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Introduction of PPE Kit as a New Pollutant in Environment

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ABSTRACT

The paper deals with the environmental issues that have been seen during the times of Corona. The main contributor to the depletion of environment because of corona virus is PPE kits used by doctors and health care workers for their protection from the virus. The issue of PPE kits pollution has not gained a momentum of limelight because people have not given it a shot about thinking on this issue and which is evident from the attitude of people with respect to masks which they throw on the streets and lakes after their use, thus people need to be made aware about this problem. The paper will also show how the authorities and hospitals are facing problem due to increased work load which leads to a situation where they cannot handle the waste properly which leads to mismanagement and thus improper disposal of PPE kits.

Various disposal and recycling methods are also shown in the research paper along with case studies.

Keywords: Biomedical, doctors, hospital, plastic.

I. INTRODUCTION

Since the outbreak of the global pandemic COVID-19 and imposition of lockdown in various countries so as to contain the spread of the disease people are using the term “the earth is healing” as humans are in their houses and there is lesser pollution but it is not hundred percent correct to say that “the earth is healing”. With the outbreak of disease there has been seen a huge growing need and demand of PPE kits i.e., Personal Protection Equipment kit, this PPE kit made up of single use plastic has given a new lease of life to plastic. The impermeable and non-porous characteristic of single use plastic has led to it being used by the health care workers for protecting themselves from the virus. India alone daily needs around 20-25 Lakh of PPE kits daily for its more than 40 Lakh health workers fighting against the virus. Also such kits need to be changed after every 8hours which will lead to more need and production of PPE kits. The production become such high that countries like India who produced 0 PPE kits have now become the 2nd biggest exporter of PPE kits in the world. According to Union minister

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Nitin Gakari India is expecting to become the largest exporter of PPE kits even with a cap of 50 lakh PPE export every day.

(A) Literature Review

1. Responsibility is needed when disposing of masks and gloves. (Article by WWF)

The article gives out a study that responsible ways are required in disposing of corona waste of gloves and mask as they are dumped at the end in see which affects the marine life also a factual description is given of effect of one mask disposed irresponsibly to the nature. The article is good for a factual understanding but lacks giving out the correct ways in which the waste should be disposed off.

2. How Face Masks, Gloves And Other Corona virus Waste Is Polluting Our Ocean.(By world Economic forum)

The article brought out various effects of single use plastic on the oceans and has given very important information that 8 million tonnes of plastics enter our ocean every year, adding to the estimated 150 million tonnes already circulating in marine environments, which had also been mentioned in the paper.

3. General Households To Cut And Store Waste Masks, Gloves For 72 Hours Before Disposing Of, Says CPCB. (Article by The Hindu)

The article is a very useful article for a common man to understand how to dispose of the corona virus waste according to CPCB guidelines, various steps are brought to light of disposing of different wastes in different ways but lacks giving factual information of amount of waste wrongfully disposed in the country.

4. PPE kit Disposal Problem elsewhere but not in Mysuru - Star of Mysore, Star of Mysore (2020)

The case study on the city of Mysuru is shown in which it gives out the steps taken by the Mysuru administration to tackle this problem and thus gave an effective SOP for the waste collection and dumping which brought them out as a role model for other cities.

5. No Shortage of Masks at the Beach - OCEANS ASIA.

The story was based on a waste found by ocean Asia's team on the Soko beaches where they found a lot of mask thrown away by people and the picture too was very famous taken by them, the information was useful as it shown the condition of one beach and gave a study of how much waste could be dumped in the Mediterranean Sea if this situation was left unnoticed.

(B) Research Questions

1. How does PPE Kit affect the environment?
2. What are the disposal and recycling methods used for PPE kits?

(C) Methodology

The research was based on the study of pollution caused by PPE kits in the environment and the disposal methods given by the relevant authorities, the research is based on the study of various news articles and blogs; also various statutes were referred to know the law described for biomedical waste management.

Apart from statutes various government notifications and guidelines were studied too.

(D) Limitations

While full efforts were made to do justice with this topic but still there were some limitation occurring during the research. As there was very less time for researching and drafting which was felt throughout the research work and lack of authentic information in the topic was also felt. The problem with material selection was also there because the aim was to use only reliable, authentic and trusted work. Also as there is a lot to study and a deep analysis is required for such a topic it was felt that the research done was not enough because of lack of content in relation to the topic.

II. THE IMPACT OF PPE KIT ON ENVIRONMENT**(A) Impact on Nature**

Plastic is harmful to environment as it non biodegradable and may take hundreds of years to disintegrate and also the chemicals released in making PPE kits(plastic) enter the animal tissue and enter into human chain. Medical PPE includes respirators, masks, face shields, goggles, gowns, coveralls, gloves and more, all of which are made of plastic material and are little-used before disposal. The respirators and surgical masks are commonly made from polypropylene, for example. Since everyday plastic items made of similar materials take up to 500 years to degrade in the ocean, these masks could be around for a long time. Similarly, gloves are commonly made from cheap and durable plastics such as polyvinyl chloride (PVC) or nitrile butadiene rubber (NBR), making them non-biodegradable with a very long shelf life.

With many others countries trying to eliminate the single use plastic from the earth India also started its campaign of making “India Plastic Free” by 2022 and also started campaigns like “My 10kg Plastic campaign”, the corona virus came as a speed breaker to all such moments.

The problem with PPE Kit which is made of single use plastic, is its waste management as plastic waste management has always been an challenge also proper disposal of it is necessary, because a world population of more than 780 crore humans wearing one or two single use masks daily, the amount of trash generated is going to be substantial. According to a WWF report, "if just 1% of the masks were disposed of incorrectly and dispersed in nature, this would result in as many as 10 million masks per month polluting the environment, weighing almost 40,000 Kg. of plastic in nature"². Such waste if not managed nor disposed of properly will lead to such waste ending up in the oceans which will cause harm the marine life. And such this picture has been seen by a team of OceansAsia in the Soko islands where along with the marine debris another thing noticeable were mask. Already every year in the Mediterranean, 5, 70,000 tons of plastic are dumped each year, an equivalent of 33,800 plastic bottles every minute, according to WWF and with the introduction of the PPE kits and masks we will soon see an increase in this number if these plastic equipments are not disposed of properly.

III. DISPOSAL AND RECYCLING METHODS FOR PPE KITS

(A) Disposal method of PPE Kit

The disposal of PPE kit with a proper process and precautions is necessary for both the environment and human society as the PPE kit used by health care worker and patients are treated as biomedical waste and such biomedical waste should be segregated from common waste and should be disposed of as per the Biomedical waste management Rules,2016.

With reference to Covid-19 waste management the pollution watch dog of India Central board of pollution control (CPCB) have issued certain guidelines on how to segregate collect and dispose of such waste.

The CPCB in its 4th revised guideline for Handling, Treatment and Disposal of Waste Generated during Treatment/Diagnosis/ Quarantine of COVID-19 Patients have also given certain guideline on management of used PPE kits which say that:

1. Waste masks and gloves in general households should be kept in paper bag for a minimum of 72 hours prior to disposal of the same as dry general solid waste after cutting the same to prevent reuse.

2. Discarded PPEs from general public at commercial establishments, shopping malls, institutions, offices, etc. should be stored in separate bin for 3 days, thereafter disposed of as dry general solid waste after cutting/shredding.

² Wwf.it. 2020. *Nello Smaltimento Di Mascherine E Guanti Serve Responsabilità*. [online].

3. In the hospitals the used PPE kits must be packed in double layered bag with yellow colour and labeled as Covid-19 waste also all the COVID-19 related waste must be sent through separate vehicles first and the vehicles should be sanitized after every trip.

4. From COVID-19 isolation wards, used PPEs such as goggles, face-shield, splash proof apron, plastic coveralls, hazmat suits, nitrile gloves must be collected into a red bag

5. Maintaining records of receipt, transportation and disposal of waste.

6. Such waste should be disposed of as per the schedule 2 of the Biomedical waste management act, which states that the yellow coloured waste should be treated by incineration/deep burial and the red coloured waste should be treated by Autoclaving/Microwaving/ Chemical Treatment.

7. CBWTF operator shall register on 'COVID19BWM' Tracking App developed by CPCB and also ensure registration of Waste Handler (with vehicle) for entering the data of COVID-19 biomedical waste received and disposed.³

(B) Ground Reality

There were many newspaper reports which claimed that corona virus waste was not disposed of properly in hospitals even in the country's premier healthcare facility, is grappling with the problem of dealing with used personal protection equipment generated since March. Where tyvek and other safety equipments like N95 mask generated from patients are lying in the premises for more than 2-3 days which was not advisable⁴.

Another report of times of India stats the incident of pune where there was a complaint of open dumping of biomedical waste from Indira Gandhi Government Medical College and Hospital, a COVID dedicated hospital, after the complaint the NMC and hospital administration remove the hazardous waste from the premises. Some citizens also claimed that the hazardous waste in red, black and yellow bags were brought from inside the DCH and dumped in the parking lot.⁵

The hospitals complain about the increase in biomedical waste by 80% due to corona virus as there is a increased usage of PPE kits also many volunteers also arrive at the hospitals to collect the dead bodies and then latter through the PPE kits after their job is done.

These incidents were reported in metropolitan cities like Pune and also from country's premier hospital AIIMS if this is the condition of waste management at such big places than we could

³ Cpcb.nic.in. 2020. [online].

⁴ Thacker, T., 2020. *Rising PPE Waste Another Concern Facing AIIMS, Now*. [online] The Economic Times.

⁵ News, C. and News, N., 2020. *Covid Waste Lies In Open, Mayo Blames NMC Contractor | Nagpur News - Times Of India*. [online] The Times of India.

imagine what would be the picture of smaller cities and hospitals.

This situation has risen because of increase of work load on the hospitals and sanitization departments during the pandemic. The hospitals have to fight the virus as well as manage the waste produced because of the safety kits. Also the amount of biomedical waste generated during this time has increased substantially. According to a latest report filed by the Central Pollution Control Board (CPCB) in the National Green Tribunal, India generates about 101 Metric Tons per day (MT/day) of COVID-19 related bio-medical waste. This quantity is in addition to normal bio-medical waste generation of about 609 MT per day.⁶ With the increase in the amount of waste generate it has become difficult to dispose of the waste properly to overcome the situation the CPCP must ensure that the guidelines given by it are followed by the respective authorities at the ground level.

1. Scenario of the state with cleanest city and cleanest capital: Madhya Pradesh

When we talk about waste management and pollution it is important for us to know what is happening in the cleanest city of India i.e., Indore and the cleanest capital among 35 capitals in country i.e., Bhopal.

In November a petition was filed in the national green tribunal, where the petitioner alleged that the state government is not taking proper steps for biomedical waste management and that the covid-19 related waste was not managed properly in the state. Also the counsel alleged that though the state has the statistics on waste production in the hospitals and other health care center but it does not have any record of Covid waste generated in the streets, localities and markets and that no disposal protocol was followed.

While the state government was of different view and it presented records of Covid waste production in the states private and government hospitals and health care centers and stating that it said that the approximately 10,900kg of covid-19 waste is generated in the state and also said that the inspectors of the MPPCB (M.P. Pollution Control Board) make regular visits at places to check that the biomedical waste generated is disposed of properly and also that there is a proper SOP designed for its waste management. In its judgment the NGT ordered the state government and form an action taken committee in this respect.⁷

⁶ NDTV-Dettol Banega Swasth Swachh India. 2020. *Waste Management During Coronavirus Pandemic: 27-Year-Old Recycles Bio-Medical Waste Into Eco-Friendly Bricks | Waste Warriors*. [online] Greentribunal.gov.in. 2020. [online].

⁷ Staff Reporter, Covid-19: Plea in NGT over disposal of masks, gloves in public places, offices in MP Free Press Journal (2020).

2. Bihar Elections

As we know that elections are the backbone of democracy but “the calcium for this backbone came at a price of 160 tones of biomedical waste generation” in the first elections after lockdown. Everyone had its eyes on the election commission, that how they will conduct the elections with necessary precautions. Though the elections were completed without any obstacle but the total biomedical waste generation in the elections was almost 160 tones which included 18 lakh face shields, 70 lakh face masks, 5.4 lakh single-use rubber gloves for polling and security personnel, 29 lakh hand sanitizer bottles of 100 and 500 ml for the safety of voters & polling personnel amid pandemic. All these items were procured by the election commission for the safety of voters including 7.21 crore of single use polythene gloves for every voter to press the EVM button and thus lead to an equivalent amount of plastic waste generation.⁸

The election commission says that in all the districts they had BMW disposal agencies but it was a question that if all the agencies worked for the elections during polling day, who reached looked after the waste of hospitals? Well the elections are now over but it has to be taken care from the next elections to minimize the use of plastics in the election as it in every election we use single use plastic glove then in the general elections of India we would be required approx 140 crore of single use plastic glove production which will do nothing but harm environment.

(C) Reuse and recycling of PPE kits:

We know that plastic takes hundreds of years to get decomposed and thus we need to find out an alternative to the PPE Kits. A new report in the journal *Science* led by researchers from Pew charitable trust and SYSTEMIQ states that nearly 80% of plastic pollution could be resolved by 2040 using current technologies and knowledge.

The example of such technology is given by:

1. The critical care decontamination system. This is a container made by a company in Ohio which can decontaminate up to 80,000 items of PPE at a single time.
2. Scientists at the University of Nebraska are researching whether ultraviolet light can decontaminate masks and respirators.

⁸ Navya Singh, Poll Staff, Voters Generated 160 Tonnes Of Biomedical Waste During Bihar Elections Theologicalindian.com (2020).

3. Biodegradable gloves are available, which can decompose in landfill in two years⁴. The Reel shield flip. This is a face visor made from paper board and wood pulp cellulose, meaning it can be composted at home. It is being sold at the same price as plastic alternatives (100 for £150).⁹

India has also contributed towards finding a better way of recycling the used PPE Kits: Dr. Binish Desai also known as recycle man of India, a 27 year old man from Gujarat who came with an idea of P-Block 2.0 in which he upgraded his previous innovation of P block bricks which he came up with at the age of 23 and made out bricks out of waste produced by paper mills. And now after four years he upgraded his innovation by using biomedical waste in making these bricks and has named it as “P-BLOCK 2.0”. The first step is of collecting and disinfecting the waste by leaving it untouched for 3 days and then disinfecting in line with CPCB’s guidelines. And then process of making bricks starts and each brick contains 52% of biomedical waste (PPE Kits and mask), 45% of paper waste and 3% of a special binding material. He claims that this brick is lighter and stronger than the previous version of p block brick and also it is ecofriendly, recyclable and cost efficient as it costs Rs. 2.8 per brick as compared to normal brick priced Rs. 4 per brick.¹⁰

There are many ways in which the plastic waste can be recycled, the scientists call for the PPE waste to be converted into fuel using pyrolysis — a chemical process for breaking down the plastic at high temperature between 300 to 400 degree Celsius for an hour without oxygen.¹¹

The above claims and innovations show that if plastic managed and innovations promoted plastic can be recycled, but for it to be recycled it has to be collected efficiently as plastic when not collected it may cause a threat to environment. According to UNEP’s Global Environment Outlook, about 8 million tones of plastic end up in ocean each year. This no. will certainly grow if we do not handle the plastic waste of PPE kit properly and the above mentioned methods of recycling will only remain on paper if there is no proper management and collection of PPE kits.

(D) A case study on Mysore

In the time of corona every city, state and even countries are facing problem with the disposing off of the PPE kits as it is and havoc to see irregular dumping of PPE kits here and there and

⁹ The Conversation. 2020. *Healthcare Is Still Hooked On Single-Use Plastic PPE, But There Are More Sustainable Options*. [online].

¹⁰ NDTV-Dettol Banega Swasth Swachh India. 2020. *Waste Management During Coronavirus Pandemic: 27-Year-Old Recycles Bio-Medical Waste Into Eco-Friendly Bricks | Waste Warriors*. [online].

¹¹ NDTV-Dettol Banega Swasth Swachh India. 2020. *COVID-19: Disposed Personal Protective Equipment Could Be Turned Into Biofuel, Say Indian Scientists | News*. [online].

sometimes it is no one's fault but lack of equipments and resources had led to such a condition. Even a city like Mysore faced such a problem where the administration was all tensed and was on fire because of the irregular dumping, but the district administration found its way through it by proper planning and day and night efforts of each and everyone assigned with this task. In Mysore approximately more than thousand PPE kits are used by doctor, healthcare workers, patients, persons visiting crematorium and other and to dispose and manage all this is a big task. It was noticed that the people visiting the crematoriums threw their PPE kits irresponsibly and exposed other people to the deadly virus, which had become an big issue and to solve this the Karnataka pollution board took various steps, one of which being lessening the burden of the MCC and appointing two other agencies whose sole task would be to deal with masks, gloves, gowns and in short every item of the PPE kit and thus the burden was taken off from the MCC and they were left only with the duty to collect and manage the other wastes such as leftover food, disposals, plastics plate and other such item from the hospitals, home quarantine patients, etc.

The main job of these agencies was to go on to every hospital private and government, home of quarantine people and other places where there are PPE kits used and collect all these PPE kits in red bags before their disposals and also their task was to visit the isolated houses two times a day and collect all item used by the patient in a yellow bag and after a certain period of time according to the SOP they were disposed off.

The PPE kits used by people in crematorium and burial ground are collected by the MCC staff, stored separately in red bags and then handed over to agencies concerned and separate mechanism to deal with this dry waste disposal. Now, everything is going smoothly due to co-operation of two agencies.¹²

The thing from which we can take inspiration from the above case study is that though everyone is facing the same problem and Mysore too faced that problem a couple of months ago but they overcame that problem and are in better position today because of their different approach towards the problem as they didn't pressurized the pre occupied hospital management or the municipality staff for this problem rather they lessened their burden and set up two different agencies for this task, whose sole purpose was to ensure that the PPE kits waste was managed properly and this had been made possible by the combined effort of the MCC and Karnataka Pollution Board.

¹² PPE kit Disposal Problem elsewhere but not in Mysuru - Star of Mysore, Star of Mysore (2020)

IV. CONCLUSION

After studying various environmental problems and health problems which may be caused by the improper disposal of PPE kits, we can draw a conclusion that the disposal of PPE kits is way too important that to by following the SOPs given by authorities. Also it is seen a grave problem that the waste collection authorities and hospital management face because of the excessive generation of biomedical waste which has led to an increased work pressure on these corona warriors, to overcome this problem innovations need to be brought up like that which Dr. Desai has found of recycling the PPE kits which is a quit useful innovation which not only will reduce the PPE kits which are not easily decomposable to be used as bricks and also will lead to less pollution in the environment and thus many such innovations need to be brought in public light. Furthermore it is important that we as common people dispose of over masks and other “corona accessories” as per the directions of the authorities so that it lessens there burden and they can focus on the biomedical waste management required in hospitals and other places where the maximum focus is needed.

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