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RESEARCH ARTICLE

COVID 19 WASTE MANAGEMENT PRACTICES IN A TERTIARY CARE HOSPITAL

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Abstract

Introduction: The world has witnessed positive environment implications of nationwide lockdowns brought down upon by Covid 19 such as cleaner rivers and clearer skies, the same is not the case with respect to solid waste management.

Objective: To study the Covid 19 waste management practices and precautions taken in a tertiary care hospital.

Methodology:A retrospective study from 1st April 2020 to 31st March 2021 was conducted at NIMS, Hyderabad. Direct observational study was done to assess the existing facility, manpower, workflow and practices followed.

Results: An average of 252 kgs biomedical waste was generated daily. All the biomedical waste including the waste generated in covid 19 areas, Rapid antigen testing centre, RTPCR lab were segregated in separate colour coded bags and were transferred to collection room, where it was stored in different rooms based on the colour, ready to be collected by GJ Multiclave for treatment and disposal. Adequate number colour coded waste bins and needle destroyers were provided to covid areas. Also, hypochlorite solution was issued in adequate quantity. No calibrated weighing machine was available onsite in covid areas nor any biomedical waste registers were maintained in Covid wards and ICUs. Yellow bins were filled beyond 3/4th level due to PPE kits leading to spillage, but frequent collection of waste was followed. Whereas other bins were not filled beyond 3/4th level to avoid spillage. There was 100% compliance in segregating infectious sharps from non-sharps. There was 100% compliance in segregating waste in Covid ICUs and 90% compliance in the Covid wards. Double packing method was followed. On-site measures like treating PPE with hypochlorite was practiced. Storage in the facility was never beyond 48 hours. A total of 19 workers were posted in three shifts for collecting waste. Adequate PPE kits were provided to all the workers in Covid units apart from the regular safety equipment. 20:10 day rule was followed where the workers worked for 20days followed by 10 days of quarantine. Training of staff was on periodic basis. Separate lifting

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trolleys for covid areas were earmarked and disinfection with hypochlorite was practiced. Workers posted underwent routine RAT once a month and a quarantine of 15 days was given to the tested positive workers.

Conclusion: On an average 252 kgs of biomedical waste generated per day. 100% compliance was observed in segregating biomedical waste in Covid ICUs and 90 % compliance in the Covid wards. On site measures like treating PPE kits with hypochlorite solution was practiced. Covid waste was transported in closed containers. Stored waste was disposed within 48 hours of collecting from wards. Regular training of health workers posted in wards improved waste management.

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Introduction:-

The world has witnessed positive environmental implications of nationwide lockdowns, brought down upon by Covid 19 such as cleaner rivers and clearer skies, the same is not the case with respect to solid waste management[1].The pandemic has altered the waste generation dynamics[2].Many types of medical and hazardous waste including infected masks, gloves, and other protective equipment, along with a higher volume of non-infected items of same nature are generated during an outbreak. Improper collection practices could lead to contamination of general municipal solid waste with the virus, which could pose a risk of transmission.Appropriate identification, collection, separation, storage, transportation, treatment, and disposal as well as important associated aspects including disinfection, personnel protection and training become part of effective management of biomedical and health care waste[3].

Objective:-

To study the Covid 19 waste management practices and precautions taken in a tertiary care teaching hospital.

Methodology:-

Direct observational study was done to assess the existing facility, manpower, workflow and practices followed at Nizam's Institute of Medical Sciences.Regular rounds in Covid wards was done for a span of one month (March 2021) to observe the practices followed and compliance in segregating biomedical waste.A retrospective data of waste generated was collected from Biomedical waste records from 1st April 2019 to 31st March 2021 to assess the trend of biomedical waste generated before and during Covid.

Results &Discussion:-

On an average, 268 kgs of biomedical waste was generated per day, with 51% yellow, 42% red, 4% blue and 3% white BMW.All the biomedical waste including the waste generated in Covid 19 wards/ ICUs, Rapid antigen testing centre, RTPCR testing labs were segregated in separate colour coded bags and were transferred to collection room (Figure 1), where it was stored in different rooms based on the colour, ready to be collected by GJ multiclave for treatment and disposal.

There was 100% compliance in segregating infectious sharps from infectious non sharps.There was 100% compliance in segregating waste in Covid ICUs while about 90 % compliance in the Covid wards.(Table 1). On-site measures like treating PPE with hypochlorite solution was practiced.Separate lifting trolleys for Covid areas was earmarked and thorough sanitization with hypochlorite solution was practiced. (Figure 2). A total of 19 workers were posted in three shifts for collecting waste.20:10 day rule was followed where the workers worked for 20 days followed by 10 days of quarantine.Adequate PPE kits were provided to all the workers in covid units apart from the regular safety equipment (Figure 3).Training of staff regarding donning and doffing and waste handling/ segregation was carried out on periodic basis.Workers posted underwent routine Rapid Antigen testing once a month and a quarantine of 15 days was given to the tested positive workers.It was observed that a total of 1,03,090 Kgs was generated during non-Covid period i.e., April 2019 to March 2020, while a total of 97,978 Kgs was generated during Covid period i.e., April 2020 to March 2021.An average of 282 kg of biomedical waste was generated per day during non-Covid period with 53% yellow, 40% red, 4% blue and 3% white BMW, while an average of 268 Kgs of

waste was generated per day during Covid period with 51% yellow, 42% red, 4% blue and 3% white BMW.The bed occupancy rate had decreased during Covid period but there was no significant decrease in Biomedical waste generation, reason being increase in Biomedical waste in the form of PPE, RAT kits etc.

Table 1:- Compliance in segregating waste.

COMPLIANCE	**%**
Compliance in segregating infectious sharps from infectious non sharps	100%
Compliance in segregating waste in Covid ICUs	100%
Compliance in segregating waste in Covid wards	90%

Table 2:- BMW generated before and during Covid.

	NON COVID(APR 19-MAR 20)	**COVID(APR 20-MAR 21)**
YELLOW	54,171	50,000
RED	40,995	40,635
BLUE	4,306	4,218
WHITE	3,618	3,125
TOTAL	**1,03,090**	**97,978**

Figure 1:- Biomedical waste collection room.

Figure 2:- Closed trolleys earmarked for Covid areas.

Figure 3:- Personal protective equipment before and during Covid.

Figure 4:- Weighing BMW at the collection site; BMW bag displaying barcode.

Figure 5:- Bar diagram depicting BMW generated before and during Covid.

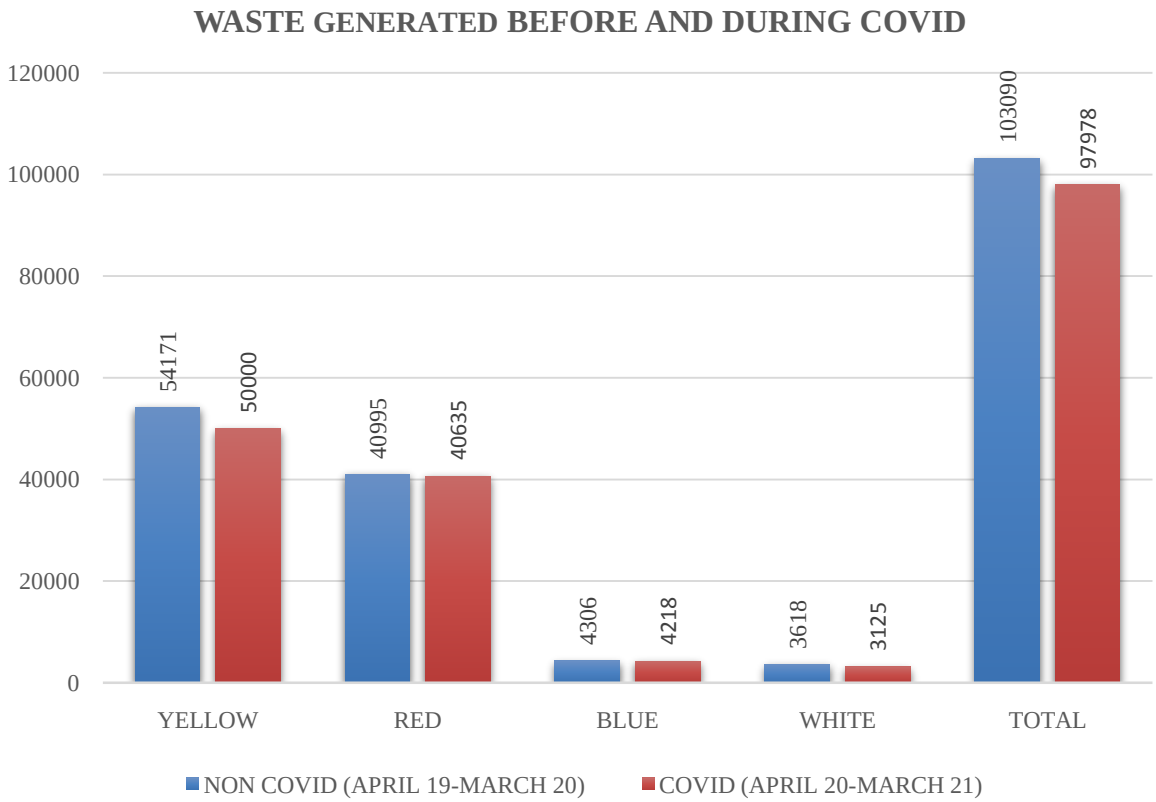


Figure 6:- Pie diagram depicting BMW generated colour code wise before and during Covid.

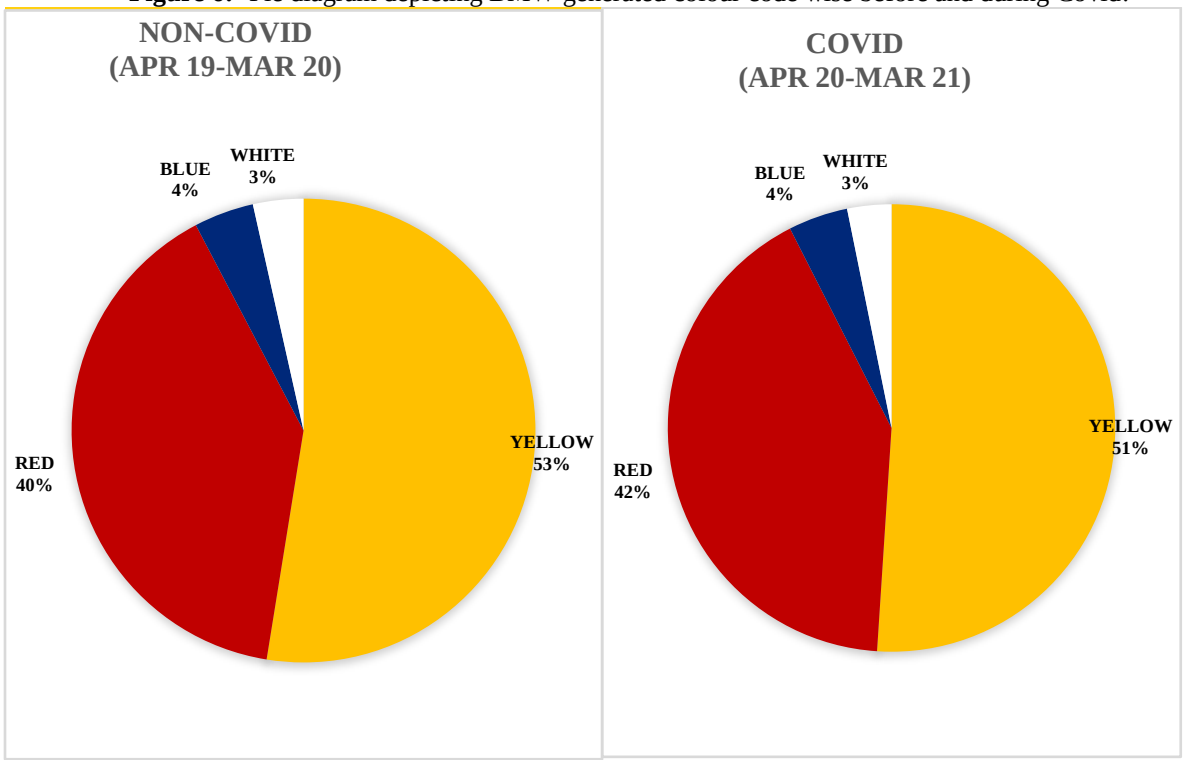


Figure 7:- Trend of BMW generated monthly before and during Covid.

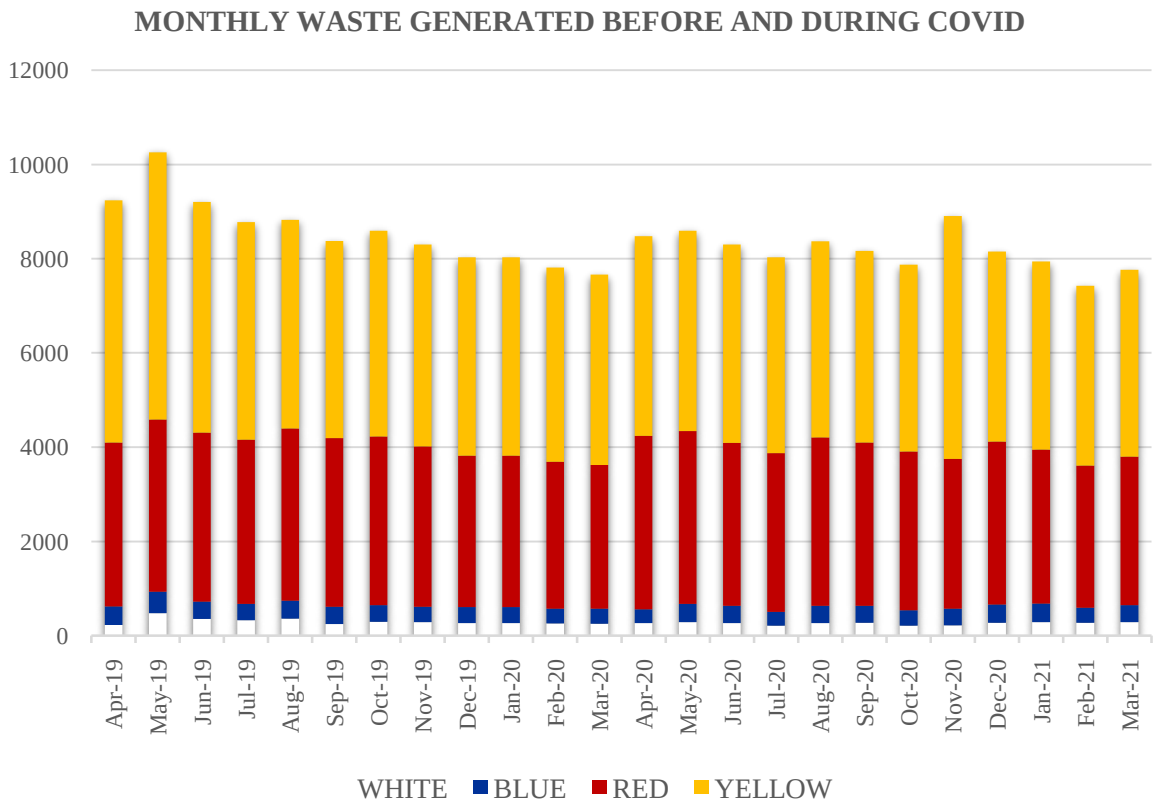
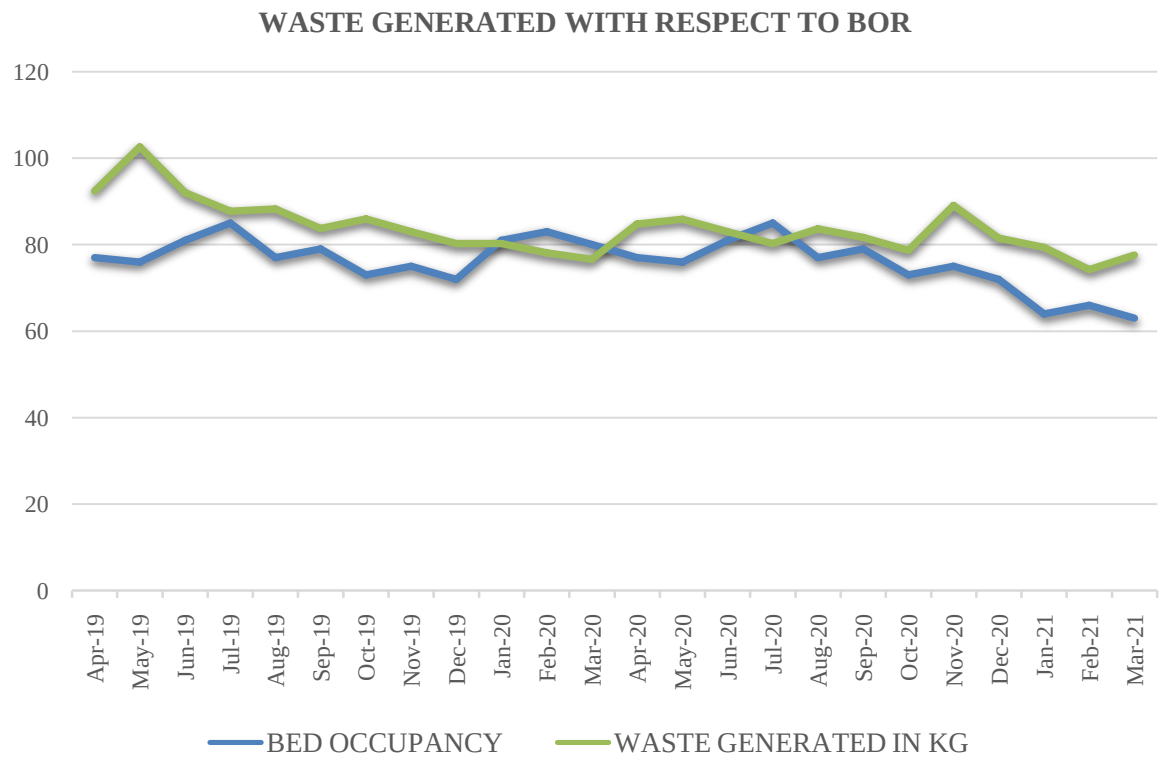


Figure 8:- Waste generated with respect to Bed occupancy rate before and during Covid.



Central Pollution Control Board Guidelines[4] : Revision 5, 26th April 2022:
Covid 19 biomedical waste is to be treated like any other biomedical waste and should be regulated as biomedical waste as defined under Biomedical waste management rules, 2016, as it is not Category A virus as per CDC.

Table 3:- Central Pollution Control Board guidelines vs practices at NIMS.

CPCB	**NIMS**
Keep separate colour coded bins (with foot operated lids) /bags /containers.	Followed
As precaution double layered bags (using 2 bags) to ensure adequate strength and no leaks.	Double packing
Dedicated collection bin labelled Covid 19 to store and keep separately in temporary storage prior handing over to common biomedical waste treatment facility (CBWTF).	Collected in colour coded bags and stored in temporary storagealong with the rest of BMW
Can also be lifted directly from the Covid wards into CBWTF collection van.	Not observed
Mandatory labelling of bags/ containers as "COVID19".	No labelling
Maintain separate records of waste generated from Covid 19 wards.	Common records
Dedicated trolleys and collection bins labelled Covid 19 waste.	Followed
Faeces from Covid 19 confirmed patient, who are unable to use toilets and excreta collected in diaper, must be treated as biomedical waste and should be placed in YELLOW bag/container. However, if bedpan is used, then faeces to be washed into toilet and cleaned with a neutral detergent and water, disinfected with 0.5% chlorine solution, then rinsed with clean water.	Followed
Collect used PPEs such as goggles, face shield, splash proof apron, plastic coverall, gloves into RED bag.	Followed
Collect used mask, head cap, shoe cover, disposable linen gown, non-plastic or semi plastic coverall in YELLOW bag.	Followed
Used masks, tissues, toiletries of Covid 19 patients shall be segregated in YELLOW bag.	Followed
Used Rapid Covid 19 Antigen test kits shall be segregated in RED bag.	Followed

Pretreat cartridges of gene expert, chips, and microtubules of CBNAAT shall be segregated in RED bag.	Followed
Retractable safety syringes used in immunization programme or as injections shall be segregated in RED bag.	Followed
Segregation of biomedical waste and general solid waste should be done at the point of generation in wards and not at temporary waste collection/storage area to ensure occupational safety.	Followed
General solid waste comprising of wrappers of medicine/ syringes, fruit peel offs, empty juice bottles/ tetra packs, used water bottles, discarded papers, carton boxes of medicine, empty bottles of disinfectants, leftover food, disposable food plate should be collected separately. In order to minimize waste generation, non-disposable items must be used for serving food, which are to be handled with appropriate precautions and cleaned and disinfected a per hospital guidelines. If use of disposable items is inevitable, use biodegradable cutlery. The wet and dry solid waste bags to be tied securely in leak proof bags, sprayed with sodium hypochlorite solution and hand over to authorizes general waste collector on daily basis. Yellow coloured bags should not be used for collecting general solid waste. Compostable bags should be used for collecting wet waste.	Followed
Provide training to waste handlers about infection prevention measures such as hand hygiene, respiratory etiquettes, social distancing, use of appropriate PPE etc. via videos and demonstration in local language.	Followed

Conclusion:-

On an average 268 kgs of biomedical waste was generated per day, with 51% yellow, 42% red, 4% blue and 3% white BMW.100% compliance was observed in segregating biomedical waste in Covid ICUs and 90 % compliance in the Covid wards.On site measures like treating PPE kits with hypochlorite solution was practiced. Waste was transported in closed containers. Stored waste was disposed within 48 hours of collecting from wards. Regular training of health workers posted in wards improved waste management.

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