Editorial

Microplastic: A Burning Issue of Present Era

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Introduction

Plastic products were introduced in the market around 1950. As the days are passing, it has becoming a burden on the nature. It is now incorporated in the soil, livestock, and seawater as well as in the human body. Plastic pollution has emerged as a pervasive global concern due to the indiscriminate use of plastics, with unplanned plastic waste disposal contributing to the generation of microplastic particles (MPs)[1].

Plastic pollution has emerged as an inescapable global concern, with plastic waste contributing to the generation of microplastic particles (MPs) that have now integrated easily into the human food chain. MPs are usually defined as plastic particles and fibers with a size between 0.001 µm to 5000 µm, so they are small enough to be easily overlooked, but they can have significant environmental and health consequences. As a result, every human being is at risk of exposure and its harmful impacts from newborn to geriatric age group. Among them, the more vulnerable groups are pregnant mothers, newborn babies, and children[2].

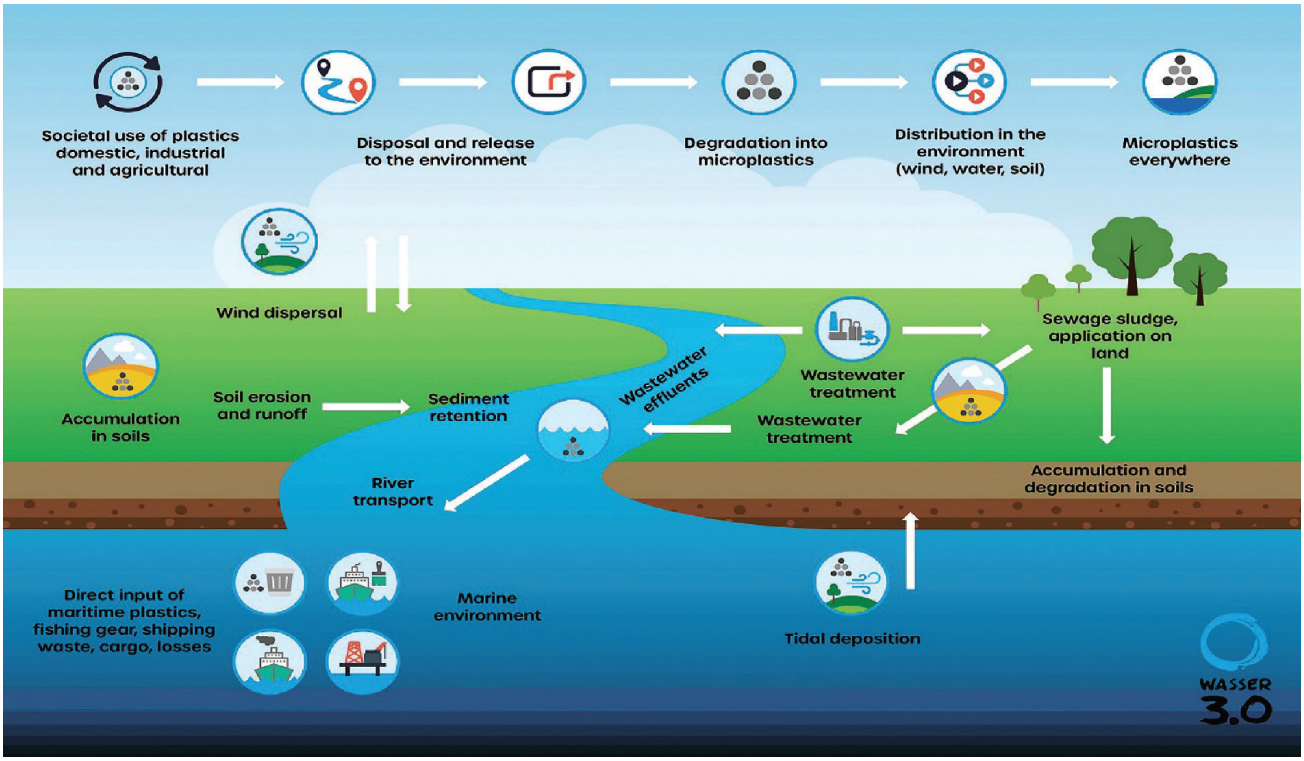

Figure 1: Distribution pathways of microplastics in the environment (Source: Wasser 3.0)

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Received Date : 20 September, 2024

Accepted Date : 30 September, 2024

How microplastics are getting into the human body?

In order to understand how to reduce our exposure to these tiny particles, it is important to know the route of

The Journal of Ad-din Women's Medical College; Vol. 13 (1), Jan 2025; p 1-3
https://doi.org/10.3329/jawmc.v13i1.81321

entry of MPs into the human body. There are three identified routes:

1. **Inhalation:** Microplastics present in the air enter the human body through this route. MPs are released at an alarming rate by synthetic fabrics.
2. **Ingestion:** Enters via food, water and drinks, but also via directly sucking on plastic and polyester products. The innocent-looking teddy, as well as other toys for the children, including plastic teethers, are chewed by the children. These are made from polyester and cause the shedding and swallowing of thousands of MPs. Seafoods are found to be a source of MPs ingestion in the human body.
3. **Skin contact:** The tiny plastic particles have been shown to cross the skin barrier and enter the bloodstream. Our skin is very porous and permeable to a wide range of substances like medicines and poisons, as well as MPs, and they are absorbed into our body within a very short period of time after coming in contact.

The widespread usage of plastic products, inappropriate disposal, and their persistence in nature make plastic pollution a global issue and a worldwide threat to aquatic ecosystems [3]

It is estimated that an average of 5 to 13 million tons of plastic enter the world's oceans each year. [4]

Plastic materials are producing mechanical problems in the environment, but breakdown products of plastic in the form of microplastic and nanoplastic (size<0.001µm) are creating the main health hazards, depending on their molecular weight, chemical structure, crystallinity, additives, and functional groups.

In one study, postpartum breast milk was analyzed for MPs using Raman micro-spectroscopy. The relationship between MP detection, maternal hygiene, breastfeeding complications, and bacterial microbiota was examined, and MPs were detected in 38.98% (23 of 59) of the breast milk samples.[5]

Another preliminary study involved the analysis of human breast milk samples collected from 15 healthy breastfeeding mothers of the fishing community (BMSF) with daily habits of seafood consumption and 8 healthy breastfeeding mothers (BMSH) with no history of seafood consumption in the past few months, and analyzed using microscopy and micro-Fourier-transformed infrared spectroscopy. In the BMSF group, a total of 276 MPs were found, while 49 MPs were found in the BMSH group, indicating a substantial difference in MP presence. [6]

Impact of microplastics on human health

- **Inflammation**: Can lead to heart disease, cancer, and autoimmune disorders.
- **Oxidative stress**: Due to production of free radicals, MPs can damage cells and DNA, leading to neurodegenerative diseases and reproductive problems.

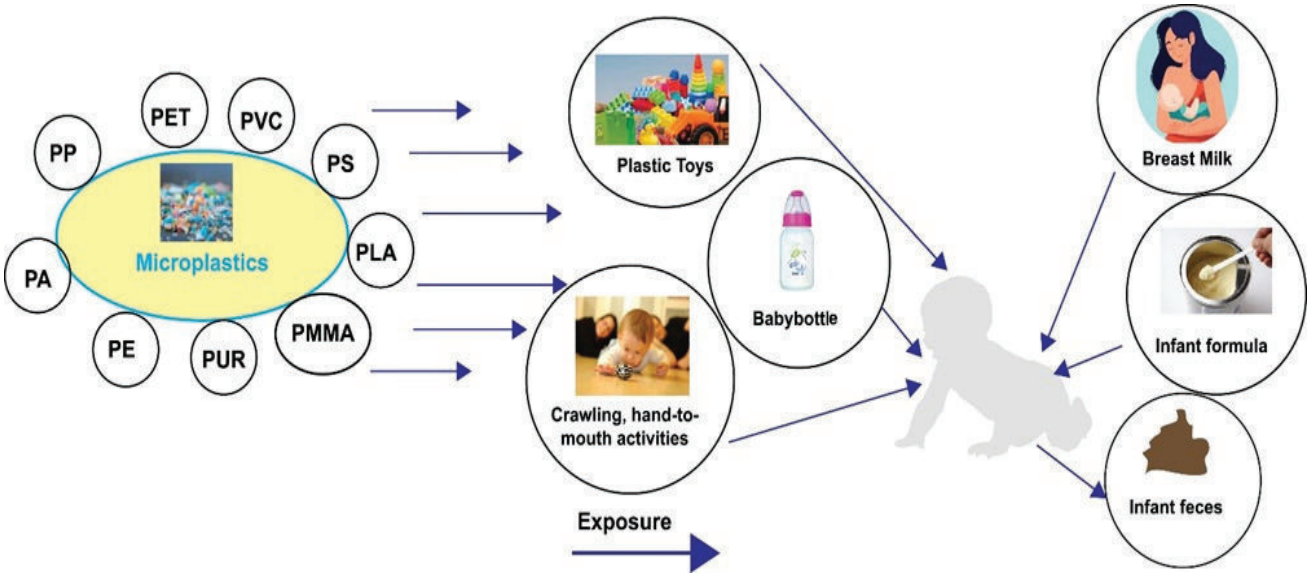

Figure 2: Sources of MPs that are producing health hazards for the children, including breast milk [7]

- **Endocrine disruption**: Can affect reproductive health of reproductive age group, as well as growth and development of the children.
- **Carcinogenesis**: Can be caused by chemicals in plastics.
- **Genotoxicity**: Can cause mutations of the gene that lead to cancer.

Presence of microplastics in breast milk can potentially affect neonates by disrupting their gut microbiome, potentially impacting their immune system, and raising concerns about potential developmental issues due to the ingestion of these plastic particles.

MPs can physically irritate the gut lining, with the sharp edges of these particles triggering micro-abrasions that interrupt the integrity of the gut barrier. On top of that, MPs can carry and release harmful chemicals, such as heavy metals and persistent organic pollutants (POPs), which further damage the gut endothelium and contribute to oxidative stress and inflammation.[8]

Microplastic pollution poses a serious threat to human health, with its presence in nature, including breast milk raising concerns for children. To minimize exposure, reducing plastic use, improving waste management, and raising awareness are crucial. Collective actions are needed for the safeguarding of environment, future generations, and human health.

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