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Investigating the detrimental effects of plastic bottle usage on women

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Abstract
The purpose of this research report is to investigate and present the detrimental effects of drinking from plastic bottles specifically on women. Plastic bottles are widely used for storing and consuming beverages, but concerns have been raised regarding their potential negative impact on human health, particularly for women. This report also explores the different composition of plastics that are at disposal today for use and highlights serious concerns about using a specific kind of plastics. This report aims to provide an overview of the potential risks associated with drinking from plastic bottles and highlight the specific implications for women's health.

Keywords: Detrimental effects, plastic bottle, metric tons

Introduction
Plastics are embedded in global and complex value chains. The annual global plastic production has increased exponentially over the past few decades, going from some 1.5 million metric tons (MT) in 1950 to an astonishing 390.7 million metric tons in 2021, marking an annual increase of four percent. Plastic production continues to increase in the coming decades as current investments in petrochemical infrastructure support this trend. The global production of primary plastic could reach up to 1,100 million tonnes by 2050.
A lot of this growth is owed to the contributing fact that plastic is very convenient, durable and mainly because it is light weight. However, plastic, as we may already be aware, is a material that does not degrade easily and takes several years to break down, even if buried under the soil. This plastic can then enter oceans and affect the species which are living underwater or other terrestrial animals. e.g. It can cause breathing difficulty and ultimately cause death. Apart from the serious implications on the ecosystem, very few people are less aware of the fact that plastics do not only spread toxicity after use but also while it is still in use. For e.g. we may all have sipped water from a plastic bottle but do we ever ponder the component of the plastic used to make the bottle or the health implications it could have. Research shows that BPA, the highly toxic chemical found in plastic, is linked to obesity, cancer, and endocrine problems in foetuses and children. Each stage of the life cycle bears consequences for people and the environment. Continued research in the field and its awareness among the general public is the need of the hour and before plastics turn out to be silent killers.

Definition
BPA: Bisphenol-A (BPA) is one of the highest volume chemicals produced worldwide. It is used to harden plastics, keep bacteria from growing in foods, and prevent cans from rusting. It is found in products we use every day: baby bottles, water bottles, food storage containers, the lining of canned goods and cash register receipts. (BPA is present in recycled and carbonless copy paper.)

Phthalates: Phthalates are a series of widely used chemicals that demonstrate to be endocrine disruptors and are detrimental to human health. Phthalates can be found in most products that have contact with plastics during producing, packaging, or delivering.

Plastic pollution: Plastic pollution is one of the global issues which clearly illustrate the triple crisis that we are facing which is pollution, biodiversity loss, and climate change.

Composition of plastic types

Plastics are made of different compositions. Plastic bottles are typically made from polyethylene terephthalate, also known as PET, a material that may contain chemical additives such as phthalates and bisphenol A (BPA). Usually clear in color, the vast majority of disposable disposable beverage and food containers and bottles are made of #1 plastic.These additives can potentially leach into the liquid contained within the plastic bottle, especially when exposed to certain conditions like heat or prolonged storage.

The other type of plastic used commonly is the high-density polyethylene, or HDPE. Usually opaque in color, this plastic is considered safe and hacs low risk of leaching. Most detergent and juice bottles, butter tubs, and toiletries containers are made of HDPE.

Polyvinyl chloride, or PVC is another component used especially for products that are tough and strong. It is used to make food wrap, bottles for cooking oil, shower curtains, inflatable mattresses, and the common plumbing pipes. PVC, although tough in terms of strength, is not considered safe for cooking or heating.

The component low-density polyethylene (LDPE), a relatively safe plastic, is used to make grocery bags, some food wraps, squeezable bottles, and bread bags.

Polypropylene (PP) is used to make common items produced such as medicine and ketchup bottles, yogurt cups, kitchenware and "microwave-safe" plastic containers. It is considered microwave-safe because of its heat resistant property, however it does not mean that the food consumed in the plastic which has been microwaved is healthy enough to consume.

Polystyrene, or Styrofoam is another commonly used form of plastic which most disposable containers and packaging food ware are made of. Many evidence suggests that this type of plastic leaches potentially toxic chemicals, especially when heated.

Researches on Plastic toxicity

Scientists haven't fully understood how most of the plastic components impact human health despite research conducted on animals. However, the European researchers are assertive about the components of plastic that were known to interfere with hormones and oxidative stress. Hormones control heart rate, metabolism, growth and development, mood, how your body deals with stress, sleep cycles, sexual function, body temperature and reproduction. Others were linked to oxidative stress. This type of cellular damage speeds aging and is an underlying cause of cancer. No one is immune to carrying these chemicals in their bloodstream, but women tend to naturally have more body fat, which increases the amount of toxins the body stores. Others are more likely to use personal care products that contain chemicals disguised as "fragrance." Also a recent study in Americans found that people eat, drink and inhale between 74,000 and 121,000 bits of microplastic every year.

Adverse Effects of drinking from Plastic Bottles

Hormonal Disruption

One of the major concerns associated with plastic bottle usage is the potential for hormonal disruption. Women, who have more complex hormonal systems compared to men, may be more susceptible to these disruptions. Prolonged exposure to these chemicals has been linked to reproductive disorders, menstrual irregularities, and increased risk of hormone-related cancers. Phthalates is a hormone-disrupting chemical that's found not only in plastic packaging, but lotions, shampoos, nail polish and makeup.

Endocrine Disorders

Researchers have found that chemical additives such as bisphenol A (BPA) and phthalates found in plastic bottles are endocrine disruptors, i.e. they have been shown to mimic or interfere with hormones in the body, particularly estrogen. Endocrine disruptors interfere with hormone production, and they have been linked to cancer, reproductive problems and issues with the immune and nervous systems. These disorders can include polycystic ovary syndrome (PCOS), thyroid dysfunction, and early onset of menopause. Such conditions can significantly impact women's reproductive health, fertility, and overall well-being.

Infertility issues

In 2015, scientists in China reviewed six studies on how BPA impacts female fertility. They found that the body of research showed that BPA interferes with glands linked to puberty and can cause structural changes to the uterus and ovaries, which are particularly impacted by BPA. This damage has been linked to infertility, ovarian cysts and ovarian cancer. One early study on women undergoing fertility treatment found that those who had higher amounts of BPA in their system had fewer eggs that had matured to the point where they could be fertilized.

And mounting research shows that everyday chemicals like those found in plastic are fueling a rise in infertility in all genders. Many researchers have found that men and women that are undergoing the in vitro methods of fertilization tend to have high levels of BBA in their blood system.

Pregnancy issues

As mentioned earlier, exposing plastic water bottles to extreme heat can result in the release of a harmful chemical that is named BPA. It can create quite higher complications in women that stop them from conceiving. Even if a woman conceives, the chances of miscarriage are quite higher.

Researchers have determined that phthalates are present in almost everyone, especially women of childbearing age. Another study of 350 pregnant American women found that those who had higher traces of monoethyl phthalate (MEP), which is used in cosmetics and perfumes, were more likely to excessively gain weight during pregnancy. The study authors stressed that this put the women at a higher risk of developing gestational diabetes.

Italian researchers published a study, Plasticenta: First evidence of microplastics in human placenta in 2021 found microplastics in human placentas for the first time. The tiny shards of plastic had made their way into all parts of the placentas of four mothers, including in the two membranes that make up the amniotic sack that surrounds the baby. In total, they looked at placentas from six different women i.e. 65 percent of the sample studied contained microplastics. The team also only tested about 4% of each placenta for plastic. The researchers believe the mothers unknowingly ate or breathed in small pieces of plastic that were carried to the placenta through their bloodstream.

Increased Cancer Risk

Evidence suggests that long-term exposure to chemicals leaching from plastic bottles, such as BPA, may increase the risk of certain cancers in women. Breast and ovarian cancers have been specifically linked to hormonal disruptions caused by these chemicals. The estrogen-like properties of the additives may contribute to the development and progression of these malignancies.

PET plastic is relatively safe, but it is important to keep it out of the heat or it could cause carcinogens (like the flame retardant antimony trioxide) to leach into your liquids. Carcinogens are those compounds that can cause cancer within a human body or any other living organism. Hence to keep you safe from such risk factors, you should stop drinking water bottles that are made from plastic.

Alternatives and Mitigation

To mitigate the potential adverse effects of drinking from plastic bottles, especially for women, the following measures can be adopted:

1. **Use alternative containers:** It is advisable that we switch to glass or stainless steel bottles for storing and consuming beverages. These alternative materials are non-toxic and do not leach harmful chemicals into the liquids.
2. **Avoid prolonged storage:** Refrain from storing beverages in plastic bottles for extended periods, especially in warm environments. Chemical leaching tends to increase with time and higher temperatures. Opt for immediate consumption or transfer the liquid to a safer container if needed.
3. **Choose BPA-free and phthalate-free options:** Look for plastic bottles labeled as BPA-free and phthalate-free. These bottles are manufactured without the use of these specific additives, reducing the risk of exposure to these harmful chemicals.
4. **Opt for filtered tap water:** Instead of relying on bottled drinks, consider drinking tap water that has been properly filtered. Investing in a reliable water filtration system can help remove impurities and contaminants, providing a safer drinking option.
5. **Be mindful of temperature:** Avoid exposing plastic bottles to high temperatures, such as leaving them in a hot car or near heating sources. Heat can accelerate the leaching of chemicals from plastic, increasing the potential risks.
6. **Educate and raise awareness:** Much of the problem exists because people are less aware about the potential adverse effects of drinking from plastic bottles, hence a promotion and awareness among women and the general public by sharing information about safer alternatives and the importance of reducing plastic waste for both personal health and the environment is crucial.
7. **Support policy changes:** Advocate for stricter regulations on the manufacturing and labeling of plastic bottles to ensure safer materials and accurate information about chemical additives. Policies that promote the use of sustainable and non-toxic alternatives should be supported.

Conclusion

In conclusion, the adverse effects of drinking from plastic bottles on women are a subject of concern due to the potential leaching of chemicals such as phthalates and bisphenol A (BPA). These chemicals can disrupt hormonal balance, leading to reproductive disorders, endocrine disorders, and an increased risk of hormone-related cancers in women. To mitigate these risks, individuals can take proactive measures, including choosing alternative materials such as switching to glass or stainless steel containers, avoiding prolonged storage of beverages in plastic bottles, opting for BPA-free and phthalate-free options, choosing filtered tap water, being mindful of temperature, raising awareness, supporting policy change and adopting healthier drinking habits can reduce their exposure to harmful substances and help mitigate the potential adverse effects on women's health.

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