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FACEMASK: A SUBTLE TOPIC OF MICROPLASTIC INDUCED HEALTH AND ENVIRONMENTAL CONCERN IN BANGLADESH DURING COVID-19

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ABSTRACT

This editorial focuses on the imperceptible side effects of widespread use of facemask especially during COVID-19 pandemic in context of Bangladesh. Both single used facemask and reusable fabricated facemasks are creating extra load on regular waste streams and accelerating the chance of microplastic leaching in various ways. In Bangladesh, a significant amount of fabricated and non-fabricated facemasks is using everyday alike the other countries of the world. This aggravated usage of facemasks tends to create microplsatic pollution that pose potential threat to both environment and human health. However, no significant studies have been done yet that focused on the imperceptible side effects of facemasks wearing by huge population of the country like Bangladesh. It is high time to bring this subtle effects to lime light and seek attention of the researchers to make scientific solution in a sustainable way.

INTRODUCTION

COVID-19 has been spreading all over the world since 2019 by SARS-COV-2 that interrupting the normal activities of public life ever since (Hasan & Haque, 2020; Zhou et al., 2020) with the most prevalent symptoms of breathlessness, agitation, drowsiness, pain and delirium (Lovell et al., 2020). At the time of writing there were no efficacious pharmaceutical measures for prevention or, treatment and every country is following non-pharmaceutical interventions (NPIs) to control spread (Ferguson et al., 2020; Hasan & Siddik, 2020). Hand washing, wearing facemask and maintaining social distance have been identified as the most effective NPIs measures against COVID-19 and are recommended as the 'new normal' (Kobayash et al., 2020; Ngonghala et al., 2020; Vieten, 2020).

Like other countries, the people of Bangladesh is trying to adopt to wear the facemask and disposal of them is becoming challenge now. Disposal of these facemasks including NPIs usually ends up in municipal landfill but they may also enter aquatic body either by direct throughout or indirectly by municipal runoff from dumping sites. As a result, it is producing 11 million metric tons of additional plastic waste stream that pose threat to the marine and freshwater ecosystem. Along with different NPIs, single use facemask, gloves and hand sanitizer bottles can be termed as 'covid waste' that have been considered as potential sources of microplastics (Aragaw, 2020; Fadare & Okoffo, 2020). As these single used plastic materials are disposed without any formal recycling procedure, and with microplastics being released during their degradation, they are likely to be an increasing threat to human and aquatic health (Sana et al., 2020).

FACEMASK USAGE IN BANGLADESH

Usage of facemask by Bangladeshi people is dependent on propensity to use ace-coverings, affordability, quality, and price and mask availability. Certified masks are used by health professionals while most of the middle class and working class people use locally produced single use surgical masks or cloth made non-surgical masks or strips of fabric clothes. Prata et

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al. (2020) suggested that about 2.65 billion pieces of facemasks are needed per month for 160 million people of Bangladesh. ESDO notified that it took 455 million pieces of facemask on average to cover up face of working people (ESDO, 2020). ESDO 2020 also estimated that 472.3 metric tons of daily covid waste production from PPEs will give rise to 1,72,402 metric tons of covid induced waste in Bangladesh of which 36,987 metric tons (21.45%) derived just from surgical mask (Fig. 1).

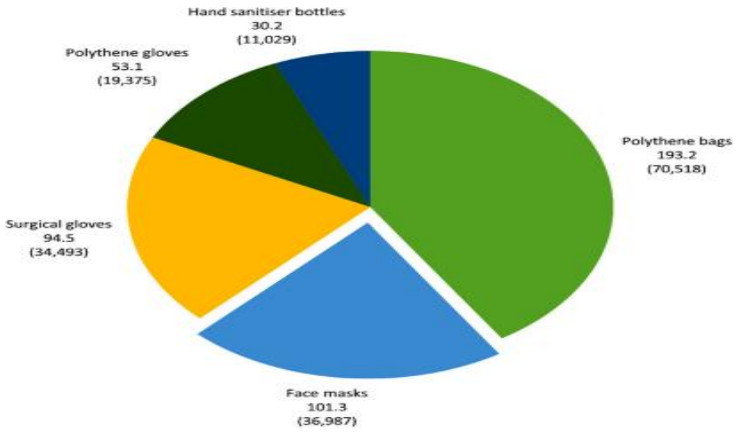

Figure 1. Different Sources of Plastic Pollution Load During COVID-19 in Bangladesh (Retrieved from ESDO, 2020)

Prior to sell in the retail market outlet, bulk consignment of product is often packaged into small units using another layer of plastic material further risks the environment. Therefore, where no structured policy or legislative framework exists for the management of waste from both single used and reusable facemasks, associated plastic packaging, gloves, bottle of sanitizers and other PPE from non-health care sector, there is a significant possibility of resultant damage to the human health and environment.

MECHANISM OF FABRICATED FACEMASK DEGRADATION

The release of microplastics from clothing is mainly caused by mechanical action and chemical (e.g. detergent) stresses, leading to detachment of microfibers from fabrics (made up of polyester, polyester-cotton blend, cotton, rayon, acrylic fabric etc.) during the washing process in laundry machines (Napper & Thompson, 2016). Further, the short-staple fibers are easily broken and released from the fabric, contributing majority to microfiber contamination. A quick review of the academic literature reveals a number of studies that indicate that laundering clothing is a significant point source for contamination of microplasic (Napper & Thompson, 2016; Almroth et al., 2018; Belzagui et al., 2019; O'Brien et al., 2020). The emission values of microfibers are influenced by mode of laundering (i.e. machine or hand), type of detergent and conditioner used, temperature and type of clothing being laundered (Hartline et al., 2016; Napper & Thompson, 2016; Zambrano et al., 2019). The size of majority of microfibers released from laundering ranged from <6µm to >2mm. Assuming that the reusable facemasks do undergo similar effects as other clothing during washing. After laundering, they are discharged into wastewater and enter the environment through wastewater effluent, atmospheric deposition or through contaminated sludge, finally making their way into oceans and human food chain (Yang et al., 2019; Henry et al., 2019). De falco et al. (2019) found that the amount of microfibers released during washing ranging from 124-308 mg for each kg of fabric washed which is equivalent to 6,40,000 to 15,00,000 units of microfibers. Owing to the lack of evidence, there is an immense knowledge gap regarding the emissions of microfibers from reusable masks during each wash and it is now essential to start investigation addressing these issues. This estimation is particularly important since millions of reusable facemasks are being sold and washed away every day in Bangladesh like the other countries of the world.

MECHANIMS OF SINGLE USE FACEMASK DEGRADATION

Single use masks are mainly manufactured from different thermoplastic polymers including polyethylene, terephthalate, high, low and linear-low density polyethylene (PE), polyvinyl chloride (PVC), polypropylene (PP), polystyrene (PS), nylon, polylytic acid and polyamide. Among these, PP and PE are most popularly used in facemasks (Fadare & Okoffo, 2020). The fate of disposed facemasks depends on the composite materials and the nature of environment they are exposed to. Improperly disposed facemasks are likely to pose a bigger problem for the aquatic environment when compared to terrestrial environment. A study conducted by Chamas et al. (2020) found plastic in the soil will degrade more readily compared to those exposed directly to the aquatic environment. Mismanaged single uses facemask deposited on land or, in landfill can find its way to aquatic ecosystem by many routes including weathering, aging and microbial degradation and become fragmented to different debris size including micro size debris (<5mm) (Vered et al., 2019; Xu et al., 2020). By existing in different of particle sizes they are therefore accessible to wide range of organisms and ecosystems, with the potential to exert damaging effects (Rios et al., 2020).

HEALTH EFFECTS OF PROLONGED FACEMASK USAGE

Though facemask induced microplsatic can pollute the environment and so does the human health in many ways, there are also some other indirect negative health effects of wearing facemasks. For examples, using facemasks for a prolonged period of time causes a host of physiologic and psychologic burdens and can decrease working efficiencies. Regular activities

cannot be performed as long as efficiently while wearing masks as compared to when masks are not worn. Long time usage of N95 and surgical masks cause physical adverse effects such as headache, difficulty in breathing, acne, skin breakdown, rashes and impaired cognition. It also interferes with vision, communication and thermal equilibrium. Tight fitting masks cause inadequate ventilation and increased level of CO_2 known as hypercapnia. As CO_2 is a known respiratory stimulant, a buildup of exhaled CO_2 between the mask and face will cause increased lung ventilation and respiratory activity. Symptoms of hypoxemia such as chest discomfort and tachypnea are also found in long time facemask users. Exhaled CO_2 builds up between the mask and face and increased levels of CO_2 cause confusion, impaired cognition and disorientation. Again frequent PPE and mask changes may cause shearing and breakdown of skin and breakdown on the bridge of the nose and cheek bones can be attributed to tight fitting masks area. Urticaria and contact dermatitis can also occur from sensitivity to components of facemasks and PPE (Lim et al., 2006; Johnson, 2016; Ong et al., 2020; Lan et al., 2020).

CONCLUDING REMARKS

In conclusion, it should be given emphasize on the immediate need for understanding the degree of risk and potential significance of the environment and health impact derived from the facemasks which could be designated as one of the aftershocks of pandemic COVID-19. Since facemasks becoming a normalized requirement during COVID-19 pandemic period, the people around the world including Bangladesh starts to get habituated to wear facemasks and this makes the chance of increasing microplsatic concentration in the environment that have the potential to create a higher chance of interaction, ingestion and pose hazardous effects on human health.

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