Effectiveness of An educational Program on Nurses` Practices toward Disinfection and Sterilization Methods for Neonatal Incubators

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Abstract

Neonates have problems keeping their body temperature within normal boundaries due to heat loss. They therefore need special care that is administered with the help of Incubators, which help minimum the heat loss via convection. Within neonatology the incubator has been identified as one of the contributing factors to HCAI due to the warm and humid environment, making it easy to spread nosocomial flora. Methodology a quasi- experimental design used in the present study with application of a (pre-test/ post-test I, post-test II), The study was carried out at NICU in tow teaching hospitals in Bagdad city, Iraq (Ibn Al-Baladi Teaching Hospital and Fatima Al-Zahra Teaching Hospital for pediatric and obstetrical). The research sample includes (60) nurses working in NICU. They are selected by using non probability sampling (purposive sample). Results findings indicates that nurses in the study group are showing fair level of practices during the pre-test time (73.4%, M±SD= 15.17 ± 4.219) while they are showing good level of practices during the post-test 1 (100%, M±SD= 35.57 ± .676) and post-test 2 (100%, M±SD= 34.97 ± 1.098) that indicate the significant changes in level of practices among nurses after applying the program. The study concluded that there was a (poor level) of practices among nurses at neonatal intensive care unit toward disinfection and sterilization of neonates incubators in pre-test and then improved to (good level) practice in post-test (1), and post-test (2) , The educational program was effective in increasing the nurse's practices regarding disinfection and sterilization of neonates incubators. **Recommendations:** Great emphasis should be directed toward the educational aspects at neonatal intensive care unit by providing educational posters, guidelines, pamphlets and manuals and providing educational guidelines, pamphlets about disinfection , sterilization and disinfectants processes that used in neonates incubators, constructed training courses for and congresses held by specialists in disinfection , sterilization and disinfectants processes that used in neonates incubators .

Keywords: Disinfection , Sterilization ,Disinfectants and Neonatal Incubators

higher when the infant is premature or if it is delivered more than 24 hours after the amniotic fluid has been released. The amniotic fluid is generally sterile and when the baby passes through the birth canal it is exposed to the bacteria residing there . This type of vertical transmission (mother to infant) can result in the infant containing types of bacteria like; Listeria monocytogenes, Gram-negative enteric rods, group B Streptococcus, staphylococcus aureus[7] . Due to their immature immune system, neonates are very susceptible for the acquisition of HAIs; moreover, babies with particular risk factors (e.g. very low birth weight, prematurity, maternal intake of corticosteroids, mechanical ventilation, etc.) show an higher risk to develop potentially life-threatening conditions such as the so called Late Onset Sepsis (LOS), which can occur after the third day of life [8]. Neonatal sepsis(NS) is one of the major challenges in pediatrics since it is the most common cause of neonatal mortality; it is responsible for about 30%–50% of the total neonatal deaths in developing countries [9]. Incubators are designed to provide an optimal environment for

Introduction

The neonatal stage is describe as the span from birth up to 28th day of living. It is the very critical period for the continuance of an infant[1]. Preterm neonates who born before 37 weeks of the gestation period are known as preterm or premature babies [2]. Newborns receiving care in the Neonatal Intensive Care Unit (NICU) are at increasing risk of hospital acquired infections [3].. Many infections in the hospitals are caused by pathogens transmitted from infected HCWs to neonates, or from one newborn to another by way of HCWs in NICU who have not washed their hands between the newborns, or they do not practice standard control measures as well. A close physical contact between health care personnel and the newborns like feeding or changing solid diapers provide abundant opportunities for the transmission of infectious materials in NICU [5]. Neonatal Infection continues to play a significant role in neonatal deaths and may be due to pneumonia, sepsis, meningitis, or viral syndromes[6]. The risk of infection after birth is

3- To find out the relationship between nurses knowledge and sociodemographic characteristics

Materials AND Methods

Quasi- experimental (test-Re-test) and application of educational program , study was carried at the NICU in Baghdad City, A purposive (non - probability) sample of (60) nurses working in NICU, were selected (30) nurses from Ibn Al-Baladi Teaching Hospital for pediatric and obstetrical as control group and were selected (30) nurses from Fatima Al-Zahra Teaching Hospital for pediatric and obstetrical as study group. Observation of Check list are designed as Steps to measure Nurses` Practices toward Sterilization and Disinfection Methods of Incubators consists of (12) items the Answer was designed on the base of marking (Sometimes, Always and Never). The reliability of the questionnaire was determined through a pilot study and validity through a panel of experts (13) Validity of the study tool remained strong - minded through a board of specialists and dependability. The first main aim from the study is to determine the effectiveness of instruction program on nurse's practices toward disinfection and sterilization methods of neonatal Incubators. The data were analyzed through the application of descriptive statistical analyses procedure (frequency, percentage and mean of score and standard deviation) and inferential analysis procedure (person correlation coefficient and t - test and ANOVA) were used to analysis the data. The result findings of the study indicated that Nurses have low level of Practices before the application of the educational program and improved after the implementation in post- test changes to develop level of Practices of Nurses toward Disinfection and Sterilization methods of neonates Incubators in NICU

newborn babies with growth problems (premature baby) or with illness problems. The incubator is isolated area environment with no dust, bacteria, and has the ability to control temperature, humidity, and oxygen to remain them in acceptable levels such as (36°C-38°C) for temperature, (70%-75%) for humidity and (25%-60%) for oxygen concentration[10]. Among medical equipment, neonatal incubators have been recognized as a source of microorganisms potentially implicated in the diffusion of HAIs [3–7]. Hence, an adequate disinfection protocol should be implemented in order to guarantee a safe environment for the babies into neonatal incubators [8]. Neonatal incubators can be an important reservoir of pathogens responsible for life-threatening outbreaks in neonatal patients. Traditional disinfection with antiseptics is not sufficient to eradicate the microorganisms that can persist for long periods in the different reservoirs[11]. Nurses' practices about precautions and infection prevention strategies are the cornerstones to minimize the burden of hospital acquired infections[19]. Disinfection and sterilization method and materials that using in them are necessary to ensure that medical instruments do not transmit infectious pathogens to patients. Since sterilization of all items of patient care is necessary, health care policies should determine, primarily on the basis of the items' intended use, whether cleaning, disinfection, or sterilization is indicated [12].

Objectives of the Study

1- To evaluate nurses Practices toward disinfections and sterilization methods for premature neonatal incubators.

2- To determine the instructional program on nurses knowledge regarding disinfections and sterilization methods for incubators

Table (1): Distribution of the Nurses according to their Socio-demographic Characteristics

No.	Characteristics		Study group		Control group	
			f	%	f	%
a	**Age (Years)**	20 – less than 30	25	83.4	18	60
		30 – less than 40	3	10	6	20
		40 – less than 50	1	3.3	5	16.7
		50 and more	1	3.3	1	3.3

		Total	*30*	*100*	*30*	*100*
		M±SD=	*26.5 ± 7*		*29.8 ± 8.7*	
b	**Gender**	Male	0	0	0	0
		Female	30	100	30	100
		Total	*30*	*100*	*30*	*100*

No: Number, f: Frequency, %: Percentage M: Mean, SD: Standard deviation

c	**Level of education in nursing**	Secondary school	7	23.3	15	50
		Diploma	21	70	14	46.7
		Bachelor	2	6.7	1	3.3
		Total	*30*	*100*	*30*	*100*
d	**Years of experience in nursing**	1 – less than 6	21	70	12	40
		6 – less than 11	5	16.7	8	26.7
		11 – less than 16	4	13.3	7	23.3
		16 and more	0	0	3	10
		Total	*30*	*100*	*30*	*100*
e	**Years of experience in NICU**	1 – less than 6	24	80	18	60
		6 – less than 11	3	10	4	13.3

No: Number, f: Frequency, %: Percentage, M: Mean, SD: Standard deviation

Regarding level of education, 70% of nurses in the study group are graduated with "diploma" degree while 50% of nurses in the control group are graduated from nursing secondary schools.

The years of experiences in nursing refers to "1-less than 6 years" among 70% of nurses in the study group and 40% of nurses in the control group. The years of experience in Neonate Intensive care Units refers also to "1-less than 6" years among 80% of nurses in the study group and 60% of nurses in the control group.

The descriptive analysis in table 4-1 reveals that average age for nurses in the study group refers to 26.5±7 years in which 83.4% of them are seen with age group of "20-less than 30 years". The average age for nurses in the control group refers to 29.8±8.7 years and 60% of them are associated with age group of "20-less than 30" years.

The gender variable shows that all nurses in the study group (100%) and control group (100%) are female nurses.

Table (2): Evaluation of Nurses' Practices about Disinfection and Sterilization for neonatal Incubator among Study and Control Group

Levels of practices	Study Group (N= 30)																								Control Group (N=30)																							
	Pre-test				Post-test 1				Post-test 2				Pre-test				Post-test 1				Post-test 2			
	f	%	M	S.D	f	%	M	S.D	f	%	M	S.D	f	%	M	S.D	f	%	M	S.D	f	%	M	S.D
Poor	7	23.3	15.17	4.219	0	0	35.57	.679	0	0	34.97	1.098	25	83.4	12.77	4.681	14	46.7	13.03	4.303	25	83.3	12.07	5.464
Fair	22	73.4			0	0			0	0			4	13.3			15	50			3	10		
Good	1	3.3			30	100			30	100			1	3.3			1	3.3			2	6.7		
Total	*30*	*100*			*30*	*100*			*30*	*100*			*30*	*100*			*30*	*100*			*30*	*100*		

f: Frequency, %: Percentage, M: Mean of total score, SD Standard deviation of total score Poor= 0 – 12, Fair= 12.1 – 24, Good= 24.1 – 36

This table displays the overall assessment of nurses' practices about disinfection and sterilization for premature incubator; the findings indicates that nurses in the study group are showing fair level of practices during the pre-test time (73.4%, M±SD= 15.17 ± 4.219) while they are showing good level of practices during the post-test 1 (100%, M±SD= 35.57 ± .676) and post-test 2 (100%, M±SD= 34.97 ± 1.098) that indicate the significant changes in level of practices among nurses after applying the program.

The nurses in the control group are showing poor level of practices during the pre-test (83.4%, M±SD= 12.77 ± 4.681), show fair level during post-test 1 (50%, M±SD= 13.03 ± 4.303), and show poor level during post-test 2 (83.3%, M±SD= 12.07 ± 5.464) that indicate no significant change in nurses' practices.

Table (3): Repeated Measure Analysis of Variance (RM-ANOVA) Test for Effectiveness of Instructional Program on Nurses' Practices about Disinfection and Sterilization for Premature Incubator among the Study Group (N=30)

Descriptive		Within-Subjects Effect								
Practices	Mean (S.D)	Source		Type III Sum of Squares	df	Mean Square	F	P-value	Sig.	Partial Eta Squared
Pre-test 15.17 (4.219) Post-test I 35.57 (.679) Post-test II 34.97 (1.098)	15.17 (4.219)	Time	Sphericity Assumed	8085.600	2	4042.800	709.692	.001	H.S	.961
	35.57 (.679)		**Greenhouse-Geisser**	**8085.600**	**1.160**	**6968.295**	**709.692**	**.001**	**H.S**	**.961**
	34.97 (1.098)		Huynh-Feldt	8085.600	1.179	6860.674	709.692	.001	H.S	.961
			Lower-bound	8085.600	1.000	8085.600	709.692	.001	H.S	.961
		Error(Time)	Sphericity Assumed	330.400	58	5.697				
			Greenhouse-Geisser	330.400	33.650	9.819				

| | | | Huynh-Feldt | 330.400 | 34.178 | 9.667 | | | | | |
| | | | Lower-bound | 330.400 | 29.000 | 11.393 | | | | | |

S.D: Standard Deviation, df: Degree of Freedom, f: F-statistics, P-value: probability value, Sig: Significance, H.S:

High Significant

This table exhibits that analysis of RM-ANOVA test indicates that instructional program was highly effective on nurses' practices among the study group evidenced by high significance associated with

"Greenhouse-Geisser" correction at p-value=0.001 and the Eta squared that indicate large size effect (.961). It is clear out of descriptive data the noticeable increasing of mean score on nurses' practices during post-test 1 and 2 that indicate the effectiveness of instructional program.
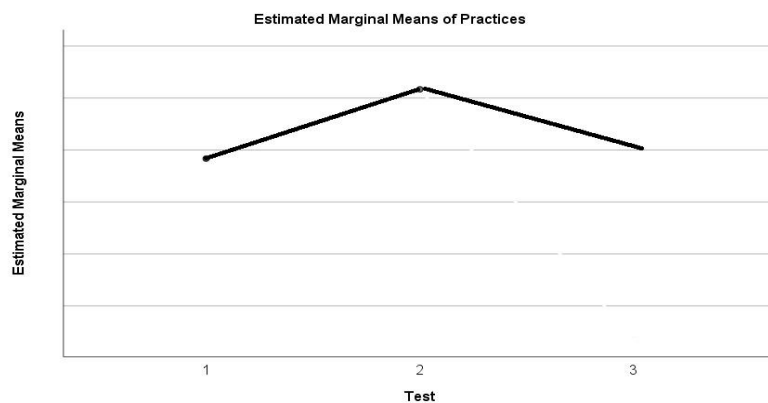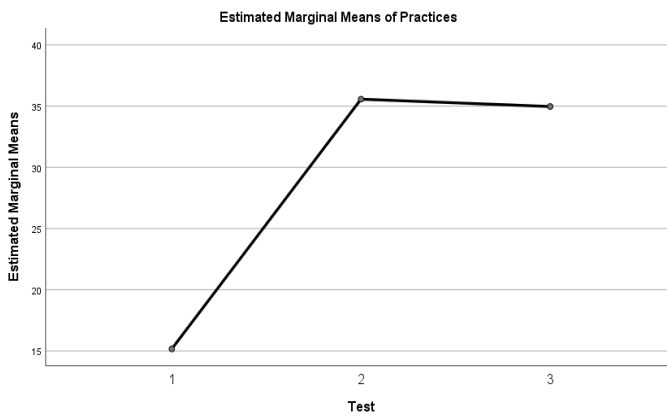
Study Group   **Control Group**

Figure (1): Estimated Marginal Mean for Nurses' Practices about Disinfection and Sterilization for Premature Incubator among Study and Control Groups

This figure exhibits the noticeable increasing of nurses' practices over the three time among the study group while among the control group there is no clear change over the three times.

Table (4): Relationship between Nurses' Practices with regard to their Age among Study and Control Groups

Practices / Age	Study group (N==30)				Control group (N=30)			
	Poor	Fair	Good	Total	Poor	Fair	Good	Total
20 – less than 30	7	17	1	25	15	2	1	18
30 – less than 40	0	3	0	3	5	1	0	6

40 – less than 50	0	1	0	1	4	1	0	5
50 and more	0	1	0	1	1	0	0	1
Total	7	22	1	30	25	4	1	30
Spearman Correlation	r_S = 0.361		*p-value = 0.089*		*Sig.= N.S*	r_S = 0.075	*p-value = 0.695*	*Sig.= N.S*

P= Probability, Sig= Significance, N.S= Not significant, S= Significant, H.S= High significant

This table reveals that there is no significant relationship has been found between nurses' practices with regard to their age among study group and control group.

Table (5): Relationship between Nurses' Practices with regard to their Level of Education among Study and Control Groups

Practices / Education	Study group (N==30)				Control group (N=30)			
	Poor	Fair	Good	Total	Poor	Fair	Good	Total
Secondary school	0	7	0	7	12	3	0	15
Diploma	7	14	0	21	13	1	0	14
Bachelor	0	1	1	2	0	0	1	1
Total	7	22	1	30	25	4	1	30
Spearman Correlation	r_S = 0.241 N.S		*p-value = 0.200*		*Sig.=*	r_S = 0.064 N.S	*p-value = 0.736*	*Sig.=*

P= Probability, Sig= Significance, N.S= Not significant, S= Significant, H.S= High significant

This table indicates that there is no significant relationship has been found between nurses' practices with regard to their level of education among study group and control group.

Table (6): Relationship between Nurses' Practices with regard to their Years of Experience in Nursing among Study and Control Groups

Practices / Years	Study group (N==30)				Control group (N=30)			
	Poor	Fair	Good	Total	Poor	Fair	Good	Total
1 – less than 6	6	14	1	21	10	2	0	12
6 – less than 11	1	4	0	5	7	0	1	8
11 – less than 6	0	4	0	4	6	1	0	7
16 and more	0	0	0	0	2	1	0	3
Total	7	22	1	30	25	4	1	30

Spearman Correlation	r_S = 0.236 p-value = 0.208 Sig.= N.S	r_S = 0.079 p-value = 0.678 Sig.= N.S

P= Probability, Sig= Significance, N.S= Not significant, S= Significant, H.S= High significant

This table reveals that there is no significant relationship has been found between nurses' practices with regard to their years of experience among study group and control group.

Table (7): Relationship between Nurses' Practices with regard to their Years of Experience in NICU among Study and Control Groups

Practices / Years	Study group (N==30)				Control group (N=30)			
	Poor	Fair	Good	Total	Poor	Fair	Good	Total
1 – less than 6	6	17	1	24	16	2	0	18
6 – less than 11	1	2	0	3	3	0	1	4
11 – less than 6	0	3	0	3	4	2	0	6
16 and more	0	0	0	0	2	0	0	2
Total	7	22	1	30	25	4	1	30
Spearman Correlation	r_S = 0.208 p-value = 0.271 Sig.= N.S				r_S = 0.224 p-value = 0.234 Sig.= N.S			

P= Probability, Sig= Significance, N.S= Not significant, S= Significant, H.S= High significant

This table reveals that there is no significant relationship has been found between nurses' practices with regard to their years of experience in NICU among study group and control group.

Discussion

Based on the study results table (1-a) most nurses in control grope and study grope are of the age (20-30) years supported by a study previous conducted, This finding was in agreement with the result of Alfahdawey and Aziz [13], and the study showed in table (1-b) all nurses in control grope and study grope were female This finding was in agreement with Alfahdawey and Aziz,2018[13]. 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. The opinion of the researcher is that the nursing staff working in the NICU should be women, because women have more knowledge in caring for neonates due to the maternal side in the women .

The study results showed in table (1-c) 70% of nurses in the study group are graduated with "diploma" This finding was in agreement with

Mohamed,(2022)[14]. which is in agreement with WHO which reported that only 15.2% graduated from the nursing college. while 50% of nurses in the control group are graduated from nursing secondary schools, this results ware agreement with AL- Joda,(2018)[15] that reveal that the majority of nurses in control group ware from secondary schools . These results come from the graduation of a number of nursing high school students that were present in this city and their appointment in these two hospitals before you closed this school, where a health institute affiliated with the Department of Health was opened that graduates many nurses who hold a diploma in nursing

The table (1-d and e) showed that years of experiences in nursing refers to "1-less than 6 years" among 70% of nurses in the study group and 40% of nurses in the control group. The years of experience in Neonate Intensive care Units refers also to "1-less than 6" years among 80% of nurses in the study group and 60% of nurses in the control group. In regard to the years of experience in the hospitals and neonatal care unit. The results in tables reveal that of the nurses are working in nursing for the period of (1-5) years than third of them are working in pediatric nursing wards

and hospitals for the same period, the current finding is consistent with the study of AL- Joda,(2018)[15]

The study results showed in table (2-3) The results indicated that the nurses' practices were weak at the previous level[16] and became at a good level after 1 and after 2. Nurses' practices improved after applying the educational program. The response was positive by the nurses to the educational program, and this indicates that the program was effective and useful in developing nurses' practices. These results are supported by Khudhair SH,2016[18]

Table 4,5,6,and 7 respectively indicated that there were no statistical significant association between nurses' practices and their age, educational level, years of experiences in nursing and years of experiences in the neonatal intensive care units[17] and experiences in nursing (p>0.05). These results agree with Khudhair SH,2016[18]

Conclusion:

The study concluded that there was a (poor level) of practices among nurses at neonatal intensive care unit toward disinfection and sterilization of neonates incubators in pre-test and then improved to (good level) practice in post-test (1), and post-test (2) , The educational program was effective in increasing the nurse's practices regarding disinfection and sterilization of neonates incubators

Recommendations:

1- Great emphasis should be directed toward the educational aspects at neonatal intensive care unit by providing educational posters, guidelines, pamphlets and manuals and providing educational guidelines, pamphlets about disinfection , sterilization and disinfectants processes that used in neonates incubators .

2- constructed training courses for and congresses held by specialists in disinfection , sterilization and disinfectants processes that used in neonates incubators .

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