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Analyzing knowledge, attitudes and practices around reusable water bottles among medical students

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Abstract

Introduction: Reusable plastic bottles have integral part of modern day life but poses significant public health and environmental challenges. In this context the present study was conducted among medical students about their knowledge, attitude & practice towards use of reusable plastics bottles as this groups are most concerned not only about their own health but also community & environment.

Objectives: The objectives of this were to evaluate the knowledge, attitude and practices of medical students regarding the plastic bottle usage and their socio-demographic profile.

Materials and methods: The descriptive cross sectional & institutional based study was conducted among 215 MBBS medical students of Calcutta National Medical College from 17th February to 2nd March 2025 by web based self administered questionnaires method with help of predesigned pretested semi-structured questionnaire. Data compilation and analysis were done in Microsoft office excel 2016.

Result: From the present study it was found among 215 study subjects 44.7% were 21-23 yrs of age group,71.1% were male, 67.4% were from urban area, 37.2% were living in hostel & 43.7% were from 1st year MBBS student. Majority of study subjects aware about single use plastics bottle (74.7%), demarcation of single use plastics bottle (33.9%), safest type of plastics bottle (32.3%) & microplastics (81%) but majority have wrong idea regarding number of plastics bottle type (77.3%). Though majority study subjects had favorable attitude towards single plastics bottle uses but practice were not correct.

Conclusion: From this present study it is concluded attitude and awareness regarding single plastics bottle uses are favorable or correct but practices are not according to their knowledge and attitude

INTRODUCTION

Plastics, particularly in the form of disposable bottles, have become an integral part of modern life due to their convenience, lightweight nature, and cost-effectiveness.[1] Made from synthetic polymers such as polyethylene terephthalate (PET), these bottles are widely used for packaging beverages, including drinking water and soft drinks.2 However, despite their practicality, the extensive use of plastic bottles poses significant public health and environmental challenges. Studies have shown that certain chemicals, such as Bisphenol A (BPA) and phthalates, can leach from plastic containers into the contents, leading to potential health risks including hormonal disruption and increased cancer susceptibility.[3,4]

In West Bengal, the rapid increase in urbanization and lifestyle changes have led to a surge in plastic consumption, with plastic bottles being a prominent contributor. Despite initiatives to reduce plastic waste, improper disposal and lack of recycling infrastructure have exacerbated environmental pollution in the state. Water bodies and urban areas are increasingly contaminated with plastic waste, contributing to ecological degradation and public health hazards. Moreover, the awareness of the health implications of using plastic bottles remains limited, particularly among the younger population, including medical students who are frequent users.[5,6]

Medical students represent a crucial demographic as future healthcare professionals and public heal-

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-th advocates. Their knowledge, attitudes, and practices concerning plastic bottle usage can significantly influence community behaviour and public health policies. This study was thus designed to gather insights into the prevalence and determinants of plastic bottle usage among them, that would contribute to evidence-based public health interventions that promote sustainable practices and enhance health awareness among future healthcare providers in West Bengal.

MATERIALS AND METHODS

Study type and design: The present study was a descriptive study with cross-sectional design.

Study Setting: The study was an institution-based study performed at Calcutta National Medical College, Kolkata.

Study Period: Between 17th February2025 to 2nd March 2025

Study Population: 1st to 4th year MBBS students of Calcutta National Medical College, Kolkata.

Exclusion Criteria: Students not willing to participate in the study

Sample size and sampling technique: Complete enumeration of all students from the 1st to 4th year currently studying in Calcutta National Medical College, Kolkata. Sample size of the study was 215.

Study Technique: Self-administered questionnaire was used to collect data.

Study Tools: A semi-structured questionnaire was developed to assess knowledge, attitudes, and practices (KAP) regarding plastic use among medical students.

Study Procedure: Following permission from the institution ethics committee, the initial draft was formulated based on a review of relevant literature and existing KAP surveys. Content and face validity were established by seeking feedback from a panel of subject experts, with suggestions incorporated to improve clarity and relevance. Subsequently, a pilot study was conducted among a small group of medical students (n = 10) to assess the comprehensibility and feasibility of the questionnaire. Based on feedback from the pilot, final modifications were made as necessary.

A google form of the questionnaire containing an initial section regrading details of the study protocol and option for written consent was mailed/ sent over whatsapp to all 1st to 4th year students of the medical college. Responses were collected anonymously.

Data Analysis: Descriptive statistics were interpreted with tables by using Microsoft office excel 2016

Ethical Issues: Study was conducted after getting ethical permission from Institutional Ethics committee and permission from appropriate authority and informed consent from study subjects to maintain anonymity and confidentiality

RESULT

The majority of the students were in first year (43.7%), between the ages of 21-23 years (44.7%), male (71.1%), from urban areas (67.4%) and stayed in the college hostel (37.2%). **(Table 1)**

Most patents knew about single use plastics (74.7%) and claimed to know the differences between reusable and single use plastics (79.5%). A third (32.5%) differentiated the types based on specific markings on the bottles. One third (33%) of the study population knew there were 5 types of plastics, while less than half (42.3%) thought that the basis of classification into different types were chemical properties of the plastic. A third (33.9%) identified HDPE as the safest plastic to reuse. The majority (81%) of the students were familiar with the term microplastics with most deriving their knowledge from the internet (65.7%). Recycling was considered the most appropriate method of disposal of single use plastic bottles by most students (74%). **(Table 2)**

The majority (94.4%) were in favour of using plastic bottles for drinking water despite 92.4% believing that plastics were hazardous for the environment, animals and for human beings. A little more than half (50.7%) agreed that only legislature could reduce the use of single use plastics, while a little less than half (49.8%) agreed that plastics could be replaced with more eco-friendly materials in the coming decade. **(Table 3)**

In practice, although all the study participants used single use plastic water bottles most of the times (45.6%) the majority used them for less than a week before changing them (49.8%), while 26% were using them even after 2 weeks. In addition to storing water plastics were also used for storing and drinking beverages (35.8%) and for storing raw (24.7%) and cooked foods (35.3%). Only 9.7% of the study population checked the markings or read the instructions before using plastic bottles. Majority of the students disposed off the plastic bottles after use into any dustbin (40.5%), while only 9.3% sold it to vendors for recycling. The most common reasons for using plastic bottles were cited as easy availability (33.9%). **(Table 4)**

DISCUSSION

Recent research across India and internationally shows that medical and healthcare students generally display moderate-to-high awareness of plastic pollution and its risks, but notable gaps persist in both detailed knowledge and sustainable practices. Attitudinal support for reducing plastic use remains high, yet actual engagement in environmentally responsible behaviours does not always match knowledge or beliefs.

The present study shows gaps and confusion in knowledge about plastic types. Approximately one-third (33%) of the participants could correctly identify the 5 main types of plastics, 42% thought classification was by property while 21% thought it was by structure. One-third (34%) could correctly identify HDPE as the safest plastic for reuse; others incorrectly select PVC, polystyrene, or none. Although several studies have looked into the knowledge domain regrading plastics, none of them involved medical students, thereby limiting the scope of comparison with a similar population. In addition, questionnaire used to assess knowledge were not uniform across the studies. Nonetheless, comparison between components of knowledge that include reuse/recycle, types and safe options show that students from professional course in Tamil Nadu, were found to have better knowledge in

three in reuse/recycle options of plastic wastes whereas the level of knowledge on types of plastics and on single use plastics was low, findings similar to the present study.[7] Lack of knowledge of labels used at the bottom of plastic containers can be a barrier against proper use. In India, the Bureau of Indian Standards (BIS) specifies standards for materials used in water bottles, including PET, HDPE, LDPE, and PP, with clear raw material and migration limit requirements.[8]

Participants in the present study showed a mixed attitude regarding reduction strategies (legislation vs. alternatives) and future replacement of plastics by eco-friendly materials, despite being in favour of the use of plastics water bottles. This was primarily driven by easy availability, light weight, and low cost. Additionally, many students live on a budget, and the upfront cost of purchasing reusable alternatives may deter them from making sustainable choices.[9] High cost of alternatives has also been reported by Peprah et al, from Ghana.[10]

These findings reinforce the fact that lack of knowledge alone is not the sole determinant of increased plastic bottled water dependency but rather the importance given to convenience. Half of the students in the present cohort supported legislations to reduce the use of single use plastic, while 39.1% were undecided. Chaudhary et al.,[11] from Uttar Pradesh, reported that 89% of their cohort of class 11 and 12 students supported the government on plastic ban, while 88.3% of a rural population from Kerala, reported by Kanagabala et al.,[12] strongly favoured a governmental ban on plastic.

Practice remains the weakest KAP domain. Despite knowledge on plastics, microplastics, their environmental and health hazards, participants continued to reuse single use plastic bottles at least occasionally. Almost 50% used single-use plastic bottles for less than a week; one-fourth used them for 1–2 weeks, while approximately another quarter used them for more than 2 weeks. Only 9.7% always checked symbols/instructions before use. Single use plastic water bottles are usually made of polyethylene terephthalate (PET). Repeated use of such water bottles has a risk of leaching of chemicals from the inner surface of the bottle into the water. Several compounds, including acetaldehyde, antimony, and phthalates, present in the leachate, may lead to adverse health effects among users.[13,14] Regular use of reusable water bottles harbors more microbes than toilet seats.[15,16] Hassan et al.,17 reported reuse of PET bottles to save or drink water among a sample of the general population in Egypt as 1-2 days/ week in 23.6%, 3-4 days/ week in 13.1% and 5-7 days / week in 56%. Furthermore, Kasemsup and Neesanan reported that 74.5% of their participants reused plastic bottles.[18] Repeated use of single use PET bottles have also been reported by Hariharan et al.,[19] from a cohort of volunteers of first-year undergraduate medical students in Tamil Nadu.

When disposing bottles, most students simply threw them in any dustbin; a small portion burned them, stored and sold by some, or discarded haphazardly. Recycling was recognized by 74% as the ideal disposal method but practiced by only 39.1% who threw their empty bottles in recycle bins. Peprah et al.,[10] studying a coastal community In Ghana, found that 57.0% of participants discarded plastic bottles in bins, while 26.0% burned them. Only 10.1% reported recycling their plastic bottles.

LIMITATIONS

The present study was a single institution study, thus having limited generalisability. Participation in the study was not uniform across the years, with lesser participation from higher years, which might have resulted in a volunteer bias.

CONCLUSION

The Medical students have sufficient knowledge and a number of outstanding positive attitudes concerning plastic use for drinking water. The current practices are however, not reflective of their knowledge or attitude towards plastic use and are more directed towards convenience. Campus initiatives, policy reform, and targeted digital campaigns will be needed to reinforce changes in practice.

CONFLICT OF INTEREST

None Declared

FUNDING

Not declared

Table 1: Distribution of study participants based on socio-demography (n= 215)

Variables	Levels	Total
Age range (in years)	18-20	95(44.2)
	21-23	96(44.7)
	24-26	20(9.3)
	27-29	4(1.8)
Gender	Male	153(71.1)
	Female	62(28.9)
Residence	Urban	145(67.4)
	Rural	70(32.6)
Accommodation availed	Home	68(31.6)
	Paying Guest	67(31.1)
	Hostel	80(37.2)
Academic year	First	94 (43.7)
	Second	69 (32.1)
	Third	12 (5.6)
	Fourth	40 (18.6)
Total		**215 (100)**

Table 2: Distribution of study participants based on knowledge questions (n=215)

Q. No.	Questions on knowledge	Response Options / Categories	n (%)
10	**Do you know about single use plastic?**	Yes	162 (74.7)
		No	53 (25.3)
5	**Can you differentiate between reusable and disposable plastic bottles?**	Yes	171 (79.5)
		No	44 (20.5)
6	**On what basis do you differentiate single use from reusable plastic bottles?**	Weight of bottle	62 (28.8)
		Specific marking on bottle	70 (32.5)
		Transparency	35 (16.3)
		Thickness	46 (21.3)
		No response	9 (4.1)
9	**How many types of plastics are there?**	5	71 (33.0)
		6	46 (21.4)
		7	49 (22.7)
		8	18 (8.4)
		No response	31 (14.5)
11	**Do you know on what property the plastic bottles are classified?**	Colour	7 (3.2)
		Structure	45 (20.9)
		Property	91 (42.3)
		No idea	50 (23.3)
		No response	22 (10.2)
12	**Can you name the type of plastic that is considered safe to reuse**	HDPE	73 (33.9)
		PVC	43 (20.0)
		Polystyrene	17 (7.9)
		All of them	26 (12.1)
		None of them	56 (26.0)
17	**Are you familiar with the term microplastic?**	Yes	174 (81.0)
		No	41 (19.0)
15	**What is the ideal method to dispose of single use plastic bottles?**	Landfilling	13 (6.0)
		Incineration	19 (8.8)
		Recycling	159 (74.0)
		Don't know	24 (11.1)
18	**What is your source of knowledge regarding microplastics?**	Internet	145 (67.4)
		Newspaper	51 (23.7)
		Parents	14 (65.1)
		Friends	27 (12.6)
		Journal	22 (10.2)
		Social media	72 (33.5)
		Others	3 (1.4)
	Total		**215 (100)**

Table 3: Distribution of study participants based on attitude questions (n=215)

Q. No.	Questions on attitude	Response Options/ Categories	n (%)
1	Are you in favour of using plastic bottles for drinking water?	Yes	203 (94.4)
		No	12 (5.6)
16	Do you believe that plastics are hazardous for all environment, animals and for human beings?	All of the above	198 (92.1)
		For environment	12 (5.6)
		For animals	2 (0.9)
		For humans	3 (1.3)
19	Do you think single usage of plastic bottles can be reduced only through legislatures banning production?	Agree	109 (50.7)
		Disagree	22 (10.2)
		Neutral	84 (39.1)
20	Do you think plastics can be replaced with more eco-friendly materials in the coming decade?	Strongly agree	45 (22.8)
		Agree	6 (27.0)
		Neutral	57 (26.5)
		Disagree	13 (6.5)
		Strongly disagree	30 (13.0)
		No response	10 (4.6)
	Total		**215(100)**

Table 4: Distribution of study participants based on practice questions (n=215)

Q. No.	Questions on practice	Response Options/Categories	n (%)
4	Do you use single use plastic bottles for drinking water?	Yes	215 (100)
		No	0
2	How frequently do you use plastic bottles for drinking water?	Always	48 (22.3)
		Most of the time	98 (45.6)
		Occasionally	69 (32.0)
7	While using plastic bottles how long do you use it?	<1 week	107 (49.8)
		1-2 weeks	52 (24.2)
		>2 weeks	56 (26.0)
8	For what purposes do you use plastic containers/ bottles?	Drinking water	157 (72)
		Drinking beverages	77 (35.8)
		Storing cooked food item	53 (24.7)
		Storing raw food item	76 (35.3)
13	Do you look at the markings or read the instructions before using plastic bottles?	Always	21 (9.7)
		Most of the time	64 (29.8)
		Occasionally	75 (34.9)
		Never	55 (25.6)
14	How do you dispose the plastic bottle after you stop using it?	Burning	5 (2.32)
		Throwing in a designated dustbin	84 (39.1)
		Throwing in any dustbin	87 (40.5)
		Store and sell	20 (9.3)
		Throwing here & there	19 (8.8)
3	What are the reasons for using plastic bottles over other materials?	Easily available	73 (33.9)
		Light weight	30 (13.9)
		Cheap	17 (7.9)
		Lightweight & Easily available	13 (6.0)
		Cheap & Easily available	12 (5.6)
		Cheap & Light weight	4 (1.8)
		Cheap, Light-weight & Easily available	66 (30.7)
Total			**215 (100)**

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ANNEXURE

Questionnaire used in the present study

1. *Are you in favour of using plastic bottles for drinking water?*
2. *How frequently do you use plastic bottles for drinking water?*
3. *What are the reasons for using plastic bottles over other materials?*
4. *Do you use single use plastic bottles for drinking water?*
5. *Can you differentiate between reusable and disposable plastic bottles?*
6. *On what basis do you differentiate single use from reusable plastic bottles?*
7. *While using plastic bottles how long do you use it?*
8. *For what eating/ drinking purposes do you use plastic containers/ bottles?*
9. *How many types of plastics are there?*
10. *Do you know about single use plastic?*
11. *Do you know on what property the plastic bottles are classified?*
12. *Can you name the type of plastic that is considered safe to reuse?*
13. *Do you look at the markings or read the instructions before using plastic bottles?*
14. *How do you dispose the plastic bottle after you stop using it?*
15. *What is the ideal method to dispose of single use plastic bottles?*
16. *Do you believe that plastics are hazardous for all environment, animals and for human beings?*
17. *Are you familiar with the term microplastic?*
18. *What is your source of knowledge regarding microplastics?*
19. *Do you think single usage of plastic bottles can be reduced only through legislatures banning production?*
20. *Do you think plastics can be replaced with more eco-friendly materials in the coming decade?*