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### Household solid waste management in urban: A study of awareness status

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#### Abstract

**Introduction:** The generation of Municipal Solid Waste (MSW) is influenced by lifestyle, urbanization, and income level of the population. Effective Solid Waste Management is crucial for the sustainable development of any city. Kanpur, with a population of over 4 million, faces significant environmental and socio-economic challenges in managing MSW.

**Objectives:** This research study, conducted in 2023-2024, aimed to assess awareness among urban households about Household Solid Waste Management (HSWM). The specific objectives were to determine the general awareness level of urban people on HSWM and to understand their awareness about the Swachh Bharat Mission and other initiatives.

**Methodology:** A descriptive survey research approach was employed in Kanpur Nagar, Uttar Pradesh. Two wards were randomly selected, and 150 respondents were chosen through simple random sampling. A pilot test refined the interview schedule. Primary data was collected through a quantitative survey and analyzed using suitable statistical methods.

**Findings and conclusion:** The study reveals a high level of awareness among urban households about Household Solid Waste Management (HSWM) and the Swachh Bharat Mission. The findings highlight the importance of education and awareness in promoting HSWM practices. While urban households are making progress in adopting HSWM practices, continued education and awareness efforts are necessary to promote sustainable waste management practices. The study's findings can inform policy and programmatic interventions aimed at promoting HSWM practices in urban India.

**Keywords:** Household, solid waste, management, awareness, urban people, Swachh Bharat mission

#### Introduction

Day to day increasing waste is a growing global concern. Rapid urbanization and industrialization have resulted in a significant increase in per capita trash creation while simultaneously reducing the amount of land available for waste disposal. Waste refers to the unwanted or discarded / rubbish or trash / materials generated by human activities, including household, commercial, industrial, and construction processes, etc. Any non-liquid waste created by individuals, households, small businesses, or institutions outside of the waste generated within cities is referred to as Solid Waste (SW) and the uncontrolled disposal of SW may affect public health and the environment (Deepalakshmi, S. *et al.*, 2022)<sup>[4]</sup>. The global population and the rising demand for food and other essentials, there has been a rise in the amount of waste being generated daily by each household (Alam and Ahmade, 2013)<sup>[5]</sup>. Household Solid Waste (HSW) refers to the waste materials generated by households, including organic waste (food waste, kitchen waste, garden waste, etc.); Inorganic waste (paper, plastic, glass, metal, etc.); Recyclable materials (newspaper, cardboard, bottles, cans, etc.); Non-recyclable materials

(textiles, leather, rubber, etc.); Hazardous waste (batteries, electronics, chemicals, etc.); Bulky waste (furniture, appliances, etc.); Construction and demolition waste (from home renovation or repair). The other examples of household solid waste includes Food scraps, Vegetable and fruit peels, Eggshells, Coffee grounds, Tea bags, Paper towels, Cardboard boxes, Plastic bags, Glass bottles, Metal cans, Old news papers, Magazines, Broken appliances, Used batteries, Old furniture, packaging materials, etc. Municipal Solid Waste (MSW) is produced by homes, workplaces, lodging facilities, retail establishments, schools, and other establishments and collected by municipal agencies. The word 'Solid Waste Management' (SWM) describes the collection, treatment and disposal procedure for solid wastes. In light of this, Solid waste management should be prioritized and recognized as an essential component of fundamental urban services. Governments and other organisations everywhere are always looking for creative ways to deal with the growing amount of waste that is produced. To handle and dispose of waste in an environmentally friendly way, several nations have invested in cutting-edge technologies and enacted stringent recycling

laws. Solid waste management is a critical issue confronting many towns and communities throughout the world. Today, solid waste management is an essential component of modern life especially urban cities like Kanpur.

Kanpur, a city with a population of over 4 million, faces significant challenges in managing its urban solid waste. The city generates around 1500 metric tons of waste per day, which poses environmental and health risks if not managed properly (Agarwal A., *et al.*, 2005) <sup>[1]</sup>. The current waste management system in Kanpur is inadequate, with insufficient manpower, financial resources, and infrastructure. The waste is often dumped in open areas, leading to pollution and health hazards (Agarwal D., 2012) <sup>[2]</sup>. However, there are efforts underway to improve the waste management system in Kanpur. The city has implemented a waste management plan, which includes door-to-door waste collection, segregation, and disposal. Additionally, there are several private companies and NGOs working in the city to promote waste management and recycling (Agustiono, T. *et al.*, 2021) <sup>[3]</sup>. To address the challenges of urban solid waste management in Kanpur, it is essential to adopt a multi-stakeholder approach. This includes involving the government, private sector, NGOs, and citizens in the waste management process. Additionally, there is a need to invest in infrastructure, technology, and human resources to improve the efficiency and effectiveness of the waste management system (Kumar A, Agrawal A., 2020) <sup>[11]</sup>. By adopting a comprehensive and sustainable approach to urban solid waste management, Kanpur can reduce its environmental footprint, improve public health, and promote economic development. On this background the present research study was undertaken during 2023-2024 to assessing awareness among urban households about Household Solid Waste Management (HSWM) in Kanpur Nagar with following specific objectives.

1. To know about general awareness level of urban people on Household Solid Waste Management.
2. To understand the Awareness level of urban people about *Swachha Bharat Mission* and other initiatives implemented by Government / and local bodies on Household Solid Waste Management.

### Materials and Methods

The present study was carried out using descriptive survey research approach in Kanpur Nagar (UP), as purposively chosen due to Kanpur Nagar having solid waste related problems and our research objectives were matching with them. Kanpur Nagar is further divided in Kanpur city under Kanpur Nagar Nigam (corporation) i.e. KNN and Kanpur rural. Kanpur Nagar Nigam is divided into 6<sup>th</sup> zones from zone 1st to 6th. Out of 6th zones, zone 4th and zone 6th were selected randomly through lottery method under simple random sampling. For the selection of wards under zone 4th and zone 6th separate lists were prepared with the help of Nagar Nigam website and their officials. From the list of 15 wards in the zone 4, ward number 42 and from list of 20 wards from the zone 6, ward number 23 were selected again randomly through lottery method for collecting unbiased sample among the population. Thus, a total of 2 wards and their different sub-areas were selected for the study. A list of respondents belonging to different wards was prepared separately and 75 respondents from each ward / zone were

selected randomly through simple random sampling (SRS) under probability sampling technique as it represented a sizable portion i.e. 50% from each. Thus, a total 150 respondents (100%) were selected from both wards / zone for interviewing and obtaining necessary information with the help of schedule. Before the survey, a pilot test was done by 15 persons as respondents to identify problems and shortcomings found in schedule. Thus, a total of total 150 respondents as urban households were selected for collection of data. A quantitative survey was performed based on primary data collected by interview schedule. The schedule is based on three points Likert scale. The collected information was evaluated, categorized, and compiled into tables displaying percentages, arithmetic mean, weighted means, and rankings. These data were analyzed using both mechanical and manual methods as well as a calculator, to complete the statistical analysis.

### Results and Discussion

#### 1. General awareness level of urban people on Household Solid Waste Management (HSWM):

It was found out from Table-1 that about 47 percent of respondents were highly aware about statement 'when you use to eat anything, then where you throw waste', about 26 percent of respondents were medium level aware, about 28 percent of respondents were low aware and 4 percent of respondents were not aware with mean score 2.18 and rank Ist. About 42 percent of respondents were highly aware about 'Understanding about garbage/ solid waste should not be throwing here and there'; about 23 percent of respondents were medium aware whereas about 35 percent of respondents were having low level awareness as compare to 11 percent of respondents were unaware with mean score 2.06 and rank IInd. In this line Mathur (2017) <sup>[7]</sup> were also reported that most of the surveyed families were aware of the arising problems of solid waste, its collection / disposal and the health hazards created by them. 92% knew that solid waste disposal is a big problem in highly populated areas. 64% families agreed that they should minimize their daily waste.

About 33 percent of respondents were highly aware about do you understand about harmful effect of garbage/household solid waste on environment, 38 percent of respondents were medium aware, 29 percent of respondents were having low level of awareness and 12 percent of respondents were don't aware with mean score 2.04 and rank III. Whereas about 37 percent of respondents were highly aware, 31 percent medium aware, 32 percent low aware with 100 percent awareness for statement 'Understanding about Household Solid Waste (HSW)'. Thus, there were no one respondents had not aware with mean score 2.04 and rank IIIrd. About 24 percent of respondents were highly aware, 42 percent medium aware and 34 percent low aware regarding statement 'Understanding about Solid Waste Management (SWM)' with 21 percent were not aware and obtained mean score 1.89 with rank IVth. About 25 percent of respondents were highly aware, 31 percent medium aware, 43 percent low aware and 15 percent of were not aware with mean score value 1.81 with rank Vth against statement 'Understanding about various types of dust bins as per government rules. In this concern Indria K concluded that as more than half of

them are using small dustbin to put house hold wastes. Other awareness statements like ‘Concern about collection and dispose of household solid waste in proper place’ (mean score value 1.80 with rank vith), ‘Understanding about minimization of Solid waste generation in your home/society’ (mean score value 1.75 with rank VIIth), ‘Awareness about municipal guidelines about Household Solid Waste Management’ (mean score value 1.73 with rank VIIIth), ‘Contributory role play in Solid Waste Management’ (mean score value 1.71 with rank IXth), ‘Understanding about Recyclable waste and Non Recyclable

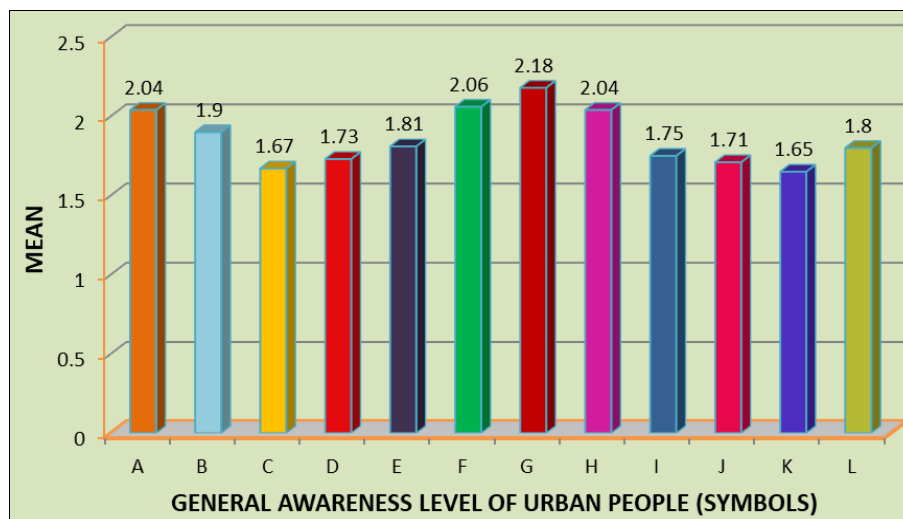
waste’ (mean score value 1.67 with rank Xth) and ‘Awareness about reuse or recycle of Household solid waste’ (mean score value 91.65 with rank XIth) respectively.

Thus, it can be concluded that majority (83.50 percent) of the urban households people were aware about Household Solid Waste Management (HSWM) as compare to 16.50 people who were not aware about this. Urban people were aware that they should not through garbage, solid waste, unused food items and wrapping materials here and there.

**Table 1:** Distribution of respondents according to the general awareness level of urban people on Household Solid Waste Management (HSWM). n=150

S N	Awareness statement about HSWM	Symbol	Not aware	Aware	If aware, then level of awareness			Mean	Rank order
			f (%)	f (%)	Low f (%)	Medium f (%)	High f (%)		
1	Understanding about Household Solid Waste (HSW)	A	-	150 (100)	48 (32.00)	47 (31.33)	55 (36.66)	2.04	III
2	Understanding about Solid Waste Management (SWM)	B	31 (20.66)	119 (79.34)	40 (33.62)	50 (42.00)	29 (24.38)	1.90	IV
3	Understanding about Recyclable waste and Non Recyclable waste.	C	30 (20.00)	120 (80.00)	65 (54.16)	30 (25)	25 (20.83)	1.67	X
4	Awareness about municipal guidelines about Household Solid Waste Management.	D	47 (31.34)	103 (68.66)	43 (41.74)	45 (43.68)	15 (14.56)	1.73	VIII
5	Understanding about various types of dust bin as per government rules.	E	23 (15.33)	127 (84.67)	55 (43.30)	40 (31.49)	32 (25.19)	1.81	V
6	Understanding about garbage/ solid waste should not be throwing here and there.	F	16 (10.66)	134 (89.34)	47 (35.07)	31 (23.13)	56 (41.79)	2.06	II
7	When you use to eat anything, then where you throw waste?	G	06 (4.00)	144 (96.00)	40 (27.78)	37 (25.69)	67 (46.52)	2.18	I
8	Understanding about harmful effect of garbage/ household solid waste on environment.	H	18 (12.00)	132 (88.00)	38 (28.78)	50 (37.87)	44 (33.34)	2.04	III
9	Understanding about minimization of Solid waste generation in your home/society.	I	60 (40.00)	90 (60.00)	45 (50.00)	23 (25.56)	22 (24.45)	1.75	VII
10	Contributory role play in Solid Waste Management (SWM).	J	27 (18.00)	123 (82.0)	62 (49.60)	31 (24.80)	30 (24.00)	1.71	IX
11	Awareness about reuse or recycle of Household solid waste.	K	31 (20.67)	119 (79.33)	65 (54.62)	30 (25.21)	24 (20.16)	1.65	XI
12	Concern about collection and dispose of household solid waste in proper place.	L	08 (5.34)	142 (94.66)	66 (46.47)	37 (26.05)	39 (27.46)	1.80	VI
Total			-	(16.50)	(83.50)	--	--	--	--

\* Data given in parenthesis denotes percentage



**Fig 1:** Distribution of respondents according to the general awareness level of urban people on household solid waste management (HSWM)

**2. Awareness level of urban people about Swachh Bharat Mission and other initiatives implemented by Government / and local bodies on Household Solid Waste Management (HSWM)**

Table-2 revealed that 100 percent of respondents were agreed with the statement ‘do you like to see that all streets should be clean and free of waste’ with mean score 3 and rank Ist. A total of 96 percent of respondents agreed to ‘every people have to know about household solid waste management’, about 3 percent of respondents undecided and only 1 percent respondents were disagreed with mean score 2.94 and rank IInd against this statement. A total of 88 percent of respondents were agreed about waste disposal on open places will be harmful for human health, where as 8 percent of respondents undecided and 4 percent of respondents disagreed with mean score 2.84 and rank IIIrd. A total of 87 percent of respondents agreed with statement that ‘Swachh Bharat Mission’ improved the awareness level among people about hygiene & sanitation, only 9 percent of respondents undecided whereas only 5 percent of respondents were disagreed about this statement. Similarly, about 90 percent of respondents agreed towards they always concern about collection and disposal of household solid waste management with mean score 2.82 and rank IV. About 83 percent of respondents agreed towards Title song ‘Gadi wala aaya, ghar se kachra nikal’ continues increase awareness among the people about solid waste management, 7 percent of respondents were undecided whereas 10 percent of respondents disagreed with this message. About 81 percent of respondents agreed that Swachh Sarvekshhan plays a role to aware people about solid waste management, while 09 percent of respondents belong to undecided whereas another 09 percent of respondents were disagreed with mean score 2.72 and rank V. About 73 percent of respondents agreed local authority has to play role in the house hold solid waste management as compare to 19 percent of respondents undecided and only 07 percent of respondents disagreed with mean score 2.66 and rank VIth. Table data also indicated that about 75 percent of respondents agreed that respiratory distress, diarrhoea and many other diseases arise due to improper waste management, while 15 percent of respondents were

undecided, and 10 percent of respondents were disagreed with mean score 2.64 and rank VIIth.

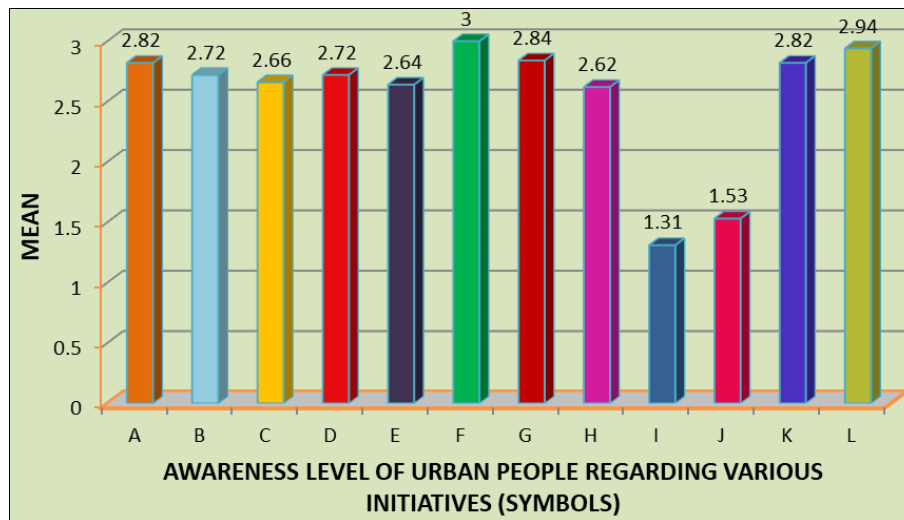
About 72 percent of respondents agreed that ‘community people are awarded of any legislation which governs household solid waste management’, while about 18 percent of respondents were undecided and 10 percent of respondents were disagreed with mean score 2.62 and rank VIIIth. About 69 percent of respondents were disagreed while 22 percent of respondents were agreed and about 09 percent of respondents were undecided related to statement ‘delay in household solid waste disposal causes of many difficulties’ with mean score 1.53 and rank IX. Similarly, about 76 percent of respondents disagreed, 7 percent of respondents agreed while 17 percent of respondents were undecided with incineration (burning of waste) is the effective disposal mechanism for household solid waste management with mean score 1.31 and rank X.

Above results are supported by Mathur (2017)<sup>[7]</sup> indicated that most of the surveyed families were aware of the arising problems of solid waste, its collection / disposal and the health hazards created by them. 92% knew that solid waste disposal is a big problem in highly populated areas. 64% families agreed that they should minimize their daily waste. Spandana and Rani (2020)<sup>[6]</sup> were also reported that most of the respondents had knowledge on solid waste management due to implementation of the program Swachha Bharat Abhiyan in the villages. The respondents who had good knowledge also had a good level of practice. Sultana, et al. (2021)<sup>[9]</sup> found out that overall awareness and practice level of household solid waste management was a moderate level in community people. Therefore, it can be concluded that Awareness level of urban people about Swachha Bharat Mission and other initiatives implemented by Government / and local bodies on Household Solid Waste Management (HSWM) was found high level of awareness with good knowledge. Although, it is necessary that community based awareness and training program on household solid waste management and recyclable waste should be must among the people. Policymakers can use this baseline data to make a strategy for increasing awareness among the community people.

**Table 2:** Distribution of respondents according to the Awareness level of urban people about Swachha Bharat Mission and other initiatives implemented by Government / and local bodies on Household Solid Waste Management (HSWM). n=150

Sr. No.	Awareness statement related to various initiatives implemented by Government /and local bodies on HSWM.	Symbol	Level of awareness			Mean	Rank order
			Agree f (%)	Undecided f (%)	Disagree f (%)		
1	‘Swachh Bharat Mission’ improved the awareness level among people about hygiene & sanitation	A	130 (86.67)	13 (8.67)	8 (5.34)	2.82	IV
2	Title song ‘Gadi wala aaya, ghar se kachra nikal’ continues increases awareness among the people about solid waste management.	B	124 (82.67)	11 (7.34)	15 (10.00)	2.72	V
3	Local authority has to play role in the HSWM.	C	110 (73.34)	29 (19.34)	11 (7.34)	2.66	VI
4	Swachh Sarvekshhan plays any role to aware people about solid waste management.	D	122 (81.34)	14 (9.34)	14 (9.34)	2.72	V
5	Respiratory distress, diarrhoea and many other diseases arise due to improper waste management.	E	112 (74.67)	23 (15.34)	15 (10.00)	2.64	VII
6	All streets should be clean and free of waste.	F	150 (100)	-	-	3.00	I
7	Waste disposal on open places will be harmful for human health.	G	132 (88.00)	12 (8.00)	6 (4.00)	2.84	III
8	Community people are awarded of any legislation which governs HSWM.	H	108 (72.00)	27 (18.00)	15 (10.00)	2.62	VIII
9	Incineration (burning of waste) is the effective disposal mechanism for HSWM.	I	11 (7.34)	25 (16.67)	114 (76.00)	1.31	X
10	Delay in household solid waste disposal causes of many difficulties.	J	33 (22.00)	14 (9.34)	103 (68.67)	1.53	IX
11	I am always concern about collection and dispose of HSWM.	K	135 (90.00)	4 (2.67)	11 (7.34)	2.82	IV
12	Every people have to know about HSWM.	L	144 (96.00)	4 (2.67)	2 (1.34)	2.94	II

\* data given in parenthesis denotes percentage



**Fig 2:** Distribution of respondents according to the awareness level of urban people regarding various initiatives implemented by the Governments and local bodies on HSWM

### Conclusion

Thus, it can be concluded from the study that a significant majority of urban households are aware of Household Solid Waste Management (HSWM) and the Swachh Bharat Mission. A highly significant majority of respondent's i.e.100% agreed that streets should be clean and free of waste, while about 96% believed that everyone should know about HSWM. The study also found that 87% of respondents credited the Swachh Bharat Mission for improving awareness about hygiene and sanitation. Furthermore, 90% of respondents expressed concern about the collection and disposal of household solid waste. The respondents demonstrated a high level of awareness regarding the proper disposal of waste and need to minimize daily waste generation. These findings also suggest that community-based awareness and training programs on HSWM and recyclable waste are necessary to sustain this level of awareness. The study also highlights the importance of education and awareness in promoting HSWM practices. The findings suggest that urban households are aware of the environmental and health impacts of improper waste disposal and are taking steps to mitigate these effects. Overall, the study concludes that urban households in India are making progress in adopting HSWM practices, but there is still a need for continued education and awareness efforts to promote sustainable waste management practices. This study can also inform policy and programmatic interventions aimed at promoting HSWM practices in urban India.

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