



Domestic Waste Disposal Practices and Perception towards Solid Waste Management in Selected Areas of Bangalore, India

Anisha Rai^{1*} and S. Umashankar¹

¹Padmashree School of Public Health, Bangalore, Karnataka, India.

Authors' contributions

This work was carried out in collaboration between both authors. Author SU designed the study. The statistical analysis was performed by both the authors. Author AR wrote the first draft of the manuscript and reviewed the literature. Both authors read and approved the final manuscript.

Article Information

DOI: 10.9734/IJECC/2021/v11i930471

Editor(s):

(1) Dr. Fang Xiang, University of International and Business Economics, China.

Reviewers:

(1) Akarsh Verma, University of Petroleum and Energy Studies, India.

(2) Akinfiresoye Waleola Ayo, Federal Polytechnic, Nigeria.

(3) Md. Moniruzzaman, Bangladesh Reference Institute for Chemical Measurements (BRiCM), Bangladesh.

Complete Peer review History: <https://www.sdiarticle4.com/review-history/73799>

Original Research Article

Received 15 July 2021

Accepted 19 September 2021

Published 04 October 2021

ABSTRACT

Aims: To assess the waste disposal practices and perception towards solid waste management in selected areas of Bangalore.

Study Design: Descriptive cross-sectional study.

Place and Duration of Study: Bangalore between November 2019- November 2020.

Methodology: Multi stage sampling technique was used. Using random sampling, respondents from 100 households were selected from each of the 3 study areas. Face to face interview and focus group discussions in all 3 areas were conducted. Semi structured questionnaires were used to collect data.

Results: The study revealed that only 35% of the respondents segregated their waste even though 64% of them had heard about it. 74.7% of them said waste van was available to collect their waste whereas few of them also resorted to open dumping and burning as method of waste disposal. 94% of the respondents said food waste was the commonly produced waste followed by plastics and papers. 14.3% respondents said garbage collection facility was not available in their area. About 72.6% of them were satisfied with the current solid waste management system. Availability

*Corresponding author: E-mail: anisha.raimph2018@gmail.com;

of regular garbage collection facility was found to be significant with waste disposal practice.

Conclusion: The variables such as age, education, size of household, source of income and monthly income were found to be significant with waste segregation practices. The waste segregation practices were found to be highly significant with knowledge on waste segregation, education on solid waste management, and exposure to information.

Keywords: Domestic waste; solid waste management; perception; waste disposal practices.

1. INTRODUCTION

Any useless, unwanted or discarded material that is not liquid or gas generated at household level is known as solid waste [1]. This waste has to be disposed off safely hence giving rise to the need of solid waste management. With the rapidly growing population, solid waste management has also become a challenge. About 5000 tons of waste is generated by Bangalore city alone [2].

Even though the solid waste is being generated in a huge amount every day, the naturally available dumping area is reducing per capita. Unsegregation is one of the major challenge in solid waste management [3]. Presently, the Bruhat Bengaluru Mahanagara Palike (BBMP), has the responsibility of collection and disposal of solid waste. They have used various approaches such as involvement of citizen and investment in infrastructure and technology [4]. The total slums and squatter settlements population of 2.53 millions contribute 762 tons of waste per day [5].

Bangalore has over 2000 slums, out of which only 597 have been recognized by the government [6]. Some slum residents are quite well established and have been able to obtain services over time either legally or illegally. The poorest slums are lacking basic requirements such as drinking water and latrines [7]. Due to lack of proper space for garbage and solid waste disposal most of the slum dwellers practice dumping wastes into the drains and the drains are usually open.

The reasons for improper solid waste management may be multifactorial. The residents may not have proper knowledge or they may be following such unhealthy practices due to lack of adequate space for waste disposal, the services rendered by government may not be sufficient such as community bins etc or the sole reason might just be negligence.

Community participation is very essential to sort the waste and minimize the waste in order to

keep the city clean and they must be involved while planning any programs [8]. Hence the objective of the study was to examine waste disposal practices, identify the problems faced by households for management of solid wastes and also determine their perception regarding solid waste management initiatives.

2. METHODOLOGY

2.1 Study Design

A Descriptive Cross-sectional study was adopted. A total of 3 areas were selected for the study area i.e. Ward number 45, Ward number 128 and Gangondanahalli slum in Bangalore. A sample size of 300 was calculated. The samples were selected using multi-stage sampling technique. Two zones were selected out of total 8 zones, from which two wards and a slum were selected for the study based on the socio-economic status of the area. A total of 300 households were then selected randomly and were interviewed using semi structured questionnaire. One focus group discussion was conducted in each of the three areas.

Area A: Ward 128 (Middle income)

Area B: Gangondanahalli slum (Low income)

Area C: Ward 45 (High income)

2.2 Inclusion Criteria

- All the adults above 18 years of age were included in the study.

2.3 Exclusion Criteria

- Those who were not willing to participate
- Those who were not available at the time of study

2.4 Data Analysis

- The frequency and percentage analysis was used to describe the

demographic data of the subjects using Microsoft Excel.

- Qualitative data was analyzed by summarizing interview transcripts and interpretations from these summaries.
- Chi square test was used to test the significance of association between independent and dependent variables using SPSS 16.0.

3. RESULTS AND DISCUSSION

The results of the study domestic waste disposal practices and perception towards solid waste management is as reported in the tables and summarized interview transcripts as well:

Table 1 shows the socio demographic variables of the respondents of the study.

Table 1. Socio demographic variables of the respondent

Characteristics	Frequency (n=300)	Percentage (%)
Age Group (in yrs.)		
18-25	28	9.3
26-35	111	37
36-45	104	34.7
Above45	57	19
Mean Age± SD=35.05±8.15 years		
Sex		
Male	49	16.3
Female	251	83.7
Educational status		
Illiterate	22	7.3
Primary	70	23.3
Secondary	37	12.3
Graduate	109	36.3
Postgraduate	58	19.3
Others*	4	1.3
Religion		
Hindu	231	77.0
Christian	3	1.0
Muslim	66	22.0
Marital status		
Married	230	76.7
Unmarried	54	18
Others	16	5.3
Type of family		
Joint family	79	26.3
Nuclear family	192	64
Single person	29	9.7
Size of household		
Single	29	9.7
2	41	13.7
3	62	20.7
4	103	34.3
>4	65	21.7
Socio economic status		
Low	35	11.7
Middle	145	48.3
High	120	40.0
Ownership		
Own	182	60.7
Rented	118	39.3

Source: Field Survey; *Diploma

A total of 83.7% respondents were female and 16.3% were male. It was observed that 34.7% of the respondents were in the age group of 36-45. The individuals above 18 years were included in the study. The mean age of the respondent was 35.05 years (SD±8.15). Majority of the respondents were in the age group of 26-35(37%) [9]. The percentage of female population (83.7%) was higher than that of male (16.3%) [6]. With regards to the educational status, 36.3% were found to have graduated followed by 23.3% who had completed primary education whereas 7.3% were found to be illiterate. It was observed that 64% of the respondents were found to be living in a nuclear family. Majority of the samples i.e. 34.3% had household size of 4. With regard to the socio

economic status, 48.3% of the sample belonged to middle class family followed by 40% respondents belonging to upper economic class. More than half of the respondents reported that they had ownership of the house. The commonly produced waste at home is presented in Table 2.

It was found that the most commonly produced waste at households was food waste followed by plastics and then paper. Wastes like tin cans and glass were least commonly produced at the households. According to the study done by T.V. Ramachandran and Bachamanda S. 60% of the waste produced in Bangalore is organic waste, 14% plastic and 12% paper [10]. The study done by Naveen et al is also consistent with this result [11]. It can be inferred that community needs to

Table 2. Commonly produced waste at home

Characteristics	Responses		Percentage by cases (%)
	Frequency (n=300)	Percentage (100%)	
Commonly produced waste at home*			
Papers	172	24.6	57.5
Plastics	178	25.5	59.5
Tin cans	24	3.4	8
Glass	43	6.2	14.4
Food waste	282	40.3	94.3

Source: Field Survey; *Multiple responses

Table 3. Waste disposal practices

Characteristics	Frequency (n=300)	Percentage (%)
Waste disposal method		
Waste van	224	74.7
By the roadside	32	10.7
Open dumping	15	5.0
Collected by the Paurakarmikas	29	9.7
Segregation of dry and wet waste		
Yes	105	35.0
No	195	65.0
Availability of garbage collection		
Yes	256	85.7
No	44	14.3
Provider for waste collection service		
Public	256	85.7
No collection of waste	44	14.3
Type of container to store waste		
Dustbin	125	41.7
Old bucket	41	13.7
Cartons/Tins	25	8.3
Plastic covers	67	22.3
Biodegradable waste bags	42	14.0

Source: Field survey

be educated on composting the organic waste produced at home and its importance which will ultimately reduce the burden of waste in the landfill. Table 3 described the practises adopted in waste disposal.

Only 35% of the household practiced waste segregation. 14.3% of the household did not have garbage collection facility in their area and (47.7%) of them said that waste was collected daily. Only 35% of the household practiced waste segregation. The study conducted by Otitaju and Seng L revealed that only (42.4%) of the respondents segregated waste at their residence which is in agreement with the findings of current study [12]. The most common reasons being lack of knowledge regarding the importance of segregation and mixing of waste by the waste collector at the time of collection. The results of the study showed that 14.3% of the household in the slum area did not have garbage collection

facility in their area. Improper and inadequate garbage collection system; lack of adequate open spaces and green areas; improper land uses; institutional and financial crisis; lack of awareness and political will are the major problems in slum areas [13]. More than two thirds of the households waste were collected by waste van. A significant number of people from slum area opted for open dumping and burning of waste.

While most of the respondents agreed that the waste should be collected daily and should be segregated into different bins, a very few of them expressed that reduction in waste generation at source leads to reduction in burden of waste disposal. Banga M conducted a study to assess household knowledge, attitude and practice towards waste segregation. The results showed that 60% of the respondents had heard about waste segregation which is similar to the findings

Table 4. Perception towards solid waste management

Characteristics	Frequency (n=300)	Percentage (%)
Daily collection of waste from households		
Disagree	1	0.3
Neutral	10	3.3
Agree	146	48.7
Strongly agree	143	47.7
Waste should be segregated in different bins		
Strongly disagree	3	1.0
Disagree	86	28.7
Neutral	63	21.0
Agree	99	33.0
Strongly agree	49	16.3
Reducing waste generation at source helps in reducing burden of waste disposal		
Strongly disagree	2	0.7
Disagree	25	8.3
Neutral	90	30.0
Agree	108	36.0
Strongly agree	75	25.0
Proper waste disposal practices will have positive impact on health and environment		
Neutral	19	6.3
Agree	158	52.7
Strongly agree	123	41.0
The current solid waste management services provided in your area is satisfactory		
Strongly disagree	40	13.3
Disagree	5	1.7
Neutral	37	12.3
Agree	172	57.3
Strongly agree	46	15.3

Source: Field Survey

Table 5. Association between socio demographic variables and waste segregation practice

	Do you segregate waste?		Total (n=300)	
	Yes	No		
Age of the respondent				Chi square=71.210 df=3 P=.00*
18-25	0	28	28	
26-35	22	89	111	
36-45	39	65	104	
Above45	44	13	57	
Education				Chi square=85.682 df= 5 P=.000*
Illiterate	0	22	22	
Primary	0	70	70	
Secondary	9	28	37	
Graduate	60	49	109	
Postgraduate	33	25	58	
Others	3	1	4	
Size of the household				Chi square=59.481 df=4 P=.000*
Single	0	29	29	
2	28	13	41	
3	17	45	62	
4	51	52	103	
>4	9	56	65	
Source of income				Chi square=49.504 df=7 P=.000*
Daily wages	2	45	47	
Scrap dealers	0	7	7	
Domestic work	0	15	15	
Business	23	19	42	
Private job	44	49	93	
Government job	19	19	38	
Others	9	24	33	
Small business	8	17	25	

Source: Field Survey; * denotes significance, P=0.05

of this study. On the contrary, when asked about the source of information, it was found that 39% of the respondents had learnt about it from friends and relatives, 30% from the itinerant buyers, 27% from newspapers and magazines and 4% said they had learnt about it at school [14].

More than half of them believed that proper waste disposal practices will have positive impact on health and environment.

It can be inferred from the table that variables such as age, education, size of household and source of income have significant effect upon the waste segregation practice. A study based on meta-analysis shows waste management behavior is almost always significant with age, education, income and household size [15].

Another survey research in Sri Lanka by Bandara et al also found that the residents with high income were more likely to perform waste reduction and separation compared with those in low income group [16].

The socio-demographic variables such as age, education, size of household, source of income and socio-economic status were found to be statistically significant with waste segregation practices whereas sex of the respondent was found to be non- significant. Al-Khateeb in his study found that age was significant with waste segregation, which means higher the age higher the waste segregation practice. It is believed that as older the people age, the more dedicated they are in waste reuse and hence the waste segregation [17].

Table 6. Association between independent variables and perception towards segregation of waste into different bins

	Waste should be segregated into different bins					Total	
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree		
Area of dwelling**							
A	0	6	45	21	28	100	Chi square=318.196 df=8 P=.000*
B	3	80	13	4	0	100	
C	0	0	5	74	21	100	
Total	3	86	63	99	49	300	
Sex of the respondent							
Male	1	18	11	9	10	49	Chi square=6.775 df=4 P=.17
Female	2	68	52	90	39	251	
Total	3	86	63	99	49	300	
Age of the respondent							
18-25	0	2	15	7	4	28	Chi square=69.318 df=12 P=.000*
26-35	3	36	27	22	23	111	
36-45	0	44	11	36	13	104	
above45	0	4	10	34	9	57	
Total	3	86	63	99	49	300	
Educational status							
Illiterate	0	14	5	3	0	22	Chi square=249.064 df=20 P=.000*
Primary	3	51	16	0	0	70	
Secondary	0	15	13	4	5	37	
Graduate	0	6	17	65	21	109	
Postgraduate	0	0	12	23	23	58	
Others	0	0	0	4	0	4	
Total	3	86	63	99	49	300	
Socioeconomic status							
Lower	2	31	1	1	0	35	Chi square=163.85 df=8 P=.000*
Middle	1	52	47	24	21	145	
Upper	0	3	15	74	28	120	
Total	3	86	63	99	49	300	

Source: Field Survey

* denotes significance $P=0.05$,

** denotes area of dwelling where A- Middle income, B- Low income and C-High income

3.1 Findings from Focus Group Discussion

Focus group discussions were conducted to understand the waste segregation practice, problems related to waste management, causes of such problems and steps that can be undertaken to improve the challenges. One focus group discussion was conducted in each of the three areas. The participants selected were the ones who were responsible for handling the household waste.

3.1.1 Waste segregation practice

Segregation of waste is the key to better waste management. Composting the wet wastes from kitchen is the best way to manage them.

Collecting dry waste in separate container introduces a way of preserving the recyclable materials and preventing their disposal in landfill. Most of the participants had an idea about dry waste and wet waste. However, in the contrary not all of them practiced segregation.

While some of them from Ward 45 practiced segregation and they also had a knowledge about its benefit. Mrs. Jaya, a housewife said, "I collect all the wastes from kitchen in a container. Few years back, one of my friends suggested about composting and I have been composting since then."

However, the residents of Gangondanahalli expressed different opinion. Most of them said there is no difference whether the waste is

segregated or not and it's easy to put everything in one cover/ container. But, they also agreed that they had been told to segregate waste by the waste collector. Mrs. Sophiya said, "No, I don't. I put all garbage in one cover. Once we were told to segregate waste. But no one segregated, they even had a fight with us. Nowadays, they don't ask us to segregate."

Since the garbage collector at the time of collection mixed everything in same container people were demotivated. This was the most common reason for not segregating as they believed that their effort in segregation was all in vain because of this behavior.

3.1.2 Major issues related to waste management

Gangondanahalli is a densely populated area. The roads and streets are narrow making it difficult for four wheeler to move into the streets. Some participants reported that waste collection facility wasn't available in some areas. In areas where waste was being collected, participants said they didn't have problem with current system. Mr. Manju said, "It has been 3 years since we came to this place, but no one has come to collect waste."

She also added, "Even if we call them, they will act like either they didn't hear us or they will say truck is already full. But they will go to nearby apartments and collect waste."

In Ward 128, the issues were mainly related to the days and timing of waste collection. Irregularity in waste collection resulted in problems like infestation of waste with flies and maggots. Also, the ones with their houses near main road said roadside dumping was major problem and this would occur frequently.

3.1.3 Causes for problems related to waste management

Most of them said that there was no supervision from responsible authorities. Some of them also believed that there was less focus on composting and recycling of waste. Lack of sense of responsibility was also stated as the common reason. When asked about the possible causes behind the above-mentioned problem, Mrs. Shyla said "we should be focusing more on composting..."

In Ward 128, irregularity in collection was stated to be the major cause for roadside dumping. Also

some stated until and unless the responsible authorities don't follow up and monitor the status of waste management in community, people will continue open dumping.

In Gangondanahalli, unavailability of community bins and unavailability of waste collection service was believed to be the reason for all problems. Even though they knew that open dumping is not good, in absence of waste collection facility they were compelled to do so. Mrs. Suma added, "The waste truck cannot enter into our streets, and it's very narrow. We have to carry waste till masjid. If I'm not free I'll send my children but if nobody is free, I'll have to dump it outside. As you can see we have only 2 rooms, if we keep garbage inside it will smell bad."

3.1.4 Improvements/changes that can be done to overcome these problems

All three areas had their own suggestions to overcome the challenges in their own area. However, most of them said responsible authority should have regular follow up, also create awareness on proper disposal of waste in society and the disease caused by improper waste management.

Mrs. Shyla stated, "Like in Western countries...the collection process should be automatic...where a separate bin is provided to each house and the collection vehicle should have a motorized mechanism to pick it and pour into the garbage van and keep back the bin and no human intervention is required at all...and there won't be spillage and exposure to humans..."

Most of them insisted that carrying cloth bags has helped them in preventing unnecessary collection of plastic and paper covers at home.

4. CONCLUSION

The study assessed the waste disposal practices followed by households in three different areas of Bangalore. Food waste was the most common waste produced in all the households. It was found that majority of the participants didn't segregate waste even though they knew the waste is to be segregated. Almost two-thirds of the household said they hadn't received any education on solid waste management by the responsible authority.

The second objective was to assess the perception of community people towards solid

waste management. About two third of the participants were satisfied with the current system. About half of the respondents said that both the responsible authority and the household itself should be responsible for managing waste produced at home. Almost all of them wanted waste to be collected daily. Some of them didn't think it was necessary to segregate waste into different bins.

The third objective was to identify determinants for waste disposal practices. In absence of waste collection facility, people opted for roadside/open dumping. Frequency and timing of waste collection were regarded as important factor to maintain a proper waste management system. Also, frequent follow up and supervision from responsible authority, availability of garbage collection facility, and availability of community bins in absence of garbage collection were among the other factors.

CONSENT

Informed consent was obtained from each respondent during the collection of data.

ETHICAL APPROVAL

Confidentiality and privacy of the information provided by the participant has been maintained.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Sharholy M, Ahmad K, Mahmood G, Trivedi R. Municipal solid waste management in Indian cities—A review. *Waste management*. 2008;28(2):459-67.
2. Hosetti BB. Prospects and perspective of solid waste management: *New Age International*; 2006.
3. Ramachandra TV, Bachamanda S. Environmental audit of municipal solid waste management. *International Journal of Environmental Technology and Management*. 2007;7(3-4):369-91.
4. Naveen B, Sivapullaiah P. Solid waste management in Bengaluru—current scenario and future challenges. *Innovation Energy and Research*. 2016;5:139.
5. Nolan LB. Slum definitions in urban India: Implications for the measurement of health inequalities. *Population and Development Review*. 2015;41(1):59-84.
6. Kumar M, Nandini N. Community attitude, perception and willingness towards solid waste management in Bangalore city, Karnataka, India. *International Journal of Environmental Sciences*. 2013;4(1):87-95.
7. Organization WH. Meeting the MDG drinking water and sanitation target: The Urban and Rural Challenge of the Decade; 2006.
8. UH AJ, Mamatha B, Surendra HS. Knowledge on household biodegradable waste management in Bangalore City. *Age*. 2015;16(25):167.
9. Kaoje AU, Sabir AA, Yusuf S, Jimoh AO, Raji MO. Residents' perception of solid waste disposal practices in Sokoto, Northwest Nigeria. *African Journal of Environmental Science and Technology*. 2017;11(2):94-102
10. Ramachandra TV, Bachamanda S. Environmental audit of municipal solid waste management. *International Journal of Environmental Technology and Management*. 2007;7(3-4):369-91.
11. Naveen BP, Sivapullaiah PV, Sitharam TG. Disposal options for solid waste of Bangalore city based on its characteristics. *International Journal of Environment and Waste Management*. 2013;12(1):77-88.
12. Otitoju TA, Seng L. Municipal solid waste management: Household waste segregation in Kuching South City, Sarawak, Malaysia. *American Journal of Engineering Research (AJER)*. 2014; 3(6):82.
13. Gowda K, Chandrashekar M, Sridhara M, Hemalatha B. Solid waste management in the slums and squatter settlements in the city of Bangalore. *International Journal of Scientific and Research Publications*. 2013;3(2):1-10.
14. Banga M. Household knowledge, attitudes and practices in solid waste segregation and recycling: The case of urban Kampala. *Zambia Social Science Journal*. 2011; 2(1):4.
15. Ghani WA, Rusli IF, Biak DR, Idris A. An application of the theory of planned behaviour to study the influencing factors of participation in source separation of food waste. *Waste Management*. 2013;33(5): 1276-81.
16. Bandara NJ, Hettiaratchi JP, Wirasinghe SC, Pilapiiya S. Relation of waste generation and composition to socio-

- economic factors: A case study. Environmental Monitoring and Assessment. 2007;135(1-3):31-9.
17. Al-Khateeb AJ, Al-Sari MI, Al-Khatib IA, Anayah F. Factors affecting the sustainability of solid waste management system—the case of Palestine. Environmental Monitoring and Assessment. 2017;189(2):93.

© 2021 Rai and Umashankar; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:

The peer review history for this paper can be accessed here:
<https://www.sdiarticle4.com/review-history/73799>