

**A survey based study on awareness and usage of Biomedical Waste Management system in Parul Sevashram Hospital, Vadodara**

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**Abstract**

**Background and Objectives:** Misconduct of the waste not only affects the producers and staffs but also affects the common people. The proper & safe management of biomedical waste has become a worldwide humanitarian issue today. With this background, this study was carried out assess the level in knowledge, attitudes and practices among Students, Interns, Laboratory Technicians and other Health Care Workers (nursing staff) in the different departments of a hospital regarding the biomedical waste management system in Parul Sevashram Hospital, Vadodara.

**Methods:** A survey study was directed using a questionnaire with closed-ended questions. It was distributed to students, interns, laboratory technicians and other health care workers at Parul Sevashram Hospital, Vadodara. The questionnaires shared via Google form were distributed to all participants through Gmail/WhatsApp. Results were expressed as an overall

mean number and mean percentage (%) of respondents for each question.

**Results:** The study suggested that 61.13% students had a higher knowledge level among BMW. However, 66.8% Interns, 81.2% Lab. Technicians and 69.7% other HCWs had a higher awareness about Attitude level. Furthermore, all participants had less practice level among BMW.

**Conclusions:** This further identifies gap between Attitude and practice, knowledge is needed to be translated into better practices at various levels in a Parul Sevashram Hospital.

**Keywords:** Attitude, Awareness, Biomedical Waste, Knowledge, Practice.

**Introduction**

Biomedical waste describes to any solid or liquid waste which is generated during diagnosis, clinical treatment, vaccination of human beings and animals or during research that may present a fear of spreading infections to

humans. (1) Hospital waste is considered harmful because they contain hazardous materials. (4)

The general waste is treated by local municipalities in the same way as house-hold waste, but special precautions and treatment methods are required for BMW, so that it does not cause any injury to human beings and the environment. (7) It is necessary to have safe and reliable methods of segregation and disposal of hospital waste. (13)

Biomedical waste management has recently shown as a problem of major concern not only to hospitals, nursing home authorities but also for the safe environment. The bio-medical wastes developed from health care units depend upon a several factors like:

(a) Methods of waste management, (b) several types of health care units, (c) specialization of healthcare units, (d) ratio of reusable items in use, (e) availability of infrastructure and resources etc. (2-10)

An overall 80% of the waste generated in the hospitals is composed of general waste while the remaining 20% comprises infectious, dangerous or radioactive waste of this, 20% of the waste is highly infectious and hazardous and that could cause serious damage to the society and the environment when it is not properly separated and disposed of. (1)

when inappropriate segregation of waste could cause different kinds of deadly infectious diseases like Human immunodeficiency virus (HIV), hepatitis C and B infections, etc.(5) The World Health Organization (WHO) appraised that in 2000, 21 million humans were infected with hepatitis B, 2 million people with hepatitis C, and at least 2600,000 people with human immunodeficiency virus because of injections with contaminated syringes. (11)

Medical Management and allied offerings are fighting the COVID19 pandemic with the available resources and

knowledge. As of the third week of March 2021, there were 121,874,133 cases of COVID19 and 2,693,946 had died because of its complications. (6)

### **Classification of Waste**

The World Health Organization (WHO) has classified biomedical waste into 8 categories including:

General Waste

Medical waste

Radioactive waste

Chemical waste

Toxic to potentially toxic waste

Sharps waste

Pharmaceuticals waste

Pressurized containers (2)

### **Source of Biomedical Waste**

Hospitals produce waste, which is growing through the years in its amount and type. The hospital waste, in addition to the risk for patients and also people who handle them, also causes a risk to public health and environment. (2)

### **Treatment and disposal techniques for biomedical waste**

There are several methods available for the treatment of infectious waste. The following methods will show the treatment that may be available at your facility.

3.1 Autoclaving

3.2 Incineration

3.3 Thermal Inactivation

3.4 Gas/Vapor Sterilization

3.5 Chemical Disinfection

### **Waste Segregation**

The waste segregation is done as per legislation provided by the ministry of environment, forest and climate change, government of India published in gazette of India under section 3 in 2016. According to that the waste shall

be segregated in bags as per the schedule storage treatment, disposal. (19)

### **Containers and their Labeling**

For collection of BMW, we must make sure that leaky-proof containers must be used along with right labeling and maintenance of their integrity, provided treatment is done chemically and thermally. Harmful material containment must be sealed. No labeling is essential except there is any chance of recycling of the wastes and in such instances the container must be labeled as 'Do Not Recycle'.

The success of biomedical waste management programme base on the knowledge and practice among Health Care Worker(HCW).(1) Since the application of the Biomedical Waste Management and Handling Rules (1998), every concerned health workers is expected to have proper knowledge, practice, and capacity to guide others for waste collection and management, and proper handling techniques.(12) Studies recorded from different parts of the country; still convey that there are gaps in the Knowledge, deficiency in the attitudinal component and inconsistency in the practice aspects which are matters of concern among the health care professionals.(5)

### **Aims and Objective**

Our study focus on assessment of Knowledge, Attitude and Practice level of Biomedical Waste Management among Students, Interns, Laboratory Technicians and other Health Care Workers in different department of Parul Sevashram Hospital, Vadodara.

### **Materials and Method**

Prospective/survey based study was carried out for a period of 4 months to assess the Knowledge, Attitude and Practices among Students, Interns, Laboratory Technicians and Health Care Workers in Parul Sevashram Hospital (PSH), Vadodara. In this 300 eligible participants are taken as the sampling frame. The

study was approved by the Parul University Institutional Ethics Committee for Human Research (PU-IECHR) with approval number: PUIECHR / PIMSR / 00 / 081734 /4004.

The tool used for the study was a close ended, self-administered questionnaire which surrounded 30 questions about Knowledge, Attitudes and Practices. 10 questions about Knowledge, 10 questions about Practice, were both in the form of multiple choice questions with one correct response and statements with Yes, No and Maybe and 10 questions about Attitude were in the form of statements with Agree, Disagree and Maybe.

The questionnaire was self-administered, with representations from the various strata of the study respondents. The questionnaires shared via Google form were distributed to all participants through Gmail/WhatsApp. The participants filled up the self-administered questionnaires without scope for undue help.

The returned questionnaires were coded and analyzed. Each correct response was given one score and the total mean was calculated for each determinant results were expressed as an overall mean number and mean percentage (%) of respondents for each question.

### **Observation and Result**

In this study, I have collected 300 responses from the participants but during the collection time I got 351 responses at the end. Total 30 questions were designed. In these, 10 questions about Knowledge, 10 questions about Attitude and 10 questions about Practice. Total 271 Students, 41 Interns, 17 Laboratory Technicians, and 22 Other Health Care Workers (Nursing Staff) were included.

According to this, on Knowledge level of BMW among participants such as Students, Interns, Lab. technicians, and other HCWs represented mean score is 165(61.13%),

23(58.28%), 11.9(69.98%) and 14.8(67.25%) respectively. (Table-II)

In the Practice level on BMW among participants such as students, interns, Lab. Technicians, and other HCWs, Total 10 questions were formed based on the Practice level of the participants.

About color-code for BM Waste to be autoclaved disinfected on BMW among participants such as Students, Interns, Lab technicians, and other HCWs represented with total 94(34.7%), 16(39.0%), 11(64.7%), and 14(63.6%) respectively given positive replies.

About correct waste disposal on the BMW among participants such as Students, Interns, Lab. Technicians and other HCWs responded total is 182(67.1%), 32(78.0%), 14(82.3%) and 21(95.4%) respectively.

According to this, participants such as Students, Interns, Lab. Technicians and other HCWs represented with Mean is 199.3(44%), 19.1(46.57%), 8.8(51.75%) and 12.1(54.99%) respectively participants have correct Practice level on BMW. (Table-III)

In the current study, Total 10 questions were designed about the Attitude level of Participants. Total 271 Students, 41 Interns, 17 Laboratory Technicians, and 22 Other Health Care Workers like (Nursing Staff) were included.

On BMW is the teamwork for safe management on BMW among participants such as Students, Interns, Lab. Technicians and other HCWs responded with total 159(58.7%), 32(78.0%), 16(94.1%) and 19(86.4%) respectively.

According to the Attitude level on BMW among participants such as Students, Interns, Lab. Technicians and other HCWs responded with total Mean is 147.8(54.5%), 27.4(66.8%), 13.8(81.2%) and 15.8(69.7%) respectively. (Table-IV)

The overall survey of my study suggested that 69.98% Lab. Technicians had a higher knowledge level regarding BMW. Nevertheless, 58.28% interns had a lack of knowledge level regarding BMW compare to other participants.

Regarding awareness about Practice level on BMW among participants, 54.9% HCWs had a higher Practice on BMW. Whereas, 44% students had poor practice on BMW compare to the other participants.

Attitude level on BMW among participants such as 81.2% Lab. Technicians had a higher Attitude and 54.5% students had shown poor Attitude level on BMW compare to the others.

Other than that, the study also suggested that 61.13% students had a higher knowledge level but they had less Practice and Attitude level among BMW. However, 66.8% Interns, 81.2% Lab. Technicians and 69.7% other HCWs had a higher awareness about Attitude level.

### Discussion

A hospital's management does not end with medical treatment. In this context, proper biomedical waste management is critical for public health. (15) To avoid serious contamination and disease transmission risks, it must be properly managed. (16) The purpose of this study was to assess the level of biomedical waste management on knowledge, practice, and attitude among students, interns, laboratory technicians, and other health care workers (nursing staff) in different departments of Parul Sevashram Hospital, Vadodara.

The cross-sectional study recognized determined lack in the knowledge component amongst the nursing staffs, though >50% of the study respondents, demonstrated good knowledge, attitudes and practices. (15) In the current study, the average knowledge level on BMW among all participants, 165.7(61.13%) students had good Knowledge level. However, 27.4(66.8%) interns,

13.8(81.2%) lab. Technicians and 15.8(69.7%) other HCWs had high Attitude level.

Furthermore, One Study suggested that newly joined or fresher requires induction training on biomedical Waste Management. (20) However, as per data of this study Participants those who have voluntarily attended seminars on BMW such as students, interns, Lab. technicians, and other HCWs with total average of 193(71.2%), 26(63.4%), 16(94.1%) and 20(90.9%) respectively.

Regarding practices related to BMW, 70% practiced the disposal in identified color coded bins, while 72% made disposal of sharps in puncture proof containers but only 30% were reporting the injuries caused by improper disposal of sharps. (15) However, in this study about identified color coded bins on BMW among participants such as students, interns, Lab, technicians and other HCWs represented with total 183(67.5%), 29(70.7%), 10(58.8%), and 17(77.3%) respectively. Regarding to disposal of sharp in puncture proof containers on BMW among all participants such as students, interns, Lab. Technicians and other HCWs responded with total 72(26.6%), 11(26.8%), 1(5.9%) and 5(22.7%) respectively. According to this overall Practice level among participants such as Students, Interns, Lab. Technicians and other HCWs represented Mean is 199.3(44%), 19.1(46.57%), 8.8(51.75%) and 12.1(54.99%) respectively have correct Practice level on BMW.

Another study found that results showed, 73.1% had a favorable attitude towards BMW management and 26.9% had an unfavorable attitude. Among them, those with the highest number of favorable attitudes were physicians (89%) and nurses (78%). (16)

However, in the current study, regarding question on Attitude level of BMW among participants such as

Students, Interns, Lab technicians and other HCWs responded with average 147.8(54.5%) students, 27.4(66.8%) interns, 13.8(81.2%) lab. Technicians and 15.8(69.7%) other HCWs had a favorable attitude towards BMW management.

There were some limitations to this study as well. Participants filled out the form later because internet was not available at the time of filling out the form. This increased the chances of the questions being incorrect and questions forgotten to be filled out. That is why we had to give reminders to those people. There was such trouble. In this study, I wanted to collect 300 responses from the participants but during the collection time I got 351 responses at the end.

### **Conclusion**

To conclude, the study was conducted among 351 participants at Parul Sevashram hospital suggested variety of observations among participants such as students, interns, laboratory technicians and other health care workers. Regarding the Knowledge level among participants such as Laboratory technicians had a high knowledge level. Practice level on BMW among Health Care Workers had a good Practice and students had low practice level on BMW compare to the other participants. Even so, in all participants had unsatisfactory result observed regarding Practice level on BMW satisfactory related to Attitude level among participants such as interns, Lab. Technicians and other health care workers had a better positive response towards BMW.

This further identifies gap between Attitude and practice, knowledge is needed to be translated into better practices at various levels in a Parul Sevashram Hospital. It should be supported by appropriate health education, training and the dedication of everyone involved in the management and handling of Biomedical Waste.

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I also thankful to all participants who have spent their valuable time to participate in study questionnaire.

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**Legend Figure and Tables**



Figure 1: Biomedical Waste from a Major Source<sup>(4)</sup>

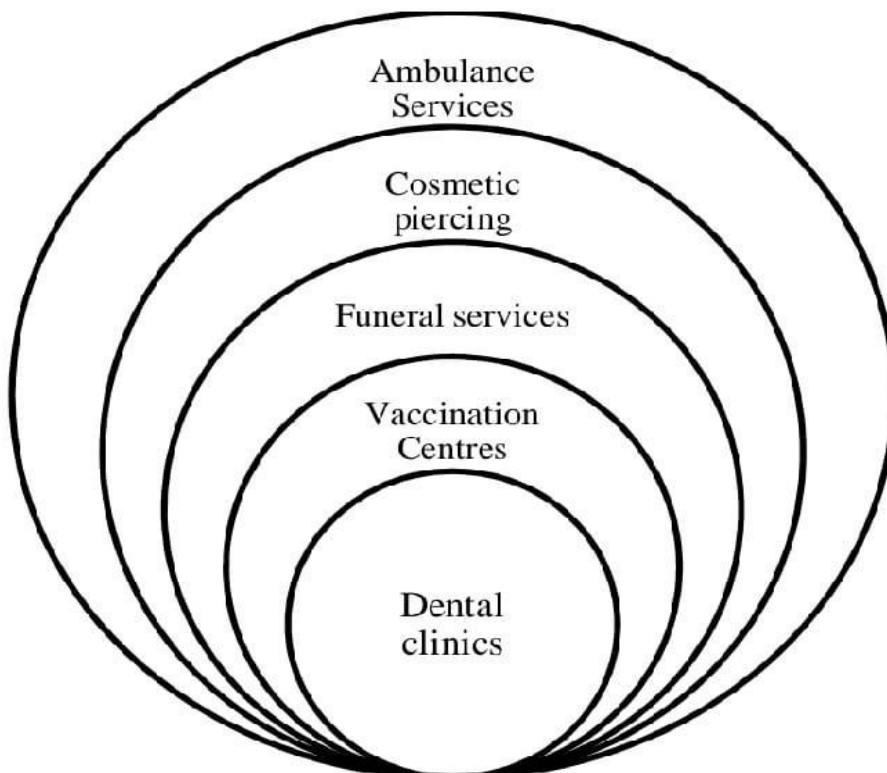


Figure 2: Biomedical Waste from A Minor Source<sup>(4)</sup>

Color-coding	Container types	Waste categories Types of waste
Yellow	Plastic bags	cat 1 human anatomical waste, cat 2 animal waste, cat 3 microbiology waste, cat 6 solid waste.
Red	Disinfected container plastic bags	cat 3 Microbiological cat 6 solid cat 7 solid waste (Waste IV tubes catheters, etc.).
Blue/White	Plastic bag/puncture proof containers	cat 4 waste sharp cat 7 plastic disposable tubings, etc.
Black	Plastic bag/puncture proof containers	cat 5 discarded medicines cat 9 incineration ash cat 10 chemical wastes

Table 1: The biomedical waste (management and handling) rules 1998).<sup>(3)</sup>

Sn.	Knowledge on BMW	Students N (%)	Interns N (%)	Laboratory Technicians N (%)	Other Health Care Workers N (%)
1.	About BM generation and legislation:	151 (55.7)	18(43.9)	11(64.7)	16(72.7)
2.	About agencies regulates wastes generated at health care facilities:	168(62)	26(63.4)	14(82.3)	13(59.0)
3.	Importance about BM waste generation, hazardous and legislation:	219(80.8)	32(78.0)	6(35.3)	20(90.9)
4.	Management & handling	186(68.6)	21(51.2)	12(70.6)	15(68.2)



	rules were first proposed in:				
5.	Amendments to the BMW rules made in:	80(29.5)	15(36.6)	10(58.8)	7(31.8)
6.	Statement describe one type of BM waste:	148(54.6)	24(58.5)	8(47.0)	10(45.4)
7.	Rules, waste should not be stored beyond:	154(56.8)	19(46.3)	12(70.6)	11(50.0)
8.	about attend voluntarily programmers about waste management:	193(71.2)	26(63.4)	16(94.1)	20(90.9)
9.	Who regulates the safe transport of medical waste?	169(62.4)	28(68.3)	15(88.2)	18(81.8)
10.	need a separate permit to transport biomedical waste:	189(69.7)	30(73.2)	15(88.2)	18(81.8)
Mean		165.7(61.13)	23.9(58.28)	11.9(69.98)	14.8 (67.25)

Table 2: knowledge level of the participant on the biomedical waste management

Sn.	Practice on BMW	Students N (%)	Interns N (%)	Laboratory Technicians N (%)	Other Health Care Workers N (%)
1.	About color-coding segregation of BM waste:	183 (67.5)	29 (70.7)	10 (58.8)	17 (77.3)
2.	About color-coding for BM waste:	195 (71.9)	34 (82.9)	15 (88.2)	19 (86.4)
3.	Is waste disposal correct in hospitals or not?	182 (67.1)	32 (78.0)	14 (82.3)	21 (95.4)
4.	Capable of causing punctures or cuts, how should these objects be disposed of ?	72 (26.6)	11 (26.8)	1(5.9)	5 (22.7)

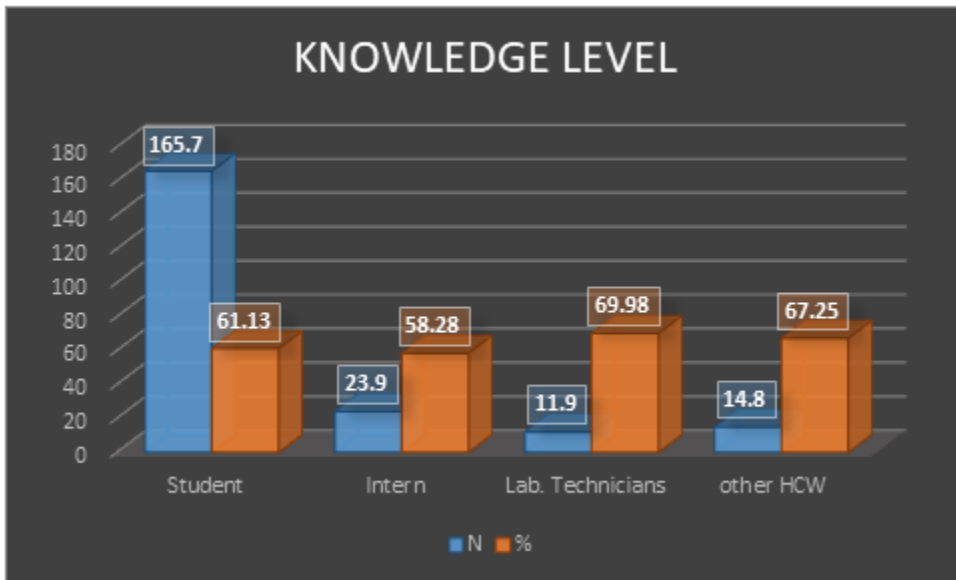
5.	Patient's documents disposed in:	60 (22.1)	7 (17.1)	2 (11.8)	3 (13.6)
6.	Color code for BM Waste to be autoclaved disinfected is :	94 (34.7)	16 (39.0)	11 (64.7)	14 (63.6)
7.	Approximate infectious waste from health care facility is :	82 (30.2)	12 (29.3)	8 (47.0)	11 (50.0)
8.	Color code for normal waste from the college :	146 (53.9)	21 (51.2)	12 (70.6)	18 (81.8)
9.	Waste that exposure with infected blood/body fluid and contaminated sharps Except :	64 (23.6)	9 (21.9)	3 (17.6)	2 (9.1)
10.	Statements about hazardous waste containers are true Except :	115 (42.4)	20 (48.8)	12 (70.6)	11 (50.0)
Mean		199.3 (44)	19.1 (46.57)	8.8 (51.75)	12.1 (54.99)

Table 3: Practice level of the participants on the Biomedical Waste Management

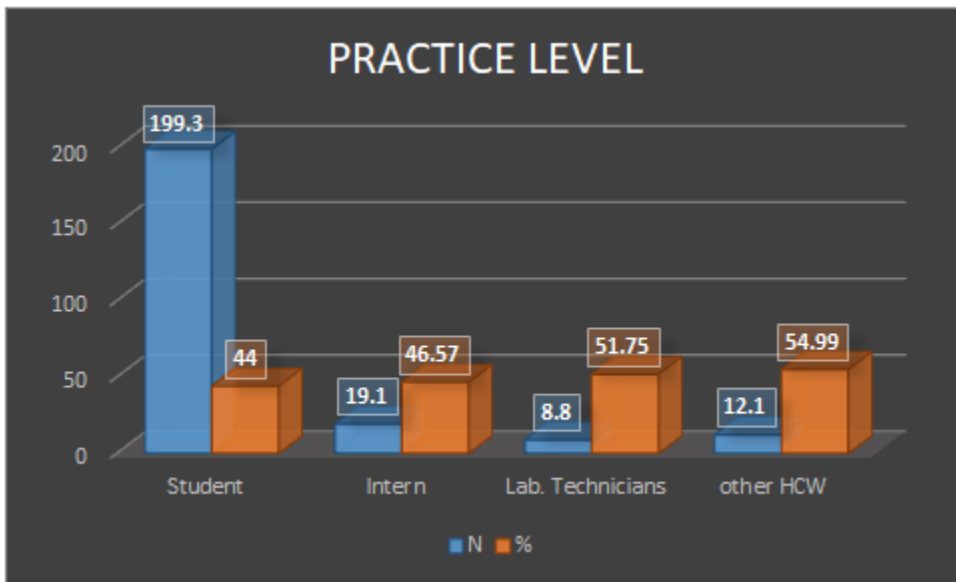
Sn.	Attitude on BMW	Students	Interns	Laboratory Technicians	Other Health Care Workers (Nursing Staff)
1.	Safe management of health care waste is not an issue at all.	120 (44.3)	22 (53.6)	13 (76.5)	14(63.6)
2.	BMW is the teamwork of people who are responsible for safe management.	159 (58.7)	32 (78.0)	16 (94.1)	19 (86.4)
3.	Safe management efforts by the hospital increase the financial burden on	77 (28.4)	10 (24.4)	11 (64.7)	9 (40.9)

	management.				
4.	Safe management of health care waste is an extra burden on work.	91 (33.6)	18 (43.9)	13 (76.5)	13 (59.1)
5.	Infectious waste should be sterilized from infections by autoclaving before shredding and disposal.	162 (59.8)	28 (68.3)	14 (82.3)	18 (81.8)
6.	An effluent treatment plant for disinfection of infection water should be set up in Medical colleges.	157 (57.9)	34 (82.9)	13 (76.5)	14 (63.6)
7.	Important to report to the Pollution Control Board of India for biomedical waste management.	178 (65.7)	35 (85.4)	15 (88.2)	16 (72.7)
8.	Labeling the container before filling it with waste is of any clinical significance.	174 (64.2)	30 (73.2)	14 (82.3)	18 (81.8)
9.	Segregation of waste at source increases the risk of injury to waste handlers.	153 (56.4)	30 (73.2)	13 (76.5)	17 (77.8)
10.	Safe disposal of BMW is necessary in healthcare areas.	207 (76.4)	35 (85.4)	16 (94.1)	20 (90.9)
Mean		147.8 (54.5)	27.4 (66.8)	13.8 (81.2)	15.8 (69.7)

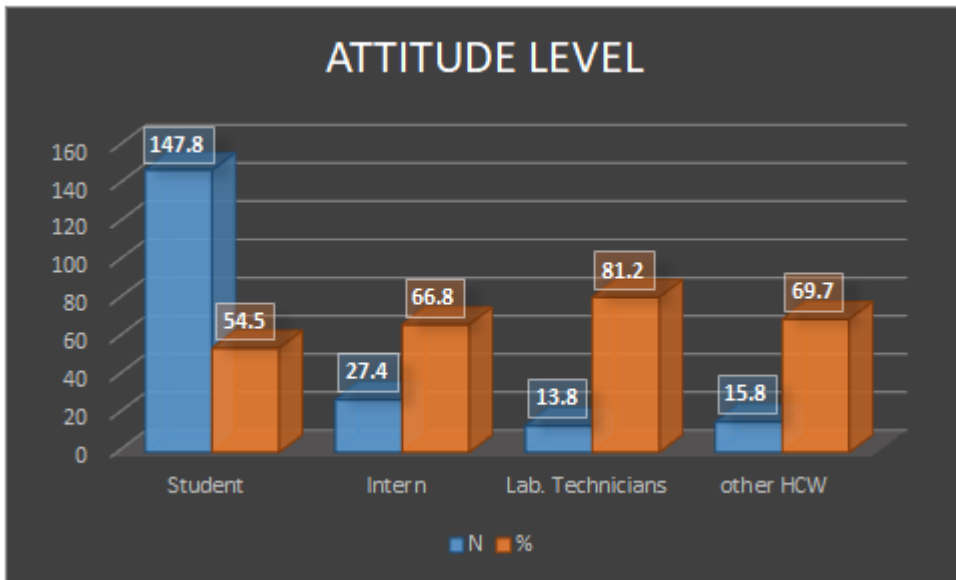
Table 4: Attitude level of the participants on the biomedical waste management



Graph 1: Knowledge level of BMW among participants



Graph 2: Practice level of BMW among participants



Graph 3: Attitude level of BMW among participants