Assessment of solid waste management practices in Kebridehar city Somali regional state, Ethiopia

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ABSTRACT

In developing countries, solid wastes are not collected and thus discharged into open spaces and drains. The consequences of this event have an impact on human life as well as the environment. The aim of this study was to assess the existing solid waste management practices, as well as sources, types, and determining characteristics of solid waste in the study area. Simple random and purposive sampling methods, respectively, were employed to select 3 sample kebeles and 160 respondents. The data were analyzed in SPSS version 26 using descriptive statistics and an econometric model. The binomial logistic model was used to determine the factors that influence solid waste management activities. The results indicated that Plastics/bags/bottles, food waste, paper/carton, tins/cans, and glasses were the major types of solid wastes in the study area. The majority (45%) of the respondents identified plastics as the dominated solid waste in Kebridehar city. Gender, marital status, and occupation had insignificant negative effects on solid waste management practice. Age (p = 0.030) and distance (p = 0.000) from the center of town, on the other hand, had statistically significant effects on solid waste management practice. The majority of respondents (76.2%) had not received any information regarding the effects of solid wastes on the environment and human life. Beside this, there were no solid waste public bins within walking distance of their residences. In conclusion, the study found that communities were not aware regarding the impacts of solid wastes on the environment; there were no solid waste public bins near the residence of communities at all. Depending on the major findings of the current study, the authors recommend that the city administration should install trash bins near the residences of the communities. The city municipalities should provide training for the communities regarding environmental and human health, the impacts of the solid wastes.

1. Introduction

Wastes that are often discharged from residential, commercial, and institutional activities make up the majority of municipal solid wastes (MSW). Food waste, paper, plastic, glass, textile scrap material, wood, and other materials are examples of these wastes. Such materials cannot decay naturally and take a longer time to deteriorate, necessitating the urgent need to find another method to alleviate such an issue (Ashani et al., 2020; Wang et al., 2017).

MSW generation in urban areas has increased dramatically in recent years as a result of increasing population, urbanization, and improved lifestyles. According to the World Bank, MSW created in urban areas is currently over 3.5 million tons per day, with that number predicted to rise to around 6.1 million tons per day by 2025 (World Bank, 2019). Various societal variables, such as population growth and rapid socioeconomic global development, have contributed to the rapid expansion in supply and demand for goods and products over the previous few decades. For effective waste management, new strategies are required to develop varied and flexible urban models. Urbanization is currently one of the major contributors to solid waste output in most parts of the world (Kumar and Pandey, 2019; Chen, 2018).

A door-to-door collection system is widespread in most industrialized countries. But municipalities in underdeveloped countries can only provide this service to a small fraction of the population due to budgetary and administrative constraints (Bezama and Agamuthu, 2019). Unplanned placement of communal bins or garbage sites could endanger water resources, especially water sources like rivers and streams. In time, other groundwater sources including hand-dug wells and boreholes will also be impacted (Odonkor et al., 2020). Many urban residents in developing countries lack access to sewerage systems and efficient...
municipal waste disposal, which severely pollutes their surroundings (Solgi et al., 2018). In addition, many city dwellers improperly manage and handle their waste products, whether on purpose or accidently aggravating soil and water pollution.

In several countries in Sub-Saharan Africa, garbage collecting techniques like communal container collection methods appear to be the most prevalent (Odonkor et al., 2020; Lloyd, 2019; Lagerkvist and Dahlen, 2012). Common containers (trash bins) are given at designated sites across neighborhoods for homeowners to drop-off their solid waste under this system. Rubbish collection vans then come, and collect these containers, emptying the trash at authorized disposal sites before returning the containers to their original places. However, this trash collection method is faced with several difficulties most of the time leading to uncollected. Therefore, there is waste overflow, ground dumping at collection sites, and unlawful storage areas (Atkinson et al., 2019).

According to the studies, significant proportions of solid waste disposal in Ethiopia are not collected and hence wind up in open places and sewers. Both human life and the ecosystem are threatened by the consequences of this occurrence. Solid waste disposal is a severe issue because, when burned, it can increase air pollution, and, when thrown in the open, it can contaminate the land, and water in the surrounding areas (Jerin et al., 2022). The management of solid waste in Ethiopia faces a variety of challenges, such as a lack of finance and resources, technical challenges, a lack of public awareness, and a lack of coordination between various government agencies and the public and private sectors (Ashikuzzaman and Howlader, 2020).

Several researchers have looked into the health and environmental effects of waste disposal, and they’ve discovered that waste and health are inextricably linked (Habib and Sarkar, 2017). As a result of the findings of these investigations, scientists have been increasingly interested in the study of environmental contamination and its impact on microorganisms. Only a small number of studies, however (Mekonnen et al., 2020), have examined the environmental and health effects of solid waste on residents who live close to garbage dumps.

Solid waste management systems in the Kebridehar city continued to be inappropriate and problematic. However, no one was willing to do the research. Municipal solid waste management has previously served the city, but has not been able to solve the problem due to rapid urbanization and population growth. Water and other liquid packaging plastics are widely disposed of in the city. As a result, the researchers decided to carry out this sociological study to solve the problems of improper solid waste management practice, which in turn encourages researchers and organizations to look for Kebridehar city in the future.

**Null hypothesis (H0):** all determinant factors have no significant effect on solid waste management practices.

**Alternative hypothesis (H1):** all determinant factors have significant effect on solid waste management practices.

## 2. Materials and methods

### 2.1. Description of study area

Kebridehar is a city in the eastern part of Ethiopia known as the Somali regional state. It is located about 1011 and 393 km to the southeast of Addis Ababa and Jigjiga, respectively. Geographically, it is located between a range of 6°15'50"-7°16'10"N and 43°37'10"-44°03'20"E, respectively, of latitude and longitude (Figure 1). The average elevation of the city is 393m mean above sea level.

According to the Central Statistical Agency (CSA) of Ethiopia, the entire population of Kebridehar city is 136,142. Men and women make up 77,685 and 58,457 of the total population, respectively. The major populations (36.99%) of the communities are pastoralists, while 21.48% of communities are urban inhabitants (Kebridehar City Environmental Protection Office [KCEPO, 2020]. The mean maximum and minimum temperature of Kebridehar varies from 21.2 °C to 35.4 °C, and 18.7 °C-20.3 °C, respectively. Beside this, the range of precipitation is between 0 and 149 (Sheng et al., 2021).

### Table 1. Sample size.

| Sample Kebeles | Total Household Heads | Sample size | Percentage |
|----------------|-----------------------|-------------|-------------|
| 01             | 1115                  | 66          | 41          |
| 02             | 932                   | 55          | 35          |
| 10             | 638                   | 39          | 24          |
| Total          | 2,685                 | 160         | 100         |

Figure 1. Study area map.
2.2. Sampling techniques and sample size determination

The Kebridehar city was the only one chosen for the study in order to collect the predicted data. This is because the city has a higher population density and produces more waste than rural places. Purposive sampling was used to select 3 sample kebeles from 12 kebeles throughout the city based on variables such as population density, commercial activity, location, and institution center. Kebele 01 (densely populated), kebele 02 (commercial activity), and kebele 10 (institution center) were chosen. Then, a simple random sampling technique was employed to select 160 respondents (Table 1).

The total number of households for selected kebeles was 2685 (Table 1). The degree of precision, z-value, P-value, confidence level, and assuming the response rate were 0.065, 1.96, 0.3, 95%, and 100%, respectively. The sample size (n) was determined by using a statistical technique developed by Dahlén et al. (2001), and can be calculated as:

\[
n = \frac{A^2 \times \hat{p} \times \hat{q}}{R^2}
\]

Where:
- n: sample size required.
- N: number of households.
- \( A \): degree of precision, expressed as a decimal: (i.e. 3%, 5%, 6.5%, 8.5%, 10%) for precision
- \( Z \): based on confidence level: 1.96 for 95% confidence.
- \( P \): estimated variance in population as a decimal (0.5 for 50–50, 0.3 for 70–30).
- \( R \): estimated response rate, as a decimal.

2.3. Data source and collection procedure

For greater precision, the current study used both primary and secondary data sources. Questionnaires, surveys, field observations, and interviews with households, government officials, and municipal administrations were used as primary data sources for this study. To supplement primary data, secondary sources of information were employed. Books and journals from individuals, governmental and non-governmental organizations, and census reports were all secondary data sources.

The generation rates, as well as attitudes on solid waste, sources, types, and collection services, were obtained from households using well-designed open and closed-ended questionnaires. It was also used to gather data on the demographics and socioeconomic characteristics of households. To make these questionnaires more accessible to sample households, they were initially written in English and then translated into Amharic and Somali languages.

Following the preparation, the questionnaires were distributed to respondents at random as pre-tests to identify any questions that were unclear or misleading. Face-to-face interviews were used to gather data from sample households.

2.4. Data analysis

The data were analyzed using the Statistical Package for Social Science (SPSS) version 26. The findings were presented using descriptive statistics. The regression of the dichotomous response variables was calculated using a binary logistic model. The binary logistic regression model was also used to identify the significant effect of determinant factors on solid waste management practices.

2.5. Ethical approval committees

The approving ethical committees are as follows: Latamo Lameso Lelamo, Mahemed Abdi Wali, and Kebede Mamo Adera.

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### Table 2. Socioeconomic characteristics of respondents.

| Characteristics of dummy variables | Description       | Frequency | Percent |
|------------------------------------|-------------------|-----------|---------|
| Sex                                | Male              | 101       | 63.1    |
|                                   | Female            | 59        | 36.9    |
| Marital status                     | Single            | 44        | 27.5    |
|                                   | Married           | 82        | 51.3    |
|                                   | Divorced          | 13        | 8.1     |
|                                   | Widowed/er        | 10        | 6.3     |
| Educational level                  | Literate          | 92        | 57.5    |
|                                   | Illiterate        | 68        | 42.5    |
| Major occupations                  | Government servant| 81        | 50.6    |
|                                   | Other Business    | 79        | 49.4    |
| Characteristics of continuous variables | Minimum      | Maximum | Means |
| Age of Respondent in year          | 24                | 74        | 48.1    |
| Family size in No                  | 1                 | 13        | 6.1     |
| Time taken in minute               | 1                 | 50        | 13.1    |
| Average income in ETB/year         | 10,000            | 600,000   | 56631.3 |

### Table 3. Major solid waste sources.

| Source                             | Frequency | Percent |
|------------------------------------|-----------|---------|
| Households                         | 58        | 36.3    |
| Commercial                         | 49        | 30.6    |
| Public Service (hospitals, clinics, schools...) | 21       | 13.1    |
| Restaurants/hotels                 | 32        | 20      |
| Total                              | 160       | 100     |

3. Results and discussions

The socio-demographic characteristics of the respondents include gender, age, religious affiliation; marital status, educational level, occupation, and income level are presented in Table 2.

3.1. Socio-economic characteristics of respondents

The researchers focused on the demographic characteristics of the respondents they wanted to get to know and work with. The researcher needs to know the respondent’s profile in order to get trustworthy results. According to the profiles of respondents, 63.1% were men and 36.9% were females, with 51.3% being married, 27.5% single, and 8.1% divorced, and 6.3% widowed.

According to the respondents, 57.5% were literate (officially educated) and 42.5% were illiterate (formally uneducated and unable to read and write). 50.6% worked in the government sectors, and 49.4% worked in other businesses. The responders were 24 years old on average and 74 years old on average. Respondents had an average family size of 6.1, with a minimum and maximum number of one and thirteen families, respectively. The average time it took to get from the town center to each kebele residence was 13.05 minutes, with the minimum and maximum times being one and fifty minutes, respectively. Furthermore, the average household income was 56631.2500 Ethiopian birr (Table 2).

3.2. Major solid waste sources

Table 3 showed that the majority of solid waste (36.3%) was generated from households, while the lower numbers of solid waste (13.1%) were generated from public services (Table 3). This result is agreed with the results of (Odonkor et al., 2020), who stated that the majority of solid wastes were generated from households. This is due to the limited number of public services in the city. However, 30.6 and 20% of solid...
wastes were generated from commercial activities and restaurants/hotels, respectively (Table 3).

### 3.3. Major solid waste types

The majority of residences dispose of various types of solid waste in the study area with little to no management. The majority of solid waste (45%) generated in the Kebridehar city were Plastics/bags/bottles. This is because the city is physically deserted and the people need a lot of fluids and drinks, a lot of canned drinks. This means that after using the sealed liquid, they throw the packaging and other similar plastics around it. According to the findings, plastic waste has been identified as a major environmental issue in Kebridehar city (Figure 2). This result was supported by (Odonkor et al., 2020), who found that the major types of waste generated by households in the Ghanaian district were plastic and rubbers. This is also supported by (Yoada et al., 2014), who stated that plastic made up 64.3% of total waste produced among households in the Madina Municipality in Accra. In addition, 18.8, 16.9, and 13.1, and 6.3% of solid wastes were food waste, paper and cartons, tines/cans, and glass, respectively (Table 4).

### 3.4. Awareness and attitude of the respondents on solid waste

Any waste management program must include public awareness and participation in relevant legislation, as well as strong technical support and adequate money. Hasan (2004) stated that waste is the result of human activities and advised everyone to have a thorough awareness of waste management in order to avoid jeopardizing the waste management plan. A person who was unaware of the effects of waste believes that if they continue to live with the waste, nothing will happen, which stifles good waste management efforts.

According to the research, knowledge of SWM is measured in terms of behavioural change toward what people do (Environmental Protection Agency [EPA], 2013). The study uses ‘yes and no’ descriptive frequency tables to estimate the level of awareness of household respondents. The results revealed that 71.9% of households were aware about solid waste, which can have major environmental consequences; yet, 76.2% of respondents had no access to knowledge on the environmental effects of solid wastes (Table 5). According to 79.6% of respondents, if solid wastes were well managed, local environmental problems could be reduced. Lack of knowledge about the effects of waste leads some people to believe that they can continue to live with the waste, which is important?

According to the overall questionnaire survey, 81.7% of respondents said that there is improper solid waste management in the study area. All respondents confirmed that there is no public bin near their home. The majority (60.6 %) of the respondents stated that solid waste collection activities were conducted door to door. However, the municipalities did not cover the entire town owing to transportation and labor constraints. Table 5 showed that 55% of households were responsible for paying 50–200 Ethiopian birr for municipal service. However, the cost varies from household to household depending on the amount of waste.
they disposed. According to the respondents, paying actions did not result in effective and efficient change because the local municipality is experiencing budget difficulties and lacks community participation. This finding is supported by Henry et al. (2006), who stated that most municipal authorities are financially compelled to provide efficient Municipal solid waste management (MSWM).

Despite the fact that a suitable waste management law exists, local administrations lack the resources to put it into effect. The majority (95%) of the respondents recognized the presence of solid waste management centers in the study area (Table 5). However, collected solid wastes were considered useless and not used for any purpose. Instead, it was dumped in an open landfill. This is due to a lack of agricultural activities in the study area.

Some solid wastes, such as metal scraps, cans, and hard plastics, were sold and transferred to another place for different unknown purposes. The findings contrasted with the results of Henry et al. (2006), who found that because organic waste made up half of municipal solid waste, increasing composting organizations can significantly reduce the quantity of MSW that ends up in landfills.

### 3.5. Generation rate of solid wastes

The majority (57.5%) of the respondents were disposing of the waste into their trash bins before being transported to the transfer station of the study area. Opposite to this, 3.7% of respondents dispose of their wastes on the road either at the night or early in the morning. This is due to the city-municipality punishing the community who dispose of the waste on the road. However, 19.9, 11.3 and 7.5% of the respondents, respectively, disposed of the wastes on open spaces, valleys, and landfills (Table 6). This result agrees with Mekonnen (2012), who concluded that communities should not be obliged to accept responsibility for their own waste collection and should dispose of waste wherever they like.

As shown in Table 6, 69.4, 10, and 11.8% of the respondents, respectively, were dispose their wastes at any time, early in the morning and late at night. The majority (62.5%) of respondents dispose of the wastes twice a day. 31.9% of the respondents dispose of the wastes once a day and 5.6% of the respondents dispose of their wastes once a week.

### 3.6. Determinant factors of solid waste management activities

A binary logistic regression model was used to determine the factors of solid waste management activities. Before analyzing the data, the variance inflation factor (VIF) and the correlation were used to test for multi-collinearity among the continuous and dummy explanatory variables.

However, all explanatory variables were included in the analysis because none of them had a multi-collinearity problem. Six of the nine independent variables were significant at p<0.05 on solid waste management activities after the explanatory factors were fitted to the model. Age, family size, length of stay, education, distance from town center, and average income were the factors considered. The remaining three variables, sex, marital status, and occupation, were all insignificant, although each had a negative or positive impact (Table 7).

Because the value of the omnibus test of model coefficients is significant, the model summary of the result demonstrates that the data well fits the models (p = 0.000). This result was contradicted with the results of the Hosmer and Lemeshow tests, which yielded no significant results (0.508). When the independent variable was included, the model correctly predicted 58.1% of the time, which is an improvement above null models (block 0).

### 3.6.1. The age of the household head

The age of the household head is a key explanatory variable that influences solid waste management methods. The age odd ratio for SWM practices is 0.855, and the age coefficient value (0.157) suggests a negative sign at the 95% confidence level (p = 0.03). This association specified that as the age of a household increased, the likelihood of using solid waste management activities reduced by 0.855 times. This meant that older household heads were less likely to utilize solid waste management, because as people aged, they lost energy in nature. The activity of solid waste management also requires additional energy or manpower. As a result, older household leaders were unable to practice as well as their younger counterparts. The result is consistent with the study confirmed as the majority of solid waste workers are junior, fresh and active who have the potential to work and keep the city clean if positively motivated (Sodiq et al., 2019).
Open dumping, on the other hand, affected younger age groups more than older age groups (Solomon, 2018). Due to their age, older people tend to make more mature decisions when analyzing health and environmental issues, which results in them expressing a high readiness to pay. In other ways, Boateng et al. (2016) and (Awuony-Vitor et al., 2013) assert that age has a detrimental impact on willingness to pay for garbage management. Older folks could be less ready to pay for rubbish removal since they see it as the government's obligation. Younger people might be more experienced with cost sharing and more eager to contribute. As various researches claim that the effects of aging reveal conflicting results.

3.6.2. Family size

Family size is the best and most essential determinant factor for solid waste management operations. Family size has a statistically significant impact and positive correlation with solid waste management activities, with a coefficient value of 0.775, an alpha value of 0.007, and an odd ratio of 2.170. When the number of families in a unit increased by 2.170, the likelihood of utilizing solid waste management increased by 2.170. This explanation showed that a high family size was normally associated with advanced labor endowment. Having a large number of families would enable a household to complete various solid waste management activities that were labor intensive, such as transporting waste to a disposal facility. In fact, families with more children are more likely to utilize their children to clean the environment rather than paying municipal authorities extra money to do so. It is predicted that individuals will be more eager to pay to maintain a clean environment because the more people a home has, the more waste is produced and disposal becomes a problem (Niringige, 2010).

Despite the fact that larger families consume more resources and produce more waste, they also lessen work load or burden since they see it as the government’s obligation. Younger people might be more experienced with cost sharing and more eager to contribute. As various researches claim that the effects of aging reveal conflicting results.

3.6.3. Duration of a household’s stay in town

This revealed how long the household heads had lived in the study city, and it is a determining factor in solid waste management techniques. At a 95% confidence level, the coefficient factor of household living duration was 0.131, with an odd ratio of 1.14 and an alpha value of 0.001. Therefore, if a family member has been living in the same area for a long time, he or she will have a responsibility to maintain the environment and keep it clean.

According to this model, there is a positive relationship and statistically significant effect on solid waste management practices to maintain other variables constant. While a unit of household living age was squeezed, the probability of using solid waste management climbed 1.14 times to the successor household head age. The possibility for household heads to employ solid waste management strategies evolved through time is that an individual offered environmental attention after ensuring his or her owner of the surroundings, who may also be elderly or residing in the town. The longer a household has lived there, the more they will comprehend the issue with the area’s solid waste management and the more they will be ready to pay for improvements.

3.6.4. Education

Education is unrivaled in its ability to modify human behavior and raise environmental awareness. With an alpha value of ($p = 0.047$), an odd ratio of (EXP (B) = 9.313), and a coefficient of education (B = 2.231), education has a substantial and positive association with solid waste management use. The model’s outcome indicated that literate people were 9.313 times more likely than illiterate people to use solid waste management activities. This finding indicates that education raises people’s awareness of the negative implications of solid waste and the benefits of solid waste management for the environment in order to mitigate its impact. This result is supported by (Solomon, 2018), who found that open dumping is adversely connected with educational levels of respondents. Another study by (Mwanthi et al., 1997) found that a lack of qualified and technical human resources, as well as poor financial and property management, resource management, and employee laxity, were important contributors to solid waste mismanagement.

There was sufficient evidence to conclude that the respondent’s age and educational level were significantly and positively correlated with how household waste was sorted before disposal, with probability values of 0.000 and 0.000, respectively (Odonkor et al., 2020). The use of community-based approaches in developing countries is severely constrained by a lack of public awareness and school education about the value of proper SWM for human health and well-being, which is also a key reason why a municipal solid waste management service in developing countries fails (Bishanu and Berissa, 2015). In a similar vein, Kebridehar city’s community participation is very low.

3.6.5. The distance between residence households and the city center

This independent variable has a statistically significant effect on the use of solid waste management practices ($p = 0.000$) at the 95% confidence range. The odd ratio value for time taken from any area of the town to the center is 0.762, and the coefficient value of -0.272. This indicated that the use of solid waste management practices has a negative relationship. In terms of solid waste management, the longer average distance from any household head to the city center is 0.762 times smaller than the household head of nearest to city center. The result was agreed with the study of (Chinasho, 2015), irregularity of waste removal from the containers after filling and long distance from containers might have negatively influenced the solid waste management services.

This implied that households living away from the city center had not got any access and services as the nearest community. Due to this reason, the areas away from the center are expected to have lower probability of using solid waste management practices as compared to households near to the city center. This means that municipalities only collect solid waste in urban areas; and communities far from the city, dump the solid waste wherever it is needed, so it pollutes the environment. This is consistent with the study of (Regassa et al., 2011), who reasoned that most of the waste collection and transportation services are often administered only by the government/town municipality, with no or little involvement of private sectors. This result also agreed with the result of (Odonkor et al., 2020) who stated that the long-distance discourages some residents; thus they tend to dispose of waste in open drains. The distance took between one and two hours from the community center to the ultimate site of waste disposal site. The average travel distance (in kilometers, one-way) from the city center to a disposal site was significantly correlated with the number of garbage disposal facilities in the neighborhood (Odonkor et al., 2020). Adu-Boahen et al. (2014) also observed this same phenomenon in their study as cited in (Odonkor and Sallar, 2021). This shows that the collection and transportation services need improvement so as to address the problems of SWM of the city. Each family should be compelled to place a container in front of the house on particular days and pick up the container once its contents have been gathered, according to one opinion, in order to salvage this scenario (Boateng et al., 2019; Francis Xavier et al., 2018).

3.6.6. Average household income

There was significant increase in the likelihood of using solid waste management practices as solid waste impact reduction choices in the study area. When the average household income in ETB increased by a unit, the likelihood of engaging in SWM activity increased by 1.0005 times at significant value ($p = 0.032$), while all other variables remained constant. With a coefficient value of 0.0005, it has a positive association.
It appears that when household wealth rises, the amount of polyethylene waste produced reduces. The findings are consistent with those of (Kuruppuarachchi and Kalukottege, 2005), who found that household income is negatively connected to the use of polyethylene items, even when they have been using non-polyethylene and metallic materials for a long time. Because the materials they utilized were not utilized and thrown away due to a lack of average household income. Low-income groups in rural and urban locations are disproportionately affected by the lack of waste collection services (Zhu et al., 2008). The environmental economics literature generally agrees that income and demand for better environmental quality are positively correlated (Awunyo-Vitor et al., 2013).

On construction sites in the city, there may be construction waste that needs to be replaced and reworked, transported, and disposed of, all of which will incur additional expenditures (Figure 3). In this aspect, waste has been identified as having a detrimental economic impact by generating extra expenses (Eze et al., 2017; Tafesse et al., 2022). In general, it is advised that ideally, bins should be emptied every day to prevent the occurrence of diseases and environmental contamination (Adzawla et al., 2019).

4. Conclusion

Solid wastes are a major source of pollution in urban areas, and in most developing countries, they contribute to the spread of various human diseases. Paper and cartons, plastics/bags/bottles, food wastes, and tins/cans were all identified as solid waste types that pollute the environment in this study. Commercial activities, households, public services/hospitals/clinics, schools, and restaurants/hotels all were the main source of these solid waste categories. Solid wastes were disposed of in the city at various disposal times from the various sources and locations mentioned above.

According to the findings, the majority of respondents collect of their waste in their own container, whereas a small percentage of respondents disposed of their waste on the road or in public places. Solid waste management activities were strongly influenced by determinant characteristics such as living duration, income, family size, education, age, and distance, whereas just three factors, sex, marital status, and occupation, had no more significant effect as the above factors. It is suggested that governments and non-government organizations work together to strengthen the private sector’s participation in SWM services. The study further recommends that the Municipal Authorities should minimize the amount of solid waste that goes to the dumping site through composting and recycling/reusing solid waste generated in Kebridehar city.

5. Recommendation

Based on the respondents, there were no public bins near the residential areas of the communities. Besides this, the communities did not take any training regarding the effects of solid wastes on the environment as well as on human life. Therefore, the authors recommend that the city administration should establish trash bins near the residences of the communities. The city municipalities should provide training for the communities regarding environmental and human health, the impacts of the solid wastes. And also the municipalities and the city administration should have to work in collaboration with the community to reduce the amount of solid waste generated in the city. The authors also recommend that the city council and municipality should work hard to expedite the disposal of solid waste in all kebeles of the city.

Declarations

Author contribution statement

Zawde Tadesse: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Wrote the paper.
Zemenu Tadesse: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Wrote the paper.
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The data that has been used is confidential.
Declaration of interest's statement

The authors declare no conflict of interest.

Additional information

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