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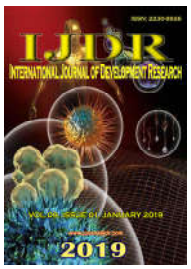

ORIGINAL RESEARCH ARTICLE OPEN ACCESS

IMPACT OF PLASTICS ON HUMAN HEALTH AND ENVIRONMENT

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ABSTRACT

Plastic is a kind of material that is commonly well known and used in everyday life in many forms. Plastic pollution where in plastic has gathered in an area and has begun to negatively impact the natural environment and create problems for plants, wildlife and even human population. Often this includes killing plant life and posing dangers to local animals. Plastics contain many chemical and hazardous substances such as Bisphenol A (BPA), thalates, antiminitroxide, brominated flame retardants, and poly- fluorinated chemicals etc. which are a serious risk factor for human health and environment. Different human health problems like irritation in the eye, vision failure, breathing difficulties, respiratory problems, liver dysfunction, cancers, skin diseases, lungs problems, headache, dizziness, birth effect, reproductive, cardiovascular, genotoxic, and gastrointestinal causes for using toxic plastics. Use of plastics causes serious environment pollution such as soil pollution, water pollution, and air pollution. Application of proper rules and regulations for the production and use of plastics can reduce toxic effects of plastics on human health and environment. Plastics associated human health risks, evidence abounds for plastics' potential to pollute and disrupt important natural processes and quality of life and its continued use at accelerating rates is unsustainable and will cause a significant burden for future generations. As plastic and plastic products are being used in day to day at the cost of environment pollution, the human and wildlife health and has become a global concern. Public should be educated about the use of plastic and plastic products which can prove to be hazardous and risk factor to many health problems of human and wild life. Hence there is an urgent need to look for biodegradable measures and effective policies and their implementation.

Objectives

- To raise public awareness on the risks on the effect of plastics on human health.
- To identify the main challenges and barriers for reducing plastic waste.
- To promote recycling of plastic polymers as a substitute for virgin plastic.

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INTRODUCTION

Plastic, one of the most preferred materials in today's industrial world is posing a serious threat to the environment and consumer's health in many direct and indirect ways (Yakub Ansari *et al.,* 2017). Plastic is a kind of material that is commonly known and used in everyday life in many forms. It becomes an important part of every one's life. To define plastics at molecular level, it is a kind of organic polymer, which has molecules containing long carbon chains as their backbones with repeating units created through a process of polymerization (http://www.merriam-webster.com/dictionary/polymer).

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Plastics may be easy and convenient for everyday use, but their negative impacts on our health cannot be overlooked. Due to its non-biodegradable nature, it keeps on piling in the environment and is creating tons of trash around the world. (Vipin Koushal *et al.,* 2014). Plastic is the most useful synthetic 'manmade' substance, made up of elements extracted from the fossil fuel resources. It has made possible most of the industrial and technological revolutions of the 19th and 20th centuries. During the past 30 years plastic materials have been used widely in food, clothing, shelter, transportation, construction, medical and leisure industries because they are light weight, low cost, extremely durable and relatively unbreakable (Kumar, 2007 and Noopur Mathur, 2014). Plastics contained many chemical and hazardous substances such as Bisphenol (BPA), thalates, antiminitroxide, brominated flame retardants, and poly- fluorinated chemicals etc. Which are a

serious risk factor human health and environment (Ram Proshad *et al.,* 2018). Plastic is made from toxic compounds known to cause illness, and because it is meant for durability, it is not biodegradable. (https://www.conserve-energy-future.com /causes-effects-solutions-of-plastic-pollution.php). Disposable shopping bags are convenient, but they are a major source of waste and pollution in our society. (https://www.reusethisbag. com/articles/plastic-shopping-bags-environmental-impact).The large-scale accumulation of waste plastics in the biosphere has given rise to the problem of severe environmental pollution. (Kim and Rhee, 2003).

Biodegradable Plastics (BDP): One of the sustainable alternatives that could be considered to deal with plastic waste is to develop bio-based and biodegradable plastic which utilize starch, cellulose, and poly lactic acid as raw materials for short-term use products. However, these are more expensive and are presently at a lab scale, which needs to be up scaled. Possible incentive- subsidy-based strategies for product development and research would assist in facilitating this up scaling. This in turn would increase their usage and enhance the market for these products (Sailaja *et al.,* 2018). This is one of the options to the conventional plastics. One of the common constituents of BDP is polyhydroxyalkanoate (PHA). The BDP are similar to conventional plastics in all aspects with the additional quality of being able to naturally decompose and break into natural and safe by-products. Some bio plastics degrade in the open air, others are made so that they compost in an industrial composting plant, aided by fungi, bacteria and enzymes. Reports of discovery of certain fungi and bacteria that hasten degradation of conventional plastics have received a lot of scientific attention. In this process, the by-products of this natural way of decomposition are safe for the environment and there are no hidden adverse consequences of this approach (Vipin Koushal, 2014). In addition to being useful for everyday life purposes, biodegradable plastics also have a great scope to be used in medicinal field.

Causes of plastic pollution

- Trash dumps and landfills are unfortunate major problems, as they allow pollutants to enter the ground and affect wildlife and groundwater for years to come.
- As plastic is less expensive, it is one of the most widely available and overused item in the world today. When disposed, it does not decompose easily and pollutes the land or air nearby when burned in the open air.
- Burning plastic is incredibly toxic, and can lead to harmful atmospheric conditions and deadly illness. Therefore, if it is in a land fill, it will never stop releasing toxins in that area.(https://www.conserve-energy-future.com/causes-effects-solutions-of-plastic-pollution.php).

Effects of plastic on human beings: Plastic has saturated our environment, leaving our health vulnerable to the dozens, if not hundreds, of industrial chemicals we are exposed to every day. The chemical compounds found in plastics are harm and causing biological effects in both humans as well as animals. The plastic-related chemicals are of critical concern for human health-bisphenol-A or BPA, vinyl chloride styrene and phthalates.

Bisphenol A (BPA): It is used for synthesising polycarbonate plastics (including food packing). It is found in common unbreakable items such as water bottles, dinner ware, eye glasses, lenses, CD'S and DVD'S. (https;//blog oup.com/2018/ 08/plastic-age). Bisphenol A (also known as BPA) can leech into the contents/liquids that plastic container is holding. BPA is a basic building block of polycarbonate plastics, such as those used for bottled water, food packaging and other items. BPA has been recognized since the 1940s as an endocrine disrupting chemical that interferes with normal hormonal function. It is a hormone disrupter that is used to make polycarbonate plastic (hard clear plastic). Bisphenol A can be found in baby bottles, water bottles, canned food liners, and Sippy cups. Human exposure occurs primarily through ingestion: diet, sucking/mouthing plastics, and skin contact. There have also been studies that showed bisphenol A increases the occurrence of diabetes, heart disease, birth defects, early puberty, low sperm count, hyperactivity, aggressiveness and high levels of certain liver enzymes. Women who have everyday contact with this chemical can have an increase in miscarriages, polycystic ovarian syndrome which is known to cause infertility, baldness in women, prostate cancer, breast cancer and ovarian cysts. (Padmini Devi *et al.,* 2014).

Vinyl chloride: It is used for the production PVC the poison plastic. It is found in window frames, carpets, upholstery, shower curtains, medical tubing and school lunch boxes. Studies dating as far back as the 1930s demonstrated that even short-term exposure to vinyl chloride in lab animals and factory workers caused liver damage. In 1980, the National Toxicology Program listed vinyl chloride as a known human carcinogen (https://ntp.niehs. nih.gov/testing/status/agents/ts 10961-h.html), which doesn't just affect the liver, but also includes the brain, lungs, and lymphatic and hematopoietic systems. (https;//blog oup.com/ 2018/08/plastic-age).

Styrene: It is used for building polystyrene plastics. It is found in disposable food packaging polystyrene cups and bottles. The International Agency for Research on Cancer (IARC) has determined that styrene is a possible carcinogen (https:// monographs.iarc.fr/wpcontent/uploads/2018/06/mono82.pdf), and studies in mice exposed to styrene by inhalation or ingestion indicate that it causes cancer of the lung. The styrene carcinogenicity is humans is more limited, the central nervous system is deemed to be the most sensitive target of styrene toxicity in humans. Chronic occupational exposure can cause tiredness, feeling drunk, slowed creation time, and impaired concentration, balance, and colour vision. (https;//blog oup.com/2018/08/plastic-age)

Phthalates: It is used for softening primarily PVC plastics. It is found in food wrappers and containers, rain coats, rubbery toys, vinyl upholstery, car interiors, medical tubing and infusing bags. (charlotte zaidi (https://blog.oup.com/ authors/charlotte-zaidi/).Phthalates are a class of chemicals that are used to soften plastics, such as PVC (Polyvinyl Chloride), bind fragrances in products, and act as solvents and fixatives, such as nail polishes. Human exposure of this occurs through different ways such as Inhalation i.e., breathing in fragrances, or fumes from solvents and fixatives, Chewing on a plastic toy creates small openings in the plastic, providing an avenue for leaching of chemicals from the toy into a child's mouth the lotions, perfumes, and deodorants. Adverse health effects include hormone disruption, developmental and reproductive problems, asthma, preterm birth, low sperm count, undescended testes, genital malformations, premature

puberty, and development of some cancers. The health effects of these chemicals is decreased lung function, increased weight gain, increased resistance to insulin, low sperm count and DNA damage to sperm. There have also been studies that show infant males exposed to this chemical have negative reproductive development. (Padmini Devi *et al.,* 2014).

Effect of plastic on environment: Toxic chemical release during manufacture is another significant source of the negative environmental impact of plastics. A whole host of carcinogenic, neurotoxic, and hormone-disruptive chemicals are standard ingredients and waste products of plastic production, and they inevitably find their way into the ecology through water, land, and air pollution (Padmini Devi *et al.,* 2014).

Air Pollution: Air pollution caused by the emission of toxic chemicals and CO2 during the manufacturing of plastic bags is a significant part of the environmental impact of this product. (Yakub Ansari *et al.,* 2017). Burning of plastic in the open air, leads to environmental pollution due to the release of poisonous chemicals. The polluted air when inhaled by humans and animals affect their health and can cause respiratory problems. (https://www.conserve-energy-future. com/causes-effects-solutions-of-plastic-pollution.php)

Water Pollution: Acid rain is recognized as a serious threat to natural and human-made environments, particularly in regions which have historically relied heavily on coal. Smog is also a well-documented and significant problem, particularly concerning human health.

Land Pollution: When plastic is dumped in land, it interacts with water and form hazardous chemicals. When these chemicals seep underground, they degrade the water quality. Wind carries and deposits plastic from one place to another, increasing the land litter. It can also get stuck on poles, track lights, trees, fences, tower etc. and animals that may come in the vicinity and might sulcate them to death. (https://www. conserve-energy-future.com/causes-effects-solutions-of-plastic -pollution.php).

Advantages of plastic: Most important advantages of plastic are medical uses and applications in public health. Plastics are cost-effective, require little energy to produce, and are lightweight and biocompatible. Plastic is soft, transparent, flexible, or biodegradable and many different types of plastics function as innovative materials for use in engineered tissues, absorbable sutures, prosthetics, and other medical applications (Andrady and Neal 2009).

Disadvantages of plastic: Plastics also have numerous disadvantages, such as toxic substances that may leak out and adversely affect humans and other organisms (APME 2006). There are many chemical substances present in plastic bottles or containers, many of which are a serious risk factor for health. For example, potentially dangerous human exposure to toxic components such as Bisphenol (BPA), thalates, antiminitroxide, brominated flame retardants, a poly-fluorinated chemicals etc. are notable (Halden, 2010).

Tips for safer for more sustainable use of plastics (Vipin Koushal *et al.*, 2014)

- Beware of cling wraps especially for microwave use.
- Avoid plastic bottled water.
- Minimize the use of canned foods and canned drinks.
- Use of own cloth bags to the grocery store or any store.

Store all the food in glass containers instead of plastic containers.

- Buy bulk cereal; bring the own paper bags.
- Use cloth rags for clean up around the house.
- Use matches instead of plastic encased lighters.
- Use cloth napkins.
- Use rechargeable batteries to reduce buying batteries packaged in plastic.
- Make a compost heap to reduce the food waste and put it back into the earth.
- Spread the word, tell people about the harmful chemicals in plastic and help reduce plastic use (Vipin Koushal *et al.,* 2014).

Recycling of plastics: Plastic waste management has assumed great significance in present day context. Recycling of plastics is considered the next viable and technically feasible option to tackle plastic waste management. Various schemes are being implemented to mitigate the impacts of plastic waste in India. It makes rising sense environmentally as well as economically and current trends demonstrate a considerable increase in the rate of recovery and recycling of plastic wastes. Recycling requires participation from the public and, therefore, needs citizens to perform separation of waste materials at the source. Separating the plastic waste from other waste will prevent plastics to be land filled and will allow it to be recycled with other plastics of the same kind. Converting waste plastics to fuel is beneficial as it not only allows for waste plastic to be disposed of but also presents the opportunity of developing an alternative to fossil fuel. Plastic waste is also integrated with bitumen for laying roads. Non-recyclable plastic waste finds its application in the co-processing of plastic waste in cement kilns. This refers to the use of wastes in industrial processes from which the energy and material form is recovered.

Conclusion

Exposures to plastics, plasticizers, and other additives to polymers are ubiquitous in modern society**.** The need for changes in manufacturing and consumption patterns of plastics is both public health stand an ethical issue. The plastic in the world is not recycled and usually ends up in landfills, where it degrades very slowly making the planet less habitable. The planet's environment, including its soil, water, and air, is affected directly in numerous ways, beginning with the extraction and use of fossil fuels during the manufacturing process of plastic bags. Emissions resulting from this process are also very harmful to both humans and the animals. Plastics offer considerable benefits for the future, but it is evident that our current approaches to production, use and disposal are not sustainable and for wildlife and human health. Plastic waste is recycled in India in an "unorganized" way. Sixty percent of the plastic-waste collected and segregated gets recycled back into materials for further processing into consumer products, while the balance is left unutilized. There are solutions, but these can only be achieved by combined actions. There is a role for individuals, via appropriate use and disposal, particularly recycling; for industry by adopting green chemistry, material reduction and by designing products for reuse and/or end-of-life recyclability and for governments and policymakers by

setting standards and targets, by defining appropriate product labelling to inform and incentivize change and by funding relevant academic research and technological developments. The best solution is to promote awareness and prevent excessive use of garbage bags and other plastic products. Plastic pollution can be reduced by using less plastics products and switching to alternatives. Now focus on another important part of eco-friendly living is reduce the use of plastic. Source reduction (Reduce and Reuse) can occur by altering the design, manufacture, or use of plastic products and materials. The present report serve as a starting point for potential changes in current plastics usage and provide future material options.

REFERENCES

Andrady A.L and Neal M.A. 2009. Applications and societal bene of plastics. *Phil. Trans. R. Soc.* B 364, 1977 1 – (doi:10.1098/rstb.2008.0304).

APME, 2006. an Analysis of Plastics Production, Demand Recovery in Europe. charlottezaidi (https://blog.oup.com/ authors/charlotte-zaidi/)

Halden R.U. 2010. Plastics and health risks. Annu RevPu H ealth 31(1), 179- 1

http://www.merriam-webster.com/dictionary/polymer

.https://www.conserve-energy-future.com/causes-effects-solutions-of-plastic-pollution.php.

https://www.reusethisbag.com/articles/plastic-shopping-bags-environmental-impact/

https;//blog oup.com/2018/08/plastic-age

Kim D.Y and Rhee H.Y. 2003. Biodegradation of Microbial and Synthetic Polyesters by Fungi, *Appl. Microbiol. Biotechnol.,* 61, 300-308.

Kumar S, Hatha A. A. M and Christi K. S. 2007. Diversity and Effectiveness of Tropical Mangrove Soil Microflora on the Degradation of Polythene Carry Bags, *Int. J. Trop. Biol.,* 55(3-4), 777-786.

NoopurMathur, Mathur.N and Singh A. 2014. Toxigenic effects of plastics on human health. *Int. J. Chem. Sci.,* 12(3), 1044-1052, ISSN 0972-768X.

Padmini Devi G, Chaitanya Kumari M.S, Bindu Madhavi, 2014. Adverse effects of plastic on environment and human beings, JCHPS Special Issue 3: October.

Ram Proshad, Tapos Kormoker, Md. Saiful Islam Mohammad Asadul Haque, Md. MahfuzurRahman, Md. Mahabubur Rahman Mithu, 2018. Toxic effects of plastic on human health and environment: A consequences of health risk assessment in Bangladesh. *International Journal of Health,* 6 (1) 1-5.

Sailaja Bhattacharya R.R.N, Mr Kaushik Chandrasekhar, Ms M V Deepthi, Dr. Pratik Roy, Mr M Ameen Khan, Dr Suneel Pandey, 2018. Challenges and opportunities - plastic waste management In India. With MOEFCC and UNEP, TERI releases discussion paper on the state of plastic waste management in India.

Vipin Koushal, Raman Sharma, Meenakshi Sharma, Ratika Sharma and Vivek Sharma 2014. Plastics: Issues Challenges and Remediation, Research Article, *International Journal of Waste Resources,* E-ISSN: 2252-5211 page no 1-10.

Yakub Ansari, F. I Chavan and M. Husain, 2017. Effect of Plastic Grocery Bags on Environment and Its Reuse. *International Journal of Advance Research, Ideas and Innovations in Technology,* ISSN: 2454-132X, (Volume3, Issue3) page no-597-600.

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