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Estimating marine plastic pollution from COVID-19 face masks in coastal regions

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ABSTRACT

Face masks are playing an essential role in preventing the spread of COVID-19. Face masks such as N95, and surgical masks, contain a considerable portion of non-recyclable plastic material. Marine plastic pollution is likely to increase due to the rapid use and improper dispensing of face masks, but until now, no extensive quantitative estimation exists for coastal regions. Linking behaviour dataset on face mask usage and solid waste management dataset, this study estimates annual face mask utilization and plastic pollution from mismanaged face masks in coastal regions of 46 countries. It is estimated that approximately 0.15 million tons to 0.39 million tons of plastic debris could end up in global oceans within a year. With lower waste management facilities, the number of plastic debris entering the ocean will rise. Significant investments are required from global communities in improving the waste management facilities for better disposal of masks and solid waste.

1. Introduction

Currently, the world is facing a major catastrophe due to the emergence of pandemic COVID-19. Due to its high contagiousness, the global community has adopted preventive measures to control its transmission and spread. One of the effective measures adopted by health workers and the general public throughout the world is the use of face masks. To prevent the transmission of the COVID-19 virus, several countries adopted the use of facemasks early, while others adopted it late. World Health Organization (WHO) also listed the use of facemasks in its guideline to stop the spread of the virus in public places (Worby and Chang, 2020). The global mask production rate has seen tremendous growth and will continue to rise in the upcoming years. As an example, globally, China is the major producer of global face masks. Face mask production in China increased to 116 million per day in February 2020, 12 times higher than usual (Adyel, 2020). The global face mask market’s value rose from 0.79 billion USD in 2019 to approximately 166 billion USD in 2020 (Phelps Bondaroff and Cooke, 2020). However, what proved to be an effective approach to slow down the transmission rate has now transformed into a severe environmental threat. Almost every country is prioritizing protecting public health over environmental health, which has badly affected policies regarding decrease usage of single-use plastics (Patrício Silva et al., 2020). Single-use face masks contain a significant portion of a polymer material such as polyurethane, polycarbonate, polypropylene, polystyrene, polycrylonitrile, polyethylene, or polyester (Fadare and Okoffo, 2020). With the rise in both consumption and production of face masks, the management of these used masks has become a global concern. The waste management system in developed and developing countries is not properly designed to handle solid waste and current pandemic waste (Aragaw, 2020). Although local and international authorities have framed many policies for the safe disposal of COVID wastes, their mass implementation has become challenging and daunting for authorities (Van Fan et al., 2021). As a result, inadequately managed masks thrown into the environment find their way into solid waste and act as a possible medium of transmission (Kampf et al., 2020; Klemes et al., 2020). Inadequate management of only 1% of face masks may contribute to waste of 30,000–40,000 kg per day (World Wildlife Fund, 2020). Apart from this, these face masks, under environmental conditions, break down into smaller sizes (less than 5 mm) particles and contribute to microplastic pollution (Zambrano-Monserrate et al., 2020). These particles enter both fresh water and coastal environments and poses a severe threat to the aquatic environment and lives (Gall and Thompson, 2015). Being small in size, these particles are easily accessible to marine organisms and enter into the food chain. Microplastic is already found in shellfish and other fish species (Smith et al., 2018). Consumption of microplastics pose severe detrimental effects on human health, such as chromosome...
Data on demography of coastal population and face mask acceptance across the globe.

Table 1

| Countries     | Total population 1000 people | Coastal population 1000 people | Coastal Length Km | Coastal population % | Face mask acceptance % |
|---------------|-----------------------------|-------------------------------|------------------|----------------------|-------------------------|
| Bangladesh    | 169,775                     | 93,037                        | 3306             | 54.8                 | 63                      |
| China         | 1,424,548                   | 341,892                       | 30,017           | 24                   | 84                      |
| Indonesia     | 272,223                     | 261,062                       | 95,181           | 96                   | 78                      |
| India         | 1,383,198                   | 365,781                       | 17,181           | 26.3                 | 80                      |
| Vietnam       | 88,360                      | 81,442                        | 11,409           | 82.8                 | 91                      |
| Sri Lanka     | 21,084                      | 21,084                        | 2825             | 100                  | 80                      |
| Philippines   | 109,703                     | 109,703                       | 33,900           | 100                  | 90                      |
| Thailand      | 69,411                      | 26,862                        | 7066             | 38.7                 | 86                      |
| Myanmar       | 54,808                      | 26,856                        | 14,708           | 49                   | 80                      |
| Pakistan      | 208,362                     | 18,961                        | 2599             | 9.1                  | 68.8                    |
| Malaysia      | 32,869                      | 32,212                        | 9323             | 98                   | 87                      |
| Japan         | 126,496                     | 121,815                       | 29,020           | 96.3                 | 83                      |
| South Korea   | 25,841                      | 23,774                        | 4009             | 92                   | 84                      |
| Korea         | 5450                        | 5199                          | 53,199           | 95.4                 | 23                      |
| Russia        | 143,787                     | 138,070                       | 110,310          | 14.9                 | 60                      |
| United Kingdom| 67,334                      | 66,392                        | 19,717           | 98.6                 | 71                      |
| Spain         | 46,459                      | 45,861                        | 7268             | 67.9                 | 95                      |
| Sweden        | 10,122                      | 8877                          | 26,384           | 87.7                 | 5                       |
| France        | 65,721                      | 26,026                        | 7330             | 39.6                 | 88                      |
| Germany       | 82,540                      | 12,051                        | 3624             | 14.6                 | 69                      |
| Italy         | 59,132                      | 46,773                        | 9226             | 79.1                 | 94                      |
| Greece        | 11,103                      | 11,014                        | 15,147           | 99.2                 | 80                      |
| Ireland       | 343                         | 343                           | 6437             | 99.9                 | 83                      |
| Finland       | 5580                        | 4062                          | 31,119           | 72.8                 | 52                      |
| Denmark       | 5797                        | 5797                          | 5316             | 100                  | 62                      |
| Netherlands   | 17,181                      | 16,047                        | 1914             | 93.4                 | 75                      |
| Belgium       | 11,620                      | 9645                          | 76               | 83                   | 85                      |
| Portugal      | 10,218                      | 9472                          | 2830             | 92.7                 | 87                      |
| Romania       | 19,388                      | 1221                          | 696              | 6.3                  | 87                      |
| Saudi Arabia  | 34,710                      | 10,482                        | 7572             | 30.2                 | 83                      |
| Iran          | 83,587                      | 19,977                        | 5890             | 24                   | 64                      |
| UAE           | 9813                        | 8331                          | 2871             | 85                   | 88                      |
| Nigeria       | 206,153                     | 52,981                        | 3122             | 25.7                 | 90                      |
| South Africa  | 58,721                      | 22,843                        | 3751             | 39                   | 78                      |
| Turkey        | 83,836                      | 48,206                        | 8140             | 57.5                 | 82                      |
| Israel        | 6714                        | 8417                          | 205              | 96.6                 | 78                      |
| USA           | 331,432                     | 143,510                       | 133,312          | 43.3                 | 73                      |
| Canada        | 37,603                      | 8987                          | 265,523          | 24                   | 78                      |
| Argentina     | 45,510                      | 20,525                        | 8397             | 45.1                 | 85                      |
| Brazil        | 213,863                     | 103,937                       | 33,379           | 48.6                 | 50                      |
| Chile         | 18,473                      | 15,055                        | 78,563           | 81.5                 | 86                      |
| Colombia      | 50,220                      | 15,016                        | 5874             | 29.9                 | 88                      |
| Australia     | 25,398                      | 22,808                        | 66,530           | 89.8                 | 32                      |
| New Zealand   | 4834                        | 4834                          | 17,209           | 100                  | 70                      |
| Mexico        | 133,870                     | 38,421                        | 23,761           | 28.7                 | 82                      |
| Costa Rica    | 5044                        | 5044                          | 2069             | 100                  | 87                      |

alteration, obesity, cancer, and infertility, to name a few (Sharma and Chatterjee, 2017). The presence of face masks is already found in many oceans, beaches and freshwater systems (Arduzo et al., 2021; De-la-Torre et al., 2021). Microplastic in the aquatic environment raises concern for public health as ocean and freshwater constitute a significant part of the global food chain. Moreover, plastic materials take longer a time to decay, and these materials will remain in the environment for centuries. Researchers carried out several analyses to estimate plastic debris in the ocean. Jambeck et al. (2015) estimated plastic waste generation for 192 coastal countries in 2010 and found that approximately 4.8 to 12.7 million metric tons (MMT) of debris had entered the global oceans. Law et al. (2020) estimated that in 2016 United States alone contributed five times higher plastic debris into the ocean than in 2010 (0.04–0.11 MMT). Lebreton and Andrade (2019) projected plastic waste generation till 2060 and reported that 91% of mismanaged plastic waste is transported via rivers to oceans. Lebreton and Andrade (2019) also reported an annual input of 5.1 million tons of plastics from land into oceans. The emergence of the COVID pandemic and the increasing usage of PPE and face masks have increased challenges in plastic waste management, especially for developing countries. However, thus far, no quantitative estimates exist on how much plastic will enter into oceans.
from used face masks. This analysis aims to estimate plastic debris entering oceans from disposable face masks used by the coastal population in 46 countries based on the coastal population, their behavioural dataset (usage of face masks), and existing waste management practices. Only two types of masks are considered (N95 masks and surgical masks), as their acceptance rate is higher among health workers and the general public. Daily and annual, face mask generation and mismanaged plastic waste from single-use masks are estimated. We hope that the estimation will shed light on the ongoing plastic waste generation and the detrimental impact of mismanaged face masks on the environment.

2. Material and method

2.1. Estimating face mask usage by coastal population

Daily face mask usage depends on coastal population percentage, mask acceptance rate by the general population, and the number of face masks used by an individual. Eqs. (1) and (2) estimates the daily and annual face mask usage by the coastal population (Sangkham, 2020, Akber Abbasi et al., 2020).

\[
DFU = \frac{\text{Coastal population} \times \text{CP percentage} \times \text{Mask acceptance} \times \text{Daily Mask Usage}}{10000}
\]  

(1)

\[
AFU = DFU \times 365
\]  

(2)

Data regarding coastal population, coastal length and coastal population percentage are taken from the Encyclopedia of Coastal Science and presented in Table 1 (Finkl and Makowski, 2020). Face mask acceptance rate in countries is obtained from international surveys (Statista. Com, Jones, 2020, Badillo-Goicoechea et al., 2020, Daily Tribune) (Table 1). It is assumed that a person uses a single mask daily, and 80% of these masks are surgical masks, and 20% are N95. This assumption was made, taking into account the cost associated with the masks. As N95 masks are more expensive than surgical masks, general people tend to use them while medical personnel use N95 masks.

2.2. Estimating mismanaged plastic waste and plastic debris

This study uses global solid waste management data compiled by the world bank (Law et al., 2020), which estimated national level waste composition data for approximately 175 countries. The percentage of plastic in MSW inadequately managed waste, and mismanaged waste is reported in Table 2. To estimate mismanaged waste, it is necessary to determine the percentage of inadequately managed waste in the MSW. Inadequate waste is defined as the unaccounted waste that can be openly burnt or that can find its way to an “open dump” and to “waterways.” These wastes can find their way into the ocean by tides, wind, wastewater outflows, and inland waterways. Mass of plastic waste transported by the different waterways varies from less than 1 kg per day to 4.2 MT per day (Jambeck et al., 2015). Since the transportation of these wastes is heavily dependent on local waterways characteristics, it is necessary to find a method that can extrapolate these results globally. In this research, the framework developed by Jambeck et al. (2015) has been followed to calculate annual mismanaged plastic waste (from face mask) produced by people dwelling within 50 km of the coast. “Mismanaged waste can be defined as the summation of inadequately managed waste and 2% litter” (Law et al., 2020). The percentage of litter (2%) was adapted from Law et al. (2020) due to lack of standards and incomparable methodologies, among other studies.

Also, data reported in other studies were based on piece count, not based on mass, and the litter’s size was variable. This does not signify the proper distribution of litter across the broader landscape. To estimate marine debris conversion from mismanaged waste, two scenarios have been considered. These scenarios are labelled as high (40%), and low (15%) and have been used to determine the number of plastic debris that enter into oceans based on estimates.
Table 3

| Countries     | Daily face mask usage | Daily SM generation in M | Daily N95 generation in M | Annual face masks in M |
|---------------|------------------------|--------------------------|---------------------------|------------------------|
| Bangladesh    | 32,120,094             | 25.7                     | 6.4                       | 11,724                 |
| China         | 68,925,427             | 55.1                     | 13.8                      | 25,158                 |
| Indonesia     | 1,95,483,225           | 39.1                     | 15.6                      | 71,351                 |
| India         | 76,539,522             | 61.2                     | 15.2                      | 27,037                 |
| Vietnam       | 6,1,364,918            | 49.1                     | 12.7                      | 22,398                 |
| Sri Lanka     | 16,867,200             | 13.5                     | 3.37                      | 6156                   |
| Philippines   | 98,192,700             | 78.56                    | 19.6                      | 35,840                 |
| Thailand      | 8,940,211              | 7.15                     | 1.78                      | 32,631                 |
| Myanmar       | 10,527,552             | 8.42                     | 2.10                      | 3843                   |
| Pakistan      | 1,1,77,478             | 0.94                     | 0.23                      | 430                    |
| Malaysia      | 27,463,951             | 21.97                    | 5.42                      | 10,024                 |
| Japan         | 97,062,192             | 77.64                    | 19.41                     | 35,428                 |
| South Korea   | 18,372,547             | 14.69                    | 3.67                      | 6706                   |
| Norway        | 1,1,35,981             | 0.91                     | 0.23                      | 415                    |
| Russia        | 12,426,840             | 9.94                     | 2.48                      | 4536                   |
| United        | 46,478,383             | 37.18                    | 9.29                      | 16,965                 |
| Kingdom       |                        |                          |                           |                        |
| Spain         | 29,626,206             | 23.7                     | 5.92                      | 10,814                 |
| Sweden        | 389,256                | 0.31                     | 0.077                     | 142                    |
| France        | 9,069,540              | 87.7                     | 31                        | 3310                   |
| Germany       | 1,214,017              | 7.26                     | 1.81                      | 443                    |
| Italy         | 34,777,596             | 0.97                     | 0.24                      | 12,694                 |
| Greece        | 8,740,710              | 27.82                    | 6.95                      | 1312                   |
| Ireland       | 284,405                | 69.2                     | 1.74                      | 104                    |
| Finland       | 1,541,935              | 0.22                     | 0.056                     | 563                    |
| Denmark       | 3,594,140              | 1.23                     | 0.31                      | 1312                   |
| Netherland    | 11,240,923             | 3.61                     | 0.79                      | 4103                   |
| Belgium       | 6,804,947              | 8.99                     | 2.24                      | 2989                   |
| Portugal      | 7,663,795              | 5.44                     | 1.36                      | 2797                   |
| Romania       | 63,736                 | 6.13                     | 1.53                      | 23                    |
| Saudi Arabia  | 2,610,018              | 0.051                    | 0.013                     | 953                    |
| Ireland       | 3,068,467              | 2.10                     | 0.52                      | 1120                   |
| UAE           | 6,231,588              | 2.45                     | 0.62                      | 2275                   |
| Nigeria       | 12,397,554             | 4.99                     | 1.25                      | 4525                   |
| South Africa  | 6,948,840              | 9.92                     | 2.48                      | 2536                   |
| Turkey        | 22,926,773             | 5.56                     | 1.39                      | 8388                   |
| Israel        | 6,368,302              | 18.34                    | 4.59                      | 2324                   |
| USA           | 45,362,076             | 5.94                     | 1.27                      | 16,577                 |
| Canada        | 1,682,366              | 36.30                    | 9.07                      | 614                    |
| Argentina     | 7,765,326              | 1.35                     | 0.34                      | 2834                   |
| Brazil        | 25,464,565             | 20.37                    | 5.1                       | 9295                   |
| Chile         | 10,616,786             | 8.5                      | 2.12                      | 3875                   |
| Colombia      | 3,964,224              | 3.17                     | 0.8                       | 1447                   |
| Australia     | 6,554,107              | 5.24                     | 1.31                      | 2392                   |
| New Zealand   | 3,383,800              | 2.71                     | 0.67                      | 1235                   |
| Mexico        | 9,136,514              | 7.31                     | 1.83                      | 3335                   |
| Costa Rica    | 4,388,280              | 3.51                     | 0.88                      | 1602                   |

This study aimed to estimate potential marine plastic pollution from the Covid-19 face masks in coastal regions. Behavioural dataset of face masks usage and solid waste management from the World Bank was used to estimate face masks usage in countries. Face masks acceptance among people is based on the infection rate. We have assumed that face masks acceptance remains consistent within selected countries, which may create inconsistency in results. Also, the distribution of surgical masks and N95 masks may vary among countries. Data regarding litter percentage and marine debris conversion was assumed from Jambeck et al. (2015). A conservative approach was adopted to estimate the conversion of marine debris from mismanaged waste. However, the situation can become worsen due to the lack of waste management facilities in poor and developed countries.

3. Results and discussions

3.1. Estimation of daily and annual face mask usage

The current study estimates daily and annual face mask usages in selected countries (Table 3). Table 3 shows that countries with higher coastal populations and face mask acceptance rates produced higher masks. Daily and annual face mask usage in Indonesia is higher than in other countries. Also, mask usage in Asian countries is higher than in other countries. It is estimated that approximately 289.63 billion face masks were used annually in Asian countries, while European countries contributed 61.02 billion face masks. The United Kingdom contributed the highest, and Romania contributed to lower masks generation among analyzed European countries. Table 3 also estimates that the number of surgical masks is higher than N95 masks. It is also seen that face mask acceptance among the general public varies among countries. Average face mask acceptance in Asian countries (above 65%) is higher than in European countries. Among the analyzed countries, Sweden (5%) and Australia (32%) have lower face mask acceptance. Acceptance of face mask among population depends on various factors such as governmental stricter policies regarding face mask, socioeconomic factors, existing cultural and social norms, infection rate, knowledge of the transmission mode of the disease, health prevention policies, behavioural factors, for example, frequently going out for work, shopping, attending public events and socializing outside home etc. (Badillo-Goiachea et al., 2020). Despite some exceptions, countries with higher infection rates use more face masks (Fig. 2). Among the analyzed countries, Sweden (5%) and Brazil (50%) have the lowest face mask acceptance with high infection rates. However, it is accepted that face mask usage will continue to increase until a safe and reliable vaccine is available for the general population.

3.2. Estimating mismanaged plastic waste and plastic debris into the ocean

Ongoing pandemic has exacerbated the plastic pollution. Increasing utilization of single-use plastic and heavy dependence on protective items such as face masks, gloves etc., among the general public will aggravate microplastic pollution. Due to delicate composition and risk of transmission, single-use masks are difficult to recycle, and if not properly managed, these masks enter into oceans as litter. These plastic particles can serve as a host of pathogenic microorganisms that could develop biofilms in future (Akber Abbasi et al., 2020). Van Doremalen et al. (2020) found that the SARS-CoV-2 virus can exist on the plastic surface for 72 h and impact living organisms. This situation will worsen for developing and underdeveloped countries where waste management is inadequate or non-existent.

This study estimates mismanaged plastic waste and plastic debris entering into oceans from the used face masks. From Table 4, it can be seen that the estimated annual plastic waste generated from mismanaged masks was 2.37 million tons in the analyzed countries. Indonesia topped the plastic waste generation contributing to 17.46%, while both Japan and the Philippines were responsible for 8% of plastic generation. Plastic waste generation in Asian countries (1.51 million tons) is significantly higher than in Europe (0.48 million tons) due to
higher acceptance of face masks and coastal populations. Similarly, the amount of mismanaged waste is also higher in Asian countries as waste management facilities in Asian countries are not as well developed as in most European countries. Table 2 shows that mismanaged waste percentage in Asian countries is higher than in European countries (highest Myanmar 100% and lowest South Korea 2%). Among the analyzed counties, mismanaged plastic waste is higher in Indonesia (0.25 million tons) and India (0.13 million tons). To estimate plastic debris entering into global oceans from mismanaged face masks, this analysis considered two scenarios (upper level of 40%, lower level of 15%). It can be seen that approximately 0.15 million tons to 0.39 million tons of plastic debris could end up in global oceans within a year. Again, countries with higher mismanaged waste, high per capita waste generation, coastal population and face mask acceptance rate are responsible for higher plastic debris that enters the oceans. The framework used in this analysis can be applied to determine the number of plastic debris and mismanaged plastic waste entering into oceans from COVID-19 face masks. Total mismanaged plastic waste generation is a function of coastal population size and mismanaged plastic waste percentage. Countries with a higher coastal population and higher mismanaged waste percentages produced a higher amount of mismanaged plastic waste. Also, it is seen that lower-income countries have a higher mismanaged waste percentage than upper-middle-class and high-income countries and are responsible for higher mismanaged plastic waste generation. Despite fast economic growth in LMC and UMC countries, waste management infrastructure is not well developed. As a result, a small portion of mismanaged waste will result in a higher number of plastic debris entering into oceans. These plastics, after reaching the marine environment, can sink or have different fates depending upon their characteristics. As stated earlier, various non-degradable synthetic materials are used in the making of PPE. Polymers having high density such as polyvinyl alcohol (PVA), polyvinyl chloride (PVC) and polyester (PEST) may end up at the bottom of the sea, while low density polymers such as polypropylene (PP), expanded polystyrene (EPS), and polyethylene (PE) can float (De-la-Torre and Aragaw, 2020; Fadare and Okoffo, 2020). Under the current scenario, collaborative actions are required from individuals, national and international authorities to protect oceans from plastic pollution. Promoting reusable face masks made from sustainable materials will help to reduce the amount of plastic pollution.

Cloth masks and biodegradable masks having proper filtering qualities (made from fabric, cotton, linen, fabric etc.) will mitigate pressure on single-use masks. Due to the increasing infection rate and widespread use of masks, many innovations in face masks have emerged. The emergence of self-cleaning masks and water-soluble masks are the ideal examples of these innovations. The government should come forward and encourage the usage of these masks through funding grants. Masks should be safely disinfected following proper guidelines for further reuse (Derraik et al., 2020; Barcelo, 2020). This will mitigate pressure in managing these enormous amounts of discarded masks. Due to COVID-19, recycling rates in many countries are still low. Recycling programs should be initiated, and necessary subsidiary incentives must be provided by authorities to enhance the recycling rate.

Proper disposal of used masks should be ensured from individual levels. Depending on the local waste management infrastructure and regulations, local authorities should formulate policies for ensuring the safe disposal of the used masks (Ilyas et al., 2020). Improper disposal should be strictly handled and subjected to punitive measures, such as fines. AI-based technologies, machine learning, and satellite imaging can handle the illegal dumping of solid waste (Abdallah et al., 2020; Dabholkar et al., 2017). In poor and underdeveloped countries, the government can use media to promote public awareness of masks’ proper disposal. Apart from these, international laws on controlling marine pollution should be revised and readjusted if necessary. Besides this, plastic generated from PPE due to COVID 19 can be transformed into resources after applying pyrolysis (Aragaw and Mekonnen, 2021). Aragaw and Mekonnen studied the thermoplastic nature of PPE and extracted fuel from them. Jung et al. also used pyrolysis and produced Hydrogen from COVID 19 face masks (Jung et al., 2020). Lee et al. (2021) used a catalytic fast pyrolysis process to synthesize aromatic compounds from COVID 19 face masks. These additional wastes created by this pandemic can be used to produce value-added products which will lead to the circular economy.

4. Conclusion

Increasing use of masks and PPE during this pandemic has contributed to ongoing plastic pollution. A massive number of plastic debris is entering the global oceans and are destroying the marine ecosystem. The need for taking urgent action is getting louder as this problem continues.
This analysis estimates COVID-19 face masks’ usage, mismanaged plastic waste, and plastic debris that may enter into oceans from 46 countries. It is estimated that approximately 0.15 million tons to 0.39-million tons of plastic debris could end up in global oceans within a year from the analyzed countries. Plastic waste generation from used masks in Asian countries (1.51 million tons) is significantly higher than in Europe (0.48 million tons). It is also noticeable that mismanaged plastic waste and marine pollution are higher in lower-income countries due to lower waste management facilities. As the pandemic progresses, usage of masks will increase, and also the pollution. As plastic materials remain in the environment for a long duration, and this will continue to destroy marine life. Face masks are now seen on sea beaches worldwide, which exposes the weakness in waste management infrastructures. Under these circumstances, immediate actions are necessary from local and international authorities to frame policies for ensuring safe face masks disposal. The analysis presented can help global and local policymakers to update their waste management policies before it is too late to protect our oceans.

CRediT authorship contribution statement

Hemal Chowdhury: Conceptualization, Writing – original draft, Writing – review & editing. Tamal Chowdhury: Investigation, Writing – review & editing. Sadiq M. Sait: Writing – review & editing.

Declaration of competing interest

The authors declare no conflict of interest.

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