



Research Article

Evaluation of the Effectiveness of Education on Methods to Prevent Hospital-Acquired Infections Among Nursing Students: A Comparative Descriptive Study

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Abstract

The objective of this study is to evaluate the effect of education provided to nursing students on methods of preventing hospital-acquired infections on their attitudes toward infection control measures. This study was designed as a comparative descriptive post-test study. The study sample consisted of a total of 80 students in their 2nd, 3rd, and 4th years of study in the Nursing Department at a university in Turkey during the 2024–2025 academic year who agreed to participate in the study. The students were divided into two groups—an intervention group and a control group—based on voluntary participation. The intervention group received training on infection control measures, while no intervention was provided to the control group. Data were collected using a “Questionnaire Form” and the “Infection Control Measures Attitude Scale.” Independent samples t-tests and descriptive statistics were used to analyze the data. The mean total score on the Attitude Scale toward Infection Control Measures was 193.10 ± 29.09 for the intervention group and 184.45 ± 40.16 for the control group. No statistically significant difference was found between the intervention and control groups in terms of total attitude scores or subscales ($p > 0.05$). It is considered that the infection control education provided to nursing students did not result in a significant change in attitude levels in the short term, but it is important in raising awareness regarding infection control. Attitude and behavior change

Keywords: Nursing students, Hospital-acquired infections, Infection control, Education.

Özet

Bu çalışmanın amacı, hemşirelik öğrencilerine verilen hastane enfeksiyonlarından korunma yollarına yönelik eğitimin enfeksiyon kontrol önlemlerine ilişkin tutumları üzerindeki etkisini değerlendirmektir. Bu araştırma karşılaştırmalı betimsel bir çalışma olarak tasarlanmıştır. Araştırmanın örneklemini, 2024–2025 eğitim-öğretim yılında Türkiye’de bir üniversitede, Hemşirelik Bölümü’nde öğrenim gören ve araştırmaya katılmayı kabul eden, 2, 3 ve 4. sınıfta olan toplam 80 öğrenci oluşturmuştur. Öğrenciler gönüllülük ve isteklilik esasına dayalı olarak müdahale ve kontrol grubu olmak üzere iki gruba ayrılmıştır. Müdahale grubuna enfeksiyon kontrol önlemlerine yönelik eğitim verilmiş, kontrol grubuna herhangi bir müdahalede bulunulmamıştır. Veriler “Anket Formu” ve “Enfeksiyon Kontrol Önlemleri Tutum Ölçeği” kullanılarak toplanmıştır. Verilerin analizinde bağımsız gruplar t-testi ve tanımlayıcı istatistikler kullanılmıştır. Müdahale grubunun Enfeksiyon Kontrol Önlemleri Tutum Ölçeği toplam puan ortalaması $193,10 \pm 29,09$, kontrol grubunun ise $184,45 \pm 40,16$ olarak belirlenmiştir. Müdahale ve kontrol grupları arasında toplam puanları ve alt boyutlar açısından istatistiksel olarak anlamlı bir fark bulunmamıştır ($p > 0.05$). Hemşirelik öğrencilerine verilen enfeksiyon kontrol eğitiminin kısa vadede tutum düzeylerinde anlamlı bir değişiklik oluşturmadığı, ancak enfeksiyon kontrolüne yönelik farkındalık kazandırmada önemli olduğu düşünülmektedir. Tutum ve davranış değişikliğinin sağlanabilmesi için eğitimlerin süreklilik göstermesi ve uygulamalı yöntemlerle desteklenmesi önerilmektedir.

Anahtar Kelimeler: Hemşirelik öğrencileri, Hastane enfeksiyonları, Enfeksiyon kontrolü, Eğitim.



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INTRODUCTION

Healthcare-associated infections (HAIs) are a significant public health issue that develop directly or indirectly during the delivery of healthcare and affect both patients and healthcare (Centers for Disease Control and Prevention, 2020; World Health Organization, 2022). HAIs not only increase mortality and morbidity but also lead to serious consequences such as prolonged hospital stays, rising healthcare costs, and the development of antibiotic resistance (European Centre for Disease Prevention and Control, 2021; WHO, 2022). In this regard, HAI is recognized as one of the most significant challenges facing healthcare systems globally (WHO, 2022).

According to a report published by the World Health Organization in 2022, approximately seven out of every 100 patients in developed countries and approximately 15 out of every 100 patients in developing countries develop at least one HAI (WHO, 2022). Additionally, it has been reported that healthcare-associated infections significantly increase the risk of mortality, particularly among patients receiving treatment in intensive care units and surgical settings (Allegranzi et al., 2011; ECDC, 2021). It is noted that HAIs can be largely prevented through proper hand hygiene, the use of personal protective equipment, and the correct application of aseptic techniques (CDC, 2020; WHO, 2009).

Nurses and nursing students, who play an active role in the delivery of healthcare services, are among the groups that are both at risk of healthcare-associated infections (HAIs) and may play a potential role in the spread of infection (CDC, 2020). Nursing students participating in clinical practice are directly involved in patient care processes; they face a risk of infection due to exposure to blood and body fluids, injuries from sharp instruments, and inadequate hand hygiene practices (Centers for Disease Control and Prevention, 2020; Occupational Safety and Health Administration, 2019). However, it has been reported that students lacking sufficient knowledge and awareness may contribute to the spread of infections, that educational deficiencies constitute a significant problem, and that students' knowledge levels are sometimes inadequate (Alrubaiee et al., 2017; Nour-Eldein et al., 2015).

The literature emphasizes that education programs on infection control are effective in enhancing healthcare workers' knowledge levels; however, it is stressed that these programs must be sustained to achieve changes in attitudes and behaviors (Gould et al., 2017). In nursing education curricula, infection control is typically addressed within fundamental nursing and clinical practice courses; however, the depth and consistency of this content may vary across institutions, and standalone structured training programs specifically targeting infection prevention remain limited (Rahiman et al., 2018). It is reported that educational interventions specifically designed for nursing students are important for fostering infection control awareness early in their professional careers (Pittet et al., 2000).

For this reason, it is of great importance to assess nursing students' attitudes toward infection control and to examine the effectiveness of educational programs. From a public health perspective, healthcare-associated infections impose a substantial economic burden on healthcare systems worldwide, including prolonged hospital stays, increased use of antimicrobial agents, additional diagnostic procedures, and higher overall treatment costs (WHO, 2022; ECDC, 2021). These financial consequences underscore the strategic importance of integrating infection control training into nursing education curricula at an early stage. In this regard, structured infection control education programs for nursing students have been recognized as a critical investment in patient safety and healthcare quality. Studies conducted in various clinical and educational settings have demonstrated that targeted training interventions can positively influence nursing students' knowledge and

behavioral intentions regarding infection prevention (Alrubaiee et al., 2017; Rahiman et al., 2018; Nour-Eldein et al., 2015). Accordingly, the aim of this study is to evaluate the effect of education provided to nursing students on methods of preventing hospital-acquired infections on their attitudes toward infection control measures.

METHOD

Type of Study

This study is a comparative descriptive post-test study designed to evaluate the effect of education provided to nursing students on methods of preventing hospital-acquired infections on their attitudes toward infection control measures.

Study Population and Sample

The study population consisted of a total of 344 students enrolled in the Nursing Department of a university in Turkey during the 2024–2025 academic year. The sample size was calculated using power analysis with the G*Power program, as no similar study was available. The power analysis was based on the classification of standardized effect sizes proposed by Jacob Cohen (1988); for a moderate effect size (0.25), 80% power, and a 5% significance level, the minimum sample size was determined to be 72 (Cohen, 1988). Taking potential attrition into account, the sample size was increased by 11.1%, and a total of 80 students were included in the study (Daniel W. Van Voorhis & Betsy L. Morgan, 2007).

In this study, the effect size was considered moderate ($d = 0.50$), taking into account values reported in similar educational and behavioral intervention studies. In the literature, it is reported that interventions in randomized controlled trials conducted in fields such as nursing education and infection control generally have effect sizes ranging from small to moderate (Cohen, 1988; Hedges & Olkin, 1985). Therefore, the use of a moderate effect size in the sample size calculation was considered both realistic and consistent with the literature. The study included students who had no diagnosed psychiatric disorders, no hearing or vision problems, actively participated in clinical practice, and agreed to participate in the study. Of the participants, 29 were second-year students, 28 were third-year students, and 23 were fourth-year students.

Sampling Method

Participants were divided into two groups an intervention group ($n=40$) and a control group ($n=40$) based on voluntary participation and availability. The intervention group consisted of students who volunteered to attend the training program, while the control group consisted of students who did not receive any training intervention during the study period.

Data Collection Forms

The questionnaire developed by the researchers consists of questions regarding students' sociodemographic characteristics, such as age, gender, academic year, and grade level; such sociodemographic data forms have been widely used in the literature to assess nursing students' knowledge, attitudes, and practices regarding infection prevention and control (Rahiman et al., 2018).

Infection Control Measures Attitude Scale

The Attitude Scale toward Infection Control Measures used in the study is an attitude scale developed by Tuğçe Şahin Tirtıl (2020) to measure nurses' attitudes toward infection control measures (Şahin Tirtıl, 2020). The scale consists of two subscales "Patient Safety" and "Healthcare Worker Safety" and contains a total of 36 items. Scoring is based on a 6-point Likert-type scale; therefore, the minimum and maximum possible scores range from 36 to 216. Higher total scores indicate that the participant has a more positive attitude toward infection control measures (Şahin Tirtıl, 2020). In the study where

the original scale was developed, the internal consistency reliability of the scale was found to be Cronbach's Alpha = 0.89. When examined separately for the subscales, the Cronbach's Alpha for the 'patient safety' subscale was 0.86, and for the 'healthcare worker safety' subscale, it was 0.87 (Şahin Tirtıl, 2020). In this context, the Cronbach's Alpha value (0.986) in this study indicates the scale's study-specific reliability; however, the alpha values obtained in the original scale's development study are provided above, which are commonly used as a reference in the literature for assessing scale reliability (Şahin Tirtıl, 2020).

Intervention/Training

The intervention group received a training program on infection control measures administered by the researchers. The training content was developed based on feedback received from faculty members in the fields of surgical nursing and nursing fundamentals. While preparing the training materials, current standard precautions and infection control guidelines found in the literature were used as a basis (CDC, 2022; WHO, 2022). The training covered topics such as hand hygiene, the use of personal protective equipment, the safe use of sharp instruments, principles of asepsis and antisepsis, and routes of infection transmission and prevention methods. The training was conducted via in-person presentation and lasted approximately 60 minutes. While the intervention group received the training, no educational intervention was administered to the control group. After the study was completed, the same specially prepared 60-minute training on infection control measures was provided to students in the control group.

Data Collection

The data were collected between November 2024 and March 2025. Post-test measurements were taken from both the intervention and control groups. For the intervention group, measurements were taken after the training on infection control measures was completed. The control group's post-test measurements were taken at the corresponding time point without any training intervention.

Data Analysis

The data obtained in the study were analyzed using SPSS (Statistical Package for the Social Sciences) for Windows 22.0. The analysis was conducted using the IBM SPSS Statistics software package. Descriptive statistics such as frequency, percentage, mean, and standard deviation were used. In the relevant literature, results regarding the kurtosis and skewness values of variables are considered to indicate a normal distribution when they fall between +2.0 and -2.0 (George & Mallery, 2010). The independent samples t-test was used for comparisons between two independent groups. The level of statistical significance was set at $p < 0.05$. As this study employed a post-test only design without pre-test measurements, group comparisons were based solely on post-intervention mean scores. This approach was chosen given the comparative descriptive nature of the study; accordingly, differences in group means rather than pre-post change scores were used as the primary basis for analysis.

Ethical Approach

In order to conduct the study, ethical approval was obtained from the Ethics Committee for Social and Human Sciences at Bartın University in Türkiye, and written permission was obtained from the relevant institution. The purpose of the study was explained to the participants, and verbal consent was obtained from all students.

RESULTS

An examination of the descriptive statistics in Table 1 reveals that the age distributions of participants in the intervention and control groups are similar. Participants aged 18–25 account for 97.5% of the

total in both groups, while those aged 25–30 account for 2.5%. There is no significant difference between the groups in terms of the age variable ($X^2=0.000$, $p=0.753$). When examining the class variable, 80.0% of the participants in the intervention group are in the second grade, 17.5% are in the third grade, and 2.5% are in the fourth grade; whereas 52.5% of the participants in the control group are in the third grade, and 47.5% are in the fourth grade. It is observed that the proportion of students in the second grade is quite high in the intervention group. There is a significant difference between the groups in terms of the grade variable ($X^2=55.200$, $p=0.000$). In terms of the type of high school attended, the highest proportion in the intervention group was 72.5% among graduates of Anatolian High Schools, followed by graduates of Science High Schools and Health Vocational High Schools at 10.0%. Similarly, in the control group, the highest proportion was 75.0% among graduates of Anatolian High Schools. There is no significant difference between the groups regarding the high school type variable ($X^2=3.160$, $p=0.531$). When examining the mothers' educational status, the highest proportion in both the intervention and control groups is 45.0% for those with a high school diploma. The proportion of mothers with an elementary school education is 17.5% in the intervention group and 22.5% in the control group. Mothers with a bachelor's degree account for 12.5% in both groups. There is no significant difference between the groups in terms of educational status ($X^2=4.028$, $p=0.402$), (Table 1).

When evaluated by fathers' educational attainment, the proportion of fathers with a middle school education was 37.5% in the intervention group and 45.0% in the control group, representing the highest proportion. The proportion of fathers with an elementary school education was 27.5% in the intervention group and 20.0% in the control group. There is no significant difference between the groups in terms of fathers' educational status ($X^2=4.213$, $p=0.378$). Finally, when examining the hospital practice duration variable, it is observed that 50.0% of participants in the intervention group have been participating in hospital practice for two years, and 35.0% for one year. In the control group, a high proportion of 85.0% have been participating in hospital practice for more than two years ($X^2=47.018$, $p=0.000$), (Table 1).

Table 1. Descriptive characteristics

		Intervention		Control		Statistical Analysis
		n	%	n	%	
Age	18-25	39	97,5	39	97,5	$X^2=0,000$ $p=0,753^b$
	25-30	1	2,5	1	2,5	
Class	2	32	80,0	0	0,0	$X^2=55,200$ $p=0,000^a$
	3	7	17,5	21	52,5	
	4	1	2,5	19	47,5	
High School Graduate	Anatolian High School	29	72,5	30	75,0	$X^2=3,160$ $p=0,531^a$
	Science High School	4	10,0	4	10,0	
	Imam Hatip High School	2	5,0	0	0,0	
	Health Vocational High School	4	10,0	3	7,5	
	Overseas	1	2,5	3	7,5	
Mother's Educational Status	Not Literate	3	7,5	6	15,0	$X^2=4,028$ $p=0,402^a$
	Elementary School Graduate	7	17,5	9	22,5	
	High School Graduate	18	45,0	18	45,0	
	Associate's Degree Holder	7	17,5	2	5,0	

	Bachelor's degree holder	5	12,5	5	12,5	
Father's Educational Status	Not Literate	0	0,0	3	7,5	$\chi^2=4,213$ $p=0,378^a$
	Elementary School Graduate	11	27,5	8	20,0	
	High School Graduate	15	37,5	18	45,0	
	Associate's Degree Holder	6	15,0	4	10,0	
	Bachelor's degree holder	8	20,0	7	17,5	
Hospital Stay Duration	Less than 1 year	2	5,0	1	2,5	$\chi^2=47,018$ $p=0,000^a$
	1 year	14	35,0	0	0,0	
	2 year	20	50,0	5	12,5	
	More than 2 years	4	10,0	34	85,0	

^aChi-Square Test; ^bFisher's Exact Test, $p=0.753$

When examining the distribution of total scores on the Infection Control Measures Attitude Scale, as presented in Table 2, no statistically significant difference was found between the intervention and control groups ($t=1.103$, $df=78$, $p=0.273$). The mean total attitude score for the intervention group was 193.100 ± 29.096 , while that for the control group was 184.450 ± 40.169 . When examining the mean scores for the Employee Safety subscale, the intervention group's mean was 88.225 ± 12.257 , while the control group's mean was 85.175 ± 18.260 . It was determined that the difference between the groups was not statistically significant ($t=0.877$, $df=78$, $p=0.383$) ,(Table 2).

When examining the mean scores for the Patient Safety subscale, the mean for the intervention group was calculated as 104.875 ± 17.687 , while the mean for the control group was 99.275 ± 23.115 . It was determined that the difference between the groups was not statistically significant ($t=1.217$, $df=78$, $p=0.227$), (Table 2). The internal consistency coefficient of the Infection Control Measures Attitude Scale was calculated as 0.986 for the total scale. The reliability coefficients for the subscales were found to range between 0.974 and 0.982.

Table 2. Differences in attitude scores for infection control measures by group

Groups	Intervention (n=40)		Control (n=40)		t	p
	Mean	Standart Deviation	Mean	Standart Deviation		
Infection Control Measures: Attitude - Total	193,100	29,096	184,450	40,169	1,103	0,273
Workplace Safety	88,225	12,257	85,175	18,260	0,877	0,383
Patient Safety	104,875	17,687	99,275	23,115	1,217	0,227

DISCUSSION

In this study, it was found that education provided to nursing students on ways to prevent hospital-acquired infections did not result in a statistically significant difference in attitudes toward infection control measures; this finding suggests that the impact of short-term, single-session training programs on behavioral variables such as attitudes may be limited. The literature indicates that education on infection control is effective in increasing knowledge levels; however, longer-term, repetitive, and practical training programs are required to achieve changes in attitudes and behavior (Farotimi,

Johnson & Adeyemi, 2018; Sams, Smith & Lee, 2020). Indeed, Sams and colleagues (2020) noted that while knowledge and awareness levels increased after training, behavioral change developed over time; Farotimi and colleagues (2018) emphasized that the effect of short-term interventions on attitudes is limited and that continuous training programs are more effective. Furthermore, it is reported that healthcare-associated infections have a high prevalence globally, occurring at an average rate of 14%, which further underscores the importance of developing attitudes and behaviors related to infection control (Raoofi et al., 2023). Furthermore, it has been demonstrated that improving adherence to hand hygiene a fundamental component of infection control plays a critical role in reducing hospital-acquired infections, and that ongoing education and behavioral interventions are necessary to sustainably develop such behaviors (Mouajou et al., 2022).

In this context, among the possible reasons for the lack of a significant difference in our study are the relatively high level of awareness regarding infection control among students prior to the training, the fact that the training was a single-session and short-term intervention, and the difficulty in changing psychosocial variables such as attitudes through short-term interventions; Additionally, it is believed that such changes develop over time through clinical experience, repeated practice, and behavioral reinforcement processes. The literature indicates that nursing students' knowledge and attitude levels regarding infection control increase significantly as their academic year and duration of clinical experience increase, with upper-level students in particular demonstrating higher awareness and more positive attitudes toward infection control (Chan, M. F., 2010; Gül, A. & Korkmaz, F., 2019).

In conclusion, the findings of this study indicate that infection control training alone is not sufficient; rather, to achieve changes in attitudes and behaviors, training programs must be ongoing and supported by practical methods.

CONCLUSION

This study found that education provided to nursing students on ways to prevent hospital-acquired infections did not have a significant short-term effect on their attitudes toward infection control measures. However, it is believed that such education plays an important role in raising awareness among students. It is of great importance for nursing students to develop an awareness of infection control early in their professional careers, both to protect their own health and to ensure patient safety. Therefore, it is recommended that infection control education not be limited to the transmission of theoretical knowledge alone, but rather be planned as practical and ongoing educational programs. For future studies, it is recommended that infection control training be planned as longer-term, practice-based, and repeated sessions. Furthermore, multicenter studies conducted at different universities and with larger samples could more comprehensively demonstrate the impact of infection control training on attitudes and behaviors.

Limitations of the Study

This study has several limitations. The fact that the research was conducted at a single university limits the generalizability of the results. Additionally, the use of a self-report method to assess attitudes may have led to social desirability bias. The short duration of the training and the lack of long-term follow-up are also among the study's other limitations. A notable structural limitation is the imbalance between groups in terms of academic year: the intervention group consisted predominantly of second-year students (80%), while the control group included no second-year students and was composed mainly of third- and fourth-year students. This class-level discrepancy may have influenced the baseline attitudes of participants and should be considered when interpreting the findings. Furthermore, the study was redesigned from a randomized controlled trial format to a comparative

descriptive post-test design due to the inability to achieve true randomization, which limits causal inferences that can be drawn from the results.

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