Effectiveness of Educational Intervention regarding Hospital Waste Management among Supporting Staffs in a Private Hospital of Lalitpur: A Pre-Experimental One Group Pretest and Posttest Study

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Housekeeping staff, often involved with biomedical waste, lack adequate skills in hospital waste management, increasing their risk. Therefore, educating them on proper waste handling is essential for their safety and the well-being of hospital staff, patients, and visitors. Hence, the purpose of this study was to examine the existing knowledge on hospital waste management and to elevate it through strategic educational initiatives. A pre-experimental one-group pretest and posttest design was adopted using a simple random sampling technique with fifty-nine supporting staff working in B&B Hospital, Lalitpur, Nepal. A semi-structured instrument was used to collect data during April 08-23, 2024, with a face-to-face interview technique. Pretest and educational intervention were done. Post-test was carried out after 2 weeks. Ethical approval was taken from the Institutional Review Committee of B&B Hospital. Data was analyzed using descriptive as well as paired t-test. In pre-intervention, only a few (15.3%) of respondents had inadequate knowledge, most (76.3%) had moderately adequate knowledge, and 8.5% had adequate knowledge. After the intervention, none had inadequate knowledge, 8.5% of respondents had moderately adequate knowledge, and almost all (91.5%) of respondents had adequate knowledge. The difference in mean score was 21.89% with a t-test value of 15.463 and p-value <0.001. The study indicates that the educational intervention was effective in enhancing the knowledge regarding hospital waste management among the targeted

sample.

Keywords: educational intervention, effectiveness, hospital waste management, supporting staff.

Hospital waste management is a structured process that involves the categorization, separation, collection, handling, and disposal of different types of waste produced in healthcare environments.[1] Effective hospital waste management is crucial to minimize risks to healthcare workers, waste handlers, the environment, and the public. The high presence of pathogenic bacteria and viruses in medical waste intensifies hazards for healthcare workers.[2,3] Additionally, needlestick and sharp injuries pose significant risks of bloodborne infections, particularly for housekeeping staff who manage biomedical waste.[4] Training programs in advanced healthcare waste management can enhance the segregation of regulated medical waste, thereby reducing risks, volumes, and costs.[5] Educational programs on hospital waste management are crucial for housekeeping staff to equip them with the knowledge and skills needed to safely manage biomedical waste, minimize infection risks, and ensure regulatory compliance.[6]

Therefore, the objective of this study is to assess the effectiveness of educational intervention on hospital waste management among supporting staff in a private hospital in Lalitpur.

Materials and Methods

A pre-experimental one-group pretest-posttest study design was adopted. The study was conducted at B&B Hospital, Gwarko, Lalitpur, which is a well-known tertiary-level trauma center with services available 24 hours a day, seven days a week. Ethical approval was obtained from the B&B Institutional Committee (Approval No: B&BIRC-24-31). Administrative approval was obtained from B&B Hospital and all the other institutions involved. Informed consent was taken from all the respondents. Privacy and confidentiality of the information were maintained throughout the study.

The supporting staff working in the B&B Hospital in all departments were the study population. The sample size was calculated based on a prevalence of 12.5%.[7] Using a 95% confidence interval and an 8% margin of error, the sample size for an infinite population was determined 134 using Cochrane's formula:

$$n_0 = \frac{Z^2 pq}{e^2}$$

Since the total population is finite (N=110), the sample size was adjusted using the finite population correction formula:

$$n = \frac{n_0}{1 + \frac{n_0 - 1}{N}} = \frac{134}{1 + \frac{134-1}{110}} \approx 59$$

Therefore, a total of 59 samples were included in this study. A simple random sampling technique was adopted in this study. The lottery method was used to select the sample by using the ID numbers of the supporting staff. Therefore, each respondent had an equal chance of being selected.

Educational Intervention Procedure

An educational package was developed and validated by consulting experts in the related field and reviewing various books, journals, and articles.

Date, time, and venue were fixed by consulting with the person in charge of the housekeeping department of B&B Hospital. It was divided into the following phases:

Pre-test phase

Semi-structured questionnaires were used to assess the level of knowledge regarding hospital waste management. Data collection was facilitated by colleagues whom the researcher had thoroughly oriented about the data collection tools. The face-to-face interview technique was used to collect data. Pretest was done in two sessions prior to educational intervention (2080.12.26 and 2080.12.27). The number of participants on the first day was 30, and on the second day, it was 29.

Intervention phase

Educational intervention was provided after the pre-test. The educational intervention was conducted using a structured lesson plan, incorporating lecture and discussion methods, and covered key aspects of hospital waste management, including types of waste, segregation, collection, handling, storage, transportation, disposal, and treatment practices. PowerPoint slides were used, and it was done in the conference hall of B&B Hospital under 2 sessions (2080.12.26 and 2080.12.27).

Post-test phase

Post-test was done after 14 days of educational intervention to assess the level of knowledge on hospital waste management, and the same questions were used. Data was collected using the face-to-face interview technique in two sessions (2081.01.10 and 2081.01.11). The number of participants on the first day was 30, and on the second day, it was 29

The data collection tool was used in this study. It was divided into 2 parts. Part I included questions related to socio-demographic data (5), which consists of questions such as age, gender, work experience, educational qualifications, training, and duration of training. Part II

included questions related to knowledge regarding hospital waste management (24), including four multiple-response questions and twenty-one multiple-choice questions. This part includes questions related to the knowledge of hospital waste management. For each correct response, the respondent was scored 1, and an incorrect response was scored 0. Reverse scoring was done for a negative response. The question was translated into the Nepali language with the help of experts. The total knowledge score was 37, and the levels of knowledge were measured by calculating the total possible score in knowledge questions and classified into 3 categories: inadequate knowledge<50%; moderately adequate knowledge: 50-75%, and adequate knowledge:>75%.[7]

The questionnaire was pretested in a similar population among 6 supporting staff working in Alka Hospital, Lalitpur.

All the data were over-viewed, checked, and verified for their completeness, consistency, and accuracy. Coding and organizing were done by data entry using the software program Excel, and the data was transferred to Statistical Package for the Social Sciences version 20.0. Data was analyzed using descriptive statistics like frequency, percentage, mean, and standard deviation for socio-demographic variables. Data was analyzed using appropriate inferential statistics. A paired t-test was used to find a significant difference between the pre-test and post-test mean knowledge scores. Data was analyzed and interpreted according to the nature of the research questionnaires.

Results

Table 1 demonstrates that the participants were predominantly young, with a mean age of 32.80±10.70 years, and the largest proportion (37.29%) belonged to the 20–30 years age group. The workforce was mainly female, accounting for 72.88% of the total participants. More than half of the respondents (59.32%) had not received any training on waste management, and among those who had undergone training, the majority (62.50%) had attended only a one-day session, indicating limited exposure to capacity-building activities. Nearly half of the participants (44.07%) had less than one year of work experience, reflecting a relatively new workforce. With respect to educational background, most participants had completed lower secondary level education (27.12%), while 13.56% had no formal education.

Among 59 respondents, only a few (15.25%) of respondents had inadequate knowledge, most (76.27%) had moderately adequate knowledge, and 8.47% had adequate knowledge. Similarly, after

Table 1: Demographic and Work-related Characteristics of Participants (n=59)

Variables	n	%
Age (in completed years)		
<20	9	15.25
20-30	22	37.29
31-40	14	23.73
>40	14	23.73
Mean±S.D:32.80±10.70		
Gender		
Male	16	27.12
Female	43	72.88
Training on Waste Management		
No	35	59.32
Yes	24	40.68
Duration of Training (n=24)		
1 day	15	62.50
2 days	4	16.67
≥3 days	5	20.83
Work Experience		
<1 year	26	44.07
1-3 years	10	16.95
3-5 years	8	13.56
>5 years	15	25.42
Educational Qualifications		
No education	8	13.56
Lower basic education (1-5)	9	15.25
Upper basic education (6-8)	14	23.73
Lower secondary level (9-10)	16	27.12
Higher secondary level (11-12)	12	20.34

educational intervention, no respondents had inadequate knowledge, only a few had (8.47%) moderately adequate knowledge, and the majority (91.53%) had adequate knowledge, as shown in **Figure 1**.

Table 2 indicates a substantial increase in the participants' knowledge following the intervention. The mean pre-intervention knowledge score among participants was 22.25±3.89. After the intervention, the mean score rose to 30.36±2.73, demonstrating a notable improvement in knowledge. Statistical analysis using a paired t-test confirmed that this difference was highly significant ($t = 15.46$, $p < 0.001$). The marked rise in mean scores, along with strong statistical significance, clearly suggests that the intervention was highly effective in enhancing participants' knowledge and achieving meaningful learning outcomes.

Table 2: Respondents Pre and Post Intervention Mean Score Difference (n=59)

Knowledge	Mean± SD	t	P-value
Pre-Intervention	22.25±3.93	15.46	<0.001*
Post-Intervention	30.35±2.73		

**Paired T test, p-value <0.05 level of significance*

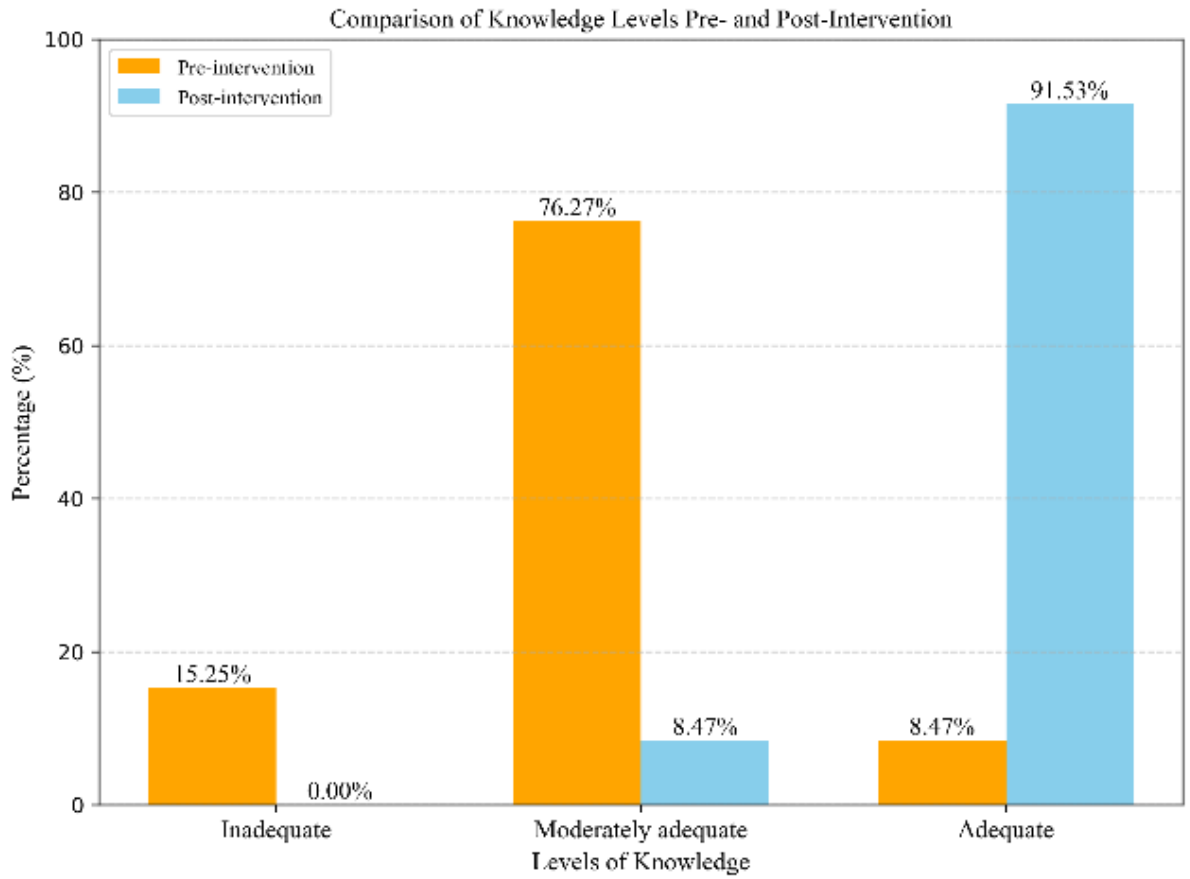

Figure 1: Respondents' Pre- and Post-Intervention Knowledge regarding Hospital Waste Management among Supporting Staff (n=59)

Discussion

Before the intervention, the study found that 8.5% possessed adequate knowledge, 76.3% had moderate knowledge, and 15.3% had inadequate knowledge. A similar study was conducted on the Effectiveness of Teaching Program on Knowledge Regarding Hospital Waste Management among Housekeeping Employees, where, in pre-intervention, 81.25% had inadequate knowledge, 17.50% had moderately adequate knowledge, and 1.25% of them had adequate knowledge.[7] Likewise, in a similar study conducted to assess the knowledge regarding biomedical waste management among 48 group-d-workers, the knowledge mean was 20.58, which is similar to the current study pre-intervention mean score that is 22.25.[8] This might be due to similar population characteristics.

The study's findings are allied to the study conducted on 40 hospital attendants of AIIMS Hospital, Patna, India, from 10th March 2017 to 18th March, which was a descriptive study of knowledge regarding Biomedical waste management. It is discovered that 23.4% had poor knowledge, 48.3% of the attendants had average knowledge, and about 28.3% had good

knowledge.[9] The findings of this study support the need for a health education and training program for the hospital attendants regarding biomedical waste management.

Additionally, a study on Knowledge of Biomedical Waste Management among Housekeeping Workers in Pondicherry Institute of Medical Sciences, Puducherry, India, involving 50 participants, showed 70% had inadequate knowledge, 26% had average knowledge, and 4% had adequate knowledge.[10] This might be due to a lack of regular ongoing training and health education for housekeeping staff on hospital waste management.

After the intervention, the study's data revealed a remarkable shift in knowledge levels among the respondents. Across the surveyed individuals, the majority, 91.5%, now exhibited adequate knowledge, a significant increase compared to the pre-intervention period. 8.5% had a moderately adequate knowledge, and there were no participants with inadequate knowledge. A similar study conducted on the Effectiveness of Structured Teaching Program on Knowledge and Practice Regarding Biomedical Waste Management among Housekeeping Staff of Government Doon Medical College Hospital, where post-test results showed, none with inadequate knowledge, 41.2% with moderate knowledge, and 58.8% adequate knowledge.[11] Similarly, a recent systematic review and meta-analysis concluded that educational interventions (EIs) significantly improve knowledge of waste management among health-care workers in low-income settings.[12]

Likewise, the findings of the study resembled those of the study on Effectiveness of Structured Teaching Program on Knowledge regarding Biomedical Waste Management among House Keeping Staff, Bangalore, where none had inadequate knowledge, 37.5% of housekeeping staff had moderately adequate knowledge, and 62.5% had adequate knowledge in the post-test score on biomedical waste management.[13] This might be due to a similar educational program. By increasing the proportion of staff with adequate knowledge, our intervention may help lay the foundation for safer, more compliant waste management, ultimately reducing the risk of infection, environmental pollution, and occupational hazards. Previous work has highlighted that the lack of well-trained, motivated, and adequately protected staff is a key barrier to effective hospital waste management.[14]

However, while knowledge increase is promising, it does not guarantee translation into sustained practice or behavioral change. Evidence from a study in Rupandehi, Nepal, revealed that despite high knowledge scores, actual practices and

involvement in waste-handling remained suboptimal, indicating a "knowledge–practice gap."[15]

Moreover, a systematic review noted that although many interventions improve knowledge (and sometimes practices), the effect on attitudes is less consistent, and long-term retention of good practices requires ongoing reinforcement.[12]

Therefore, our findings should be interpreted in light of these limitations. Without follow-up assessment of practice (segregation, disposal, use of protective equipment) and institutional support (availability of bins, color-coding, waste-disposal infrastructure), the knowledge gained may not translate into meaningful risk reduction or system improvement. This is especially relevant in low-resource hospital settings, where structural and logistic constraints (e.g., lack of color-coded bins, inadequate disposal systems) often hinder proper waste management regardless of staff knowledge.[14,16]

Conclusion

The study concluded that the post-intervention mean knowledge score is increased than pre- pre-intervention mean knowledge score on hospital waste management after educational intervention. Hence, educational intervention is effective in increasing the knowledge of supporting staff regarding hospital waste management. In-service training should be conducted by the hospital authority on a regular period of time to update the knowledge regarding hospital waste management among supporting staff.

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