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Araştırma Makalesi/Research Article

The Effect Of Infection Control Training Given to Neonatal Intensive Care Nurses On Nurses' Knowledge Level and Hand Hygiene Practices

Gonca KARATAŞ BARAN[1], Esra OFLAZOĞLU[2], Kadriye KIZILTEPE[3]

Yenidoğan Yoğun Bakım Hemşirelerine Verilen Enfeksiyon Kontrol Eğitiminin Hemşirelerin Bilgi Düzeyi ve El Hijyeni Uygulamalarına Etkisi

ABSTRACT

Objective: This study was conducted to evaluate the awareness and knowledge levels of Neonatal Intensive Care Unit nurses about measures to reduce health care related infections, to provide the necessary training and to evaluate the training results.
Methods: Quasi-experimental study was carried out in a gynecology hospital. The study sample consisted of 108 nurses/midwifes. Before and after presentation training on infection control measures; Hand Hygiene Belief Scale score, Hand Hygiene Practice Inventory score and twenty multiple-choice question answers aiming to measure knowledge levels of infection control were evaluated. Wilcoxon Signed Rank Test was used for before-after training comparisons. The results were evaluated at the level of significance p<.05 at the 95% confidence interval. The STROBE checklist was used.
Results: The mean age of the research group was 29.95±7.83, 83.3% of them were nurses and 16.7% of them were midwifes**.** There was an increase of 5.39±13.24 (p<.001) in the Hand Hygiene Belief Scale score, 1.20±6.51 (p=.014) in the Hand Hygiene Practice Inventory score, and 2.14±2.28 (p<.001) in the infection control knowledge score and these increases were statistically significant.
Conclusion: In this study, the training given on infection control positively affected the hand hygiene beliefs and practices of health workers and increased their knowledge level. Regular trainings are important in the development of knowledge, attitudes and behaviors of nurses about infection control.
Key Words: Hand Hygiene, Infection Control, Inservice Training, Neonatal Intensive Care, Nursing care,

ÖZ
Amaç: Bu çalışma, Yenidoğan Yoğun Bakım Ünitesi hemşirelerinin sağlıkla ilişkili enfeksiyonları azaltmaya yönelik önlemler konusundaki farkındalık ve bilgi düzeylerini değerlendirmek, gerekli eğitimleri vermek ve eğitim sonuçlarını değerlendirmek amacıyla yapıldı.
Yöntem: Yarı deneysel çalışma bir kadın doğum hastanesinde gerçekleştirilmiştir. Araştırmanın örneklemini 108 hemşire/ebe oluşturmuştur. Enfeksiyon kontrol önlemlerine yönelik sunum eğitimi öncesi ve sonrasında; El Hijyeni İnanç Ölçeği puanı, El Hijyeni Uygulama Envanteri puanı ve enfeksiyon kontrolüne ilişkin bilgi düzeylerini ölçmeyi amaçlayan yirmi çoktan seçmeli soru yanıtı değerlendirilmiştir. Eğitimöncesi-sonrası karşılaştırmalarında Wilcoxon İşaretli Sıralama Testi kullanılmıştır. Sonuçlar %95 güven aralığında p<.05 anlamlılık düzeyinde değerlendirilmiştir. STROBE kontrol listesi kullanılmılştır.
Bulgular: Araştırma grubunun yaş ortalaması 29,95±7,83 olup %83,3'ü hemşire, %16,7'si ebedir. Eğitim sonrası El Hijyeni İnanç Ölçeği puanında 5,39±13,24 (p=0,001), El Hijyeni Uygulama Envanteri puanında 1,20±6,51 (p=0,14), enfeksiyon kontrol bilgi puanında ise 2,14±2,28 (p=0,001) artış saptanmıştır ve bu artışlar istatistiksel olarak anlamlıdır.
Sonuç: Bu çalışmada enfeksiyon kontrolü konusunda verilen eğitim, sağlık çalışanlarının el hijyeni inanç ve uygulamalarını olumlu yönde etkileyerek bilgi düzeylerini artırmıştır. Hemşirelerin enfeksiyon kontrolüne ilişkin bilgi, tutum ve davranışlarının geliştirilmesinde düzenli eğitimler önemlidir.
Anahtar Kelimeler: El Hijyeni, enfeksiyon kontrolü, hemşirelik bakımı, hizmetiçi eğitim, yenidoğan yoğun bakım.

[1]**Corresponding author:** Phd Nurse**,** Saglik Bilimleri University Etlik Zübeyde Hanım Gynecology Training and Research Hospital, Healt Care Services. Ankara, Turkey. **e-mail:**goncabaran@gmail.com, **ORCID ID:** 0000-0002-7996-6144
[2] Nurse, Saglik Bilimleri University Etlik Zübeyde Hanım Gynecology Training and Research Hospital Infection Control Nursing Departent Ankara, Turkey. **e-mail:** esraoflaz@hotmail.com **ORCID ID:** 0000-0003-4188-9697
[3] Nurse, Saglik Bilimleri University Etlik Zübeyde Hanım Gynecology Training and Research Hospital, Healt Care Services, Ankara, Turkey. **e-mail:** kadriyekiziltepe@gmail.com, **ORCID ID:** 0000-0002-2274-6992
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INTRODUCTION

Healthcare-associated infections (HAIs) cause increased morbidity, mortality and cost in the Neonatal Intensive Care Unit (NICU) and are a common complication in hospitalized patients and are preventable factors (Karadag et al., 2016). Birth weight, gestational week, severity of the disease, length of hospital stay and invasive interventions are known risk factors. Infections lead to longer hospital stays and increased healthcare costs (Uslu et al., 2010; Dramowski et al., 2022). As advances in medical technology lead to improved mortality in very low birth weight infants, healthcare professionals are trying to define measures to reduce HAIs in NICUs. These strategies are; hand hygiene practices, prevention of central venous catheter-induced bloodstream infections, rational use of antibiotics in treatment and prophylaxis, improvement of the host's immune system, skin care and early breastfeeding (Uslu et al., 2010).

Hand hygiene is the most important and simple factor in the prevention of HAIs, but the least compliance factor (Clancy et al., 2021). One of the most important problems in the prevention of nosocomial infections, which requires significant knowledge and skill, is the problems encountered in compliance with hand hygiene. Many of these problems are individual factors such as knowledge, attitude, practice, belief and perception, and their determination has an important place in increasing the behavior of complying with hand hygiene (Turan, 2020). It is extremely important to provide training to nurses on the prevention of infections, starting from the pre-graduation period, and to update in-service training throughout their working life (Ünsar et al.,. 2022).

Successful hand hygiene programs inevitably has an educational component (WHO, 2009). Hospital staff should be trained on HAI symptoms, importance, side effects, results, precautions, ways of transmission of microorganisms, and ways to protect staff. Nurses have great responsibilities in the prevention and control of HAIs in the NICU (Ulus, 2021).

Measuring nurses' knowledge levels about preventing healthcare-associated infections can provide information about the quality of the service process. It is also important to determine the in-service training needs of nurses (Ünsar et al., 2022). In this study, it was ensured that the problems in health care practices in NICU were identified in terms of infection control measures, training was given about necessary precautions and the effects of education on these practices were investigated. It was thought that raising awareness of the beliefs and practices of health personnel about hand hygiene and evaluating hand hygiene education, especially in the clinical setting, will enable the improvement of learning outcomes.

METHODS

This quasi-experimental study was conducted to evaluate the awareness, belief, attitude and knowledge levels of NICU nurses about measures to reduce HAIs in NICUs, to provide necessary infection control precautions training and to evaluate the training results. The study was conducted and reported according to the Strengthening the Reporting of Observational studies in Epidemiology (STROBE) checklist.

STROBE is a checklist used in the preparation of observational research articles and should be written in the article.

Research questions

- What are the NICU nurses and midwifes' beliefs and practices regarding hand hygiene?
- What is the knowledge base of infection control for NICU professionals"
- Does NICU infection control training have an effect on hand hygiene beliefs, practices, and NICU infection control knowledge?

Participants

The study was carried out between 01/04/2022-15/06/2022 in a gynecology hospital. The potential participant of the study consisted of nurses and midwives working in the NICU of the hospital where the research was conducted. Sample calculation was not made in the research, and the training was repeated 3 times to reach entire population. The inclusion criterion for the study was that the nurses working in the NICU participated in the planned training. Nurses and midwives who volunteered and completed the pretest and posttest data were included in the study. There are 115 nurses/midwives working in the unit, and the research was completed with 108 nurses/midwives who answered all the pretest-posttest questions.

Data collection tools

The data collection form, which was created by scanning the relevant literature (Karadag et al., 2016; Uslu et al, 2010; Turan, 2020) to be used in the collection of research data, consists of 3 parts.

In the first part, there were professional questions about the participant.

In the second part, there was the Hand Hygiene Belief Scale (HHBS) consisting of 22 questions and the Hand Hygiene Practice Inventory (HHPI) consisting of 14 questions. This scale measures hygiene belief, importance and perception of hand hygiene and inventory measures hand hygiene practices (Karadag et al., 2016). This scale and ınventory were developed by Thea van de Mortel in 2009 (Van De Mortel T, 2009). This scale and inventory are a 5-point Likert-type scale made up. (a range of 5 responses (1: I Definitely Disagree, 2: I Disagree, 3: I'm Not Sure, 4: I Agree, 5:I Definitely Agree) (Karadag et al., 2016). Items numbered 5,8, 10,16,17,18,19,20 in the HHBS are reverse scored and the scoring ranges from 22 to 110. There are 14 questions in the HHPI and the score varies between 14-70 (Karahan et al., 2020).

In the third part, twenty questions aiming to measure the knowledge level of NICU infection control were evaluated with multiple choice options.

The data in the second and third sections were repeated before and after the training.

Infection control training was included in the in-service training program. The training, which consisted of power point presentations and lasted four lessons (each approximately 45 minutes), was carried out in 3 sessions (the study group could be reached through 3 training sessions) by the infection control nurse from the research team, and the training topics are given below.

First lesson: Five situation rule, ısolation definition, ısolation precautions, use of personal protective equipment.

Second lesson: Causative microorganisms in health care-associated ınfections, hand hygiene ındications, types of hand hygiene.

Third lesson: Risk factors in neonatal ıntensive care, most common ınfections and control measures in neonatal ıntensive care.

Fourth lesson: Infection control precautions in neonatal ıntensive care units, the ımportance of hand washing in neonatal ıntensive care units.

Data Collection Tools' Validitiy and Realibility

The internal consistency reliability coefficient of the scale was reported to be .76 in the HHBS and .85 in the HHPI (Karadag et al., 2016). In our study, the pre- and post-educational HHBS cronbach alpha values were .86 and .76 and HHPI .95 and .91.

Setting

Before the training, the data collection form was filled in by the participants. Six weeks after the training, the second and third parts of the data collection form were filled by the participants again. Thus, "HHBS", "HHPI" and "NICU infection control knowledge level" were evaluated as pre-test and post-test. A high score on the HHBS indicates a high belief in hand hygiene, a high score on the HHPI indicates that hand hygiene practices are performed correctly, and a high score on the NICU infection control knowledge test indicates a good level of knowledge on infection control.

Ethical considerations

Ethical approval from the Clinical Research Ethics Committee of the hospital (Etlik Zübeyde Hanım Women's Diseases and Research Hospital Clinical Research Ethics Committee Date: 31.03.2022, Number: 34). Informed consent was obtained from the volunteers.

Data analysis

The analysis of the data was done in the computer environment with SPSS 20.0 ready-made statistical program. In the evaluation of the data; descriptive statistics (number, percentage, mean and standard deviation) were used. Wilcoxon Signed Rank Test was used for before and after training comparisons. Mann-Whitney U test and Kruskal–Wallis test was used to compare between HHBS, HHPI, and NICU Infection Control Knowledge Score and occupational variables. The results were evaluated according to the significance level of $p<.05$ at the 95% confidence interval.

RESULTS

Occupational characteristics were given in Table 1. The mean age of the health personnel working in the NICU was 29.95±7.83 (22-50), and 83.3% of the health personnel working in the NICU were nurses and 16.7% were midwives. The duration of working in the profession was 0-5 years at a rate of 62.0%, and the duration of working in the NICU was 3.66±4.22 (1-20). 79.6% of the research group

stated that they had a bachelor's degree, 44.4% had a low level of English, and 41.7% had an intermediate level of English. Before the training, 44.4% of the NICU nurse midwives had a NICU certificate, 96.3% received training on nosocomial infections, 98.1% received training on hand hygiene, 88.9% received training on isolation precautions, 89.8% stated that they knew the isolation figures.

Table 1. Ocupational and Professional Characteristics

	n	%
Ocupation		
Nurse	90	83.3
Midwife	18	16.7
Level of education		
Health vocational high School	3	2.8
Associate Degree	8	7.4
Undergraduate completion	8	7.4
Licence	86	79.6
Master's and above	3	2.8
Tenure in the profession		
0-5 years	67	62.0
6-10 years	7	6.5
11-15 years	14	13.0
16-20 years	12	11.1
Foreign language level		
No	11	10.2
Little	48	44.4
Middle	45	41.7
Good	4	3.7
Having NICU certificate		
Yes	48	44.4
No	60	55.6
Receiving education on Hospital Infections		
Yes	104	96.3
No	4	3.7
Receiving education on Hand hygiene practices		
Yes	106	98.1
No	2	1.9
Receiving education on isolation precautions		
Yes	96	88.9
No	12	11.1
Knowing the isolation figures		
Yes	97	89.8
No	11	10.2

Table 2 presented the descriptive data and analysis of the pre-training and post-training HHBS, HHPI, and NICU Infection Control Knowledge Score.

In the pre- and post-education; 5.39±13.24 (z= -4,686; p<.001) in HHBS, 1,20±6,51 (z= -2.448; p=.014) in the HHPI, and 2.14±2.28 (z= -7.299; p<.001) in the NICU Infection Control Knowledge Score was found increases and these increases were statistically significant (Table 3).

Not stated in the table, no statistically significant difference was found in the analysis performed between the HHBS, HHPI, and NICU Infection Control Knowledge Score and occupational variables (occupation, years of employment, years of employment in NICU, certificate status, hospital infections, training on hand hygiene and isolation precautions) (p>.05).

Table 2. Findings of Hand Hygiene Belief Scale, Hand Hygiene Practice Inventory and NICU Infection Control Knowledge Score

	Pre-Training		**Post Training**		**Post Training - Pre Training**	
	n	**Mean±SD Med (min-max)**	**n**	**Mean±SD Med (min-max)**	**n**	**Mean±SD Med (min-max)**
Hand Hygiene Belief Scale (HHBS)	108	88.56±11.89 90 (27 - 103)	108	93.96±8.07 94 (39 - 71)	108	5.39±13.24 4 (-28 - 73)
Hand Hygiene Practice Inventory (HHPI)	108	67.58±5.96 70 (17 - 70)	108	68.79±2.99 70 (53 - 70)	108	1.20±6.51 0 (-14 - 53)
NICU Infection Control Knowledge Score	108	12.49 ±1.73 13 (7 - 16)	108	14.63±1.67 15 (11 - 18)	108	2.14±2.28 2 (-3 - 9)

Table 3. Pre-Post training comparison of HHBS, HHPI and Infection Control Knowledge Score

Post Training - Pre Training (HHBS)	**n**	**Rank Mean**	**Rank Sum**	**Analysis**
	25[a]	50.18	1254.50	z= -4.686
	78[b]	52.58	4101.50	**p< .001**
	5[c]	108		
Total	108			
Post Training - Pre Training (HHPI)				
	15[a]	30.60	459.00	z= -2.448
	39[b]	26.31	1026.00	**p= .014**
	54[c]			
Total	108			
Post Training - Pre Training (NICU Infection Control Knowledge Score)				
	9[a]	34.22	308.00	z= -7.299
	85[b]	48.91	4157.00	**p< .001**
	14[c]			
Total	108			

Wilcoxon Signed Rank Test
a= Post-Training total < Pre-Training total
b= Post-Training total > Pre-Training total
c= Post-Training total = Pre-Training total

DISCUSSION

In our study, it was determined that the mean age of the health personnel working in the NICU was 29.95±7.83 years and the working year in the profession was 62.0%, and the working year in the NICU was 3.66±4.22. From these results, it was concluded that the research group was at the beginning of their professional experience.

With the effect of developments and advances in the diagnosis and treatment process, the survival rate of newborns in need of NICU tends to increase day by day (Kumar et al., 2018). However, newborns in need of NICU are at high risk for HAIs. HAIs are important cause of morbidity and mortality in infants, especially in premature newborns (Hocevar et al., 2014). Serious measures are required to ensure infection control in the NICU. HAIs prolong the hospitalization period of patients and therefore creates a burden in terms of patient and public health (Arda et al., 2015). Prevention and control of infection in NICUs is of vital importance and it is essential to evaluate all contamination and transmission routes (Theron et al., 2022).

Nurses are healthcare professionals who spend the most time with direct patient contact. In the

literature, it is stated that the group that needs to be informed the most about infection control is nurses (Infal et al., 2018). In our study, 44.4% of the NICU nurses and midwives had a NICU certificate, 96.3% received training on nosocomial infections, 98.1% received training on hand hygiene, 88.9% received training on isolation precautions, 89.8% stated that they knew the isolation figures. In the study conducted by Dogu et al. (2017), it was concluded that 99.4% of the nurses had previously received training on infection precautions and isolation (Doğu et al., 2017). The data of this study show similarities with our study. In another study, 89.0% of nurses stated that they received training on infection control measures (Ozturk et al., 2019).

Hand hygiene is a key weapon against HAIs, but hand hygiene compliance globally remains substandard (Deshommes et al., 2021). In our study, it was concluded that the beliefs of the healthcare professionals about hand hygiene were positive according to the pre-training HHBS (88.56±11.89) and HHPI (67.58±5.96), and they mostly practiced hand hygiene. Considering that the maximum score that can be obtained from the HHPI is 70, hand hygiene practices are considered to be at a very good level, especially the post-training score of 68.79±2.99. In the study of Karahan et al. (2020), it was determined that the mean HHBS of healthcare workers was 84.03±8.28 (min=53.0 max=106.0) and the mean HHPI was 63.97±6.37 (min=28.0 max=70.0) (Karahan et al., 2020). In the study of Ceylan et al. (2020), the mean score (*SD*) of the participating students on the HHBS was 89.80 (7.98); HHPI was 66.66 (4.05) (Ceylan et al., 2020). Hand hygiene remains one of the most effective and economical methods of infection control and prevention. Plenty of evidence supporting its efficacy is well established. Compliance with hand hygiene practice is an important focus for all hospitals (Alslaim et al., 2022). Due to the importance of this subject, as a result of the training we provided, a statistically significant increase of 5.39±13.24 in the HHBS and 1.20±6.51 in the HHPI was observed. One study found that an infection prevention and control interactive (video, game,..) educational intervention significantly increased knowledge of infection prevention and control strategies (Koo et al, 2016). Studies have shown that simulation-based training of healthcare professionals with a practical, bedside and hands-on approach increases compliance with hand hygiene and reduces HAIs (Nakamura et al., 2019; Cartier et al., 2016).

Lack of knowledge, lack of equipment and workload, ideas of employees about infection control, the idea that frequent hand hygiene damages the skin, forgetfulness or ignorance may be the reasons for low hand hygiene compliance (Theron et al., 2022). Therefore, our study primarily aimed to raise awareness and knowledge about hand hygiene. It is very important for all healthcare professionals to fully comply with hand hygiene in terms of protection from HAIs.

In the prevention of HAIs, healthcare professionals need to know and apply infection control measures very well, and this information should be kept up-to-date with in-service training (Ozturk et al., 2019). In our study, the NICU Infection Control Knowledge score was calculated as 12.49 ±1.73 and 14.63±1.67 before and after the education, and an increase of 2.14±2.28 was found at the end of the education ($p<.001$). It is very important to provide the health personnel with behaviors based on consistency, that is, on the basis of real knowledge, attitude and real behavior, instead of the behaviors that are gained only as a result of the stimulus-reaction approach. Correct knowledge forms the basis of correct behavior. The most essential feature that determines the characteristics of health behaviors is based on fully learned and assimilated knowledge (Ulutasdemir et al., 2008).

In our study, no statistically significant difference was found in the analysis performed between the HHBS, HHPI and NICU Infection Control Knowledge Score with occupational variables (occupation, working year, NICU working year, certificate status, hospital infections, training on hand hygiene and isolation precautions) ($p>.05$). In Turan's research with nurses in 2020; age, marital status, family structure, having a child, education level, weekly working hours, the characteristics of the unit worked, the total time spent in the profession, the number of patients in the unit, the number of monthly shifts, occupational satisfaction and hand hygiene education were found to have no effect on the hand hygiene beliefs of the nurses (Turan, 2020).

Implications for Practice And Research

Neonatal intensive care units are units that serve sensitive patient groups. Nurses working in these units should be more careful, attentive and knowledgeable about health care related infections that cause morbidity and mortality and can be prevented. Nurses are in direct contact with patients in their clinical practice and therefore have the potential to be carriers of hospital pathogens and a source of cross-contamination. Therefore, nurses' hand hygiene beliefs, compliance and behavior are very important. There is a need to increase awareness and knowledge level of nurses on infection control and hand hygiene through in-service trainings. It is important to ensure that nurses who provide all care of newborn patients and have the most contact with them have a high level of awareness and knowledge about infection control management and appropriate hand hygiene.

Infection control is the practical discipline of preventing acquired infections in healthcare settings. Similar to a public health practice, infection control is a core process of every healthcare facility. Infection control programs are cost-effective methods, but inadequacies may occur in their implementation. Health professionals, especially nurses, need to be constantly supported in this regard. Nurses working in sensitive areas such as neonatal intensive care need to be reinforced with continuous and repetitive trainings on infection control management and appropriate hand hygiene. In addition, there is a need for practices to increase the hand hygiene compliance of nurses and research to evaluate the effectiveness of these practices.

CONCLUSION

In this study, it was concluded that the nurses and midwives working in NICUs have high levels of knowledge about hand hygiene beliefs and practices. The training given to nurses on infection control, increases the level of hand hygiene belief, practice and knowledge. Regular trainings are important in the development of knowledge, attitudes and behaviors of nurses about infection control. Nurses and midwives have a key role in the promotion of hand hygiene and the development of social culture. It is thought that it is necessary to obtain positive results in this direction, to update information and awareness with continuous in-service training, as well as to determine and implement more comprehensive strategies.

Limitations

Despite the proven success of the training program, our study has limitations. The data are limited to the opinions of the neonatal intensive care nurses and midwives of the hospital where the research was conducted. A limitation is that the effectiveness of the training could not be evaluated through observation in addition to the verbal reporting of nurses' and midwives' practices and knowledge on infection control. This was a quasi-experimental design, there was no control group and only pre- and post-measurements were available. Another limitation is that the power point presentation technique was used in the training method and interactive techniques were not included.

Ethics Committee Approval: Ethical approval from the Clinical Research Ethics Committee of the hospital (Etlik Zübeyde Hanım Gynecology Training and Research Hospital Clinical Research Ethics Committee Date: 31.03.2022, Number: 34). Informed consent was obtained from the volunteers.

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