 3.1. Perception of environmental problems faced by the community

The majority of those surveyed believed that the quality of their environment was affected by the location of the dumpsite. Approximately 74% of the respondents claimed that the odor emanating from the dumpsite was their main concern [31]. reported that about 78% of the people living close to the dumpsites are affected by air pollution and bad odor). Around 18% of the respondents believed that the dumpsite's location affected the quality of their health complained of burning smoke as a major issue. About 8% of the respondents think that dumpsites hampered the aesthetic value of that area. A previous study reported potential hazards such as flies, noise, smoke, odor, and threat to water supply are the major reasons of people's unwillingness to live close to the dumpsites [12].

The participants of the CD community have been affected by significant environmental issues, such as health problems, water contamination, noise pollution, and unpleasant smells. However, they do not consider the problems related to mosquitoes and sandflies as severe as the other issues mentioned (Tables 3 and 4). In comparison, participants in the AD community were exposed to fewer environmental problems, with most in CD community experiencing severe conditions and most in AD experiencing moderate conditions. Participants from CD community experienced higher noise pollution (moderate, 32.1%; severe, 39.6%) than AD community (moderate, 52.76%; severe, 33.07%). CD community perceived mosquito and sandfly disturbances as highly severe (39.6%), while it was reported as 21.2% by the AD community. High level of disturbances by mosquito was also reported from the nearby community of dumpsites compared to the distant communities [11]. Health problems were more prevalent in CD (19.49%) than AD (9.68%), emphasizing the environmental burdens near dumpsites and the need for targeted interventions (Tables 3 and 4). [10] stated that the bad smell from the dumpsite had a negative impact on the quality of life of the surrounding inhabitants. In addition, 80.5% of participants said that the bad odor was related to their present state of poor health. Bio-contaminants, the landfill also emitted toxic gases that cause serious air pollution [32]. Residents living near dumpsites were less satisfied with the location of their community than those residing further away from the dumpsite [11].

People living closer to or away from the dumpsites with high income and with good employment did not show any significant effect on causing waterborne diseases. It is likely that people with high income and employed can take measures to prevent some of the diseases as they are more conscious compared to the people living surrounding the dumpsites with low income and unemployment. Similar observation was found in the case of airborne diseases (Tables 5 and 6). These results suggest that even employed and higher income people cannot realize the severity of environmental and health impacts of dumpsites. Therefore, more research should be conducted in the dumpsite area and mitigation measures taken by the public health authority.

About 35.56% of the respondents claimed that the management agency is solely responsible for ensuring clean surroundings. Dumpsites near Khalishpur Custom House, Cocacola factory, Railway station, Khalishpur new market, KDA new market, PTI More, near the Zilla school, Khalishpur Newsprint mill, and Shantidham More were found better and well managed compared to other dumpsites. Dumpsites of Rajbandh, Mujgunni and CSS Abha center were in poor condition, remaining uncovered, closed to the main road and residential building, causing severe environmental and health related problems to the nearby community, including unpleasant odor, mixing with rainwater, and spreading waste from the open tanks. Mixing these wastes with the open bodies of water poses environmental and human health risks [28].

**Table 3**
Respondents' assessment of the significance of environmental problems in the community.

| | Living close to the dumpsites (CD) (<50 m) | | | | | Living away from the dumpsites (AD) (50–300 m) | | | | | Significance |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Minor *n* (%) | Moderate *n* (%) | I don't know *n* (%) | Severe *n* (%) | Highly severe *n* (%) | Minor *n* (%) | Moderate *n* (%) | I don't know *n* (%) | Severe *n* (%) | Highly severe *n* (%) | |
| Noise pollution | 0 | 17 (32.1) | 14 (26.4) | 21 (39.6) | 1 (1.9) | 11 (8.66) | 67 (52.76) | 42 (33.07) | 7 (5.51) | 0 | 0.011 |
| Mosquitoes and sandflies | 0 | 0 | 0 | 32 (60.3) | 21 (39.6) | 1 (0.8) | 10 (7.9) | 0 | 89 (70.1) | 27 (21.2) | .073 |

**Table 4**
Respondents' rating of major problems of dumpsites.

| | Living close to the dumpsites (CD) (<50 m) | | | | Living away from the dumpsites (AD) (50–300 m) | | | | Significance |
|---|---|---|---|---|---|---|---|---|---|
| Major problem | No problem *n* (%) | Health problem *n* (%) | Water pollution *n* (%) | Unpleasant odor *n* (%) | No problem *n* (%) | Health problem *n* (%) | Water pollution *n* (%) | Unpleasant odor *n* (%) | |
| | 1 (0.85) | 23 (19.49) | 7 (5.93) | 87 (73.73) | 33 (53.23) | 6 (9.68) | 1 (1.61) | 22 (35.48) | 0.000 |

**Table 5**
Combined effect of disease type and income in the dumpsite area.

| | Waterborne diseases | | | | Airborne diseases | | | |
|---|---|---|---|---|---|---|---|---|
| Distance*income | Living close to the dumpsites (CD) (<50 m) | | Living away from the dumpsites (AD) (50–300 m) | | Living close to the dumpsites (CD) (<50 m) | | Living away from the dumpsites (AD) (50–300 m) | |
| | <US$185.54 .151 (SE) | >US$185.54 .229 (SE) | <US$185.54 .097(SE) | >US$185.54 .153(SE) | <US$185.54 .155 (SE) | >US$185.54 .236 (SE) | <US$185.54 .100 (SE) | >US$185.54 .157 (SE) |

### *3.2. Perception of the diseases most reported by participants in both communities*

Most of the respondents suffered from diarrhea in both communities, where diarrhea outbreak was within 32.1% in CD community and 22.8% in AD community (Table 7). Allergic problem was dominant airborne disease which was higher in the CD (30.2%) compared to AD (18.1%) communities. Higher levels of pulmonary illness (16.98%) and asthma (11.32%) were reported by the respondents of the CD community compared to the AD community (Table 7). These results indicated that closer vicinity of the dumpsites was more subjected to water and air pollution, thereby causing more health risks. Most of the residents were victims of cholera, typhoid, chest related illnesses and diarrhea, malaria, and skin infections. A previous study reported that improper waste disposal near residential areas contributes to health issues. Individuals residing within a 100-m radius are found to be more susceptible to malaria, dengue, and asthma compared to those living at distances exceeding 500 m[33].

#### *3.2.1. Perception of waterborne diseases encountered by participants in CD community*

Fig. 2 represents the graphical representation of the respondent's assessments of living in the community near the dumpsite (<50 m) regarding waterborne diseases. Most of the respondents who stayed (5-10) years faced more waterborne diseases (e.g., dysentery, diarrhea) compared to those who lived more than 10 years. These results indicated that long staying residents might slowly adapt to the polluted environment, or they might get some level of immunity developed against waterborne pathogens. Another possible explanation might be people living a long time surrounding the dumpsites follow more hygienic household practices (e.g., washing with clean water) than the short stay respondents [34,35]. Previous studies also reported that people living closer to dumpsites suffering from diseases such as diarrhea, stomach pain, dysentery, and cholera more than people living far away from dumpsites[16,17,36].

#### *3.2.2. Perception of airborne diseases encountered by participants in CD community*

Fig. 3 shows the graphical representation of the respondent's assessment of living in the community near the dumpsite (<50 m) in terms of airborne diseases. Most of the respondents who stayed more than 10 years faced more airborne allergy and chest related illness compared to the short stay participants. The plausible explanation of higher chance of airborne allergic among the respondents living more than ten years in the CD community might be due to their long term stays close to the dumpsites, which exposed them to dangerous airborne compounds that act as allergens and are capable of causing different symptoms [31,34,37–39]. Similarly, shortness of breath and respiratory problems are the main health problems associated with landfill gas emissions and continue to increase throughout the year[40–42].

### *3.3. Perception of significant problems of dumpsites in both communities*

Fig. 4 shows the graphical representation of the respondent's rating of living in both communities in terms of the seriousness of each of the environmental characteristics. Results show that participants lived near the dumpsite (<50 m) faced more problems like health problems, unpleasant odor, water pollution, and liters and garbage in the street than participants lived away (50-30 m) from the dumpsites. A *t*-test was used to assess whether the differences noted between the ratings on the significance of the major problems by the two communities were statistically significant ($p < 0.05$) [11]. showed that adverse environmental conditions caused more severe problems for participants in the CD community than in the AD community.

It is highly recommended to construct clean, hygienic, and well-constructed covered dustbins with no odor spreading out. Assurance of regular collection and transportation of waste from the households' bins and primary dump sites. There is a need to enhance public awareness, training, and practices concerning waste management systems. Khulna City Corporation should establish the capacity to supply waste bins and ensure the timely collection of bins from all areas of KCC. Drainage systems should be maintained properly to prevent waterlogging and reduce the production of mosquitoes, flies, insects, and offensive odors. Financial resources,

**Table 6**
Combined effect of disease type and employment status in the dumpsite area.

| Distance*employment | Living close to the dumpsites (CD) (<50 m) | | | | | | Living away from the dumpsites (AD) (50–300 m) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Self-employed | Employed | Unemployed | Retired | Farmer | Day labor | Self-employed | Employed | Unemployed | Retired | Farmer | Day labor |
| Waterborne Diseases (SE) | – | .168 | .292 | .825 | – | .185 | .825 | .097 | .176 | – | .159 | .369 |
| Airborne Diseases (SE) | – | .176 | .305 | .862 | – | .193 | .862 | .102 | .184 | – | .166 | .385 |

**Table 7**
Respondents' ratings of how participants in both communities' report illnesses.

| Waterborne diseases | Living close to the dumpsites (CD) (<50 m) | | | | Living away from the dumpsites (AD) (50–300 m) | | | | Significance |
|---|---|---|---|---|---|---|---|---|---|
| | No diseases *n* (%) | Diarrhea *n* (%) | Dysentery *n* (%) | | No diseases *n* (%) | Diarrhea *n* (%) | Dysentery *n* (%) | | |
| | 32 (60.4) | 17 (32.1) | 4 (7.5) | | 93 (73.23) | 29 (22.83) | 5 (3.94) | | 0.090 |
| Airborne diseases | No diseases *n* (%) 22 (41.51) | Chest illness *n* (%) 9 (16.98) | Allergy *n* (%) 16 (30.19) | Asthma *n* (%) 6 (11.32) | No diseases *n* (%) 92 (72.5) | Chest related illness *n* (%) 8 (6.3) | Allergy *n* (%) 23 (18.1) | Asthma *n* (%) 4 (3.1) | 0.009 |

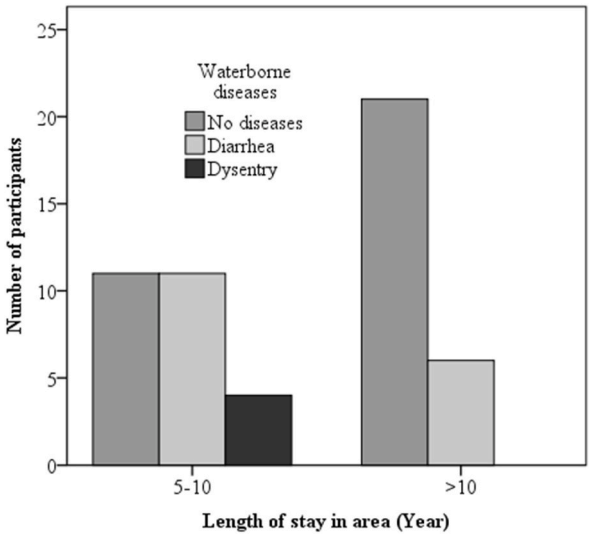


**Fig. 2.** Cross-tabulation between the duration participants lived in the community near the dumpsite (<50 m) and waterborne diseases.

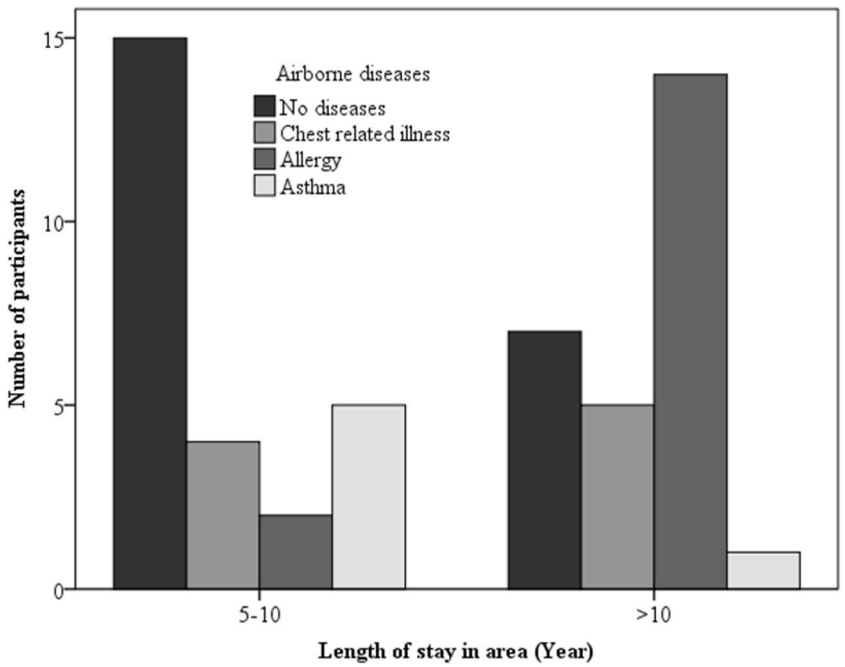


**Fig. 3.** Cross-tabulation between the participant's length of stay in the area near dumpsite (<50 m) and airborne diseases.

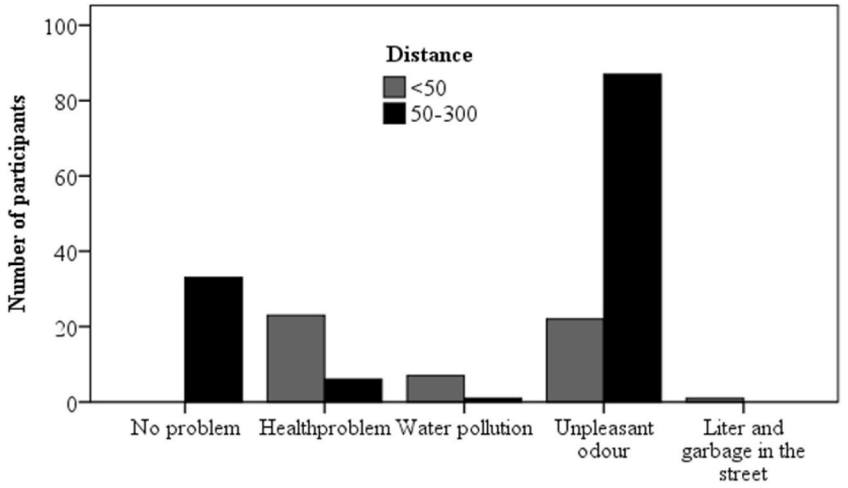


**Fig. 4.** Comparison between two communities indicating the major problems of each dumpsite.

institutional framework, proper selection of technology, transportation systems, and disposal options should be improved for the management of KCC solid waste. The city corporation authority should establish thorough monitoring protocol to confirm that household waste is being disposed of in securely sealed, biodegradable waste bags. In pursuit of long-term environmental sustainability, an effective waste management approach should encompass sorting, recycling, treatment, and the advancement of energy generation. Achieving this objective necessitates meticulous planning at each stage of the waste management process.

## 4. Conclusion

This study concludes that the CD community experienced a lot of problems, including health problems, water and air pollution, unpleasant odors, mosquitoes, and sandflies. The AD community was facing lower environmental problems and health related problems compared to the CD community. Inhabitants living close to the closer proximity of the dumpsite, are becoming more conscious about environmental pollution and health hazards. The health effects associated with waste in this study show that proper waste management is needed. The dumpsite should be away from the residential areas to avoid certain environmental and health problems.

To the best of our knowledge, this is the first attempt to address the health status assessment of people near the dumpsites in Khulna city. While this study has limitations, such as reliance on self-reported health status without clinical diagnosis data, it still offers valuable baseline information for future research on dumpsite-induced environmental and human health risks as well as policy-making for sustainable waste management strategies. Future research should prioritize the development of environmentally sound dumpsites that effectively mitigate odor dispersion, prevent water contamination, preserve soil quality, and safeguard public health.

## Ethics declarations

This study was reviewed and approved by the Ethical Clearance Committee of Research and Innovation Centre (RIC), Khulna University, Khulna, with the approval number: KUECC-2022-10-46.

## Author contribution statement

Afra Tanjim Shammi: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Nazia Hassan: Conceived and designed the experiments; Analyzed and interpreted the data.

Md Rony Golder: Shikder Saiful Islam: Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Hriday Molla: Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data.

## Data availability statement

Data will be made available on request.

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.heliyon.2023.e19810.

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