

Original Research Article

A study on awareness of household waste management in a rural area of Northern Kerala

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ABSTRACT

Background: Proper waste management is a major concern of public health. It is necessary to create positive behavioural changes towards waste management among public in order to control diseases. Objective was to assess the awareness of waste management among the households of Cheruthazham Panchayat in northern Kerala.

Methods: A community based cross sectional study was conducted in Cheruthazham Panchayat, under Kalliasseri block, located in Kannur district of Kerala state from June 2017 to July 2018. A total of 400 households were studied. Multistage sampling was done. Data was collected by direct interview using a pre-tested semi-structured questionnaire. Data was analyzed using SPSS software.

Results: The participants responsible for the waste management in household were women. Out of the 400 participants, 83%, 11% and 6% were Hindus, Muslims and Christians respectively. Majority of them (82%) had an educational qualification of high school and above. Most of them (82.5%) were housewives. About 47% of the study population belongs to upper middle class. Their major sources of information about solid waste management were Kudumbasree class, gramasabha meetings and media. In the study, 19.2% had good knowledge, 79.2% had average knowledge and 1.5% had poor knowledge on waste management.

Conclusions: Majority of the participants had above average attitude towards household waste management. Continuous awareness programmes have to be conducted on safe waste disposal and efforts should be made to sustain the supervision of household waste management.

Keywords: Awareness, Household, Waste management

INTRODUCTION

Solid waste may be defined internationally as the non-liquid waste materials from domestic, trade, commercial, industrial, agricultural and mining activities and from public services. Wastes arising from human and animal activities are normally solid and are discarded as useless or unwanted. The Resource Conservation and Recovery Act of 1976 (RCRA) defines solid waste to include garbage, refuse, sludge from municipal sewage treatment plants, ash from solid waste incinerators, mining waste, waste from construction and demolition and some hazardous wastes.¹

Solid waste can be classified in terms of their original use (such as packaging waste), the material (glass, paper, or plastics), their physical properties (combustible or biodegradable), their origin (domestic, commercial, industrial or agricultural), and the safety parameters (hazardous/radioactive).² The household wastes can be classified as biodegradable and nonbiodegradable waste. Biodegradable wastes are wastes like food waste that can be decomposed by biological processes. This should be composted at the community level. Non-biodegradable wastes are wastes like plastics, broken glass, etc. that cannot be decomposed, that can be segregated and sold or recycled. Waste segregation is the sorting out or

separating out the biodegradable and nonbiodegradable waste in to separate bins.³

Waste should be properly stored before disposal. Storage is the action of accumulating rubbish before disposal.⁴ Liquid waste is the used and unwanted water. Waste water generated in the toilet is called “black water”. It is also called as sewage, which contains the excreta and other harmful pathogens. Waste water generated in the kitchen, bathroom and laundry is called “greywater”.⁵ It is also termed as sullage. Lack of a proper environmental sanitation system and poor hygiene can lead to deterioration of public health.^{6,7}

The 2011 census of India estimates a population of 1.21 billion which is 17.66% of the world population. About 0.1 million tonnes of MSW is generated in India every day.⁸ Increasing population, urbanization, industrialization and changing consumption patterns are resulting in the generation of increasing amounts and different types of waste. There is a need to practice integrated solid waste management approach such as incorporation of more environmental and economic friendly concepts of source separation; recovery of waste; legitimization of the informal systems; partial privatization and public participation.^{9,10}

India has undertaken several waste management programmes. In 1999, the Government of India restructured the comprehensive rural sanitation programme and launched the total sanitation campaign (TSC) which was later (on 1 April 2012) renamed Nirmal Bharat Abhiyan (NBA).¹¹ Kerala has launched a Clean Kerala mission in 2002, with the objective of creating a garbage free Kerala.¹⁰ One of the recent initiatives of Kerala government in 2016 was “Nava Kerala Mission”.¹¹

The purpose of my study was to assess the awareness of domestic waste management among rural people. The findings can be utilized to alter the quality of environment and thus improve public health.

METHODS

Study design and setting

It was a community based cross sectional study. Cheruthazham Panchayat, under Kalliasseri block is located in Kannur district of Kerala state. It has got a total of 9454 households and a population of around 45000.

Study population

The study included households in Cheruthazham Panchayat of Kannur district.

Inclusion criteria

All households with permanent residents of Cheruthazham Panchayat for atleast a period of 6 months.

Study period

This study was conducted for a period of 18 months, from June 2017 to July 2018.

Sample size

A study done on household waste disposal in a Panchayath of K. S. Hegde Medical Academy, Mangalore in 2015, showed that about 55% of households reduce, reuse and recycle waste materials.¹² so by taking 55% as prevalence rate and 10% as relative precision, sample size was 327 as per $4pq/d^2$, where P = prevalence, Q = 1-P and d = precision. By considering 10% of non-response rate, sample size obtained was 360, rounded off to 400.

Sampling method

Multistage sampling. First the area of Cheruthazham Panchayat with 17 wards was divided into four zones (north, south, west and east) based on stratified sampling so that each zone has 4 or 5 wards. Secondly, from each of these 4 zones, two wards were selected randomly. Thus 8 wards were selected. Selection of houses First household was randomly selected by spinning the bottle at one of the junctions and the house in whichever direction the mouth of the bottle pointed taken as the first house. Then the consecutive houses were visited till 50 houses were obtained from each of the eight wards making the sample size of 400.

Study materials and tools

Data was collected by direct interview using a pre-tested semi-structured questionnaire with two parts: part 1 included questions on socio-demographic variables such as age, address, religion, caste, head of the family, education and employment of the respondent, family income, type of family, number of family members. Part 2 included questions on awareness of waste disposal.

Scoring system

Knowledge questions were scored. Maximum score obtainable in knowledge was 66 and minimum score was zero. Knowledge was graded as poor (0-20), average (21-40) and good (41-66). Data was analyzed with software SPSS 16. All results are expressed in frequencies and percentages. Pilot testing was done in twenty households of study area and the required changes were made in the questionnaire.

Socio economic scale

In this study, socio economic status (SES) was assessed using modified B. G. Prasad scale. B. G. Prasad scale is based on the per capita income of an individual. It classified the status in to five classes.¹³

Analysis

The data was entered in Microsoft Excel 2007 spread sheet and analyzed using SPSS version 16.0 software. The descriptive statistical methods like mean, standard deviation, frequencies and proportions were used.

Ethical consideration

Approval for the study was obtained from the institutional ethical committee, Academy of Medical Sciences, Kerala. The purpose of the study was explained to the study participants. Data was collected after getting a written informed consent from the study participants.

RESULTS

The total households taken in the study was 400. Majority were in the age group 40-49 years (31%). The mean age of the study population was 45.16 ± 11.61 years. All the respondents were females (100%). About 83% of the study participants belong to Hindu religion and 70% of the study population belong to the nuclear family.

Table 1: Socio-demographic factors of the study population (n=400).

Education	Frequency	%
Primary school	30	7.5
Middle school	42	10.5
High school	191	47.8
Intermediate school/post diploma	119	29.8
Graduate	18	4.5
Total	400	100.0
Occupation		
Unemployed/housewife	330	82.5
Unskilled	45	11.2
Semi-skilled	11	2.8
skilled	6	1.5
Clerical/shop owner/farmer	5	1.2
Semi professional	3	0.8
Total	400	100.0

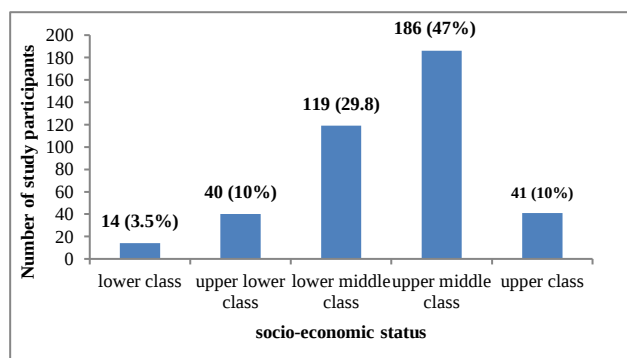


Figure 1: Socio-demographic status* of the study population (n=400).

Table 1 shows that majority (47.8%) of the study population had high school education. There was no illiterate in the study population. Majority (82.5%) of the participants were housewives.

Figure 1 shows that majority (47%) of the study population belong to upper middle class and 3.5% belong to lower class.

Knowledge

Table 2 shows that 79.2% had average knowledge and 19.2% had good knowledge.

Table 2: Awareness about household waste management (n=400).

Grading	Frequency	Percentage
Poor	6	1.5
Average	317	79.2
Good	77	19.2
Total	400	100.0

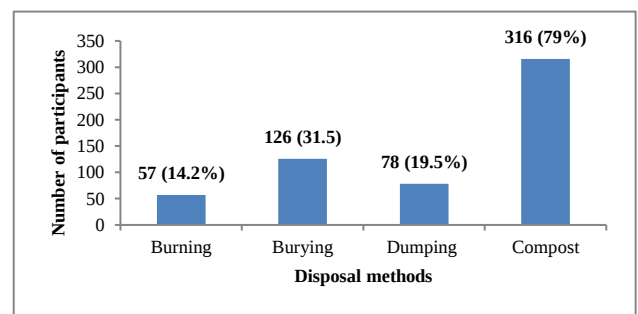


Figure 2: Awareness about different waste disposal methods.

Majority (79%) of them were aware about composting followed by burying (31.5%). About 16.5%, 9.9% and 1.8% considered at least two methods, three methods and four of these methods for waste disposal respectively. The results were mutually non-exclusive.

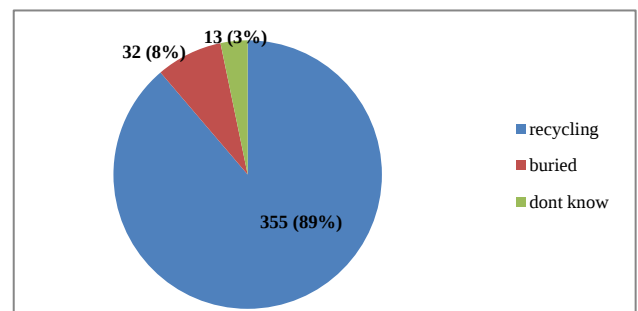


Figure 3: Awareness regarding management of non-biodegradable waste (n=400).

All of the respondents knew that non-biodegradable waste means wastes like plastics that are hazardous to

environment. Most of them (89%) were aware that non-biodegradable waste can be collected and sent for recycling, and 8% believed burying is a waste disposal method.

About 66.5% of the participants had obtained awareness on waste management. Majority of them had the source of knowledge about waste management from multiple sources like Kudumbasree class (51.2%) followed by gramasabha meetings (21.2%) and medias (38.5%). Majority (79%) of them were aware about composting followed by burying (31.5%). About 16.5%, 9.9% and 1.8% considered at least two methods, three methods and four of these methods for waste disposal respectively. Majority (93.75%) of the respondents were aware that waste segregation means dividing waste as biodegradable and non-biodegradable waste. About 80.2% were aware that waste segregation is necessary to dispose waste efficiently and 6.25% were unaware about the need of waste segregation. All of the respondents knew that non-biodegradable waste means wastes like plastics that are hazardous to environment. Most of them (89%) were aware that non-biodegradable waste can be collected and sent for recycling.

Assessment of awareness regarding composting

All of the study participants (100%) were aware that composting is the process of converting organic waste to manure. And 93.5% were aware that food waste can be composted. Vermi composting method was known by majority (81%) of the participants followed by pipe composting (71%). 84.5% of the respondents were aware that the plastics can be recycled and 15% were aware that plastics, glass, paper are recyclable waste. About 6.8% were unaware about the items to be recycled. Majority (78.2%) of the participants knew that plastic products can be made from recyclable materials and 15.5% do not know about the items made from recyclable materials. Majority of the study population (87.2%) were aware that recycling is important in order to conserve the natural resources and 8.8% were unaware about its significance. 44.5% of the respondents were aware that burning plastics can lead to ozone layer depletion. In the study, 73.2%, 36.8% and 25% of the participants were aware that insecticides, paints and fertilizers belong to hazardous waste respectively. About 73% of the respondents were aware that electrical equipments belong to e-waste, followed by battery (47%), computer parts (43.2%), and watches (24%).

Assessment of awareness based on storage and disposal of wastes (n=400)

In the study, 91.5% of the participants were aware that waste should be stored in closed containers. About 90% of them were aware that wastes should be removed daily from the house and 10.2% said it needs to be removed once in a week. 74.5% of them reported that wastes should be removed during day time whereas, 25.5% said

it should be removed at night. 26.8% of the participants are unaware about the diseases caused by littering. Most of the study participants (54.2%) were aware that wastes can be reduced by buying more of reusable items.

Table 3: Awareness regarding reduction of household waste.

Waste reduction	Frequency	Percentage
By buying less of disposable items	178	44.5
By buying more of rechargeable items	59	14.8
By buying more of reusable items	217	54.2
Don't know	18	4.5

Most of the study participants (54.2%) were aware that wastes can be reduced by buying more of reusable items. The results are mutually non-exclusive.

Table 4: Awareness regarding the hazards of littering.

Hazards of littering	Frequency	Percentage
Harm people	155	38.8
Harm animals	26	6.5
Harm waterways	220	55
Harm environment	76	19
Don't know	33	8.2

Majority (55%) of the respondents were aware that littering can harm waterways. The results are mutually non-exclusive.

Liquid waste management

Majority of them (51%) were aware that both sewage and sullage are the different types of liquid waste.

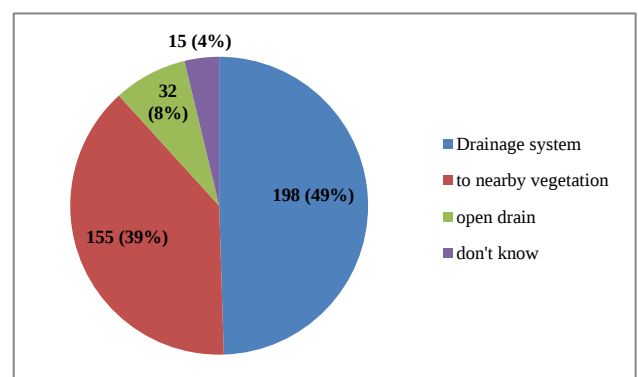


Figure 4: Awareness regarding the disposal of liquid waste (n=400).

The education of participant was significantly associated with knowledge of household waste management (chi square test).

Table 5: Relation between knowledge and education of the participants.

Factors	Knowledge		Total (400)	P value#
	Average (%)	Good (%)		
Education				
Primary school	29 (96.7)	1 (3.3)	30	<0.05
Middle school	32 (76.2)	10 (23.8)	42	
High school	159 (83.2)	32 (16.8)	191	
Intermediate/post diploma	91 (76.5)	28 (23.5)	119	
Graduate	12 (66.7)	6 (33.3)	18	

DISCUSSION

Socio-demographic profile

The majority of the study participants were in the age group 40-49 years (31%) and 30-39 years (28.2%). In the present study, 57% belonged to a family size with less than or equal to four members. About 41% and 2% belonged to the family size with 5 to 8 members and 9 to 12 members respectively. These findings are consistent with the NFHS 4 report. In NFHS 4 report, 54.8% of the households are with 1-4 numbers of family members, 45.2% with 5-8 members and 4.9% with more than 9 members.¹⁴

In the study, 65.8% of the women had an education level up to high school, 34.3% had an education qualification of more than high school and 4.5% were graduates. None of them were illiterates. According to NFHS-4 report of Kerala, 28.7% of the women have completed 12 or more years of schooling, 19% completed 10-11 years, 34% completed 5-9 years of schooling whereas, 4.2% of women have not done schooling. Based on updated B. G. Prasad classification of socio-economic status, 10% of the study population belonged to upper class, 47% belonged to upper middle class and very few belonged to lower class (3.5%). In the study, majority of the houses have concrete ceiling (87.8%) followed by tiled (10%), kutch ceiling (2%) and asbestos (0.2%). Around 97% of them have their own house and 3% have rented house. The NFHS 4 report India found that 89% of households have pucca houses, 0.4% kacha house and 10.5 percent have semi-pucca houses.¹⁵

Knowledge regarding household waste management

In this study, 66.5% of the participants have obtained the awareness on waste management. Their major source of information was from Kudumbasree class (51.2%), gramasabha meetings (21.2%) and media (38.5%). The present study reflected that 19.2% of the participants had good knowledge, 79.2% had average knowledge and 1.5% had poor knowledge on waste management. In a study done by Shewasinad et al in Ethiopia, though 81.8% of the respondents have good knowledge, 18.2% had poor knowledge on waste management.¹⁶

Solid waste and its disposal

In the study, 62.8% were aware that the food wastes, plastics, broken glass comes under solid waste and very few (8.5%) knew that all these wastes like food, plastics, garden waste, building structure are also solid wastes. Different findings were observed in a study done by Shewasinad et al in Ethiopia, where 100% of them knew what waste mean.¹⁶ Of which, 78% thought wastes are useless materials and 22% think it is the sweepings from house. In another study done by Kumar et al in Bangalore, only 14.2% of the households were aware about the solid waste generation and disposal.²³

In this study, waste disposal methods known by the participants are composting (79%), burying (31.5%), dumping (19.5%), and burning (14.2%). In another KAP study on waste management by Florence et al in Nigeria, people opined that refuse management is the storage of refuse in bins (83%), or burning of refuse (68.2%) or burying of refuse (13.4%).¹⁷

Biodegradable and non-biodegradable wastes

In the study, all of the respondents were aware about the difference between biodegradable and non-biodegradable waste. About 97% of them aware that biodegradable waste could be managed by composting and 89% were aware that non-biodegradable waste can be collected and sent for recycling. In a study on resident knowledge and willingness to engage in waste management by Mukherji et al in Delhi reported that 60% of the residents didn't know the difference between biodegradable and non-biodegradable wastes, which is much low compared to the present study.¹⁸ Another study conducted by Jyothi et al in Bangalore found that 68.3% were aware about composting as the management of biodegradable wastes.¹⁹ In a study done by Joseph et al in Mangalore, 81.9% of the participants knew that plastics are non-biodegradable.¹⁵

Waste segregation

In this study, 93.75% of the respondents were aware that waste segregation means dividing waste as biodegradable and non-biodegradable waste. This is almost consistent with the findings of study done by Subramoniam et al in

Kerala, where 100% of the participants were aware of the waste sorting.²⁰ In the present study, about 80.2% were aware that waste segregation is necessary to dispose waste efficiently, 21.5% felt it was necessary to get manure, 0.5% consider it as a means to earn income and 6.25% are unaware about the need of waste segregation.

Storage and disposal

In the study, 91.5% of the participants were aware that waste should be stored in closed containers. About 89.8% of them were aware that wastes should be removed daily from the house and 10.2% said it needs to be removed only once in a week. This was in contrast to the study done by Amouei et al in Iran where, 58.8% of the respondents opined that wastes should be daily carried away.²¹ In another study conducted by Sequeira et al in Mangalore city showed that 50% of the households stored their waste in plastic bags and 42.5% of the households disposed them daily.²²

Composting

In the study, 100% of the study participants were aware that composting is the process of converting organic waste to manure. And 93.5% were aware that food waste can be composted. They were aware about the different types of composting like vermicompost (81%), pipe compost (71%), ring compost (1.5%) but 0.8% of them were unaware about methods of composting. Among the participants, 60.8% were aware that the compost pit should be dug away from the well, 33% said it should in a site where there is adequate sunlight, 21% opined it should not be in stagnant areas and 6.8% were completely unaware about the place for compost pit in the house. In a survey done on household SWM in Colombo, only 30% of the households were aware about the compost bins while 6% were unaware.²³ In this study, 62% of the participants were aware of the biogas plant, whereas 38% were not.

Recycling

This study reveals that 84.5% of the respondents were aware that the plastics can be recycled and 15% were aware that all these wastes like plastics, glass, paper are recyclable but, 6.8% were unaware about the items to be recycled.

In the present study, 46% of the participants were aware that the symbol on plastic cover whereas, 54% don't know about it. Majority of the study population were aware that recycling is important in order to conserve natural resources (87.2%) and energy (12.8%) and 8.8% were unaware about its significance.

Different types of wastes

In the study, 73.2%, 36.8% and 25% of the participants were aware that insecticides, paints and fertilizers belong

to hazardous waste respectively but, 3% were unaware about it.

In the present study, about 73% of the respondents were aware that electrical equipments belong to e waste, followed by battery (47%), computer parts (43.2%), and watches (24%). Only 4.2% were unaware about it. In the present study, 22%, 36.8% and 17% of the respondents were aware that biomedical wastes include menstrual cloth, napkins, and diapers respectively.

Hazards of littering

In the study, respondents were aware that littering can harm waterways (55%), harm people (38.8%), harm environment (19%), harm animals (6.5%) and 8.2% were unaware of the hazards of littering. They were also aware about the diseases caused by littering like diarrheal diseases (21%), typhoid (18%), dengue (34%), leptospirosis (9.5%). Around 27% were totally ignorant of these diseases.

These findings almost match with a KAP study on solid waste management in Tanzania reported that respondents were aware that cholera (30%), diarrhea (26%), typhoid (15%) can be caused due to improper waste disposal.²⁴ Another study done in Tangail on disposal of solid waste reported that 53% of the respondents were not aware about hazards of solid wastes and 47% were unaware of how solid wastes pollutes environment.²⁵

Waste reduction

In the study, participants were aware that waste can be reduced by buying less of disposable items (44.5%), buying more of rechargeable items (14.8%), and buying more of reusable items (54.2%) whereas, 4.5% were unaware about the waste reduction.

Liquid waste management

In the present study, majority of the participants (51%) were aware that both sewage and sullage are the different types of liquid waste. About 49% of the respondents were aware that liquid waste can be disposed by proper drainage system, 39% opined that it can be drained to nearby vegetation, 8% considered open drain system and 4% were unaware about any of the disposal methods. All of them (100%) knew that latrine waste should be disposed in septic tank.

Knowledge regarding household waste management

Solid waste and its disposal

In the study, 62.8% were aware that the food wastes, plastics, broken glass comes under solid waste and very few (8.5%) knew that all these wastes like food, plastics, garden waste, building structure are also solid wastes.

Different findings were observed in a study done by Shewasinad et al in Ethiopia, where 100% of them knew what waste mean.¹⁶ Of which, 78% thought wastes are useless materials and 22% thinks it is the sweepings from house.

In another study done by Kumar et al in Bangalore, only 14.2% of the households were aware about the solid waste generation and disposal.²⁶ In this study, waste disposal methods known by the participants are composting (79%), burying (31.5%), dumping (19.5%), and burning (14.2%).

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In the study, all of the respondents were aware about the difference between biodegradable and non-biodegradable waste. About 97% of them aware that biodegradable waste could be managed by composting and 89% were aware that non-biodegradable waste can be collected and sent for recycling.

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In this study, 93.75% of the respondents were aware that waste segregation means dividing waste as biodegradable and non-biodegradable waste. In the present study, about 80.2% were aware that waste segregation is necessary to dispose waste efficiently, 21.5% felt it was necessary to get manure, 0.5% consider it as a means to earn income and 6.25% were unaware about the need of waste segregation.

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Hazards of littering

In the study, respondents were aware that littering can harm waterways (55%), harm people (38.8%), harm environment (19%), harm animals (6.5%) and 8.2% were unaware of the hazards of littering. They were also aware about the diseases caused by littering like diarrheal diseases (21%), typhoid (18%), dengue (34%), leptospirosis (9.5%). Around 27% were totally ignorant of these diseases.

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Liquid waste management

In the present study, majority of the participants (51%) were aware that both sewage and sullage are the different types of liquid waste. About 49% of the respondents were aware that liquid waste can be disposed by proper drainage system, 39% opined that it can be drained to nearby vegetation, 8% considered open drain system and 4% were unaware about any of the disposal methods.

The study relies on participant's self-assessment of their knowledge, which may not accurately reflect their true understanding. Also, the study was localized to a single panchayat and the findings may not be generalizable to other regions with different socio-economic backgrounds.

CONCLUSION

A community based cross sectional study was conducted in Cheruthazham Panchayat of Kannur district to assess the knowledge of household waste management among the residents. Their major sources of information about solid waste management were Kudumbasree class, gramasabha meetings and media. In the study, 19.2% had good knowledge, 79.2% had average knowledge and 1.5% had poor knowledge on waste management. Continuous awareness programmes and campaigns on safe waste disposal has to be conducted in community.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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