

## ARTICLE TYPE

# Knowledge, attitude and practices towards biomedical waste management among nursing students in UiTM Selangor Puncak Alam Campus

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## Abstract:

Biomedical waste means any waste, which is generated during the diagnosis, treatment or immunization of human beings or animals in a health institution. Incorrect and inappropriate knowledge of management of healthcare waste may contribute to serious health consequences and a significant impact on the environment as well. The aim of the study is to assess the level of knowledge, attitude and practices toward biomedical waste management among nursing students in UiTM Selangor Puncak Alam Campus. A cross-sectional study was performed on 157 nursing students from second, third and fourth-year students which were selected using purposive sampling. The instruments used in this study was questionnaires on Knowledge, Attitude, and Practices of Biomedical Waste Management to assess knowledge, attitude and practices (KAP) of BMW management among nursing students. The mean scores of KAP were  $M= 6.75, SD= 1.25$ ,  $M= 15.07, SD= 2.54$  and  $M= 7.25, SD= 1.28$ . There is a significant difference ( $p= 0.001$ ) between the level of education and attitude. Nursing students have good knowledge, positive attitude and good practices. Besides, diploma students had a better attitude than degree students.

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## 1. INTRODUCTION

Biomedical waste is waste which is produced during the diagnosis, treatment or immunization of humans or animals in health institutions [1]. About 75% to 90% of the overall quantity of waste produced from health-care institutions is general or non-hazardous waste and the remaining 10% to 25% is viewed as a hazardous material requiring careful management. Sharps, infectious, pathological, pharmaceutical, cytotoxic, chemical and radioactive wastes are category as hazardous health care waste [2].

Nowadays, categorized medical wastes generated from healthcare events have suddenly inflate due to the usage of disposable medical equipment, population, size and number of health care institutions had increased [3]. However, only half (58.0%) of the sampled facilities from 24 countries had sufficient systems for the safe handling of health care waste [4]. The average generation rates of overall clinical waste in Selangor's government hospitals were estimated to be 1.355 kg/bed/day assuming the occupancy bed is 100% [5]. Besides, the average clinical waste generation rate in a hospital in Penang island was estimated at 0.74 kg/bed/day [6]. Inappropriate segregation of general waste and medical waste is a common issue in medical waste management globally [7]. Studies had found that the waste generated in

the healthcare events contributed to a higher risk of infection compared to another type of wastes [8]. The waste material could lead to a greater danger to health and environment, and the hospital staffs are susceptible to get infectious disease that could cause death such as hepatitis B and C virus, human immunodeficiency virus, and injuries [9].

The different factors such as lack of awareness, lack of knowledge and health workers' attitude were identified as the major issues in managing clinical waste in Malaysia [10]. Inadequate knowledge and lack of awareness had caused the hospitals becoming the place for the transmission of disease [11]. Besides, incorrect and improper knowledge on the management of medical waste may contribute adverse effect to health and environment [8]. Moreover, negligence in segregation and inadequate waste management practices by the healthcare facilities might result in the inappropriate disposal of clinical waste that will cause health risks to community and harmful effect to the surrounding [10].

A study had shown that the level of knowledge toward biomedical waste management among nursing students was below than average which is (39.7%) while (27.6%) had good, only (1.8%) had excellent knowledge [12]. Regarding attitude, only half (54.0%) of the respondents had a good attitude towards the proper disposal of medical waste [13].

Approximately 30.0% to 35.0% healthcare personnel did not practice segregation causing mixing of the infectious waste with general waste which is undoubtedly an issue because the healthcare wastes contain infectious wastes which if not correctly disposed can pose a high health hazard to the community [14]. Even though students had fewer years of exposure, their knowledge was good, but they lack the practical aspect of BMW management [15].

## 2. METHODOLOGY

### 2.1 Study Design and Settings

This study used a quantitative research method which is cross-sectional study design. The study was conducted at UiTM Selangor, Puncak Alam Campus.

### 2.2 Population and Sampling

The selected population of this study were undergraduate nursing students, UiTM Selangor, Puncak Alam Campus consisted of both the diploma and degree students from the second year until the fourth year. The sample of this study was selected using purposive sampling.

### 2.3 Sample Size

In order to calculate the number of the sample size, the Raosoft calculator is used. From the population size, the minimum sample size suggested is 157.

### 2.4 Study instrument

The questionnaire that was used in this study was Knowledge, Attitude, and Practices of Biomedical Waste Management. This questionnaire was used to assess KAP of BMW management among nursing students which was adapted from the previous study by Kumar and Padmaja [16]. It is a self-administering questionnaire that consists of four parts which are part a, part b, part c, and part d.

**Part A** consists of four items of sociodemographic data which include student's age, gender, year of study, and level of education. **Part B** consists of Knowledge of BMW to measure the level of knowledge. It consists of 9 multiple choice questionnaires. Each correct and incorrect answer in the knowledge section was given 1 and 0, respectively. The higher score indicates a higher level of knowledge with the scores ranges from 0 to 9. **Part C** consists of the Attitude of BMW to measure the level of attitude. It consists of 9 items. Four items consist of 3-point Likert scale structure which scales from always, sometimes and never and five items consist of yes, no and not sure. The scoring is given as 2 points for yes and always, 1 point for not sure and sometimes and 0 points for no and never. The higher score indicates a higher level of attitude with the score ranging from 0 to 18. **Part D** consists of Practices of BMW to measure the level of the practice. It is consisting of 9 multiple choice questionnaires. Each correct and incorrect response in the practice section was given 1 and 0 respectively. The higher score indicates the higher level of practices with the scores ranges from 0 to 9.

### 2.5 Data collection

Before conducting data collection, a brief explanation had been given to class representative. Then, appointment had been made to set the time and place. The data collection took place in the hall room to gather the respondents. Then, the respondents were explained to ensure that they understand the purpose of this study. Each respondent was provided with informed consent form, which must be documented and signed. Then, the respondents were given 15 to 20 minutes to complete the questionnaires. Upon completion the questions, the questionnaires were collected and checked for completion. If there were an incomplete answer, it would be returned to the respondent for completion.

### 2.6 Data analysis

Data was analyzed using the Statistical Package for IBM Social Science (SPSS) version 21.0. The level of knowledge, attitude, and practices (KAP) towards BMW management among nursing students were analyzed using descriptive statistics. In order to see the relationship between socio-demographic with knowledge, attitude, and practices on biomedical waste management, Mann-Whitney U and Kruskal-Wallis tests were used for the analysis. The significant level for this test was at  $p < 0.05$ .

### 2.7 Ethical consideration

Approval of the research was obtained from UiTM ethic committee. The reference number was (600-IRMI (5/1/6)). Before distributing the questionnaire, the respondents were briefed regarding the consent and may refuse or withdraw themselves to participate in this study anytime.

## 3. RESULT

### 3.1 Demographic distribution of respondents

Table 3.1: Distribution of age, gender, year of study and level of education of respondents (n= 157)

Variables	Frequency (n)	Percent (%)
<b>Age</b>		
20	38	24.2
21	49	31.2
22	42	26.8
23	27	17.2
24	1	0.6
<b>Gender</b>		
Male	6	3.8
Female	151	96.2
<b>Year of study</b>		
Second year	65	41.4
Third year	66	42.0
Fourth year	26	16.6
<b>Level of education</b>		
Degree	86	54.8
Diploma	71	45.2

### 3.2 Knowledge toward Biomedical Waste Management

Table 3.2 shown the knowledge of biomedical waste management by nursing students according to correct and incorrect answers. It is revealed that majority of the nursing students, 96.2% (n= 151) disposed of the sharp into the correct colour bag. However, more than half of the

respondents, 53.5% (n= 84) did not know what Incinerator meant. Surprisingly, only 28.0% (n= 44) acknowledged the percentage of infectious waste in hospitals in Malaysia.

Table 3.2:  
The knowledge of biomedical waste management by nursing students

Items	Correct n (%)	Incorrect n (%)
Is there any existence of rules/Act for Biomedical Waste Management?	138 (87.9)	19 (12.1)
Is Color coding available for BMW?	143 (91.1)	14 (8.9)
Disposal of anatomical waste into which colour bag?	145 (92.4)	12 (7.6)
Sharps disposal has to be in which colour bag?	<b>151 (96.2)</b>	<b>6 (3.8)</b>
What is meant by Incinerator?	<b>73 (46.5)</b>	<b>84 (53.5)</b>
Up to which level the bag has to fill?	139 (88.5)	18 (11.5)
Personal protective equipment (PPE) includes?	79 (50.3)	78 (49.7)
Percentage of infectious waste in hospitals in Malaysia?	44 (28.0)	113 (72.0)
Is it necessary to have a Biohazard symbol on BMW bag?	145 (92.4)	12 (7.6)

Table 3.3 shows the level of Knowledge toward BMW Management among nursing students. The total mean scores for the knowledge were M= 6.75, SD= 1.25 with maximum score= 9.00 and minimum score= 2.00.

Table 3.3:  
Level of Knowledge toward BMW among Nursing Students (n= 157)

Variables	Mean	SD	Maximum	Minimum
Knowledge	6.75	1.25	9.00	2.00

### 3.3 Attitude toward Biomedical Waste Management

Table 3.4 shown the attitude of biomedical waste management by nursing students. Most of the respondents, 94.3% (n= 148), felt that BMW management is compulsorily needed for healthcare delivery. Meanwhile, only 1.3% (n=2) of the respondent did not think that BMW management is compulsorily for healthcare delivery. Furthermore, only 26.8.6% (n= 42) of the respondents thought their knowledge regarding BMW management is adequate. Meanwhile, 49.0% (n=77) of the respondent was not sure regarding their about BMW management. However, 9.6% (n=15) of the respondents thought further training for BMW management is not required.

Table 3.4: The attitude of biomedical waste management by nursing students

Items	Always/ Yes n(%)	Sometimes/ Not sure n(%)	Never/ No n(%)
Is there any necessity of BMW management rules?	145 (92.4)	9 (5.7)	3 (1.9)
Do you feel that BMW management is compulsorily needed for healthcare delivery?	<b>148 (94.3)</b>	<b>7 (4.5)</b>	<b>2 (1.3)</b>

How often do you recommend biomedical waste (BMW) management at your in-charge wards?	111 (70.7)	30 (19.1)	16 (10.2)
Do you follow colour coding for waste disposal?	144 (91.7)	9 (5.7)	4 (2.5)
Will you advise your coworkers to follow colour coding for waste disposal?	130 (82.8)	25 (15.9)	<b>2 (1.3)</b>
Will you inform to sanitary staff to transport waste once the bag is full?	73 (46.5)	59 (37.6)	25 (15.9)
Do you think your knowledge regarding BMW management is adequate?	<b>42 (26.8)</b>	<b>77 (49.0)</b>	<b>38 (24.2)</b>
Do you think any further training required on BMW management?	125 (79.6)	17 (10.8)	15 (9.6)
Do you suggest segregation of waste?	143 (91.1)	11 (7.0)	3 (1.9)

Table 3.5 shows the level of Attitude toward BMW Management among nursing students. The total mean scores for the attitude were M= 15.07, SD= 2.54 with maximum score= 18.00 and minimum score= 4.00.

Table 3.5:  
Level of Attitude toward BMW Management among Nursing Students (n= 157)

Variables	Mean	SD	Maximum	Minimum
Attitude	15.07	2.54	18.00	4.00

### 3.4 Practices toward Biomedical Waste Management

Table 3.6 shown the practice of biomedical waste management by nursing students according to correct and incorrect answer. Majority of the respondents 98.1% (n= 154) used PPE while handling soiled linen. Next, only 27.4% (n= 43) of the respondents used sharp destructor. On the other hand, 91.7% (n= 144) were practicing the segregation of infectious waste and non-infectious waste.

Table 3.6: The practice of biomedical waste management by nursing students

Items	Correct n(%)	Incorrect n(%)
Soiled linen should keep in which colour bag?	129 (82.2)	28 (17.8)
Are you using PPE while handling soiled linen?	<b>154 (98.1)</b>	<b>3 (1.9)</b>
Are you practising hand hygiene in between every activity?	153 (97.5)	4 (2.5)
Are you using sharps destructor/sharp destroyer?	<b>43 (27.4)</b>	<b>114 (72.6)</b>
Are there colour code bags for waste disposal?	118 (75.2)	39 (24.8)
Will you inform to sanitary staff once the biomedical waste (BMW) bag is full?	118 (75.2)	39 (24.8)
Non-infectious waste should put in which colour code?	128 (81.5)	29 (18.5)
Are you practising the segregation of infectious waste and non-infectious waste?	144 (91.7)	13 (8.3)
All domestic and kitchen waste should dump into which bag?	151 (96.2)	6 (3.8)

Table 3.7 shows the level of Practices toward BMW Management among nursing students. The total mean scores for the attitude were  $M= 7.25$ ,  $SD= 1.28$  with maximum score= 9.00 and minimum score= 0.00.

Table 3.7: Level of Practice toward BMW Management among Nursing Students (n= 157)

Variables	Mean	SD	Maximum	Minimum
Practice	7.25	1.28	9.00	0.00

### 3.5 Relationship between socio-demographic with knowledge, attitude, and practices on biomedical waste management.

Table 3.8 shows the result of a Kruskal-Wallis test to find the relationship between year of study with knowledge, attitude and practices. It was observed that student in the second year, third year and fourth year had the same scores of knowledge, 7.00 (2), 7.00 (1) and 7.00 (2) respectively. The z statistics for knowledge is 0.382 and p-value is 0.826 which is  $> 0.05$ . There is no significant difference between the year of study and knowledge. Next, for the attitude, it was revealed that student in the second year and third year had the highest scores, 16.00 (2) and 16.00 (2) respectively. However, it is seen that fourth-year student had the lowest scores, 15.00 (4). The Z statistics is 4.762 and p-value is 0.092 which is  $> 0.05$ . There is no significant difference between the year of study and attitude. Meanwhile, It was observed that student in the second year, third year and fourth year had the same scores of practice, 7.00 (2), 7.00 (1) and 7.00 (2) respectively. The z statistics for practice is 2.031 and p-value is 0.362 which is  $> 0.05$ . There is no significant difference between the year of study and practice.

Table 3.8: Relationship between the year of study with knowledge, attitude, and practices

Variables	Median (IQR)			Z statistic	p-value
	2nd year	3rd -year	4th year		
Knowledge	7.00 (2)	7.00 (1)	7.00 (2)	0.383	0.826
Attitude	16.00 (2)	16.00 (2)	15.00 (4)	4.762	0.092
Practice	7.00 (2)	7.00 (1)	7.00 (2)	2.031	0.362

Note.  $df=2$

Table 3.9 shows the result of Mann Whitney to find the relationship between the level of education with knowledge, attitude and practices. The Z statistics for knowledge is -1.949 and p-value is 0.051, which is  $> 0.05$ . There is no significant difference between the level of education and knowledge. For the attitude, the Z statistics is -3.474 and p-value is 0.001, which is  $< 0.05$ . There is a significant difference between the level of education and attitude. Meanwhile, the Z statistics for practice is -1.761 and p-value is 0.078, which is  $> 0.05$ . There is no significant difference between the level of education and practice.

Table 3.9: Relationship between level of education with knowledge, attitude, and practices

Variables	Median (IQR)		Z statistic	p-value
	Diploma	Degree		
Knowledge	7.00(2)	7.00(1)	-1.949	0.051
Attitude	16.00(2)	15.00(3)	-3.474	0.001*
Practice	7.00(1)	7.00(2)	-1.761	0.078

\* $p < 0.05$

## 4. DISCUSSION

### 4.1 Knowledge toward Biomedical Waste Management

Findings showed that nursing students had a good knowledge toward BMW management. This study also found that the majority of the nursing students, 96.2% (n= 151) disposed of sharp into the correct colour bag. Therefore, it can be concluded that most of the nursing student had knowledge regarding colour coding bag. Similar to the study done in Udaipur, India showed that knowledge of nursing student regarding colour coding was 91.11% [17]. The finding differs from a study done in Maharashtra, India showed that there was an inadequate of knowledge about colour coding in medical waste management among respondents as they could not tell which category of waste belonged to which colour container [18]. Thus, training programs have to be done for both students and health care personnel in order to increase their knowledge about colour coding.

### 4.2 Attitude toward Biomedical Waste Management

Findings showed that nursing students had positive attitude toward BMW management. This study also showed that that majority of the respondents, 94.3% (n= 145) felt that BMW management is compulsorily needed for healthcare. This finding is similar with the study done in Kothamangalam, India which showed the majority of the respondents, 94.3% (n= 249) felt BMW management should compulsorily be made [19]. The rules of BMW are crucial so that all the health care workers followed and thus practice safe management of BMW. Next, this study showed most of the respondent 79.6% (n= 125) thought further training required on BMW management. A similar study done in Kothamangalam, India which revealed that majority of the respondent, 97.3% (n= 257) thought they require further training on BMW management [19]. This might happened because they are aware of the importance of further training in order to improve their knowledge regarding BMW management as well as improve their attitude and practice.

### 4.3 Practices toward Biomedical Waste Management

Nursing students had good practice toward BMW management. The finding is contradicted with a study done in Kothamangalam, India which showed that the respondent had a poor practice of BMW management [19]. The finding revealed that majority of the respondents, 98.1% (n= 154) used PPE while handling soiled linen. Similarly, research done in Rajkot, India showed that most of the respondents (84.8%) using personal protective measures while handling BMW [20]. On the other hand, most of the students 91.7% (n= 144) were practicing the segregation of medical waste. Most respondents agreed that medical waste must be segregated. This was consistent with the results from a study done in Rajkot, India that show that most of the respondents (86.9%) did practice segregation of BMW [20]. This happened because the students had good knowledge regarding BMW management.

#### 4.4 Relationship between socio-demographic with knowledge, attitude, and practices on biomedical waste management.

There was a significant difference between the level of education and attitude. It was revealed that attitude level is higher in diploma level compared to degree level students. This finding contradicts from the study done in Punjab, India which stated that a higher level of education influences the attitude toward biomedical waste management [12]. This might occurred because of the attitude of the degree nursing students itself since nobody is watching as supported by Ajmera and Jayalkshmi [17].

#### 5. CONCLUSION

Findings from this study showed that nursing students had a good level of knowledge, positive attitude and good practice towards BMW management. As we know, nursing profession spends most of the time with patients in the hospitals compared to other healthcare providers and it increases their exposure and risk to the danger that presents in the hospital environment, mainly from biomedical waste. Thus, a high level of knowledge, attitude and practices toward BMW management is essential, especially to the people that involve in the healthcare setting. These aspects are essential to nursing students as the nursing profession is directly involved with the biomedical waste. In order to prepare nursing students for the profession in future, knowledge, attitude and practices toward BMW management need to be continuously increased or updated during the study period.

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