

^Hazardous of plastics during COVID-19 on marine environment: a case study from Egypt

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Abstract

Plastic pollution and its impact on the marine ecosystems is a major concern globally, and the situation was exacerbated after the outbreak of COVID-19.

This briefing delivers a synopsis of the environmental and climate impacts of single-use gloves and masks used for COVID-19 protection from June to August 2020. To the best of our knowledge, this study presents the first such information from the Middle East. .It pinpoints the need for further knowledge and action, such as a safe, sustainable, transparent and unconventional waste management processes related to COVID-19 in order to reduce the negative impacts now and in any future events. It identifies the need for further knowledge and action to reduce these impacts now and in any future events.

Keywords: Plastic Pollution, Personal Protective equipment (PPE), COVID-19, Marine Ecosystems; Hazardous.

INTRODUCTION

Millions of plastic items of different sizes, being discharged into the water bodies daily, worldwide, causing Plastic pollution (De-la-Torre & Aragaw, 2021). This situation was exacerbated, worldwide, during the COVID-19 pandemic, as millions of people are using single-use plastic face mask, gloves and face shields as personal protective equipment (PPE). The continuous and massive increase of gloves, masks and some sorts of wrapping made from single-use plastics, would end up littering land and marine environments ecosystems globally, a visible side-effect of the increased use of PPE, causing hazardous problems (Aydel, 2020; European Environmental Agency 2021). Moreover, such pollution would lead to emissions of greenhouse gases, potentially harming environment (Prata et al., 2020; Vanapalli et al., 2021). Connexion (2020), stated that more than 20 million French citizens (about 6% of the population) admitted throwing away their masks on public roads, on beaches, and along coasts (Canning-Clode *et al.*, 2020). Environmentalists fear that gloves and masks thrown out of car windows will pollute the environment for decades to come

The rate of accumulation of plastics in the marine environments, depends on the anthropogenic activities, direction and speed of wind, and coastal water uses (James et al., 2021). Impacts of the macro and microplastic pollution through ingestion and entanglement by marine animals caused many problems in many parts of the world (Cauwenberghe et al., 2013; Thompson et al., 2014; James et al., 2021). Scientists warn that the ingestion and suffocation are the most disturbing impacts of marine plastics marine wildlife (e.g. whales, turtles and seabirds). Marine animals can easily become physically entangled (Hirsh, 2020). Those animals mistake floating plastic for prey and die of starvation as their stomachs are filled with plastic rubbish (Boucher & Friot, 2017). Recently, a couple of dead whales were found on the Northern Coast of the Mediterranean Sea in Egypt When Scientists dissected these whales, they found tens of plastic bags and hundreds of small and large plastic parts inside their stomach.

Although studies related to plastic pollution and their consequences on the ecosystem and biota have been carried out worldwide, nothing is known about this type of pollution in the Middle East. The present study was particularly aimed at understanding the distribution of the macro- and microplastics in the surface waters, and in the guts of some dead whales which found on the Northern Coast of Egypt, and impact during COVID-10- pandemic on this type of pollution.

Plastics, in general, are non-biodegradable materials (Ryan, 2015, Ali et al., 2021). However, photooxidation by UV radiation and mechanical fraction can help in the fragmentation of the plastics into small fragments (Tamara et al., 2017). Microplastics (having size <5 m) have an enormous impact on the marine ecosystem and they are considered as a potential threat (Gewert et al., 2015; James et al., 2021; Patrício et al., 2021). These plastics can travel thousands of miles by water currents and wind action (Barnes et al., 2009; Al-Salem et al. 2021).

The present study was focused to provide a short focus and a baseline information on the distribution of the plastics and PPE in the coastal waters and their ingestion to better understand the intensity of the impacts plastic pollution generate on the marine environment in the Middle East during COVID-19 pandemic.

METHODOLOGY

Study area

The study was conducted in the Northern coast in Egypt (31.3543° N, 27.2373° E). It was selected as a couple of whales were found dead on the shore and we suspected that they were suffocated from plastic (will be discussed later).

RESULTS & DISCUSSION

Immense quantities of PPE plastic wastes have been generated globally due to the COVID-19 pandemic, which added an extra pressure to conventional solid waste management practices. Inappropriate disposal will end up polluting the marine environment and the situation is exacerbating. PPEs are potentially infectious litter and special handling is required. Therefore, it is a must to reveal the plastic-associated environmental load of the pandemic in order to prevent marine plastic pollution to continue exacerbating.

Countless face masks, face shields, different types of gloves, garments and plastics materials were consumed irrationally during the COVID-19 pandemic as a preventive measure against the spread of coronavirus (OSPAR, 2020; Vanapalli et al., 2021, El Sheekh & Hassan 2021). Unfortunately, they are found stranded in the beaches, coastlines, rivers, and littering cities instead of getting rid them in the suitable garbage boxes for subsequent removal for recycling or to be disposed suitably, in landfills. Nevertheless, there were no clear instructions for disposing mechanisms, people are improperly disposing plastics, especially PPE, throwing them near the location where they end their helpfulness, carried off by a gust of wind, accumulation of these plastics will continue to aggravate over time, pollute the marine environment (Moore, 2020; Rhee, 2020).

During the lockdown, a couple of dead whales were found laid down on the shore of the Mediterranean Sea in Egypt (Fig. 1).



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Fig 2. Different pieces of plastic garbage pulled out from the stomach of dead whale (Small fragments in the right panel and plastic bags in the left panel)

Table 1 shows the number and percentage of different items collected from the gut of these dead whales. PPEs (gloves and masks) represents 70%, while number of plastic bags represented 7% of the total litter.

Tab. 1. Items collected from the gut of the dead whale laid down on the Northern Coast of Egypt. Figures between parentheses are the percentage (%) of each item.

Number of Gloves	273 (28.90%)
Number of face masks	393 (41.60%)
Number of plastic bags	67 (7.10%)
Others	211 (22.40%)
Total	944 (100%)

Plastic litter may have fates after reaching the marine environments; the low density plastics can float and stay in the marine environments for long periods of time, probably subject to surface water currents, while high-density plastics sink and reach bottom marine sediments, while others may become buried in the sediments, and they become part of the geological record, eventually (Fadare and Okoffo, 2020; De-la-Torre et al., 2021). This is an alert as they do not degrade naturally and they will pollute the environment for many years to come (Adelodun 2021).

Egypt is witnessing intense tourism, fishery and other anthropogenic activities that have made their coastal zones and biota vulnerable to macro- and microplastic contamination. This form of plastic pollution is an alarming, yet poorly understood. Therefore, there is a research need in order to fill the current knowledge gaps regarding COVID-19-associated PPE pollution and lay groundwork for better waste management and legislation, especially, they could be transferred from local to remote areas where measurements are scarce. Controlling the accumulation of plastics through their degradation (biological, chemical or physical), is yet to be resolved. It is necessary, to identify sources and drivers of plastics and to track them, including PPE, after entering the marine ecosystems and understand their potential fate (Al-Salem et al 2021). When plastics and other marine litter are degraded, they release microplastics as well as new species invading the aquatic environment; these new species are called Alien invasive species (AIS). Most PPEs have characteristic morphology different from other marine plastic, therefore, it is worth to investigate their suitability as AIS and microplastic drivers (Pinochet et al., 2020).

The magnitude of PPE pollution remains unknown, especially in the Middle East, despite there are some published reports worldwide (Fadare and Okoffo, 2020; Prata et al., 2020; De-la-Torre et al., 2021; Galgani et al., 2021). There is a debate that

PPEs and PPE-derived microplastics are a potential source and vector of chemical pollutants in the marine ecosystems (Fred-Ahmadu et al., 2020). Thus, it is necessary to consider these two drivers of marine pollution with associated pollutants.

This briefing highlighted the needs of a further research to accurately evaluate and lessen the potential environmental impacts of litter in public spaces future actions. There is an urgent need for unconventional materials and product designs, and advanced approaches and policies to encourage desirable consumer behavior related to use, sanitation, collection, safe disposal and the prevention of littering. Finally, national and international campaigns for monitoring of aspects of single-use plastic is needed to facilitate research and guide future policy options (reliable up-to-date data collection on littering). Raising awareness to change behavior and municipal waste management (including efficient collection, safety, hygiene, and recycling schemes).

In summary, this short focus indicated a relatively low level of knowledge about COVID-19, particularly regarding disposal of PPEs, among laymen in the Middle Eastern countries. To the best of knowledge, this is the first attempt documenting the abundance of plastic debris on beaches in Egypt .

CONCLUSIONS

The most important lesson we learned from the COVID-19 pandemic is that we should prepare now for potential disruptive events in an uncertain future.

More collection bins for PPEs only should be installed in the cities. Used masks, used gloves, used personal clothes and all PPEs must be separately collected and discharged in closed garbage bags to transport them to final treatments (e.g. landfilling or incineration) safely.

Recyclable plastics should be used, rather than unrecyclable ones.

Governments should monetize the scavenging of plastics from waterbodies to reduce the eventual environmental cataclysm and save endangered aquatic wildlives.

Simply, good knowledge, optimistic attitudes, and suitable practices towards COVID-19 will help us to cope with the pandemic.

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