

Review

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[MD Rezanur Rahman Howlader Emu](#) *

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Review

The Effect of Plastic Pollution on Human Health in Coastal Area: A Comparative Analysis of Bangladesh and India

MD Rezanur Rahman Howlader Emu

Department of Mathematics and Natural Sciences, BRAC University, 66 Mohakhali, Dhaka, 1212, Bangladesh; md.rezanur.rahman.howlader.emu@g.bracu.ac.bd

Abstract: Plastic pollution has emerged one of main problem of the twenty first century as well as critically environmentally issue on the Costal area. Plastic debris or scrapes accumulates in enormous quantity severely impacting not only the marine but also the human ecosystems. Bangladesh and Indians who lives in the Coastal are highly vulnerable to the adverse effects of plastic pollution due to their close proximity to large water bodies, reliance on marine resources, and often improper knowledge of inadequate waste management systems. The study survey the pathways through which type plastic pollution affects human health in these regions, also emphasizing the severity of the problem and the need for urgent solutions. In additions, the paper also inspected some policy responses as well as waste management practices, and community-level efforts to mitigate the health risks associated with the plastic related pollution

Keywords: plastic pollution; India ; Bangladesh; micro-plastic; respiratory; tourism

1. Introduction

Plastic pollution now becomes a global environmental problem, where an estimated 8 million tons of plastic waste entering in the river body, mainly in the ocean annually (Jambeck et al, 2015). Coastal areas are the main beneficiary of the pollution due to their close proximity to waterways, it become a major problems for water bodies since the use of the single used plastic both by the increased tourism and the locals. However, fishing activities, and lack of efficient waste disposal systems also escalate the problem into much deeper. Bangladesh and India, which located at the South Asian region, are particularly more vulnerable due to their vast coastlines along the Bay of Bengal, where millions of people depend on their livelihood in the marine environment for food security (Islam & Huda, 2019).

Those regions and their accumulation of plastic waste along with the coastlines and in marine ecosystems poses a severe health hazards to coastal communities as well as the tourist. The Direct contact with plastic scrap, ingestion of the micro-plastic through seafood, and the release of harmful compound from degrading plastics all contribute to a growing concern over public health (Rochman et al., 2013; Thompson et al., 2009).

2. Sources of Plastic Pollution in Coastal Areas

2.1. Mismanaged Waste Disposal

In Bangladesh and India, there is a practice of the inappropriate waste disposal method which also significantly contributes to the plastic pollution. In Bangladesh city like Chittagong and subsequently in India city like Mumbai are major hotspot for the plastic accumulation problems. These regions are one of the most affected regions in both of the respective countries. These regions lack comprehensive waste management systems which also leading them to the open dumping and the flow of plastic waste into rivers and seas, particularly during the monsoon seasons (Ali, 2019; Chakraborty & Dhar, 2020).

2.2. Marine Activities and Fisheries

The fishing industry in both countries is another significant contributor to the plastic related pollution. The use of the Fishing nets, ropes, and gear made from plastic are often discarded into the ocean, such type of ignorant activity further adding to the plastic waste load. As the Coastal communities heavily dependent on fishing are therefore exposed to higher levels of plastic debris in their waters (Veerasingham et al., 2020; Bhattacharya, 2018).

2.3. Tourism

Coastal tourism, is also consider as a major economic activity subsequently in regions like Cox's Bazar in Bangladesh and Goa in India, These type of Coastal regions played as major role in contributing country's GDP in the tourism sector. In Goa the estimated tourist was 8.04 millions of people in the year of 2023 which is 17.9% increase from the previous year of 2022. It also included the 0.43 million foreign visitor. (Herald Goa, 2024) . In 2023, Cox Bazar received around 2.2 million people compared to the 2.5 million in 2022 (Financial Express, 2024; Global Economic Data, 2024).

Effects on Tourism in Bangladesh

Cox's Bazar, is the longest natural sea beach in the world, is also a popular tourist destination. However, the growing accumulation of plastic waste, which includes bottles, food packaging, and fishing nets, has led to a noticeable degradation of the beach environment in Cox's Bazar. In the recent study, it's found that the plastic debris downgrades the appeal of beaches as well as the city to visit, it is discouraging for the tourists, especially foreign visitor from visiting Cox's bazar and that kind of actions harming the local economy, since a lot of people are on tourism, specially the restaurant and hotels (Islam et al., 2022). In Addition to that, the tourists also face health hazards due to the exposure of harmful chemicals or compounds from the plastic waste, the notable example such as micro-plastic which can contaminate both seafood and water (Khan et al., 2020)

Effects on Tourism in India

One of the most notable coastal regions in India, are Goa and Kerala, are also facing the worst consequences effects of the plastic pollution. Goa, one of the most popular tourist destinations, in India experiences the significant decline in tourist satisfaction due the polluted of their. The study revealed that marine plastic scrapes not only harmful for marine life as well as it also reduces water quality, such types of situations turn dispirit tourists from participating, the activities like swimming, diving and surfing (Sharma & Patil, 2021). Moreover, the inhalation and ingestion of micro-plastics through contaminated food and water have also been linked to the health issue especially the gastrointestinal and respiratory issues among both tourists and the locals (Rathore et al., 2019).

3.1. Microplastic Ingestion

Ingestions of micro-plastic become major concern for the scientist since now days micro-plastic found in the human gut as well as human brain. The often consider as a critical pathways through which plastic pollution impacts on the human health. The size of micro-plastic is considers as less than 5 millimeter in size and these microscopic plastic particles unknowingly absorbed by coastal populations,' marine life including fish, shellfish, and plankton. A recent study conducted in Bangladesh and India showed that micro-plastics found in seafood sold in local markets have been found (Veerasingham et al., 2020; Ali, 2019) The long-term consumption of seafood contaminated with micro-plastics might cause the digestive problems, liver damage, and as well as carcinogenic effects in humans (Rochman et al., 2013; Thompson et al., 2009).

3.2. Chemical Leaching and Pollution

As plastics break down, phthalates, bisphenol A (BPA), and persistent organic pollutants (POPs) among other chemical additions can seep into the environment. Known endocrine disruptors, these compounds have been connected to rising cancer risk, developmental abnormalities in children, and reproductive health difficulties as well as to other disorders (Thompson et al., 2009; Patel et al., 2018).

Plastic garbage is common in coastal areas, hence people there are more exposed to these dangerous substances through food sources and contaminated water (Patel et al., 2018).

3.3. Vector-Borne Diseases

One of the issues that may over look was how the accumulation of plastic waste contributed to the vector borne diseases. In the coastal areas plastic also held responsible for the breeding grounds for disease. Plastic scrapes traps stagnant water, that promoting the spread of waterborne diseases like malaria and dengue fever, which are already prevalent in tropical coastal regions of Bangladesh and India. The Poor waste management in coastal slums also exacerbates this problem, increasing the health burden on vulnerable populations (Nithya et al., 2021; Sarkar & Patil, 2020)

In Bangladesh

In coastal areas of Bangladesh, including Cox's Bazar, elevated plastic pollution has intensified the incidence of vector-borne diseases. The study indicates that abandoned plastic debris accumulates rainwater, forming small pools that conducive to the proliferation of mosquitoes, especially the species called the *Aedes aegypti*, the principal vector for dengue illness (Karim et al., 2021). The Seasonal increases in dengue cases, especially during the monsoon season, are caused by these increase in mosquito breeding grounds and improper waste management in such locations.

In India

In India, coastal areas such as Goa and Kerala also experiencing the heightened risks of vector-borne diseases linked to plastic waste. In recent time India has experienced a sudden spike in diseases like malaria and chikungunya, as plastic debris along coastlines creates ideal breeding conditions for the mosquitoes. A research studies indicate that inadequate plastic disposal system contributes to the environmental degradation and increases public health risks (Rautela & Arya, 2020). The National Vector Borne Disease Control Programme (NVBDCP) highlights the important role of environmental factors and how the plastic waste can accumulate the increase of mosquito habitats, especially within communities who lives along the coast.

4. Case Studies: Bangladesh and India

4.1. Bangladesh: Coastal Communities in the Bay of Bengal

Bangladesh has an approx. the length of 55,598 sq ml, from there a significant part of the country has low-lying vulnerable Coastal areas that has significant challenges due to the plastic related problem. The major concern of this problem is attributed to the increases of plastic waste into rivers and seas. A significant portion of the country's people lively hood depends on the sea and waters. The pollution of the water negativity impact their life as well as country's economy. In an estimations around 1 million tons of mismanaged plastic waste ends up annually that contributing to the country's position among the top global contributors to marine plastic pollution. (Islam & Huda, 2019; Ali, 2019). This escalating problem jeopardises the livelihoods of coastal communities that depend on fishing and seafood as their principal sources of revenue.

One of the coastal areas that is affected most is Cox's Bazar. It is affected most because a significant portion of the local population depends on fishing. The seafood is consider as their key source of both nutrition and income. However, in a recent study suggest that micro-plastics are now pervasive in seafood that was consumed by coastal communities, raising major concerns about long-term health effects. Among potential of many concern the most vital one is that micro-plastics now enter into our food chain and cause damage at the cellular levels (Veerasingam et al., 2020). In addition to that, the region is experiencing intensified plastic pollution, worsened by the sudden influx of the refugees from the surrounding Rohingya camps, whose waste management systems are significantly substandard (Islam & Huda, 2019).

4.2. India: The Western and Eastern Coasts

The western coast of India (Mumbai, Gujarat) and the eastern coast of India (Tamil Nadu, Odisha) are both badly impacted by plastic pollution, which is a problem due to India's 7,500

kilometres of coastline. Annually, Mumbai generates millions of tonnes of plastic debris, and despite numerous cleanup initiatives, a significant portion continues to enter the Arabian Sea (Nithya et al., 2021). (Veerasingam et al., 2020).

On the eastern coast, notably in Tamil Nadu and Odisha, where fishing and agriculture are the local economies, the accumulation of plastic garbage in coastal areas has resulted in not just environmental degradation but also increased human health hazards. (Chakraborty & Dhar, 2020; Sarkar & Patil, 2020).

In spite of initiatives such as India's nationwide prohibition of single-use plastics, the extent of the plastic pollution issue, particularly in densely populated coastal regions, continues to escalate, and compliance and enforcement standards are inconsistent across states. Bangladesh and India urgently require enhanced waste management systems and improved public health initiatives to address the threats of plastic pollution to coastal communities (Nithya et al., 2021; Islam & Huda, 2019).

5. Health Impacts on Coastal Communities

5.1. Respiratory Issues and Allergies

Plastic burning is a common waste disposal practice in coastal areas of Bangladesh and India. When plastic burn its release of harmful chemical such as dioxins and furans are act as toxins to human health and leading to the respiratory diseases such as asthma and bronchitis. The individual people who lives in the coastal area exposed to the burning of these plastics waste have high risk of lung and other respiratory infection. (Thompson et al., 2009; Patel et al., 2018).

5.2. Gastrointestinal Disorders

Another major problem in the health related issues are on the gastrointestinal effect. The problem becomes a major concerning now days since the ingestion and the consumption of micro-plastics in the seafood become a common scenario. The long term exposure of such chemical may lead to the severe conditions such as intestinal blockage and malnutrition vulnerable populations, particularly in children. (Veerasingam et al., 2020; Patel et al., 2018).

5.3. Mental Health and Livelihood Concerns

The damage of coastal environment caused by plastic pollution adversely affects the emotional well-being of coastal people. The abrupt rise in disease among the seaside village has significantly affected the residents' livelihoods. (Ali, 2019; Bhattacharya, 2018).

6.1. Policy and Community-Based Responses

In Bangladesh

Government agencies and non-governmental organisations (NGOs) in Bangladesh and India are working together to minimise plastic pollution through a variety of legislation, campaigns, and community involvement activities. These programs emphasise regulatory steps, public awareness, and practical solutions for reducing plastic trash in coastal areas.

The government of Bangladesh has enacted substantial measures to mitigate plastic pollution. In 2002, Bangladesh became one of the first countries worldwide to prohibit single-use plastic bags, with the objective of reducing urban and marine plastic pollution (Mamun et al., 2021). The government has established the National 3R (Reduce, Reuse, Recycle) trash Management Strategy, emphasising community involvement, recycling, and trash minimisation. This method promotes the utilisation of alternative resources to diminish plastic waste in rivers and coastal regions by recycling plastic items.

Bangladesh has also aligned with many other international agencies, among them as the United Nations Development Programmed (UNDP) is one of them. The UNDP's Trash programe policy initiative with partners and local municipalities to create recycling and reduce the plastic pollution

by converting garbage into valuable resources that can help the country's economy. (Hasan & Hossain, 2021). These collaborative efforts align with Bangladesh's goal to reduce plastic pollution by 30% by 2030 (UNDP, 2020).

In India

India has implemented many public and governmental approaches to reduce plastic waste, particularly around the coast. In 2019, the Indian government launched the "Swachh Bharat Mission", a comprehensive initiative aimed at improving sanitation and waste management throughout the country. This strategy encompassed the establishment of plastic recycling and waste management systems, and also create a public concern on the use of plastic pollutions. The Indian government also implement the law of the strict bans on single-use plastics in coastal regions such as Tamil Nadu and Maharashtra (Raj & Rathod, 2021). The National Green Tribunal (NGT), one of the India's prominent environmental regulatory authority, has implemented regulations mandating responsible plastic waste disposal and imposing penalties on industrial polluters in coastal areas (Sinha & Pathak, 2020).

The Plastic Trash Management (Amendment) Rules, that is introduced in the Indian parliament 2022 restrict the use of single-use plastics and mandate that plastic makers also take the responsibility (EPR) in order to manage plastic waste effectively. This rule mandates companies to manage the complete lifecycle of their products, from production to disposal, hence encouraging the use of environmentally sustainable solutions (Pathak et al., 2022).

6.2.: Non-Governmental organizations Initiatives in Bangladesh and India

There are many numbers of NGOs in both nations that are diligently engaged in alleviating plastic pollution in coastal regions of both nations. NGOs like BRAC, Jago foundation , ASHA played a major role to mitigate the use of plastic as well as to create concern among people

The Environmentalist Foundation of India (EFI) conducts cleanup initiatives and educational campaigns in coastal regions, such as Chennai and Mumbai. EFI collaborates with local communities to eliminate plastic waste from beaches and facilitate awareness programs in educational institutions. The organisation has launched a "Plastic-Free Coast" campaign in collaboration with local authorities to tackle plastic waste in coastal ecosystems (Chakraborty & Dhawan, 2020).

Conclusion

Plastic pollution has a major impact on the health of coastal residents in Bangladesh and India. While attempts have been made, there is an urgent need for more robust waste management systems, stronger plastic use rules, and increased community engagement in minimising the detrimental consequences of plastic pollution (Islam and Huda, 2019; Patel et al., 2018). To protect the health and livelihoods of coastal populations, particularly in vulnerable regions such as Bangladesh and India, immediate and coordinated action at the local, national, and international levels is required.

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