International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 08 Issue: 08 | Aug - 2024 SJIF Rating: 8.448 ISSN: 2582-3930

Assessment of Behaviour among Households towards Solid Waste Management in GHMC

Md. Kaleemullah[1]

Research Scholar, Osmania University & Assistant Professor Bhavans Vivekananda College of Science, Humanities and Commerce, Sainikpuri, Hyderabad
Email : mkm7722@gmail.com

Dr. S V Satyanarayana[2]
Retd. Senior Professor of Commerce, Osmania University, Hyderabad
Email : vajjalasura@yahoo.co.in

ABSTRACT

Background: Rapid urbanization has made domestic waste management a crucial environmental challenge in Hyderabad, which generates 5,500 to 6,000 metric tons of waste daily. Despite regulations, improper disposal practices persist, posing risks to public health and sustainability.

Research Methodology: This mixed-methods study used surveys of 404 households and secondary data to assess household waste management behavior in GHMC. Statistical tools like Chi-square tests and ANOVA were used to analyze the influence of demographic factors.

Results: Significant variations in waste management practices were found across demographics. Improper disposal methods, such as roadside dumping (mean = 3.43, p-value = 0.13) and burning (mean = 3.17, p-value = 0.572), are prevalent among older adults and higher-income households (mean = 3.44, p-value = 0.002). Conversely, younger individuals (<20 years, mean = 3.36, p-value = 0.084) and lower-income groups (<₹10,000, mean = 3.13, p-value = 0.805) show better adherence to sustainable practices like the 3R's and composting (mean = 3.32, p-value = 0.013). Education level also influences waste management behavior, with primary education correlating with better practices (mean = 3.41, p-value = 0.315).

Conclusion: Targeted interventions are needed to address improper disposal practices among older and higher-income groups. Positive trends in waste facility utilization and e-waste disposal are noted, but burning and burying waste remain common. Enhanced educational campaigns and infrastructure improvements are essential for sustainable waste management.

Keywords: Solid Waste Management, Household Behavior, Urbanization, Environmental Sustainability, Waste Segregation, Greater Hyderabad Municipal Corporation (GHMC), Recycling, Waste Reduction, Education, Public Health.

INTRODUCTION

In an era of rapid urbanization, managing domestic waste has become a crucial environmental issue. As cities expand and consumption patterns shift, the volume of waste generated poses significant risks to public health and environmental sustainability. The Ministry of Environment, Forest and Climate Change reports that India produces around 62 million tons of waste annually, growing at an average rate of 4% per year. Solid waste, particularly plastics and electronic waste, constitutes a major portion of this total. In 2020-21, India generated approximately 160,038.9 tons of solid waste daily, with Maharashtra, Uttar Pradesh, and Telangana being the largest contributors.

The introduction of new Solid Waste Management Rules by the Union Ministry of Environment, Forests and Climate Change (MoEF&CC) in 2016 highlights the need for effective waste management practices. These rules emphasize source segregation into categories such as biodegradable, non-biodegradable, combustible, sanitary, hazardous, and construction and demolition wastes. Despite these regulations, widespread implementation remains limited, with only 29% of waste being segregated at the source in Telangana from April to June 2022.

Household behavior is crucial in addressing the solid waste management challenge. Effective change requires more than regulatory measures; it demands altering entrenched habits and enhancing awareness of the environmental impacts of improper waste disposal. Social marketing is a key tool for facilitating this transformation.

In response to this need, Telangana has adopted an Information, Education, and Communication (IEC) strategy as part of its integrated municipal waste management project. This strategy employs various communication methods, including public meetings, workshops, school activities, street plays, and the distribution of educational materials. The IEC strategy aims to promote the separation of wet and dry waste and encourage the use of dual dustbins, leveraging social marketing to impart knowledge, foster positive attitudes, and drive behavioral changes among diverse groups, including children, youth, housewives, offices, institutions, and businesses. This study seeks to assess household behavior towards solid waste management practices. By analyzing the strategies, challenges, and outcomes of these initiatives, the research aims to offer a blueprint for governments, organizations, and policymakers to effectively use social marketing communication tools to drive community change and advance environmental sustainability.

REVIEW OF LITERATURE

The important studies reviewed on the research topic are presented as follows:

Eshete, Desalegn, and Tigu (2023): This study reveals a significant knowledge-action gap in solid waste management (SWM) in Gelemso Town, Ethiopia. Although there is high knowledge and positive attitudes towards SWM, practical implementation is lacking. Contributing factors include limited experience with waste sorting, inadequate waste removal methods, low awareness of the 3R (Reduce, Reuse, Recycle) concept, and insufficient SWM infrastructure. The research provides a well-structured questionnaire to assess knowledge, attitudes, and practices related to SWM, offering valuable insights for policymakers and facilitating targeted interventions.

Nesterenko and Rosokhata (2023): This study focuses on marketing communication strategies within Ukraine's national waste management system. It highlights the need to assess the effectiveness of marketing initiatives aimed at attracting investors to the waste disposal sector. The findings offer insights into optimizing marketing efforts to enhance waste management and sustainability.

Praveen Sultana (2023): Sultana's research evaluates the Swachha Badi program, which aims to educate students about waste collection, segregation, and composting. The study emphasizes the program's role as a learning center and a platform for spreading waste management knowledge. It highlights the effectiveness of communication strategies in engaging students and the broader community in sustainable waste management practices.

Nik Masdek et al. (2023): This study investigates the antecedents of sustainable food waste management behavior among Malaysian urban households. By integrating the Theory of Planned Behaviour and the Norm Activation Model, the research identifies key predictors such as environmental awareness, personal norms, attitudes, and perceived behavioral control. Structural Equation Modelling shows that intention partially mediates the relationship between these factors and actual behavior, with socio-demographic variables also moderating these associations.

ALFARAS (2023): This research examines the relationship between respondents' knowledge of SWM and their practices and implementation levels. The study finds a significant positive correlation, suggesting that increased knowledge leads to better practices and implementation. These findings underscore the importance of enhancing knowledge to improve waste management strategies and outcomes.

Qu et al. (2023): The study explores college students' attitudes towards waste separation and recovery on campus. Using quantitative methods, including descriptive statistics and regression analysis, the research identifies significant factors influencing attitudes and behaviors. The results indicate that favorable attitudes are positively correlated with active participation in waste management initiatives, providing insights for developing effective waste management strategies in educational settings.

Zainul Ikhwan et al. (2023): This study investigates the adoption of waste management innovations in schools on Penyengat Island, Tanjungpinang City. Using descriptive qualitative methods and Everett M. Rogers' Diffusion of Innovation Theory, the research highlights the importance of intensive communication and community ownership in the successful adoption of waste management practices. It also points out challenges such as inadequate facilities and low public awareness, recommending enhanced stakeholder collaboration and improved communication strategies.

Owojori et al. (2022): This research explores solid waste management practices at a rural university, revealing low levels of knowledge and awareness among students. The study highlights major challenges to implementing a circular economy, including insufficient knowledge, inadequate facilities, and financial constraints. It emphasizes the need for educational improvements and better waste management practices.

Sharmin Sultana et al. (2022): This study assesses waste management awareness and practices in the Mugda community, utilizing both descriptive and inferential statistical analyses. The research provides a methodological framework for evaluating and addressing waste management challenges in similar urban contexts.

Premsudha et al. (2022): The study focuses on Hyderabad's Integrated Municipal Solid Waste Management (IMSWM) system, detailing the entire process from waste generation to disposal. It highlights the environmental and health impacts of improper waste management and the critical role of public awareness and participation. The research analyzes the Hyderabad Integrated Municipal Solid Waste (HIMSW) plant's operations, emphasizing the need for sustainable solutions and addressing gaps in public attitudes towards waste management.

Limon and Villarino (2021): This study analyzes household food waste management in the northern Philippines, providing insights into the diverse knowledge, attitudes, and practices related to food waste. The factor analysis

reveals the complexities of managing food waste and offers a detailed understanding of the factors influencing household waste practices.

Fadhullah et al. (2021): The study uses a cross-sectional survey with stratified random sampling to examine household waste segregation perceptions and socio-demographic correlations. It identifies relationships between waste segregation perceptions and various socio-demographic factors, recommending further observational studies to complement survey data and address gaps in understanding the impact of socio-economic factors on waste management practices.

Usha Rani Vistharakula et al. (2021): This review examines the role of socio-economic factors in waste generation and the importance of effective waste management practices for sustainable living. Conducted in Hyderabad, India, the study utilizes data from 60 households, analyzing it through frequencies and percentages to draw meaningful conclusions about waste management practices in the region.

STATEMENT OF PROBLEM

In recent years, Hyderabad has been grappling with an escalating solid waste management crisis. In 2020, the city was producing a staggering 5,500 to 6,000 metric tons of waste daily, as per data from the National Environmental Engineering Research Institute (NEERI). This alarming statistic makes Hyderabad the top producer of waste in terms of quantity, with each person generating approximately 0.57 kg of waste daily. Domestic waste, constituting 37.18% of the total waste, surpasses other categories such as commercial waste.
The segregation of waste at its source helps prevent the contamination of recyclable and organic materials with non-recyclable and hazardous waste. Waste segregation at the source is a crucial component of a circular economy, where resources are used efficiently, and waste is minimized through recycling and reusing materials. However, this vision will only become a reality when people's attitudes toward waste change. This situation underlines the urgency of addressing issues such as knowledge gaps of household regarding solid waste management, attitude of households towards solid waste management (whether it is positive or negative), and whether it contributes to behavioural change in GHMC (Greater Hyderabad Municipal Corporation).

NEED FOR THE STUDY

According to a study conducted by the National Environmental Engineering Research Institute (NEERI), Hyderabad stands out as the city generating the highest amount of waste, with an average of 0.57 kilograms of waste produced per person per day. One of the major sources of waste is domestic waste, which accounts 37.18 % so therefore household's role is crucial in managing domestic solid waste. Nevertheless, the Greater Hyderabad Municipal Corporation (GHMC) has initiated actions to address this problem, including the implementation of initiatives like the 'Zero Waste' program. But the success of these initiatives depends on the practices they have regarding waste management which foster positive attitudes, and cause behavioural change among household. Hence this study proposes the need for assessment of knowledge, attitude and behaviour of household towards solid waste management in GHMC.

OBJECTIVE OF THE STUDY

- To analyze the behaviours of the Households towards Solid waste management in GHMC.
- To investigate a relationship between household demographics and behaviour of solid waste management practices

HYPOTHESIS

Hypothesis are in relation to the behaviours of households towards solid waste management in GHMC. Below are the hypothesises:

H01: There is no significant difference between behaviours of households towards solid waste management based on Age

H02: There is no significant difference between behaviours of households towards solid waste management based on Income

H03: There is no significant difference between behaviours of households towards solid waste management based on Education

RESEARCH METHODOLOGY

A. Research Design: The study adopts both inferential and descriptive research approaches. Descriptive research helps in understanding the current state of knowledge towards solid waste management among households in GHMC. Inferential research, on the other hand, helps in making predictions or inferences about the population based on the sample data collected.

B. Source of data for the Study:

Primary Data: Primary data was collected through a questionnaire survey conducted among 404 households across six zones within the GHMC area. The questionnaire, designed to assess knowledge towards solid waste management, included both closed and open-ended questions. It was adapted from similar studies by Gaëla Leroy (2019), with modifications to suit the GHMC context.

Secondary Data: Secondary data was sourced from journals, books, annual reports of various government pollution boards, and newspaper articles.

C. Sampling Frame: The sampling frame includes households residing in the six zones of GHMC. For this study, a household is defined as a group of individuals living together in a single dwelling unit, sharing common facilities for cooking, eating, and living. Households are considered primary generators of solid waste.

Zones: The zones included in the study are LB Nagar, Charminar, Khairthabad, Secunderabad, Serilingampaly, and Kukatpally.

D. Sample Size: Sample size is determined using following formula.

Population: The focus of our study is on the population within the jurisdiction of the Greater Hyderabad Municipal Corporation (GHMC). Total population of GHMC is 7.3 million as of 2024.

Parameters: To ensure the reliability of our findings, we have set the following parameters:

Desired Confidence Level (CL): 95%

Margin of Error (E): 5% (expressed as a proportion)

Estimated Population Standard Deviation (σ): 0.5 (based on previous studies)

Formula and Calculation: Sample Size

$$n = \left(\frac{1.96^2 \cdot 0.5^2}{(0.05)^2} \right)$$

$$n = \left(\frac{3.8416 \cdot 0.25}{0.0025} \right)$$

$$n = \left(\frac{0.9604}{0.0025} \right)$$

$$n \approx 384.16$$

Result: Based on our calculations, we would need a sample size of approximately 384 individuals from the GHMC population to achieve a confidence level of 95% with a margin of error of 5%. It is determined as 385

E. Sampling Method: Stratified random sampling with proportional allocation was applied to ensure each zone was represented according to its population size. The following table summarizes the population, proportion, and sample size for each zone:

Zone	Population	Proportion	Sample Size
LB Nagar	1,107,163	15.1%	61
Charminar	1,675,029	22.9%	92
Khairthabad	1,307,190	17.9%	72
Secunderabad	1,329,956	18.2%	73
Serilingampaly	794,577	10.9%	44
Kukatpally	1,108,946	15.2%	62
Total	**7,322,861**	**100%**	**404**

F. Data Collection:

i. Primary data is collected through questionnaire from households using emails, social media platforms and door-door data surveys.

ii. Secondary data is collected from journals, books, annual reports of various government pollution boards and newspaper articles.

G. Statistical Tools: The data collected was analysed using the following statistical tools: Inferential Statistics: Chi-square test, ANOVA.

Pilot study:

In order to ensure the trustworthiness of our survey instrument, we undertook a rigorous pilot testing phase involving 50 respondents. This critical phase aimed to validate the reliability of the questionnaire and refine its content to best serve our research objectives. Through meticulous data collection and analysis, which included both reliability analysis and confirmatory factor analysis, we sought to ascertain the robustness of our survey instrument. The reliability coefficient, a pivotal metric in social science research, emerged at an impressive 0.8, comfortably exceeding the widely accepted threshold of 0.7. This compelling result attests to the high internal consistency among the survey items, affirming the questionnaire's reliability in effectively measuring the intended constructs. Furthermore, recognizing the complexity of the initial questionnaire comprising 15 elements, we embarked on a meticulous process to streamline and optimize its content. By scrutinizing each element with precision, we distilled the questionnaire to 22 elements, ensuring a more focused and efficient data collection process without compromising the integrity of the study.

Reliability: The questionnaire has been checked for its validity and reliability through a pilot study.

Table 1-Reliability Statistics

Reliability Statistics	
Cronbach's Alpha	N of Items
.927	22

(Source: Author's complied data)

The Cronbach's Alpha coefficient of 0.927, as obtained from the reliability statistics presented in Table 1, indicates a high level of internal consistency among the items in the questionnaire. This coefficient value suggests that the items within the questionnaire are highly correlated with each other, indicating reliability in measuring the construct of interest.

SCOPE OF THE STUDY

The scope of this study is cantered within the jurisdiction of the Greater Hyderabad Municipal Corporation (GHMC). In this context, solid waste exclusively refers waste generated by residential households. The research endeavours to engage residents and households across diverse localities within GHMC. This study aims to shed light on the effectiveness of solid waste management awareness initiatives after 2016 within GHMC, offering insights that can inform future waste management strategies and contribute to more sustainable waste practices in the region.

PERIOD OF STUDY

Secondary data was collected from 2016 to 2022 i.e., six calendar years timeline. While field (primary data) was collected from respondents between November 2023 to March 2024 (5 months).

BEHAVIOUR OF HOUSEHOLDS TOWARDS SOLID WASTE MANAGEMENT IN GHMC

The analysis of 22 variables adopted from Leroy, G. (2019) and modified as per GHMC context in the study of household behaviors towards solid waste management provides critical insights into community engagement and practices. These insights underscore the effectiveness of both regulatory measures and incentive-based programs in enhancing waste management behaviors, while also highlighting areas where further education and support are needed to foster more comprehensive and consistent waste managements practices across all demographics.

One-way ANOVA for levels of Behaviour amongst households Based on Age factor

Analyses of variance have been performed to check the significance of behaviours of households about solid waste management in the Greater Hyderabad Municipal Corporation (GHMC) based on various age groups. Understanding behaviour is significant because different age groups exhibit distinct behaviours and perspectives towards waste management.

Table 2 – Respondents Behaviour towards solid waste management based on Age

Variable	Age	Mean	P-value
I dispose of my household waste by the roadsides, major streets, and gutters.	< 20 Yr	2.87	0.13
	21 Yr - 40 Yr	3.32	
	41 Yr - 60 Yr	3.19	
	> 60 Yr	3.43	
	Total	3.15	
I use the waste dump provided by the GHMC only	< 20 Yr	3.48	**0**
	21 Yr - 40 Yr	2.93	
	41 Yr - 60 Yr	3.75	
	> 60 Yr	3.26	
	Total	3.42	
I make use of a waste bin	< 20 Yr	3.32	0.158
	21 Yr - 40 Yr	3.32	
	41 Yr - 60 Yr	3.58	
	> 60 Yr	3.55	

	Total	3.44	
I bury waste in pits	< 20 Yr	3.33	0.796
	21 Yr - 40 Yr	3.41	
	41 Yr - 60 Yr	3.28	
	> 60 Yr	3.25	
	Total	3.32	
I sort and separate my household waste before dumping it	< 20 Yr	3.41	0.651
	21 Yr - 40 Yr	3.24	
	41 Yr - 60 Yr	3.37	
	> 60 Yr	3.23	
	Total	3.33	
I dump my household waste in nearby lakes and ponds	< 20 Yr	3.07	**0**
	21 Yr - 40 Yr	2.83	
	41 Yr - 60 Yr	3.57	
	> 60 Yr	3.16	
	Total	3.19	
I usually burn my household waste	< 20 Yr	3.15	0.572
	21 Yr - 40 Yr	3.15	
	41 Yr - 60 Yr	3.17	
	> 60 Yr	2.94	
	Total	3.11	
I apply the 3R's concept of reducing, reusing, and recycling solid waste in my household	< 20 Yr	3.36	**0.084**
	21 Yr - 40 Yr	3.11	
	41 Yr - 60 Yr	3.15	
	> 60 Yr	2.92	
	Total	3.17	

I educate others regarding waste management practices	< 20 Yr	2.87	**0.006**
	21 Yr - 40 Yr	3.09	
	41 Yr - 60 Yr	3.41	
	> 60 Yr	3.14	
	Total	3.12	
I responsibly dispose of E-waste as per environmental guidelines	< 20 Yr	3.95	0.328
	21 Yr - 40 Yr	3.84	
	41 Yr - 60 Yr	3.73	
	> 60 Yr	3.75	
	Total	3.83	
I engage in the composting of organic waste materials	< 20 Yr	3.32	**0.013**
	21 Yr - 40 Yr	2.63	
	41 Yr - 60 Yr	3.18	
	> 60 Yr	3.19	
	Total	3.13	
I minimize the use of single-use items	< 20 Yr	3.92	0.274
	21 Yr - 40 Yr	3.61	
	41 Yr - 60 Yr	3.65	
	> 60 Yr	3.61	
	Total	3.73	
I have participated in upcycling activities (transforming waste into useful products)	< 20 Yr	3.52	**0.026**
	21 Yr - 40 Yr	3.65	
	41 Yr - 60 Yr	3.72	
	> 60 Yr	3.23	
	Total	3.55	
I supported startups focused on recycling initiatives	< 20 Yr	3.45	0.372

	21 Yr - 40 Yr	3.61	
	41 Yr - 60 Yr	3.43	
	> 60 Yr	3.25	
	Total	3.44	
(Banyan Nation, Recykal, Eco-Orbit solutions, Ahuja Green technologies)	< 20 Yr	3.38	**0.003**
	21 Yr - 40 Yr	3.49	
	41 Yr - 60 Yr	3.15	
	> 60 Yr	2.84	
	Total	3.23	
I purchase secondhand products to reduce the waste	< 20 Yr	3.23	**0**
	21 Yr - 40 Yr	3.37	
	41 Yr - 60 Yr	3.96	
	> 60 Yr	3.83	
	Total	3.58	
I practice mindful consumption by planning meals, shopping with a list to avoid over-purchasing, reducing food waste, and choosing local and seasonal products to minimize the carbon footprint.	< 20 Yr	3.69	**0.059**
	21 Yr - 40 Yr	3.53	

	41 Yr - 60 Yr	3.91	
	> 60 Yr	3.47	
	Total	3.68	
I use the plastic vending machine to dispose of plastic bottles as a cash incentive	< 20 Yr	4.21	0.659
	21 Yr - 40 Yr	4.24	
	41 Yr - 60 Yr	4.32	
	> 60 Yr	4.14	
	Total	4.24	
I am compatible with the new waste management practices on a daily routine	< 20 Yr	4.44	0.786
	21 Yr - 40 Yr	4.31	
	41 Yr - 60 Yr	4.38	
	> 60 Yr	4.44	
	Total	4.40	
Utilizing auto tippers changed my habits of waste disposal practices	< 20 Yr	3.22	0.261
	21 Yr - 40 Yr	3.11	
	41 Yr - 60 Yr	3.29	
	> 60 Yr	3.47	
	Total	3.27	
Adopting twin-bin system changed my habits of waste segregation practices	< 20 Yr	3.19	0.203
	21 Yr - 40 Yr	2.95	
	41 Yr - 60 Yr	3.25	
	> 60 Yr	3.44	
	Total	3.21	
I'm willing to continue using auto tipper	< 20 Yr	3.23	0.498
	21 Yr - 40 Yr	3.23	

	41 Yr - 60 Yr	3.42	
	> 60 Yr	3.48	
	Total	3.33	
I'm willing to continue using twin-bin system	< 20 Yr	3.85	0.388
	21 Yr - 40 Yr	3.73	
	41 Yr - 60 Yr	3.91	
	> 60 Yr	4.06	
	Total	3.89	

One-way ANOVA for levels of Behaviour amongst households Based on Income factor

Analyses of variance have been performed to check the significance of behaviors of households about solid waste management in the Greater Hyderabad Municipal Corporation (GHMC) based on various education levels. Understanding behavior is significant because different education levels exhibit distinct behaviors and perspectives towards waste management.

Table 3 – Respondents Behaviour towards solid waste management based on Income

Variable	Income	Mean	P value
I dispose of my household waste by the roadsides, major streets, and gutters.	Below 10,000	2.97	**0.002**
	10,000 - 20,000	3.14	
	20,001 - 30,000	2.86	
	30,001 - 40,000	2.63	
	40,001 - 50,000	2.83	
	Above - 50,001	3.44	
	Total	3.15	
I use the waste dump provided by the GHMC only	Below 10,000	3.67	**0**
	10,000 - 20,000	2.86	
	20,001 - 30,000	4.03	
	30,001 - 40,000	3.03	

	40,001 - 50,000	3.29	
	Above - 50,001	3.58	
	Total	3.42	
I make use of a waste bin	Below 10,000	3.21	**0.002**
	10,000 - 20,000	3.24	
	20,001 - 30,000	4.00	
	30,001 - 40,000	3.28	
	40,001 - 50,000	3.19	
	Above - 50,001	3.58	
	Total	3.44	
I bury waste in pits	Below 10,000	3.36	0.729
	10,000 - 20,000	3.29	
	20,001 - 30,000	3.59	
	30,001 - 40,000	3.44	
	40,001 - 50,000	3.32	
	Above - 50,001	3.25	
	Total	3.32	
I sort and separate my household waste before dumping it	Below 10,000	3.41	0.558
	10,000 - 20,000	3.24	
	20,001 - 30,000	3.55	
	30,001 - 40,000	3.22	
	40,001 - 50,000	3.53	
	Above - 50,001	3.27	

	Total	3.33	
I dump my household waste in nearby lakes and ponds	Below 10,000	3.13	**0.01**
	10,000 - 20,000	3.03	
	20,001 - 30,000	3.76	
	30,001 - 40,000	2.84	
	40,001 - 50,000	2.90	
	Above - 50,001	3.32	
	Total	3.19	
I usually burn my household waste	Below 10,000	3.21	0.545
	10,000 - 20,000	3.24	
	20,001 - 30,000	2.83	
	30,001 - 40,000	3.34	
	40,001 - 50,000	3.12	
	Above - 50,001	3.05	
	Total	3.11	
I apply the 3R's concept of reducing, reusing, and recycling solid waste in my household	Below 10,000	3.13	0.805
	10,000 - 20,000	3.29	
	20,001 - 30,000	3.03	
	30,001 - 40,000	3.38	
	40,001 - 50,000	3.07	
	Above - 50,001	3.15	
	Total	3.17	
I educate others regarding waste management practices	Below 10,000	2.95	0.801

	10,000 - 20,000	3.08	
	20,001 - 30,000	3.14	
	30,001 - 40,000	2.94	
	40,001 - 50,000	3.15	
	Above - 50,001	3.20	
	Total	3.12	
I responsibly dispose of E-waste as per environmental guidelines	Below 10,000	3.46	**0.01**
	10,000 - 20,000	4.00	
	20,001 - 30,000	4.24	
	30,001 - 40,000	3.72	
	40,001 - 50,000	3.61	
	Above - 50,001	3.87	
	Total	3.83	
I engage in the composting of organic waste materials	Below 10,000	3.05	**0.012**
	10,000 - 20,000	2.94	
	20,001 - 30,000	3.90	
	30,001 - 40,000	2.53	
	40,001 - 50,000	3.03	
	Above - 50,001	3.22	
	Total	3.13	
I minimize the use of single-use items	Below 10,000	3.82	0.365
	10,000 - 20,000	3.89	
	20,001 - 30,000	3.69	

	30,001 - 40,000	3.38	
	40,001 - 50,000	3.47	
	Above - 50,001	3.79	
	Total	3.73	
I have participated in upcycling activities (transforming waste into useful products)	Below 10,000	3.54	**0.04**
	10,000 - 20,000	3.77	
	20,001 - 30,000	3.76	
	30,001 - 40,000	3.47	
	40,001 - 50,000	3.14	
	Above - 50,001	3.58	
	Total	3.55	
I supported startups focused on recycling initiatives	Below 10,000	3.46	0.971
	10,000 - 20,000	3.44	
	20,001 - 30,000	3.55	
	30,001 - 40,000	3.44	
	40,001 - 50,000	3.31	
	Above - 50,001	3.45	
	Total	3.44	
(Banyan Nation, Recykal, Eco-Orbit solutions, Ahuja Green technologies)	Below 10,000	3.03	**0.016**
	10,000 - 20,000	3.59	
	20,001 - 30,000	2.72	
	30,001 - 40,000	3.28	
	40,001 - 50,000	3.03	

	Above - 50,001	3.28	
	Total	3.23	
I purchase secondhand products to reduce the waste	Below 10,000	3.38	0.101
	10,000 - 20,000	3.36	
	20,001 - 30,000	3.86	
	30,001 - 40,000	3.34	
	40,001 - 50,000	3.53	
	Above - 50,001	3.72	
	Total	3.58	
I practice mindful consumption by planning meals, shopping with a list to avoid over-purchasing, reducing food waste, and choosing local and seasonal products to minimize the carbon footprint.	Below 10,000	3.64	0.517
	10,000 - 20,000	3.67	
	20,001 - 30,000	3.72	
	30,001 - 40,000	3.50	
	40,001 - 50,000	3.46	
	Above - 50,001	3.80	
	Total	3.68	
	Below 10,000	4.13	**0.03**

I use the plastic vending machine to dispose of plastic bottles as a cash incentive	10,000 - 20,000	4.45	
	20,001 - 30,000	3.69	
	30,001 - 40,000	4.25	
	40,001 - 50,000	4.31	
	Above - 50,001	4.25	
	Total	4.24	
I am compatible with the new waste management practices on a daily routine	Below 10,000	4.46	0.696
	10,000 - 20,000	4.30	
	20,001 - 30,000	4.34	
	30,001 - 40,000	4.25	
	40,001 - 50,000	4.32	
	Above - 50,001	4.47	
	Total	4.40	
Utilizing auto tippers changed my habits of waste disposal practices	Below 10,000	3.28	0.321
	10,000 - 20,000	3.20	
	20,001 - 30,000	3.31	
	30,001 - 40,000	2.91	
	40,001 - 50,000	3.15	
	Above - 50,001	3.39	
	Total	3.27	
Adopting twin-bin system changed my habits of waste segregation practices	Below 10,000	3.33	**0.015**
	10,000 - 20,000	2.94	
	20,001 - 30,000	3.45	

	30,001 - 40,000	2.84	
	40,001 - 50,000	2.83	
	Above - 50,001	3.44	
	Total	3.21	
I'm willing to continue using auto tipper	Below 10,000	3.74	**0.013**
	10,000 - 20,000	3.14	
	20,001 - 30,000	3.45	
	30,001 - 40,000	2.97	
	40,001 - 50,000	2.92	
	Above - 50,001	3.50	
	Total	3.33	
I'm willing to continue using twin-bin system	Below 10,000	4.08	0.29
	10,000 - 20,000	3.76	
	20,001 - 30,000	4.00	
	30,001 - 40,000	3.63	
	40,001 - 50,000	3.69	
	Above - 50,001	3.99	
	Total	3.89	

One-way ANOVA for levels of Behaviour amongst households Based on Education factor

Analyses of variance have been performed to check the significance of behaviors of households about solid waste management in the Greater Hyderabad Municipal Corporation (GHMC) based on various education levels. Understanding behavior is significant because different education levels exhibit distinct behaviors and perspectives towards waste management.

Table 4 – Respondents Behaviour towards solid waste management based on education

Variable	Education	Mean	P value

I dispose of my household waste by the roadsides, major streets, and gutters.	No Formal Education	2.90	**0.002**
	Primary School (up to class 5) Secondary School (up to class 10)	3.18	
	Higher Secondary education (classes 11 and 12)	3.00	
	Diploma or vocational education	2.54	
	Undergraduate degree	3.49	
	Postgraduate degree	2.98	
	Doctorate or specialized professional degree	3.08	
I use the waste dump provided by the GHMC only	No Formal Education	3.54	**0.083**
	Primary School (up to class 5) Secondary School (up to class 10)	3.59	
	Higher Secondary education (classes 11 and 12)	2.83	
	Diploma or vocational education	3.14	
	Undergraduate degree	3.45	
	Postgraduate degree	3.46	
	Doctorate or specialized professional degree	3.64	
I make use of a waste bin	No Formal Education	3.15	**0.099**
	Primary School (up to class 5) Secondary School (up to class 10)	3.71	

	Higher Secondary education (classes 11 and 12)	3.31	
	Diploma or vocational education	3.14	
	Undergraduate degree	3.59	
	Postgraduate degree	3.46	
	Doctorate or specialized professional degree	3.42	
I bury the waste in pits	No Formal Education	3.15	0.777
	Primary School (up to class 5) Secondary School (up to class 10)	3.29	
	Higher Secondary education (classes 11 and 12)	3.33	
	Diploma or vocational education	3.34	
	Undergraduate degree	3.42	
	Postgraduate degree	3.23	
	Doctorate or specialized professional degree	3.24	
I sort and separate my household waste before dumping it	No Formal Education	3.35	0.968
	Primary School (up to class 5) Secondary School (up to class 10)	3.35	
	Higher Secondary education (classes 11 and 12)	3.25	
	Diploma or vocational education	3.49	

	Undergraduate degree	3.34	
	Postgraduate degree	3.21	
	Doctorate or specialized professional degree	3.36	
I dump my household waste in nearby lakes and ponds	No Formal Education	3.06	**0.096**
	Primary School (up to class 5) Secondary School (up to class 10)	3.35	
	Higher Secondary education (classes 11 and 12)	2.81	
	Diploma or vocational education	2.77	
	Undergraduate degree	3.33	
	Postgraduate degree	3.25	
	Doctorate or specialized professional degree	3.27	
I usually burn my household waste	No Formal Education	3.25	0.517
	Primary School (up to class 5) Secondary School (up to class 10)	3.35	
	Higher Secondary education (classes 11 and 12)	3.22	
	Diploma or vocational education	3.20	
	Undergraduate degree	3.14	
	Postgraduate degree	2.82	

	Doctorate or specialized professional degree	3.02	
I apply the 3R's concept of reducing, reusing, and recycling solid waste in my household	No Formal Education	3.23	0.315
	Primary School (up to class 5) Secondary School (up to class 10)	3.41	
	Higher Secondary education (classes 11 and 12)	3.25	
	Diploma or vocational education	3.11	
	Undergraduate degree	3.29	
	Postgraduate degree	2.88	
	Doctorate or specialized professional degree	2.98	
I educate others regarding waste management practices	No Formal Education	2.96	0.269
	Primary School (up to class 5) Secondary School (up to class 10)	3.29	
	Higher Secondary education (classes 11 and 12)	3.19	
	Diploma or vocational education	3.03	
	Undergraduate degree	3.29	
	Postgraduate degree	2.88	
	Doctorate or specialized professional degree	3.00	
I responsibly dispose of E-waste as per environmental guidelines	No Formal Education	3.44	**0.04**

	Primary School (up to class 5) Secondary School (up to class 10)	4.18	
	Higher Secondary education (classes 11 and 12)	3.81	
	Diploma or vocational education	3.91	
	Undergraduate degree	3.90	
	Postgraduate degree	4.00	
	Doctorate or specialized professional degree	3.66	
I engage in the composting of organic waste materials	No Formal Education	3.10	0.712
	Primary School (up to class 5) Secondary School (up to class 10)	3.53	
	Higher Secondary education (classes 11 and 12)	3.08	
	Diploma or vocational education	3.40	
	Undergraduate degree	2.99	
	Postgraduate degree	3.16	
	Doctorate or specialized professional degree	3.20	
I minimize the use of single-use items	No Formal Education	3.81	0.205
	Primary School (up to class 5) Secondary School (up to class 10)	4.47	

	Higher Secondary education (classes 11 and 12)	3.33	
	Diploma or vocational education	3.69	
	Undergraduate degree	3.78	
	Postgraduate degree	3.68	
	Doctorate or specialized professional degree	3.61	
I have participated in upcycling activities (transforming waste into useful products)	No Formal Education	3.40	**0.05**
	Primary School (up to class 5) Secondary School (up to class 10)	4.06	
	Higher Secondary education (classes 11 and 12)	3.36	
	Diploma or vocational education	3.29	
	Undergraduate degree	3.72	
	Postgraduate degree	3.55	
	Doctorate or specialized professional degree	3.34	
I supported startups focused on recycling initiatives	No Formal Education	3.38	0.315
	Primary School (up to class 5) Secondary School (up to class 10)	3.65	
	Higher Secondary education (classes 11 and 12)	3.64	
	Diploma or vocational education	3.60	

	Undergraduate degree	3.53	
	Postgraduate degree	3.21	
	Doctorate or specialized professional degree	3.17	
(Banyan Nation, Recykal, Eco-Orbit solutions, Ahuja Green technologies)	No Formal Education	2.94	**0.004**
	Primary School (up to class 5) Secondary School (up to class 10)	3.47	
	Higher Secondary education (classes 11 and 12)	3.36	
	Diploma or vocational education	3.46	
	Undergraduate degree	3.45	
	Postgraduate degree	3.05	
	Doctorate or specialized professional degree	2.80	
I purchase secondhand products to reduce the waste	No Formal Education	3.04	**0.013**
	Primary School (up to class 5) Secondary School (up to class 10)	3.76	
	Higher Secondary education (classes 11 and 12)	3.56	
	Diploma or vocational education	3.34	
	Undergraduate degree	3.74	
	Postgraduate degree	3.73	

	Doctorate or specialized professional degree	3.58	
I practice mindful consumption by planning meals, shopping with a list to avoid over-purchasing, reducing food waste, and choosing local and seasonal products to minimize the carbon footprint.	No Formal Education	3.65	0.464
	Primary School (up to class 5) Secondary School (up to class 10)	3.65	
	Higher Secondary education (classes 11 and 12)	3.47	
	Diploma or vocational education	3.57	
	Undergraduate degree	3.80	
	Postgraduate degree	3.86	
	Doctorate or specialized professional degree	3.46	
I use the plastic vending machine to dispose of plastic bottles as a cash incentive	No Formal Education	4.19	**0.04**
	Primary School (up to class 5) Secondary School (up to class 10)	4.24	
	Higher Secondary education (classes 11 and 12)	4.33	
	Diploma or vocational education	4.34	
	Undergraduate degree	4.39	
	Postgraduate degree	4.13	
	Doctorate or specialized professional degree	3.86	
I am compatible with the new waste management practices on a daily routine	No Formal Education	4.48	0.3

	Primary School (up to class 5) Secondary School (up to class 10)	4.47	
	Higher Secondary education (classes 11 and 12)	4.33	
	Diploma or vocational education	4.14	
	Undergraduate degree	4.51	
	Postgraduate degree	4.39	
	Doctorate or specialized professional degree	4.20	
Utilizing auto tippers changed my habits of waste disposal practices	No Formal Education	3.08	**0.051**
	Primary School (up to class 5) Secondary School (up to class 10)	3.71	
	Higher Secondary education (classes 11 and 12)	3.11	
	Diploma or vocational education	2.89	
	Undergraduate degree	3.45	
	Postgraduate degree	3.23	
	Doctorate or specialized professional degree	3.17	
Adopting twin-bin system changed my habits of waste segregation practices	No Formal Education	2.94	**0.012**
	Primary School (up to class 5) Secondary School (up to class 10)	3.82	

	Higher Secondary education (classes 11 and 12)	3.06	
	Diploma or vocational education	2.63	
	Undergraduate degree	3.46	
	Postgraduate degree	3.16	
	Doctorate or specialized professional degree	3.08	
I'm willing to continue using auto tipper	No Formal Education	3.38	0.163
	Primary School (up to class 5) Secondary School (up to class 10)	3.94	
	Higher Secondary education (classes 11 and 12)	2.97	
	Diploma or vocational education	3.03	
	Undergraduate degree	3.42	
	Postgraduate degree	3.48	
	Doctorate or specialized professional degree	3.15	
I'm willing to continue using twin-bin system	No Formal Education	3.81	**0.041**
	Primary School (up to class 5) Secondary School (up to class 10)	4.35	
	Higher Secondary education (classes 11 and 12)	3.53	
	Diploma or vocational education	3.74	

	Undergraduate degree	4.04
	Postgraduate degree	4.04
	Doctorate or specialized professional degree	3.59

FINDINGS

I. Improper Disposal Practices

Improper Disposal Practices

Improper disposal of household waste is a significant issue across all demographics within GHMC. The findings reveal the extent to which different groups engage in various improper disposal practices.

Improper Disposal by the Roadside, Major Streets, and Gutters:

- Individuals over 60 years old report the highest incidence of disposing waste by the roadside, major streets, and gutters (Mean = 3.43, p-value = 0.13), indicating a very great extent. This suggests a potential lack of engagement or ability to utilize proper disposal methods within this age group.
- Households earning above ₹50,000 also exhibit a higher tendency for improper roadside disposal (Mean = 3.44, p-value = 0.002), showing a very great extent. This may indicate a disconnect between income levels and environmental responsibility.
- Educationally, individuals with an undergraduate degree show the highest mean (3.49, p-value = 0.002), highlighting that formal education alone does not always translate to better waste disposal practices to a very great extent.

Disposal of Waste in Lakes and Ponds:

- Disposal of waste in lakes and ponds is alarmingly high, especially among those aged 41-60 years (Mean = 3.57, p-value = 0.00), suggesting a very great extent of engagement in this practice. This age group might engage more frequently in outdoor activities, thereby contributing to pollution in water bodies.
- Households earning ₹20,001-₹30,000 exhibit the highest mean (3.76, p-value = 0.01), indicating a very great extent, potentially due to lack of awareness or infrastructure for proper waste disposal.
- This trend is mirrored among those with primary education (Mean = 3.35, p-value = 0.096), underscoring the need for targeted educational campaigns in schools to a very great extent.

Burning Household Waste:

- Burning household waste is another prevalent practice, especially among the 41-60 years group (Mean = 3.17, p-value = 0.572), indicating a very great extent of engagement. This age group might resort to burning as a convenient waste disposal method.

- Households earning ₹30,001-₹40,000 show a higher propensity to burn waste (Mean = 3.34, p-value = 0.545), reflecting a very great extent of this practice.
- Individuals with primary education (Mean = 3.35, p-value = 0.517) are more likely to burn their waste, suggesting that lower educational attainment may correlate with less environmentally friendly practices to a very great extent.

Burying Waste in Pits:

Burying waste in pits is a consistent practice across all age groups (Mean = 3.32, p-value = 0.796), indicating a very great extent and suggesting that it is a deeply ingrained habit. This uniformity extends across income levels (p-value = 0.729) and education (p-value = 0.777), suggesting a widespread need for accessible and effective waste disposal alternatives to a very great extent.

II. Utilization of Waste Management Facilities

Use of Waste Dumps Provided by GHMC:

- Utilization of waste management facilities shows varied engagement across different demographics. The 41-60 years age group demonstrates the highest compliance in using GHMC-provided waste dumps (Mean = 3.75, p-value = 0.00), indicating a very great extent of effective outreach to this demographic.
- Conversely, younger individuals (< 20 years) and those in lower-income brackets (₹10,000-₹20,000) exhibit lower usage, highlighting a gap that needs addressing to a moderately extent.
- Education-wise, individuals with higher education (doctorate or professional degrees) are more compliant (Mean = 3.64, p-value = 0.083), suggesting that higher education correlates with better utilization of municipal waste facilities to a very great extent.

Use of Waste Bins:

- The use of waste bins is widespread, with the 41-60 years group leading (Mean = 3.58, p-value = 0.158), reflecting a very great extent of adherence to proper waste management practices.
- Higher-income households (₹20,001-₹30,000) also show high compliance (Mean = 4.00, p-value = 0.002), indicating a very great extent, potentially due to better access to resources.
- Those with secondary education show higher usage (Mean = 3.71, p-value = 0.099), indicating that basic education efforts have been effective to a very great extent.

Responsible Disposal of E-Waste:

- Responsible disposal of e-waste is commendably managed, with high overall means across age groups (Total Mean = 3.83, p-value = 0.328), indicating a very great extent.
- Households earning ₹20,001-₹30,000 show the highest compliance (Mean = 4.24, p-value = 0.01), reflecting a very great extent.
- Education-wise, those with secondary school education lead (Mean = 4.18, p-value = 0.04), indicating effective awareness campaigns and infrastructure for e-waste disposal to a very great extent.

Utilizing Auto Tippers:

Utilizing auto tippers has gained traction, particularly among households earning above ₹50,000 (Mean = 3.39, p-value = 0.321), indicating a very great extent, and those with secondary school education (Mean = 3.71, p-value = 0.051), reflecting the importance of income and education in adopting newer waste management technologies to a very great extent.

III. Engagement in Waste Reduction Activities

Sorting and Separating Household Waste:

- Sorting and separating household waste is more common among the 41-60 years group (Mean = 3.37, p-value = 0.651), suggesting a very great extent of conscientious waste management.
- Higher-income households (₹20,001-₹30,000) also show better compliance (Mean = 3.55, p-value = 0.558), reflecting a very great extent of the role of financial stability in adopting sustainable practices.
- Those with vocational education exhibit higher engagement (Mean = 3.49, p-value = 0.968), indicating the impact of specialized training to a very great extent.

Applying the 3R's Concept (Reduce, Reuse, Recycle):

- The application of the 3R's concept is notably higher among younger individuals (< 20 years) (Mean = 3.36, p-value = 0.084), suggesting a very great extent of a generational shift towards sustainability.
- Lower-income households (< ₹10,000) exhibit better adherence (Mean = 3.13, p-value = 0.805), indicating a very great extent, possibly due to economic necessity.
- Primary school education also correlates with higher compliance (Mean = 3.41, p-value = 0.315), highlighting the effectiveness of early education on sustainable practices to a very great extent.

Composting Organic Waste:

- Composting organic waste is more prevalent among the youngest age group (Mean = 3.32, p-value = 0.013), suggesting a very great extent of awareness and adoption among these demographics.
- Households earning ₹20,001-₹30,000 (Mean = 3.90, p-value = 0.012) show a very great extent of engagement.
- Secondary school educated individuals show the highest engagement (Mean = 3.53, p-value = 0.712), indicating the importance of school-level interventions to a very great extent.

Minimizing the Use of Single-Use Items:

- Minimizing the use of single-use items is highly practiced across all demographics, especially among younger individuals (Mean = 3.92, p-value = 0.274) and lower-income households (Mean = 3.82, p-value = 0.365), suggesting a very great extent of broad-based understanding of the environmental impact of single-use items.
- Those with primary education lead this practice (Mean = 4.47, p-value = 0.205), reflecting effective early education programs to a very great extent.

Participating in Upcycling Activities:

- Participation in upcycling activities is higher among the 41-60 years group (Mean = 3.72, p-value = 0.026) and households earning ₹10,000-₹20,000 (Mean = 3.77, p-value = 0.04), indicating a very great extent of creative reuse of waste materials.
- Education-wise, primary school educated individuals show the highest participation (Mean = 4.06, p-value = 0.05), suggesting that foundational education plays a crucial role in fostering sustainable practices to a very great extent.

Purchasing Second-Hand Products:

- Purchasing second-hand products is more common among older age groups (41-60 years) (Mean = 3.96, p-value = 0.00) and households earning ₹20,001-₹30,000 (Mean = 3.86, p-value = 0.101), reflecting a very great extent of a shift towards sustainable consumption.

- Individuals with an undergraduate degree show higher compliance (Mean = 3.74, p-value = 0.013), indicating that higher education promotes more sustainable purchasing habits to a very great extent.

Practicing Mindful Consumption:

- Practicing mindful consumption is widely adopted, particularly among the 41-60 years group (Mean = 3.91, p-value = 0.059) and higher-income households (above ₹50,000) (Mean = 3.80, p-value = 0.517), indicating a very great extent of financial stability and middle age correlating with more deliberate and sustainable consumption practices.
- Education-wise, those with a postgraduate degree exhibit the highest mean (3.86, p-value = 0.464), reflecting the impact of advanced education on sustainable behavior to a very great extent.

IV. Awareness and Education

Educating Others Regarding Waste Management Practices:

- Educating others about waste management is more common among the 41-60 years group (Mean = 3.41, p-value = 0.006), indicating a very great extent of their potential role as community influencers.
- Households earning ₹20,001-₹30,000 (Mean = 3.14, p-value = 0.801) and those with secondary education (Mean = 3.29, p-value = 0.269) also show higher engagement, suggesting that financial stability and basic education foster a proactive approach to waste management to a very great extent.

Supporting Startups Focused on Recycling Initiatives:

- Supporting startups focused on recycling initiatives is consistent across age groups (Total Mean = 3.44, p-value = 0.372), with higher support seen in households earning ₹20,001-₹30,000 (Mean = 3.55, p-value = 0.971), reflecting a very great extent.
- Education-wise, individuals with primary education lead (Mean = 3.65, p-value = 0.315), indicating the role of early education in fostering support for innovative waste management solutions to a very great extent.

Adoption of Modern Waste Management Practices:

- Adoption of modern waste management practices, such as using plastic vending machines, is highly accepted, with uniform adherence across age groups (Total Mean = 4.24, p-value = 0.659), indicating a very great extent.
- Households earning ₹10,000-₹20,000 show the highest compliance (Mean = 4.45, p-value = 0.03), and those with vocational education lead (Mean = 4.34, p-value = 0.04), reflecting the impact of targeted education and economic incentives on the adoption of new technologies to a very great extent.

Compatibility with New Waste Management Practices:

- Compatibility with new waste management practices shows a high overall mean of 4.40 (p-value = 0.786). The highest compatibility is observed among those over 60 years (Mean = 4.44), indicating a very great extent.
- Higher-income households (above ₹50,000) show greater acceptance (Mean = 4.47, p-value = 0.696), indicating a very great extent of financial resources facilitating the adoption of new practices.
- Education-wise, those with an undergraduate degree exhibit the highest mean (4.51, p-value = 0.3), highlighting the role of higher education in fostering adaptability to new methods to a very great extent.

Adopting the Twin-Bin System:

- Adopting the twin-bin system shows moderate adoption with an overall mean of 3.21 (p-value = 0.203). Those over 60 years show the highest mean (3.44), while households earning below ₹10,000 lead (Mean = 3.33, p-value = 0.015), indicating a very great extent.
- Education-wise, primary school educated individuals show the highest compliance (Mean = 3.82, p-value = 0.012), suggesting that early education and age-specific interventions can improve adoption rates to a very great extent.

Willingness to Continue Using Auto Tippers:

- Willingness to continue using auto tippers has a mean of 3.33 (p-value = 0.498). The highest willingness is seen among those over 60 years (Mean = 3.48), indicating a very great extent, while households earning above ₹50,000 show higher compliance (Mean = 3.50, p-value = 0.013), indicating a very great extent.
- Education-wise, those with primary school education exhibit the highest willingness (Mean = 3.94, p-value = 0.163), indicating a very great extent.

Willingness to Continue Using the Twin-Bin System:

- Willingness to continue using the twin-bin system shows a high overall mean of 3.89 (p-value = 0.388). The highest willingness is observed among those over 60 years (Mean = 4.06), indicating a very great extent, while households earning below ₹10,000 lead (Mean = 4.08, p-value = 0.29), indicating a very great extent.
- Education-wise, those with primary school education exhibit the highest compliance (Mean = 4.35, p-value = 0.041), reflecting a very great extent.
- with primary school education exhibit the highest compliance (Mean = 4.35, p-value = 0.041).

CONCLUSION

The study reveals significant variations in waste management practices within GHMC. Improper disposal, such as roadside dumping and waste in lakes, is most prevalent among individuals over 60 and higher-income households, indicating a need for targeted interventions. Positive trends include high utilization of GHMC waste facilities, especially among the 41-60 age group and higher-income households, and responsible e-waste disposal across all demographics. Waste reduction activities, like sorting, applying the 3R's concept, and composting, show promising results, particularly among younger individuals and lower-income households.

Despite these positive trends, burning and burying waste remain common practices, highlighting the need for more robust interventions. Adoption of modern practices, such as plastic vending machines and the twin-bin system, is relatively high, indicating a positive shift towards new technologies.

In summary, while progress is evident in some areas, significant challenges in changing improper disposal habits persist. Effective educational campaigns and improved infrastructure are essential for promoting sustainable waste management practices across all demographics.

REFERENCES:

- Ajzen, I. (1985). From Intentions to Actions: A Theory of Planned Behavior. In: Kuhl, J., Beckmann, J. (eds) Action Control. SSSP Springer Series in Social Psychology. Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-69746-3_2
- Eshete, H., Desalegn, A., & Tigu, F. (2023). Knowledge, attitudes and practices on household solid waste management and associated factors in Gelemso town, Ethiopia. *PLoS ONE, 18*(2), February.
- Nesterenko, V., & Rosokhata, A. (2023). Marketing communication in the context of the optimal model of the national pattern system of waste management in Ukraine. UKRAINIAN BLACK SEA REGION AGRARIAN SCIENCE, 27*(2).
- Parveen Sultana (2023). Participatory communication and solid waste management: Siddipet 'Swachh Badir' efforts towards sustainable development. *International Journal of Arts, Humanities and Social Studies, 5*(1), 98–103.
- Nik Masdek, N. R., Wong, K. K. S., Mohd Nawi, N., Sharifuddin, J., & Wong, W. L. (2023). Antecedents of sustainable food waste management behaviour: Empirical evidence from urban households in Malaysia. Management and Marketing, 18(1), 53–77.
- ALFARAS, R. S. A. (2023). Integrated Urban Solid Waste Management: Knowledge, Practices, and Implementation. Journal of Environmental Management and Tourism, 14(5), 2328.
- Qu, D., Shevchenko, T., Shams Esfandabadi, Z., & Ranjbari, M. (2023). College Students' Attitude towards Waste Separation and Recovery on Campus. 15(2), 1620.
- Zainul Ikhwan, Ulfa Hanum, Fadhil Indris, Catur Puspawati, & Kusrini WulanSari (2023). Diffusion Innovation Behavior Student in Waste Management Schools on Small Islands. International Journal of Social Science, 3(4), 499-506.
- Owojori, O. M., Mulaudzi, R., & Edokpayi, J. N. (2022). Student's Knowledge, Attitude, and Perception (KAP) to Solid Waste Management: A Survey towards a More Circular Economy from a Rural-Based Tertiary Institution in South Africa. *Sustainability (Switzerland), 14*(3).
- Sultana, S. , Islam, M. , Jahan, F. and Khatun, F. (2021) Awareness and Practice on Household Solid Waste Management among the Community People. Open Journal of Nursing, 11, 349-366.
- Premsudha, R., Kavyasri, M., Sreeharsha, M., Sathwika, V., Natraj, S., & Anusha, B. (2022). Augmentation of Municipal Solid Waste Management in Hyderabad City. International Journal of Advanced Research in Science, Communication and Technology (IJARSCT), 2(1), 410-417.
- Limon, M. R., & Villarino, C. B. J. (2020). Knowledge, attitudes and practices on household food waste: Bases for formulation of a recycling system. Global Journal of Environmental Science and Management, 6(3), 323–340.
- Fadhullah, W., Imran, N. I. N., Ismail, S. N. S., Jaafar, M. H., & Abdullah, H. (2022). Household solid waste management practices and perceptions among residents in the East Coast of Malaysia. BMC Public Health, 22(1).
- Rani Vistharakula, U., Reddy Ramala, G., & Vijaya Lakshmi, V. (2021). Knowledge, attitude, practice and socio-economic factors influence on households waste management practices. *The Pharma Innovation Journal, 5*, 545–550.