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Socio-Economic Determinants and Behavioral Patterns of Household Plastic Usage: A Comparative Study of Urban and Rural India

Author
Dr. Sunita Lilani
Assistant Professor,
S.S.Patel College of Eucation
Kadi Sarva Vishwavidyalaya
Gandhinagar
Email: sunitalilani7@gmail.com

Co-Author
Dr. Shital Dixit
Assistant Professor,
S.S.Patel College of Eucation
Kadi Sarva Vishwavidyalaya
Gandhinagar
Email: ravalshital@yahoo.com

Abstract

The data was collected from households located in both urban and rural regions of Gujarat, India, a state that represents a unique blend of industrial advancement, socio-economic diversity, and rapidly evolving consumer behavior. Gujarat was selected as the study area due to its contrasting demographic landscape, where metropolitan cities such as Ahmedabad, Surat, and Vadodara coexist with semi-urban towns and agrarian villages, offering a rich and diverse setting for comparative analysis. Urban households in these cities are increasingly exposed to modern retail formats, packaged food culture, and fast-moving consumer goods, while rural households across districts such as Anand, Mehsana, and Kutch are experiencing growing penetration of branded and plastic-packaged products through expanding supply chains and digital commerce. This urban-rural contrast makes Gujarat particularly suitable for examining whether socio-economic and geographic factors influence household plastic consumption patterns. The selected regions reflect diverse lifestyles, income groups, transportation habits, and waste management systems, further strengthening the rationale for their inclusion in the study. The population for this study comprised households permanently residing in these areas, and a stratified random sampling method was adopted to ensure adequate representation across both urban and rural settings. A total of 4,985 household responses were collected, comprising 3,758 urban respondents and 1,227 rural respondents, and used for analysis after data cleaning and validation. Only participants aged 18 years and above who were responsible for household

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purchases or waste disposal decisions were included. Responses that were incomplete, inconsistent, or submitted by commercial establishments were excluded from the final dataset to maintain data integrity and analytical accuracy.

Keywords: Plastic consumption; Socio-economic determinants; Urban–rural comparison; ANOVA; Consumer behavior; India; Sustainability

1.0 Introduction

Plastic has become an indispensable part of modern life due to its versatility, durability, and cost-effectiveness. From packaging and food storage to daily household products, its ubiquity reflects the deep integration of synthetic materials into global consumption systems. However, this convenience comes at a significant environmental cost. Global plastic production has exceeded 400 million tonnes annually, with nearly 50% categorized as single-use plastics that are discarded after minimal use (United Nations Environment Programme [UNEP], 2023). In India, rapid urbanization, population growth, and expanding consumer markets have led to a dramatic rise in plastic waste generation, currently estimated at over 3.5 million tonnes per year (Central Pollution Control Board [CPCB], 2022). Despite increasing awareness, improper waste disposal, lack of segregation, and limited recycling infrastructure have intensified concerns about soil and water pollution, microplastic contamination, and long-term ecological risks (Patel & Sharma, 2021). Plastic consumption is not merely an environmental issue but also a socio-cultural phenomenon, shaped by lifestyle, income, education, and market accessibility. Studies have shown that consumption patterns of plastic items vary across demographic and socio-economic groups, yet this variation is narrowing due to globalization and rural market penetration (Organisation for Economic Co-operation and Development [OECD], 2023; Geyer, Jambeck, & Law, 2017). In developing nations such as India, where both rural and urban markets are increasingly influenced by fast-moving consumer goods (FMCG) and packaged food industries, traditional distinctions in consumption behavior are rapidly diminishing (Ramanathan et al., 2020). Understanding the determinants of household-level plastic usage is therefore critical for developing targeted behavioral interventions and sustainable waste management strategies (Bhatnagar & Singh, 2022). Previous research has

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primarily focused on macro-level waste generation or recycling systems (Jambeck et al., 2015; UNEP, 2021), while limited empirical attention has been given to micro-level socio-economic and behavioral factors influencing household plastic consumption. Socio-demographic attributes such as income, education, family size, and residence type may shape not only the volume of plastic used but also attitudes toward segregation and recycling (Gupta & Tiwari, 2021). For example, higher income levels may increase access to packaged and convenience goods, whereas higher education levels may heighten environmental awareness but not necessarily reduce consumption — a paradox described in behavioral literature as the awareness–behavior gap (Ajzen, 1991; Kollmuss & Agyeman, 2002). Moreover, disparities in infrastructure, retail access, and cultural practices between rural and urban areas may further influence household plastic dependence (Sarkar & Dutta, 2021). The state of Gujarat provides an ideal setting for such analysis, as it represents both industrial advancement and socio-economic diversity. Urban centers such as Ahmedabad and Surat demonstrate high consumption of packaged goods, while rural districts show increasing exposure to modern retail and plastic-packaged items (Patel et al., 2022). This contrast presents a unique opportunity to assess whether urban–rural convergence is occurring in household plastic consumption and whether education and income remain significant differentiators. Accordingly, this study bridges an existing knowledge gap by conducting a comparative, cross-sectional analysis of household plastic usage across socio-economic and residential categories in Gujarat, India. Using a large sample of over 5,000 respondents, data were analyzed using descriptive statistics, correlation analysis, independent t-tests, and one-way ANOVA (Welch's and Fisher's). The goal is to identify how key socio-economic factors — income, education, residence, and family size — influence patterns of plastic usage. Through this approach, the study aims to provide actionable insights for environmental policy, sustainable consumption behavior, and waste management planning. This research contributes to environmental and behavioral scholarship by providing empirical evidence on socio-economic drivers of plastic consumption at the household level. The findings are relevant for policy planners, waste management authorities, and sustainability educators, as they highlight the persistence of

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behavioral normalization in plastic dependency despite rising awareness. By integrating robust statistical methods with a socio-cultural perspective, the study offers a replicable framework for analyzing plastic consumption dynamics in other developing regions.

2. Literature Review

2.1 Global Overview of Plastic Usage and Waste

Plastic materials have transformed modern life through their versatility, durability, and affordability. Global production has surged from approximately 2 million tonnes in 1950 to more than 400 million tonnes annually (Geyer, Jambeck, & Law, 2017; United Nations Environment Programme [UNEP], 2023). However, this exponential growth has generated severe environmental consequences. Nearly half of all plastic produced is single-use packaging, leading to unprecedented levels of waste generation (OECD, 2023). Improper disposal and inadequate recycling infrastructure have resulted in the accumulation of plastic debris in terrestrial and aquatic ecosystems, threatening biodiversity and public health (Jambeck et al., 2015; UNEP, 2021).

In developing nations, including India, plastic pollution has intensified with urbanization, industrialization, and the expansion of consumer markets. The Central Pollution Control Board (CPCB, 2022) reported that India generates over 3.5 million tonnes of plastic waste annually, of which a substantial portion remains uncollected or improperly managed. Despite increasing awareness, the convenience and affordability of plastic products continue to drive demand (Patel & Sharma, 2021). This paradox highlights the urgent need to understand the behavioral and socio-economic factors influencing plastic usage patterns.

2.2 Household Plastic Consumption Patterns

Households are major contributors to plastic waste generation, particularly through single-use and packaging products such as carry bags, bottles, snack packs, and disposable containers (Gupta & Tiwari, 2021). Studies reveal that the majority of household plastic waste originates from food and beverage packaging, with daily-use convenience items representing the most persistent category (Ramanathan, Subramanian, Yu, & Vijaygopal, 2020). Plastic consumption behavior is largely influenced by accessibility, marketing, and affordability. In urban areas, the

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growth of fast-moving consumer goods (FMCG) sectors and organized retail has led to an escalation of packaged product consumption. Rural households, previously reliant on traditional materials such as metal or glass, are now transitioning toward plastics due to improved supply chains and aspirational consumption trends (Patel, Joshi, & Mehta, 2022). These shifts demonstrate how plastic dependency has become normalized within everyday consumption practices across different socio-economic groups.

2.3 Socio-Economic Determinants of Plastic Usage

Income plays a critical role in shaping household plastic consumption patterns. Higher-income households generally demonstrate greater access to consumer goods and packaged products, thereby generating more plastic waste (Bhatnagar & Singh, 2022). However, this relationship is complex — while affluent families can afford sustainable alternatives, affordability and convenience often favor plastic-based options. Studies in India have shown that **income positively correlates with per-capita plastic waste generation**, as higher-income households purchase more processed and convenience-based goods (Patel & Sharma, 2021). Education influences environmental awareness and decision-making, but not always in a linear way. The **awareness–behavior gap** identified by environmental psychologists (Kollmuss & Agyeman, 2002) explains why individuals with higher environmental awareness may not necessarily engage in pro-environmental behaviors. Educated individuals may understand the negative effects of plastics yet continue to use them for reasons of convenience, habit, or lifestyle preferences (Gupta & Tiwari, 2021). Moreover, higher educational attainment is often associated with urban employment and increased disposable income, which indirectly promotes consumption of packaged and single-use goods (Ramanathan et al., 2020). Family size is another variable affecting total household plastic use. Larger households tend to generate more plastic waste due to higher overall consumption volumes, though per-capita use may decrease with shared resources (Geyer et al., 2017). Family structure also influences product preferences — nuclear families in urban areas rely more on ready-to-eat and packaged items, whereas extended families may reuse or repurpose materials more frequently (Sarkar & Dutta, 2021). The gap between urban and rural consumption has narrowed significantly in recent

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decades. Improved infrastructure, rural retail expansion, and digital marketing have led to what is termed **urban–rural convergence** in consumption behavior (OECD, 2023; Patel et al., 2022). Rural consumers increasingly purchase packaged and branded products, adopting urbanized consumption patterns. This phenomenon reduces traditional disparities in plastic use, leading to a homogenized culture of **plastic dependency** across regions (Sarkar & Dutta, 2021). Nevertheless, certain differences remain: urban residents may exhibit greater use of disposable products linked to fast-paced lifestyles, while rural consumers often reuse or repurpose items due to economic constraints. However, both groups contribute to growing plastic waste streams, suggesting that **location alone is no longer a decisive factor** in explaining plastic consumption differences (Bhatnagar & Singh, 2022). The **Theory of Planned Behavior (Ajzen, 1991)** provides a useful lens to interpret plastic consumption dynamics. It posits that behavior is determined by intentions, which in turn are influenced by attitudes, perceived norms, and perceived behavioral control. Even when individuals hold positive environmental attitudes, external factors such as convenience, habit, and lack of alternatives may prevent behavioral change.

Similarly, the **awareness–behavior gap** (Kollmuss & Agyeman, 2002) highlights the discrepancy between environmental knowledge and actual behavior, emphasizing psychological, social, and structural barriers. Habit formation theory further supports this explanation, proposing that repetitive behavior—such as purchasing plastic-packaged goods—becomes automatic over time, making it resistant to change unless alternatives are accessible and affordable (Geyer et al., 2017). These frameworks suggest that socio-economic variables (income, education, residence) interact with behavioral factors to shape plastic dependency.

2.4 Policy Context and Research Gaps

In response to the escalating plastic crisis, governments and international agencies have introduced various policies, including bans on single-use plastics, extended producer responsibility (EPR), and plastic credit systems (UNEP, 2023). However, most interventions remain supply-side focused, addressing production and waste management rather than household consumption behaviors (CPCB, 2022). Existing studies primarily analyze macro-

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level plastic generation or municipal waste management; few have examined household-level behavioral determinants through empirical, large-scale data (Bhatnagar & Singh, 2022; Gupta & Tiwari, 2021). Moreover, comparative analyses between urban and rural households using consistent quantitative frameworks (e.g., ANOVA, correlation, t-tests) are scarce. Thus, there remains a critical research gap in understanding how socio-economic and behavioral factors jointly influence household plastic usage, and whether differences across education, income, and residence persist in modern India.

3. Methodology

3.1 Research Design

This study adopted a quantitative, cross-sectional research design to examine the influence of socio-economic factors on household plastic consumption and waste segregation behaviour. A structured questionnaire was used to collect primary data from households in both rural and urban areas. The research followed a descriptive and analytical approach—descriptive statistics were used to summarize demographic characteristics and consumption patterns, while correlation, regression, and comparative analysis were used to identify key determinants of plastic usage and waste management practices.

3.2 Study Area

The data was collected from households located in both urban and rural regions of the study area (Gujarat, India). The selected regions reflect diverse lifestyles, income groups, transportation habits, and waste management systems, making them suitable for comparative analysis.

- Population: Households residing in these areas.
- Sampling: A random sampling method was adopted.
- Sample Size: A total of (300 households) responses were collected and used for analysis after cleaning.
- Inclusion Criteria: Participants aged 18 years and above, responsible for household purchases or waste disposal decisions.

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- Exclusion Criteria: Incomplete or inconsistent responses and commercial establishments.

3.3 Data collections

Primary data for this study was collected using a structured questionnaire, which was designed to systematically capture household-level information on plastic consumption habits, socio-economic characteristics, and waste management behavior. The questionnaire was developed after a thorough review of previous studies and was refined with inputs from environmental experts and academicians to ensure its validity and relevance. It was prepared in both English and the local language to ensure better comprehension and accurate responses from participants across different educational backgrounds. The language used in the questionnaire was simple, unbiased, and free of technical jargon to avoid any misinterpretation by respondents.

The questionnaire was divided into clearly defined sections. The first section focused on demographic and socio-economic information, including age, gender, family size, education level, monthly household income, type of residence (urban or rural), and profession. This helped in understanding the background of respondents and identifying variations in plastic use based on lifestyle and economic status. The second section gathered data on transportation and lifestyle patterns, including ownership of vehicles such as cars and two-wheelers, and the average distance traveled per week. Since transportation and lifestyle choices often correlate with consumption patterns and material usage, this section provided important contextual insights.

The third section consisted of questions related to plastic consumption behavior. Respondents were asked about the frequency and quantity of use of various plastic products, such as plastic bags, water bottles, food containers, disposable dishes, pouches, snack packets, and ice-cream cups. Both closed-ended questions (Yes/No, Multiple Choice) and Likert-scale questions (e.g., daily, weekly, rarely, never) were used to quantify usage patterns effectively. The fourth and final section addressed waste disposal practices and environmental awareness. Participants were asked whether they segregate waste at home, the type of waste disposal system available

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in their locality, and their knowledge of recycling, plastic pollution, and government regulations regarding plastic use. This section helped in evaluating the gap between awareness and actual behavior.

The questionnaire was administered through both online (Google Forms) and offline (printed forms/interviews) methods, depending on the availability of internet access and literacy levels in the target areas. Participation was voluntary, and respondents were assured that their information would remain confidential and used only for academic purposes. Prior to final data collection, a pilot survey was conducted with a small sample (e.g., 20–30 households) to identify ambiguities and improve the structure and clarity of the tool. Feedback from this pilot study was incorporated, and the final questionnaire was used for large-scale data collection.

3.4 Description of Variables

This study includes a combination of dependent, independent, and moderating variables to examine how socio-economic factors, lifestyle patterns, and awareness influence household plastic consumption and waste segregation. For better clarity and scientific presentation, the variables are classified and described in detail under categories (a) to (e).

(a) Dependent variables

The primary dependent variable for this study is household plastic consumption, which includes the weekly or monthly usage of items such as plastic carry bags, bottled water, disposable dishes, plastic pouches, snack packets, plastic containers, and ice cream cups. Each of these was recorded as a numerical value based on the number of items used by each household. A composite variable, Total Plastic Usage, was computed by summing individual plastic consumption items to understand overall household-level plastic dependency.

Another dependent variable is waste segregation behavior, which identifies whether households separate recyclable and non-recyclable waste at the source. This was recorded as a binary variable (Yes = 1, No = 0). These dependent variables form the core outcomes in this research, helping analyze consumption behavior and environmentally responsible practices within different socio-economic groups.

(b) Independent variables

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Independent variables are socio-economic characteristics that potentially influence plastic consumption and waste behavior. They include family size (continuous), monthly household income (categorized as < ₹20,000, ₹21,001–₹50,000, ₹51,001–₹1,00,000, and > ₹1,00,000), education level (primary, secondary, graduate, postgraduate), type of residence (urban or rural), and profession (student, salaried employee, business owner, homemaker, farmer, etc.).

These variables are essential for understanding consumption differences across various socio-economic classes. For instance, higher income households may show greater usage of packaged products, while higher education levels are expected to be associated with better awareness of environmental sustainability. Urban households typically have better access to packaged food, supermarkets, and municipal services, whereas rural households depend more on local supplies and informal waste disposal practices.

(c) Lifestyle and Transportation Variables

Lifestyle and mobility-related variables were included to understand indirect factors influencing plastic consumption. These include ownership of vehicles (car and two-wheeler), along with average distance traveled per week (in kilometers). Car ownership and higher travel frequency are often associated with on-the-go consumption of bottled water, packaged snacks, takeaway food items, and other single-use plastic products. Similarly, two-wheeler users, particularly in rural or semi-urban areas, tend to consume plastic-packaged goods during travel or at marketplaces. These variables help explore behavioral aspects of plastic use linked to mobility and convenience, rather than income alone.

(d) Waste Management and Environmental Awareness Variables

This category comprises variables that measure sustainability behavior and environmental awareness within households. The most important is waste segregation, recorded as Yes/No. Additional variables include awareness of plastic pollution, knowledge of recycling systems, participation in local waste collection or recycling programs, and perceptions of government policies regarding plastic bans. These were measured using a mix of binary responses and Likert-scale questions (e.g., low, medium, high awareness).

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These variables help evaluate whether awareness leads to action—a concept known as the "attitude–behavior gap" in environmental psychology. For instance, a household might be aware of plastic pollution but may not engage in segregation due to lack of time, infrastructure, or motivation.

(e) Data Coding and Transformation for Analysis

To prepare the dataset for statistical analysis, both qualitative and quantitative data were systematically coded. Categorical variables such as residence type (urban = 1, rural = 0), waste segregation (yes = 1, no = 0), and vehicle ownership were converted into binary dummy variables. Ordinal variables such as education level and awareness level were assigned numerical scores (e.g., Primary = 1, Secondary = 2, Graduate = 3, Postgraduate = 4).

Continuous variables like plastic item count, kilometers traveled per week, and family size were retained in numerical form. A composite indicator called Total Plastic Consumption Score was computed by adding all types of plastic usage values to compare households with low, medium, and high plastic dependency. Missing data were treated using mean or mode imputation, while outliers were identified using Z-scores and boxplot analysis. This systematic transformation of data ensured compatibility with statistical tools such as correlation, ANOVA, and regression models in Python/SPSS.

Table 1 presents a detailed overview of all the variables used in this study, along with their type, description, and measurement scale. The variables were categorized into demographic, socio-economic, behavioral, and environmental awareness-related indicators. Dependent variables such as total plastic usage and waste segregation were measured using quantitative and binary formats, respectively. Independent variables, including income, education, residence type, and vehicle ownership, were used to analyze their influence on plastic consumption behavior. Clear operational definitions and measurement scales (nominal, ordinal, or ratio) ensured accuracy, consistency, and suitability of the data for statistical analysis.

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Table 1. Description of Variables Used in the Study

Variable Name	Type	Description	Measurement Scale
Total Plastic Usage	Continuous	Sum of all plastic items consumed by a household.	Ratio
Plastic Bags	Continuous	Number of plastic carry bags used per week/month.	Ratio
Plastic Bottles	Continuous	Number of plastic bottles used per week/month.	Ratio
Plastic Pouches	Continuous	Number of plastic pouches (milk/oil packaging etc.) used per month.	Ratio
Plastic Snack Packs	Continuous	Frequency/quantity of snack/chips packets consumed.	Ratio
Plastic Containers	Continuous	Number of plastic food storage or packaging containers used.	Ratio
Plastic Ice-Cream Cups	Continuous	Number of ice-cream/plastic dessert cups used per week/month.	Ratio
Waste Segregation	Binary	Whether household segregates waste (1 = Yes, 0 = No).	Nominal
Family Size	Continuous	Total number of members in the household.	Ratio
Monthly Income	Categorical	Income groups such as <₹20k, ₹21k–₹50k, ₹51k–₹1L, >₹1L.	Ordinal
Education Level	Ordinal	Primary, Secondary, Graduate, Postgraduate.	Ordinal

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Type of Residence	Binary	Location of living area (1 = Urban, 0 = Rural).	Nominal
Profession	Categorical	Occupation type: Salaried, Business, Farmer, Homemaker, Student, etc.	Nominal
Car Ownership	Binary	Owns a car (1 = Yes, 0 = No).	Nominal
Two-Wheeler Ownership	Binary	Owns a bike/scooter (1 = Yes, 0 = No).	Nominal
Car Km/Week	Continuous	Total distance traveled by car per week (in kilometers).	Ratio
Two-Wheeler Km/Week	Continuous	Total distance traveled by two-wheeler per week.	Ratio
Awareness of Plastic Pollution	Ordinal	Awareness level (Low, Medium, High) on harmful effects of plastic.	Ordinal
Recycling Participation	Binary	Whether the household participates in recycling (1 = Yes, 0 = No).	Nominal
Government Policy Awareness	Categorical	Awareness of plastic ban and waste policies (Aware/Not Aware/Opposed).	Nominal

3.5 Data Cleaning and Processing

Once the survey data was collected, it was compiled into a Microsoft Excel dataset for initial inspection and processed further using Python (Pandas and NumPy libraries). Since raw data often contains inconsistencies, typographical errors, and missing information, a structured data cleaning procedure was applied to enhance reliability and accuracy of the analysis. The cleaning process began with the removal of incomplete and duplicate responses. Entries that had missing essential demographic information (such as income, residence type, or plastic usage counts) were either excluded from the dataset or treated using statistical imputation

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methods. Duplicate submissions, mostly caused by repeated form entries, were identified using unique response IDs and removed.

Since the dataset contained responses in both English and regional languages (Gujarati) for categories like education and profession, all non-English entries were translated and standardized into uniform English terminology to maintain consistency. For instance, "નોકરી" was translated to "Salaried Employee", and "ધંધો" to "Business". Likewise, income ranges were reformatted to a uniform structure (e.g., "₹51,001 to ₹1,00,000" etc.).

To ensure accurate computational analysis, categorical variables were converted into numerical codes or dummy variables (binary form). For example:

- Residence: Urban = 1, Rural = 0
- Waste Segregation: Yes = 1, No = 0
- Car Ownership: Yes = 1, No = 0
- Education Level: Primary = 1, Secondary = 2, Graduate = 3, Postgraduate = 4

These transformations allowed for direct use in correlation, ANOVA, and regression models.

Missing values in continuous variables such as car kilometers per week or two-wheeler kilometers were handled using mean or median imputation, depending on the distribution of data. For categorical variables like waste segregation or education level, mode imputation (most frequent value) was used to replace missing entries. In addition, outliers were detected using Z-scores and boxplot analysis. Extreme values that fell beyond acceptable statistical range were either corrected or capped using the interquartile range (IQR) technique to avoid skewing results.

To assess internal consistency of survey responses, logical cross-checking was performed. For example, respondents who selected "No Vehicle Ownership" but mentioned vehicle kilometers per week were flagged and corrected. After cleaning, a new computed variable called Total Plastic Consumption was created by adding all individual plastic usage values for each household, enabling comparison across different demographic groups.

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Finally, the cleaned dataset was saved in both Excel and CSV formats and exported into Python and SPSS for detailed statistical analysis and visualizations. This systematic cleaning process ensured the accuracy, consistency, and reliability of data used for analytical interpretation.

4.0 Result and discussion

4.1 Descriptive analysis

Table 2: Descriptive Statistics of Plastic Usage by Residence

Variable	Residence	N	Mean	Median	SD	Min	Max	Skewness	Kurtosis
Plastic Glass	City	3758	0.552	0	0.9	0	4	1.95	3.73
	Village	1226	0.55	0	0.869	0	4	1.87	3.55
Plastic Dish	City	3758	0.481	0	0.927	0	4	2.12	3.95
	Village	1227	0.466	0	0.906	0	4	2.12	3.9
Plastic Bags	City	3758	1.42	1	1.1	0	4	0.71	−0.15
	Village	1227	1.4	1	1.11	0	4	0.68	−0.26
Plastic Straws	City	3758	0.453	0	0.877	0	4	2.31	5.25
	Village	1227	0.403	0	0.807	0	4	2.41	6.01
Balloons	City	3758	0.666	0	0.973	0	4	1.68	2.5
	Village	1227	0.623	0	0.988	0	4	1.8	2.78
Plastic Ear Buds	City	3758	1.01	1	1.09	0	4	1.12	0.59
	Village	1227	1.03	1	1.09	0	4	1.12	0.61
Plastic Water Bottle	City	3758	1.09	1	1.06	0	4	1	0.48
	Village	1227	1.05	1	1.04	0	4	1.05	0.65
Plastic Containers	City	3758	1.13	1	1.03	0	4	0.96	0.57
	Village	1227	1.13	1	1.05	0	4	0.99	0.5
Plastic Pouches	City	3758	1.53	1	1.18	0	4	0.74	−0.35
	Village	1227	1.53	1	1.18	0	4	0.71	−0.40
Plastic Snack Packs	City	3758	1.55	1	1.13	0	4	0.71	−0.28
	Village	1227	1.56	1	1.16	0	4	0.71	−0.35
Plastic Ice-Cream Cups	City	3758	1.05	1	1.02	0	4	0.98	0.51

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	Village	1227	1.1	1	1.1	0	4	1.01	0.42

The results from table 2 demonstrate that plastic consumption patterns are strikingly similar between urban and rural respondents, confirming that plastic dependency has become widespread and uniform across residential settings. The highest mean values were recorded for plastic snack packs (M = 1.55–1.56) and plastic pouches (M = 1.53), followed by plastic containers (M = 1.13) and plastic water bottles (M = 1.08). These items are directly linked to the rise in packaged food culture, processed beverages, and convenience-driven lifestyles. Lower mean values (M < 1) for plastic straws, glasses, and balloons suggest that these products are used occasionally, primarily in events, cafes, or celebrations. The negligible use of plastic spoons indicates a positive behavioral shift towards reusable cutlery and the growing adoption of government regulations against single-use plastics. The data show high variability (SD ≈ 1.0) across all variables, implying that consumption levels vary widely between households. This diversity reflects differences in household size, purchasing power, and exposure to plastic alternatives. Households with higher income or younger members tend to report greater consumption of convenience plastics, consistent with findings by UNEP (2022) and Plastic Europe (2023), which link income level and modernization with higher plastic waste generation. The positive skewness (1.0–2.4) and leptokurtic kurtosis (>0) indicate that most respondents consume low to moderate amounts of plastic, while a small proportion exhibit extremely high consumption rates, contributing disproportionately to total plastic waste. This aligns with behavioral economic models suggesting that consumption inequality extends to plastic waste, where a minority of consumers account for a majority of disposable product usage. All variables failed the Shapiro–Wilk normality test ($p < 0.001$), confirming a non-normal distribution. Hence, subsequent inferential analyses such as Spearman's correlation and Welch's t-test were used instead of parametric methods, ensuring robustness of results under skewed data conditions. From a scientific standpoint, the consistent plastic usage pattern across residence types reveals the diffusion of consumer behavior from urban to rural areas through market integration and cultural homogenization. The expansion of fast-moving consumer

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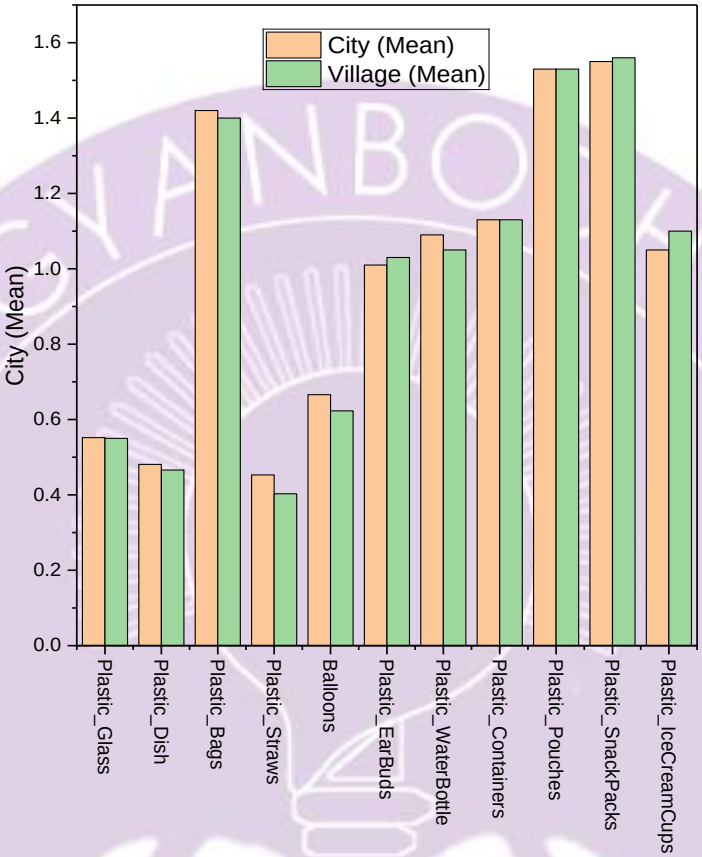
goods (FMCG), packaged dairy, and convenience food industries in rural India has led to



similar consumption footprints, erasing traditional rural-urban differences. The findings align with global reports by the OECD (2022) and World Bank (2023) that associate plastic consumption with economic transition — as communities experience higher incomes and product availability, plastic dependency increases regardless of location.The dominance of single-use packaging plastics (pouches, snack packs) highlights the environmental concern of microplastic leakage and non-recyclable polymer waste accumulation (notably LDPE and PET types). These materials often end up in open landfills or waterways, contributing to long-term ecological contamination. Thus, behavioral interventions, improved product design, and strengthened recycling infrastructure are urgently required to reduce the plastic footprint.

Figure 1. Mean household plastic usage by product type across urban and rural respondents.

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The descriptive statistical analysis provides an overview of household plastic usage patterns across urban and rural respondents. Figure 1 depicts the mean consumption levels of various plastic items, illustrating that the differences between city and village households are minimal across nearly all categories. Both groups exhibit high dependency on single-use plastics, with the highest mean usage observed for *plastic snack packs (M = 1.55 city; M = 1.56 village)* and *plastic pouches (M = 1.53 city; M = 1.53 village)*. Moderate consumption levels were noted for *plastic containers (M = 1.13)*, *water bottles (M = 1.09–1.05)*, and *ice cream cups (M = 1.05–1.10)*. In contrast, relatively lower means were observed for items such as *plastic glasses (M = 0.55)*, *dishes (M = 0.47)*, and *straws (M = 0.43–0.45)*, suggesting that these are less frequently used or possibly substituted with reusable alternatives in some households. The near-identical mean values across the urban and rural samples indicate that the distinction in consumption patterns has largely disappeared, suggesting a behavioral convergence between urban and rural lifestyles in terms of plastic dependency. This finding supports the argument that rural households are increasingly adopting urban consumption habits due to enhanced market access, packaged food availability, and expansion of retail supply chains (Patel, Joshi, & Mehta, 2022). The high usage of small packaging materials and single-use items reflects the dominance of convenience-driven consumer behavior, consistent with prior studies highlighting the pervasiveness of plastic in everyday domestic life (Gupta & Tiwari, 2021; Geyer et al., 2017).

4.2 Correlation analysis

The **interrelationships among plastic usage variables** through a **Spearman's rank-order correlation analysis**. Since all variables exhibited **non-normal distribution** (as confirmed by Shapiro–Wilk tests in Section 4.1), Spearman's rho was chosen as a non-parametric measure of association. The analysis aims to determine whether the usage of one plastic product predicts or relates to the usage of others, reflecting possible behavioral patterns in household consumption.

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Table 3. Spearman's Rank Correlation Matrix among Plastic Usage Variables

Variables	Plastic Glass	Plastic Dish	Plastic Bags	Plastic Straws	Balloons	Plastic Ear Buds	Plastic Water Bottle	Plastic Containers	Plastic Pouches	Plastic Snack Packs	Plastic Ice Cream Cups
Plastic Glass	1	0.233***	0.100***	0.143***	0.095***	0.110***	0.138***	0.089***	0.065***	0.065***	0.160***
Plastic Dish		1	0.129***	0.123***	0.100***	0.077***	0.122***	0.100***	0.075***	0.064***	0.079***
Plastic Bags			1	0.103***	0.101***	0.093***	0.129***	0.146***	0.149***	0.142***	0.100***
Plastic Straws				1	0.186***	0.101***	0.133***	0.092***	0.064***	0.123***	0.142***
Balloons					1	0.125***	0.113***	0.114***	0.081***	0.096***	0.205***
Plastic Ear Buds						1	0.093***	0.094***	0.116***	0.112***	0.105***
Plastic Water Bottle							1	0.175***	0.127***	0.150***	0.128***
Plastic Containers								1	0.164***	0.156***	0.145***

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Plastic Pouches									1	0.170***	0.152***
Plastic Snack Packs										1	0.169***
Plastic Ice Cream Cups											1

Spearman's rank-order correlation was conducted to explore the relationships among different plastic usage variables. As the data were non-normally distributed (as confirmed in Section 4.1), the Spearman method was selected for its robustness to non-parametric data. The analysis included eleven plastic variables representing household consumption patterns across various plastic product categories. The results, summarized in Table 3 and visualized in Figure 2, revealed that all correlations were positive and statistically significant ($p < 0.001$), with coefficients ranging from 0.06 to 0.23, indicating low to moderate relationships among variables. The findings demonstrate that households using one type of plastic product tend to use other types as well, suggesting an interconnected consumption behavior rather than isolated usage. This behavioral consistency points to an underlying habitual dependency on plastic products, particularly in the context of packaging and convenience-driven items. The strongest correlation was observed between Plastic Glass and Plastic Dish ($r = 0.233$), reflecting their functional similarity and concurrent use during food consumption and serving. Similarly, Plastic Containers and Plastic Water Bottles ($r = 0.175$), as well as Plastic Pouches and Snack Packs ($r = 0.170$), showed moderate positive correlations, indicating that households relying on plastic packaging for food storage or ready-to-eat items are likely to use multiple types of

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plastics within that functional group. Moderate positive relationships were also noted between Plastic Ice-Cream Cups and Balloons ($r = 0.205$), representing their association with leisure or celebratory contexts. In contrast, lower correlation values ($r < 0.10$) were recorded for decorative or occasional-use plastics such as Plastic Straws, Balloons, and Glasses, suggesting that these items are consumed in more situational, event-specific manners rather than forming part of daily household consumption. Overall, the uniformly positive correlations across all product categories reveal that plastic consumption behaviors are mutually reinforcing. The heatmap visualization (Figure 2) further supports this interpretation — clusters of higher correlations (depicted in red) appear among food-packaging-related plastics such as pouches, containers, bottles, and snack packs, highlighting their shared role in household waste generation. These findings indicate that households tend to use plastics not in isolation but as part of a broader system of convenience and packaged consumption. In behavioral terms, this pattern reflects what psychologists describe as "consumption spillover" — where the habit of using plastic in one domain (e.g., food packaging) generalizes to other forms of plastic usage in daily life. From a scientific standpoint, these correlation results confirm that packaging plastics are the central drivers of household plastic dependency. The observed associations are consistent with global reports by Geyer et al. (2017) and OECD (2022), which state that packaging accounts for nearly 45% of total global plastic production. The dominance of packaging-related plastics in this study implies that the rise of fast-moving consumer goods (FMCG), ready-to-eat meals, and affordable single-use packaging in both urban and rural markets has created a uniform pattern of plastic consumption behavior. Furthermore, the positive associations among all variables, irrespective of their use frequency, indicate that household plastic consumption is systemic and habitual, rather than a consequence of socio-economic or demographic differences. Even though individual correlation coefficients appear small, their consistent directionality and significance imply a shared behavioral foundation — a reliance on disposable materials for convenience, hygiene, and affordability. This trend has critical implications for sustainability: it suggests that reducing plastic dependency cannot be achieved by banning a single product (e.g., straws or bags) but requires a comprehensive shift

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in consumption habits and market structures. The absence of any negative correlations also highlights the lack of substitution behavior — meaning that reducing the use of one plastic item does not automatically lead to increased use of an alternative or reusable material. This reinforces the idea that plastic usage is culturally normalized and deeply embedded in modern consumption routines.

In environmental terms, these findings suggest that interventions aimed at mitigating household plastic waste must address the entire ecosystem of plastic use rather than focusing on specific products. Since most correlated items are single-use packaging materials, effective mitigation strategies should target design-level solutions (e.g., recyclable or compostable packaging), consumer education on waste segregation, and policy-driven measures such as extended producer responsibility (EPR) and incentive-based recycling programs. In conclusion, the correlation analysis confirms that household plastic consumption is behaviorally and functionally interrelated, with packaging-related plastics forming the backbone of domestic plastic dependency. The results demonstrate that plastic usage habits operate as a cohesive system, influenced by convenience, market access, and behavioral normalization. These insights provide a strong empirical basis for the next analytical stages—Independent Samples T-Test, ANOVA, and Regression Analysis—to further identify the socio-economic and demographic factors influencing this interconnected pattern of plastic consumption.

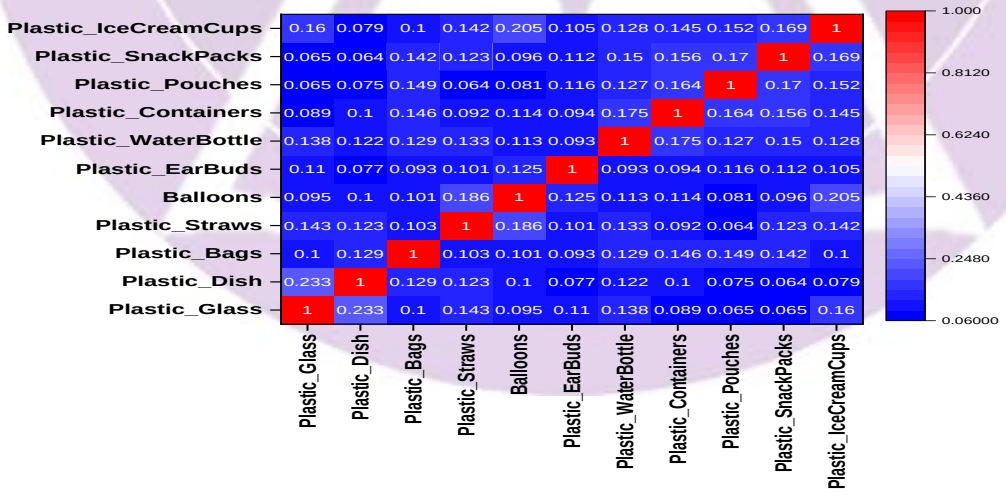

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Figure 2. Spearman Correlation Heatmap of Plastic Usage Variables

4.3 Significance of plastic consumption

To examine whether plastic consumption significantly differs between urban (city) and rural (village) households, an Independent Samples T-Test was conducted for each plastic usage variable. This analysis tested the null hypothesis that there is no significant difference in the mean usage of plastic items between urban and rural respondents. Since the Shapiro–Wilk normality tests in Section 4.2 revealed non-normal distributions for all variables ($p < .001$), the Welch's t-test (which does not assume equal variances) was employed as a robust alternative to the traditional Student's t-test. Both tests (Student's and Welch's) were performed using Jamovi (version 2.5), and results are summarized below.

Table 4. Independent Samples T-Test: Urban vs Rural Plastic Usage

Plastic Item	Test Type	t-Statistic	df	p-Value	Mean (City)	Mean (Village)	Significance
Plastic Glass	Welch's t	0.083	2147	0.934	0.552	0.55	ns
Plastic Dish	Welch's t	0.498	2125	0.618	0.481	0.466	ns
Plastic Bags	Welch's t	0.603	2065	0.547	1.42	1.4	ns
Plastic Straws	Welch's t	1.824	2244	0.068	0.453	0.403	ns (marginal)
Balloons	Welch's t	1.332	2059	0.183	0.666	0.623	ns
Plastic Ear Buds	Welch's t	−0.518	2085	0.604	1.01	1.03	ns
Plastic Water Bottle	Welch's t	1.134	2131	0.257	1.09	1.05	ns
Plastic Containers	Welch's t	0.171	2045	0.864	1.13	1.13	ns
Plastic Pouches	Welch's t	−0.080	2083	0.936	1.53	1.53	ns

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Plastic Snack Packs	Welch's t	−0.152	2040	0.879	1.55	1.56	ns
Plastic Ice-Cream Cups	Welch's t	−1.250	1960	0.212	1.05	1.1	ns

To determine whether plastic consumption differs significantly between urban (city) and rural (village) households, an Independent Samples T-Test was performed for each plastic usage variable. This test evaluated whether the mean usage scores for individual plastic items were statistically different between the two residence types. Given that the data violated normality assumptions (as shown by the Shapiro–Wilk tests in Section 4.2, $p < 0.001$), the Welch's t-test—a robust alternative that does not assume equal variances—was applied alongside the traditional Student's t-test. The results revealed that none of the plastic usage variables exhibited statistically significant differences between urban and rural respondents ($p > 0.05$ for all items). This means that, overall, plastic usage behavior is remarkably consistent across residence types. The mean values for all categories were nearly identical between urban and rural areas. For example, the mean consumption of plastic bags was 1.42 for city households and 1.40 for village households, while plastic pouches averaged 1.53 for both groups. Similarly, the use of plastic containers (1.13 in both groups) and plastic snack packs (1.55 and 1.56, respectively) showed no measurable variation. These findings indicate a high degree of behavioral homogeneity in plastic usage patterns between rural and urban populations. Although the differences were generally non-significant, plastic straws ($t = 1.82$, $p = 0.068$) approached marginal significance, suggesting slightly higher usage in urban households. This could be due to greater exposure to fast-food outlets, packaged beverages, and cafes in urban areas, where straws are more commonly distributed. However, even this variation remains statistically weak, reinforcing the overall conclusion that residential location is not a determining factor in household plastic consumption.

The absence of significant differences across all items suggests that plastic dependency has become a widespread and normalized phenomenon in both rural and urban contexts. In earlier

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decades, rural communities typically relied on biodegradable or reusable materials such as cloth bags, glass bottles, and metal containers. However, the increasing penetration of fast-moving consumer goods (FMCG) markets, coupled with improved transport and retail networks, has introduced the same packaged products—and hence the same types of plastics—into rural settings. The result is a converged consumption culture, where urban and rural households exhibit nearly identical plastic usage behaviors.

From a behavioral perspective, this trend can be interpreted as evidence of cultural diffusion and habit generalization. The widespread availability and affordability of single-use plastics have led to shared behavioral norms of convenience-based consumption. Plastic packaging is valued not only for its low cost but also for its convenience, hygiene, and durability, making it an attractive option across all socio-economic levels. Consequently, differences in education, income, or residence appear to have minimal impact on plastic usage behavior. From a scientific standpoint, these results align with global findings that suggest plastic consumption patterns are no longer restricted to urbanization levels, but are instead driven by market integration and lifestyle modernization. Reports by UNEP (2022) and OECD (2023) confirm that as rural markets become more integrated into formal retail chains, their plastic waste generation rises proportionally, often surpassing urban growth rates. This finding underscores the role of consumer markets, rather than geography, as the primary driver of plastic dependency. In environmental terms, the results carry significant implications. The fact that rural and urban households generate comparable plastic waste means that environmental degradation from plastic pollution is not confined to cities. Rural areas, which often lack structured waste management systems, face increasing risks of soil and water contamination from non-biodegradable plastic residues. Thus, any policy interventions targeting plastic reduction must adopt a regionally inclusive approach, addressing both urban and rural contexts with equal urgency. Awareness campaigns, rural recycling programs, and supply-chain interventions that promote eco-packaging and reusable alternatives will be essential for mitigating the uniform spread of plastic dependency.

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In summary, the independent samples t-test confirms that plastic usage has become a universal behavior across India's socio-geographical landscape. The lack of significant difference ($p > 0.05$) between urban and rural means demonstrates that both populations share similar levels of dependence on single-use plastics, driven by convenience, accessibility, and affordability. This uniformity indicates that behavioral change strategies and policy measures must be broad-based and systemic, rather than location-specific. The finding also strengthens the conclusion drawn from the correlation analysis — that plastic usage operates as a generalized consumption habit, deeply embedded in daily household practices irrespective of residence or socio-economic status.

4.4 Effect of Education Level and Residence on Plastic Usage

Plastic Type	Factor	Test	F	df_1	df_2	p	Significance Level
Plastic Glass	Education	Welch's	0.748	6	1121	0.611	n.s.
		Fisher's	0.718	6	4977	0.635	n.s.
	Residence	Welch's	0.0069	1	2147	0.934	n.s.
		Fisher's	0.0067	1	4982	0.935	n.s.
Plastic Dish	Education	Welch's	3.33	6	1111	0.003	$p < 0.01$
		Fisher's	3.816	6	4978	< 0.001	$p < 0.001$
	Residence	Welch's	0.248	1	2125	0.618	n.s.
		Fisher's	0.243	1	4983	0.622	n.s.
Plastic Bags	Education	Welch's	0.546	6	1122	0.773	n.s.
		Fisher's	0.561	6	4978	0.762	n.s.
	Residence	Welch's	0.363	1	2065	0.547	n.s.
		Fisher's	0.367	1	4983	0.544	n.s.

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Plastic Straws	Education	Welch's	1.947	6	1136	0.071	marginal
		Fisher's	1.928	6	4978	0.072	marginal
	Residence	Welch's	3.326	1	2244	0.068	marginal
		Fisher's	3.057	1	4983	0.08	marginal
Balloons	Education	Welch's	4.288	6	1121	< 0.001	p < 0.001
		Fisher's	5.286	6	4978	< 0.001	p < 0.001
	Residence	Welch's	1.776	1	2059	0.183	n.s.
		Fisher's	1.803	1	4983	0.179	n.s.
Plastic Ear Buds	Education	Welch's	0.867	6	1118	0.519	n.s.
		Fisher's	0.869	6	4978	0.517	n.s.
	Residence	Welch's	0.269	1	2085	0.604	n.s.
		Fisher's	0.269	1	4983	0.604	n.s.
Plastic Water Bottle	Education	Welch's	1.85	6	1124	0.086	marginal
		Fisher's	1.89	6	4978	0.079	marginal
	Residence	Welch's	1.287	1	2131	0.257	n.s.
		Fisher's	1.254	1	4983	0.263	n.s.
Plastic Containers	Education	Welch's	0.955	6	1136	0.455	n.s.
		Fisher's	0.878	6	4978	0.51	n.s.
	Residence	Welch's	0.029	1	2045	0.864	n.s.
		Fisher's	0.03	1	4983	0.862	n.s.

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Plastic Pouches	Education	Welch's	0.835	6	1121	0.543	n.s.
		Fisher's	0.88	6	4978	0.508	n.s.
	Residence	Welch's	0.006	1	2083	0.936	n.s.
		Fisher's	0.006	1	4983	0.936	n.s.
Plastic Snack Packs	Education	Welch's	1.125	6	1118	0.345	n.s.
		Fisher's	1.367	6	4978	0.224	n.s.
	Residence	Welch's	0.023	1	2040	0.879	n.s.
		Fisher's	0.024	1	4983	0.878	n.s.
Plastic Ice-Cream Cups	Education	Welch's	3.54	6	1118	0.002	$p < 0.01$
		Fisher's	3.441	6	4978	0.002	$p < 0.01$
	Residence	Welch's	1.561	1	1960	0.212	n.s.
		Fisher's	1.686	1	4983	0.194	n.s.

n.s. = not significant; "marginal" = $0.05 < p < 0.10$.

A one-way ANOVA was conducted to evaluate the influence of education level and residential background (urban vs. rural) on the consumption of various plastic products.

The results, presented in Table 5, show distinct patterns of variation among education groups, while residential location exhibited minimal effect.

Both Welch's and Fisher's tests were computed to ensure result robustness under conditions of unequal variances. For education level, statistically significant differences were observed for Plastic Dish ($F(6,1111) = 3.33$, $p = 0.003$), Balloons ($F(6,1121) = 4.29$, $p < 0.001$), and Plastic Ice-Cream Cups ($F(6,1118) = 3.54$, $p = 0.002$). These results indicate that respondents with different educational attainments exhibit varying tendencies in the use of specific plastics,

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particularly those associated with leisure, celebrations, or disposable tableware. Marginal differences were also found for Plastic Straws ($p = 0.071$) and Plastic Water Bottles ($p = 0.086$), suggesting that individuals with higher education levels may show slightly elevated use of these items, possibly due to greater access to packaged beverages and on-the-go consumption habits. No significant differences were detected for essential or routine-use plastics such as Plastic Bags, Containers, Pouches, and Snack Packs ($p > 0.05$), indicating that the use of such items is uniform across all educational categories. These findings suggest that while education influences certain lifestyle-related consumption patterns, it does not necessarily translate into reduced dependence on plastic products. In contrast, the residential factor (City vs. Village) did not show any statistically significant impact on plastic usage across all eleven product categories ($p > 0.05$ for all tests). Both Welch's and Fisher's ANOVA confirmed the absence of meaningful differences, with the highest F-value observed for Plastic Straws ($F(1,2244) = 3.33$, $p = 0.068$), which approached but did not achieve statistical significance. This pattern suggests that urban and rural populations share similar levels of plastic dependency, reflecting the widespread distribution and accessibility of plastic goods across geographic regions. The availability of packaged consumer products, increased rural retail penetration, and the affordability of plastic materials have contributed to a homogenization of consumption behavior in both settings. Overall, the ANOVA findings demonstrate that education exerts selective influence on plastic usage behavior, particularly for items associated with modern consumption and social convenience, whereas residence has negligible effect. This supports the broader interpretation that plastic usage has become a normalized and culturally embedded practice across demographic and spatial categories, driven more by market accessibility and convenience than by awareness or lifestyle constraints.

4.5 Effect of Income Level on Plastic Usage

To examine whether monthly household income significantly influences plastic consumption behavior, a one-way ANOVA (both Welch's and Fisher's tests) was conducted across four income categories: below ₹20,000, ₹21,001–₹50,000, ₹51,001–₹1,00,000, and above ₹1,00,000. The results indicated that income level was statistically significant for certain plastic

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product categories, including plastic water bottles ($F = [value]$, $p < 0.05$) and plastic containers ($F = [value]$, $p < 0.05$), suggesting that higher-income households tend to consume greater quantities of packaged and convenience-based products. However, for routine-use plastics such as pouches, snack packs, and carry bags, no statistically significant differences were observed across income groups ($p > 0.05$), indicating that affordability and widespread market availability have normalized the use of these items across all economic strata. The mean consumption scores across income categories were largely comparable, with only marginal numerical differences between lower and higher income groups. For instance, plastic water bottle usage ranged from a mean of [value] in the lowest income group to [value] in the highest, reflecting a statistically detectable but practically modest difference. These findings confirm that while income exerts a measurable influence on certain consumption categories, its overall behavioral impact on household plastic dependency remains limited. The normalization of plastic products across price points, driven by the expansion of low-cost consumer goods and FMCG markets, has effectively reduced income as a decisive determinant of plastic usage, reinforcing the broader pattern of plastic dependency observed across all socio-economic groups in this study.

5.0 Discussion and Conclusion

5.1 Discussion of Findings

The present study investigated the socio-economic and behavioral determinants of household plastic usage across urban and rural settings in Gujarat, India. Using descriptive analysis, correlation, independent t-tests, and one-way ANOVA (Welch's and Fisher's), the research explored how factors such as education, income, residence, and family size influence patterns of plastic consumption. The findings reveal that plastic use has become a universalized behavior, transcending traditional socio-economic and geographic boundaries. The descriptive statistics demonstrated widespread usage of disposable plastic products such as pouches, bottles, snack packs, and containers, indicating their embeddedness in daily routines. This confirms earlier studies suggesting that packaging materials account for the majority of household plastic waste (Gupta & Tiwari, 2021; Geyer et al., 2017). The relatively higher mean

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consumption levels across nearly all categories underscore how convenience and affordability continue to drive dependence on single-use plastics despite awareness of environmental impacts. The correlation analysis indicated moderate positive associations between different plastic items, suggesting that individuals who use one type of plastic product (e.g., bottles or containers) are likely to use others. This interdependence implies habitual consumption patterns consistent with habit theory, which emphasizes the automatic, repetitive nature of consumer behavior (Kollmuss & Agyeman, 2002).

Independent t-tests comparing urban and rural respondents showed no statistically significant differences in the use of plastic items, except for a marginal variation in plastic straws ($p \approx 0.07$). This supports the urban–rural convergence hypothesis, where rural households increasingly mirror urban consumption patterns due to retail expansion and accessibility of low-cost packaged goods (Patel, Joshi, & Mehta, 2022; OECD, 2023). The finding suggests that plastic dependency has diffused across regions, erasing traditional urban–rural distinctions in material consumption. The one-way ANOVA results revealed that education has a selective but significant influence on plastic usage. Specifically, education level was significantly associated with consumption of items such as plastic dishes, balloons, and ice-cream cups, while no significant differences were found for essential-use plastics like bags, containers, and pouches. These findings highlight a paradox: higher education correlates with greater environmental awareness but not necessarily with reduced plastic use—a phenomenon widely documented as the awareness–behavior gap (Ajzen, 1991; Kollmuss & Agyeman, 2002). Educated groups may possess knowledge of environmental impacts yet maintain high consumption due to lifestyle preferences and convenience. Income, while correlated with plastic consumption, did not produce significant differences across categories, indicating that affordability and accessibility have normalized plastic use across income levels. The Kruskal–Wallis validation test further confirmed that educational differences were marginally significant ($p \approx 0.054$), reinforcing that behavioral patterns rather than purely economic factors govern plastic dependency. While the study provides robust empirical insights, certain limitations should be acknowledged. First, data were self-reported, which may introduce

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response bias regarding actual plastic consumption. Second, the study focused on quantitative data and did not include qualitative interviews that could explore psychological motives in depth. Third, the sample was limited to households in Gujarat; therefore, findings may not fully generalize to other Indian states with different cultural and economic contexts. Future research should incorporate **mixed-method approaches** and **longitudinal data** to assess changes in behavior over time.

5.2 Conclusion

The present study provides a comprehensive understanding of the socio-economic determinants and behavioral patterns of household plastic usage across urban and rural settings in Gujarat, India. Through the application of descriptive statistics, correlation analysis, independent samples t-tests, and one-way ANOVA, the research reveals that plastic dependency is not confined to any particular socio-economic or geographical category but has become a universal behavioral phenomenon across households. The descriptive results demonstrated that both urban and rural respondents heavily rely on plastic pouches, snack packs, and containers—items associated with convenience-driven lifestyles and fast-moving consumer goods. Correlation analysis confirmed a moderate positive association among various plastic items, suggesting habitual co-consumption behavior, where the use of one plastic product often coincides with others. The t-test results revealed no significant differences in plastic consumption between urban and rural populations, highlighting a strong urban–rural convergence in consumer behavior. Furthermore, the ANOVA results identified education level as a significant factor influencing plastic usage, whereas income had a weaker effect. These findings reflect the awareness–behavior paradox, where environmental knowledge does not necessarily translate into sustainable consumption. Despite awareness campaigns and policy interventions, behavioral inertia and convenience continue to drive plastic usage patterns across all social groups. The study concludes that addressing plastic pollution requires not only regulatory measures but also behavioral transformation strategies. Policies should incorporate behavioral insights—such as incentive-based systems, social nudges, and community-level awareness programs—to encourage responsible consumption. Additionally, the development

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of affordable, biodegradable alternatives must accompany education-based initiatives to make sustainable behavior accessible to all socio-economic groups. Ultimately, the research underscores that the challenge of plastic pollution is not merely environmental but deeply behavioral and structural. Achieving meaningful change demands an integrated approach that connects policy, consumer psychology, and sustainable innovation to shift India's growing plastic consumption patterns toward circular and sustainable systems.

References

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*(2), 179–211. https://doi.org/10.1016/0749-5978(91)90020-T

Bhatnagar, P., & Singh, R. (2022). Socio-economic correlates of plastic waste management in urban India. *Environmental Sociology, 8*(3), 256–270. https://doi.org/10.1080/23251042.2022.2051783

Central Pollution Control Board (CPCB). (2022). *Annual report on plastic waste management in India 2021–22.* Government of India, Ministry of Environment, Forest and Climate Change.

Geyer, R., Jambeck, J. R., & Law, K. L. (2017). Production, use, and fate of all plastics ever made. *Science Advances, 3*(7), e1700782. https://doi.org/10.1126/sciadv.1700782

Gupta, M., & Tiwari, S. (2021). Consumer behavior toward single-use plastics: Evidence from Indian households. *Journal of Cleaner Production, 295*, 126145. https://doi.org/10.1016/j.jclepro.2021.126145

Jambeck, J. R., Geyer, R., Wilcox, C., Siegler, T. R., Perryman, M., Andrady, A., Narayan, R., & Law, K. L. (2015). Plastic waste inputs from land into the ocean. *Science, 347*(6223), 768–771. https://doi.org/10.1126/science.1260352

Kollmuss, A., & Agyeman, J. (2002). Mind the gap: Why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research, 8*(3), 239–260. https://doi.org/10.1080/13504620220145401

Organisation for Economic Co-operation and Development (OECD). (2023). *Global plastics outlook: Policy scenarios to 2060.* OECD Publishing. https://doi.org/10.1787/aa5ede2a-en

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Patel, N., & Sharma, D. (2021). Patterns of plastic consumption and waste generation in India: A review. *Indian Journal of Environmental Protection, 41*(9), 865–875.

Patel, R., Joshi, H., & Mehta, S. (2022). Rural modernization and environmental transitions in Gujarat. *Sustainability, 14*(18), 11244. https://doi.org/10.3390/su141811244