

## Evaluation of waste knowledge levels of staff and students working in a school of dentistry, in Van, Turkey, in 2019

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### Original Article

#### Abstract

**BACKGROUND AND AIM:** Various types of harmful wastes, which may or may not be contaminated with body fluids, result from health care services. When dental clinics are improperly managed, various environmentally hazardous wastes emerge. This study aims to determine and compare the knowledge levels of academic and dental health personnels and dentistry students and reveal the need for education.

**METHODS:** The study was conducted face-to-face with 90 people, consisting of 4th and 5th-grade students studying at dentistry school, assistant professors, research assistants, nurses, and cleaning staff. The statistical significance level was set at 5% in calculations and SPSS statistical software was used for calculations.

**RESULTS:** No significant difference was found between the study participants when their waste knowledge levels were evaluated by gender and work experience. Significant differences were found between the study participants when their waste knowledge levels were evaluated by their education level and according to their roles ( $P < 0.05$ ). Waste knowledge levels of individuals with an undergraduate or post-graduate degree were found to be higher than primary or high school graduates. The knowledge level of the cleaning staff was found to be significantly lower than all other groups.

**CONCLUSION:** The results reveal the need to update the medical waste knowledge of all health care occupations, especially the cleaning staff, at regular intervals, regardless of their work experience.

**KEYWORDS:** Medical Waste; Dentistry; Knowledge

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Various types of harmful wastes, which may or may not be contaminated with body fluids, result from health care services. These harmful wastes can be classified as pathological wastes, infectious wastes, cutting wastes, pharmaceutical wastes, genotoxic wastes, chemical wastes, wastes containing high levels of heavy metal, pressure vessels, and radioactive wastes. Radioactive or cytotoxic wastes account for 1% of these wastes and cutting wastes, chemical and pharmaceutical wastes, and pathological and infectious wastes account for 1%, 3%, and 15% of these wastes, respectively. 80% of these wastes are risk-free

wastes that are not considered hazardous for the public.<sup>1,2</sup>

When dental clinics are improperly managed, various environmentally hazardous wastes emerge. These include sharp components, used disposable products, infectious wastes (bloody cotton, gauze, etc.), mercury-containing wastes (mercury, amalgam residues), lead-containing wastes (lead foil packs, lead aprons), and chemical wastes (used films, fixators, and disinfectants). Studies have shown that waste water from dental clinics typically involves high metal concentrations such as mercury, silver, copper, tin, and zinc.<sup>3</sup>

Being familiar with and discriminating

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contaminated wastes will be beneficial to protect waste collectors and the society and will significantly reduce the cost of disposal processes.<sup>4</sup>

Wastes should be collected in bags and/or boxes of different colors and segregated at source:

- Any material that has come into contact with body fluids such as blood and saliva, tissues, organs, body parts, blood and body fluids, needles, and vaccine sets should be carried in red bags, which is the symbol of medical waste warning or internationally infectious waste.

- Domestic wastes from health care institutions should be collected separately from medical wastes in black plastic bags and stored separately from medical wastes. These wastes include uninfected kitchen wastes, office wastes, garden wastes, etc.

- Recyclable materials such as papers, glasses, polyethylene terephthalate (PET) bottles, and tin cans that are qualified as domestic wastes and do not have an infectious quality should be carried in blue bags.<sup>5</sup>

Wastes in the places where dentistry practices are performed are generally contaminated with blood and saliva and are potential sources of infection.<sup>6,7</sup> Poor management in the collection and disposal of health care wastes can lead to infections and injuries. Safe waste management can be achieved by minimizing wastes, separating general wastes from hazardous wastes, and disposing harmful wastes.<sup>8</sup> This can only be achieved with a high level of knowledge on wastes. Improper waste management can pose hazards to health care staff and other persons around them.<sup>9</sup> Therefore, waste management should also be included in undergraduate curricula of all health care occupations.<sup>10</sup>

In the literature, the effects of factors such as occupation, experience, education level, and gender were investigated in the studies examining the biomedical waste knowledge levels of dental health care personnel.<sup>4,11-14</sup>

A good waste management plan is essential for segregating wastes in health care

institutions and controlling and rendering medical wastes harmless. Therefore, regular training should be provided to health care occupations.<sup>13</sup> Cooperation of all health care occupations, institution employees, and personnel responsible for the transportation and disposal of wastes is required for the success of waste management. Thus, awareness of all staff and institution employees should be raised and they should be trained.<sup>15</sup> This information reveals the importance of waste and medical waste education. In the light of this information, this study aims to determine and compare the knowledge levels of academic and dental health personnels and dentistry students who provide health care services in School of Dentistry, Van Yuzuncu Yil University, Van, Turkey, and reveal the need for education.

## Methods

This prospective, cross-sectional, questionnaire-based study was conducted face-to-face with 90 people (participation in the survey was achieved until 15 volunteers were reached in each group), consisting of 4<sup>th</sup> and 5<sup>th</sup>-grade students, studying at School of Dentistry, Van Yuzuncu Yil University, assistant professors, research assistants, nurses, and cleaning staff in April 2019. Questionnaire forms filled in the study were also benefited from the literature and included questions on demographic information such as age, gender, education level, and work experience of individuals as well as 50 questions measuring the knowledge level on medical waste. Among the 50 questions, 9 questions were about red waste bags, 7 questions were about domestic black waste bags, 5 questions were about sharp medical waste bin, 4 questions were about blue recycling waste bags, and 25 questions were about general waste information questions.<sup>4,10,13,16</sup> Knowledge level assessments were determined by the number of correct answers (poor: < 25 correct answers out of 50, moderate: 25-37 correct answers out of 50, good: > 37 correct answers out of 50).

Volunteers aged 18 years old and more were included in the study. Individuals who worked in clinics for less than three months and individuals who did not work in the clinic were excluded. The approval for the study was obtained from the Non-Invasive Clinical Research Ethics Committee of Van Yuzuncu Yil University (Decision No.: 28/09/2018-05).

Descriptive statistics for continuous variables from the characteristics of interest were expressed as mean, standard deviation (SD), and minimum and maximum values. One-way analysis of variance (ANOVA) was used to compare the groups in terms of continuous variables. Following the ANOVA, Duncan's multiple comparison test was used to identify the different groups. Pearson's correlation coefficients were calculated to determine the correlation between variables (age-total score). Validity and reliability of questionnaire were tested. Overall internal reliability was high and coefficient alpha was 0.91 (Cronbach's alpha).

In the study, "knowledge levels" was considered as main trait (characteristic). From the previous studies, the SD for "knowledge levels" varies between 2.8 and 5.2.<sup>17,18</sup> Thus, SD was considered as 4. For the 95% of confidence coefficient and approximately 80% power value, type I error is 0.05 (Z-value is 1.96 for the 5% type I error); the effect size was taken by the researcher as 2. Based on this information, the necessary sample size was calculated by the equation " $n = Z^2 \times \sigma^2/d^2$ ". According to this equation, minimum sample size in each group was found as 15 [ $n = (1.96^2 \times 4^2/2^2 \cong 15)$ ]. The statistical significance level was set at 5% in calculations and SPSS software (version 20, IBM Corporation, Armonk, NY, USA) was used for calculations.

## Results

Of 90 individuals participating in the study, 53 (58.9%) were men and 37 (41.1%) were women and the mean age was  $27.92 \pm 7.40$  years (ranged from 20 to 54 years). Education level, occupation, experience, and thoughts about waste applications of individuals' were shown in table 1.

**Table 1.** Distribution of descriptive features

Variable	Value
Age (year)	Minimum-maximum 20-54 27.92 ± 7.40
Gender	Men 53 (58.89) Women 37 (41.11)
Education level	Primary school 4 (4.44) Secondary school 3 (3.33) High school 9 (10.00) Associate degree 8 (8.89) Undergraduate 36 (40.00) Post-graduate 30 (33.30)
Occupation	Cleaning staff 15 (16.67) Nurse 15 (16.67) 4 <sup>th</sup> -grade student 15 (16.67) 5 <sup>th</sup> -grade student 15 (16.67) Research assistant 15 (16.67) Assistant professor 15 (16.67)
Work experience (year)	0-2 33 (36.67) 3-5 25 (27.78) 6-10 23 (25.56) 11-15 6 (6.67) > 16 3 (3.33)
Are waste applications successful?	Very successful 4 (4.44) Successful 37 (41.11) No idea 28 (31.11) Slightly successful 12 (13.33) Unsuccessful 9 (10.00)

Data are expressed as mean ± standard deviation (SD) or number and percentage.

The ratios of good level of knowledge score according to the occupations were 100%, 93.33%, 93.33%, 86.67%, 80.00%, and 33.33% for 4<sup>th</sup>-grade student, 5<sup>th</sup>-grade student, assistant professor, nurse, research assistant, and cleaning staff, respectively (Table 2).

**Table 2.** Level of knowledge of waste among occupations

Occupation	Scoring			Total [n (%)]
	Good [n (%)]	Moderate [n (%)]	Poor [n (%)]	
Cleaning staff	5 (33.33)	7 (46.67)	3 (20.00)	15 (100)
Nurse	13 (86.67)	2 (13.33)	0 (0)	15 (100)
4 <sup>th</sup> -grade student	15 (100)	0 (0)	0 (0)	15 (100)
5 <sup>th</sup> -grade student	14 (93.33)	1 (6.67)	0 (0)	15 (100)
Research assistant	12 (80.00)	3 (20.00)	0 (0)	15 (100)
Assistant professor	14 (93.33)	1 (6.67)	0 (0)	15 (100)

**Table 3.** Comparison of the total number of correct answers at the waste information level according to gender, working years of the individuals, degree of education, and occupation

Variable		N	Mean $\pm$ SD	Minimum-maximum	P
Gender	Men	53	39.40 $\pm$ 7.88	6.00-47.00	0.281
	Women	37	41.22 $\pm$ 7.40	1.00-47.00	
Work experience (year)	0-2	33	40.18 $\pm$ 8.27	1.00-47.00	0.618
	3-5	25	39.04 $\pm$ 6.77	25.00-47.00	
	6-10	23	39.83 $\pm$ 9.49	6.00-47.00	
	11-15	6	44.50 $\pm$ 1.64	42.00-46.00	
	> 16	3	42.67 $\pm$ 2.52	40.00-45.00	
Degree of education	Primary school	4	31.75 $\pm$ 4.99 <sup>b</sup>	28.00-39.00	0.001
	Secondary school	3	31.89 $\pm$ 7.21 <sup>a,b</sup>	27.00-41.00	
	High school	9	31.89 $\pm$ 18.10 <sup>b</sup>	1.00-47.00	
	Associate degree	8	39.88 $\pm$ 6.83 <sup>a,b</sup>	25.00-47.00	
	Undergraduate	36	41.92 $\pm$ 3.78 <sup>a</sup>	29.00-47.00	
Occupation	Post-graduate	30	42.20 $\pm$ 4.61 <sup>a</sup>	28.00-47.00	0.001
	Cleaning staff	15	30.33 $\pm$ 1.32 <sup>b</sup>	1.00-45.00	
	Nurse	15	42.60 $\pm$ 4.22 <sup>a</sup>	32.00-47.00	
	4 <sup>th</sup> -grade student	15	41.53 $\pm$ 3.11 <sup>a</sup>	38.00-47.00	
	5 <sup>th</sup> -grade student	15	42.00 $\pm$ 4.68 <sup>a</sup>	29.00-47.00	
	Research assistant	15	41.67 $\pm$ 5.54 <sup>a</sup>	28.00-47.00	
	Assistant professor	15	42.73 $\pm$ 3.58 <sup>a</sup>	33.00-47.00	

SD: Standard deviation

a and b present statistically significant differences between degrees of education and occupations

The ratios of moderate and poor levels of knowledge score according to the occupations were shown in table 2.

No significant difference was found between the study participants when their waste knowledge levels were evaluated by gender and work experience (Table 3).

A significant difference was found between the study participants when their waste knowledge levels were evaluated by their education level ( $P < 0.05$ ). Waste knowledge levels of individuals with an undergraduate or post-graduate degree were found to be higher than primary or high school graduates (Table 3).

A significant difference was found between the study participants when their waste knowledge levels were evaluated according to their roles ( $P < 0.05$ ). The knowledge level of the cleaning staff was found to be significantly lower than all other groups (Table 3).

## Discussion

In this study, waste knowledge levels of individuals with an undergraduate or post-graduate degree were found to be higher

than primary or high school graduates. The medical waste knowledge level increases as the level of education increases. In the study of Santhosh and Reshma, the knowledge levels of 4<sup>th</sup>-grade dentistry students on medical wastes were found to be lower than the knowledge level of 5<sup>th</sup>-grade students.<sup>16</sup> Sanjeev et al. reported that the level of education affected the level of knowledge on medical waste; graduate and post-graduate personnel had higher levels of knowledge on medical waste and among dentistry students, the level of knowledge of senior students was higher.<sup>4</sup> Hascuhadar et al. reported that college and high school graduates got higher scores in terms of medical wastes.<sup>13</sup>

Sharma et al. evaluated the level of knowledge on the medical waste as poor if there was under 4 answers to 10 questions. According to occupations, they reported that 25% of dentists, 36% of nurses, 40% of laboratory technicians, and 45% of class IV employees (cleaners and maintenance personnel) were at poor level.<sup>10</sup>

In this study, the level of knowledge of those who answered less than half (50%) of the questions was considered poor. In spite of

this, only 20% poor level of knowledge was observed in cleaning staff, and overall medical waste information level of dental healthcare workers was higher than the study of Sharma et al.<sup>10</sup>

In the study of Santhosh and Reshma, they accepted the correct response rate below 25% as weak level of knowledge and accordingly, they found the weak rate of medical waste information among dentistry students as 11.1% in 3<sup>rd</sup> grades, 20.5% in 4<sup>th</sup> grades, and 5.9% in 5<sup>th</sup> grades.<sup>16</sup> In this study, it was found that 4<sup>th</sup> and 5<sup>th</sup>-grade dentistry students did not have a poor level of knowledge and overall, the knowledge level of dentistry students was higher than study of Santhosh and Reshma.

In this study, when the correlation between work experience on year basis and medical waste knowledge level was examined, it was observed that the years of work was not effective on the medical waste knowledge level, and this result was consistent with the studies by Hascuhadar et al.<sup>13</sup> and Koseoglu et al.<sup>14</sup>

Hascuhadar et al.<sup>13</sup> and Koseoglu et al.<sup>14</sup> evaluated the correlation between the medical waste knowledge level and gender and demonstrated that there was no difference between genders. Similarly, in this study, no significant gender differences were observed in the waste knowledge levels of individuals.

When the correlation between the knowledge level and distribution of tasks of staff was examined, several studies indicated a lack of training and knowledge in cleaning staff.<sup>10,13,19</sup> Narang et al. reported that the level of knowledge of dentists was higher than the dental assistant staff on medical waste.<sup>11</sup> Singh

et al. declared that only a quarter of class IV workers (cleaning and maintenance workers) had information about biomedical waste and their level of knowledge was less than doctors, nurses, and paramedics.<sup>12</sup> This study also found that the knowledge level of the cleaning (support) staff was significantly lower than the other groups.

The limitation of this study is that the questionnaire reminds answers to the participants. However, according to Gilbert et al., this method is an adequately valid, affordable, and fast method to collect data.<sup>20</sup>

## Conclusion

In this study, the medical waste knowledge level of participants with graduate and post-graduate education level was found to be the highest. In addition, the medical waste knowledge level of the cleaning staff was found to be lower than the level of other health care occupations. These results reveal the need to update the medical waste knowledge of all health care occupations, especially the cleaning staff, at regular intervals, regardless of their work experience. We also think that the cleaning staff, who seem to have a low level of education, should be given more frequent training and the success of the training should be checked periodically.

## Conflict of Interests

Authors have no conflict of interest.

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