

Effectiveness of an Educational Program on Nurses' Knowledge Regarding Neonatal Sepsis: A Quasi-experimental Study

Dilshad Abdullah Mohamed, Akram Mohamed Alatroschi¹

Department of Pediatrics, Psychiatric and Pediatric Nursing Unit, College of Nursing, ¹Department of Pediatrics, College of Medicine, University of Duhok, Iraqi Kurdistan, Iraq

Abstract

Background and Objectives: Neonatal sepsis is the main health problem that is accountable for about 30–50% of the overall neonatal mortality in the developing nations. Nurses can provide a straight care and have the ability to impact on neonate's outcomes, so that teaching nurses about sepsis is measured essential to improve neonates' care, safety, and outcomes. The present study intends to increase the nursing knowledge regarding neonatal sepsis in Heevi Pediatric and Maternity Hospitals ICU departments. **Materials and Methods:** A quasi-experimental study was conducted in the Heevi Pediatric and Maternity Hospitals from October 15, 2020 to January 20, 2021. The study included two groups: the control group (27 nurses) from Heevi Pediatric Hospital and the interventional group (25 nurses) from Maternity Hospital. The data were collected through the use of a questionnaire prepared in English and translated into Arabic and Kurdish. Its first part was concerned with demographic characteristics of the nurses, and the second part assessed their knowledge before and after implementation of the educational program regarding neonates with sepsis using a scoring system. The statistical calculations were performed by Statistical Package for Social Sciences, Version 25 (SPSS 25; IBM Corp.; USA). The ethical approval of the current intervention was obtained from the research Ethics Committee of Directorate of Health. **Results:** The pre-assessment of the outcomes showed that the control and experimental groups were comparable in knowledge score ($P = 0.0931$), whereas the post-assessment of the outcomes has showed a highly significant improvement in the experimental knowledge score in comparison to the control group ($P \leq 0.0001$). The control and experimental groups were comparable in knowledge (awareness), and this comparability is highly significant in the interventional group ($P < 0.0001$), but in the control group, there is also a noticeable progress as $P = 0.0014$. The nurses were comparable in the different educational groups regarding nurses' educational levels and their awareness of neonatal sepsis ($P = 0.9737$). The nurses were comparable in the experimental group with their age ($P = 0.3410$), experience in working in neonatal intensive care units ($P = 0.3744$), and the training courses the nurses shared ($P = 0.49546$). In the control group unit, the maximum score of nurses' knowledge was 20 and the minimum score was 9. Whereas in the interventional group, the maximum score was 17 and the minimum score was 11. After application of the program to the interventional group, the score was as follows: in the control group, the maximum and minimum scores were 21 and 11, whereas in the interventional group, the scores were 24 and 19, respectively. **Conclusion:** The educational program was effective in increasing the nurses' knowledge regarding neonatal sepsis care.

Keywords: Educational program, knowledge, NICU, nurses, PICU, PNICU, SICU

INTRODUCTION

Neonatal sepsis is the main health problem that is accountable for about 30–50% of the overall neonatal mortality in the developing nations. It is valued that around 20% of the newborns develop sepsis and nearly 1% die from sepsis-associated reasons.^[1] The major contamination of the bloodstream is a medical syndrome characterized by a systemic inflammatory reaction,^[2] with or without indication of a supposed or confirmed infection. It could

be unique of the more recurrent contagious pictures in the neonatal stage and is the one that most increases morbidity and mortality.^[3] The nurses can provide a straight care

Address for correspondence: Dilshad Abdullah Mohamed, Department of Pediatrics, Psychiatric and Pediatric Nursing Unit, College of Nursing, University of Duhok, Iraqi Kurdistan, Iraq.
E-mail: dilshad_msc14@yahoo.com

Submission: 08-Nov-2021 **Accepted:** 14-Feb-2022 **Published:** 30-Jun-2022

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: WKHLRPMedknow_reprints@wolterskluwer.com

How to cite this article: Mohamed DA, Alatroschi AM. Effectiveness of an educational program on nurses' knowledge regarding neonatal sepsis: A quasi-experimental study. Med J Babylon 2022;19:185-90.

Access this article online	
Quick Response Code: 	Website: www.medjbabylon.org
	DOI: 10.4103/MJBL.MJBL_98_21

and have the ability to impact on neonates' outcomes, so that teaching nurses about sepsis is measured essential to improve neonates' care, safety, and outcomes. To reach this fact, qualified and efficient staffs are needed: an evidence-based educational interference on sepsis will aid nurses to become more knowledgeable in the initial detection of clinical signs of sepsis. Correspondingly, application of educational programs and interventions in an organized technique to be sure that nurses can provide excellent care.^[4] Knowledge, experience, and caution are needed for identification of superfine signs early to prevent neonatal disability or death; early diagnosis and management are important to prevent unwanted effects, so nurses use numerous ways to assess and identify signs and symptoms of sepsis.^[5] Nurses must be able to distinguish, assess, and intervene when neonatal physiological irregularities occur. They can simplify and speed up the transfer process through an awareness of what is needed in preparation for the transfer. Moreover, they can help assess and support a family during a period of high stress.^[6] Through nursing diagnosis, the nurse uses medical perception and decision and scans reference data on a patient's health status, allowing care to be organized and individualized.^[7]

Nurses have the professional liability to evaluate newborns for signs of sepsis, so nurses in the neonatal intensive care unit (NICU) should watch for signs of infection throughout the infant's long hospital stay. Experimental methods of knowledge are used to build on the nurses' past experiences so that they are able to "see" sepsis by incorporating clinical patterns of knowledge.^[8] Whereas evaluation of sepsis in newborns requires special expertise and experience.^[9] The cases of the neonatal sepsis at Heevi Teaching Hospital during the period from 2018 to 2020 were 169, and the mortality rate was 55 cases, which account for 32.54% of these cases. In the Maternity and Delivery hospital at Duhok city, the estimation of neonatal sepsis in premature NICU in the years 2018–2020 is as follows: 128 cases were admitted, out of which 88 were managed in Maternity Hospital, and the mortality rate was 26 cases, which account for 29.54% (Statistical Department in Maternity and Delivery Hospital).

Problem statement

The researcher made an educational program for evaluating the nurses' knowledge, regarding neonatal sepsis in Heevi and Maternity Hospitals in Duhok city.

The aim of the study

The present study aims to determine the effectiveness of the educational program in improving nurses' knowledge and awareness related to neonatal sepsis in NICUs.

Ethical consideration

The study was conducted in accordance with the ethical principles that have their origin in the Declaration of

Helsinki. It was carried out with patients' verbal and analytical approval before the sample was taken. The study protocol and subject information and consent form were reviewed and approved by a local Ethics Committee according to the document number 20092020-4 dated 20/09/2020 to get this approval.

MATERIALS AND METHODS

A quasi-experimental study was conducted in the Heevi Pediatric and Maternity Hospitals from October 15, 2020 to January 20, 2021. Ethical approval was obtained from the Directorate of Health. The study samples included the control group, which was selected from Heevi Pediatric Hospital (27 nurses), and the interventional group, which was selected from the Maternity Hospital (25 nurses). The nurses of male gender and nurses who did not participate in the educational program and those whose experience was less than 1 year were excluded. The data were collected through the use of a questionnaire that was created through a comprehensive review of the previous studies and literatures related to the concept of the current study and based on reliable and recent sources, prepared in English and translated into Arabic and Kurdish at the request of the nurses. The first part was concerned with demographic characteristics of the studied nurses, and the second part assessed nurses' knowledge before and after implementation of the educational program regarding definition, signs and symptoms, causes, laboratory investigations, diagnosis, complications, methods of infection prevention, isolation measures, and nursing care given to neonates with sepsis. A scoring system for knowledge items was applied in which a score of 25 indicated a good knowledge and lower scores indicated a poor one. The interventional group was divided into subgroups, each subgroup had two to three nurses according to the shift and was provided in three sessions; then the lectures were reviewed in two sessions to confirm the information. Nurses' knowledge was assessed post-program implementation, using the same tools which were used in pre-program implementation. The evaluation was conducted immediately post-program by another trained and qualified person. Prior to the main study, a pilot study was conducted to reduce bias.

Data were analyzed through application of descriptive and inferential statistical data analysis adapted for the benefit of the present study. The statistical calculations were performed by Statistical Package for Social Sciences, Version 25 (SPSS 24; IBM Corp.; USA). The homogeneity of the general information between control and experimental groups was performed by an independent *t*-test and Pearson's χ^2 test. We searched for the outliers using a tail quantile of 0.1 and *Q* of 3 for the pre- and post-knowledge, experience, and age. Comparisons of pre-test knowledge between nurses in the control and experimental groups were examined by an independent *t*-test. Comparisons of knowledge in nurses with different educations in the experimental and

control groups were examined through one-way analysis of variance. Correlation of knowledge score with age, education, and educational courses in both control and experimental groups was examined in bivariate regression and shown as scatter matrix plots.

RESULTS

Table 1 has shown that the control and experimental groups were comparable in education, age, experience in neonatal care units, and education course. In Table 2, the pre-assessment of the outcomes showed that the control and experimental groups were comparable in knowledge score, whereas the post-assessment of the outcomes showed a highly significant improvement in the experimental knowledge score in comparison to the control group. It is obvious from Table 3 that the control and experimental groups were comparable in knowledge (awareness), and this comparability is highly significant in the interventional group, but in the control group, there is

also a noticeable progress as Table 4 shows that the nurses were comparable in the different educational groups regarding nurses' educational levels and their awareness of neonatal sepsis. Table 5 shows that the nurses were comparable in the experimental group with their age ($P = 0.3410$), experience in working in NICU, and the courses nurses shared. Figure 1 shows the comparability of scores before and after applying for the educational program on nursing awareness regarding neonatal sepsis. As it is obvious from the figure, in the control group and before the educational program, the nurses' knowledge maximum score was 20 and the minimum score was 9. Whereas in the interventional group, the maximum score was 17 and the minimum score was 11. After application of the program to the interventional group, the score was as follows: in the control group, the maximum and minimum scores were 21 and 11, whereas in the interventional group the scores were 24 and 19, respectively. Figure 2 shows the correlation of knowledge scores in relation to different

Table 1: Comparison of general information between nurses in the control and experimental groups

Characteristics	Study groups		P-value
	Control (n=21)	Experimental (n=23)	
Setting (%)			
NICU	10 (47.62)	23 (100)	<0.001 ^a
SICU	11 (52.38)	0 (0.00)	
Education (%)			
Midwifery	7 (33.33)	8 (34.78)	0.1543 ^a
Nurse institute	9 (42.86)	14 (60.87)	
Nurse college	5 (23.81)	1 (4.35)	
Age (years), mean	25.33 (1.46)	26.26 (2.38)	0.1309 ^b
Experience (years), mean	2.81 (1.40)	3.78 (2.13)	0.0834 ^b
Education course, mean	2.10 (0.89)	2.52 (1.27)	0.2091 ^b

All included nurses were females because four nurses were excluded to make homogeneity between control and experimental groups

^aPearson χ^2 and ^bindependent *t*-tests were performed for statistical analyses

Table 2: Comparisons of pre- and post-test knowledge between nurses in the control and experimental groups

Knowledge	Study groups, mean		P-value
	Control (n=21)	Interventional (n=23)	
Pre-test knowledge score	15.05 (2.58)	13.96 (1.55)	0.0931
Post-test knowledge score	16.24 (2.77)	21.48 (1.27)	<0.0001

An independent *t*-test was performed for statistical analyses

Table 3: Comparisons of pre- and post-knowledge scores in the control and experimental groups

Knowledge	Study groups, mean					
	Control (n=21)		P-value	Interventional (n=23)		P-value
	Pre-test	Post-test		Pre-test	Post-test	
Pre-test knowledge score	15.05 (2.58)	16.24 (2.77)	0.0014	13.96 (1.55)	21.48 (1.27)	<0.0001

Paired *t*-test was performed for statistical analyses

Table 4: Comparisons of knowledge in nurses with different education in the experimental group

Knowledge	Education level, mean			P-value
	Midwifery (n=8)	Nursing institute (n=14)	Nursing college (n=1)	
Post-test knowledge score	21.38 (1.19)	21.36 (1.22)	24.00	0.9737

An independent *t*-test was performed for statistical analyses

Table 5: Correlation of knowledge scores regarding age, education level, and education courses in the experimental group

	Correlations—post-test knowledge score			
	R-value	P-value	95% confidence interval	
			Lower 95%	Upper 95%
Age	-0.20798	0.3410	-0.57121	0.223373
Experience	-0.19427	0.3744	-0.56151	0.236905
Education course	-0.10462	0.6347	-0.49546	0.321442

Bivariate regression was performed for statistical analyses

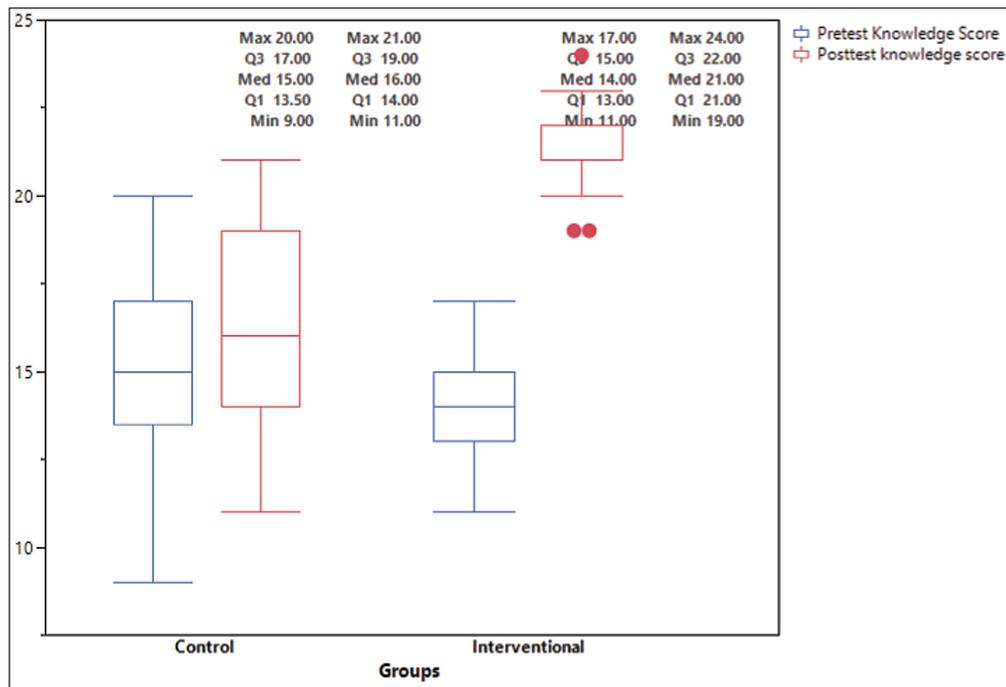


Figure 1: Comparisons of pre- and post-test knowledge between nurses in the control and experimental groups

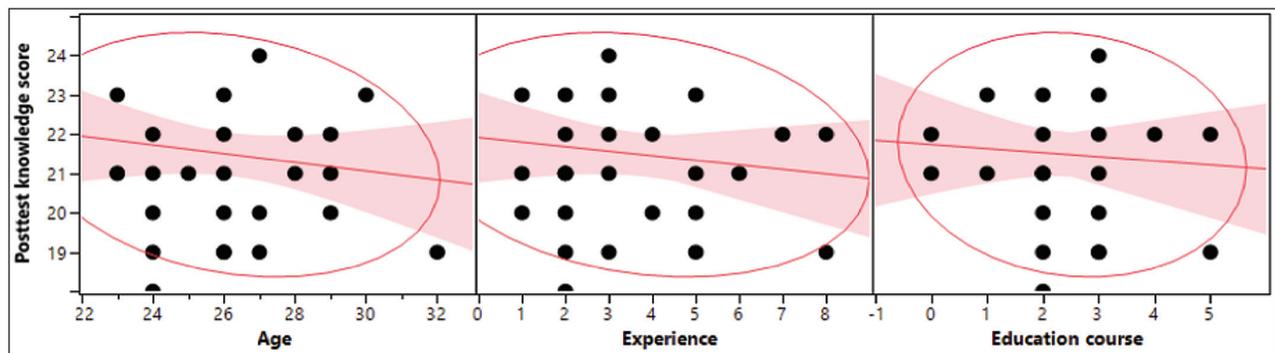


Figure 2: Correlation of knowledge scores of age, education level, and education courses in the experimental group

educational levels, nurses' age, and their experience of courses with regard to neonatal sepsis.

DISCUSSION

Concerning characteristics of the studied nurses, the current study revealed that the mean age in the experimental and control groups is around 25–26 years;

all nurses were female and about half of them were graduated from the nursing institute. This finding was in agreement with the result of Westbrook in 2016^[10] and in agreement with Alfahdaway and Aziz.^[11] They showed that most of the nurses in this study are in young age (20–29) and all of them were female. It is in agreement with a study results which expose that 97% of the sample is female.^[11] This result comes because there is a growing

need to female nurses, especially in maternity and pediatric hospitals, and today more females than males are employed during the expansion of the opening of institutes and colleges of public health.^[2] This outcome reliable with a study conducted by Abd Elhady reported that the age (20–29 years) was the large portion of the example.^[12] The reason behind that in point of view of the researcher is that the nurses who work in NICUs should be at a young age and they have to make a great effort at work and bear the burden and hardship of work for long periods during the night. Younger nurses were more motivated to acquire knowledge and had more capability of accepting new knowledge.^[2] The years of employment in nursing show that most of the nurses have a period of 1–5 years of employment in NICU.^[11] This might be related to the fact that some of the nurses were engaged in working within NICU from the beginning of their employment in nursing. The participated nurses were from different educational levels, but the nurses from institute graduations (having diplomas) were more than those from other graduations (having a bachelor in nursing science, midwifery in our hospitals), which is in agreement with WHO which reported that only 15.2% graduated from the nursing college. Regarding the educational or training courses in our study, all nurses in both groups were shared in such courses (2.35, 2.64 mean), respectively, which was around 2.5 years.^[11] It turns out that it is mandatory for all nurses to participate in such courses to avoid or reduce the occurrence of nursing mistakes during the neonatal assessment or nursing care; this is similar to what had been reported in the study of Kakemam *et al.*^[13] who indicated that participated nurses had few years of experience (mean 3.88) and it is similar to what had been reported in the study of Ayiasi *et al.*,^[14] in which half of nurses' experience was less than 5 years. More than two-thirds of nurses had experience for less than 3 years in NICUs.^[15] Nurses who work in intensive care units and provide care for critical newborns must be knowledgeable and qualified to provide better care for the newborns.^[16] For that, the researchers give attention to the knowledge of nurses regarding sepsis and their ability to detect early cues and actions taken on suspicion of sepsis are of paramount importance in this respect. Regarding the qualification, nurses' ability to know the physiological and behavioral indicators associated with neonatal sepsis has been considered a valuable clinical tool.^[17] Also, it is indicated that more nurses' knowledge in this regard was more related to work in the NICUs than to the level of nursing education.^[18] Nurses provide direct care and have the ability to influence neonatal outcomes, so educating nurses about sepsis is fundamental to improving the safety and outcome of neonatal care.^[19] Our study indicated that the level of knowledge (awareness) of the participating nurses before and after applying the educational program in the control group improved slightly ($P = 0.0003$). This may be related to the finding that nurses' knowledge

regarding the needs of premature infants with sepsis is not up to standard during pre-test assessment, and it may also be related to the critical relationship between pre-test and post-test scores with respect to the counseling program among the nursing staff. In contrast to the experimental group, the participating nurses had a significant improvement between the pre-test and post-test for the information of the attendees at P -value < 0.0001 , which indicates that the program is applicable and it is confirmed by discriminating in the mean medical care provider information. These values indicate that the nurses in the experimental group were committed and interested in the educational program and that they wanted to develop their knowledge regarding the nursing care of critical infants. Also, this might be due to that the researchers gave more information and health education getting better care for premature babies. Nurses' total level of knowledge significantly improved post-implementation of the educational program when compared with pre-implementation.^[20] Our results are in agreement with Thomas and co-workers.^[21] They proved the result of the social insurance worker information about the causes of infection made in the pre- and post-test and showed that there is a significant relationship between the pre-test and post-test nursing learning score toward disease control.^[11] The formal and logical headings that are used in the tutorial are the reason for the high level of post-test that comes for the screening test that plans to raise the level of nurses' general knowledge about the NICU.^[22] Early recognition of the subtle and less specific signs and symptoms of neonatal sepsis may improve treatment and long-term outcomes.^[17] The lack of continuous education for nurses and motivation to learn lead to a great desire for nurses to gain information about the nursing care of critical infants and to reduce the mortality rate.^[15] These findings were in agreement with Abd Elhady in 2015 who found that there was a statistical enhancement in nurses' knowledge concerning isolation procedures when compared with immediate earlier application of teaching guidelines. Also in contrast with Fathy Mohamed Belal *et al.*,^[1,23] the author showed an improvement in nurses' knowledge score regarding notification and isolation of infection post-program than pre-program with a statistically significant difference. Since nursing officials are the evaluators on the frontlines of the newborn, their knowledge of neonatal sepsis and early detection plays a key role in managing this life-threatening condition.^[23] For that, this study covered most of the important aspects of knowledge on neonatal sepsis, yet further research on this topic would be of value in identifying further deficiencies in knowledge and to bridge the gaps. A study in Iran found an improvement in knowledge and practice of sepsis care among ICU nurses after an educational program.^[24] Thus, regular training programs will be useful in raising awareness about neonatal sepsis with the goal of reducing the global burden of its morbidity and mortality.

Limitations of the study

Data collection and program implementation took long periods because of frequent absenteeism of nurses, overload of nurses' work, and drop-out of some nurses due to days off, especially during program implementation. Curfews were also imposed on some days due to COVID-19, and some nurses were affected by COVID-19 at that time, so they were getting 14–21 days of leave to recover from this virus, and the researcher was also forced to wait until they returned to complete the program.

CONCLUSION

The educational program was effective in increasing the nurse's knowledge regarding neonatal sepsis care.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Fathy Mohamed Belal N, Salah Ismail S, Hassan Bayoumi M. Impact of intervention program on nursing performance provided for neonates with sepsis at intensive care units. *Egypt J Health Care* 2017;8:1-16.
2. Hewamalage P, Siriwardhane H, Aththanayake A, Amarasekara S, Weerasekera M. Nurses' knowledge on neonatal sepsis in a tertiary care hospital in Sri Lanka. *Sri Lanka J Child Health* 2019;48:316-20.
3. Santos APdS, Silva MdLcd, Souza NLd, Mota GM, França DFd. Nursing diagnoses of newborns with sepsis in a neonatal intensive care unit. *Rev Latino-Americana de Enfermagem* 2014;22:255-61.
4. Burnett E, Curran E, Loveday HP, Kiernan MA, Tannahill M. The outcome competency framework for practitioners in infection prevention and control: Use of the outcome logic model for evaluation. *J Infect Prev* 2014;15:14-21.
5. Mkony MF, Mizinduko MM, Massawe A, Matee M. Management of neonatal sepsis at Muhimbili National Hospital in Dar es Salaam: Diagnostic accuracy of C-reactive protein and newborn scale of sepsis and antimicrobial resistance pattern of etiological bacteria. *BMC Pediatr* 2014;14:293.
6. Maternal BS. *Fetal and Neonatal Physiology-E-book: A Clinical Perspective*. Elsevier Health Sciences; 2017.
7. Alfaro-LeFevre R. *Critical Thinking, Clinical Reasoning and Clinical Judgment: A Practical Approach*, Pageburst E-book on Kno. Elsevier Health Sciences; 2016.
8. Liaw SY, Scherpbier A, Klainin-Yobas P, Rethans JJ. A review of educational strategies to improve nurses' roles in recognizing and responding to deteriorating patients. *Int Nurs Rev* 2011;58:296-303.
9. Lawal AK, Rotter T, Kinsman L, Machotta A, Ronellenfitsch U, Scott SD, *et al*. What is a clinical pathway? Refinement of an operational definition to identify clinical pathway studies for a Cochrane systematic review. *BMC Med* 2016;14:35.
10. Westbrook JL. Evidence based recommendations for treating and reducing the incidence of nosocomial neonatal sepsis in the intensive care setting: A best practice approach. 2016.
11. Alfahdaway FT, Aziz AR. Effectiveness of an educational program on nurses' knowledge about the premature baby needs at neonatal intensive care unit of pediatric teaching hospitals in Baghdad city. *Ind J Public Health Res Develop* 2018;9:1227-32.
12. Abd Elhady MS. Impact of Teaching Guidelines on Improving Nurse's Performance and Patient's Safety Regarding Nosocomial Infection in Dialysis Unit. Benha University; 2015.
13. Kakemam E, Hajizadeh A, Azarmi M, Zahedi H, Gholizadeh M, Roh YS. Nurses' perception of teamwork and its relationship with the occurrence and reporting of adverse events: A questionnaire survey in teaching hospitals. *J Nurs Manage* 2021;29:1189-98.
14. Ayiasi RM, Criel B, Orach CG, Nabiwemba E, Kolsteren P. Primary healthcare worker knowledge related to prenatal and immediate newborn care: A cross sectional study in Masindi, Uganda. *BMC Health Serv Res* 2014;14:65.
15. Al-Wily M. Effectiveness of educational program on nurses knowledge toward nosocomial infection at neonate intensive care units in Baghdad hospitals: A thesis submitted by, University of Baghdad/College of Nursing. Published Master Thesis; 2015. p. 79-88.
16. Grazel R, Phalen AG, Polomano RC. Implementation of the American Academy of Pediatrics recommendations to reduce sudden infant death syndrome risk in neonatal intensive care units: An evaluation of nursing knowledge and practice. *Adv Neonatal Care* 2010;10:332-42.
17. Boettiger M, Tyer-Viola L, Hagan J. Nurses' early recognition of neonatal sepsis. *J Obstet Gynecol Neonatal Nurs* 2017;46:834-45.
18. Asadollahi M, Arshadi Bostanabad M, Jebraili M, Mahallei M, Seyyed Rasooli A, Abdolalipour M. Nurses' knowledge regarding hand hygiene and its individual and organizational predictors. *J Caring Sci* 2015;4:45-53.
19. Mohammed EMI. Nurses' Knowledge Regarding Care of Neonatal Sepsis in Bahri Teaching Hospital. Khartoum State, Sudan: University of Gezira; 2017.
20. Atshan R, Aburghif L. Effectiveness of an educational program on nurses' knowledge toward children with meningitis at pediatric teaching hospitals in Baghdad City. *Int J Sci Res Publ* 2016;6:346-56.
21. Govind B, Veerarahavan B, Anandan S, Thomas N. *Haemophilus parainfluenzae*: Report of an unusual cause of neonatal sepsis and a literature review. *J Infect Dev Ctries* 2012;6:748-50.
22. Higman W. The Development and Evaluation of an e-Learning Module for Neonatal Clinicians to Support Breast Feeding. Coventry University; 2016.
23. Rubarth LB. *Nursing Patterns of Knowing in Assessment of Newborn Sepsis*. The University of Arizona; 2005.
24. Yousefi H, Nahidian M, Sabouhi F. Reviewing the effects of an educational program about sepsis care on knowledge, attitude, and practice of nurses in intensive care units. *Iran J Nurs Midwifery Res* 2012;17:S91-5.