

**ASSESSMENT OF KNOWLEDGE ATTITUDE AND PRACTICE OF BIO-MEDICAL  
WASTE MANAGEMENT AMONG HEALTH CARE PROFESSIONALS IN A TERTIARY  
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**ABSTRACT**

Health care sectors are service-oriented, providing medical care facilities consists of observational, diagnostic, research, therapeutic and rehabilitative services. In this sector, health care professionals handle the Biomedical Waste (BMW) management. In other words the private and public health sectors are responsible for the generation of BMW. Hence it is need of the hour to assess the Knowledge, Attitude and Practice (KAP) levels among health care professionals for the effective management of BMW and as well as to control its deleterious effects. Therefore this study is aimed to assess the Knowledge, Attitude and Practice on BMW management among healthcare professionals working in a tertiary care hospital. An observational study was conducted among the health care professionals to assess KAP levels for the effective management of BMW at Narayana medical college and hospital using self-administered, pre-designed, pre-tested, semi-structured questionnaire whereas data was collected using google forms. The results demonstrate that most 247(100%) of them had good knowledge about BMW, aware of Bio-hazard symbol, its guidelines and transmission of diseases. The parameter Attitude, reveals that majority 212(85.8%) agree for safe disposal of BMW and its management, whereas some (78.1%) feel that it is a team work, while others (76.1%) exerts it is an extra burden to their routine work. The last parameter practice states that most 240 (97.2%) were aware of Personal Protective Equipment (PPE) usage while handling BMW and as well as its guidelines framed by ministry of health, to prevent contamination while handling items related to patients, whereas 90.3% aware of color coding containers at BMW disposal, while 86.6% knew about maintenance of biomedical waste records. Thus above study clearly concludes that the Knowledge, Attitude and Practice on BMW management among healthcare professionals were high in a tertiary care hospital.

**KEYWORDS:** Biomedical waste management, health care professionals and KAP.**INTRODUCTION**

Bio Medical Waste is generated in the process of diagnosis, treatment or immunization of human beings or animals, or in research activities pertaining thereto or in the production or testing of biological.<sup>[1]</sup> At present the global statistical data reveals that a significant proportion of biomedical waste is generated every day, ranging from 0.9 kg/bed/day to 3 kg/bed/day. According to WHO (2000), 85% of hospital generated biomedical waste is non-hazardous, whereas 10% is infectious in nature and remaining 5% is non-infective in nature but hazardous.

Moreover the BMW is also one of the key factor in affecting living things either directly or indirectly and also affects humans causing various diseases and disorders.<sup>[2,3,4,5,6]</sup> however there has been a rise in BMW production from 500-750 gm per day to 2.5-4.5kg after the COVID-19 pandemic. This rapid increase in BMW production due to pandemic causing threat to environment and major health concern in the community.

As per WHO norms 16 billion injections were administered every year either in the form of treatment or

immunization.<sup>[7]</sup> Among all the disciples, primary health care setting is a major contributor for biomedical waste generation. In India, annually about 0.33 million tons of biomedical waste is generated especially from hospitals.<sup>[8]</sup> Moreover, it is estimated that 484 TPD (tonnes per day) of BMW is generated in India out of which 447 TPD is treated and 37 TPD is untreated.<sup>[9]</sup>

The major step involved in Bio Medical Waste (BMW) Management includes Segregation of the waste, Transportation of the waste and Disposal of the Waste. Yet, another most important aspect of the BMW Management is the Knowledge, Attitude and Practice (KAP) of the health care professionals handling the waste.<sup>[10]</sup>

Knowledge is termed as the awareness on biomedical waste management, while Attitude is the feelings towards BMW management. Practice is addressed as the process of identification, later segregation and final disposing of biomedical wastes. Health care professionals should possess adequate knowledge on health hazards of BMW, and as well as right attitude towards BMW management and also practice safety concerns regarding disposal of BMW.<sup>[8]</sup>

In resolving health issues, major risks, and treating ill people in various healthcare services and settings leads to generation of waste, which is hazardous to health. The BMW produced in the course of healthcare setting influences in generating infections. Poor knowledge of handling BMW leads to serious consequence, which causes deleterious effects on environment.<sup>[11]</sup> At Geneva in June 2007, WHO framed some principle guidelines for the effective, safe and sustainable management of BMW, and as well as in order to protect health care professionals and also environment. For effective management of BMW, one should need proper committed right resources, with strong teamwork. The health care professionals and facilitators should follow good clinical and BMW practices. Legal and good Governance, financial and human resources support were needed by Government to carry this type of activities.<sup>[12]</sup>

In majority of cases it is evident that collection and disposal of BMW is critical challenge, because it is associated with health concern of community. Out of all the health issues, major concern with diseases like HIV/AIDS, Hepatitis B and C, since they are ready for instant transmission through BMW. In order to stop this kind of viral transmissions every institution should follow the BMW guidelines framed by WHO, to collect or receive, store or transport, treat or dispose, in handling BMW. For instance collected BMW should be segregated in color coded bags. Disposal will be handled by both health care professionals and general community. Inappropriate handling of BMW may lead to serious health consequences and also significantly affects the nature. Moreover, lack of awareness and knowledge on BMW in hospitals are becoming viral zone for

infections rather than prevention and control.<sup>[13]</sup> Therefore it is mandate for health care professionals to understand the basics of BMW for its effective management that includes adequate knowledge on the disposal, colour coded system and its deleterious affects.

At Present in India BMW generation tend to increase every year due to Healthcare industry run by either by public or private. It comprises of Hospitals, medical centres, clinical trial centres, telemedicine centres, clinical settings, medical tourism, and other health insurance sectors. Hence it is need of the hour to assess the KAP levels among health care professionals for the effective management of BMW and as well as to control its deleterious effects. Thus this study is aimed to assess the Knowledge, Attitude and Practice on BMW management among healthcare professionals working in a tertiary care hospital.

## MATERIALS AND METHODS

**STUDY DESIGN:** A hospital based observational study has been carried out in Narayana Medical College & Hospital (NMCH), Nellore, and Andhra Pradesh, India.

**PERIOD OF STUDY:** The study was carried out from Sep - Oct 2022, for a period of two months.

**INCLUSION CRITERIA:** All the health care professionals of both genders (lab technicians, Nursing staff, and students) were included after taking their informed consent.

**EXCLUSION CRITERIA:** Those who were not willing/interested, were excluded.

**SAMPLE SIZE:** Study subjects: 271.

**DETAILS OF THE STUDY:** Data was collected using self-administered, pre-designed, pre-tested, semi-structured questionnaire through google forms. Prior Institutional Ethics Committee Clearance and informed consent from the study subjects were obtained.

## Statistical analysis

Collected data was entered into Microsoft Excel and analysed using 25.0 version of SPSS Software. For Quantitative variables, the values were expressed as Mean and Standard Deviation. For Qualitative variables, the values were expressed as numbers and percentages. To study the subjects towards BMW for Attitude and Practice, Likert scale was used.<sup>[5,6,14]</sup>

## RESULTS

The study was conducted among health care professionals of both genders (lab technicians, Nursing staff, and students) of a tertiary care hospital in Nellore district, Andhra Pradesh. Nearly 251 were enrolled in the study with their informed consent, in the Department of community medicine, Narayana Medical College and Hospital, Nellore.

### Background characteristics

Next we assessed the background characteristics which has been documented in table 1. Out of 271 health care professionals, 247 had submitted their responses. Among them, majority of the participants were females 184(74.5%) and remaining were males 63(25.5%). Next we studied the occupational status. Among health care professionals, 194 (78.5%) were Nursing staff and 53 (21.5%) were Lab Technicians of both gender. Later we assessed the Knowledge level among health care professionals on BMW management. Among health care professionals, Out of 247 study subjects, 247(100%) of the study subjects aware of BMW guidelines set by Government of India and also aware about the bio-hazard symbol. Most of these study subjects aware about the transmission of HIV/AIDS through Biomedical waste and also have sufficient knowledge about the disposal methods of Biomedical Waste.

### Attitude of the healthcare professionals toward bio medical waste management

Next we studied the attitude among health care professionals and results has been documented in table - 2. The results clearly demonstrated that most of the study subjects have good attitude towards Biomedical Waste Management.

Out of 247 study subjects assessed, 212(85.8%) health care professionals strongly agree for safe disposal of BMW in healthcare setup, while 78.1% health care professionals strongly believe that BMW Management is a team work. Interestingly 76.1% health care professionals feel that BMW management creates extra burden on routine work.

The majority of subjects up to 202(81.8%) are well aware of BMW management and its risk associated with transmission of infectious disease. Most of them feel that Personal protective Equipment (PPE) is must while handling the biomedical waste, while 72.9% study subjects were aware of De-contamination and disinfection, which eliminates the infection. In addition to that health care professionals up to 189(76.5%) agree that use of color codes for segregation of BMW is must. The health care professionals up to 75.3% understand that proper BMW management reduces the risk associated with it. 74.5% subjects feel that it is

mandatory to upgrade knowledge on BMW Management.

### Practice of health care workers in bio medical waste management

Next we studied the practice of BMW management and results obtained is depicted in table 3. The results presented in the table 3 highlights the pattern of practice of BMW management among health care professionals. Most of the health care professionals up to 226(91.5%) strictly follow the guidelines framed by ministry of health for Biomedical waste Management. It has been noticed that the majority of cases up to 205(83%) stick to the infection control policy while handling COVID-19 patients. Later we studied usage of PPE among health care professionals. Most cases up to 240 (97.2%) among health care professionals were aware on usage of PPE while handling BMW. 84.6% of the health care professionals discards their PPE after handling biomedical wastes.

Majority of the health care professionals up to 221(89.5%) follows proper hand hygiene before and after every procedure. 90.3% health care professionals follow color coding containers according to the type of wastes while disposal of BMW. Most of them well aware of policies for separating BMW under the label such as non-hazardous, hazardous and sharp waste. 86.6% of study subjects maintain biomedical waste records while 209(84.6%) health care professionals will take care in preventing sharp related injuries like avoid recapping of used needles etc. Most of them 210(85%) follow strict guidelines to prevent contamination while handling items related to COVID-19 patients and as well as NON-COVID patients.

**Table 1: Knowledge of study subjects regarding Bio medical Waste (n=247).**

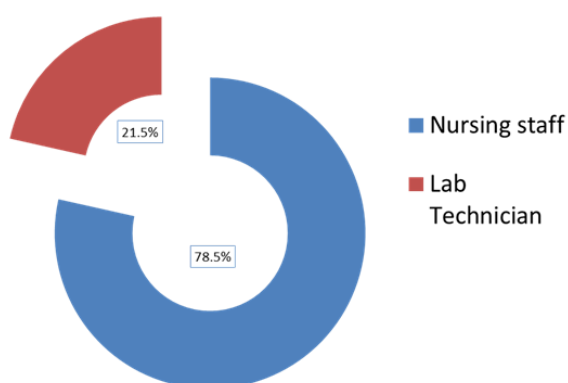
S.No.	Questions on Knowledge	Yes (%)	No (%)
1	Do you heard about Biomedical Waste?	246 (99.6)	01 (0.4)
2	Are you aware of Biomedical waste rules set by Government of India?	247(100.0)	00(0.0)
3	Biomedical waste is a health hazard?	246(99.6)	01(0.4)
4	Do you know about the bio-hazard symbol ?	247(100.0)	00(0.0)
5	Are you aware of categories of Biomedical waste?	246(99.6)	01(0.4)
6	Do you know about the transmission of Hepatitis through Biomedical waste ?	245(99.2)	02(0.8)
7	Do you know about the transmission of HIV/AIDS through Biomedical waste ?	247(100.0)	00(0.0)
8	Do you know about the disposal methods of Biomedical waste?	247(100.0)	00(0.0)
9	Are there any guidelines for Biomedical waste disposal by Government of India ?	246(99.6)	01(0.4)

**Table 2: Attitude of study subjects towards Bio Medical Waste (n=247).**

S. NO	Questions on Attitude	Strongly Agree(%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly Disagree (%)
1	It is necessary for Safe disposal of BMW in healthcare setup	212(85.8)	32(13.0)	00(0.0)	03(1.2)	00(0.0)
2	BMW management is a team work	193(78.1)	53(21.5)	00(0.0)	00(0.0)	01(0.4)
3	BMW management creates extra burden on routine work.	188(76.1)	48(19.4)	04(1.6)	04(1.6)	03(1.2)
4	BMW management is risk for transmission of diseases	202(81.8)	42(17.0)	02(0.8)	01(0.4)	00(0.0)
5	Segregation of BMW into different categories is time consuming	192(77.7)	46(18.6)	03(1.2)	02(0.8)	04(1.6)
6	PPE is must while handling biomedical waste	190(76.9)	54(21.9)	03(1.2)	00(0.0)	00(0.0)
7	De-contamination and disinfection reduces the infection.	180(72.9)	64(25.9)	02(0.8)	01(0.4)	00(0.0)
8	Use of color codes for segregation of waste is must	189(76.5)	56(22.7)	02(0.8)	00(0.0)	00(0.0)
9	BMW management enhances the quality assurance of health sectors.	186(75.3)	57(23.1)	04(1.6)	00(0.0)	00(0.0)
10	It is mandatory to upgrade knowledge on BMW Management	184(74.5)	61(24.7)	01(0.4)	01(0.4)	00(0.0)

**Table 3: Practice of study subjects on Biomedical Waste (n=247).**

S.No	Questions on Practice	Always (%)	Sometimes (%)	Never (%)
1	Do you follow the guidelines by ministry of health, BMW Management?	226(91.5)	20(8.1)	01(0.4)
2	Do you adhere the infection control policy while handling COVID-19 patients?	205(83.0)	41(16.6)	01(0.4)
3	Did you use PPE while handling biomedical wastes?	240(97.2)	04(1.6)	03(1.2)
4	Did you discard all PPE after handling biomedical wastes?	209(84.6)	37(15.0)	01(0.4)
5	Do you follow proper hand hygiene before and after every procedure ?	221(89.5)	25(10.1)	01(0.4)
6	Do you follow color coding of containers while disposing BMW?	223(90.3)	23(9.3)	01(0.4)
7	Do you follow policies separating BMW (nonhazardous, hazardous & sharp waste) in segregation?	214(86.6)	32(13.0)	01(0.4)
8	Do you maintain Biomedical waste records?	214(86.6)	32(13.0)	01(0.4)
9	Did you care in preventing sharp injury like avoid recapping used needle?	209(84.6)	35(14.2)	03(1.2)
10	Did you prevent contamination while handling items of COVID-19 patients and other NON-COVID-19patients?	210(85.0)	35(14.2)	02(0.8)

**Figure 1: Distribution of study subjects by occupation.****DISCUSSION**

BMW is a big challenge to the current health care facilities. Segregation of biomedical waste at the point of generation not only reduces the financial expenditure for management of BMW, but also the health hazards due to handling of these wastes. Moreover health care facilities generate huge BMW. This health care facilities may be public or private sector. In general BMW management system has been analysed using three influential factors like, KAP (Knowledge, Attitude and Practice). Thus, assessing the KAP levels among health care professionals is important in the present scenario. Moreover enough knowledge on KAP levels allows health care professionals for the effective management of BMW and as well as to control its deleterious effects.



Thus this study is aimed to assess the Knowledge, Attitude and Practice on BMW management among healthcare professionals working in a tertiary care hospital.

The present study was conducted in the Department of community medicine, Narayana Medical College and Hospital, Nellore. The study conducted after getting approval from ethical committee from the institute. Nearly 251 health care professionals of both genders (lab technicians, Nursing staff, and students) were enrolled in the study with their informed consent of Nellore district, Andhra Pradesh.

Initially screened the background characteristics and documented in table 1. Previous studies also assessed similarly (Aravind A et al (2023)<sup>[9]</sup>; Dalui et al (2021)<sup>[15]</sup>; Chudasama Rajesh et al (2013).<sup>[16]</sup> The health care professionals up to 271 were enrolled and 247 had responded to the questionnaire. The demographic data reveals that majority of the participants were females 184(74.5%) and remaining were males 63(25.5%) [Dalui et al (2021),<sup>[15]</sup> Lavanya K.M. et al (2018)<sup>[17]</sup>]; reported similar findings. Later we screened the occupational status and found that 194 (78.5%) were Nursing staff and 53 (21.5%) were Lab Technicians of both gender.

After completing demographic analysis we performed KAP analysis among health care professionals. Earlier studies clearly demonstrated the significance of KAP analysis (Pandey et al study<sup>[18]</sup> (2016)).

In the present study at first we analysed the levels of Knowledge level among health care professionals on bio medical waste management and observed that 247(100%) of the study subjects aware of BMW guidelines set by Government of India and also aware about the bio-hazard symbol which was similar to the earlier studies reported (Basavaraj et al study<sup>[19]</sup> (2021), Anand et al study<sup>[20]</sup> (2016), Malini et al study<sup>[18]</sup> (2015)). In addition most of them are aware about the transmission of HIV/AIDS through BMW and also have sufficient knowledge about the disposal methods. These findings were agreement with earlier studies that too presented similar data.

Later the second parameter "attitude" was studied and data obtained is documented in table -2 and majority has good attitude towards Biomedical Waste Management. Most cases 212(85.8%) strongly agree for safe disposal of BMW, while 78.1% consider that BMW Management is a team work whereas 76.1% feel that it is an extra burden. Subjects 202(81.8%) is well known about usage of Personal protective Equipment (PPE), effective management of BMW, and its risk associated with transmission of infectious diseases. The cases upto 76.5% agree that use of color codes for BMW segregation, while 72.9% aware of De-contamination and disinfection. Cases up to 75.3% understands that proper BMW management reduces risk complications,

whereas 74.5% wants to upgrade their knowledge on BMW Management.

Our findings presented here were concomitantly in agreement with other studies (Dalui et al study<sup>[15]</sup> (2021), Basavaraj et al study<sup>[19]</sup> (2021), Anand et al<sup>[20]</sup> (2016), Parida et al study<sup>[21]</sup> (2019).

In final we assessed the last parameter "practice" in the management of BMW and results presented in table 3. Cases 226(91.5%) follows the guidelines framed by ministry of health for Biomedical waste Management. 240 (97.2%) cases were aware on usage of PPE and 205(83%) adopted infection control policy while handling COVID-19 patients, while 84.6% cases discards their PPE after handling BMW.

Majority of cases aware of policies for separating BMW under the label such as non-hazardous, hazardous and sharp waste. 221(89.5%) follows proper hand hygiene, and 90.3% cases identified color coding containers according to the type of wastes, 86.6% maintain biomedical waste records while 209(84.6%) aware of sharp related injuries like avoid recapping of used needles etc. Most cases 210(85%) follows guidelines to prevent contamination while handling items related to COVID-19 patients and as well as NON-COVID patients. The present findings were well related to other studies reported similar findings (Lavanya et al study<sup>[17]</sup> (2018), Saini et al study<sup>[13]</sup> (2004). Interestingly for the first time the present study highlights the importance of effective management of BMW among health care professionals (both genders).

Thus the above study concludes that, Knowledge is well known parameter and most 247(100%) them had good knowledge about Bio-hazard symbol, its guidelines and as well as of transmission of diseases through BMW. In case of Attitude, majority 212(85.8%) of the subjects agree for safe disposal of BMW and its management, whereas 78.1% realize that it is a team work, while 76.1% feel its an extra burden to their routine work. The last parameter practise highlights that most 240 (97.2%) were aware of PPE while handling BMW and its guidelines framed by ministry of health and as well as to prevent contamination while handling items related to COVID-19 patients, whereas 90.3% follows color coding containers at BMW disposal, while 86.6% knew about maintenance of biomedical waste records.

## CONCLUSIONS

Thus above study concludes that the Knowledge, Attitude and Practice on BMW management among healthcare professionals were high.

**RECOMMENDATIONS:** An effective and goal oriented training program's is necessary to further improve the knowledge, attitude and practices about Biomedical waste management with frequent quality checks and feedback to the hospital staff.

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