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AN OVERVIEW ON THE POSSIBLE CHALLENGES ON WASTE DISPOSAL DURING COVID-19 PANDEMIC

NYATHI S* AND OLOWOYO JO

Department of Biology, P.O.Box 139, Sefako Makgatho Health Sciences University, Pretoria, South Africa

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ABSTRACT

The COVID-19 pandemic has changed the quantity and composition of waste all over the world. This review documented possible challenges on the management of waste due to the pandemic since more infectious waste is being produced from healthcare facilities, isolation and quarantine places. The information was collected from various scientific research papers, publications by different governments and institutions. Included in this review was discussion on how COVID-19 has changed the quantities and composition of the different types of waste. The review showed that from developing countries, if strict restrictions are not in place, it is possible for waste pickers to get infected with COVID 19 during waste separation. The current method of waste disposal in many countries may seem inadequate looking at the different forms in which people might become infected. Solutions suggested by different institutions or governments worldwide have also been discussed taking into account the developed and less developed countries. This paper recommends further research to get the exact data on the increment of both municipal solid waste and medical waste from different municipalities and healthcare facilities once the lockdown restrictions are eased.

KEY WORDS : COVID-19, Medical waste, Municipal solid waste, Quantity and composition of waste, Infectious waste, Waste management

INTRODUCTION

The corona virus disease known as CoVID-19 was first identified in China in December 2019. It is caused by a virus referred to as SARS-COV-2 and was declared as a pandemic on 11th of March, 2020 (COVID-19, 2020). At the time of writing this paper, COVID-19 had spread worldwide with the number of cases totalling 31 361 979 and 965 742 deaths (John Hopkins University Coronavirus Resource Centre, 2020). The first case of COVID 19 was reported in South Africa on the 3rd of March 2020. At the time of writing this article, the number of cases had risen to 661 936 while the total death from COVID-19 was 15 992 (sacoronavirus). According to the World Health Organisation (WHO) 2020, COVID-19 is transmitted through channels such as body contacts and respiratory system. It was also later suggested that COVID 19 could be airborne and as such everybody was mandated to put on a facemask in order to prevent the spread. In light of this, the WHO has given guidelines on how to better fight the virus which include social distancing and the use of personal protective equipment (PPE) such as masks, gloves, aprons and goggles for health care workers. In line with these guidelines many governments in the world have encouraged people to put on face masks when they are in public (Nzediegwu and Chang, 2020). The use of different types of PPEs by citizens will definitely generate a large quantity of waste that has to be managed effectively (Kalina and Tilley, 2020)

To achieve social distancing and control COVID-19 as recommended by WHO, nationwide lockdowns were introduced by most countries. These lockdowns resulted in cleaner rivers and reduction in green house gases worldwide but created a new problem of solid waste management (Gardiner, 2020; Chen *et al.*, 2020; Vaghefi, 2020). Various harmful and medical waste that include

Corresponding author's email: nyathisenzeni@yahoo.co.uk

contaminated masks, gloves, and other protective equipment, along with high volumes of non-contaminated substances of similar nature are produced during an outbreak (UNEP, 2020: Vaghefi, 2020). Furthermore, since many governments worldwide have encouraged people to work from home so as to observe social distance, there has been an increase of online shopping for food and other necessities. This has resulted in the production of more domestic waste in the form of both organic and inorganic (Zambrano-Monserrate *et al*., 2020: Vaghefi, 2020). If there are no proper collection systems in place, the general municipal solid waste will be contaminated with the virus leading to a health risk to handlers of the waste (Bhakta Sharma *et al*., 2020).

This review evaluates the possible challenges on waste disposal during the covid-19 pandemic and the extent of understanding the importance of proper waste management strategies during the fight against the spread of COVID-19. We also hope that this review will encourage other researchers to investigate how far the Covid-19 pandemic has altered the composition of MSW and how best to deal with the waste in order to avert health and environmental catastrophe when the next pandemic strikes, particularly in the developing countries.

Types of wastes and possible changes to composition and quantity due to COVID-19

The types of waste produced worldwide are: Municipal Solid Waste and Medical waste,

Municipal Solid Waste

Municipal solid waste is composed of solid waste that comes from households and industrial or commercial settings (Tariwari *et al*., 2015). The household or domestic waste is collected from residential places, streets, marine areas, parks as well as litter bins. Industrial or commercial waste is collected from hotels, restaurants, shops, offices and all the other industries but does not include hazardous and construction waste (Kadir and Abidin, 2016). The industrial and commercial waste will drop during the lockdown periods imposed by most countries worldwide (IFC, 2020; Naughton, 2020; Veghafi, 2020; Dente and Hashimoto, 2020). Regarding domestic waste, it has increased in quantity due to a large number of people shopping online. Online shopping has increased the quantity of plastics and cardboard boxes (Zambrano-Monserrate *et al*., 2020; Veghafi, 2020; Nghiem *et al*., 2020; Cesaro and Pirozzi, 2020). Besides online shopping household waste increased due to spoilage since in some countries people hoarded food and other things that they perceived to be necessary during the lockdown periods (Naughton, 2020). In general, the municipal waste has increased in quantity, devastating existing waste collection systems and sites where this waste is discarded (IFC, 2020).

The MSW might contain more food waste from food producers during the initial stages of lockdown. In the United states of America (USA) and India, it was reported that a huge amount of food waste was produced by farmers due to closure of schools and the hospitality industry and other institutions that usually buy big quantities of food from farmers (Waste 360, n.d.; https://www.waste360.com/food-waste/new-challenges-and-solutions-food-waste-duringcovid-19-pandemic: FAO, 2020). Furthermore since the COVID- 19 existence, PPE is no longer used in the healthcare sector only but also in domestic settings which might increase harmful PPEs within MSW (Singh *et al*., 2020; Nzediegwu and Chang, 2020; UNEP, 2020). Plastic being the major component of PPEs, it will increase the amount of plastic going to landfills.

Medical Waste

According to Anwer and Faiza (2020), although not all medical waste form hospitals and laboratories is a threat , even tiny quantities of harmful waste is sufficient to spread the virus and deter the efforts of controlling COVID-19. Everyday medical waste consist of sharp objects, anatomical or pathological waste and hazardous waste that include contaminated personal protective equipment and bandages that might contain viruses, body fluids , blood and non-harmful substances such as cardboard, plastic, textiles and synthetic material (Kalogiannidou *et al*., 2020; Alverson, 2020). Noxious waste such as radioactive substances, chemical waste and expired drugs may be found in medical waste (Alverson, 2020)

Scholars concur that medical waste is bound to increase worldwide during the COVID-19 pandemic due to the increasing number of people getting infected on a daily basis. In India, it has been reported that the quantity of medical waste generated from patients has risen to 15 times more while in Wuhan, china where the COVID-19 virus was first detected, reported an average of 240 metric

tonnes compared to their usual less than 50 tonnes per day (Calma, 2020). In Iran it was reported that medical waste generated in Tehran between March 2019 and January 2020 ranged from 52 to 74 tonnes daily but during COVID-19 pandemic it has surged to between 80 to 110 tonnes daily (Daryabeigizand and Vaezi Heir, 2020). It is of importance to also note that the increase of medical waste during the pandemic will be exacerbated by the fact that medical waste is no longer produced in health facilities alone but also in households, quarantine and isolation facilities as well.

Impacts of covid-19 on waste management

Major business that produce huge amounts of waste were closed during the lockdown periods worldwide, this led to more waste being produced in agricultural sectors, residential areas and medical facilities (Naughton, 2020). The handling of both medical waste and MSW should be paramount during the pandemic since some people who are COVID-19 positive are isolating at home and some are in designated quarantine facilities. Scholars like Kampf *et al*. (2020) have revealed the prolonged survival of COVID-19 on inert surfaces (plastic, glass, metal, and cardboard) for up to 9 days. This continued existence of COVID-19 on immobile surfaces may lead to an outbreak through biomedical waste from places that deal with COVID-19 patients (Chan *et al*., 2020; Anwer and Faiza, 2020). The waste produced during treatment of infected patients maybe another avenue by which COVID-19 is transmitted besides person to person contact and touching infected surfaces (Anwer and Faiza, 2020).The waste emanating from quarantine facilities and healthcare facilities if it is muddled up with general waste, might result in community spread of COVID-19 (Anwer and Faiza, 2020: Vaghefi, 2020: ADB, 2020). It is important to note that community spread will be very easy particularly in the developing countries where the poor engaging in waste picking for survival do not have protective equipment.

During the outbreak of the COVID-19 pandemic, most countries came with several measures to try to combat the diseases. Some of the measures introduced are similar while others differ from country to country or even city to city depending on the extent of the spread. A good example is the separation of waste for recycling. In Tehran (Iran) lawful separation and recycling of MSW was ceased due to the possibility of spreading the virus (Daryabeigizand and Vaezi Heir, 2020) while Italy and most of the countries in the European Union (EU) have banned separation of waste in the households with infected people (Zambrano-Monserrate *et al*., 2020; ACRPLUS, 2020). In the United States of America (USA) certain cities that were concerned about the spread of COVID-19 in recycling centres stopped recycling while in the United Kingdom (UK), where waste has been classified into different categories , waste falls within medium and low and is collected weekly or fortnightly (Zambrano- Monserrate *et al*., 2020; DEFRRA, 2020). While these measures of recycling might work very well for the developed countries, in the developing countries it can be difficult because recycling is both formal and informal with the bulk of recycling materials collected by the informal waste pickers(Nyathi *et al.,* 2018). The informal waste pickers cannot afford to buy protective equipment hence they are at higher risk of Covid-19 (World Bank, 2020). The informal recycling might be a source of infection to most informal waste pickers from developing countries since according to scholars such as Chan *et al*. (2020) Covid-19 can survive on immobile surfaces for up to 9 days.

In most developing countries, waste pickers collect recyclables from streets and also from landfills. With this pandemic , the waste pickers are at risk of contracting COVID-19 from domestic waste coming from residential place with COVID-19 patients self isolating at home if the waste is not properly managed. The formal waste workers will be affected as well and ultimately the whole population (Gomes Mol and Caldas, 2020). Restrictions on recycling due to the COVID-19 pandemic led to recycling companies having problems in recovering recyclable materials leading to lose of income (Cesaro and Pirozzi, 2020).

Another challenge brought back by COVID-19 seems to be the increase of single use plastic bags because of expediency and hygiene purposes (Singh *et al*., 2020). In countries where campaigns against single use plastics had become successful, there will be a setback since this practice will be entrenched in their minds (Naughton, 2020: Kalina and Tilley, 2020). An increase in the manufacturing of PPEs exacerbates the existence of plastics in the environment because the major component of PPEs is plastic. Ordinary people are now also using protective equipment such as masks and gloves, discarding them recklessly without any consideration to environmental degradation. In

Hong Kong there have been reports of masks discarded in beaches and oceans (WHO, 2020).

Suggested measures for addressing challenges of waste management during the COVID-19 pandemic

A number of suggestions to address challenges of waste management during this pandemic have been suggested by several scholars, the World Health Organisations (WHO), governments and other institutions. Some of the suggestions maybe easily applied in the developed world where the infrastructure is well developed and funds are easily available but challenges maybe experienced in the less developed world. During the pandemic a major problem is the possibility of infectious waste being mixed with domestic waste since a lot of people who test positive for COVID-19 are asked to self isolate at home. This will be of high risk especially in developing countries where informal waste pickers go around the streets of residential areas seeking for recyclables to resale.

In order to deal with the waste from places where people are self isolating, UNEP, (2020) suggested that medical waste such as contaminated PPEs must be treated as dangerous hence it should be separated from the rest of the household waste and collected by specialist municipality workers or waste management operators. This suggestion might be easy to implement in the developed countries but might not be in less developed countries due to extra finances needed to train municipal workers or for the municipalities to hire private companies specialised in waste management.

ADB (2020) further recommends treating MSW as not recyclable and discarding it in sanitary landfill sites with enhanced security and management in order to keep away informal waste pickers. It also accentuated the need for increasing infrastructure for waste management so as to limit the spread of COVID-19 and other diseases due to additional medical waste. Again these suggestions are very good but will also still be a challenge in less developed countries where the most vulnerable of the society depend on waste picking due to job scarcity hence they will still continue seeking for recyclable material. Furthermore, some landfill sites are not even fenced and even those that were once fenced, the fences might have been vandalised. The local governments might not have resources to repair or erect fences or increase infrastructure because most resources are being channelled to fight COVID-19.

According to UNEP (2020), proper management of surplus solid waste will be a challenge during and post COVID-19 outbreak hence Kulkarni and Anatharama (2020) suggested that the solution to deal with large amounts of waste will be thermal treatment in order to recover energy. This will be a very sustainable solution since the thermal energy recovered can be easily converted to electricity. Furthermore methane gas can also be recovered from the waste and be used as fuel. Converting waste to energy decreases the volume of waste that ends up going to the landfills (Kumar and Samadder, 2018; World Bank, 2018). While the recovery of energy from waste is a sustainable approach for getting rid of waste, the facilities should meet stringent guidelines so as to avoid environmental pollution by toxic substance from the burning of waste. According to Meyer *et al*. (2019) most of the developed countries have the infrastructure for energy recovery from waste since they are turning away from landfills due to lack of land or environmental concerns but most of the developing countries do not have the required infrastructure. This means that the developing countries need to find means in the form of sponsorship or aid if their own governments do not have sufficient funds to develop proper infrastructure to convert waste to energy.

When it comes to handling medical waste the WHO, (2020) recommends thermal treatment under controlled conditions or utilisation of biocidal substances that destroy coronavirus for the waste treatment and removal in the healthcare facilities. It is important to note that local waste management agencies could provide mobile incinerators or autoclave units in the city for disposing of the extraordinary amounts of single use PPEs (Singh *et al*., 2020: ADB, 2020). It is recommended that medical waste produced by self isolating patients should be separated by double bagging; tying the bags and the outside of the bags sanitised and disposed of instantly if there is dedicated medical waste collection. Where dedicated medical waste collection does not exist, the bagged waste should be stored for 72 hours and then discarded with general waste (ADB, 2020; Vaghefi, 2020; Maria *et al*., 2020; ACR+, 2020). When this type of waste is collected, the recommendation is to avoid using vehicles which have automatic compaction systems since they can easily spread the virus because of high

moisture content of the waste, resulting in overflow of leachate from these collection vehicles (Daryabeigizand and Heir, 2020; Maria *et al*., 2020). Kempf *et al*. (2020) further recommends that the infected waste when taken to landfills for disposal should be placed in specific areas that are visibly categorized and be covered on a daily basis using water proof liners. These are good suggestions since covering on a daily basis will prevent scattering of the waste and also in the developing countries, it will prevent informal waste pickers from picking the contaminated substances while water proofing liners will prevent leachate from contaminating the surrounding environment.

CONCLUSION

The purpose of this review was to highlight the possible challenges on waste disposal during the COVID-19 pandemic particularly with respect to changes in composition and quantities. Having analysed articles by different scholars, clearly COVID-19 pandemic has presented challenges on waste management worldwide. The pandemic has not only increased the amounts of MSW and medical wastes but it has also changed their composition as well due to increased use of PPEs of different types in health care centres, quarantine centres, residential areas, work places and by the general public at large. This has brought about immense challenges for all governments worldwide in the way the waste is managed in order to avert the spread of the virus particularly in developing countries.

The researchers recommend further investigation on the impacts of COVID-19 on waste management. This could be done by collecting the exact data from places like Municipalities, industries, hospitals, care homes, and landfill sites managers once lockdown restrictions are eased. This will give a true picture of how the waste has increased and changed in composition during the pandemic. At the present moment data on changes on MSW and medical waste is inadequate. If the exact data is collected, it will assist governments worldwide to come up with strategies of waste management during times of pandemics so they will be well prepared when the next pandemic strikes.

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