Knowledge & Practice about Biomedical Waste Management & Prevention of HAI among Nursing Students

Manjunath Jadhav[1], Tejesh Patil[2], Rohit Rathod[3]

ABSTRACT

Background: In accordance with the Bio-Medical Waste Rules established in 1988 in India, bio-medical waste is defined as any waste generated during the diagnosis and treatment of humans and animals, or any waste produced during the production or testing of biological materials. The management of biomedical waste has emerged as a critical issue for healthcare providers due to its increased risk of infection and injury. Insufficient understanding of proper healthcare waste handling can lead to severe health repercussions.

Aims: To evaluate the level of knowledge evaluate the level of knowledge and practice about importance of biomedical waste management and prevention of hospital acquired infection among nursing students and to determine the association between level of knowledge and practice about importance of biomedical waste management and prevention of hospital acquired infection among nursing students with selected demographic variables:

Materials and Methods: The methodology employed for this study was descriptive in character, for evaluating the knowledge structured questionnaire and observational checklist were used, number of subjects were 100, sampling technique of the present study is purposive sampling.

Results: Reveals that in accordance to frequency and percentage of distribution of respondents according to their selected demographic variables age distribution of chi-square value is 7.04 and p-value is 0.13. Gender distribution of chi-square value is 1.96, and p-value 0.3. Academic year & course about Diploma in General Nursing & Midwifery distribution of chi-square value is 1.98 and p-value is 0.7

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(Moderately significant), about Basis B.Sc. Nursing distribution of chi-square value is 3.78 and p-value is 0.7 (Moderately significant). Undergone in-service educational programme distribution of chi-square value is 1.51 and p-value is 0.8* (Highly significant).

Conclusion: Majority of the respondents interpreted from the results that there exist a significant association between knowledge and practices with age, educational qualification (general and B.Sc. Nursing), it was noticeable from the findings that, majority of health team members (87%) were never exposed to any in-service educational programme regarding biomedical waste management. This fact stressed the need to spread the message through conducting in-service educational programmes at tertiary care hospital Belagavi.

KEYWORDS

• Comparative Study • Knowledge • Biomedical Waste Management • Prevention • Hospital Acquired Infection

KEY MESSAGE: Prior attending in-service education programme the students have poor and average knowledge score were as after attending in-service education programme on regular basis all students acquire good knowledge and practice about Biomedical Waste Management that helps to reduce the number of Hospital Acquired Infections.

INTRODUCTION

The management of Biomedical Waste is a critical issue for all healthcare providers and institutions, as the waste produced during healthcare operations presents a higher risk of infection and injury compared to any other type of waste.[1]

Hospital-acquired infections (HAIs) pose a significant threat to public health globally, mainly due to their rapidly rising incidence each year. Additionally, the rise of bacterial strains that are resistant to current treatment options exacerbates this risk. The aim of this study was to examine the frequency of HAIs reported in public hospitals at the county level.[2]

A secure environment is vital for maintaining a healthy life. Healthcare professionals face an elevated risk of acquiring infections in their work settings. By providing adequate information regarding biomedical waste, this risk can be gradually reduced.[3]

Approximately 10-25 percentage of biomedical waste is deemed hazardous, presenting potential dangers to humans, animals, and the ecosystem. In India, it is estimated that around 0.33 million tonnes of medical waste are produced annually.[4]

The daily waste generation rate per bed varies from 0.3 to 8.4 kg. According to data from the Ministry of the Environment, the country generated 651.23 tonnes of Biomedical Waste (BMW) each day in 2020. From May 2020 to March 2022, the daily output of BMW surged by approximately 962.31 tonnes due to the effects of the COVID-19 pandemic.[5]

Hospitals serve as health care institutions that deliver patient care services. It is the responsibility of hospitals and health care facilities to safeguard public health. This can be achieved either directly through patient care or indirectly by maintaining a clean and healthy environment for both their staff and the community. Present waste management practices are marked by inadequate collection services and improper disposal at open dumpsites.[6]

Hospitals have yet to adopt appropriate methods for disposing of health care waste and continue to discard their waste in municipal garbage dumps without any form of segregation. It is disheartening to observe that in numerous hospitals, it is commonplace to encounter substantial piles of "Biomedical Waste" that include used intravenous plastic bottles, intravenous drip sets, needles, bandages, swabs, pharmaceuticals, human tissues, blood-soaked items, sanitary napkins, and pads. It is alarming to discover that the majority of hospitals and health care centers in many metropolitan areas and towns lack incinerators and other technologies necessary for the treatment and disposal of biomedical waste. Aside from a few large private hospitals in metropolitan areas, none of the

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smaller hospitals and nursing homes possess an effective system for the safe disposal of their waste. The approach of government and municipal hospitals is no better than that of these private hospitals and nursing homes. Some hospitals continue to sell their plastic waste to contractors who recycle or resell it.[7]

Hospitals and various health care facilities produce a significant amount of waste that has the potential to transmit infections, particularly HIV, Hepatitis B and C, as well as Tetanus, to individuals who handle it or come into contact with it. Members of the health care team face an increased risk of exposure to the hazards present in the hospital environment, primarily due to biomedical waste. It is essential for them to be well-informed and equipped with the latest knowledge, skills, and practices in waste management to minimize hospital-acquired infections and safeguard their own health. Research indicates that the current level of knowledge among health care team members regarding biomedical waste management is inadequate, and providing training can enhance their attitudes and practices. Health care team members must possess sufficient knowledge to fulfil their responsibilities, ensuring the safe handling, collection, storage, treatment, and disposal of biomedical waste.[8]

OBJECTIVES

- To evaluate the level of knowledge evaluate the level of knowledge and practice about importance of biomedical waste management and prevention of hospital acquired infection among nursing students.

- To determine the association between level of knowledge and practice about importance of biomedical waste management and prevention of hospital acquired infection among nursing students with selected demographic variables:

HYPOTHESIS

H₁: There will be significant association between level of knowledge and practice about importance of biomedical waste management and prevention of hospital acquired infection among nursing students.

H₂: There will be no a significant association level of knowledge and practice about importance of biomedical waste management and prevention of hospital acquired infection

among nursing students.

REVIEW OF LITERATURE

A cross-sectional study was conducted in March 2022. The participants of the study were nursing staff who handle biomedical waste (BMW). Data was gathered through a semi-structured questionnaire. Results indicated that 50% of the staff nurses possessed good knowledge, while 20% exhibited poor knowledge. A significant relationship was identified between knowledge of biomedical waste management and both the qualifications and the duration of clinical practice of the staff (p<0.05).[9]

A descriptive correlational research design was employed in the current study. A total of 100 health team members were chosen for the study through a convenience sampling method. Data was gathered using a proforma for socio-demographic variables, a structured questionnaire to evaluate knowledge, and an observational checklist to assess practices. The collected data were analyzed using both inferential and descriptive statistics. The findings of the current study indicated that 78% of the health team members possessed moderately adequate knowledge. Additionally, the practice aspect was found to be moderately adequate for 64% of the respondents. A significant coefficient of correlation (r = 0.694) was determined between knowledge and practice, suggesting that as knowledge increases, practice also improves.[10]

A comparative analysis was carried out regarding the categorization of medical waste produced in Tabriz, Iran, with the aim of assessing the quantity, generation rate, quality, and composition of the medical waste generated. Out of the 25 operational hospitals in the city, 10 hospitals of varying sizes, specializations, and classifications were chosen to take part in the study. The findings revealed that the average (weighted mean) generation rates of total medical waste, hazardous-infectious waste, and general waste were 3.48, 1.039, and 2.439 kg/bed per day, respectively. In the analyzed hospital waste, 70.11% was classified as general waste, 29.44% as hazardous-infectious waste, and 0.45% as sharps waste. The results indicated significant differences in the characteristics of medical waste among the hospitals examined, and the study recommended that the implementation of effective management, training, and

segregation programs should be prioritized to reduce treatment and disposal issues.[11]

A descriptive study was carried out in a tertiary level hospital located in New Delhi, India, aimed at evaluating the knowledge, attitudes, and practices related to Bio Medical Waste management among the staff. The study included 156 participants, comprising doctors and nurses from designated patient care areas. A semi-structured questionnaire was utilized as the data collection tool. The results indicated that consultants exhibited 85% knowledge, while nurses demonstrated a knowledge level of 60%. Concerning attitudes, nurses achieved a perfect score of 100%, whereas consultants scored 80%. In terms of practical application, consultants scored 80%, while nurses attained a score of 100%. A notable gap was identified in the knowledge, attitudes, and practices of consultants regarding Bio Medical Waste management.[12]

MATERIALS AND METHODS

Research methodology: The methodology employed for this study was descriptive in character.

Research design: Descriptive design.

Study Variables: Knowledge about biomedical waste management and practice on prevention of hospital acquired infection among nursing students.

Demographic Variables: Age, gender, religion, and exposure to in-service educational programmes.

Research setting: Surgery unit at tertiary care teaching hospital Belagavi.

Population of the study: 60 number of Diploma in General Nursing & Midwifery students, and 40 number of Basic B.Sc. Nursing students, overall samples were 100.

Sample size: 100 subjects

Sampling technique: Purposive sampling

Data collection tool: The tool consists of 3 sections

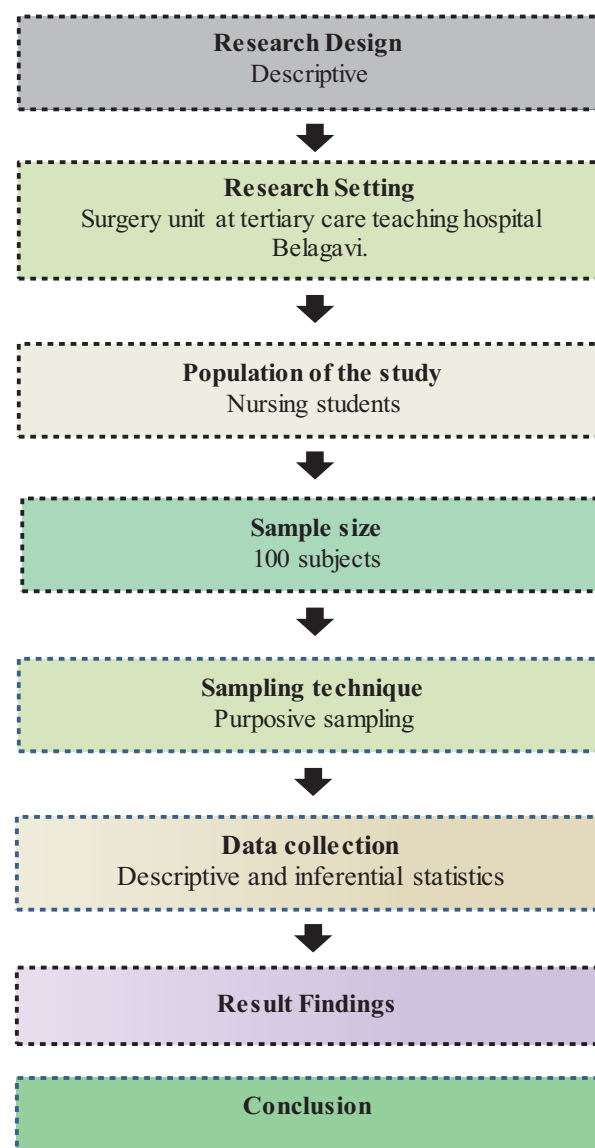**Section A:** Demographic data of nursing students.

Section B: To evaluate the level of knowledge and practice about biomedical waste management and prevention of hospital acquired infection.

Section C: To evaluate the level of knowledge and practice about biomedical waste management and prevention of hospital acquired infection among B.Sc. nursing students.

Reliability of the tool:

Reliability of the knowledge questionnaire and observational checklist were established by test- retest reliability technique, using these values co-efficient correlation was done with the help of Karl Pearson's formula. The reliability score obtained was r = 0.92 for knowledge and r = 0.91 for practice which showed knowledge questionnaire and practice checklist were highly reliable.

Schematic Representation of Research Design

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│        Research Setting         │
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│   teaching hospital Belagavi.   │
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RESULTS

Section-A: Demographic data of nursing students.

Table 1: Frequency and percentage of distribution of respondents according to their selected demographic variables   N= 100

Demographic variables	Frequency (f)	Percentage (%)	Chi-square
Age (Years)			
17-19 years	25	25	X2= 7.04
20-22 years	30	30	DF= 4
23-25 years	45	45	P value= 0.13
Gender			
Male	55	55	X2= 1.96, DF= 2
Female	45	45	P value= 0.3
Academic year & course			
Diploma in General Nursing & Midwifery			
1st year	10	10	X2= 1.98
2nd year	20	20	DF= 4
3rd year	30	30	P value= 0.7*
Basis B.Sc. Nursing			
1st year	10	10	X2= 3.78
2nd year	10	10	DF= 6
3rd year	5	5	P value= 0.7*
4th year	15	15	
Undergone in-service educational programme			
Yes	60	60	X2= 1.51, DF= 4
No	40	40	P value= 0.8*

Table 1, Reveals that in accordance to frequency and percentage of distribution of respondents according to their selected demographic variables age distribution of chi-square value is 7.04 and p-value is 0.13. Gender distribution of chi-square value is 1.96, and p-value 0.3. Academic year & course about Diploma in General Nursing & Midwifery distribution of chi-square value is 1.98 and p-value is 0.7 (Moderately significant), about Basis B.Sc. Nursing distribution of chi-square value is 3.78 and p-value is 0.7 (Moderately significant). Undergone in-service educational programme distribution of chi-square value is 1.51 and p-value is 0.8* (Highly significant).
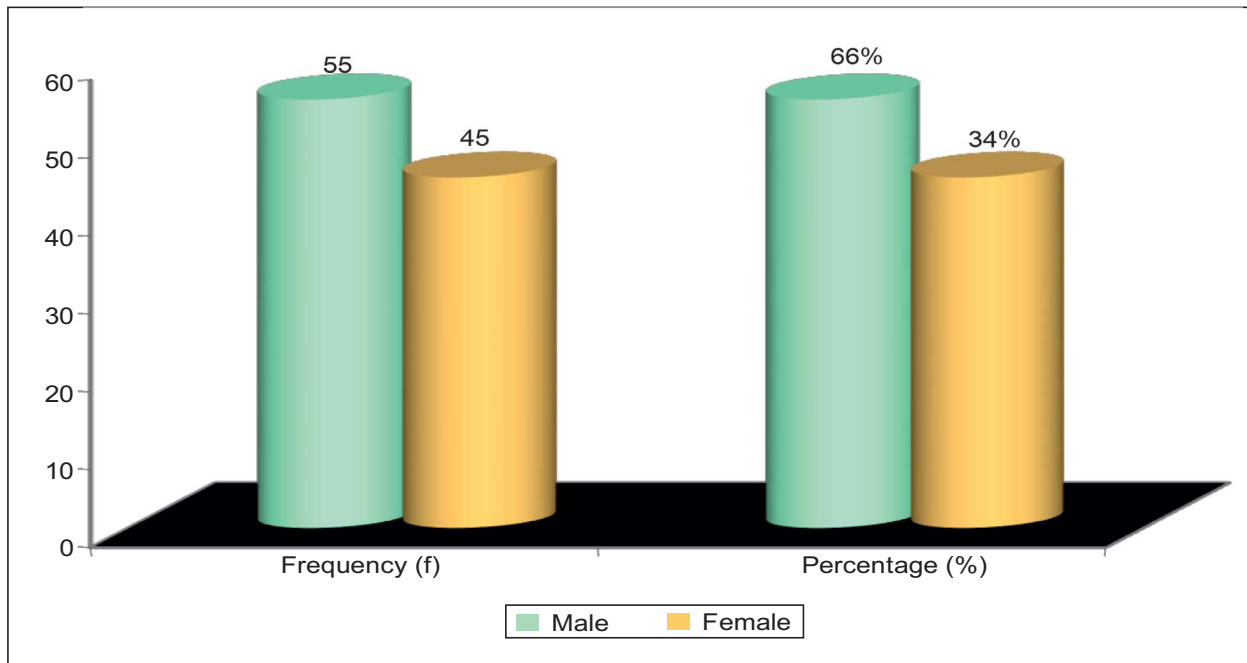
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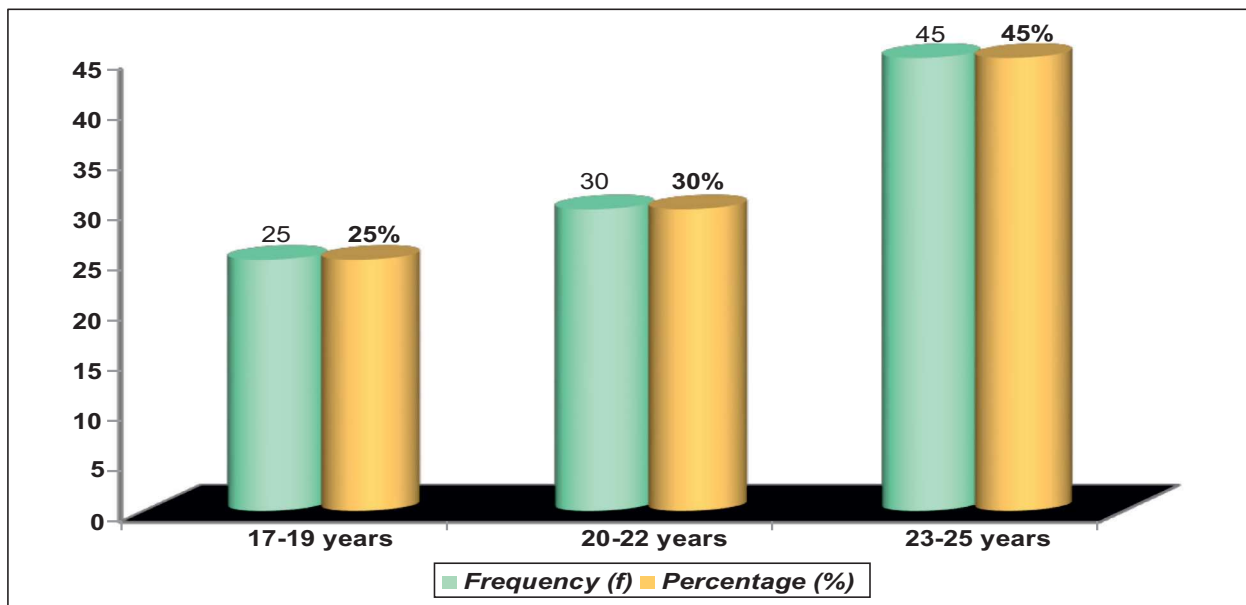
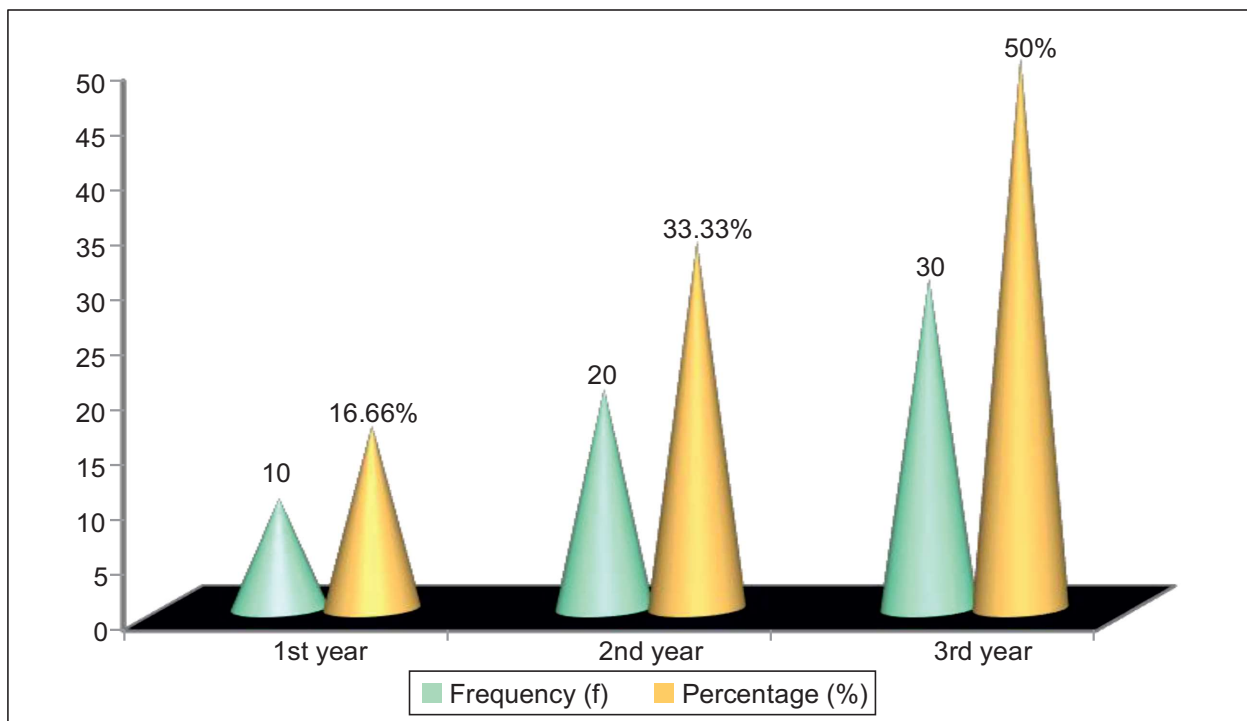**Graph 1:** Distribution of respondent's accordance to age

Distribution of respondents accordance to age, majority of the findings were 45 (445%) belonged to 23-25 years, 45 (45%) belonged to 30-35 years, and 25 (25%).
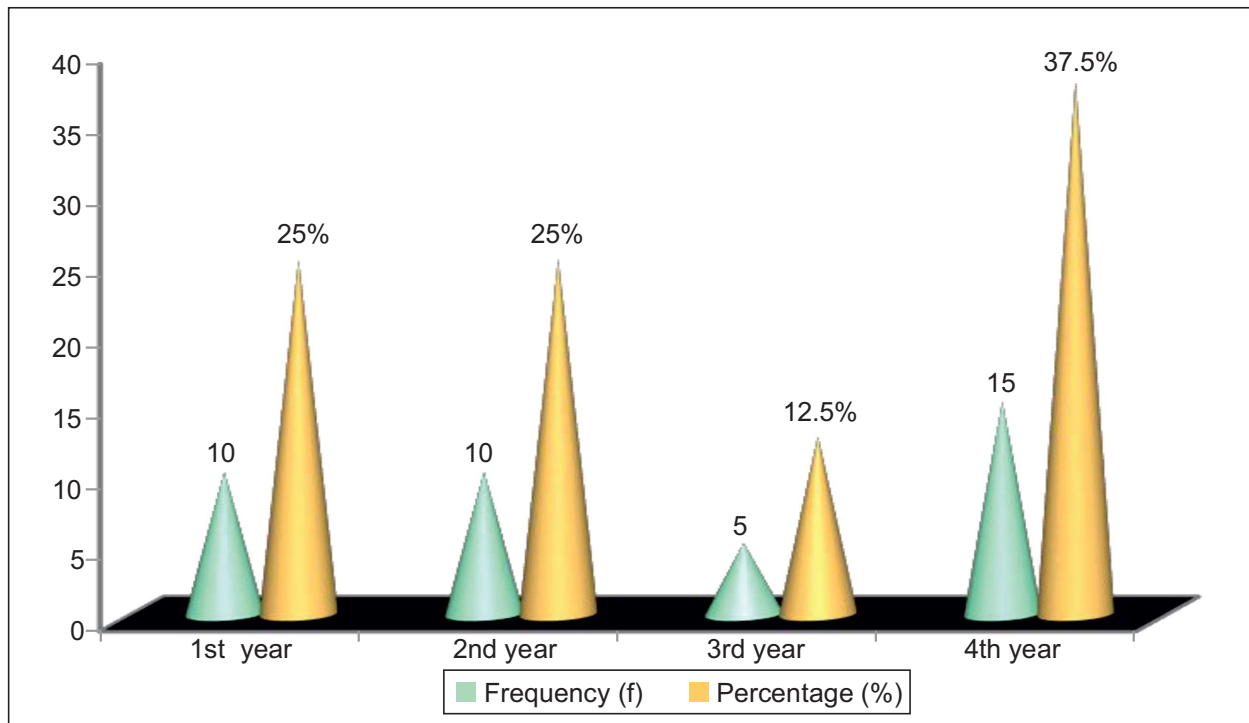

Graph 2: Distribution of respondent's accordance to gender

Distribution of respondents accordance to gender, majority of the findings were 55 (66%) belonged to males, and 45 (34%) belonged to females.
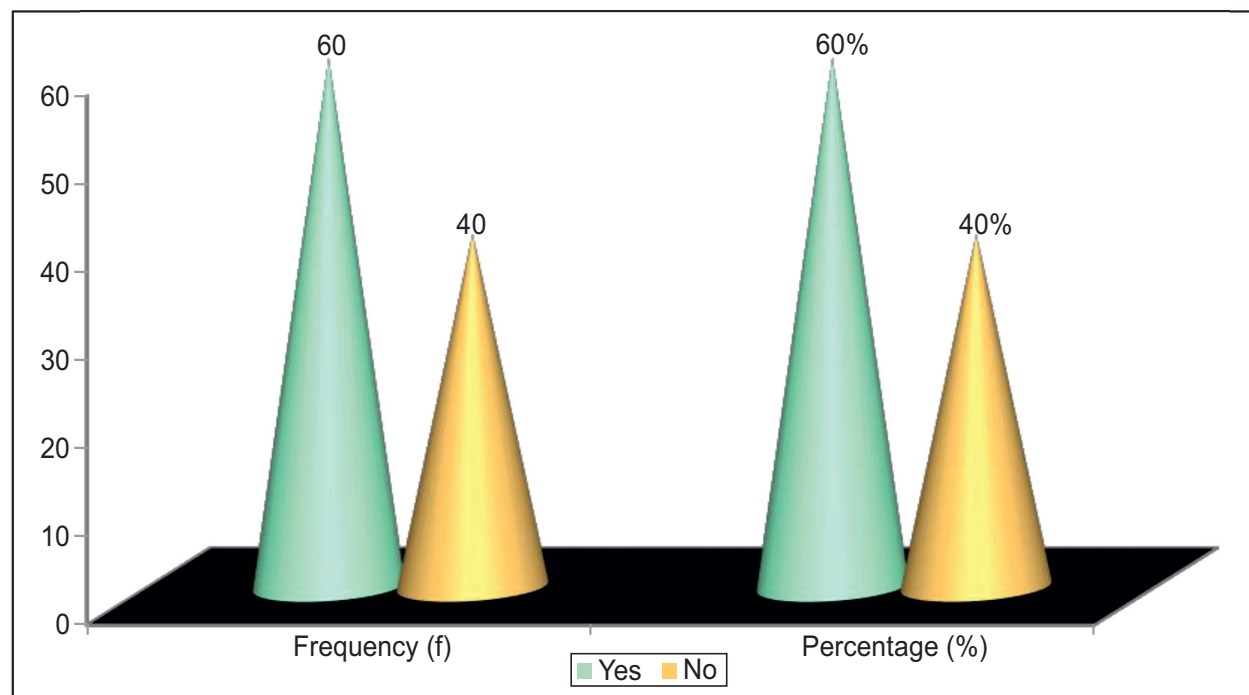

Graph 3: Distribution of respondent's accordance to academic year (Diploma in General Nursing & Midwifery)

Distribution of respondents accordance to academic year, majority of the findings were 30 (50%) belonged to 3rd year, 20 (33.33%) belonged to 2nd year, and 10 (16.66%) belonged to 1st year.

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Graph 4: Distribution of respondent's accordance to academic year (Basic B.Sc. Nursing)

Distribution of respondents accordance to academic year, majority of the findings were 15 (37.5%) belonged to 4th year, 10 (25%) belonged to 1st year, 10 (25%) belonged 2nd year, and 5 (12.5%) belonged to 3rd year.

Graph 5: Distribution of respondent's accordance to Undergone in-service educational programme

Distribution of respondents accordance to undergone in-service education programme majority of the respondent's 60 (60%) are attended in-service education programme, and 40 (40%) are not attended in-service education programme.

Section B: To evaluate the level of knowledge and practice about biomedical waste management and prevention of hospital acquired infection among diploma in general nursing and midwifery students.

Table 2: Knowledge score about biomedical waste management and prevention of hospital acquired infection among diploma in general nursing and midwifery students   N= 60

Level of knowledge	Obtained score	Frequency (f)	Mean	Mean (%)	SD
Poor	0-10	10	13.3	22.1	0.8
Average	11-20	30	16.22	27.3	2.3
Good	20-30	15	15.5	25.5	1.9
Very good	30-40	5	15	25	1.9
Overall score		60	60	100	6.9

Table 2, represents the distribution of Mean percentage and SD of knowledge score biomedical waste management and prevention of hospital acquired infection among diploma in general nursing and midwifery students. Shows that the highest mean score is (16.22$\pm$2.3) which is 27.3% of student's obtained average score, more or less similar mean score is (15.5$\pm$1.9) which is 25.5% of students obtained good score, medium mean score is (15.5$\pm$ 1.9) which is 25% of students obtained very good score, and less mean score is (13$\pm$0.8) which is 22.1% of students obtained poor score.

Section C: To evaluate the level of knowledge and practice about biomedical waste management and prevention of hospital acquired infection among B.Sc. nursing students.

Table 3: Knowledge score about biomedical waste management and prevention of hospital acquired infection among Basic B.Sc. Nursing students.

Level of knowledge	Obtained score	Frequency (f)	Mean	Mean (%)	SD
Poor	0-10	5	7	17.5	1
Average	11-20	20	10.5	26.2	2.2
Good	20-30	10	15.5	38.7	1.8
Very good	30-40	5	7	17.5	1.2
Overall score		40	40	100	6.2

Table 3, represents the distribution of Mean percentage and SD of knowledge score biomedical waste management and prevention of hospital acquired infection among Basic B.Sc. nursing. Shows that the highest mean score is (15.5$\pm$1.8) which is 38.7% of student's obtained good score, more or less similar mean score is (10.5$\pm$2.2) which is 26.2% of students obtained average score, less mean score is (7$\pm$ 1.5) which is 17.5% of students obtained very good score, and less mean score is (7$\pm$1) which is 22.1% of students obtained poor score.

DISCUSSION

In the current study data analysis represents the distribution of Mean percentage and SD of knowledge score biomedical waste management and prevention of hospital acquired infection among diploma in general nursing and midwifery students. Shows that the highest mean score is (16.22$\pm$2.3) which is 27.3% of student's obtained average score, more or less similar mean score is (15.5$\pm$1.9) which is 25.5% of students obtained good score, medium mean score is (15.5$\pm$ 1.9) which is 25% of students obtained very good score, and less mean score is (13$\pm$0.8) which is 22.1% of students obtained poor score. Represents the distribution of Mean percentage and SD of knowledge score biomedical waste management and prevention of hospital acquired infection among Basic B.Sc. nursing. Shows that the highest mean score is (15.5$\pm$1.8) which is 38.7% of student's obtained good score, more or less similar mean score is (10.5$\pm$2.2) which is 26.2% of students obtained average score, less mean score is (7$\pm$ 1.5) which is 17.5% of students obtained very good score,

and less mean score is (7±1) which is 22.1% of students obtained poor score.

In the similar study, Data collected were analyzed by using inferential and descriptive statistics. The results of the present study revealed that, 78% among the health team members had moderately adequate knowledge. The practice aspect was also found to be moderately adequate for 64% of respondents. A substantial coefficient of correlation value (r = 0.694) was established between knowledge and practice interpreting that, as knowledge increases practice also increase. The computed Chi-square values to find out the association between levels of knowledge and practice with demographic variables were found to be significant for age, educational qualification, designation and professional experience with P-values of 0.011, 0.001, 0.001 and 0.014 respectively at 0.05 level of significance.

CONCLUSION

The findings of the study revealed that majority of the nursing students belonged to had moderately adequate knowledge and practices regarding biomedical waste management. It was also evident that there was a substantial correlation between the knowledge and practices of nursing students which inferred, as knowledge increases practices also increases. It was interpreted from the results that there exist a significant association between knowledge and practices with age, educational qualification (general and B.Sc. Nursing), it was noticeable from the findings that, majority of health team members (87%) were never exposed to any in-service educational programme regarding biomedical waste management. This fact stressed the need to spread the message through conducting in-service educational programmes at tertiary care hospital Belagavi.

The Department of Health officials, District health officers, policy makers can consider the outcomes of present study to plan educational programmes in the future, which will update the existing knowledge and practices of health team members.

ACKNOWLEDGEMENT

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