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WHAT DO NURSES WORKING IN PRIMARY HEALTH CARE SERVICES KNOW ABOUT MEDICAL WASTE MANAGEMENT?

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Abstract: With the increase in population, the need for health services also uprises the production of medical waste. Nurses have important responsibilities in the management of medical waste with great risks for human and environmental health. The search was conducted as a descriptive study in order to evaluate the know ledge level of nurses working in primary health care units about medical waste. The research was conducted with nurses (N=80) working in primary health care units in a province in Türkiye/Central Anatolia Region, between January 5 and February 5, 2020, actively working, not on leave/report and volunteering to participate in the search (n=75). The data of the study were collected with the "Medical Waste Information Level Determination Form". The form consisted of three parts, including socio-demographic characteristics, separation of waste types, and knowledge level of medical waste use, and 49 questions. In the results of the study, the mean score of nurses' knowledge of sorting waste types was 9.9±2.7 (min: 3, max:15 points), while the mean of medical waste use knowledge score was 19.2±2.7 (min:10, max:23 points).In order to meet the knowledge need of nurses, it should be ensured that the level of knowledge is determined, the practices in the field are supervised and developed, and in-service trainings should be provided within this scope.

Keywords: Medical waste, Nursing, Primary health care, Knowledge

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1. Introduction

Human health and the environment are faced with many threats with the innovations that have emerged with the increasing number of population and developing technology worldwide. In particular, the demand for health services has increased with the population, and the management of waste products has also become an important problem (Windfeld and Brooks, 2015). The word "waste" means substances that are used in places such as hospitals, homes, factories, that emerge at all stages from production to consumption and are no longer useful to the user (Turkish Language Association, 2023). According to the World Health Organization, "Medical waste", on the other hand, refers to body fluids and secretions, including blood and blood products, and all kinds of waste, tissue and organ parts contaminated with them (WHO, 2015). On the authority of the data of European Union countries, the average daily amount of medical waste per person is 2.82 kg (Cerrahoğlu and Kılıçaslan, 2019). As stated by the "Medical Waste Control Regulation" published in the Official Gazette dated 25.01.2017 and numbered 29959, wastes originating from health institutions are classified as domestic waste, hazardous waste, radioactive waste and medical waste. Infectious, pathological and penetrating wastes are included in the scope of medical waste (Medical Waste Control Regulation, 2017).

Primary health care services are at the center of the health care system (Ayhan Başer et al., 2015). Effective delivery of primary health care services not only reduces the disease burden of the society, but also enables our secondary and tertiary treatment institutions to provide better and higher quality health services and health education. Various types of waste occur in these institutions, which form the basis of health services (Matos et al., 2018). Institutions in Primary Health Care Services are classified as health institutions that produce moderate amount of waste with medical wastes from these types of waste (Medical Waste Control Regulation, 2005). In these institutions that provide continuous service, medical waste management is of great importance in terms of the sustainability of the service.

Waste generated during health care activities is much more important than any other type of waste. Because medical wastes carry a high risk of infection and injury. If medical wastes are not managed well, they show permanent properties in water and soil and disrupt the ecological balance (Bariya et al., 2017). Incorrect

practices in the on-site separation of medical wastes affect the country's economy negatively (Verma et al., 2008). For this reason, it is necessary that all personnel working in health institutions have received the necessary training in this regard. Nurses, who are in direct contact with the patient, assume primary roles in treatment and care practices, and make up the majority of health professionals working in health care centers, have important duties (Mir et al., 2013; Matos et al., 2018; Sürme and Maraş, 2022).

For nurses, improper separation of medical wastes may result in infectious diseases or occupational accidents (Pandit et al., 2005). Increasing the level of knowledge about medical waste, which has serious risks, is important in terms of environmental health, public health, prevention of nosocomial infections, providing a safe working environment, preventing stab wounds, ensuring appropriate recycling and successful management of medical waste. Therefore, nurses need to update their knowledge and skills in managing medical waste over time (Jadhav et al., 2015; Gayathri and Kumaravel, 2018; Toluk et al., 2021). The reason why this study was conducted is to determine the knowledge level of nurses working in Primary Health Care Units about medical waste.

1.1. Research Questions

What is the knowledge level of nurses working in primary health care units about medical waste?

Do the sociodemographic characteristics of nurses working in primary health care units affect their level of knowledge about medical waste?

2. Materials and Methods

2.1. Purpose and Type of Research

The research was carried out as a descriptive study in order to determine the knowledge level of nurses working in primary health care units in a province in Türkiye/Central Anatolia Region about medical waste.

2.2. Research Population and Sample

The study population of the research consisted of nurses (N=80) working in the Primary Health Care Units in a province located in Türkiye/Central Anatolia Region between January 5 and February 5, 2020 (The population number in the study was obtained from the Provincial Health Directorate Public Health Services Unit). The sample of the study consisted of 75 nurses who were active on the specified dates, were not on leave/reported and volunteered to participate in the research. (Response rate 93.75%)

2.3. Data Collection Tools

In the study, the data were collected with the "Medical Waste Information Level Determination Form" prepared by the researchers, using the relevant literature (Doğan and Göktaş, 2017; Medical Waste Control Regulation, 2017; Turan et al., 2019; Ulutaşdemir et al., 2020). In the research, the items in the measurement tool were presented to the opinion of 8 experts who were thought to have knowledge of the scope of the research. Experts were asked to evaluate the results in line with the Laswhe technique to calculate the content validity index. In line with the suggestions from experts, the content validity rate was found to be above 0.78 and necessary adjustments were made. The form consists of three parts. In the first part, there are nine socio-demographic questions about the age, gender, educational status, working year, unit of work, knowledge of the waste regulation and the problems experienced by the nurses regarding medical waste. In the second part, 15 items of waste materials were listed and they were asked to mark the correct one among the "red bag", "cutting tool box", "black bag" and "blue bag" options used to separate these materials. In the third part, the knowledge level of nurses about the use of medical waste was evaluated with 25 propositions. Nurses were asked to tick one of the options "true", "false" and "I don't know" for each proposition. In the whole form, each correct answer was scored as "1", each wrong, I don't know and blank answer was scored as "0"; the highest score that can be obtained from the second part is 15, the lowest score is 0; The highest score that can be obtained from the third section was determined as 25 and the lowest score as 0.

2.4. Application of Data Collection Tools

In order to evaluate the comprehensibility of the data collection tool, a pre-application was made with eight nurses on January 4, 2020, and since there was no change in the form after the pre-application, these nurses were included in the sample. The form was applied by the researchers by face-to-face interview method in the unit where the nurses work. It took approximately eight minutes to fill out the form.

2.5. Data Analysis

While evaluating the findings obtained in the study, IBM SPSS Statistics 22.0 (IBM SPSS, Türkiye) program was used for statistical analysis. Data were summarized as number, percentage, mean and standard deviation. Shapiro-Wilk test was performed for the normal distribution, and kurtosis and skewness were evaluated. In the comparison of the groups, t test and one-way ANOVA were used in independent groups. Tukey test was used to evaluate the different group. The predictors of correct answer numbers were evaluated by multiple regression analysis Enter model. The assumptions for this model were revised and the categorical variables were recorded as 0 and 1.

3. Results

Of the nurses participating in the study, 86.7% were women and 34.7% had a bachelor's degree. While the rate of employees working in primary health care services for 1-5 years is 45.3%, 53.3% of them have 11 years or more working years in nursing, and 60.0% work in a family health center. While 45.3% of the participants are aware of the regulation on the control of medical waste, 41.3% of them partially know this regulation. The rate of those who have problems in the disposal of medical wastes is 12.0%, and those who have partial

problems are 17.3%. Lack of information and inability to reach the medical waste bag quickly are cited as the source of the problem.

When the sorting of waste types is evaluated, the three highest correct answers of the participants about the type of medical waste bag to be disposed of are "scalpel, suture needle" (90.7%), "tools and materials that have come into contact with the blood and secretions of the patient" (86.7%), "papers contaminated with the patient's blood" (84.6%). The lowest three correct answers were related to "doctor and nurse office waste" (42.7%), "uncontaminated serum bottles" (53.3%) and "finished hand disinfectant boxes" (53.3%). The mean score of the answers given by the participants to the level of knowledge of sorting waste types is 9.9±2.7(min:3-max:15) (Table 1).

Table 2 shows the correct answer rate for each question. The questions with the lowest percentage of correct answers respectively were "the thickness of the medical waste bag should be 150 microns" (4.0%), "all expired drugs should be thrown into the medical waste box" (16.0%) and "the mouth of the sharps and piercing tool boxes should be closed and placed in plastic bags colored blue" (24%). A significant part of the group accepted these false statements as true and gave a false answer. The mean score of the answers given by the participants to the level of knowledge of medical waste use is 19.2±2.7 (min: 10-max: 23) (Table 2).

When the relationship between the level of knowledge of waste types separation and the mean score of socio-demographic characteristics is evaluated, there is no significant difference in terms of gender, working years as a nurse, working unit, having knowledge about the regulation of medical waste control and having problems in the disposal of medical wastes. (P>0.05).The mean number of correct answers of the nurses who graduated from Health Vocational High School was lower than those of associate and undergraduate degrees, and the mean of correct answers of the nurses with 5 years or less working years in primary care was higher than the nurses with longer working hours (P<0.05). There was no significant difference between the mean medical waste use knowledge score and sociodemographic characteristics (P>0.05) (Table 3).

Table 1. Distribution of nurses' responses to statements regarding sorting waste materials

Statements	True		False/ I don't know	
	n	%	n	%
Scalpel, suture needle**	68	90.7	7	9.3
Tools and materials that have come into contact with the blood and secretions of the patient*	65	86.7	10	13.3
Papers contaminated with the patient's blood*	63	84.0	12	16.0
Food waste***	60	80.0	15	20.0
Abeslang in contact with the patient*	58	77.3	17	22.7
Intravenous solution, intracath and syringe needles**	58	77.3	17	22.7
Broken bulb tips**	51	68.0	24	32.0
Pet water bottle****	49	65.3	26	34.7
Metal beverage cans****	48	64.0	27	36.0
Packaging of disposable materials used****	44	58.7	31	41.3
Paper coffee cup****	42	56.0	33	44.0
Uncontaminated serum bottles****	40	53.3	35	46.7
Finished hand disinfectant boxes****	40	53.3	35	46.7
Uncontaminated glass hollow syrup bottles****	35	46.7	40	53.3
Doctor and nurse office waste****	32	42.7	43	57.3
Mean values of the responses	Mean(SD) 9.9(2.7)		(Min-Max) (3-15)	

Wastes marked with(*) should be thrown in to red bags, xastes marked with(**) should be thrown in to sharp object boxes, wastes marked with(***) should be thrown in to black bags, wastes marked with(****) should be thrown in to blue bags, SD= standard deviation.

Table 2. Distribution of nurses' responses to statements regarding using medical waste

Statements	True		False/ I don't know	
	n	%	n	%
All wastes that have come into contact with the blood and secretions of the patients are medical wastes.	74	98.7	1	1.3
The following statement should be present on medical waste bags: "Warning Medical Waste"	72	96.0	3	4.0
Medical waste bags should not be full.*	70	93.3	5	6.7
Wastes that have been thrown into a waste bag should never be taken out again.	70	93.3	5	6.7
Medical wastes can also be carried by hand without a container.*	69	92.0	6	8.0
Sharp objects that are not thrown in a suitable bag pose risk.	69	92.0	6	8.0
Medical wastes and domestic wastes are not carried together with the same vehicle.	68	90.7	7	9.3
Sorting waste with bare hands poses risk.	68	90.7	7	9.3
The carrier of medical waste should wear orange colored long sleeved overalls.	67	89.3	8	10.7
The carrier of medical waste should have an education about medical wastes.	67	89.3	8	10.7
Medical waste bag should be compressed from the top in order to have more waste.*	66	88.0	9	12.0
Sponge that is used for medical dressing is disposed in a domestic waste after the prosedure.*	64	85.3	11	14.7
The carrier of medical waste should use bonnet, mask, gloves, kneepads and boots as protective equipment.	64	85.3	11	14.7
Lids of the medical waste containers should be open.*	63	84.0	12	16.0
It is not mandatory that medical waste bags have "International Biohazard" symbol on them.*	63	84.0	12	16.0
Medical waste bags should be renewed everytime when wastes are collected.	63	84.0	12	16.0
Only nurses working at the unit have the responsibility of medical wastes in primary healthcare services.*	61	81.3	14	18.7
Sharp object boxes should be filled to a maximum level of ¾.	58	77.3	17	22.7
Injector packages are also medical waste together with the injector.*	54	72.0	21	28.0
Disposing needles with caps closed after using the injector poses risk.	53	24.0	22	29.3
Primary healthcare services generate moderate amount of waste.	41	54.7	34	45.3
Injector should be thrown into the sharp object box together with the needle after using.*	27	36.0	48	64.0
The sharps should be placed in blue plastic bags after they are filled.*	18	24.0	57	76.0
All expired medicines should be thrown into the medical waste box.*	12	16.0	63	84.0
The thickness of the medical waste bag should be 150 microns.*	3	4.0	72	96.0
Mean values of the responses	Mean(SD) 19.2(2.7)		(Min-Max) (10-23)	

Statement smarked with (*) indicate wrong statements, SD= standard deviation.

Table 3. Distribution of nurses' knowledge levels regarding sorting waste materials and using medical waste according to socio-demographic features

	Knowledge Level Regarding Sorting Waste Materials		Knowledge Level Regarding Using Medical Waste	
	Mean (SD)	Test and P value	Mean (SD)	Test and P value
Gender				
Female	9.98(2.6)	t=0.090	19.42(2.5)	t=1.637
Male	9.90(3.4)	P=0.928	17.90(3.6)	P=0.106
Education status				
Health vocational high school	8.91(2.9)		18.91(2.6)	
Associate degree	10.91(2.6)	t=3.372	18.68(3.4)	t=1.404
Bachelor's /Postgraduate degree	10.10(2.3)	P=0.040	19.89(2.1)	P=0.252

Table 3. Distribution of nurses' knowledge levels regarding sorting waste materials and using medical waste according to socio-demographic features (continue)

	Knowledge Level Regarding Sorting Waste Materials		Knowledge Level Regarding Using Medical Waste	
	Mean (SD)	Test and P value	Mean (SD)	Test and P value
Clinical experience (in years)				
≤ 5	11.00(2.4)	t=6.942	19.20(2.7)	t=0.003
6-10	9.26(2.6)	P=0.002	19.26(2.4)	P=0.997
≥ 11	8.57(2.6)		19.20(3.1)	
Nursingexperience (in years)				
≤ 5	10.63(2.8)	t=0.968	19.86(1.6)	t=2.517
6-10	9.92(2.4)	P=0.385	17.76(3.3)	P=0.088
≥ 11	9.62(2.7)		19.33(2.9)	
Department				
Family health center	9.66(2.8)	t=-1.190	19.45(2.1)	t=0.896
Other*	10.43(2.5)	P=0.238	18.86(3.5)	P=0.373
Knowledge about "Directive on MedicalWaste Control"				
Yes	10.23(3.2)	t=0.752	19.11(2.9)	t=-0.281
Partly/No	9.75(2.2)	P=0.455	19.30(2.6)	P=0.780
Havingtroublesaboutdisposingmedicalwaste				
Partly /Yes	10.63(3.1)	t=1.357	18.63(3.2)	t=-1.176
No	9.69(2.5)	P=0.179	19.46(2.5)	P=0.243

* Public health laboratories, Emergency health services stations, Home care units, SD= standard deviation.

4. Discussion

Medical wastes interact directly or indirectly with the environment and people from the moment they are produced. Medical wastes that are not collected and disposed of in accordance with the rules can become a problem that negatively affects the environment and human health (Çalıs and Arkan, 2014). It is important to determine the awareness of nurses, who are among the primary health care providers that form the basis of the health system of the countries.

In our study, the rate of those who had problems with the disposal of medical wastes was 12.0%, while those who had problems partially were 17.3%. The majority of the nurses stated that the source of the problem was the lack of knowledge and the inability to reach the medical waste bag quickly. In the study titled medical waste management by Yazgan et al. (2014) indicated that the lack of information and workload at the highest rates are seen as the reasons for the problems in medical waste. In line with the similar results we have seen in the studies, it is thought that the problems experienced are that the unit-oriented and practical waste management training is insufficient and the locations where the waste bins are located in the units are not updated.

In our study, the mean score of knowledge level of nurses in sorting waste types was 9.9±2.7 out of 15 points. In the study conducted by Doğan and Göktaş (2017) on nursing students, the mean knowledge level was found to be 7.22±1.86 out of 10 points, similar to our study. In the study carried out by Saharma et al. (2020) with medical, dental and nursing students, the correct answer rate of nurses to questions about the sorting of medical waste types was 39%.Studies on this subject in the literature show that the level of knowledge of health personnel about medical waste has increased after training (Kwakye et al., 2011; Sharma et al., 2020).

When the medical waste knowledge level of the participants in our study was evaluated, the three highest correct answers to which type of medical waste bag to dispose of the existing waste were respectively "scalpel, suture needle" (90.7%), "tools and materials that came into contact with the blood and secretions of the patient" (86.7%), "papers contaminated with the patient's blood" (84.6%). The lowest three correct answers were related to "doctor and nurse office waste" (42.7%), "uncontaminated serum bottles" (53.3%) and "finished hand disinfectant boxes" (53.3%). As can be seen from the results of our research, it was determined that while nurses' correct response rates for medical and sharps wastes in sorting waste types were high, the correct response rates for packaging waste were low. In the study conducted by Çalıkoğlu and Aras (2019) with 467 nurses, they determined that the participants (76.0%) had less knowledge about which type of medical bag the packaging wastes should be put into. In another study conducted by Malini and Eshwar (2015) with healthcare professionals, it was determined that 50% of the participants had insufficient knowledge about the sorting of hospital wastes according to colors. In terms of the management of sharps waste, it was determined in the study of Azuike et al. (2015) that 72% of healthcare workers apply separation into yellow plastic waste bins of sharps. All these studies are similar to our studies. These results we obtained may suggest that routine and frequently performed applications in primary health care services increase the correct response rates, and there

are deficiencies in the separation of wastes in less applied practices.

In our study, the mean score of nurses' medical waste use knowledge level was found to be 19.2±2.7 over 25 points. In the study conducted by Saharma et al. (2020) on healthcare workers, it was found that the level of knowledge about medical waste was low in 62.33% of nurses (12 points out of 28 points and below were considered low).

While 45.3% of the participants in our study stated that they had knowledge about the regulation on the control of medical waste, the questions with the lowest percentage of correct answers to the statements about the use of medical waste were "the thickness of the medical waste bag should be 150 microns" (4.0%), "all expired medicines should be thrown into the medical waste box" (16.0%) and "the sharps should be placed in blue plastic bags after they are filled" (24%). However, the correct information about these three statements is contained in the Regulation on Control of Medical Wastes (Medical Waste Control Regulation, 2017). In the study of Turan et al. (2019) on nursing students, the rate of knowing the points to be considered in the collection of cutting waste separately from the source was 55.3%.As similar to our study, the study of Moreira and Günther (2016) on the evaluation of waste management in primary health care services stated that the doubts experienced by nurses about where to dispose of expired medicines were high, and information brochures and warning cards were suggested for this. Medicines, vaccines and serums that have expired or are no longer used, their packaging is damaged, spilled and contaminated are classified as pharmaceutical waste (Medical Waste Control Regulation, 2017).

While the rate of knowing the necessity of having an international biohazard emblem on medical waste bags was 84% in the present study, it was found to be 85.4% in the study conducted by Uzunlulu et al. (2022) with healthcare professionals, and 68% in the study conducted by Saharma et al. (2020) with nurses, both of which had similar reports to the present study. In their study, Turan et al. (2019) reported that the rate of knowing the international biohazard emblem by nursing students was lower (54.1%). We think that this may be due to the fact that working nurses do more medical practice than students and that their awareness increases at the same time.

It was found that while nurses who graduated from Health Vocational High School have a lower knowledge level of separating waste types compared to associate and undergraduate graduates, the mean score of knowledge level of separating waste types of nurses with a working year of 5 years or less in their institution is higher than the nurses with longer working hours. Both theoretical and practical training received during associate and undergraduate education can be regarded as an important factor in the high number of correct answers. It is thought that why their correct numbers are high is because nurses who have worked in the institution for the last 5 years or less are in the group with undergraduate and graduate education, have just graduated, and receive orientation training when they are new to the institution.

5. Conclusion

It has been observed that the level of knowledge of nurses working in primary health care services about the separation and use of medical wastes is insufficient. It has been determined that there is incomplete and incorrect information about the Medical Waste Control Regulation and the separation of medical wastes. It is very important for both human and environmental health to support the subject with in-service trainings within the institution and to ensure the continuity of education, and to provide practical training as well as theoretical knowledge. In the in-service trainings, it is thought that it will be beneficial to support education with innovative learning approaches used together with developing technology, to distribute information brochures and to hang reminder posters on the walls of the institution. We expect nursing students to gain awareness about medical waste and its management when they start their professional lives and to reflect this in their practices. Therefore, in order to develop knowledge, attitudes and behaviors, it is recommended to include these subjects more in nursing curricula and to allocate sufficient financial resources for medical waste management.

Limitations

The research is limited to nurses working in Primary Health Care Units in a province in Türkiye/Central Anatolia Region and the results can be generalized to these nurses. For this reason, it is recommended to repeat the study with different sample groups.

Author Contributions

The percentage of the author(s) contributions is presented below. All authors reviewed and approved the final version of the manuscript.

	G.G.	E.P.K.	N.Ü.D.
C	40	30	30
D	40	30	30
S	40	30	30
DCP	50	50	
DAI	40	30	30
L	40	30	30
W	40	30	30
CR	40	30	30
SR	40	30	30

C=Concept, D= design, S= supervision, DCP= data collection and/or processing, DAI= data analysis and/or interpretation, L= literature search, W= writing, CR= critical review, SR= submission and revision.

Conflict of Interest

The authors declared that there is no conflict of interest.

Ethical Approval/Informed Consent

In order to conduct the study, written permission was obtained from the Non-Interventional Clinical Ethics Committee of Kırıkkale University (Date: 04.09.2019 Number: 14) and the Provincial Health Directorate (46743357-799), and informed consent was obtained from the patients who agreed to participate in the study. The research was conducted in accordance with the Principles of the Declaration of Helsinki.

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