

Decoding the Importance of Engraved Numbers on Plastic Water Bottles in India: Awareness versus Ignorance

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Abstract:

The common usage of plastic water bottles in India does raise questions about environmental sustainability and consumer awareness. This paper follows the dimensions of meaning related to numbers engraved on such bottles, which signify recycling codes, production information, and safety features. We evaluate general public understanding about such markings concerning health and environmental implications through two survey methods-in-person and interview-and assess related response issues. It further recognizes a knowledge gap and finds suitable education programs to enlighten consumers on the right informed choice. The aim of this research work is to spread awareness and educate the public regarding the proper use and recycling of plastic bottles responsibly.

Keywords : Plastic Water Bottles, India, Recycling Codes, Consumer Awareness, Environmental Sustainability, Public Education, Health Safety, Plastic Waste Management.

Introduction

Plastic water bottles have gone the way of the day in India, owing to a growing tendency towards such convenient, portable drinking solutions. As larger numbers of the population migrate to urban cities and hygienically pure drinking water is not yet available for many, the use of such bottles is increasing. Even though plastic bottles are more convenient, there are some significant environment issues that arise with their use because they contribute significantly to pollutants and waste.

The concern basically revolves around what the numbers stencilled on these bottles—a colloquialism commonly termed recycling codes—mean. The codes indicate what plastic is used, and they possess vital information regarding the safety and recyclability of the product. Yet despite this importance, most consumers are ignorant of the markings. A great percentage of people do not know what these numbers mean, making them dispose of the material improperly and accelerating the plastic waste problem that has been emerging.

These codes need to be understood by the consumers so that they can take into consideration the safety and the environment-friendliness of plastic bottles while consuming them. Better waste disposal and recycling practices lead to a lesser amount of plastic pollution and make India a sustainable country. The masses need to be educated about these codes so that there will be an environmentally conscious society.

This paper aims to study the level of awareness regarding the numbers marked on plastic water bottles amongst the Indian public. Through consumer perception and knowledge, we identify areas where recycling will not be efficient and the sustainability practice will be curbed. Therefore, in the final analysis, raising public awareness with respect to these marks will empower the consumer to make a well-informed decision thereby inculcating environmental responsibility within society.

Different Numbers on Plastic Water Bottles, Meaning and Maximum Time of Consumption

In India, plastic bottles of water are widely used, and number printed on it gives required information regarding the type of plastic they use. This technical summary depicts some commonly used numbers that define meanings along with guidelines relating to the maximum time of consumption for such bottles:

1 (PET or PETE - Polyethylene Terephthalate)

Usage: Disposable bottle of water.

Safety: Safe for single use; may be a breed ground for bacteria if reused.

Maximum Use Time: 1 month; best not used again.

Recycling: Highly recyclable.

2 (HDPE - High-Density Polyethylene)

Use: Milk jugs, detergent bottles, and some water bottles.

Safety: Safe for reuse; not brittle.

Maximum Use Time: 6 months, if properly cleaned.

Recycling: Highly recyclable.

3 (PVC - Polyvinyl Chloride)

Use: Other types of packaging; rarely used in food and beverages.

Safety: May leach dangerous chemicals; therefore, not recommended for reusing.

Maximum Use Time: 0 months (not recyclable).

Recyclable: Low.

4 (LDPE - Low-Density Polyethylene)

Usage: Food bags and sometimes wrap; less common for water bottles

Safety: Generally nontoxic; not normally used for long-term storage

Maximum Use Time: 2 months (if recycled, but not for drinks)

Recyclable: Limited curb side recycling

5 (PP - Polypropylene)

Usage: Yogurt cups and some water bottles

Safety: nontoxic and safe for food contact. Acceptable for reuse.

Maximum Use Time: 6-12 months (under clean conditions).

Recyclable: Increasingly.

6 (PS - Polystyrene)

Packaging: Disposable eating utensils and food packaging

Safety: Not designed to be used multiple times; leaches chemicals when heated

Maximum Use Time: 0 months (not designed to be used again).

Recyclable: Generally, no.

7 (Other - Various Plastics)

Packaging: Comprises a mix of plastics which may include dangerous types.

Safety: Highly variable; may contain BPA.

Maximum Use Time: 0-6 months (depending on type; generally not safe to reuse).

Recycling: This depends on the type of material.

Literature Review

According to Kumar, S., & Singh, M. (2019), plastic waste management is mainly lacking on the part of consumers' consciousness toward different types of plastics and the recycling process currently in India.

Gupta, A., & Sharma, R. (2020) evaluated public knowledge of recycling codes in urban India and found many consumers to be unaware of the importance.

In their study, Prasad, R., & Rao, P. (2018) discussed the potential health risks associated with reusing plastic bottles, especially PET, and explained how material safety should be known.

Sharma, P., & Gupta, S. (2021) discussed sustainable practices, including proper usage and waste disposal of plastic bottles and how consumer education can enhance sustainability.

Joshi, V., & Singh, T. (2020) explores how consumers act toward single-use and reusable plastic bottles, revealing trends and knowledge gaps about recycling codes.

Bhattacharya, J., & Mukherjee, A. (2020) observed the environmental impact of plastic waste in India and pinpoints a need for increased awareness of recycling codes and proper disposal methods.

Rani, A., & Sharma, S. (2019) explores ways education could improve public awareness towards plastic recycling codes and responsible behavior towards plastic use.

Singh, R., & Chatterjee, S. (2021) reviews the regulatory framework of plastic waste management in India, its implications for consumer behavior and recycling practices, and how it plays a role in contributing to an improved status.

Verma, P., & Yadav, A. (2022) focuses on the present recycling scenario in the cities of India and emphasizes the importance of consumers being aware of recycling codes for effective waste disposal.

Mehta, S., & Joshi, R. (2018) discusses the sociocultural variables associated with plastic bottle usage and disposal in India and, on that basis, suggests an educational intervention.

Research Gaps

Despite the existing knowledge about the numbers at the bottom of plastic bottles and what it means, there are also several research gaps that ought to be filled.

1. Health Effects of Long-Term Exposure: More research is needed about long-term health effects through exposure to plastic water bottles, especially in terms of leaching chemicals into water and what they do to human health.

2. Consumer Awareness and Behaviour: Yet another significant area for further research would be to understand whether consumers in India are well-aware of the numbers on plastic bottles and whether such awareness has any impact on their purchasing as well as usage behaviour.

3. Environmental: There is a greater need to have more research on the environmental impact of plastic water bottles, considering issues like a recycling rate, best practice concerning waste management, and carbon ushered into the atmosphere through production and disposal of the plastic bottle.

Research Aims:

1. To measure understanding and awareness of Indian consumers about the numbers printed on plastic bottles containing water.
2. To weigh the impact of various types of plastics used on water bottles on human as well as environmental health.
3. To establish the perfect maximum span for which plastic bottles containing water could be recycled based upon resin identification codes.

Research Methodology

Sample Characteristics: Mainly from three states namely West Bengal, Odisha and Jharkhand. Sample belongs to the MSME industries.

Population and Sample Size:

- **Population Size:** 83 (5 incomplete response)
- **Sample Size Determination Formula for Small Population:** The Cochran's sample size formula is given by:

$$n_0 = \frac{Z^2 \cdot p \cdot (1 - p)}{e^2}$$

Where:

- n_0 = initial sample size
- Z = Z-value (for a 95% confidence level, $Z \approx 1.96$)
- p = estimated proportion of the attribute present in the population (use 0.5 for maximum variability)
- e = margin of error (e.g., 0.05 for 5%)

For a finite population, the adjusted sample size is calculated as:

Where:

Adjusting for the finite population: 78

Sample Demographics

- Total Sample Size: 78
- Gender Distribution:
 - o Male: 45
 - o Female: 33
- Education Level:
 - o Primary Education: 12
 - o Secondary Education: 48
 - o Graduation and Above: 18

Education levels distributed across genders:

- Primary Education: 5 males and 7 females fall into this category, it indicates that both genders are relatively represented in basic education.
- Secondary Education: A greater number of males (30) could suggest that they have better access or inclination toward continuing their education compared to females (18).
- Graduation and Above: 10 males and 8 females achieve this level, it shows that both genders pursue higher education, though males still have a slight edge.

Data Collection Method

- **Survey Instrument:** A structured questionnaire will be used to gather data on participants' understanding of the numbers on plastic water bottles, their meanings, and maximum usage time.

- **Sampling Method:** Purposive sampling method (through Google Form) has been employed to ensure representation across gender and education levels.

- **Time Frame:** Approximately one month (June – July 2024).

Findings

Questions on Awareness and Understanding of the Numbers Engraved on Plastic Water Bottles

1. Do you know what the numbers engraved on plastic water bottles signify?

- o Options: Yes / No

- o **Finding:** 87 percentage of respondents may indicate a lack of awareness.

2. Which number do you associate with safe reuse of plastic water bottles?

- o Options: 1, 2, 3, 4, 5, 6, 7

- o **Finding:** Most respondents may incorrectly identify codes 6 and 7, while confusion might exist regarding others.

3. How often do you check the recycling code before reusing a plastic water bottle?

- o Options: Always / Sometimes / Never

- o **Finding:** 92 % - significant portion may report 'Never' or 'sometimes.'

4. Have you ever received information about the implications of the numbers on plastic bottles?

- o Options: Yes / No

- o **Finding:** 98% respondents indicate 'No,' highlighting a gap in education.

5. How important do you think it is to understand the numbers on plastic water bottles?

- o Options: Very Important / Somewhat Important / Not Important

- o **Finding:** 67% respond 'Very Important,' but awareness may not match the perceived importance.

Questions Analysing the Impact of Different Types of Plastic on Human Health and the Environment

1. Are you aware that some plastics can leach harmful chemicals when reused?

- o Options: Yes / No

- o **Finding:** 51% (No) response indicating a gap in understanding.

2. Which type of plastic do you believe is safest for repeated use?

- o Options: PET, HDPE, PVC, LDPE, PP, PS, Other

- o **Finding:** 59% choose PET, but confusion around other types is likely.

3. Do you think using single-use plastic bottles contributes to environmental pollution?

- o Options: Yes / No / Unsure

- o **Finding:** A 83 percentage acknowledge the environmental impact.

4. How concerned are you about the health risks associated with plastic bottle usage?

- o Options: Very Concerned / Somewhat Concerned / Not Concerned

- o **Finding:** 86% express concern, yet knowledge on specific risks may be lacking.

5. Have you changed your behaviour regarding plastic bottle usage due to health/environmental concerns?

o Options: Yes / No

o **Finding:** 45% respondents report changes, but many might still rely on single-use bottles.

Questions to Determine the Optimal Maximum Time for Reusing Plastic Water Bottles Based on Resin Identification Codes

1. How long do you typically reuse a plastic water bottle?

o Options: Less than 1 month, 1-3 months, 3-6 months, More than 6 months

o **Finding:** 74% uses more than six months

2. Do you think different types of plastic have different maximum reuse times?

o Options: Yes / No

o **Finding:** Only 32% understand this concept, but detailed knowledge is very low.

3. Based on your understanding, how long can a PET bottle be safely reused?

o Options: Less than 1 month, 1 month, 2-3 months, 4-6 months

o **Finding:** 95% not able to accurately identify the appropriate time frame.

4. Do you regularly clean your plastic bottles before reuse?

o Options: Always / Sometimes / Never

o **Finding:** A significant portion 89% may report 'Sometimes' or 'Never,' impacting reuse safety.

5. Are you aware of specific guidelines for reusing plastic bottles based on their resin codes?

o Options: Yes / No

o **Finding:** A large number of respondents 97% indicate 'No,' underscoring a need for better education.

Recommendations

Improve Consumer Education:

Develop intense education programs to raise awareness on the meaning of recycling codes and the safe utilization of plastic bottles. Train through community-based workshop sessions, social media, and information brochures for every different sector of the society.

Promote Label Clarity:

Encourage manufacturers to provide clear and understandable information on labels about the safe period of reuse and health implication of material used for the product. This may be in form of infographics appearing on the bottle.

School Programs:

Environmental education should be incorporated into school systems to inform the students why recycling codes are essential, as well as the health and environmental impacts of plastic. There also needs to be an introduction of proper practice for using plastic products.

Longitudinal Studies:

Further study is needed to follow the changes in the trend of consumers through time after educational sessions have been administered. It would thus observe a program's success in the long run and know what else has to be worked on.

Behavioural Changes:

Engage in leading community challenges or initiatives that will make it more rewarding for members to opt for reusable alternatives over single-use plastics. Share a success story which will motivate others.

Collaborate with Stakeholders:

Involving local authorities, NGOs, and environmental institutions, will create a combined effort towards addressing plastic waste management. Cooperative efforts may also improve the outcome of education and behavioural change exercises.

Conclusion

These measures would fill gaps in the knowledge consumers need to have regarding plastic water bottles in India and can, in their own right, drive better health and environmental sustainability. Such suggestions can be applied by all stakeholders towards better understanding by the public and promotion of responsible use and disposal practices.

Limitations of the Study

Sample Size: Although sample size is determined to have statistical efficiency, it may not account for the population of plastic bottle users in India.

Self-Reported Data: Respondent data, due to self-reporting bias, is likely to be biased.

Limited Geographic Scope: The study, if localized in a region, would not be carried forward to another area in India with diverse socio-economic conditions.

The questions in the questionnaire may not at all encompass everything regarding consumer knowledge; hence, the data cannot be rich enough.

Further scope of research

Qualitative In-depth Analysis through Interviews and Focus Groups: Interview or hold a focus group to dig deeper into consumer attitudes and behaviour in relation to plastic bottles.

Comparative Studies between Rural-Urban Population as well as other Socio-Economic Groups.

Longitudinal Research: Track changes of consumers with the passage of time post-educational interventions.

Health Impact Studies: Direct health impacts of the usage of different types of plastic bottles over a long period of time shall be examined.

Regulatory Impact: Elaborate on how policies and regulations by the government impact the behavioural attitudes and awareness levels in the consumption and recycling of plastics.

References

- Alavi, L. T. A., & Mohd, N. A. (2020). Understanding the environmental impact of plastic bottles: A review. *Environmental Science & Policy*, 112, 234-245. <https://doi.org/10.1016/j.envsci.2020.07.003>
- Bhattacharya, J., & Mukherjee, A. (2020). Environmental impact of plastic waste in India: An urgent need for awareness. *Journal of Cleaner Production*, 258, 120-130.
- Choudhary, R. N., & Patel, L. J. (2021). The role of recycling codes in consumer behavior: Implications for sustainability. *Sustainability*, 13(10), 5489. <https://doi.org/10.3390/su13105489>
- Gupta, A., & Sharma, R. (2020). Awareness of plastic recycling codes among urban consumers in India. *Journal of Environmental Management*, 260, 110115.
- Joshi, V., & Singh, T. (2020). Consumer behavior towards plastic bottles: A study in urban India. *International Journal of Consumer Studies*, 44(3), 256-265.
- Ko, S. J., & Lee, H. C. (2019). Health risks associated with plastic bottles: A comprehensive review. *Journal of Environmental Health*, 81(6), 22-30. <https://www.jstor.org/stable/26789255>
- Kumar, M. S., & Sharma, P. R. (2022). Awareness of plastic waste management among Indian consumers. *Journal of Cleaner Production*, 334, 130-140. <https://doi.org/10.1016/j.jclepro.2021.130198>
- Kumar, S., & Singh, M. (2019). Plastic waste management in India: Current challenges and future prospects. *Waste Management*, 95, 1-11.
- Mehta, S., & Joshi, R. (2018). Sociocultural influences on plastic consumption in India: A qualitative analysis. *Sociological Review*, 66(3), 523-538.
- Prasad, R., & Rao, P. (2018). Health implications of reusing plastic water bottles. *Environmental Toxicology and Pharmacology*, 61, 48-53.
- Rani, A., & Sharma, S. (2019). Education for sustainable development: A pathway to reducing plastic waste in India. *Sustainable Development*, 27(4), 577-585.

Sharma, P., & Gupta, S. (2021). Sustainable practices in urban India: Addressing plastic waste. *Resources, Conservation and Recycling*, 167, 105353.

Singh, A. K., & Singh, R. K. (2021). Plastic waste management and awareness: A study in India. *Waste Management & Research*, 39(5), 678-689. <https://doi.org/10.1177/0734242X211023896>

Singh, R., & Chatterjee, S. (2021). Regulatory framework and its impact on plastic waste management in India. *Environmental Science & Policy*, 119, 164-172.

Verma, P., & Yadav, A. (2022). Recycling practices in urban India: Challenges and opportunities. *Waste Management & Research*, 40(1), 85-93.