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AWARENESS ABOUT PLASTIC SAFETY IN DOCTORS OF RAWALPINDI AND ISLAMABAD
Types of plastics used as utensils

Plastic available in market is of different types based on the resin added to it called the **Resin Identification Coding (RIC) system**. Each plastic type is allotted a specific number that is written on the bottom of containers. It consists of a triangular design of arrows with a number inside and an abbreviation of the plastic resin type.
<table>
<thead>
<tr>
<th>Resin Code</th>
<th>Polymer Resin</th>
<th>Structure</th>
<th>General Applications</th>
</tr>
</thead>
</table>
| 1          | PET                 | ![PET Structure](image) | * Plastic drinking bottles  
             |                     |                    | * Food jars        |
| 2          | HDPE                | ![HDPE Structure](image) | * Shampoo, dish, laundry and house cleaning bottles  
             |                     |                    | * Shipping containers |
| 3          | PVC                 | ![PVC Structure](image) | * Packaging materials  
             |                     |                    | * Pipes, fencing    |
|            |                     |                    | * Blood bags, medical tubing                             |
| 4          | LDPE                | ![LDPE Structure](image) | * Bags for dry cleaning & newspapers  
             |                     |                    | * Shrink wrap, film |
| 5          | PP                  | ![PP Structure](image) | * Medicine bottles  
             |                     |                    | * Bottle caps       |
|            |                     |                    | * Automotive parts                                        |
|            |                     |                    | * Carpeting                                               |
| 6          | PS                  | ![PS Structure](image) | * Disposable cups, utensils, food containers  
             |                     |                    | * Foam packaging    |
| 7          | OTHER               | Resin is other or a mixture of mentioned resins            | * 3 and 5 gallon reusable water bottles  
             |                     |                    | * Packaging        |
7 TYPES OF PLASTIC (Based on Resin Identification Code)

#1: Polyethylene Terephthalate (PET)
#2: High Density Polyethylene (HDPE)
#3: Polyvinyl Chloride (PVC)
#4: Low Density Polyethylene (LDPE)
#5: Polypropylene (PP)
#6: Polystyrene (PS)
#7: Other

Number written on bottom of plastic bottle in a triangle
Main health hazards of plastic utensils

It is anticipated that almost half of these plastics have chemicals that can be poisonous for humans. The different resins used in synthesizing plastics are mostly linked with estrogenic and carcinogenic activity. They also cause cardiovascular, renal diseases, birth defects, infertility and obesity. Some examples of these resins are bisphenol A (BPA), polycarbonate (PC), non-BPA-based polypropylene (PP), Phthalates etc. Phthalates and BPA especially are harmful for children, women of reproductive age.
PLASTIC Impact on Human Health

- Irritation in eyes, vision failure
- Headache, dizziness & unconsciousness
- Breathing difficulties, asthma, respiratory problems
- Thyroid, coughing, swelling of throat
- Liver dysfunction
- Lungs problem
- Diarrhea, Vomiting, indigestion, typhoid, stomach ache, food poisoning
- Skin diseases: rashes, allergy, skin cancer
- Birth effect, infertility, hormonal changes, declining sperm count, cancer

SOIL POLLUTION
AIR POLLUTION
WATER POLLUTION

Source:
www.ecologycenter.org
www.mindfully.org
www.answers.com

Factors increasing hazards of plastics

Most plastic items release these chemicals in the liquid contained in them even without any physical stress (e.g. of heat or UV light). But the leaching of chemicals from container in food is more frequent (in 71% of plastics) if the liquid contains both polar and non-polar components like in milk and increases more in presence of heat, sunlight or microwaving.
Safe and unsafe plastics

Recent studies show that some of these seven types of plastic contain higher amounts of endocrine disruptors than other plastics and are **highly unsafe** for health. These unsafe plastics are indicated by **numbers 3, 6 and 7**. Unsafe plastics are named as Polyvinyl chloride or PVC (no. 3 plastic) containing phthalates; Polystyrene or PS (no. 6) and Polycarbonate (no. 7) which contains Bisphenol A (BPA).

Other plastics that are **relatively safer** are High Density Polyethylene or HDPE (no. 2), Low Density Polyethylene or LDPE (no. 4), Polypropylene or PP (no. 5) and Polyethylene Terephthalate or PET (no. 1). But **PET (no.1) should be used with caution, not to re-use.**
Is Your Plastic Safe?

What to look for on the bottle:

SAFE

- Plastics marked number 1, 2, 4, or 5.

AVOID

- Plastics marked number 7 are usually polycarbonate, but may be other types of nonrecyclable plastic. Check the packaging, or call the manufacturer to see if a bottle is made of polycarbonate plastic.

- Plastics marked #3 are PVC plastic, a dangerous chemical sometimes used in plastic squeeze bottles and peanut butter jars.

- Plastics marked #6 are made with polystyrene, a chemical used in Styrofoam food trays that can damage the brain and nervous system.

<table>
<thead>
<tr>
<th>Plastic</th>
<th>Common Uses</th>
<th>Adverse Health Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polyvinylchloride (#3PVC)</td>
<td>Food packaging, plastic wrap, containers for toiletries, cosmetics, crib bumpers, floor tiles, pacifiers, shower curtains, toys, water pipes, garden hoses, auto upholstery, inflatable swimming pools</td>
<td>Can cause cancer, birth defects, genetic changes, chronic bronchitis, ulcers, skin diseases, deafness, vision failure, indigestion, and liver dysfunction</td>
</tr>
<tr>
<td>Phthalates (DEHP, DINP, and others)</td>
<td>Softened vinyl products manufactured with phthalates include vinyl clothing, emulsion paint, footwear, printing inks, non-mouthing toys and children’s products, product packaging and food wrap, vinyl flooring, blood bags and tubing, IV containers and components, surgical gloves, breathing tubes, general purpose labware, inhalation masks, many other medical devices</td>
<td>Endocrine disruption, linked to asthma, developmental and reproductive effects. Medical waste with PVC and phthalates is regularly incinerated causing public health effects from the release of dioxins and mercury, including cancer, birth defects, hormonal changes, declining sperm counts, infertility, endometriosis, and immune system impairment.</td>
</tr>
<tr>
<td>Polycarbonate, with Bisphenol A (#7)</td>
<td>Water bottles</td>
<td>Scientists have linked very low doses of bisphenol A exposure to cancers, impaired immune function, early onset of puberty, obesity, diabetes, and hyperactivity, among other problems (Environment California)</td>
</tr>
</tbody>
</table>
Rising concerns on plastic safety

The first such study revealing a harmful effect of BPA at low doses got published in 1997, and after that, more than 100 such studies have been published.

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.

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. But people were mostly not supporting this ban as they were confused due to the opposing claims of scientists and plastic industry.
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 0 to 3 years age on 1st January 2013. 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.
Participants and Methods in our survey

A total of 228 doctors were surveyed from two selected medical colleges with their affiliated hospitals namely; Rawalpindi Medical College and its Allied hospitals and Shifa College of Medicine (Islamabad) and its affiliated hospital.

**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 numbering system of plastics in pilot study. Aware doctors (p) were 6.66%. Taking margin of error (e) as 3.3%, with confidence level of 95%, sample size came out to be 228).
Both genders of age 25 to 65 years were included. Doctors who have also attained some degree related to environmental sciences were excluded from the study to avoid the effect of extra training programs on knowledge.

Data was collected by using questionnaires made in English with some close ended and some open ended questions. Data was collected after taking consent from doctor. Confidentiality of information was maintained and due respect was given to them. Data was entered and analyzed in SPSS version 21.
In our study awareness about plastic safety was defined as knowledge that should be possessed by doctor to ensure safe use of plastics. Seven variables were included to judge their knowledge. And those who answered 4 or more questions correctly were labeled as ‘aware’ and those answering less than 4 questions correctly were labeled as ‘unaware’. These seven questions and their operational definitions used were:
1. Do you know plastic utensils release chemicals in the food they contain: ‘yes’ was correct answer and ‘no’ was incorrect.

2. Do you know certain types of plastics release more toxic chemicals than other types: ‘yes’ was correct answer and ‘no’ was incorrect.

3. How many types/qualities of plastic are available: ‘7’ was correct answer and any other answer was incorrect.

4. Do you know each plastic type is allocated a specific number: ‘yes’ was correct answer and ‘no’ was incorrect.

5. Which plastic numbers one should avoid to be used as utensils: Selecting numbers ‘3, 6 and 7’ was correct answer and any other answer was incorrect.

6. Do you know which factors increase the rate of release of chemicals from plastic: Selecting all four options ‘heat, microwave, sunlight and chemical composition of food’ was correct answer and any other answer was incorrect.

7. Which diseases you know to be linked with use of plastic: Correct answer was choosing at least four of these options given with question: ‘cancer, infertility, birth defects, renal diseases, obesity, cardiovascular diseases’. Any other answer was incorrect.
RESULTS:

A total of 228 doctors were recruited in this study. Demographic and professional characteristics are shown in table 1. Awareness about plastic safety is shown in figure 1 to 7. Overall awareness was calculated using our scale was only 27.2% shown in figure 8.
Table 1: Demographic and professional characteristics of doctors (n=228)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age groups in years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25-35 years</td>
<td>190</td>
<td>83.3</td>
</tr>
<tr>
<td>36-45 years</td>
<td>23</td>
<td>10.1</td>
</tr>
<tr>
<td>46-55 years</td>
<td>7</td>
<td>3.1</td>
</tr>
<tr>
<td>56-65 years</td>
<td>8</td>
<td>3.5</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>65</td>
<td>28.5</td>
</tr>
<tr>
<td>Female</td>
<td>163</td>
<td>71.5</td>
</tr>
<tr>
<td>Highest Qualification</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MBBS</td>
<td>196</td>
<td>86.0</td>
</tr>
<tr>
<td>Postgraduate diploma</td>
<td>5</td>
<td>2.2</td>
</tr>
<tr>
<td>MCPS or equivalent</td>
<td>11</td>
<td>4.8</td>
</tr>
<tr>
<td>FCPS or equivalent</td>
<td>16</td>
<td>7.0</td>
</tr>
<tr>
<td>Professional Experience Of Doctors In Years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;1 year</td>
<td>29</td>
<td>12.7</td>
</tr>
<tr>
<td>1-10 years</td>
<td>178</td>
<td>78.1</td>
</tr>
<tr>
<td>11-20 years</td>
<td>12</td>
<td>5.3</td>
</tr>
<tr>
<td>&gt;20 years</td>
<td>9</td>
<td>3.9</td>
</tr>
<tr>
<td>Total</td>
<td>228</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Knowledge about plastic safety
Figure 1: Do you know plastic utensils release chemicals into the food they contain?
Figure 2: Do you know certain types of plastics release more toxic chemicals than other types?
Figure 3: How many types/qualities of plastic are available for utensils?
Figure 4: Do you know each plastic type is allocated a specific number?
Figure 5: Which plastic numbers one should avoid to be used as utensils?
Figure 6: Do you know which factors increase the rate of release of chemicals from plastic?
Figure 7: Which diseases you know to be linked with use of plastic?
Figure 8: Overall Awareness about plastic safety (According To Our Scale: aware is one answering 4 or more questions correctly)
Limitation of current study

There is no standard tool available for measuring awareness about plastic safety as this concept is not established in our public and public health authorities even. And so we made our own scale of measuring awareness about plastic safety, the validity of which is uncertain.
CONCLUSION AND RECOMMENDATIONS:

Mostly doctors were unaware of plastic safety, especially regarding the plastic numbers to be avoided for use as utensils and types of plastics available for use as utensils.

More research should be conducted and facts should be revealed for public and policy makers to make evidence based decisions. Guidance should be taken from agencies stating ban on different plastic types. Moreover, community and all stakeholders should be sensitized against this rising threat along with strengthening advocacy and transparency in policy.
Before any valid decision is made, efforts should be directed towards promoting *alternatives* of plastics such as stainless steel and glass.

Tests for leaching of lead and cadmium were also conducted on *glass* baby bottles since these are a good alternative to plastic bottles. No detectable lead or cadmium was found to leach from the glass. The *aluminium* and *stainless steel* bottles are also harmless with respect to leaching of metals in water.
HOW TO REDUCE PLASTIC USE IN YOUR HOME
REFERENCES


17. Vom Saal F, Welshons W. Large effects from small exposures. II. The importance of positive controls in low-dose research on bisphenol A. Environmental Research. 2006;100(1):50-76.


Thank you