ISSN: 1343-4292
Volume 140, Issue 01, April, 2022

Effectiveness of an Educational Program on Nurses' practice regarding Neonatal Sepsis in Neonatal and Premature Care Units a quasi-experimental study

Dilshad Abdullah Mohamed[1]

Pediatric Nursing Unit, College of Nursing, University of Duhok, Iraqi Kurdistan, region[1]

ABSTRACT— Neonatal sepsis is the main health problem that is accountable 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 neonate's care safety and outcomes. The present study aims to determine the effectiveness of the educational program in improving nurses' practice and practical procedures that related to neonatal sepsis in neonatal intensive care units. A quasi-experimental design was used. The interventional group included 23 nurses from Heevi pediatric hospital (Neonatal intensive care unit, Semi intensive care unit) and the control group were 25 nurses from maternity hospital, Neonatal intensive care unit. The overall period was 1 year including preparation of the educational program, sampling, analyzing of the results and the discussion. The pre-assessment of the outcomes showed that the control and experimental groups were comparable in practice score, mean and standard deviation 3.17 (0.491), 3.0 (0.5) respectively whereas the post assessment of the outcomes has been showed a highly significant improvement in the experimental practice score in comparison of the control group 3.22 (0.422) 3.96 (0.2). The control and experimental groups were comparable in practice and this comparability is highly significant in interventional group (P-value < 0.000). Maximum number of the participants (52.1%) were in neonatal intensive care unit at maternity and delivery hospital, 26-30 years old was the prevalent age, institutes graduation nurses were the prevalent (54.2%), the majority of nurses (68.8%) their experience was<5 years' in neonatal intensive care units, (79.2%) of nurses had 1-3 educating and training courses related to neonatal care.

KEYWORDS: Nurses, practice, educational program, NICU, SICU, PICU, PNICU.

1. INTRODUCTION

Neonatal sepsis is the main health problem that is accountable about 30-50% of the overall neonatal mortality in the developing nations. It is valued at around 20% of the newborns develop sepsis and nearly 1% dies from sepsis-associated reasons [1]. The neonatal sepsis signs and symptoms are generic, which include hyperthermia or hypothermia, respiratory distress, cyanosis, apnea, feeding problems, tiredness or irritability, hypotonic, seizures, bulging of the fontanels, poor perfusion, bleeding complications, abdominal distention, hepatomegaly, inexplicable jaundice [2]. Neonatal sepsis can be classified to two types early onset sepsis (EOS), It presents within the first 72 hours of life. In severe cases, the neonate may be symptomatic at birth. Infants with EOS usually present with respiratory distress and pneumonia [3]. In EOS the source of infection is generally the maternal genital tract and it is related to maternal risk factors where the bacteria found in the cultures are present in [4]. The second type or the Late-onset Sepsis (LOS) is acquired after delivery; this can be caused by contaminated hospital equipment, exposure to medicines that lead to antibiotic resistance, having a catheter in a blood vessel for a long time, staying in the hospital for an

extended period of time [5]. The onset of LOS is most frequently defined at 72 h after birth, a cut-off time point considered to adequately differentiate LOS from EOS in terms of the spectrum of causative pathogens [6]. Late-onset sepsis (LOS) is common in infants admitted to neonatal intensive care units (NICUs) [7]. Mortality from LOS is high and ranges from 7% in near-term infants to 39% in preterm infants infected with Gram-negative organisms [8]. Globally the estimation of deaths every year due to septicemia is 2.9 million children (44% of them are under 5 years of age, and 25% of this number are due to neonatal sepsis [9]. The incidence of neonatal sepsis among suspected neonates in a study conducted in Baghdad-Iraq was 54.67% from a total of 150 neonates in three Hospitals [10]. The vast majority of neonate victims happen within the first week of birth, and approximately (99%) could be in developing countries [11]. In the first week of life, the neonatal morbidity and mortality due to sepsis are considered to be 13%, 42% respectively [12]. Neonatal sepsis or primary infection of the bloodstream (BSI) is a clinical syndrome characterized by a systemic inflammatory response (SIR), with or without evidence of a suspected or confirmed infection [13]. It is one of the more frequent infectious pictures in the neonatal period, and is the one which most raises morbidity and mortality [14]. Preventing neonatal sepsis includes some main procedures like adherence to hand-hygiene, scientific aseptic procedures in the administration of intravenous lines, skincare, careful use of antibiotics, and minimizing invasive interventions e.g., prompt removal of central venous catheters (CVCs) and reducing mechanical ventilation, etc [15].

Worldwide According to World health organization (WHO) an estimated 130 million babies are born each year and about 4 million of them die in the neonatal period. of these, 8 million do not survive till their first birthday, and more than 10 million die before the age of five [16]. It is estimated that neonatal deaths account for a third of global child mortality and that infections are a major cause of neonatal mortality. In developed countries 98% of all neonatal deaths occur in developing countries [17]. In the years 2018, 2019, and 2020 the number of newborns who died was 122, 127, and 82 respectively in Heevi pediatric hospital in Duhok city. while the number of neonates who died due to neonatal sepsis in both neonatal intensive care unit (NICU) and Semi-intensive care unit (SICU), in the same years, are as follows, in 2018, 68 neonates were admitted, 19 of those died (10 males, 9 female) in 2019, 52 neonates were admitted, 22 of them died (10 males, 12 female), in 2020, 49 neonates were admitted, 14 of them died (8 males, 6 female), (Heevi Hospital Statistical Department, 2021). The 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 neonate's 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 [18]. Application of the educational programs and interventions in a regular way to make sure the nurses are able to provide quality care [19]. Therefore, nurses have a professional and ethical obligation to protect the health of their patients and share responsibility for preserving and protecting the normal situation [20]. In addition, the fundamentals of nursing performance provide a comprehensive framework for achieving high-quality nursing care and clarifying the contribution of nursing to improving health care outcomes and patient experiences [21]. The Principles of nursing practice provide an overall framework for the performance of high-quality nursing care and explain the contribution of nursing to improving healthcare matters and patient trials [22].

Problem Statement: The researcher made an educational program for evaluating the nurses' practice, 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' practice and practical procedures that related to neonatal sepsis in neonatal intensive care units.

2. Method and subjects

A Quasi-experimental study was done.

2.1 Administrative arrangement

Before data collection, the college approval letter of scientific committee was obtained in order to coordinate with General Directorate of Health (DOH) of Duhok. Therefore, formal administrative approval was obtained to conduct this study in Heevi Teaching Hospital and Maternity and Delivery Hospital. In 20/09/ 2020, references number,20092022-4

2.2 Setting of the study

1. Conducted in the Heevi Pediatric and Maternity Hospitals.
2. Time of sampling was from 15th of January 2021 to 10th of April 2021.
3. The study samples include two groups, the control group were selected from Heevi pediatric hospital (23 nurses), and the second group was interventional group were selected from maternity hospital (25 nurses).

Female with experience for more than one year, and have attended at least one course related to nursing care in neonatal units. The nurses of male gender and nurses who did not participate in educational program and those whose experience was less than one year were excluded. The data was collected through the use of a questionnaire for collecting demographic data, whereas for practice the researcher has used a check list which is a special checklist for evaluating nursing practice.

Tool of data collection: It was divided into two parts:
Part one: Concerned with demographic characteristics of the studied nurses, namely nurse's age, qualification, years of experience, previous course about neonatal sepsis in NICUs.

Part two: An observational checklist: adopted from Bowden & Greenberg, (2016), Loveday et al., (2014) and WHO, (2009) used to assess nurses' actual practices which also subdivided in to three parts.

Aseptic technique procedures: which include 14 procedures (Washing or rubbing hands, hand hygiene, wearing gloves and protective clothing, disinfected oxygen mask and nasal cannula, provide oral care, checking body temperature, intravenous cannulation & administration of IV fluids, using glucometer, Administration of O2 therapy, etc.).

Assessing and documenting signs of Ineffective Tissue Perfusion: consist of three items which are related to nurse’s assessment procedures, and include (Assessing and note quality and strength of peripheral pulses, assessing respiratory rate, depth and note signs of difficulty breathing such as tachypnea, dyspnea, cyanosis, Assessing the skin for changes in color, temperature and moisture & skin care daily).

Nursing observational procedures: consist of three items which includes (Observing signs of inflammation in the region of the umbilicus such as pus secretions or offensive odor, Observing and recording symptoms of GIT, such as vomiting, abdominal distension or diarrhea, blood in stool, Observing and recording the intake and output by measuring fluid intake and output to avoid dehydration).

Scoring system: Nurses' actual practices total score was 60. The total aseptic technique procedures (14 procedure) getting 42 score, the total assessing and documenting signs of Ineffective Tissue Perfusion (3 procedure) getting 9 score, the nursing observational procedures (3 procedure) getting 9 score. If the nurse performed the procedure will he will get 3, if he performed with minor mistakes he will get 2, when he requires support he will get 1, while with no experience or didn't do, he will get 0.

Time consumed for assessing nurses' actual practices was approximately 60 minutes. Each nurse was observed three times for each procedure and then the average score was obtained.

Statistical analyses: 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 (SPSS 25; IBM Corp; USA). The homogeneity of the general information between control and experimental groups was performed by an independent t-test and Pearson Chi-squared tests. We searched for the outliers using a tail quantile of 0.1 and Q of 3 for the pre and post practice, experience, 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 experimental and control groups were examined through ANOVA one-way. Correlation of knowledge score with age, education, and education courses in both control and experimental groups were examined in bivariate regression and were shown in Scatter matrix plots.

2.3 Educational program steps

Assessment phase: The researcher had attended to NICUs one day for two shifts (morning & afternoon shift) for each setting by rotation. The researcher interviewed each nurse individually using pre-designed interviewing questionnaire for 10 minutes.

Planning phase: Another qualified person was trained and educated to assess and evaluate the study samples after implementing the educational program.

Implementation phase: The interventional group was divided to subgroups, each sub-group were 2 to 3 nurses according to the shift, (5 subgroups of 3 nurses, another 5 subgroups of 2 nurses) and they set with the researcher around the table in the nurses' station, which is the appropriate, better and calmer place to give the lectures in the NICU in maternity hospital. The researcher found that the evening and night time are better for giving the lectures than the morning time, because the nurses in the morning time were very busy and all pediatric seniors visit the unit in that time, so the nurses have to be with the seniors in order to document their information and advices. The practical lectures were given to each sub- group separately, the scientific lectures were explained, discussed for each sub-group and displayed picture, videos related to the practical procedures, by using the laptop. The educational program was provided in 5 scientific and practical sessions. Time needed for each session was 45-60 minutes for practical lectures. Sessions were given in six days a week in maternity and obstetric hospital. The better teaching methods were used like PowerPoint, videos, pictures, lecture discussion, demonstration and re-demonstration, while teaching materials were handout and real equipment.

Evaluation phase: Nurses practice and performance were assessed post-program implementation, using the same checklist which was used in pre-program implementation. The evaluation of nurse performances was conducted immediately post-program implementation.

Pilot study: The pilot study was conducted on a purposive sample of (5) nurses, 2 of whom were from the

control group that was carried out in the pediatric hospital (NICU) and 3 from the interventional group that was carried out in the maternity hospital (NICU).

Validity of the instrument: In order to measure the study tool, the validity and reliability of the test, were applied by a panel of 9 experts, the experts were from different disciplines, and their comments were considered and applied to the study questionnaire.

Reliability of the Study tool: The reliability was tested by using Cronbach's Alpha to ascertain reliability and consistency of the survey. Cronbach's Alpha for the survey instrument for the practice item was (82%) indicating acceptable level of reliability and consistency.

Statistical analyses: Data of the current study were analyzed through application of descriptive and inferential statistical data analysis is adapted for the benefit of the present study. The statistical calculations were performed by Statistical Package for Social Sciences 25 (SPSS 24; IBM Corp; USA). The nurses in the control and experimental groups were checked for the homogeneity tests for age, gender, pretest practice, education, and experience. Frequency, Percentage, Mean and standard deviation. The homogeneity of the general information between control and experimental groups was performed by an independent t-test and Pearson Chi-squared tests. In this regard, the male nurses in the control group were excluded from the study remaining 23 and 25 nurses in the control and experimental groups, respectively. Comparisons of pre-test practice between nurses in the control and experimental groups were examined by an independent t-test. Comparisons of pre and post practice scores in controls and experimental groups were examined in paired t-test. Comparisons of post practice scores between controls and experimental groups were examined in an independent t-test. P value < 0.05 are considered as significant value, whereas P value of > 0.05 are considered no significant value.

3. The results

As shown in table one maximum number of the participants worked in NICU in maternity hospital twenty-five (52.1%) and half of nurses twenty-four (50%) were from age group of 26-30 years, otherwise twenty-six (54.2%) of them graduated from nursing institutes, while thirty-three (68.8%) of nurses have <5 years' experience in neonatal intensive care units, finally thirty-eight (79.2%) of nurses had 1-3 educating and training courses related to neonatal care. As shown in table (2) most of the nurses performed with minor mistakes during their practice with Mean and standard deviation 57.02 (±6.107). Table (3) shows significant association between nurses' practical interventions regarding neonatal sepsis with their level of education with P- value < 0.001, while there is no significant association with their other parameters. Table (4): indicates that the practice level of control group was not changed within a time in pre and post application of the educational program, while in the interventional group the practice level improved obviously. As shown in table (5); there were mild differences between pre and post educational program practice of control group, while there were significant differences between pre and post program for the intervention group.

4. Discussion of the results

Concerning to characteristics of the studied nurses the current study revealed that more than half of nurses were from age group 26-30 years old, the Mean and standard deviation of the age in experimental and control groups is 26.38 (±2.907), This finding is in concordance with that of [23] which studied knowledge and practice about standard precautions among university hospital nurses in the United Arab Emirates and accepted with [24]. Young age nurses have more ability to acquire practical knowledge and change their behaviors based on submission of up to date knowledge. [25] our results are in agreement with [26]. Shows

that most of the nurses in his study were in young age (20-29) years old and all of them were female. These outcomes reliable with who reported that the age (20-29 years) was the large portion of the samples [27]. The reason behind that in the 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 burdens and hardship of work for long periods specially during the night. Younger nurses were more motivated to acquire knowledge and had more capability of accepting new knowledge [28].

All nurses were female, male nurses were excluded from the study sample to make homogeneity in both groups, this finding was in agreement with the result of [29] which studied compliance of Cypriot nurses with standard precautions to avoid exposure to pathogens, and reflected approximately the same results. It's in agreement with a study results expose that 97% of the sample is female [26]. Also due to the nature of admitted patients in the intensive care units in both hospitals were neonates and infants so the female gender is more occupied to deal with infants as nursing care were more related to females so they more preferred to working in intensive care units than males. This result come because there is a growing need to female nurses especially in maternity and pediatric hospital, and today more females than males during the expansion of the opening of institutes and colleges of public health [28].

The participated nurses were from different educational levels, but the nurses from institute graduations (having diplomas) were more than the other graduations nurses (having a bachelor in nursing science, Midwifery in our hospitals) and they were more than half of nurses 26 (54.2%) which is in agreement with who reported that only 15.2% graduated from nursing college, also this finding was in agreement with the result of [29] and because the midwifery institute was not found in Duhok so their graduation are few and also the college of nursing was established in 2008 so their graduation are less than institute graduation. In the present study the experience of nurses was working in NICUs were less than 5 years with Mean and Standard deviation 3.58 (±2.172), The years of employment in nursing refer that most of the nurses have a period of (2-5) years of employment in NICU [26]. This might be related to that some of nurses were engaged in working within NICU from the beginning of their employment. More than three-quarters of nurses (79.2%) were shared in education and training courses that related to nursing care of neonates and infants in intensive care units with Mean and standard deviation 2.50 (±1.305). Regarding the educational or training courses in our study all nurses in both groups were shared in such courses [26]. 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 the similar to what had been reported in the study of [30] who indicated that participated nurses were with few years of experience (Mean 3.88) and it is similar to what had been reported in the study of [31] where half of nurses their years of experience less than five years. Attending continuing nursing education courses and training programs (from the researchers' point of view) has the benefits of keeping nurses informed and improving their practices especially in Perform procedures that require strict sterilization techniques and intensive care. [32], found that, nurses with longer years of experience had better practice regarding universal precaution in a study about nosocomial infection control training program of knowledge and practice in the intensive care unit in El- Gala Military Hospital in Egypt.

More than two third of nurses had experience for less than 3 years in neonatal intensive care units [33]. Nurses who work in intensive care units and provide care for critical newborns must be knowledgeable and qualified to provide better care for the newborn [34]. Our study results are not agreeing with [35] found that, nurses with longer years of experience had better practice regarding universal precaution in a study about nosocomial infection control training program of knowledge and practice in the intensive care unit in El- Gala Military Hospital in Egypt [35].

Regarding the practical performances in the areas that the nurses deal with the infants need to special and closed care, our study indicates that the majority of nurses in both groups make mistakes while performing nursing procedures in intensive care units and this was expected due to the large number of patients, the lack of medical staff and the excessive workload in those areas. Also, due to the Corona pandemic recently, which led to the infection of much medical staff with this virus, which led to a significant shortage of nursing staff, as every infected nurse has to take a rest for a period of not less than 14 days or until he recovers from the disease. the current study showed a statistically significant association between the level of nurses' education and their practice regarding neonatal care which is evident from the P-value (<0.001**). As evident in the current study in the control group there was a slight change happen pre and post education program mean and standard deviation 3.17 (0.491), 3.22 (0.422) respectively.

While in the intervention group the change is obvious between pre and post education program mean and standard deviation 3.0 (0.5), 3.96 (0.2) respectively, As the majority of nurses performed very well, in other words, they followed the scientific nursing steps when performing any nursing procedure for patients, this is in agreement with a study conducted by [36] related to nurses' performance about vital signs for neonates with sepsis revealed that less than half of the studied nurses had incompetent performance regarding vital signs pre- program implementation. While, the majority of them had competent performance regarding vital signs post- program implementation. This finding was in agreement with a study performed in Ain shams university found that, more than three quarters of studied nurses had good performance about measuring vital signs after intervention in study about effect of educational program for nurses of pediatric care about care of critically ill children in Egypt [13].

As the nurses showed remarkable acceptance when receiving scientific lectures and implemented them directly on patients, as through the scientific steps when providing nursing care for children, it became clear to them that any nursing procedure that is not based on a scientific basis is wrong and reflects positively on the patient's health and delays the patient's recovery. Concerning the practice or nursing practical procedures the researcher divided the nurses to four sub groups, in both controls and interventions according to the scientific steps of each procedure which was explained in the method. In control group and pre education program the majority of nurses 17 (73.9%) has minor mistakes during doing nursing procedures, the quadrant of them 5 (21.7%) did nursing procedures without any mistakes with mean and standard deviation 3.17 (0.491), whereas post education program approximately the same rate 18 (78.3%), 5 (21.7%) Performed with Minor Mistake, Well Performed respectively with mean and standard deviation 3.22 (0.422), there was no change happens before and after the education program in control groups, this is may be due to the works overload and the deficiency of the equipment's and also may be due to lack of time to do the procedure scientifically which make the nurse to did some mistakes during their nursing procedures.

While in intervention group pre education program the majority of nurses 19 (76%) did their nursing procedures with minor mistakes, while after application the education program the data showed that there was a good change in nursing performances toward neonatal sepsis, 24 (96%) will performed and its evidenced from mean and standard deviation 3.0 (0.5), 3.96 (0.2) pre and post the program respectively. In addition, this finding was in agreement with a study conducted in Khartoum state, Sudan found that, no one of the studied nurses had poor performance in vital signs after intervention program, so it is a basic procedure in the assessment of the neonate in study about quality of nurses' performance in neonatal intensive care units [37]. This is evident that the nurses adhered to the scientific steps that were explained and simplified to them during the educational program. Also the researcher instilled in the nurses' minds how to adhere to the correct and scientifically sound nursing procedures and their importance in changing

the patient's health status for the better. And how the scientific procedures will decrease the rate of mortality among admitted infants in intensive care units. In the other hand the present study showed a significant change in the nurses' practice between controls and interventions pre and post the educational program as obvious from P- values and evidenced from mean and standard deviation, in the control group there was no effect of the nurses' knowledge on their practice regarding neonatal sepsis as showed in the mean and standard deviation -1.174 (1.497), -2.522 (3.246) respectively. This finding was in agreement with a study conducted in Baghdad/Iraq, 2018 reported that, nurses had inadequate practice for caring babies with neonatal sepsis in the incubator before application of the education program, while their practice was improved after application of education program. [38] also that's in agreement with a study conducted in Egypt which revealed that there was a positive correlation between nurses' practice pre/post program implementation. [13] while this finding was disagreement with a study conducted in Soudan, reported that, there was no improvement in the performance of nurses, in his study about nurses knowledge and compliance with universal precautions in an acute hospital [29]. Otherwise in the intervention group nursing information has greatly improved nursing performance that's mean there was a great effect of the educational program on nurses practical procedures regarding neonatal sepsis care as obvious from mean and standard deviation -15.52 (5.034) practice.

Our study results are in agreement with a study conducted in Turkey which viewed that, the majority of the studied nurses applied bases of infection control of nursing practical procedures while they giving care to infant, on the same line [39] who studied "Assessment of infection control practices in neonatal intensive care unit" and revealed that, the majority of their studied group used the scientific practical nursing procedures while they deled with the patients to reduce the infection and how they prevented transmitted it.

The educational program is supposed to have an impact on nursing performance because every nursing procedure is based on a scientific basis and the nurses must adhere to the scientific steps when carrying out nursing care for each patient and this is what happened in the current study. The more experienced and competent nurses incorporated empirical, aesthetic, and personal knowledge in their assessments. More experienced nurses also used less authority-based knowing.

5. Limitation of the study

Data collection and program implementation took long period 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 to 21 days of leave to recover from this virus, and the researcher was also forced to wait until they returned to complete the program.

6. Conclusion

The educational program was effective in enhancing the nurse's practice regarding neonatal sepsis care. The present study intends to evaluate the nursing practice regarding neonatal sepsis. Maximum number of the participants (52.1%) were in neonatal intensive care unit at maternity and delivery hospital, 26-30 years old was the prevalent age, institutes graduated nurses were the prevalent (54.2%), the majority of nurses (68.8%) their experience was<5 year in neonatal intensive care units, (79.2%) of nurses had 1-3 educating and training courses related to neonatal care. The pre-assessment of the outcomes showed that the control and experimental groups were comparable in practice score, mean and standard deviation 3.17 (0.491) 3.0 (0.5) respectively whereas the post assessment of the outcomes showed a highly significant improvement in the experimental group 3.22 (0.422), 3.96 (0.2), (P-value < 0.000).

ISSN: 1343-4292
Volume 140, Issue 01, April, 2022

Table 1:-Demographic characteristics of participant nurses (n=48)

Characteristics		Freq. (%)	Mean (SD)
Setting	NICU- Heevi	11(22.9)	
	SICU- Heevi	12(25.0)	
	NICU-Gynecology	25(52.1)	
Age Categories	<= 25	20(41.7)	
	26-30	24(50.0)	26.38 (±2.907)
	31-35	4(8.3)	
Educational level	Midwifery	15(31.3)	
	Nursing institute	26(54.2)	
	Nursing college	7(14.6)	
Experience	<5 Years	33(68.8)	
	=>5 Years	15(31.3)	3.58 (±2.172)
Training Course	Have no Training course	4(8.3)	
	1-3 Training courses	38(79.2)	2.50 (±1.305)
	4-6 Training courses	6(12.5)	

Table 2: The nurses' practice pre-educational program

Groups	Practice Pre-Educational Program			Mean (±SD)
	Performed with Support	Performed with Minor Mistake	Well Performed	
Control	1	17	5	57.02
Intervention	3	19	3	(±6.107)

Table: 3 Association of all nurses' practice with their demographic characteristics

Demographic characteristics		Nurses' Practice			P. Value
		Performed with Support	Performed with Minor Mistake	Well Performed	
Age Categories	<= 25	0	17	3	**0.120****
	26-30	4	17	3	
	31-35	0	2	2	
Years of Experience	<5 Years	1	26	6	**0.165****
	=>5 Years	3	10	2	

Level of Education	Midwifery	2	12	1	< **0.001****
	Nursing institute	2	23	1	
	Nursing college	0	1	6	
Training Course	Have no Training course	0	4	0	**0.459****
	1-3 Training courses	3	29	6	
	4-6 Training courses	1	3	2	

**= fissure exact test was used to show the association

*P-value<0.05 ------- statistically significant

Table: 4 Nurses' Practice level in pre and post-Educational Program

Groups	Pre-Education Program				Post-Education Program		
	Performed with Support Freq. (%)	Performed with Minor Mistake Freq. (%)	Well Performed Freq. (%)	Mean (±SD)	Performed with Minor Mistake Freq. (%)	Well Performed Freq. (%)	Mean (±SD)
Control group	1 (4.3%)	17 (73.9%)	5 (21.7%)	3.17 (0.491)	18 (78.3%)	5 (21.7%)	3.22 (0.422)
Intervention group	3 (12%)	19 (76%)	3 (12%)	3.0 (0.5)	1 (4%)	24 (96%)	3.96 (0.2)

Mean (±SD) standard deviation

Table: 5 Nurses Practice differences between Pre and Post-Educational Program.

	Control Group				Intervention Group		
	Mean (±SD)	95% CI	Sig. (2-tailed)		Mean (±SD)	95% CI	Sig. (2-tailed)
Nurses Practice	-2.522 (3.246)	(-3.925 to -1.118)	0.001*		-15.52 (5.034)	(-17.598 to -13.442)	0.000 *

*P-value<0.05 ------- statistically significant

Paired Samples T. Test was used to show the differences

7. References

[1] Sharma, C.M., et al., "Neonatal sepsis": bacteria & their susceptibility pattern towards antibiotics in neonatal intensive care unit. Journal of clinical and diagnostic research: JCDR, 2013. 7(11): p. 2511.

[2] Loboda, A.M. and I.V. Tarasova, The Standards of Practical Skills in Neonatology. 2018.

[3] Kuzniewicz, M.W., et al., A quantitative, risk-based approach to the management of neonatal early-onset sepsis. JAMA pediatrics, 2017. 171(4): p. 365-371.

[4] Hincu, M.-A., et al., Relevance of biomarkers currently in use or research for practical diagnosis approach of neonatal early-onset sepsis. Children, 2020. 7(12): p. 309.

[5] Carter, G.P., et al., Genomic analysis of multiresistant Staphylococcus capitis associated with neonatal sepsis. Antimicrobial agents and chemotherapy, 2018. 62(11): p. e00898-18.

[6] Dong, Y. and C.P. Speer, Late-onset neonatal sepsis: recent developments. Archives of Disease in Childhood-Fetal and Neonatal Edition, 2015. 100(3): p. F257-F263.

[7] Mohsen, L., et al., Emerging antimicrobial resistance in early and late-onset neonatal sepsis. Antimicrobial Resistance & Infection Control, 2017. 6(1): p. 1-9.

[8] Shah, B.A. and J.F. Padbury, Neonatal sepsis: an old problem with new insights. Virulence, 2014. 5(1): p. 170-178.

[9] Mustefa, A., A. Abera, and A. Aseffa, Prevalence of neonatal sepsis and associated factors amongst neonates admitted in arbaminch general hospital, arbaminch, southern Ethiopia, 2019. J Pediatr Neonatal Care, 2020. 10(1): p. 1-7.

[10] Al-Mayah, Q.S., F.A. Chalob, and T.I. Jawad, Incidence of neonatal sepsis in a sample of Iraqi newborns. Pakistan Journal of Biotechnology, 2017. 14(4): p. 797-802.

[11] Niermeyer, S. From the Neonatal Resuscitation Program to Helping Babies Breathe: Global impact of educational programs in neonatal resuscitation. in Seminars in Fetal and Neonatal Medicine. 2015. Elsevier.

[12] Jawin, V., et al., Beyond critical congenital heart disease: newborn screening using pulse oximetry for neonatal sepsis and respiratory diseases in a middle-income country. PloS one, 2015. 10(9): p. e0137580.

[13] Fathy Mohamed Belal, N., S. Salah Ismail, and M. Hassan Bayoumi, Impact of Intervention Program on Nursing Performance Provided for Neonates with Sepsis at Intensive Care Units. Egyptian Journal of Health Care, 2017. 8(1): p. 1-16.

[14] Belachew, A. and T. Tewabe, Neonatal sepsis and its association with birth weight and gestational age among admitted neonates in Ethiopia: systematic review and meta-analysis. BMC pediatrics, 2020. 20(1): p. 1-7.

[15] Reyes, J.L., et al., Etiology and antimicrobial resistance patterns in early and late neonatal sepsis in a Neonatal Intensive Care Unit. Arch Argent Pediatr, 2015. 113(4): p. 317-323.

[16] Wynn, J.L., Defining neonatal sepsis. Current opinion in pediatrics, 2016. 28(2): p. 135.

[17] Tewabe, T., et al., Clinical outcome and risk factors of neonatal sepsis among neonates in Felege Hiwot referral Hospital, Bahir Dar, Amhara Regional State, North West Ethiopia 2016: a retrospective chart review. BMC research notes, 2017. 10(1): p. 1-7.

[18] Puopolo, K.M., et al., Management of neonates born at≥ 35 0/7 weeks' gestation with suspected or proven early-onset bacterial sepsis. Pediatrics, 2018. 142(6).

[19] Burnett, E., Effective infection prevention and control: the nurse's role. Nursing Standard (2014+), 2018. 33(4): p. 68.

[20] Sole, M.L., D.G. Klein, and M.J. Moseley, Introduction to Critical Care Nursing E-Book. 2020: Elsevier Health Sciences.

[21] Oldland, E., et al., A framework of nurses' responsibilities for quality healthcare—Exploration of content validity. Collegian, 2020. 27(2): p. 150-163.

[22] Meehan, T.C., F. Timmins, and J. Burke, Fundamental care guided by the careful nursing philosophy and professional practice model©. Journal of clinical nursing, 2018. 27(11-12): p. 2260-2273.

[23] Pasay, J.M.E., et al., Compliance with Standard Precautions among Hospital Nurses in Ozamiz City, Philippines. Journal of Multidisciplinary Studies Vol, 2015. 4(1): p. 108-138.

[24] Porto, J.S. and M.H.P. Marziale, Reasons and consequences of low adherence to standard precautions by the nursing team. Revista gaucha de enfermagem, 2016. 37(2).

[25] Eskander, H.G., W.Y.M. Morsy, and H.A.A. Elfeky, Intensive care nurses' knowledge & practices regarding infection control standard precautions at a selected Egyptian cancer hospital. prevention, 2013. 4(19): p. 160-174.

[26] Alfahdawey, F.T. and A.R. Aziz, 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. Indian Journal of Public Health Research & Development, 2018. 9(8).

[27] Abd Elhady, M.S., Impact of Teaching Guidelines on Improving Nurse's Performance and Patient's Safety Regarding Nosocomial Infection in Dialysis Unit. 2015, Benha University.

[28] Hewamalage, P., et al., Nurses' knowledge on neonatal sepsis in a tertiary care hospital in Sri Lanka. Sri Lanka Journal of Child Health, 2019. 48(4): p. 316-320.

[29] WESTBROOK, J.L., EVIDENCE BASED RECOMMENDATIONS FOR TREATING AND REDUCING THE INCIDENCE OF NOSOCOMIAL NEONATAL SEPSIS IN THE INTENSIVE CARE SETTING: A BEST PRACTICE APPROACH. 2016.

[30] Kakemam, E., et al., Nurses' perception of teamwork and its relationship with the occurrence and reporting of adverse events: A questionnaire survey in teaching hospitals. Journal of Nursing Management, 2021. 29(5): p. 1189-1198.

[31] Ayiasi, R.M., et al., Primary healthcare worker knowledge related to prenatal and immediate newborn care: a cross sectional study in Masindi, Uganda. BMC health services research, 2014. 14(1): p. 1-11.

[32] Wasswa, P., et al., Implementation of infection control in health facilities in Arua district, Uganda: a cross-sectional study. BMC infectious diseases, 2015. 15(1): p. 1-9.

[33] Orsido, T.T., N.A. Asseffa, and T.M. Berheto, Predictors of Neonatal mortality in Neonatal intensive care unit at referral Hospital in Southern Ethiopia: a retrospective cohort study. BMC pregnancy and childbirth, 2019. 19(1): p. 1-9.

[34] Benoit, B. and S. Semenic, Barriers and facilitators to implementing the baby-friendly hospital initiative in neonatal intensive care units. Journal of Obstetric, Gynecologic & Neonatal Nursing, 2014. 43(5): p. 614-624.

[35] Marchant, E.A., et al., Neonatal sepsis due to coagulase-negative staphylococci. Clinical and Developmental Immunology, 2013. 2013.

[36] Al Sharkawi, S.S., et al., Intervention Program for Nurses about Care of Preterm Neonates Undergoing Continuous Positive Airway Pressure. 2019.

[37] Mohammed, E.M.I., Nurses' Knowledge Regarding Car of Neonatal Sepsis in Bahri Teaching Hospital, Khartoum State, Sudan (2017). 2017, University of Gezira.

[38] Mohammed, A.Q., Assessment of Nurses' Knowledge and Practices Regarding Nasogastric Tube at Neonatal Intensive Care Unit in Baghdad Hospitals. Indian Journal of Public Health Research & Development, 2019. 10(4).

[39] Ibrahim, Y.S., A.-R.M. Said, and G.K. Hamdy, Assessment of infection control practices in a neonatal intensive care unit (NICU). Egyptian J Comm Med, 2011. 29: p. 27-45.