



ASSESSMENT OF HOSPITAL WASTE GENERATION IN COVID-19 PANDEMIC-A COMPARATIVE STUDY

Dentistry

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ABSTRACT

The sudden outbreak of the covid 19 virus has led to significant increase in biomedical waste, consequently, safe disposal of a large quantity of waste has become a more serious concern. In this study, the effect of covid 19 outbreak on medical waste was evaluated via assessing the solid waste generation, composition and management status in 2 government and 2 private health institutions of North India. The results indicated that the epidemic covid-19 leads to increased waste generation on an average of 128.25% in both private and government hospitals. Changes in plans and management measurements such as increasing the frequency of waste collection per week leads to lowered risk of infection transmission from medical waste in the studied hospitals.

KEYWORDS

Covid-19, Biomedical waste management, waste generation.

INTRODUCTION

Ever increasing population growth in cities has led to an increased production of various types of wastes, in particular, biomedical wastes¹. Biomedical waste is defined as any waste, which is generated during the diagnosis, treatment or immunization of human beings or in research activities pertaining thereto, or in the production or testing of biologicals².

The medical waste management includes waste segregation, storage, transportation, disinfection and final disposal. Proper management of medical wastes in order to control its corresponding risks on health and to prevent the transmission of infections such as Hepatitis, AIDS and Typhoid is a necessity¹.

The risk of infection with Corona virus disease 2019 (COVID -19) has been found higher for people in close contact of a confirmed case of COVID 19, Health care workers, family members, or people living in or recently been to an area with ongoing spread of COVID -19. Considering the transmission of Severe Acute Respiratory Syndrome Corona virus 2 (SARS – CoV-2) globally and utilization of personal protective equipment (PPE) led to excessive biomedical wastes generation, which has become a new major threat to humans and the environment. Improper handling of hospital wastes might aggravate the spread of SARS-CoV-2 to medical staff and people who handle wastes³.

Proper BMW management in accordance to the stipulated rule was one of the neglected aspects of health care for years, especially in developing countries like India. In addition to the BMW Management Rules, 2016 by Government of India, Ministry of Environment, forest and Climate Change which prescribed simple categories for segregation of different BMWs, an amendment in 2018 also came into force with the aim to improve the compliance to the rules⁴. Amidst the COVID -19 pandemic, the scenario might worsen as evidenced by some initial experiences, with piles of PPE accumulating in the hospital⁵.

The aim of this study was to evaluate effects of Covid -19 on the quantity, composition and management of medical wastes in order to identify the challenges posed by the epidemic on medical wastes management. Therefore, four hospitals in North India were surveyed and their wastes management activities were compared with before COVID -19 pandemic.

METHODS

In this study, four hospitals including two private and two public hospitals in different areas of North India were surveyed in terms of waste generation, waste composition and waste management. The project proposal was submitted to institutional Ethics Committee and

clearance obtained. The data were collected by interviews with staff, responsible for waste management in different hospitals.

Classification of produced waste in given hospitals was done according to the model presented in Table 1, which is common in waste management system in India. For the given hospitals, the general characteristics of waste management activities is summarized in Table 2.

Data were reviewed and analyzed in the two period of before and during Covid -19 pandemic via Statistical T- Test and 95% confidence interval, to understand the impact of epidemic on waste generation, waste composition and status of hospital waste management.

RESULTS AND DISCUSSION

The results showed that Covid-19 pandemic has increased the waste generation rate in the studied hospitals. According to Table 3, the waste generation rate were not the same, on average, 128.25% increases were observed for daily waste generation rate in four studied hospitals. Waste generation surveys provide an estimate of quantity of wastes generated and also the type of wastes. Estimation of quantity of waste is an important activity to plan the safe management of health care wastes.

Increased wastes generation rate in health care establishments during Covid -19 pandemic were reported in similar studies⁶. Increased hospital waste generation in all communities is predictable for some reasons including the increase in number of patients admitted to the hospital. The results of this study showed that although an increase in waste generation was seen in all hospitals, however, the ratio of increase ranged from 0.2 to 1.68 kg/bed/day. The average waste generation rates per patient bed in the time before the epidemic and during the epidemic, were found to be 0.75 and 1.64 kg waste per day per bed, respectively.

Also, the ratio of infectious waste has increased in most hospitals, this ratio increased by an average of 50.75 % for given hospitals.

Considering the increase in the ratio of infectious waste compared to before the Covid 19 pandemic, a change in hospital management activities based on the new conditions is required to decrease the possibility of disease transmission from the waste mass⁷. The results showed that the management of medical waste in studied hospitals has a satisfying status, which is due to the proper management of hospital waste as a serious threat to health and environment in recent decades in India. However in some countries there is a concern about the spread of the virus due to poor management of infectious waste.

As shown in table 4, the management of medical waste in studied

hospitals in the stages of segregation, storage, disinfection and transportation shows that the increase in quantity and infectious potential of waste in Covid -19 pandemic was on range of storage and disinfection equipment in hospitals. the use of autoclave as a common method of waste disinfection in hospitals as well as on-site use of this equipment provides a good model for medical waste management in epidemic. This process will decrease the chances of transmitting the causative agent during the transportation of waste to the final disposal centers. Also, important in management of infectious waste due to concerns about the possibility of virus transmission is the reduction of storage time, as reported in South Korea reducing, this period from 7 days to less than one day⁸.

In medical waste management, segregation of infectious wastes from the other wastes is crucial during the pandemic period. In the studied hospitals, by separating Covid -19 ward from other wards, the wastes produced in this ward was generally considered as infectious wastes and entered the disinfection stages. However, according to the previous procedures in other wards, infectious, sharp and pathological wastes were stored and managed separately. Although these conditions can be effective in reducing the risk of transmission of the virus, there are some reports that in Covid -19 pandemic, all generated waste is considered as infectious wastes⁹. However, such plans will depend on the financial situation and available equipment. However due to contamination potential of face masks and gloves used by staff patients and clients, it is necessary to consider special containers to dispose them off separately from the common waste in the hospital¹⁰.

Based on the classification presented in figure 1 and taking into account the results of this study, the status of hospital waste management in studied hospitals were evaluated to be in low risk and safe status.

Table 1: Category Of Medical Waste In This Study

TYPE OF MEDICAL WASTE	Colour code	EXAMPLES
SEMI-HOUSEHOLD WASTE	Black	Dry paper towel, film packet plastic, syringe and needle packaging, food waste, food waste packaging.
INFECTIOUS AND PATHOLOGICAL WASTE	Yellow	Personal protective equipment like mask and gown in Covid-19 pandemic Blood contaminated paper towel, blood-contaminated gauze, extracted tooth, tissue, chemical and pharmaceutical waste
CONTAMINATED (RECYCLABLE) WASTE	Red	latex gloves, syringe, blood bags, I.V sets, rubber catheters
INFECTIOUS SHARP WASTE	White	Surgical blades, needles, Lancet
INFECTIOUS AND INJURIOUS SHARP WASTE	Blue	Glass ampoule, glass bottles, injection vials, metal implants

Table 2 General Characteristics Of The Studied Hospitals.

Hospital	Category	Covid Ward	Other ward	Total number of beds in Covid Ward	Total number of bed in other ward	Temporary storage facilities
A	Private	Yes	Yes	35	100	Yes
B	Public	Yes	Yes	50	10	Yes
C	Private	Yes	Yes	20	50	Yes
D	Public	Yes	Yes	120	500	Yes

Table 3 Medical Waste Generation In Studied Hospitals

Hospitals	Total waste generation Kg/day		Infectious waste generation Kg/day		Total waste generation Kg/day/bed		Increase ratio in Covid-19 compare with before Covid-19 Percentage (%)
	Before Covid -19	In Covid -19	Before Covid -19	In Covid -19	Before Covid -19	In Covid -19	
A	60	50	25	28	0.6	0.8	33%
B	8	100	5	60	0.8	2.0	150%
C	50	40	20	30	1.0	1.5	50%
D	307	274	123	196	0.6	2.28	280%

Table 4 Medical Waste Activities In Covid-19 Pandemic In Studied Hospitals

Hospital	Segregation of waste	Disinfection methods	Storage before disinfection (on/day)	Collection and transport after disinfection (in week)	Use of personal protective equipment	Final disposal methods
A	Yes	Autoclave	1	7	Yes	Landfill
B	Yes	Autoclave	1	4-5	Yes	Landfill
C	Yes	Autoclave	1	6	Yes	Landfill
D	Yes	Autoclave	<1	2-3	Yes	Landfill

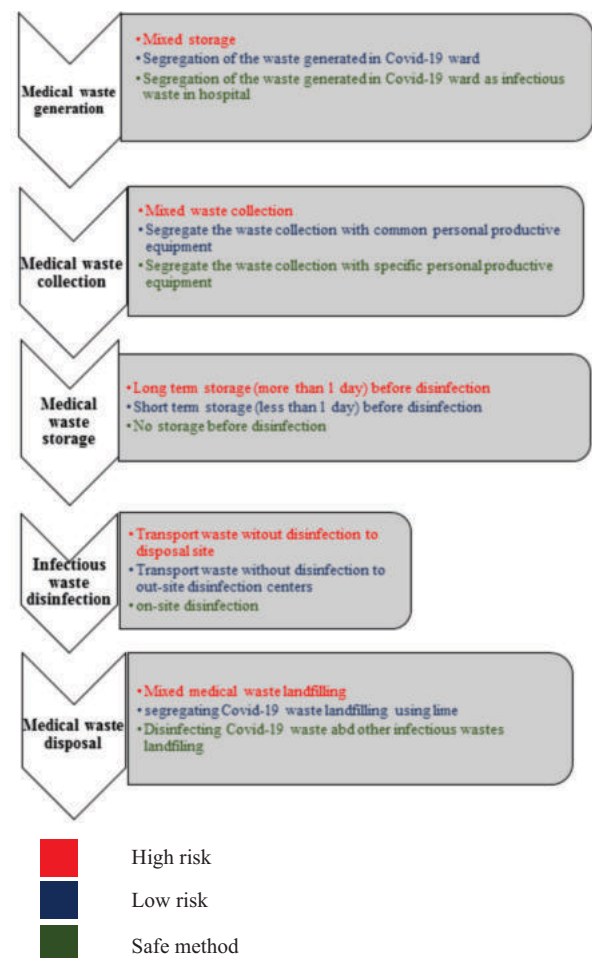


Figure 1: Different Plan For Medical Waste Management In Epidemic Condition.

CONCLUSION

The existence of appropriate high capacity disinfection equipment in hospitals have led to proper management of infectious wastes. Segregation of Covid -19 wastes from other medical wastes as well as daily disinfection of Covid 19 wastes and infectious wastes generated in other wards has decreased the possibility of disease transmission.

The pillar of biomedical waste management is segregation of wastes at source and waste reduction.

The current CPCB guidelines revised in 2020 are an improvement over earlier rules of BMW, 2016 in terms of improved segregation, transportation and disposal methods to decrease environmental pollution and ensure safety of staff, patients and public.

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Conflicts of interest Nil

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