Journal of Cardiovascular Disease Research
ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 03, 2023

THE PRACTICE OF BIOMEDICAL WASTE DISPOSAL THE HEALTHCARE PERSONNEL IN INDIA DURING COVID-19

Dr. Suresh Kumar Sethi,[1] Dr. Gouri Shankar Jha,[2] Dr. Anurag Jain,[3] Dr. Mahesh Gupta[4*]

[1]MBBD, MD, Professor, Department of General Medicine, Shri Shankaracharya Medical College, Bhilai, Durg, Chhattisgarh
[2]MBBD, MS (Anatomy) D- Ortho, PhD (Ortho), Assistant professor, Department of Anatomy, Darbhanga Medical college, Darbhanga, Bihar
[3]MBBS, MS, Associate Professor, Department of General Surgery, Government Medical College, Ratlam, Madhya Pradesh

[4*]MBBS, MD, Assistant professor, Department of Community Medicine, Government Medical College, Ratlam, Madhya Pradesh

Corresponding author:

Dr. Mahesh Gupta
Email id- drmguptagmc@gmail.com

Conflict of Interest: None
Type o study: Original Research Paper
Date of submission: 12 February 2023
Date of acceptance: 30 February 2023
Date of publication: 25 March 2023

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ABSTRACT

Background: The COVID-19 pandemic has greatly affected all the fields with a pronounced effect on the medical field affecting all the departments. It has greatly changed biomedical waste disposal and generation. The ongoing condition warrants studies assessing the preparations at the various levels of the healthcare system during COVID-19.

Aim: The present study aimed to assess the practices of biomedical waste disposal among healthcare personnel during the COVID-19 pandemic.

Methods: The study included the allied healthcare staff, nurses, and doctors' various departments of the Institute that were assessed concerning their practices for biomedical waste disposal during the COVID-19 pandemic.

Results: Among 859 nurses, 75.20% (n=646) subjects followed the appropriate methods for disposal of biomedical waste which was a significant proportion with p=0.02. A similar significant adequate practice of biomedical waste was seen in doctors where 68.40% (n=197) subjects among 288 were practicing the adequate biomedical waste disposal criteria. For the various divisions, Injection OPD and IPD personnel were doing adequate practice concerning biomedical waste disposal with p<0.001. However, non-significant results were seen for ICU and OT with p=0.1

Conclusion: The present study showed that nearly 3/4th of the study subjects assessed in the present study followed the proper protocols for the disposal of biomedical waste during the

COVID-19 pandemic. However, 100% compliance should be made by the healthcare workers with the periodic monitoring of biomedical waste disposal and appropriate resource allocation.

Keywords: Biomedical waste disposal, COVID-19, healthcare workers, COVID pandemic

INTRODUCTION

Wastes from medical institutes are usually considered among the most hazardous type of waste on side with the wastes generated from radiation. The waste generated from the healthcare sector is different from other wastes in its creation, formulation, handling, and disposal ways.[1] Improper handling of waste from the healthcare sector can be dangerous not only for the person handling the waste and operators but also for the general population. Improper waste disposal from the healthcare sector which is hazardous can lead to severe blood-borne and hospital-acquired infections which can further pose occupational hazards of high severity.[2]

BMW (biomedical waste management) is defined as any waste including solid or liquid generated as a final or intermediate product generated during diagnosis, treatment, or research on animals or human beings.[3] There are conflicts concerning biomedical waste disposal in the practice and the knowledge globally. This conflict is even seen in the healthcare professionals and persons which poses a significant challenge in hospital management and the safety of an individual. This challenge is further severed by surveillance of the hospital administration, lack of formal training, limited priority, and lack of interest. This challenge in the Indian scenario is higher owing to the >28,000 healthcare facilities and nearly 1.6 million healthcare workers in India. The literature data depicts that nearly 2 kilograms of biomedical waste are produced in India per bed per day.[4,5]

For the sustainable and safe management of biomedical wastes, the WHO proposed the core principles in 2007. WHO has focused on the vitality of accurate resource investment with a commitment towards reducing the harmful effect levels on the environment and people secondary to biomedical waste disposal.[6] In 2014, after the release of the second edition of the Blue Book, that focused on the newer practice adoption in comparison to the 1999 first edition. The Indian government, in 1998 had also issued the first guidelines on biomedical waste management which were later amended in the year 2000, 2003, and 2011 respectively with the latest guidelines of 2016. However, the wide majority of healthcare sectors of India are not operationalized using the existing guidelines for biomedical waste management.[7]

Also, presently with the COVID-19 pandemic, biomedical waste management and generation practices have changed drastically. Various forms of PPE (personal protective equipment) have been used by various personnel in the healthcare sectors including splash-proof aprons, full body suits, visors, face shields, gloves, and masks which were also available to be used by the general Indian population. With these practices, generation of the waste is sure to be increased making the BMW practice assessment vital to evaluate if public health facilities in India are consistent with standard guidelines and can withstand the shift in paradigm during the crisis of COVID-19.[8]

Various studies have assessed the practice and attitude of the healthcare sectors for biomedical waste management where most of the studies focused on tertiary care institutions, old guidelines, and the private sectors. However, further studies are needed to assess BMW management

practices in various healthcare centers during the COVID-19 pandemic stress.[9] To assess these factors, the present study was done to assess the practices of biomedical waste disposal the healthcare personnel during the COVID-19 pandemic in India.

MATERIALS AND METHODS

The present cross-sectional clinical study was done to assess the practices of biomedical waste disposal the healthcare personnel during the COVID-19 pandemic in India. The study population was comprised of the healthcare personnel of the Institute. After explaining the detailed procedure, written and verbal informed consent was taken from all the study participants.

For a collection of the data, before data collection, all researchers were given appropriate training to make them familiar with the data collection procedure, observation, and tools. They were then asked to observe the practices of biomedical waste disposal by different healthcare professionals.

The study assessed the healthcare workers from various levels including pharmacists, laboratory technicians, nurses, and doctors practicing at the institutes. Various departments considered for assessment were Pediatrics, Orthopedics, Obstetrics and Gynecology, General Surgery, and general medicine.

In all the included departments, the observations done were in the ICU (intensive care units), procedure rooms, injection OPD, IPD (inpatient department), and OPD (outpatient department). Periodic monitoring was done for the data collection procedure by the co-investigators and the principal investigating personnel. After the literature search and subject expert consensus, various checklists for observation were made. The main criteria assessed was the practice for appropriate disposal of biomedical waste concerning if the waste disposal was done in appropriate bins that were color-coded following the latest guidelines for biomedical waste management.

For the study of the safety of the patient, management and training facilities, standard operating procedures, and the existence of a separate committee for biomedical waste management related information was collected as part of the study data.

The data gathered were analyzed statistically using the SPSS software version 26.0 (IBM, Chicago, IL). The data were expressed in mean and standard deviation and number and percentages. Odd ratio and likelihood ratio tests were used in the present study. The significance level was considered at the p-value of <0.05.

RESULTS

The present cross-sectional clinical study was done to assess the practices of biomedical waste disposal the healthcare personnel during the COVID-19 pandemic in India. The study assessed 1296 healthcare personnel for the appropriate practice of biomedical waste during the COVID-19 pandemic. The study included the majority of nurse subjects with 66.28% (n=859) nurses followed by 22.22% (n=288) doctors as participants, and 11.49% (n=149) study participants were the other healthcare personnel belonging to the different categories including security personnel, billing department, pharmacy personnel, and sweepers of the institute.

Various departments assessed in the present study were Orthopedics, Pediatrics, Obstetrics and Gynecology, General surgery, and General Medicine. The majority of the study participants were

from the General medicine department with 61.95% (n=803) subjects followed by 10.03% (n=130) subjects from General Surgery and Pediatrics each, 9.18% (n=119) subjects from the Obstetrics and Gynecology, and least 8.64% (n=112) subjects from the Department of Orthopedics. The divisions of the various departments assessed were IPD with 44.67% (n=579) subjects followed by OPD with 28.31% (n=367) subjects, injection OPD with 19.21% (n=249) subjects, and least 7.79% (n=101) subjects from the ICU/operation theatre/procedure room as shown in Table 1.

On assessing the practice of the appropriate biomedical waste disposal by various healthcare personnel, concerning the departments, among 112 subjects from the Orthopedic department, appropriate BMW disposal was seen in 80.35% (n=90) study subjects which were non-significant with p=0.07. Among 130 subjects from Pediatrics, 83.84% (n=109) subjects followed the appropriate BMW disposal methods which were statistically significant with p=0.01. IN 119 subjects from Obstetrics and Gynecology, 70.58% (n=84) subjects followed the adequate biomedical waste disposal methods. In 130 subjects from General Surgery, 82.30% (n=107) subjects were using appropriate methods for biomedical waste disposal which was non-significant statistically with p=0.42. Concerning the designation of the study participants, among 859 nurses, 75.20% (n=646) subjects followed the appropriate methods for disposal of the biomedical waste which was a significant proportion with p=0.02. A similar significant adequate practice of biomedical waste was seen in doctors where 68.40% (n=197) subjects among 288 were practicing the adequate biomedical waste disposal criteria. For the various divisions, Injection OPD and IPD personnel were doing adequate practice concerning biomedical waste disposal with p<0.001. However, non-significant results were seen for ICU and OT with p=0.16 as depicted in Table 2.

The study results for the assessment of different variables of biomedical waste management are summarized in Table 3. The biomedical waste management committee was present with 1072 study subjects and was absent in 224 study subjects where adequate biomedical waste disposal was practiced by 75.46% (n=809) subjects with the biomedical waste management committee and in 61.16% (n=137) subjects with no biomedical waste management committee respectively. This difference was statistically non-significant with p=0.34. SOP (standard operating protocol) was present in 1079 subjects where appropriate biomedical waste disposal was followed in 75.62% (n=816) study subjects which was a statistically non-significant proportion with p=0.43 (Table 3).

DISCUSSION

The present study assessed 1296 healthcare personnel for the appropriate practice of biomedical waste during the COVID-19 pandemic. The study included the majority of nurse subjects with 66.28% (n=859) nurses followed by 22.22% (n=288) doctors as participants, and 11.49% (n=149) study participants were the other healthcare personnel belonging to the different categories including security personnel, billing department, pharmacy personnel, and sweepers of the institute. These distributions of the study subjects were comparable to the previous studies of Askarian M et al[10] in 2010 and Chartier Y et al[11] in 2014 where authors assessed the

healthcare professionals concerning their knowledge of appropriate disposal of the biochemical waste.

The study results showed that the majority of the study participants were from the General medicine department with 61.95% (n=803) subjects followed by 10.03% (n=130) subjects from General Surgery and Pediatrics each, 9.18% (n=119) subjects from the Obstetrics and Gynecology, and least 8.64% (n=112) subjects from the Department of Orthopedics. The divisions of the various departments assessed were IPD with 44.67% (n=579) subjects followed by OPD with 28.31% (n=367) subjects, injection OPD with 19.21% (n=249) subjects, and least 7.79% (n=101) subjects from the ICU/operation theatre/procedure room. These demographics were consistent with the studies of Hanumantha Rao P[12] in 2009 and Jahnavi G[13] in 2006 where authors assessed the subjects with demographics comparable to the present study in their studies.

Concerning the practice of appropriate biomedical waste disposal by various healthcare personnel, concerning the departments, among 112 subjects from the Orthopedic department, appropriate BMW disposal was seen in 80.35% (n=90) study subjects which were non-significant with p=0.07. Among 130 subjects from Pediatrics, 83.84% (n=109) subjects followed the appropriate BMW disposal methods which were statistically significant with p=0.01. IN 119 subjects from Obstetrics and Gynecology, 70.58% (n=84) subjects followed the adequate biomedical waste disposal methods. In 130 subjects from General Surgery, 82.30% (n=107) subjects were using appropriate methods for biomedical waste disposal which was non-significant statistically with p=0.42. Concerning the designation of the study participants, among 859 nurses, 75.20% (n=646) subjects followed the appropriate methods for disposal of the biomedical waste which was a significant proportion with p=0.02. A similar significant adequate practice of biomedical waste was seen in doctors where 68.40% (n=197) subjects among 288 were practicing the adequate biomedical waste disposal criteria. For the various divisions, Injection OPD and IPD personnel were doing adequate practice concerning biomedical waste disposal with p<0.001. However, non-significant results were seen for ICU and OT with p=0.16. These results were consistent with the previous studies of Capoor MR[14] in 2021 and Leyland AH[15] in 2020 where a similar proportion of the healthcare personnel followed the appropriate biomedical waste disposal practice.

The study results for the assessment of different variables of biomedical waste management showed that the biomedical waste management committee was present with 1072 study subjects and was absent in 224 study subjects where adequate biomedical waste disposal was practiced by 75.46% (n=809) subjects with the biomedical waste management committee and in 61.16% (n=137) subjects with no biomedical waste management committee respectively. This difference was statistically non-significant with p=0.34. SOP (standard operating protocol) was present in 1079 subjects where appropriate biomedical waste disposal was followed in 75.62% (n=816) study subjects which was a statistically non-significant proportion with p=0.43. These findings were in agreement with the studies of Devi A et al[16] in 2019 and Dey P[17] in 2020 where different variables for biomedical waste management similar to the present study were reported by the authors in their studies.

CONCLUSION

Considering its limitations, the present study concludes that nearly 3/4th of the study subjects assessed in the present study followed the proper protocols for the disposal of biomedical waste during the COVID-19 pandemic. However, 100% compliance should be made by the healthcare workers with the periodic monitoring of biomedical waste disposal and appropriate resource allocation.

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TABLES

Characteristics	**%**	**N=1296**
Department		
Orthopedics	8.64	112
Pediatrics	10.03	130
Obstetrics and Gynecology	9.18	119
General surgery	10.03	130
General medicine	61.95	803
Designation		
Nurses	66.28	859
Doctors	22.22	288
Others	11.49	149
Divisions		
ICU/OT/procedure room	7.79	101
Injection OPD	19.21	249
IPD	44.67	579
OPD	28.31	367

Table 1: Observation of Biomedical waste management in various sectors of the Institute

Characteristics	**Number (n=1296)**	**Appropriate BMW disposal**		**p-value**
		%	**N**	
Department				
Orthopedics	112	80.35	90	0.07
Pediatrics	130	83.84	109	**0.01**
Obstetrics and Gynecology	119	70.58	84	0.25
General surgery	130	82.30	107	0.42

General medicine	803	69.24	556	
Designation				
Nurses	859	75.20	646	**0.02**
Doctors	288	68.40	197	**0.03**
Others	149	69.12	103	**-**
Divisions				
ICU/OT/procedure room	101	70.29	71	0.16
Injection OPD	249	75.90	189	**<0.001**
IPD	579	76.33	442	**<0.001**
OPD	367	66.48	244	-

Table 2: Appropriate biomedical waste disposal by the healthcare personnel of the study

Variables	**Total (n=1296)**	**Appropriate BMW disposal**		**p-value**
		%	**N**	
The biomedical waste management committee				
Present	1072	75.46	809	0.34
Absent	224	61.16	137	
SOP for BMW management				
Present	1079	75.62	816	0.43
Absent	220	59.54	131	

Table 3: Assessment of BMW disposal variables in the study subjects