An Assessment of Training on Medical Waste Management Provided to Nursing Students

Hemşirelik Öğrencilerine Verilen Tıbbi Atık Yönetimi Eğitiminin Değerlendirilmesi

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ABSTRACT

The current study was done in order to assessment of effectiveness of the training on medical waste management provided to nursing students who studied at Nursing Department of Health Sciences Faculty, Gümüşhane University. 309 students were included in the study. The students were applied with one group of pretest and posttest. A pretest of 20 questions about medical wastes was administered to the students 1-3 days before the training in order to explore their medical waste knowledge levels and to detect the effectiveness of the training. Instructors and lecturers provided the students with three hour training about identification and classification of hospital wastes, the term of medical wastes and hazardous waste, management and importance of medical wastes, separation disposal recycling of medical wastes, potential risks posed by medical wastes and dangerous wastes for healthcare workers and public health, points that nurses should consider about hospital waste management and measures to be taken by nurses in practice. At the end of the training, students received the posttest and were assessed out of 100. In a result, it was found that there was a significant difference between pretest scores and posttest scores ($p<0.001$)and students' scores considerably were increased with training on medical wastes and their management(58.8±11.1-77.5±10.9). Besides, it was also identified that there was a significant difference between pretest scores and posttest scores in terms of academic grades and first year graders had the lowest pretest and posttest scores.

Keywords: Medical Waste, Nursing, Students, Waste Management.

ÖZ

Bu çalışma Gümüşhane Üniversitesi Sağlık Bilimleri Fakültesi Hemşirelik Bölümünde öğrenim gören Hemşirelik Bölümü öğrencilerine verilen tıbbi atık yönetimi eğitiminin etkinliğinin değerlendirilmesi amacı ile yapılmıştır. Araştırma kapsamına 309 öğrenci alınmıştır. Öğrencilere tek gruplu ön test son test uygulaması yapıldı. Öğrencilerin tıbbi atıklar ile ilgili bilgi düzeylerini ölçmek ve eğitim sonrası eğitimin etkinliğini belirleyebilmek için sınıflara eğitimden 1-3 gün önce 20 soruluk tıbbi atıklar ile ilgili ön test uygulandı. Öğrencilere öğretim üyeleri ve öğretim elemanları tarafından hastane atıklarının tanımlanması ve sınıflandırılması, tıbbi atıklar ve tehlikeli atıklar kavramı, yönetimi, önemi, hastane atıklarının ayrıştırılması, bertarafı, geri dönüşümü, tıbbi atıkların ve tehlikeli atıkların çalışan ve halk sağlığı açısından oluşabileceği potansiyel riskleri, hemşirelerin hastane atık yönetimi konusunda dikkat etmesi gereken unsurlar ve uygulama sırasında almaları gereken tedbirler hakkında 3 saatlik eğitim verildi. Eğitim sonunda öğrencilere son test uygulandı. Öğrenciler 100 puan üzerinden değerlendirildi. Sonuçta verilen tıbbi atıklar ve yönetimi eğitimi sonucunda ön test ve son test puanları arasında anlamlı bir farkın olduğu ($p<0,001$), eğitimle birlikte öğrencilerin aldığı puanların önemli derecede arttığı bulunmuştur (58,8±11,1-77,5±10,9). Ayrıca bu çalışmada sınıf ile ön test ve son test puanları arasında anlamlı bir fark olduğu en düşük ön test ve son test puanlarına 1. sınıf öğrencilerinin sahip olduğu bulunmuştur.

Anahtar Kelimeler: Tıbbi Atık, Hemşirelik, Öğrenci, Atık Yönetimi.

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INTRODUCTION

Wastes are materials that are created as a result of production and consumption activities and that permanently damage human beings and environment. Wastes are variously classified: domestic wastes, industrial wastes, dangerous and harmful wastes, recyclable and harmless wastes and special wastes.[1] Quality and quantity of medical facilities have been increased and important improvements have been made in our country in proportion to the increasing population.[2]However amount of medical wastes has been climbed up due to disposable medical consumables such as one use needles and blood sets in these facilities in order to prevent increasing dangerous and infectious diseases.[3]According to guidelines about medical waste control issued in Official Gazette; wastes that include infectious, pathological and sharp objects are defined as medical waste.[4]More precisely; wastes that are left after medical practices in health facilities, medical laboratories and research centers such as blood and blood products, cultures, pathological wastes, contaminated laboratory tools and other equipments, dialysis wastes, injectors, other sharp objects with needles, lancet, microscope slides, lamellas, quarantined wastes, body parts, carcasses of lab animals are called medical wastes.[5,6] Medical wastes are special wastes that should separately be collected and disposed of with special methods. Waste management should be implemented with a systemic approach from production phase to disposal phase in order to protect health of workers, patients and public because exposure to medical wastes may cause serious diseases and injuries owing to infectious pathogens, toxic or dangerous chemical or pharmaceutical agent contents, their ability to change hereditary structure, radioactive contents or sharp objects.[2] Doctors, nurses, assistants and other hospital personnel, patients receiving care and treatment at home or health facilities, workers employed at support units, workers employed at waste disposal factories and workers who handle with waste in disposal areas are under risk.[7]Health care workers who are exposed to injuries most are doctors and nurses. Injuries can happen while medical personnel are using sharp objects, medical tools and equipments, closing caps of needles or putting these objects and tools in waste bins.[8]The study by Aydoğan et al. was stated that health care workers make mistakes while they are classifying wastes and thus put domestic wastes and medical wastes together. Employing trained personnel about wastes, tracking domestic wastes and stores, providing training programs and keeping regular registers will result in important contributions to the quality and sustainability of health care facilities.[9]

MATERIAL AND METHOD

The population of the study consisted of 399 students studying at the Department of Nursing, Faculty of Health Sciences, Gümüşhane University in 2016 2017 academic year. The sample consisted of 309 students who agreed to participate in the study. A pretest of 20 questions about medical wastes was performed to the students 1-3 days before the training in order to explore their medical waste knowledge levels and to detect the effectiveness of the training. Instructors and lecturers provided the students with three hour training about identification and classification of hospital wastes, the term of medical wastes and hazardous wastes, management and importance of medical wastes, separation-disposal recycling of medical wastes, potential risks posed by medical wastes and dangerous wastes for healthcare workers and public health, points that nurses should consider about hospital waste management and measures to be taken by nurses in practice. After training, students received the posttest and were assessed out of 100 points. Results were assessed through SPSS17 statistical software. Independent Sample T test, Paired Sample T Test and One

Way Anova test were performed after parametric conditions were achieved.

Ethical Aspect of Research

The ethical approval and necessary permissions were taken from the Gümüşhane University Scientific Research and Publication Ethics Committee (24.10.2017) for the research.

RESULTS AND DISCUSSION

71.1% of the participants were female while 26.9% of them were male, 31.7% of them were 1st year graders, 26.5% of them were 2nd year graders, 30.7% of them were 3rd year graders and 11% of them were 4th year graders (Table 1).

Table 1. Descriptive Characteristics of the Students

Descriptive characteristics	Number	Percentage
Sex		
Female	226	73.1
Male	83	26.9
Academic grades		
1st year	98	31.7
2nd year	82	26.5
3rd year	95	30.7
4th year	34	11.0

It was found that average pretest score of the female participants was 59.8±10.4 while their average posttest score was 78.4±10.9 and average pretest score of the male participants was 56.0±12.5 while their average posttest score was 74.8 ±10.6. As a result of the analysis (Table 2), a significant difference was determined when the pretest and posttest scores of the students were examined according to gender and grades ($p<0.05$).

In terms of academic grades; average pretest score of the 1st year graders was 53.9±10.0 while their average posttest score was 74.6±10.8; average pretest score of the 2nd year graders was 62.6±10.3 while their average posttest score was 80.2±10.9; average pretest score of the 3rd year graders was 61.1±10.0 while their average posttest score was 77.3±10.2 and average pretest score of the 4th year graders was 57.5±13.8 while their average posttest score was 79.8±11.7. As for the average scores of the total students, their pretest score was 58.8±11.1 while their posttest score was 77.5±10.9. As a result of the analysis done to find out what caused the difference; it was understood that the difference was produced by the 1st year graders. According to results of the test done to explore the effectiveness of the training, it was found that there was a significant difference between pretest and posttest ($p<0.001$) (Table 2).

Table 2. Comparison of Students' Pretest and Posttest Scores According to Their Descriptive Characteristics

Descriptive Characteristics	N	Pretest	Posttest
Sex			
Female	226	58.87 ±10.82	77.96 ±11.40
Male	83	56.32 ±12.27	74.57 ±10.45
Test value		2.661	2.726
P value		**0.008**	**0.007**
Academic Grade			
1st year	98	52.31±10.56	73.89± 11.13
2nd year	82	61.82± 10.87	79.75± 11.08
3rd year	95	61.00± 9.69	77.10 ±10.58
4th year	34	57.97 ±11.92	79.05 ±11.89
Test		12.191	3.263
P value		**0.000**	**0.022**
Total		58.8 ±11.1	77.5± 10.9
Test value			-25.982
P value			**0.000**

In Table 3, the comparison that was made with the scores and used sex variable demonstrated that female participants had statistically higher scores particularly in relation to measures to be taken against wastes and protection against wastes than male participants ($p<0.05$). Other comparisons did not yield significant differences in terms of sex variable ($p>0.05$). When average pretest and posttest scores were compared, it was understood that scores of the assessment questions were considerably high ($p<0.001$). The comparison that compared the pretest and posttest scores of the students after the

training showed that scores significantly increased in identification and classification of hospital wastes, separation disposal recycling of medical wastes and measures to be taken by nurses in practice ($p<0.001$)

Table 3. Comparison of Students Pretest and Posttest Scores According to Their Descriptive Characteristics and Training Subjects

	Training-Subjects							
	Identification and Classification of Hospital Wastes		**Disposal**		**Public Health**		**Measures and Prevention**	
	Averages ± Standard Deviation							
	Pretest	**Posttest**	**Pretest**	**Posttest**	**Pretest**	**Posttest**	**Pretest**	**Posttest**
Sex								
Female	8.73±5.16	14.60±6.06	11.52±4.89	21.54±4.37	20.48±4.26	20.64±4.09	18.11±4.67	21.17±3.92
Male	8.49±5.23	13.25±5.02	10.96±5.32	21.62±4.13	19.63±4.33	20.00±4.34	17.22±5.80	19.69±4.57
Test-Sex	p>0.005	p>0.005	p>0.005	p>0.005	p>0.005	p>0.005	p>0.005	p>0.005
Pretest-Posttest		p<0.05		p<0.05		p<0.05		p<0.05
Academic Grades								
1	7.36±5.14	13.68±5.16	9.42±4.71	20.78±4.85	19.36±5.32	18.68±4.26	16.15±4.40	20.73±4.25
2	10.48±4.94	16.89±5.91	13.23±4.73	21.58±4.22	20.12±3.68	20.79±3.72	17.98±5.60	20.48±4.41
3	8.42±5.37	12.63±5.45	11.52±4.78	22.10±3.54	21.36±3.13	21.89±3.65	19.68±4.82	20.47±3.99
4	8.64±4.51	13.91±6.36	11.89±5.31	22.16±4.64	20.00±4.71	20.67±4.58	17.43±4.01	22.29±3.45
Test-Academic Grades	p<0.001	p<0.001	p<0.001	p>0.05	p<0.05	p<0.001	p<0.001	p>0.05
Pretest-Posttest		p<0.05		p<0.05		p>0.05		p<0.05
Total	8.67±5.20	14.23±5.82	11.37±5.01	21.56±4.30	20.25±4.29	20.46±4.17	17.88±5.01	20.77±4.15
Pretest-Posttest		p<0.001		p<0.001		p>0.005		p<0.001

When average scores of all academic grades were compared with each other, it was seen that there was a significant difference among them ($p<0.05$). It was observed that first year graders generally showed the lowest scores in all subjects (except those subjects of separation disposal recycling of medical wastes and measures to be taken by nurses in practice).

It was seen that there was a significant difference among the students in terms of pre-training knowledge scores concerning the training subjects ($p<0.001$) and the students demonstrated the lowest knowledge level in identification and classification of hospital wastes, separation disposal recycling of medical wastes, measures to be taken by nurses in practice; respectively but the highest knowledge level in dangerous wastes for healthcare workers and public health ($p<0.001$). When scores of the assessment questions were compared with each other in terms of post-training knowledge scores, it was identified that the students yielded the lowest knowledge in identification and classification of hospital wastes as compared to other subjects ($p<0.001$) and scores of other subjects were close to each other.

Although nursing students are involved in the management of hospital wastes during clinical practice, they are among the most risky groups for stab wounds [10].According to the results of this research conducted to evaluate the efficacy of medical wastes and management education given to nursing students, it was found that there was a significant difference between the pretest and posttest scores according to gender and it was found that the pretest and posttest scores of female students were higher than male students. In the study of Hasçuhadar et al. (2007) done to explore medical waste knowledge level of hospital personnel; no significant difference was found in waste knowledge according to sex variable[11]. In the study conducted by Turan et al. (2019), it was determined that the rate of knowing the international biohazard symbol among the second grade nursing students was higher than the third and fourth grade students.[12]

Yazgan et al. (2013) conducted a study with the hospital staff entitled "Turgutlu District State Hospital Medical Waste Management and found that there was a significant difference in the perception of the individual dimension according togender, but not a significant difference in the perception of the system dimension. As a result of the study, it was found that women found medical waste management more effective than men.[13]

Amount of wastes, which are produced by health facilities in developed countries, is higher. It is believed that the reason of which is to use disposable medical consumables. The reason why amount of medical wastes produced by health facilities in developing countries is high is that they are not separated at source and are mixed with domestic wastes.[14] The students were demonstrated the lowest scores in identification and classification of hospital wastes in this study, made us conclude that this subject should be emphasized more. And the participant students showed low scores may have resulted from the fact that they did not have any active clinical experience and there was no agreement on separation of medical wastes.

In a study, it was found that there was a significant difference between education variable and individual and system dimensions by Yazgan et al. (2013) about Turgutlu District State Hospital Medical Waste Management with hospital staff. As a result of their analysis, it was found that university graduates find medical waste management less effective than primary school graduates[12].

In the study titled Tutar A New Approach to Medical Waste Management in Ankara, conducted by Tutar (2004), it was observed that the employees were not conscious about medical waste, that the trainings included only cleaning personnel, that the equipment used within the scope of waste management was insufficient and the amount and type of waste determined that no study[14-18].

In the study of Özder et al. hospital directors were provided with a training about waste management, effectiveness of the training was tested with pretest and posttest and it was concluded that those hospital directors that received the training had considerably higher scores.[19] In the study of Kumar et al. done with research hospital personnel, it was also found that those hospital personnel to whom the training was given showed higher knowledge attitude and behavior scores about medical wastes.[19] These studies proved that the trainings were effective and concurred with our study. When the studies in the literature are examined, it is found that the education given is quite effective in medicalwaste management.[20,21] To decrease medical wastes, to lessen the economic burden caused by these wastes and to protect health of medical workers, the public and the environment; a well designed waste management plan, regular training programs, written policies and continual supervision should be provided. Separation of resources and separation of recyclable materials, proper management of material stocks in institutions and reduction of unnecessary disposable materials should be applied.[22-24]Thus, amount of medical wastes can be cutdownmorethan 50%. In this study, since the training on medical waste enhanced knowledge level it may be argued that trainings were effective methods as first step to be taken. In this sense, the study undertaken by Mosquera et al. Reported that amount of wastes went down considerably thanks to the training given.[25,26]In this context, medical waste and management training should be given to hospital personnel as well as students who apply to hospitals and awareness of medical waste and management should be gained in nursing students. [26-29]

CONCLUSION AND RECOMMENDATIONS

As a result of the medical waste management training given in this study, a significant difference was found between the pretest and posttest scores of the students ($p<0.001$), and it was found that the scores obtained by the students increased significantly with the education (58.8 ± 11.1-77.5 ± 10.9).

In this study was showed that a significant difference between pretest and posttest scores existed in terms of academic grades and the first year graders had the lowest pretest and posttest scores. Despite the expectation that education level normally rises as academic grades go up towards the 4th year, the scores obtained by the students were generally not consistent with academic grades; which supports our supposition that waste training will be more beneficial and useful if they are provided not as a part of courses but as an extra curriculum activity because this training on waste management were provided to the students as an extra curriculum activity and thus their scores of the assessment questions increased.

An emphasis should be placed on undergraduate nursing education so that nursing students can achieve a high level of correct behaviors to prevent hospital infections, their knowledge level about hospital infections can be checked because they do internship at hospitals each year and lacking points can be identified and revised. Besides, students should receive training programs about prevention of hospital infections before they start the profession. Incorrect and wrong interactions of nursing students with departments, those responsible and other health care workers should be prevented and on job training programs should be held. Nurses should be made to practice techniques that will prevent hospital infections through demonstration methods.

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