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RESEARCH ARTICLE

IMPACT AND CHALLENGES OF COVID-19 ON HEALTHCARE WASTE MANAGEMENT IN A TERTIARY CARE TEACHING HOSPITAL, HYDERABAD INDIA

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Abstract

Introduction:-

Worldwide, there is a growing concern about the negative effects of infectious medical waste produced during the COVID-19 pandemic and the contamination risks associated with waste management. Therefore, measures to ensure that medical waste is managed safely and in an environmentally sound manner will avoid negative health and environmental effects from such waste, thus protecting the health of patients, health workers and the public.(1)

Health sector and allied services are battling with COVID19 pandemic with the available resources and knowledge. As of third week of March 2021, there are 121,874,133 cases of COVID19 and 2,693,946 had died due to its complications.(2)

COVID-19 and its subsequent BMW is an unprecedented challenge worldwide. BMW generated during COVID-19 patient isolation, testing and care need special consideration as it challenges the previous notion that only 15%-20% waste can be considered infectious. This study analyses the BMW generation rates in NIMS before and during COVID-19 .

Total estimated BMW generated before and during COVID-19 (April'19-March'20 and April'20-March'21) is 1,03,090 kg and 97,978 kg respectively. Study illuminates the impact of COVID-19 on existing challenges of waste management, highlighting the need for proper disposal of waste to reduce contamination risks and related environmental threats. Finally, this study summarises the recommendations for COVID waste management, which can provide valuable insights to administrators and managers.

Aims And Objectives:-

1. To compare the waste generated before and during the COVID-19 pandemic.
2. To compare the waste generated with respect to bed occupancy rate.
3. To recommend solutions for the challenges posed by COVID 19 in handling of BMW.

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Medthodology:-

A quantitative retrospective analytical study was carried out in tertiary care teaching hospital to estimate the BMW generation between April 2019 to March 2021. Data was put in excel 2007 sheet and analysed. Statistical test (paired t test) was applied to derive p value and corelation between waste generated and BOR was made. The data was collected from various sources like BMW committee, Medical Record Department of NIMS, published review articles and other internet sources.

Results And Discussions:-

Definition of Biomedical waste in COVID-19 context: Biomedical waste in COVID19 context extends to waste generated during treatment, diagnosis, quarantine and home care of COVID19 patients. Solid waste is considered infectious only if it is contaminated by body fluids and secretions of COVID-19 patients (like tissues, masks, gloves etc.), otherwise uncontaminated solid waste is handled as per Solid Waste Management Rules, 2016.(3)

As COVID19 virus is infectious, adequate measures must be taken while handling the virus in lab setup. For non-propagative lab tests COVID19 is classified under BSL2 (Biosafety Level) and for viral culture assessments, under BSL3.(4) Any patient will shed the virus in respiratory secretion, saliva and aerosol generated during sneezing and coughing that contaminate surfaces, articles of daily use.(5)

Fig 1:-

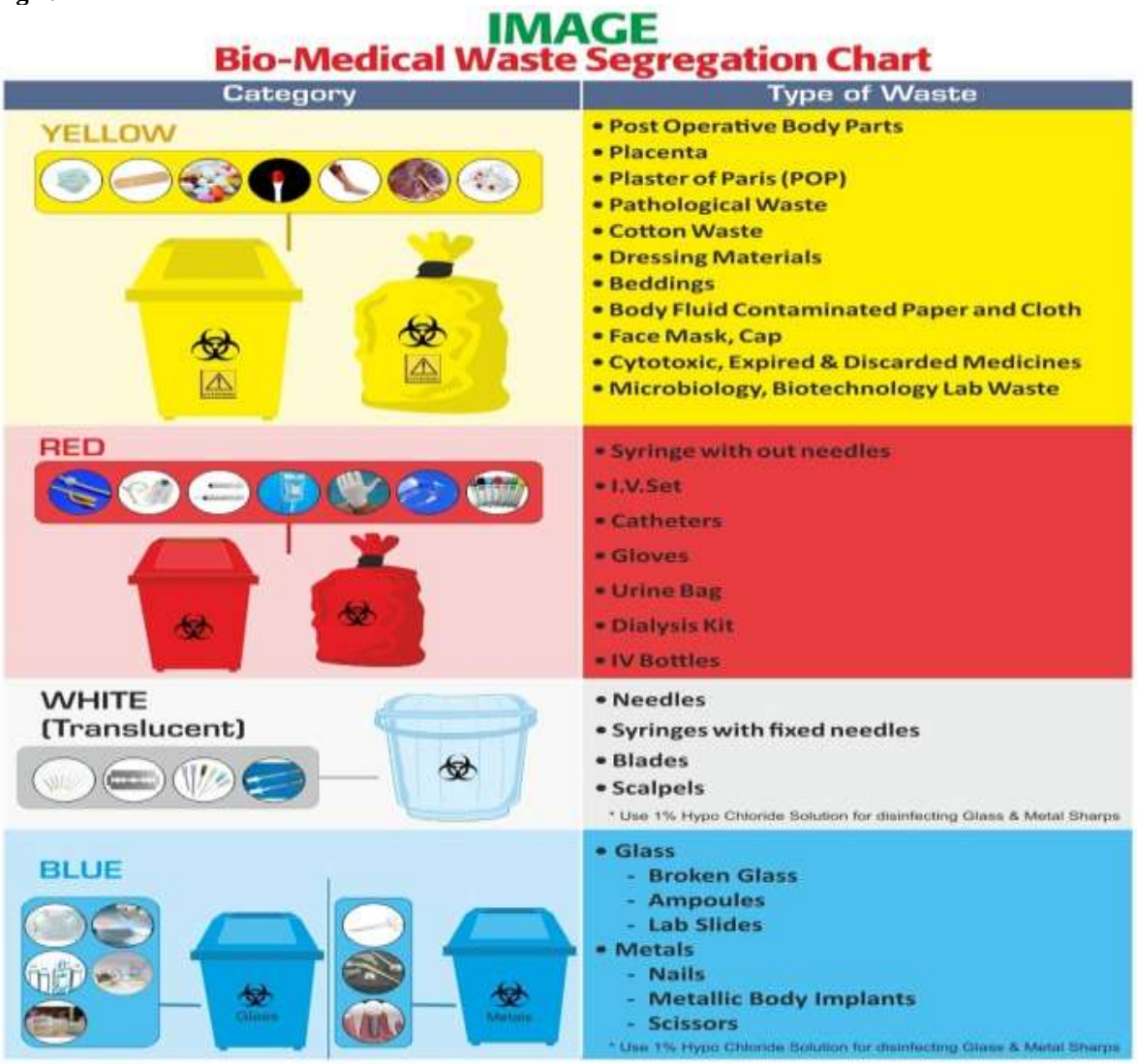

Figure 1:- Illustrates the BMW segregation and disposal methods.

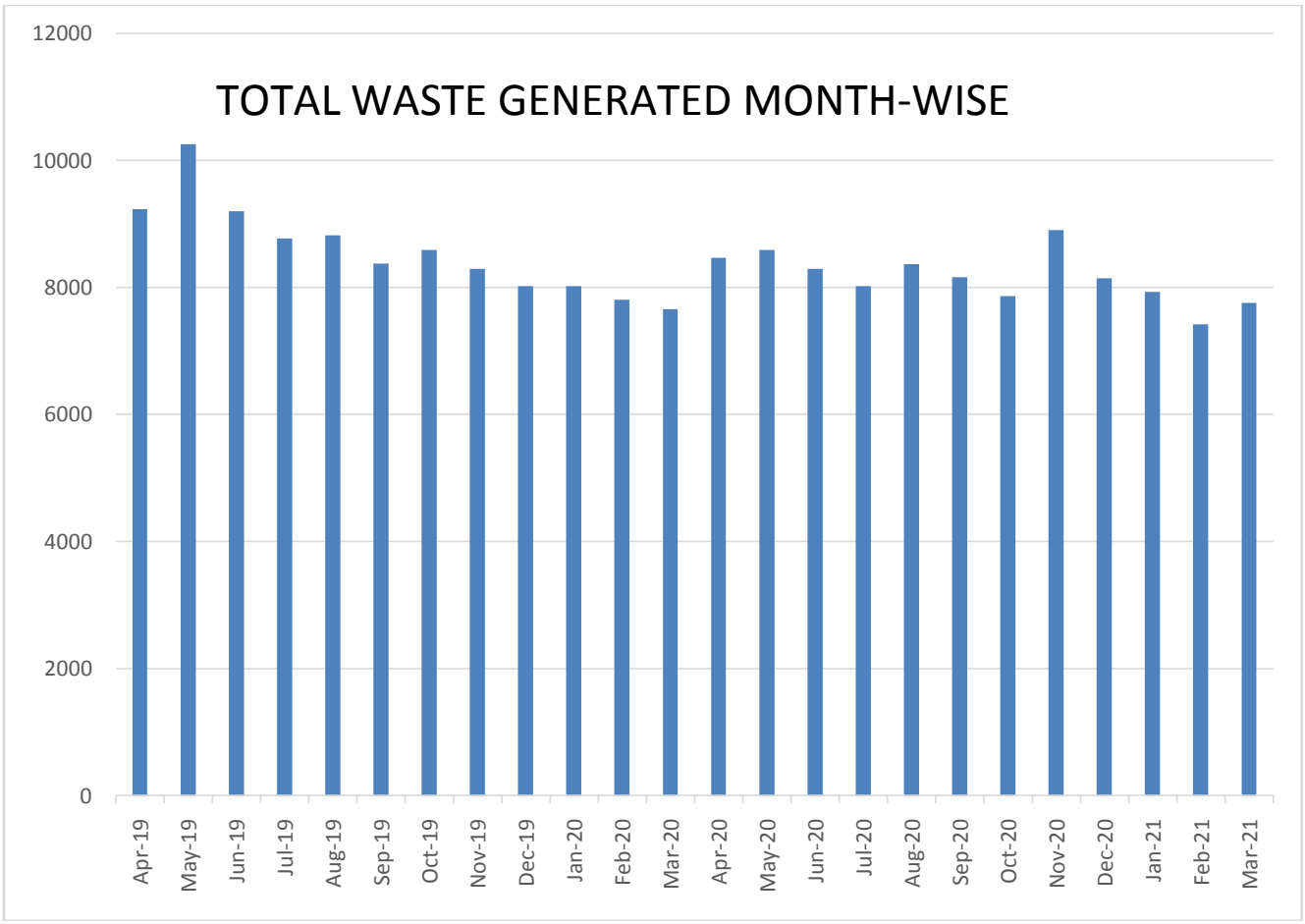

Fig 2:- Showing month wise total waste generation.

Table 1:- Category wise waste generation compared before and during COVID.

WASTE CATEGORY	NON-COVID (APR 19-MAR20)	COVID (APR20-MAR21)	TOTAL % DECREASE.
YELLOW	54,171 KG	50,000 KG	7.69%
RED	40,995 KG	40,635 KG	0.8%
BLUE	4,306 KG	4,218 KG	2.1%
WHITE	3,618 KG	3,125 KG	13.7%
TOTAL	1,03,090 KG	97,978 KG	5%

Month wise total waste generated is shown in figure1. Highest amount of waste (10258 kgs) was generated during May of 2019 while the lowest (7423 kgs) was recorded in Feb of 2021. The total waste during the pre COVID(April 2019-march 2020) period was estimated to be 1,02,030 kgs while on the other hand it was 97,978 kgs during the pandemic period (April 2020-march 2021). It was observed that the total of 5% decrease in the total waste generated during COVID pandemic period was found.

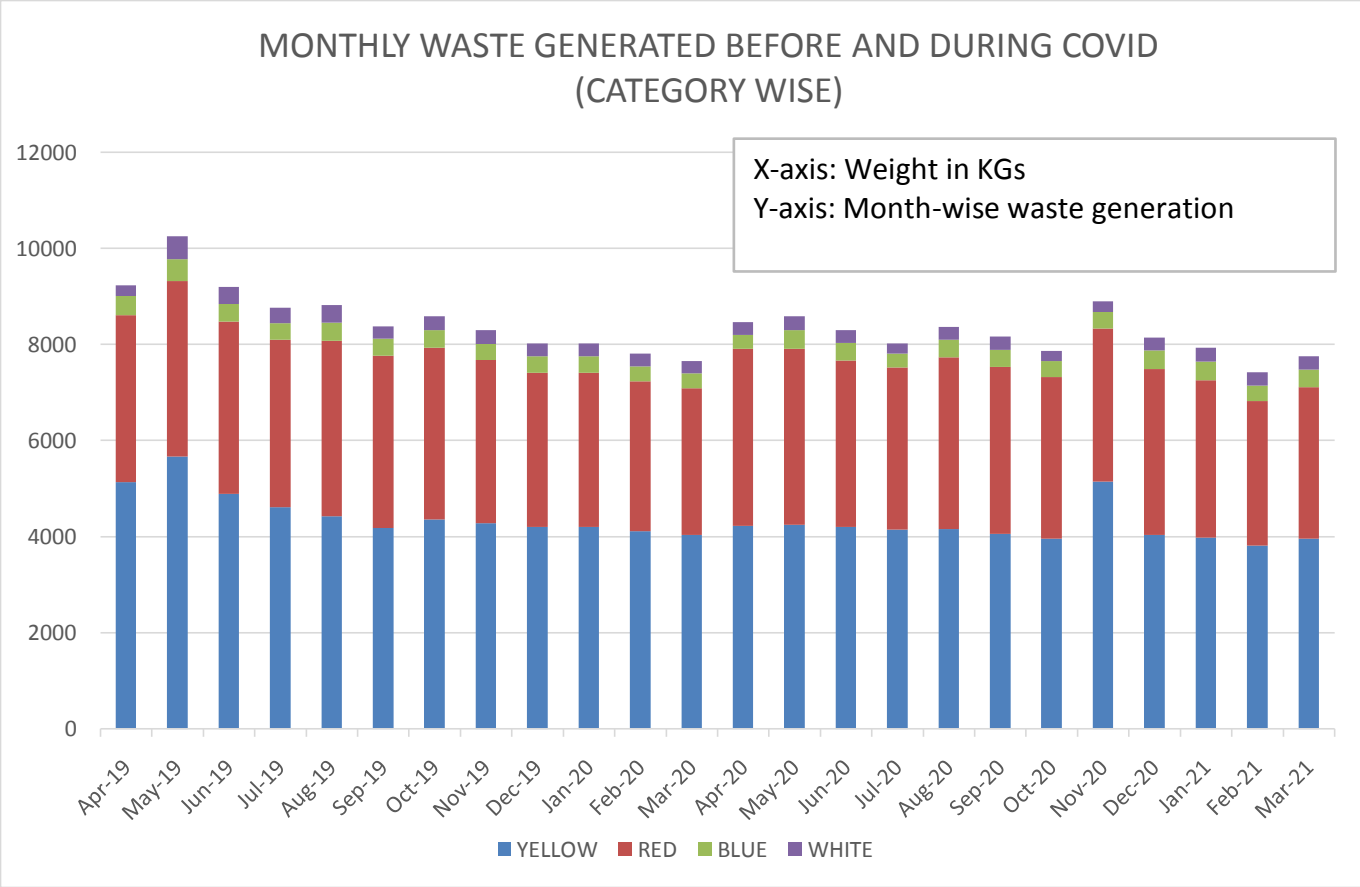

Fig 3:- Showing monthly waste generated before and during COVID.

Above bar diagram depicts the total waste in kgs generated according to the colour category for the study period. There was a decrease in the amount of total waste generated in each colour category during the COVID period. A total of 7.69% decrease in yellow bag category was observed. 0.8% decrease in weight was found for red bag category, 2.1% decrease for blue bag and 13.7% decrease for white category waste was found. Results are tabulated in the table 1.

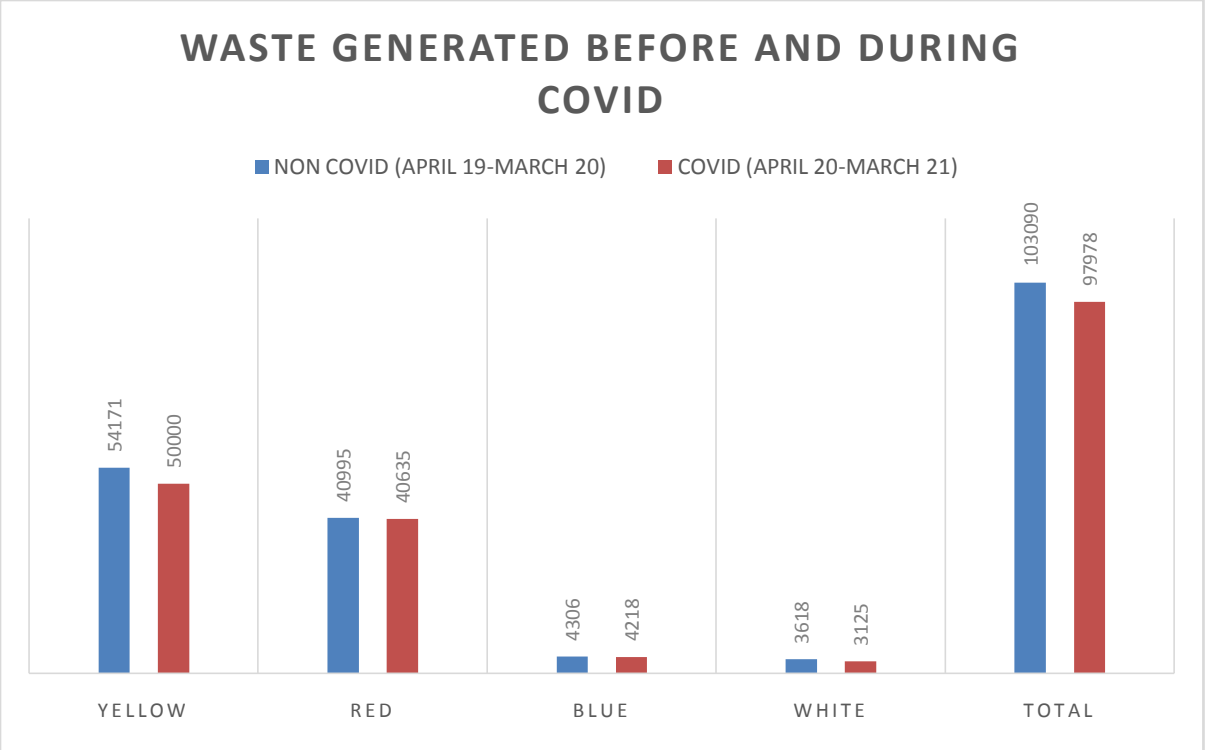

Figure 4:- Showing category wise waste generation before and after COVID pandemic depicting a decreasing trend in waste generation in each category of BMW.

Bed occupancy rate of Nizam's institute of medical sciences, which is a 1489 bedded tertiary teaching hospital was compared with respect to the amount of biomedical waste generated. It was noted that the average BOR before COVID (April 2019-march 2020) was 69% while it was 60% after the pandemic. Hence a total of 9% decrease in BOR was observed.

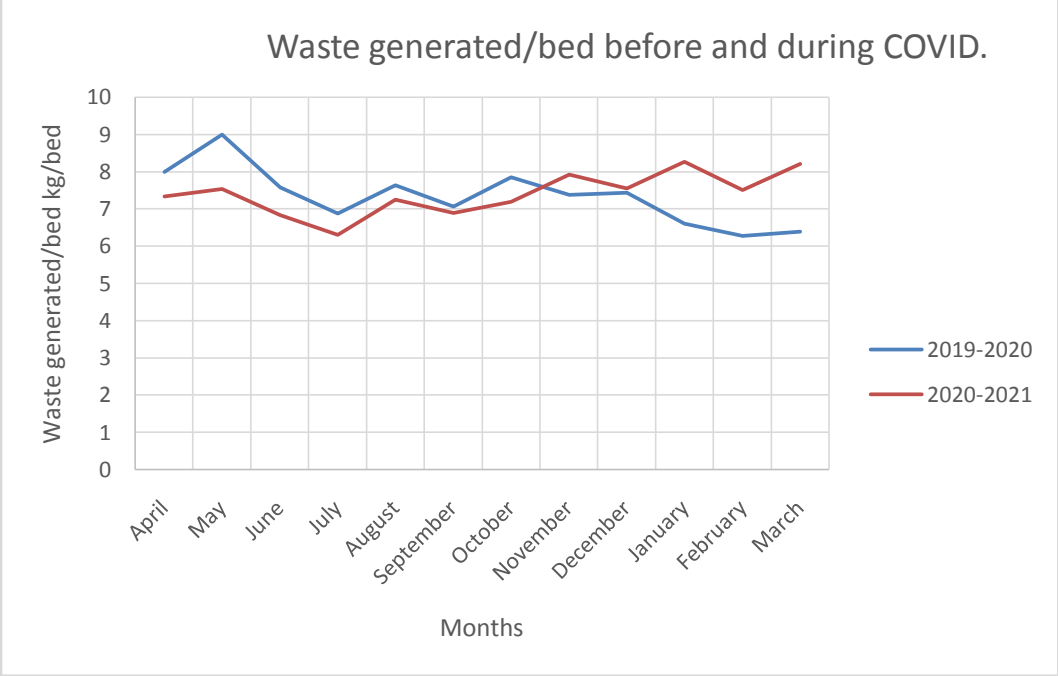

Fig 5:- Depicts waste generated per bed before and during COVID.

P value for waste generated per bed is 0.8 which is statistically insignificant denoting that waste reduced per bed is not significantly reduced during COVID when compared to pre COVID period, while on the other hand p value for total waste generated is 0.03 which is statistically significant inferring that the total reduction in waste during COVID is significantly reduced

There is a mean difference of 426 kgs in the mean waste generated before and during COVID while the mean difference of 0.1039 kg is found in the mean waste generated per bed before and during pandemic.

The reduction in the waste generated per bed is not significant, this can be attributed to the fact that the significant usage of PPE's, reusables and precautionary tests were done during pandemic period that ultimately added to the waste generation per bed.

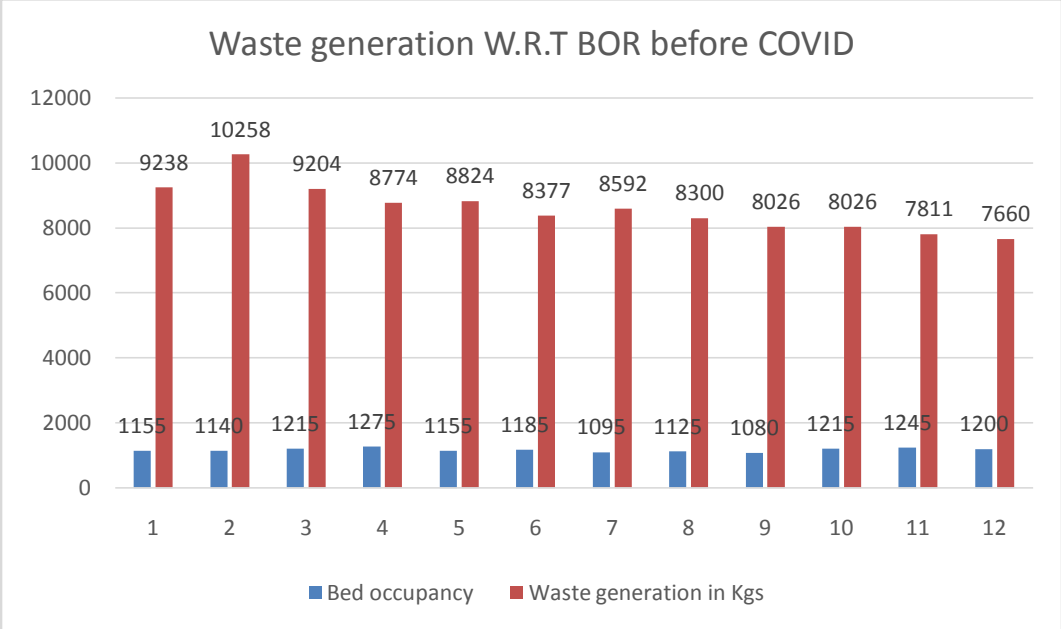

Fig 6:- Showing waste generation wrt BOR before COVID.

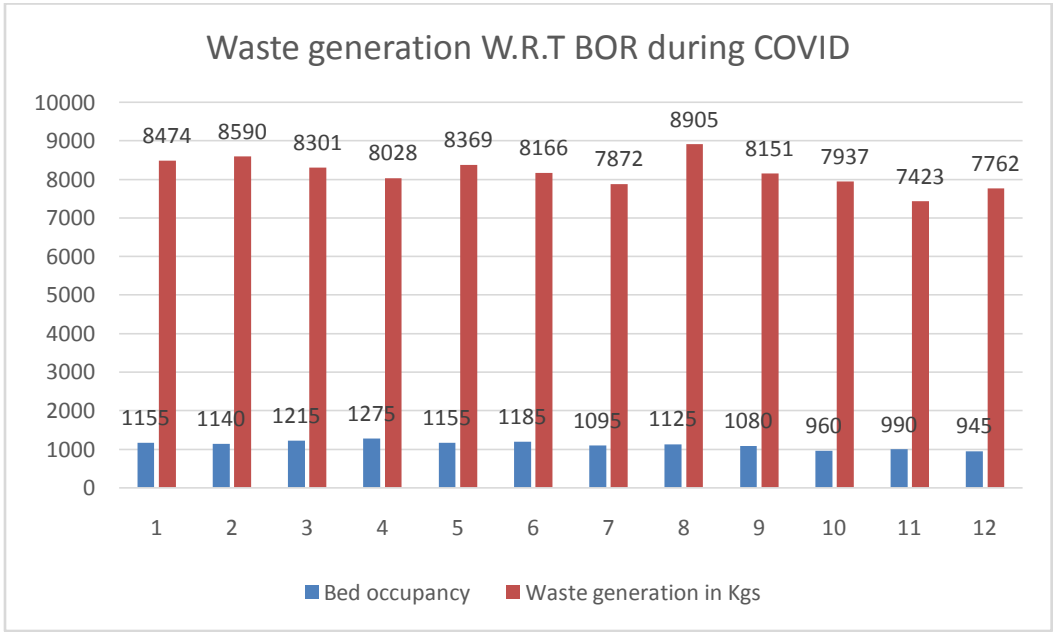

Fig 7:- Showing waste generation wrt BOR during COVID.

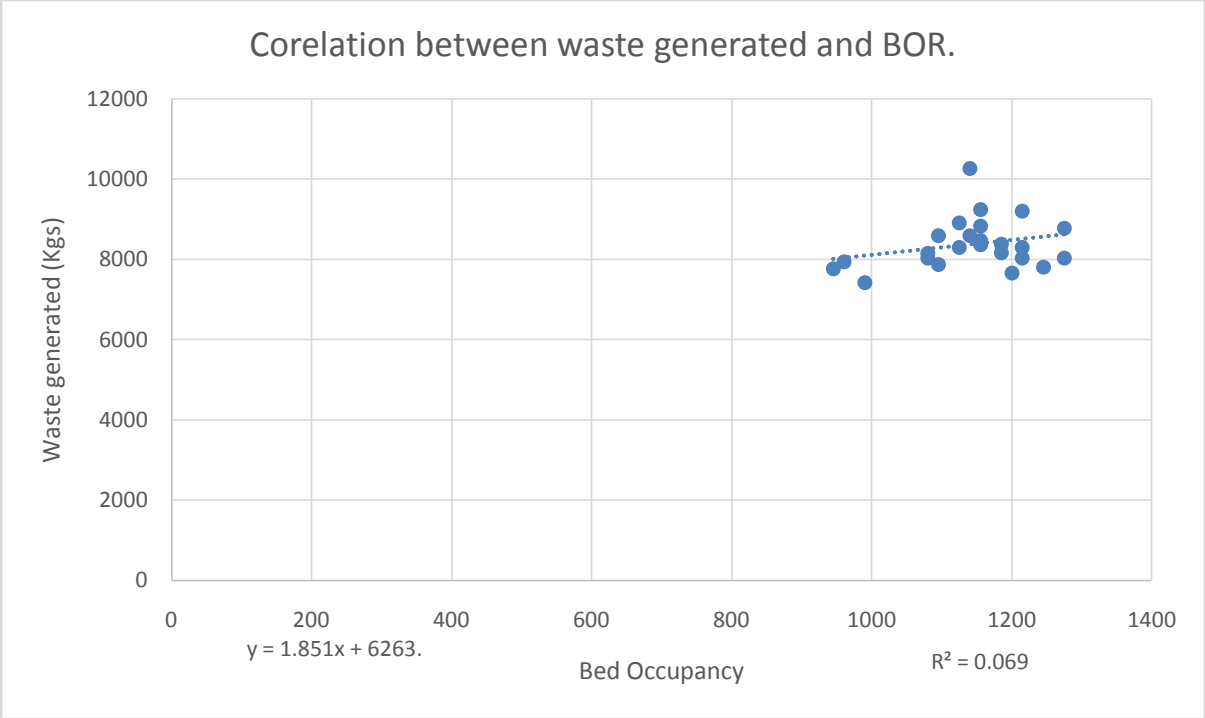

Fig 8:- Depicts corelation between waste generated and BOR.

As depicted in fig 8 there is a positive corelation between waste generated and BOR with an R =0.069 and p=0.213. this explains that waste got reduced proportionally as bed strength got decreased.

BMW management rules in India:

India implemented Biomedical Waste Management (BMWM)rules first in 1998 and then a morecomprehensive legislation-BMWM rules, 2016 and their amendments in 2018 and 2019.(6)COVID19 was declared as a pandemic in March 2020 and India hadresponded with stringent guidelines from CPCB. CPCBbrought outspecific guidelines for handling, treatment and disposal of waste generatedduring treatment, diagnosis, quarantine ofCOVID-19 patients onMarch 18, 2020, followed by fourth revision on July 17, 2020.Theseguidelines are required to be followed by all stakeholders in addition toexisting practices under BMWM Rules, 2016as amended.(7)

Challenges imposed by COVID 19 in BMW management:

Since the beginning of pandemic there has been an alarming concern over the disposal of the waste generated by healthcare facilities. Therefore, effective measures have to be designed meticulously for its proper disposal.Real time supervision with proper infrastructure for BMWMalong with implementation of existing guidelines are ofparamountimportance. As per CPCB, in India out of 2.7 lakh health care facilitiesonly 1.1 lakh had complied with the 2016 BMWM and SolidWaste rules.In the time of pandemic, biomedical waste andsolid waste handling and safe disposal are crucial.(8)(9)

Everyday COVID 19 is bringing a new challenge to healthcare industry

1. Safe disposal of the waste generated during quarantine period is essential as it is potentially infectious.
2. With the establishment of new COVID isolation wards, ICU's, quarantine homes, dedicated COVID centres, there has been a significant increase in waste generation which needs to be disposed off safely.
3. The safe burial of dead bodies of COVID patients is a new challenge to the healthcare providers.
4. Virus shed in stools may lead to contamination of drinking water and ultimately cause exposure to humans through aerosols.
5. Excessive use of cleaning agents like soaps and detergents, and also water during COVID-19 pandemic could contaminate the water bodies.

6. PPE is now utilised by general population, patient attendants visiting hospitals, care centres, office staff in public and private offices, airport staff and railway officials. These new consumers are either unaware or untrained on the potential hazard of improperly discarded protective gears and etiquettes of PPE use.
7. COVID-19 testing, vaccine research labs may be handling huge viral load and any mistake could be catastrophic.

Challenges faced by healthcare personnel in Nizam's institute of medical sciences in managing COVID 19 waste:

1. Main challenge during pandemic was to make SOP's for COVID 19 BMW management.
2. The training which was given to the workers handling BMW was a challenge at the beginning of the pandemic as there was a fear among them regarding the Corona virus spread.
3. Shortage of staff due to the personnel getting infected with COVID or getting exposed to the virusled to decrease in the frequency of waste collection in a day thereby increasing the spread of infection among the staff.
4. Improper wrapping of PPE's led to frequent filling of the bins which in turn led to discarding them in incorrect category of bins or in vicinity exposing staff to unnecessary risk of getting infected.

International guidelines for COVID-19 waste management:

Guidelines implemented worldwide for COVID-19 waste managementlike WHO, CDC, OSHA CPCB recommend that COVID-19 wasteposes no extra threat than any other biomedical waste and advise tohandle it as any other infectious waste. Briefly, the followingguidelines are discussed:

CDC:

As per Centre for Disease Control waste from COVID 19 patientsis not a A category infectious waste so BMW from potential or knownCOVID-19 virus contamination should be managed like any other regulatedmedical waste (RMW) with assurance of safe work practices andPPE utilization to prevent waste worker from waste stream exposure.(10)

United States-

OSHA (Occupational Safety and Health Administration)and other state guidelines mentioned COVID-19 waste posing noextra threat than any other biomedical waste and advised to handle asother BMW. COVID19 contaminated solid/general waste should beprocessed as any other solid waste. Strict maintenance of safe engineeringpractices, wearing of personal protection gear is also advised whilehandling waste.(11)

Europe:

COVID-19 patients staying at home were advisedto keep apaper bag in the same room to discard used masks. Care takers and familymembers must keep separate paper bag to discard masks worn by them.

These bags can then be handed over to waste collectors. All waste bagsmust be double layered to reduce any leaking to the environment.(12)

Italy:

Waste was categorised into T1 (Municipal waste generated byhouseholds with COVID-19 positive people in isolation or people inmandatory quarantine) and T2 (Municipal waste generated by householdswithout COVID-19 positive people in isolation or people inmandatory quarantine). T1 waste is considered as infectious waste andhas to be picked up by specific agencies dealing this type of waste.(13)

Recommendations:-

Recommendations can be proposed and followed at national level for proper management of COVID 19 BMW:

1. Appropriate training on handling of covid 19 waste should be provided to the staff.
2. Frequent IEC activities should be conducted so that everyone is made aware about the hazards posed by covid waste.
3. BMW segregation posters with special emphasis on covid waste should be pasted in every ward, ICU and OT's of the hospital.
4. Collection and dumping methods should be supervised strictly as covid waste is highly infectious.
5. Proper wrapping and disposal measures of PPE's in correct category bin should be adopted by every person.

6. More effort should be made in implementation of existing rules and guidelines laid by the hospital authorities in managing covid waste.
7. Weighing the waste properly and reporting to PCB should be properly done and supervised.
8. Intensive control and monitoring of illegal practices such as open burning, dumping on streets and incineration, should be done.
9. Collection and dumping methods should be supervised strictly as covid waste is highly infectious.
10. Proper wrapping and disposal measures of PPE's in correct category bin should be adopted by every person.
11. More effort should be made in implementation of existing rules and guidelines laid by the hospital authorities in managing covid waste.
12. Weighing the waste properly and reporting to PCB should be properly done and supervised.
13. Intensive control and monitoring of illegal practices such as open burning, dumping on streets and incineration, should be done.

Conclusion:-

The total waste before covid was1,03,090 kgs and after was 97,978 kgs. A 5% decrease in the total waste was observedwith a mean difference of **426** kgs and a p value of **0.03** (significant). Mean waste generated per bed before COVID was **7.42** kgs and during pandemic was **7.32** kgs with a mean difference of **0.103** kgs and a p value of **0.8** (insignificant). Category wise decrease was found to be **7.69%** for yellow bag, **0.8%** for red bag, **2.1%** for blue bag and **13.7**% for white. Average BOR before COVID was **69**% and during was **60%.** Decrease in BOR was **9%.** Positive corelation between waste generated and BOR was observed showing that waste reduction was proportionate to BOR reduction.

This study revealed that the overall waste generated during pandemic when compared to pre COVID period (Apr 2019-Mar 2020) was significantly reduced while the waste generated per bed did not show any significant reduction. Furthermore it recommends the solutions for the challenges posed by COVID 19 in the management of BMW. For effective disposal of waste, undertaking of stringent measures must be ensured, proper training on how to handle the COVID waste has to be provided to every staff personnel through seminars, IEC activities and awareness programmes.

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