Original Article

Awareness About Unsafe Plastic Utensils and Linked Health Hazards Amongst Doctors

Bushra Anwar[1], Khushbakht Anwar[2], Aashi Ahmed[1], Nadia Nisar[1], Saima Omair[1] and Warda Wazir[1]

ABSTRACT

Objective: To assess the awareness about plastic utensils in doctors of Rawalpindi and Islamabad.
Study Design: Cross-sectional study
Place and Duration of Study: This study was conducted at two medical colleges of Rawalpindi and Islamabad in a period of six months in year 2017.
Materials and Methods: Data was collected from 228 doctors selected using simple random sampling technique in three medical colleges and hospitals. Their knowledge about different qualities of plastic, the number allocation of plastics, and which plastic numbers to avoid as utensils was assessed. Also, their awareness about the leaching of chemicals from plastic utensils, factors increasing this leaching, and diseases associated with the use of plastic, was assessed.
Results: Only 27.2% of doctors in our study sample were aware of plastic safety as measured using our awareness scale. Lowest awareness was found for the question about which plastic numbers to avoid (1.3% awareness). The highest awareness was found for the question about the leaching of chemicals from plastics into food (93.4%)
Conclusion: According to our results, the majority of the doctors were unaware of plastic safety
Key Words: Awareness, Plastic safety, leaching of chemicals

Citation of article: Anwar B, Anwar K, Ahmed A, Nisar N, Omair S, Wazir W. Awareness About Unsafe Plastic Utensils and Linked Health Hazards Amongst Doctors. Med Forum 2021;32(10):86-90.

INTRODUCTION

Different types of plastics are available in the market, based on the resin identification coding (RIC) system. Each plastic type is allotted a specific number that is written on the bottom of plastic bottles and containers.[1,2] It consists of a triangular design of arrows with a number inside and an abbreviation of the resin type.[3] It is anticipated that almost half of plastic containers have chemicals that can be poisonous for humans.[4]

The different resins used in synthesizing plastics are mostly linked with estrogenic and carcinogenic activity.[5] Some examples are bisphenol-A (BPA), polycarbonate (PC), non-BPA-based polypropylene (PP) and Phthalates. BPA and Phthalates are especially harmful for children and women of reproductive age.[6]

[1.] Department of Community Medicine, HITEC IMS, Taxila.
[2.] Msph student, London School of Hygiene and Tropical Medicine

Correspondence: Bushra Anwar, Lecturer, Community Medicine Department, HITEC IMS, Taxila
Contact No: 0300-4466885
Email: bushra.anwar@live.com

Received: March, 2021
Accepted: July, 2021
Printed: October, 2021

Most plastic items release these chemicals in the liquid contained in them, even without any physical stress. This leaching is frequent if the liquid contains both polar and non-polar components such as in milk, and is further increased in the presence of heat, sunlight, or microwave heating.[5]

Recet studies show that some of these seven types of plastics contain higher amounts of endocrine disruptors and are considered highly unsafe for health.[5,7] These unsafe plastics are indicated by numbers 3, 6, and 7 and are made up of Polyvinyl chloride or PVC (no. 3 plastic), Polystyrene or PS (no. 6), and Polycarbonate (no. 7), which contains Bisphenol A (BPA). Other plastics that are safer are Polyethylene Terephthalate or PET (no.1), High-Density Polyethylene or HDPE (no. 2), Low-Density Polyethylene or LDPE (no. 4), and Polypropylene or PP (no.5).[7,8]

On a global scale, despite being notorious for its harmful effects, plastic is still being used on a large scale in everyday life because of its convenience in eating, drinking, and use in everyday household items like baby bottles, teethers and toys, which can expose us to destructive chemicals of plastic.[7] A study in Korea evaluated the levels of BPA in the urine of infants and found BPA in all samples, which was higher in those infants who were bottle-fed (P=0.014).[10] BPA affects fertility, reproductive, immune, developmental, renal and nervous systems by its cytotoxic and mutagenic actions.[11]

There are gaps in public awareness about these issues. A Nigerian study showed that majority people did not know the meaning of the label 'BPA free' written on bottles. Most policymakers are also unaware of its meaning. The lack of awareness about plastic safety suggests a high level of exposure to these chemicals.[12]

To date, there are no statistics or studies available about the awareness of unsafe plastic utensils in doctors internationally or nationally. To fill this gap, we conducted a pilot study first, on doctors of Rawalpindi Medical College, to calculate the desired sample size, which revealed 0% overall awareness. Current research aimed to assess awareness about unsafe plastic utensils in doctors as they are supposed to be well aware with any kind of health hazards. Its results will be valuable for health-sector authorities to focus on this neglected issue by increasing research, health education, and regulating the sale and use of unsafe plastics.

MATERIALS AND METHODS

This is a descriptive cross-sectional study conducted in six months period during the year 2017. Sampling was done from two selected medical colleges with their affiliated hospitals namely, Rawalpindi Medical College and its Allied hospitals, Shifa College of Medicine, Islamabad and its affiliated hospital. A total of 228 doctors were surveyed. Sample size was calculated after conducting a pilot study on 20 doctors from Rawalpindi Medical College. The proportion used for calculating sample size was of awareness about the numbering system of plastics in the pilot study, which was 6.66%. Taking margin of error (e) as 3.3%, with confidence level of 95%, the sample size came out to be 228. Sample was selected using consecutive sampling technique. Both genders of age 25 to 65 years were included. Doctors who had attained some degree related to environmental sciences were excluded from the study. Data was collected by using questionnaires made in English with close-ended questions.

In this study, awareness about unsafe plastic utensils was defined as knowledge that should be possessed to ensure the safe use of plastics. Information was collected regarding age, gender, clinical/ basic sciences department, highest qualification, years of experience, and knowledge about unsafe plastic utensils. Seven variables were included to judge their knowledge. Questions included knowledge about leaching of chemicals from plastic utensils, higher toxicity of certain plastics, seven types of plastics, numbering system of plastics, number of unsafe plastic utensils (3, 6 and 7), factors increasing leaching and diseases linked with unsafe plastic utensils. Those who answered four or more questions correctly were labeled as 'aware,' and those answering less than four questions correctly were labeled as 'unaware'.

Data was collected after obtaining informed consent from the doctor. Confidentiality of information was maintained, and due respect was given to them. Data was entered and analyzed in SPSS version 21. For effect modifiers like field of doctors (clinical/ basic sciences and qualification, stratification was done during the analysis of results, and awareness was compared among these groups using chi-square test.

RESULTS

A total of 228 doctors were recruited in this study. Majority were young female doctors with MBBS as their qualification and 1-10 years of experience. The demographic and professional characteristics of the sample are shown in table 1.

Table No.1: Demographic and professional characteristics of doctors (n=228)

Characteristics	Frequency	Percent
Age groups in years		
25-35 years	190	83.3
36-45 years	23	10.1
46-55 years	7	3.1
56-65 years	8	3.5
Gender		
Male	65	28.5
Female	163	71.5
Clinical/ Basics		
Clinical sciences	188	82.5
Basic sciences	40	17.5
Highest Qualification		
MBBS	196	86.0
Postgraduate diploma	5	2.2
MCPS or equivalent	11	4.8
FCPS or equivalent	16	7.0
Professional Experience Of Doctors In Years		
<1 year	29	12.7
1-10 years	178	78.1
11-20 years	12	5.3
>20 years	9	3.9
Total	**228**	**100.0**

Most doctors were aware about leaching of chemicals from plastics and higher toxicity of certain plastics. Lowest awareness was found regarding numbers of unsafe plastic type. Table 2 shows knowledge about plastic safety and percentage of correct and incorrect responses to each question.

Table No.2: Awareness of doctors about questions asked about plastic use (n=228)

Question asked	Correct answer (%)	Incorrect answer (%)	Total (%)
Do you know plastic utensils release chemicals in the food they contain?	93.4	6.6	100
Do you know certain types of plastics release more toxic	78.9	21.1	100

chemicals than other types?			
How many types/ qualities of plastic are available?	3.1	96.9	100
Do you know each plastic type is allocated a specific number?	43	57	100
Which plastic numbers one should avoid to be used as utensils	1.3	98.7	100
Which factors increase the rate of release of chemicals from plastic?	42.5	57.5	100
Which diseases you know to be linked with use of plastic?	14.9	85.1	100

Those who answered four or more questions correctly were labeled as 'aware' and those answering less than four questions correctly were labeled as 'unaware'. Overall awareness calculated using this scale was only 27.2%.

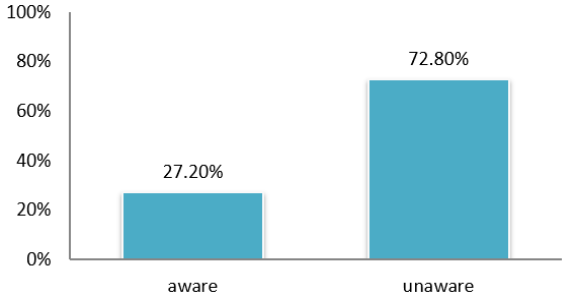

Figure No.1: Overall Awareness about plastic safety (n=228)

Overall awareness was compared among groups of doctors according to their field. Doctors working in clinical departments were more aware as compared to basic sciences doctors (p-value= 0.021). Also doctors having higher qualification had higher level of awareness with significant p-value of 0.043 (refer to table 3).

Table no.3:

Effect modifier	Aware	Unaware	p-value
Clinical/ basic department			
Clinical sciences	57 (30.3%)	131 (69.7%)	0.021
Basic sciences	5 (12.5%)	35 (87.5%)	
Qualification			
MBBS	49 (25%)	147 (75%)	0.043
Postgraduate diploma	2 (40%)	3 (60%)	
MCPS or equivalent	2 (18.2%)	9 (81.8%)	
FCPS or equivalent	9 (56.3%)	7 (43.8%)	

Data are shown as N (%) and p-value calculated using chi-square test.

DISCUSSION

This study aimed to assess the awareness of doctors about the unsafe plastic utensils. According to results, majority doctors (93.4%) were aware that leaching occurs from plastics into the food they contain. Lowest awareness was found regarding which plastic numbers to be avoided for use as utensils; the correct answer was given by only three doctors (1.3%). Overall 62 doctors (27.2%) were aware of unsafe plastic utensils according to the scale used, while the majority of 166 (72.8%) doctors were unaware of it. This highlights the lack of awareness, and the need thereof, of raising public awareness of the hazards of plastic materials on a large scale to address the rising issue of plastic safety.[13] In the past few years, there has been an increase in concern about the possible health problems linked with exposure to phthalates, a chemical in plastics.[14] Only a few years back, there were limited studies available which studied the relationship between BPA and effects on human health.[15] The first such study got published in 1997, and after that, more than 100 such studies have been published.[16, 17] More researches are now available for PBDEs as well.[18]

In current study, only 15% doctors were aware of the diseases linked with the use of plastic utensils. This level of awareness is considered very low as doctors are supposed to be knowledgeable regarding health risks in environment. Similar results were shown by a survey done on experts' opinions about phthalates, an important chemical of plastics, in Norway. This survey revealed a high gap in knowledge. None of the six experts (0%) agreed that they have a high level of knowledge about phthalates toxicokinetics.[19] This low level of awareness is probably due to lack of consensus on hazards of plastics among plastic industry and scientists coupled with lack of political will in curbing its use. Therefore, our current trend of plastic use and manufacture is rising at a fast rate.[20] A survey done in the US also showed that people were confused about banning BPA due to the opposing claims of scientists and the plastic industry.[21] In California, a bill named 'AB319' was started in 2005 on banning BPA, which was actively opposed by industries making plastics, chemicals, grocery and baby products. Uncertainty was spread by contradictory statements and obscuring real information from the public, especially by those interested in BPA production.[22]

Plastic is toxic for infants as well, and its use needs to be regulated. It is banned in many developed countries. Association of Canadian Community Colleges advises elimination of Styrofoam plastics as it is supposed to be a probable carcinogen.[23] In France also, the use of bisphenol A in baby bottles was banned on 30th June 2010, and also banned for use in food packaging made

for children of ages 0 to 3 years, on 1st January 2013.[24] Also, U.S. state governments and European authorities suggested legal actions to limit the use of certain phthalates, as evident by Consumer Product Safety Improvement Act in 2008 by US.[25]

This is an innovative study and to our knowledge is the first study on this topic in our country. Researchers conducted a pilot study to test the check the efficacy of questionnaire and used a sufficient sample size for data collection. However, there were some limitations also in this study. Firstly, no international, national or local study was found on this topic so comparison with other studies was insufficient. Secondly, there is no standard tool available for measuring awareness about plastic safety as this concept is not established in our public and even public health authorities. So we made our own scale of measuring awareness about plastic safety, the validity of which is uncertain**.**

CONCLUSION

In this study, we observed that most doctors were unaware of unsafe plastic utensils and diseases linked with them. However, most of them knew that chemicals leach from plastics in food, and certain plastic types leach more chemicals than other types. This awareness was found to have significant relation with the qualification of doctors.

Recommendations: Seminars should be done to raise awareness of doctors regarding unsafe plastic utensils. Public can benefit from awareness campaigns through public health messages on social media. Policies should be made to cut down manufacture and use of plastics that are more toxic and safe alternatives should be made available. Safe alternatives for plastic include glass and lead. Glass baby bottles since these are an excellent alternative to plastic bottles. It has been found that no detectable lead or cadmium leaches from the glass. The aluminium and stainless-steel bottles are also harmless with respect to leaching of metals in water.

Acknowledgments: The research reported here was made possible through the participation and support of a number of individuals. We are grateful for the support of all our participants and those who facilitated our engagement with the participants. We are pleased to acknowledge here contribution of Dr. Sayema Awais and Dr. Madiha Shafi who supported the research endeavour in terms of data collection and data management processes.

Author's Contribution:

Concept & Design of Study:	Bushra Anwar
Drafting:	Khushbakht Anwar, Aashi Ahmed, Nadia Nisar
Data Analysis:	Saima Omair, Warda Wazir
Revisiting Critically:	Bushra Anwar, Khushbakht Anwar
Final Approval of version:	Bushra Anwar

Conflict of Interest: The study has no conflict of interest to declare by any author.

REFERENCES

1. Nature Works LLC. Plastic Coding Guidelines in the United States. SPI Coding System Background. [Internet]. 2008 Available from: http://www.natureworksllc.com/~/media/The_Ingeo_Journey/EndofLife_Options/plastic_codes/2008_04_10_plastic_code_guidelines_pdf.pdf
2. American Chemistry Council. Plastics: plastic packaging resin identification codes. [Internet]. Available from: http://plastics.american-chemistry.com/Education-Resources/Plastics-101/Plastic-Packaging-Resin-Identification-Codes.html
3. Federal trade commission. Green guides. Part 260–guides for the use of environmental marketing claims: 24. [Internet]. Available from: https://www.ftc.gov/sites/default/files/attachments/press-releases/ftc-issues-revised-green-guides/greenguides.pdf
4. Rochman CM, Browne MA, Halpern BS, Hentschel BT, Hoh E, Karapanagioti HK. Policy: Classify plastic waste as hazardous. Nature 2013;494:169–71.
5. Yang CZ, Yaniger SI. Most plastic products release estrogenic chemicals: a potential health problem that can be solved. Environ Health Perspect 2011;119:989-96.
6. Koch HM, Calafat AM. Human body burdens of chemicals used in plastics manufacture. Phil Trans R Soc B. 2009;364:2063–78.
7. Edgar D, Edgar RA. Fantastic Recycled Plastic: 30 Clever Creations to Spark Your Imagination. Characteristics and properties of plastics. 1st ed. Lark Books: New York; 2009.
8. Carwile J, Luu H, Bassett L, Driscoll D, Yuan C, Chang J, et al. Polycarbonate bottle use and urinary bisphenol A concentrations. Environ Health Perspect 2009;117(9):1368-72.
9. What Science Should We Really Follow? [Internet]. Mercola.com. 2021 [cited 24 September 2021]. Available from: https://articles.mercola.com/sites/articles/archive/2013/04/11/plastic-use.aspx
10. Rhie YJ, Nam HK, Oh YJ, Kim HS, Lee KH. Influence of bottle-feeding on serum bisphenol A levels in infants. J Korean Med Sci 2014; 29:261-4.
11. Gowder SJ. Nephrotoxicity of bisphenol A (BPA)--an updated review. Curr Mol Pharmacol 2013; 6:163-72.
12. Pouokam GB, Ajaezi GC, Mantovani A, Orisakwe OE, Frazzoli C. Use of Bisphenol A-containing baby bottles in Cameroon and Nigeria and possible

risk management and mitigation measures: community as milestone for prevention. Sci Total Environ 2014;481:296-302.
13. Thompson R, Swan S, Moore C, vom Saal F. Our plastic age. Phil Trans R Soc B 2009;364 (1526):1973-6.
14. Latini G. Monitoring phthalate exposure in humans. Clin Chim Acta 2005;361(1-2):20-9.
15. Rochester JR. Bisphenol A and human health: a review of the literature. Reprod Toxicol 2013;42:132-55.
16. Vom Saal F, Welshons W. Large effects from small exposures. II. The importance of positive controls in low-dose research on bisphenol A. Environmental Res 2006;100(1):50-76.
17. Vom Saal F, Timms B, Montano M, Palanza P, Thayer K, Nagel S, et al. Prostate enlargement in mice due to fetal exposure to low doses of estradiol or diethylstilbestrol and opposite effects at high doses. Proceedings of the National Academy of Sciences 1997;94(5):2056-2061.
18. Welsh L. Polybrominated diphenyl ethers: Causes for concern and knowledge gaps regarding environmental distribution, fate and toxicity. Sci Total Environ 2008;400(1–3):425–36.
19. Zimmer K, Gutleb A, Ravnum S, Krayer von Krauss M, Murk A, Ropstad E et al. Policy relevant results from an expert elicitation on the health risks of phthalates. Environ Health 2012;11(Suppl 1):S6.
20. Ali M, Bhuiyan A, Gayen T. Rise in Single-Use Plastic Pollution Amid COVID-19 Pandemic: Bangladesh Perspective. J Agriculture, Food and Environment 2021;02(02):80-84.
21. Brewer PR, Ley BL. Contested evidence: Exposure to competing scientific claims and public support for banning bisphenol-A. Public Underst Sci 2014;23(4):395-410.
22. Quitmeyer A, Roberts R. Babies, bottles, and bisphenol A: the story of a scientist-mother. PLoS Biol 2007;5(7):e200.
23. Association of Canadian Community Colleges, National Round Table on the Environment and the Economy (Canada). Green Guide: A User's Guide to Sustainable Development for Canadian Colleges. Canada: Alger press; 1992. p. 131.
24. Bisphenol A. A body of evidence supporting exposure reduction. Prescrire Int 2013; 22(141):219-23.
25. Kamrin MA. Phthalate risks, phthalate regulation, and public health: a review. J Toxicol Environ Health B Crit Rev 2009;12(2):157-74.