

# School Health Nurses' Attitudes and Behaviors Toward Medical Waste Management

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## Abstract

**Background:** Within the scope of health services provided in school settings, medical waste management is crucial for both environmental health and student safety.

**Aim:** This study aimed to determine the attitudes and behaviors of school health nurses in Türkiye toward medical waste.

**Methods:** This descriptive study was conducted between February and April 2025. Data were collected via Google Forms using the Demographic Information Form and the Medical Waste Attitudes and Behaviour Scale (MWABS). A total of 158 participants were recruited for the study using snowball sampling, after reaching out to school health nurses working in Türkiye via social media. The data were analysed using the Mann-Whitney U test and the Kruskal-Wallis test.

**Results:** Of the participants, 90.5% were female, and the mean age was 31.98±9.47 years. Additionally, 57.6% were employed in the public sector, 46.8% reported that their institutions did not have a medical waste management plan, and 68.4% had not received training on medical waste management. Nurses working in private schools, those who had received medical waste management training, and those familiar with waste management procedures had higher MWABS scores ( $p<0.05$ ). The mean MWABS score was 94.06±28.77.

**Conclusion:** School health nurses demonstrated moderate attitudes toward medical waste management. Nearly half of the schools lacked a formal management plan. Strengthening training programs and implementing waste management plans are recommended.

**Keywords:** Attitude, behavior, medical waste, nurses, school health

## Introduction

Waste management is a critical process in healthcare settings.<sup>1</sup> Disruptions in this process can harm public health in multiple ways.<sup>2</sup> Improper management of medical waste, in particular, may lead to serious risks, including the spread of infections and environmental contamination.<sup>3</sup> Medical waste refers to materials generated during healthcare delivery, such as used needles, blood and body fluids, contaminated syringes, and soiled dressings.<sup>1</sup> In Türkiye, more than 135,000 tons of medical waste were generated in 2021 alone.<sup>4</sup> Between 2018 and 2020, the country's total waste volume increased, with hazardous waste nearly doubling during this period.<sup>5</sup> This trend is especially concerning because medical waste, as a category of hazardous waste, poses significant threats to environmental sustainability.<sup>1</sup> Inadequate management of medical waste not only endangers environmental sustainability and public health but also negatively affects healthcare workers.<sup>6,7</sup> Failures in waste management processes can lead to occupational injuries and the spread of infectious diseases within communities. Such negligence threatens both individual and public health,<sup>8</sup> as well as environmental well-being.<sup>1</sup>

In 2017, Türkiye introduced regulations to control and reduce the risks associated with medical waste. According to these regulations, any unit that generates medical waste through its activities is classified as a "waste generator."<sup>9</sup> In addition to hospitals, medical centers, and laboratories, infirmaries are also recognized as sources of medical waste. School health nurses working in infirmaries in Türkiye may generate medical waste through emergency interventions, care, treatment, and immunization practices.<sup>10</sup>

An organization that generates medical waste must establish a medical waste management plan. This plan should encompass the processes of generation, collection, transportation, treatment, and disposal of medical waste.<sup>11</sup> Medical waste should be transported, stored, and disposed of appropriately according to its quantity.<sup>9</sup> Nurses' attitudes play a critical role in the proper and safe segregation of medical waste. Previous studies have examined the attitudes of nurses working in hospitals toward medical waste management.<sup>12-19</sup> However, the role of nurses in medical waste management extends beyond hospital settings. In school health services, nurses are responsible for key activities such as conducting health screenings, monitoring chronic conditions, providing first aid, preventing communicable diseases, and delivering health education. In Türkiye, there are no up-to-date official data on the exact number of school nurses nationwide, and their roles may vary across institutions. Moreover, school nurses contribute to the continuity of care for school-aged children by facilitating coordination among schools, families, and healthcare institutions. This highlights their potential responsibility

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in ensuring proper medical waste management in educational settings. This study is expected to address a gap in the literature by examining school health nurses' attitudes and behaviors toward medical waste. Accordingly, the aim of this study was to investigate these attitudes and behaviors.

## Research Questions

1. What are the Medical Waste Attitude and Behavior Scale (MWABS) scores of school health nurses?
2. Do MWABS scores differ according to the descriptive characteristics of school health nurses?

## Materials and Methods

### Study Design

The study employed a descriptive design.

### Sample

The sample size was calculated using G\*Power 3.1.9.7 (Heinrich-Heine-Universität Düsseldorf, Düsseldorf, Germany) for an independent samples t-test. Based on the study by Asadullah et al.,<sup>20</sup> an effect size of 0.58 was used, with a 5% margin of error and 95% power, yielding a required sample size of 158. A total of 158 participants who consented to participate were included in the study. Participants ranged in age from 23 to 63 years. The inclusion criteria were: (1) having at least two months of professional experience, (2) working in Türkiye, and (3) being employed in a school with an infirmary. The exclusion criteria were: (1) not being a nurse, (2) working in a school without an infirmary, and (3) having less than two months of experience.

### Data Collection Tools

Data were collected using the Descriptive Information Form and the Medical Waste Attitude and Behavior Scale.

**Descriptive Information Form:** This form was developed by the researchers based on the literature and consists of 10 items, including age, gender, educational status, clinical practices (e.g., blood glucose measurement, dressing), years

of professional experience, duration of employment in the school setting, type of school, receipt of training on medical waste management, and knowledge of the medical waste management process.<sup>20</sup>

**Medical Waste Attitude and Behavior Scale:** This scale was developed by Uskun et al.<sup>21</sup> in 2023. It is a 5-point Likert-type scale consisting of 24 items rated from *Strongly Agree* (5) to *Strongly Disagree* (1). The scale includes four subdimensions: awareness (items 1, 2, 3, 4, 7, 8, 9, 10, 11, 12, 13), behavior (items 14, 15, 16, 17, 18), cognitive (items 5, 6, 19, 20, 21), and attention (items 22, 23, 24). Total scores range from 24 to 120. In the original study by Uskun et al.,<sup>21</sup> the Cronbach's alpha reliability coefficient was 0.94. In the present study, the Cronbach's alpha coefficient was calculated as 0.98. A higher score on the scale indicates more positive attitudes and behaviors toward medical waste.

### Data Collection

Data were collected between February and April 2025. Participants were reached through social media platforms (LinkedIn, Instagram, Facebook) by searching the keywords "school nurse" and "school health nursing." Invitations and informational messages were sent to users identified as school health nurses. Since paramedics may also work in private schools in Türkiye, individuals who identified themselves as paramedics were excluded from the study. School health nurses who met the inclusion criteria and agreed to participate were included in the sample. The data collection instruments were transferred to Google Forms (Google LLC, Mountain View, CA, USA) and distributed to participants via direct messaging. Using the snowball sampling method, participants referred other school health nurses they knew to the researchers. Participation was voluntary and anonymous. Data were stored in a password-protected digital folder accessible only to the researchers via a secure email account. Each participant was allowed to complete the survey only once, ensuring data integrity and security.

### Data Analysis

Data analysis was conducted using IBM SPSS version 27.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were presented as numbers, percentages, means, and standard deviations. Normality was assessed using skewness and kurtosis values,

**Table 1.** Descriptive characteristics and medical waste practices of school health nurses (n=158)

|                                   | Mean±SD    | Range |                                                                                          | n   | %    |
|-----------------------------------|------------|-------|------------------------------------------------------------------------------------------|-----|------|
| Age [years]                       | 31.98±9.47 | 23–63 | Do you perform clinical procedures such as blood glucose measurement and wound dressing? |     |      |
|                                   | n          | %     | Yes                                                                                      | 154 | 97.5 |
| Gender                            |            |       | No                                                                                       | 4   | 2.5  |
| Female                            | 143        | 90.5  | Does your school have a medical waste management plan in place?                          |     |      |
| Male                              | 15         | 9.5   | Yes                                                                                      | 71  | 44.9 |
| Educational level                 |            |       | No                                                                                       | 74  | 46.8 |
| High school                       | 4          | 2.5   | Do not know                                                                              | 13  | 8.3  |
| Associate degree                  | 29         | 18.4  | Have you received training on medical waste management?                                  |     |      |
| Bachelor's degree                 | 99         | 62.6  | Yes                                                                                      | 50  | 31.6 |
| Master's degree                   | 26         | 16.5  | No                                                                                       | 108 | 68.4 |
| Work experience in school setting |            |       | Are you familiar with the medical waste management process?                              |     |      |
| <3 years                          | 92         | 58.2  | Yes                                                                                      | 76  | 48.1 |
| ≥3 years                          | 66         | 41.8  | No                                                                                       | 82  | 51.9 |
| Clinical experience               |            |       | How frequently is medical waste collected at your institution?                           |     |      |
| <3 years                          | 61         | 38.6  | Not collected                                                                            | 61  | 38.6 |
| ≥3 years                          | 97         | 61.4  | Do not know                                                                              | 14  | 10.8 |
| Type of school                    |            |       | Daily                                                                                    | 17  | 8.9  |
| Public (state)                    | 91         | 57.6  | As needed                                                                                | 56  | 35.4 |
| Private                           | 67         | 42.4  | Weekly                                                                                   | 10  | 6.3  |

SD: Standard deviation.

**Table 2.** Medical Waste Attitude and Behavior Scale [MWABS] scores according to nurses' descriptive characteristics (n=158)

| Characteristics                                                                          | n   | %    | Mean rank | Z/H    | p            |
|------------------------------------------------------------------------------------------|-----|------|-----------|--------|--------------|
| Gender                                                                                   |     |      |           |        |              |
| Female                                                                                   | 143 | 90.5 | 79.58     | -0.650 | 0.948        |
| Male                                                                                     | 15  | 9.5  | 78.77     |        |              |
| Educational level                                                                        |     |      |           |        |              |
| High school                                                                              | 4   | 2.5  | 59.88     | 6.263  | 0.099        |
| Associate degree                                                                         | 29  | 18.4 | 78.00     |        |              |
| Bachelor's degree                                                                        | 99  | 62.6 | 75.59     |        |              |
| Master's degree                                                                          | 26  | 16.5 | 99.08     |        |              |
| Type of school                                                                           |     |      |           |        |              |
| Public (state)                                                                           | 67  | 42.4 | 93.26     | -3.247 | <b>0.001</b> |
| Private                                                                                  | 91  | 57.6 | 69.37     |        |              |
| Work experience in school setting                                                        |     |      |           |        |              |
| <3 years                                                                                 | 92  | 58.2 | 76.64     | -0.930 | 0.352        |
| ≥3 years                                                                                 | 66  | 41.8 | 83.49     |        |              |
| Clinical experience                                                                      |     |      |           |        |              |
| <3 years                                                                                 | 61  | 38.6 | 72.83     | -1.455 | 0.146        |
| ≥3 years                                                                                 | 97  | 61.4 | 83.70     |        |              |
| Have you received training on medical waste management?                                  |     |      |           |        |              |
| Yes                                                                                      | 50  | 31.6 | 86.40     | -2.790 | <b>0.005</b> |
| No                                                                                       | 108 | 68.4 | 64.59     |        |              |
| Are you familiar with the medical waste management process?                              |     |      |           |        |              |
| Yes                                                                                      | 76  | 48.1 | 100.06    | -5.444 | <b>0.000</b> |
| No                                                                                       | 82  | 51.9 | 60.45     |        |              |
| Do you perform clinical procedures such as blood glucose measurement and wound dressing? |     |      |           |        |              |
| Yes                                                                                      | 154 | 97.5 | 79.52     | -0.033 | 0.973        |
| No                                                                                       | 4   | 2.5  | 78.75     |        |              |

Bold values indicate statistical significance. Z: Mann-Whitney U test, H: Kruskal-Wallis test.

with values between +1.5 and -1.5 considered indicative of a normal distribution. Since MWABS scores did not meet the assumption of normality, non-parametric tests were applied. The Mann-Whitney U test was used to compare two independent groups, while the Kruskal-Wallis test was used for comparisons involving three or more groups.<sup>22</sup> Statistical significance was set at  $p < 0.05$ .

## Ethical Considerations

Ethical approval was obtained from Maltepe University Non-Interventional Research Ethics Committee [Approval Number: 2024/22-15, Date: 28.11.2024]. Permission to use the MWABS was obtained via email from the corresponding author. Participants were informed about the study, and informed consent was obtained prior to participation. Any questions or concerns raised by participants were addressed. The study was conducted in accordance with the 2013 revision of the Declaration of Helsinki.

## Results

Table 1 presents the descriptive characteristics of the participants and information related to medical waste practices. The mean age of participants was  $31.98 \pm 9.47$  years [range: 23–63 years]. Of the participants, 90.5% were female, 62.6% held a bachelor's degree, and 41.8% had been working in their current school for more than three years. Additionally, 38.6% had less than three years of clinical experience, and 42.4% were employed in private schools. The majority of participants (97.5%) reported performing invasive procedures such as blood glucose measurement. It was found that 46.8% of the schools did not have a medical waste management plan, and 68.4% of participants had not received training on medical waste management.

**Table 3.** Subscale scores of the Medical Waste Attitude and Behavior Scale [MWABS] among nurses (n=158)

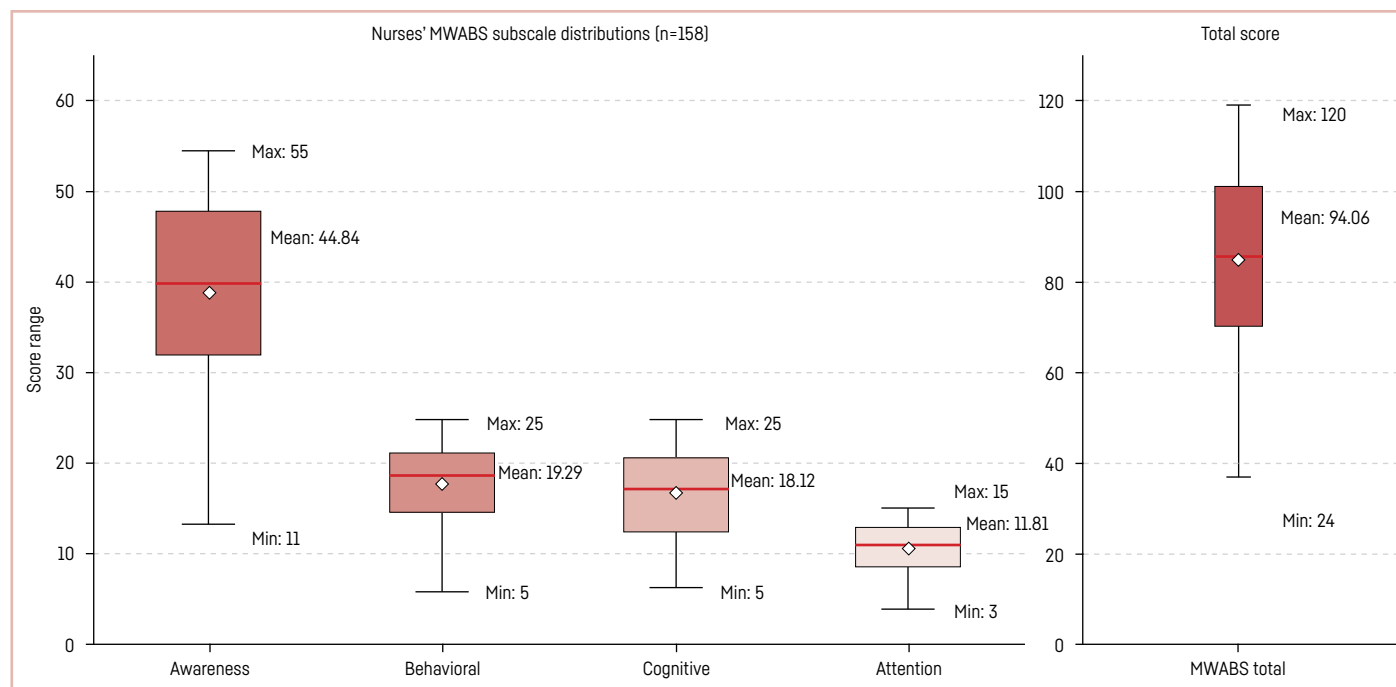
| Scale/subdimension | Mean±SD     | Score range |
|--------------------|-------------|-------------|
| Awareness          | 44.84±13.90 | 11–55       |
| Behavioral         | 19.29±6.18  | 5–25        |
| Cognitive          | 18.12±5.88  | 5–25        |
| Attention          | 11.81±3.96  | 3–15        |
| MWABS              | 94.06±28.77 | 24–120      |

SD: Standard deviation.

Furthermore, 51.9 reported not knowing the medical waste management process, and 38.6% stated that medical waste was not collected in their institutions [Table 1].

Table 2 presents MWABS scores according to participants' descriptive characteristics. No statistically significant differences were found in terms of gender, education level, years of school or clinical experience, or performance of procedures ( $p > 0.05$ ). However, significant differences were observed based on school type, receipt of medical waste management training, and knowledge of the medical waste management process ( $p < 0.05$ ) [Table 2].

Table 3 and Figure 1 present the MWABS scores and their distribution. The highest mean score was observed in the Awareness subscale [44.84±13.90], while the



**Figure 1.** Distribution of Medical Waste Attitude and Behavior Scale (MWABS) subscale scores among nurses.

lowest was in the Attention subscale [11.81±3.96]. The Behavioral [19.29±6.18] and Cognitive [18.12±5.88] subscales indicated moderate levels. The overall MWABS mean score was 94.06±28.77, suggesting that participants' awareness, behaviors, cognitive understanding, and attention regarding medical waste management were at a moderate level (Table 3).

## Discussion

Medical waste management is a critical issue in healthcare. School health nurses may act as generators of medical waste due to certain clinical practices performed in school settings. However, studies examining the attitudes and behaviors of school health nurses regarding medical waste are limited.

This study examined the practices, attitudes, and behaviors of school health nurses toward medical waste. Based on the scale score range, it can be concluded that their attitudes and behaviors are at a moderate level. Previous studies have also reported moderately positive attitudes among nurses toward medical waste.<sup>23-25</sup> However, some studies have identified lower levels of positive attitudes.<sup>26-28</sup> Overall, it can be stated that school health nurses' attitudes toward medical waste range from low to moderate.

A considerable proportion of participants reported not receiving training on medical waste management, and approximately half indicated that they were unfamiliar with the process. This finding is consistent with previous studies, which have highlighted knowledge gaps and practice errors among healthcare workers regarding medical waste management.<sup>12-14,17,18</sup> These results suggest that school health nurses may lack sufficient knowledge, which could negatively affect proper waste management practices.

In this study, school health nurses working in private schools demonstrated more positive attitudes toward medical waste compared to those in other settings. This difference may be attributed to better access to resources in private institutions. Similarly, Thirunavukkarasu et al.<sup>15</sup> reported that organizational support positively influences medical waste management practices.

Furthermore, nurses who had received training on medical waste management exhibited more positive attitudes than those who had not, indicating that training plays a significant role in improving attitudes and behaviors. Other studies in the literature have also demonstrated that training positively influences knowledge, attitudes, and practices related to medical waste management.<sup>13-19</sup>

Another notable finding of our study was that approximately half of the schools did not have a medical waste management plan. This suggests that even when school nurses possess individual awareness, deficiencies in organizational structures may hinder effective implementation. Similarly, Sürme and Maraş<sup>16</sup> reported that despite nurses' individual efforts, the absence of systematic planning and institutional support negatively affected waste management practices.

In this study, no differences were found between attitudes and variables such as clinical experience, length of employment in schools, gender, or educational level. However, previous studies have reported that healthcare workers with greater experience tend to demonstrate more positive attitudes toward medical waste management.<sup>15,18</sup>

## Limitations

This study has several limitations. First, as the data were collected through self-report measures, responses may have been influenced by social desirability bias. Second, the sample consisted of school health nurses who were accessible via social media, limiting the generalizability of the findings to the broader population in Türkiye. Additionally, the lack of up-to-date official data on the number of school health nurses in Türkiye made it difficult to clearly define the study population, representing another limitation.

## Conclusion

School health nurses have moderately positive attitudes and behaviors toward medical waste management; however, gaps remain in training and the implementation of medical waste management plans. Based on these findings, periodic and mandatory medical waste management training programs should be established for school health nurses. The results underscore the importance of regular and systematic training tailored to the type of school in which nurses are employed. Accordingly, it is recommended that nurses receive training specific to their institutional context. Furthermore, the development and implementation of medical waste management plans in schools should be mandated by regulation. Administrators in both public and private schools should provide adequate training and resources to support school health nurses in this regard. Future studies should incorporate observational methods to evaluate medical waste management practices. Overall, these findings may inform policy development and improvements in medical waste management within school health services.

**Ethics Committee Approval:** The study was approved by the Maltepe University Non-Interventional Research Ethics Committee [Approval Number: 2024/22-15, Date: 28.11.2024].

**Informed Consent:** Written informed consent was obtained from all participants.

**Conflict of Interest:** The authors have no conflicts of interest to declare.

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**Peer-review:** Externally peer-reviewed.

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