

## Effect of Staff Development Program on Nurses' Performance Regarding Quality Standards of Neonatal Care

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### Abstract

**Background:** The quality standards of neonatal care provide a basis for what is expected and required, support the monitoring and measurement of performance against measures of best practice in order to identify priorities for improvement and provide information on how best practice can be used to support high quality neonatal care. **The aim** of this study was to assess the effect of staff development program on nurses' performance regarding quality standards of neonatal care. **Design:** A quasi-experimental design was used in carrying out the study. **Setting:** The study was conducted at the Neonatal Care Units at Mansoura University Children's Hospital, Mansoura General Hospital and Mansoura Hospital for Health Insurance. **Subjects:** A convenient sample of 103 nurses working in neonatal intermediate care units in the previously mentioned study settings. **Tools:** Data were collected using the following tools; self-administered questionnaire sheet to assess nurses' knowledge about neonatal care standards and standardized practical observational checklist to assess the nurses' application of neonatal care standards in the intermediate care units (Level II). **Results:** The study results revealed that there was statistical significant difference in relation to nurses' knowledge and practices regarding standards of neonatal care in the intermediate care units pre, immediate post and at follow up of staff development program implementation. It was found that more than four fifth of nurses had poor knowledge before program implementation, while, immediately after the program and at follow up, 98% and 94.2% of them had good knowledge respectively. All of nurses achieved incompetent practice before the program implementation, while 36% and 16.5% of them achieved competent practice immediate post program and at follow up respectively. **Conclusion:** There was a significant positive effect of staff development program on nurses' knowledge, while, there was a limited positive effect on their practices and on the achievement of quality standards of neonatal care. **Recommendations:** Emphasize on the importance of conducting periodical continuing staff development programs for neonatal nurses to improve their performance, and to achieve the quality standards of neonatal care.

**Key words:** Quality standards of neonatal care, Neonatal nurses, Staff development program.

### Introduction

The birth of a healthy neonate is one of the finest gifts of nature. Neonatal period, comprising the first 28 days of life is considered a stage of vulnerability to

neonate's health and represents the time of the greatest risk to the neonate. Neonatal period is responsible for 60% to 70% of infant deaths in recent decades, occurring mainly until the 6<sup>th</sup> day of life, being the key indicator of quality of care to neonates. Therefore, this requires

proper care, greater vigilance and monitoring by health professionals (**American Academy of Pediatrics [AAP], 2016**). Recently, the progression in neonatal care has enabled better survival of broad spectrum of neonates. In this respect, neonatal care having a great importance for the proper development and wellness of neonates. Meanwhile, a healthy start to neonatal period is vital in establishing the neonate's healthy life (**Ferreira Pinheiro, Santos Tinoco, Souza da Silva Rocha, Paulino Rodrigues, de Oliveira Lyra & Fernandes Ferreira, 2016**).

Quality is not a luxury, it is a basic requirement of any service. Continuous attention to quality is a requirement for the survival of any care. Quality of neonatal care is a key component of the neonatal health right and the route to equity and dignity for neonates. So, the objective of effective high-quality neonatal care is to deliver the best services that safely attend to the neonates' needs at the right time in the right place to achieve the highest impact on neonatal survival and well-being (**World Health Organization [WHO], 2017**). The issue of quality of neonatal care is not new, since the 1960s, there was increasing interest in the quality of neonatal care on the part of providers and organizations. The concepts about quality and how to achieve it are considered the key to neonatal survival in the 1990s and beyond (**Beattie, Shepherd & Howieson, 2017**). Moving beyond 2015, the WHO envisions a world where 'every neonate receives quality care throughout the postnatal period.' This vision is in alignment with the complementary global action agenda conceptualized by WHO and partners in 2013–2014 'Strategies toward Every Newborn Action Plan (ENAP)' that provides a road map of strategic actions for ending preventable neonatal morbidity and mortality (**Tunçalp et al., 2015**).

Quality of neonatal care must never become some abstract concept or theoretical pursuit. A focus on quality means a focus on

how we can positively transform the lives of neonates. In contrast, a failure to focus on quality and to make it the primary concern can result in lasting emotional and physical damage to neonates and even death. In this respect, the management of neonates at neonatal care units should be based on various modalities of support and application of standard protocols of care for achievement of quality care and improving neonates' outcomes (**Brenner, De Allegri, Gabrysch, Chinkhumba, Sarker & Muula, 2015**).

The quality standards have been a part of the nursing world since Nightingale. A standard is a professionally agreed level of performance or a pre-determined baseline level of excellence that comprises a model to be followed and practiced. These standards are the key actions that provide a basis for delivery of effective and equitable neonatal services. Hence, the quality standards are intended to drive up the quality of care and considered an integrated approach for provision of services that a fundamental to the delivery of high quality care to neonates in need of special neonatal services (**WHO, 2016**).

The strategic approach of the Egyptian Ministry of Health (MOH) underscores the importance of quality and integration as essential components to the implementation of sustainable neonates' services at hospital levels. Hence, over the last 30 years, the MOH in partnership with the United States Agency for International Development (USAID) and other partners have developed the essential neonatal nursing care protocols that made steady and significant strides in reducing neonatal morbidity and mortality through appreciable improvements in neonatal health care. These protocols reflect the most recent clinical evidence-based nursing practices and have been adapted for use in district and general hospitals in Egypt to standardize nursing management among neonatal nurses in providing quality integrated neonatal health services. (**Ministry of Health and**

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**Population [MOHP] & United States Agency for International Development [USAID], 2010).**

Therefore, optimum neonatal health and positive developmental outcomes for neonates depend on healthcare providers who can provide consistency in standards of care based on current best evidence, and who are competent and professionally accountable within their role (Duff, Gardner & Osborne, 2014). Neonatal nurses who are in continuous interaction with neonates play a vital role in providing neonatal services. Hence, they have an important role in keeping track of the recent information and techniques related to neonatal care, interpreting the findings and preventing irreversible mistakes. The crucial role of nurses in scientific progress within the field of neonatal nursing reveals the necessity of professional development to be liable for quality nursing care (Sajjadnia et al., 2015).

Neonatal care has come a long way in a short time. Beside supportive technology and treatment advances, there have been equally worthy care innovations, comprising competencies and standards designed and developed to sustain enhanced and safe quality care. In ensuring the continuity of evidenced based effective care for neonates and high quality in the neonatal care unit environment, the highlights to ensure competent practice through continuous opportunities for professional development should be emphasized. This can be accomplished by planning an inventive and flexible service supported by proper educational development programs that should be efficient and effective in light of an ever-changing healthcare and support nurses to be ethically, personally and professionally liable for quality nursing care.

### **Aim of the study**

This study aimed to assess the effect of staff development program on nurses'

performance regarding quality standards of neonatal care.

### **Research hypothesis:**

1- The implementation of the staff development program may improve the nurses' knowledge and practice about quality standards of neonatal care.

2- The implementation of the staff development program may achieve the quality standards of neonatal care.

### **Subjects and Methods**

#### **Design:**

A quasi-experimental design was utilized for this study.

#### **Setting:**

The study was carried out in the Neonatal Care Units at Mansoura University Children's Hospital (MUCH), Mansoura General Hospital and Mansoura Hospital for Health Insurance (International Hospital for Sandou).

#### **Subjects:**

The subjects of the present study included a convenient sample of all neonatal nurses working in the intermediate care units in the previously mentioned settings, the total number of nurses was (103), 63 nurses at Mansoura University Children's Hospital (MUCH), 21 nurses at Mansoura General Hospital and 19 nurses at Mansoura Hospital for Health Insurance. The nurses' inclusion criteria were being a permanent nursing staff regardless their age, qualification or years of experience in the workplace.

**Tools:** The data were collected by the following study tools:

**Tool (I): Self-administered questionnaire sheet (pre, post & follow up):**

This tool was designed by the researcher based on reviewing of recent related literature and written in simple Arabic language to assess nurses' knowledge about neonatal care standards and composed of four parts in the form of open and closed ended questions, it included:

**Part I: Characteristics of the nurses,** which include: age, educational level, years of experience and previous attendance of training program related to neonatal care standards.

**Part II: Nurses' knowledge about the quality of neonatal nursing care.** It was consisted of 6 questions, which includes: definition, goals, criteria and standards of neonatal nursing care quality, importance of monitoring neonatal nursing care quality, and the barriers hindering nurses' application of neonatal nursing care standards.

**Part III: Nurses' knowledge about common health problems of neonates.** It was consisted of 39 questions, which includes:

A-Nurses' knowledge about preterm neonates (5 questions), such as definition, causes, clinical manifestations, associated health problems, and nursing care for preterm neonates.

B-Nurses' knowledge about hypothermia in neonates (7 questions), such as, definition, causes, risk factors, clinical manifestations, and nursing care of neonatal hypothermia.

C-Nurses' knowledge about neonatal jaundice (7 questions), such as normal range of bilirubin in the blood , causes, clinical manifestations, complications of hyperbilirubinemia, side effects of phototherapy, and nursing care for neonates under phototherapy.

D-Nurses' knowledge about respiratory distress syndrome (RDS) (5 questions), such

as normal range of respiratory rate, causes, clinical manifestations, assessment of respiratory distress grades, and nursing care for neonates with respiratory distress syndrome.

E-Nurses' knowledge about birth asphyxia (4 questions), such as causes, grades, and nursing care of birth asphyxia.

F-Nurses' knowledge about infants of diabetic mothers (IDM) (8 questions), such as normal range of blood glucose level, characteristics of infants of diabetic mothers, causes of hypoglycemia of IDM, clinical manifestations, associated health problems, and nursing care for IDM.

G-Nurses' knowledge about neonatal sepsis (3 questions), such as risk factors, clinical manifestations and nursing care of neonatal sepsis.

**Part IV: Nurses' knowledge about standards of neonatal care in the intermediate care units ( Level II ).** It was consisted of 43 questions related to nurses' role at neonate's admission (3 questions), neonatal assessment (10 questions), daily care of neonates (4 questions), feeding of neonates (12 questions), positioning of neonates (3 questions), and infection control in neonatal care units (11 questions).

**Scoring system:**

Nurses' answers were checked against the pre designed model key answer and accordingly; their knowledge were computed and the items were classified and evaluated as follows:

**A:** The questions that had more than one answer and the open-ended questions were evaluated as follows:

- A correct and complete answer was given the score (2)

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- A correct and incomplete answer was given the score (1)

- An incorrect or unknown answer was given the score (0)

**B:** The closed questions were evaluated as follows:

- A correct answer was given the score (2)
- An incorrect or unknown answer was given the score (0)

The nurses' answers were categorized as follows:

- Good level of knowledge :  $\geq 75\%$
- Average level of knowledge :  $\geq 60\% < 75\%$
- Poor level of knowledge :  $< 60\%$

**Tool (II): Standardized Practical Observational Checklists:** It was adopted by researchers from the Egyptian Ministry of Health and Population in collaboration with the United States Agency for International Development (USAID) and its Technical Assistance Contractor, John Snow, Inc (JSI) (Sheha et al., 2010). This tool was used to assess the nurses' application of quality standards of neonatal care in the intermediate care units (Level II). It was composed of the following parts:

### **Part 1: Neonate's admission in the intermediate care unit, which included:**

A: Preparation for neonate's admission (10 Items).

B: Procedures of neonate's admission (18 Items).

### **Part 2: Assessment of neonates, which included:**

A: General appearance (8 Items).

B: Vital signs (18 Items).

C: Growth measurements (21 Items).

### **Part 3: Daily care of neonates in the intermediate care unit (15 Items).**

#### **Part 4: Baby bath, which included:**

A: Preparation for bathing (4 Items).

B: Baby bath technique (23 Items).

#### **Part 5: Feeding of neonates, which included:**

A: Bottle feeding preparation and technique (23 Items).

B: Gavage feeding:

1. Nasogastric / orogastric tube inserting technique (14 Items).

2. Gavage feeding technique (20 Items).

#### **Part 6: Intravenous therapy preparation and technique (42 Items).**

#### **Part 7: Insertion and removal of intravenous cannula technique:**

A: Technique of intravenous cannula insertion (24 Items).

B: Technique of intravenous cannula removal (10 Items).

#### **Part 8: Blood Sampling collection, which included:**

A: Intravenous blood sampling technique (17 Items).

B: Technique of blood sampling collection through broken needle (16 Items).

C: Capillary blood sampling technique (12 Items).

D: Arterial blood sampling technique (16 Items).

#### **Part 9: Oxygen therapy (11 Items).**

#### **Part 10: Suctioning, which included:**

A: Nasopharyngeal / oropharyngeal suctioning technique (18 Items).

**Part 11: Infection control techniques (26 Items).**

➤ **Scoring system:**

The score for each observation in the standardized practical observational checklist was evaluated as follows:

- A correct and completely done was given the score (2)
- A correct and incompletely done was given the score (1)
- An incorrect or not done was given the score (0)

Total nurses' scores were categorized as follows:

- Competent level score:  $\geq 85\%$
- Incompetent level score:  $< 85\%$

**Methods:**

▪ Official permission to conduct the study was obtained from the responsible authorities of Mansoura University Children's Hospital (MUCH), Mansoura General Hospital and Mansoura Hospital For Health Insurance (International Hospital for Sandouq).

▪ Ethical approval was obtained from the Research Ethics Committee of Faculty of Nursing / Mansoura University. The researcher obtained the oral consent from each nurse for her participation after explaining the aim of the study and privacy and confidentiality of data. The nurses assured that, they can withdraw at any stage from the study without any responsibilities.

▪ Review of related literature covering various aspects of quality standards of neonatal care in intermediate care units (Level II). This was done using available books, articles, journals and internet search to be acquainted with previous and current relevant literature and to develop tools of the study for data collection.

▪ The developed tools were tested for their **reliability** using Alpha Cronbach's test. The alpha reliability for tool I was 0.887 and tool II was 0.916.

▪ Tools of the study were tested through jury members in the field of the study to ensure content **validity** of tools and necessary modification was done.

▪ The pilot study was conducted on 10% of the studied nurses (n=10) to evaluate clarity and applicability of the tools and to estimate the required time to fulfill the study tools. Some items of the questionnaire were modified and unnecessary procedures were omitted. The sample of pilot study was excluded from the study.

▪ The purpose of the study was explained by the researcher to each nurse. The researcher was available at different times on morning and afternoon shifts for data collection.

▪ Each nurse was assessed individually for her knowledge and actual practices regarding quality standards of neonatal care through a self-administered questionnaire sheet and standardized practical observational checklist.

▪ Based on the findings of the assessment and review of literature, the staff development program was developed and implemented for nurses according to their actual need assessment. The staff development program was conducted in fifteen sessions, included eight theoretical and seven practical sessions. Time for each session was varied from 30 to 45 minutes. The program was consisted of:

• **Theoretical sessions about :**

1. Quality of neonatal nursing care.
2. Levels of neonatal care units.
3. Common health problems of neonates in the intermediate care units (Level II):

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- Preterm baby.
- Hypothermia.
- Hyperbilirubinemia.
- Respiratory distress syndrome (RDS).
- Birth asphyxia.
- Infant of diabetic mother.
- Neonatal sepsis.

- 4 - Assessment of neonates.
- 5 - Feeding of neonates.
- 6 - Daily care of neonates.
- 7 - Infection control.

### • Practical sessions regarding:

1. Neonate's admission in the intermediate care unit.
2. Assessment of neonates.
3. Daily care of neonates.
4. Feeding of neonates.
5. Blood sampling collection.
6. Intravenous therapy.
7. Oxygen therapy.
8. Suctioning.
9. Infection control techniques.

■ Nurses was divided into small groups; five in each group. Various teaching methods were used in the form of lectures, group discussion, demonstration and re-demonstration. Various teaching media were used, such as power point, videos, real objects, flip chart, and handout guidelines regarding quality standards of neonatal care in intermediate care units. The program was carried out in the unit and in class.

■ Moreover, the instructional booklet was given to each nurse to attract her attention, motivate and help her for reviewing, and support teaching and practice regarding quality standards of neonatal care.

■ Nurses' knowledge and practices were reassessed immediately after the implementation of the program (post test), and three months later (follow up).

### Statistical Analysis

■ The collected data were revised, coded, tabulated and analyzed by using the number and percentage distribution

■ Data were analyzed using compatible personal computer using the Statistical Package for Social Sciences (SPSS) for windows version 21 (SPSS Inc., Chicago, IL, USA).

■ Graphics were done by using Excel program.

■ Chi-square test ( $\chi^2$ ), Friedman test, Fisher exact test and Wilcoxon Signed Ranks test (Z test) were used to estimate the statistical significance between variables of the study.

■ A significant difference was considered when ( $P < 0.05$ ).

### Result:

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**Figure (1):** illustrated that , more than one third of the studied nurses (38.8%) were in the age group from 25 to less than 30 years, while 28.2% of them had an age from 20 to less than 25 years. The nurses' mean age was  $29.1 \pm 6.13$  years.

**Figure (2):** Concerning educational level of the studied nurses, revealed that the highest percentage of the nurses (63.1%) had bachelor degree in nursing, while, 21.4% of them had a secondary school nursing certificate and the minority of them (5.8%) had technical nursing institute certificate.

**Figure (3):** It is clear from that a relatively high percentage of the studied nurses (35.9%) had more than 10 years of experience, while the minority of them (5.8%) had less than one year of experience. The mean of nurses' years of experience was  $3 \pm 0.9128$  years.

**Figure (4):** It was observed from that 87.4% of the studied nurses did not attain any previous training courses related to neonatal care.

**Table (1):** It is clear from that, there was statistical significant difference in relation to total knowledge of nurses regarding quality of neonatal nursing care pre, immediate post and follow up of staff development program implementation ( $\chi^2 = 251.052$  &  $P < 0.001$ ). It was noted that, all nurses (100%) had poor knowledge preprogram, while 83.5% and 52.4% of them had good knowledge immediately post program and at follow up respectively.

Concerning total nurses' knowledge about common health problems of neonates, it was found that, there was statistical significant difference pre, immediate post and at follow up ( $\chi^2 = 246.070$  &  $P < 0.001$ ). It was noted that, approximately three quarters of nurses (73%) had poor knowledge pre program, while the great majority (96%) and the majority (86.4%) of them had good knowledge immediately post program and at follow up respectively.

Regarding total nurses' knowledge about standards of neonatal care in the intermediate care units (Level II), it was observed that, there was statistical significant difference pre, immediate post program and at follow up ( $\chi^2 = 266.110$  &  $P < 0.001$ ). It was also noted that, only 7.7% of nurses had good knowledge pre program. While, this percentage improved to 99% immediately post program & at follow up.

In relation to total nurses' knowledge, it was found that, there was statistical significant difference pre, immediate post program and at follow up ( $\chi^2 = 179.844$  &  $P < 0.001$ ). It was noted that, the majority of nurses (81.5%) had poor knowledge pre program. While, immediately after the program & at follow up, 98% and 94.2% of nurses had good knowledge respectively.

**Table (2):** It is evident from that, there was statistical significant difference in relation to total nurses' practices regarding neonates' admission in the intermediate care unit (Level II) pre, immediate post program and at follow up ( $\chi^2 = 19.864$  &  $P < 0.001$ ). It was observed that, none of nurses (0%) achieved competent practice pre program. While, 18.4% & 11.7% of them achieved competent practice immediately post program and at follow up respectively.

Additionally, it was observed that, there was statistical significant difference in relation to total nurses' practices regarding assessment of neonates pre, immediate post and follow up of staff development program implementation ( $\chi^2 = 73.928$  &  $P < 0.001$ ). It was observed that, none of nurses (0%) achieved competent practice pre program, compared to more than half of them (51.5%) immediately post program and less than half of them (44.7%) at follow up.

In relation to total nurses' practices regarding daily care of neonates in the intermediate care unit, it was found that, there was statistical significant difference pre, immediate post and follow up of staff development program implementation ( $\chi^2 = 25.340$  &  $P < 0.001$ ). It was noted that, all of the nurses (100%) achieved incompetent practice pre program. While, 21.4% & 19.4% of them achieved competent practice immediately post program & at follow up respectively.

Concerning total nurses' practices regarding baby bath, it was observed that, there was statistical significant difference pre, immediate post program and at follow up ( $\chi^2 = 66.425$  &  $P < 0.001$ ). It was noted that, 71% of nurses achieved competent practice pre program, compared to all of them (100%) immediately post program & at follow up.

Regarding total nurses' practices regarding feeding of neonates, it was found that, there was statistical significant difference

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pre, immediate post program and at follow up ( $\chi^2= 74.899$  &  $P < 0.001$ ). It was noted that, none of nurses (0%) achieved competent practice pre program, compared to more than half of them (51.5%) immediately post program. On the other hand, this percentage decreased to 21.4% at follow up.

Additionally, it was noted that, there was statistical significant difference in relation to total nurses' practices regarding intravenous (IV) Therapy pre, immediate post program and at follow up ( $\chi^2= 19$  &  $P < 0.001$ ). It was noted that, only 19.4% of nurses achieved competent practice pre program, compared to 47.6% & 39.8% of them immediately post program & at follow up respectively.

Concerning total nurses' practices regarding blood sampling collection it was observed that, there was statistical significant difference pre, immediate post and follow up of staff development program implementation ( $\chi^2= 54.885$  &  $P < 0.001$ ). It was noted that, all of nurses (100%) achieved incompetent practice pre program, while 58.3% of them achieved competent practice immediate post program. On the other hand, this percentage decreased to 36% at follow up.

Also, it is clear that, there was statistical significant difference in relation to total nurses' practices regarding oxygen therapy pre, immediate post and follow up of staff development program implementation ( $\chi^2= 123.139$  &  $P < 0.001$ ). It was found that, approximately two fifth of nurses (39.8%) achieved competent practice pre program, compared to all of them (100%) and 91.3% of them immediately post program & at follow up respectively.

In relation to total nurses' practices regarding nasopharyngeal and oropharyngeal suctioning, it was found that, there was

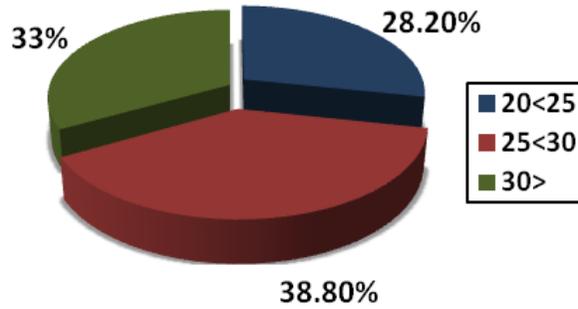
statistical significant difference pre, immediate post and follow up of staff development program implementation. ( $\chi^2= 70.433$  &  $P < 0.001$ ). It was noted that, All of nurses (100%) achieved incompetent practice pre program. While, more than half of them (50.5%) & more than two fifth of them (41.7%) achieved competent practice immediately post program & at follow up respectively.

Also, it is clear that, there was statistical significant difference in relation to total nurses' practice regarding infection control techniques pre, immediate post program and at follow up ( $\chi^2= 37.248$  &  $P < 0.001$ ). It was found that, none of nurses (0%) achieved competent practice pre program, compared to 31% of them immediately post program & more than one quarter of them (26.2%) at follow up.

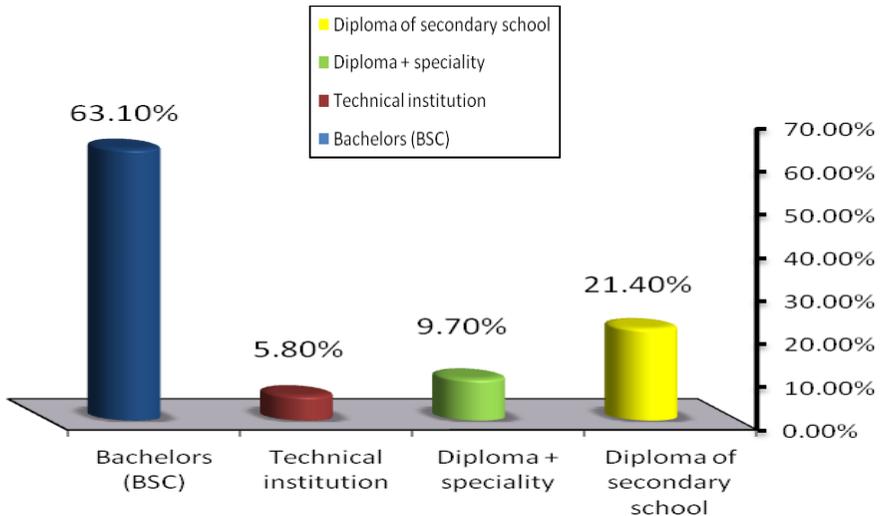
**Table (2):** Additionally, It is evident from that, there was statistical significant difference in relation to total nurses' practices regarding standards of neonatal care in the intermediate care units (Level II) pre, immediate post and follow up of staff development program implementation ( $\chi^2= 46.182$  &  $P < 0.001$ ). It was noted that, all of nurses (100%) achieved incompetent practice pre program. While, more than one third of them (36%) achieved competent practice immediately post program. On the other hand, this percentage declined to 16.5% at follow up of the program.

**Table(3):** Concerning relation between total nurses' knowledge and their total practices, reveals that, there was no statistical significant relation between total knowledge of nurses and their total practices immediately post and at follow up of staff development program implementation.

**Figure (1):** Distribution of the Nurses according to their Age in Years.



**Figure (2);** Distribution of the Nurses according to their Educational Level



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Figure (3); Distribution of the Nurses in relation to their Years of Experience

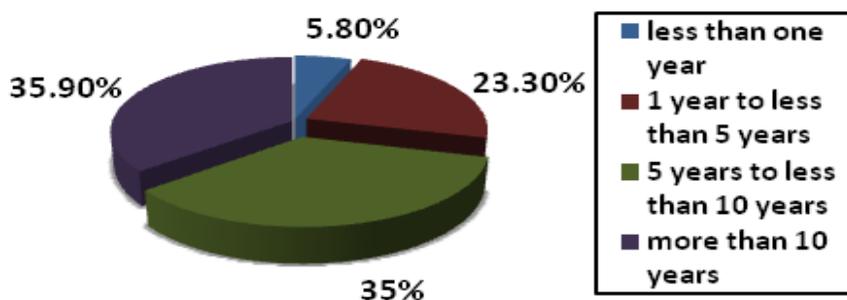
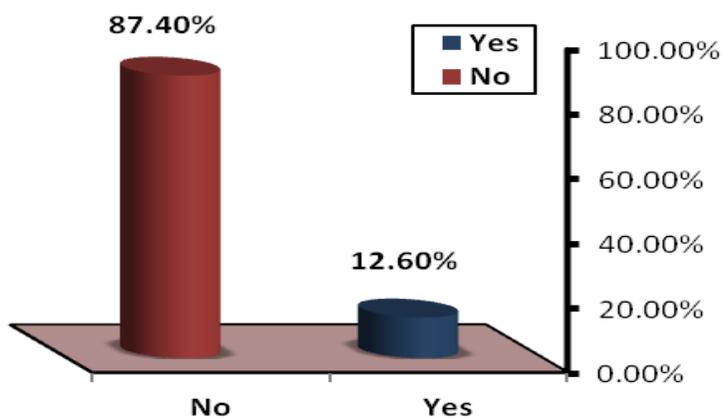


Figure (4); Distribution of the Nurses according to their Attainment of Previous Training Courses



**Table (1):** Number and Percentage Distribution of Total Nurses' Knowledge about Quality Standards of Neonatal Nursing Care in the Intermediate Care Units Pre, Immediate Post and at Follow Up.

Variables	Total number of nurses = 103 (100%)						Test of significance $\chi^2$ & P
	Pre		Immediate post		Follow up		
	No	%	No	%	No	%	
<b>Nurses' knowledge level about quality of neonatal nursing care</b>							251.052
- Good	0	0	86	83.5	54	52.4	< 0.001*
- Average	0	0	9	8.7	32	31.1	
- Poor	103	100	8	7.8	17	16.5	
<b>Nurses' knowledge level about common health problems of neonates</b>							246.070
- Good							< 0.001*
- Average	4	4	99	96	89	86.4	
- Poor	24	23	4	4	13	12.6	
	75	73	0	0	1	1	
<b>Nurses' knowledge level about standards of neonatal care in the intermediate care units</b>							266.110
- Good	8	7.7	102	99	102	99	< 0.001*
- Average	22	21.4	1	1	1	1	
- Poor	73	70.9	0	0	0	0	
<b>Total nurses' knowledge level</b>							179.844
- Good	1	1	101	98	97	94.2	< 0.001*
- Average	18	17.5	2	2	6	5.8	
- Poor	84	81.5	0	0	0	0	

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**Table (2):** Number and Percentage Distribution of Total Nurses' Practices regarding Standards of Neonatal Care in the Intermediate Care Units (Level II) Pre, Immediate Post and at Follow Up.

Variables	Total number of nurses = 103 (100%)						Test of significance $\chi^2$ & P
	Pre		Immediate post		Follow up		
	No	%	No	%	No	%	
<b>Total nurses' practices level regarding neonates' admission in the intermediate care unit (Level II)</b>							19.864 <b>&lt; 0.001*</b>
- Competent practice	0	<b>0</b>	19	<b>18.4</b>	12	<b>11.7</b>	
- Incompetent practice	103	100	84	81.6	91	88.3	
<b>Total nurses' practices level regarding assessment of neonates</b>							73.928 <b>&lt; 0.001*</b>
- Competent practice	0	<b>0</b>	53	<b>51.5</b>	46	<b>44.7</b>	
- Incompetent practice	103	100	50	48.5	57	55.3	
<b>Total nurses' practice level regarding daily care of neonates in the intermediate care unit</b>							25.340 <b>&lt; 0.001*</b>
- Competent practice	0	<b>0</b>	22	<b>21.4</b>	20	<b>19.4</b>	
- Incompetent practice	103	<b>100</b>	81	78.6	83	80.6	
<b>Total nurses' practice level regarding baby bath</b>							66.452 <b>&lt; 0.001*</b>
- Competent practice	73	<b>71</b>	103	<b>100</b>	103	<b>100</b>	
- Incompetent practice	30	29	0	0	0	0	
<b>Total nurses' practice level regarding feeding of neonates</b>							74.899 <b>&lt; 0.001*</b>
- Competent practice	0	<b>0</b>	53	<b>51.5</b>	22	<b>21.4</b>	
- Incompetent practice	103	100	50	49.5	81	78.6	
<b>Total nurses' practice level regarding intravenous (IV) therapy</b>							19 <b>&lt; 0.001*</b>
- Competent practice	20	<b>19.4</b>	49	<b>47.6</b>	41	<b>39.8</b>	
- Incompetent practice	83	80.6	54	52.4	62	60.2	
<b>Total nurses' practice level regarding blood sampling collection</b>							54.885 <b>&lt; 0.001*</b>
- Competent practice	0	<b>0</b>	43	<b>58.3</b>	37	<b>36</b>	
- Incompetent practice	103	<b>100</b>	60	41.7	66	64	
<b>Total nurses' practice level regarding oxygen therapy</b>							123.139 <b>&lt; 0.001*</b>
- Competent practice	41	<b>39.8</b>	103	<b>100</b>	94	<b>91.3</b>	
- Incompetent practice	62	60.2	0	0	9	8.7	
<b>Total nurses' practice level regarding nasopharyngeal / oropharyngeal suctioning</b>							70.433 <b>&lt; 0.001*</b>
- Competent practice	0	<b>0</b>	52	<b>50.5</b>	43	<b>41.7</b>	
- Incompetent practice	103	<b>100</b>	51	49.5	60	58.3	
<b>Total nurses' practice level regarding infection control techniques</b>							37.248 <b>&lt; 0.001*</b>
- Competent practice	0	<b>0</b>	32	<b>31</b>	27	<b>26.2</b>	
- Incompetent practice	103	100	71	69	76	73.8	
<b>Total nurses' practices level</b>							46.182 <b>&lt; 0.001*</b>
- Competent practice	0	<b>0</b>	37	<b>36</b>	17	<b>16.5</b>	
- Incompetent practice	103	<b>100</b>	66	64	86	83.5	

(\*) Statistically significant at  $P < 0.05$

**Table (3):** Relation Between Total Nurses' Knowledge and their Total Practices Pre, Immediate Post & Follow up of Staff Development Program Implementation.

Practices	Total number of nurses = 103 (100%)						$\chi^2$	P
	Knowledge							
	Poor		Average		Good			
No	%	No	%	No	%			
<b>Pre:</b>								
- Competent practice	0	0	0	0	0	0	-----	-----
- Incompetent practice	84	81.5	18	17.5	1	1		
<b>Immediately post:</b>								
- Competent practice	0	0	0	0	37	36	1.143**	0.285
- Incompetent practice	0	0	2	2	64	62		
<b>Follow up:</b>								
- Competent practice	0	0	0	0	17	16.5	1.259**	0.262
- Incompetent practice	0	0	6	5.8	80	77.7		

(\*\*) Fisher exact test

## Discussion

The results of the current study revealed that, more than one third of the studied nurses' age was between 25 to less than 30 years, with a mean age of  $29.1 \pm 6.13$  (figure 1). This finding was consistent with Ashor, Khalifa, El-Gendy and Younis, (2016) who conducted a study aimed to examine the effect of a designed nursing care protocol on clinical outcomes for neonates with hyperbilirubinemia in neonatal units at Shebin El-Kom teaching hospital and El Gamea El Sharea for neonates and reported that, 48.4% of studied nurses were in age group between 25 to less than 30 years. Moreover, Elkazaz and Berma, (2017) who conducted a study about stress and self efficacy among nurses in neonatal care units at El-Nasr, El-Tadamon, and Port-Fouad general hospitals in Port Said who found that, more than two thirds of the nurses being in the age group less than 30 years, with a mean age of  $27.4 \pm 4.9$ .

The findings of the current study illustrated that, the highest percentage of studied nurses had a bachelor degree in nursing (figure 2). This finding was in an

agreement with Fayed, Elbahasawy and Omar, (2016) who conducted a study about effect of instructional program on nurses compliance with universal precautions of infection control in the NCUs at El Menoufia, Egypt and reported that, 51.7% of the studied nurses had a bachelor degree in nursing. This result may indicate that the Egyptian hospitals prefer to hire the highly qualified nurses, especially in the critical departments as NCUs to be able to endure the critical responsibilities. Regarding years of experience, the current study revealed that more than one third of the studied nurses had more than 10 years of experience in NCU (figure 3). This finding was similar to Elkazaz and Berma, (2017) who reported that, 42.5% of the nurses have experienced more than nine years. From the researchers' point of view, years of experience have a significant effect on the nurses' knowledge and practices.

In relation to the studied nurses' attainment of previous training courses, the current study revealed that, the majority of the nurses did not attend any previous training courses related to neonatal care (figure 4). Similarly, El sayed, Sabry,

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**Sharkawy, Elsayed and Ali, (2016)** who conducted a study about establishing basic standards of nursing care protocol at neonatal intensive care unit at Tanta university hospital and reported that, most of the nurses did not attend any previous in-service training program related to neonatal care. The researcher believes that this finding might be owing to the absence of continuing education department in the study settings, lack of motivation for training as well as increased workload in neonatal care units. This might be one of the leading causes that affect negatively on nurses' level of knowledge and practices pre program that consolidate their lack of efficiency to provide quality of care to neonates. Attending continuous training programs plays a crucial role in enhancing and updating nurses' knowledge and performance beside improving the quality of care given to neonates. Without enough training for nurses and clear orientation, no quality of care could be achieved.

The previous result of the present study is in accordance with **The British Association of Perinatal medicine (BAPM), (2010)**, which stated that , a lack of trained neonatal staff may lead to care that is unsafe to neonates. Also, **Vidal Ronfani, Silveira, Mello, Santos, Buzzetti & Cattaneo, (2013); and Jeffery et al., (2014)** stated that, the implementation of effective training programs for health care providers in hospital settings followed by moderate improvement in essential newborn care is a must .While, the previous result was confronting with a study conducted by **Mohamed, (2012)**, about assessment of nurses' knowledge and performance regarding nursing care given to chronic renal failure patient under-going maintenance hemodialysis, Tanta University, who revealed that, in-service training had no effect on both nurses' knowledge and performance.

The findings of the present study (**table 1**) revealed that, there was significant

improvement regarding nurses' knowledge about the quality of neonatal nursing care immediate post and at follow up of staff development program implementation. This improvement might be due to nurses' knowledge refreshment throughout the program intervention. Therefore, the neonatal nurses should acquire in-depth theoretical knowledge regarding the concepts and goals of neonatal care quality and how to achieve, monitor and improve it to create a difference in their performance that considered a key to neonatal survival (**National Association of Neonatal Nurses (NANN), 2016; and WHO, 2017**).

The present study at the same table (**table 1**) revealed a statistical significant difference in relation to total nurses' knowledge about common health problems of neonates before, immediate post program and at follow up. Neonates in the intermediate care units experience a variety of problems that affect their physiological and physical condition. So, they require the collaborative efforts of a knowledgeable and skilled nursing personnel for delivering the best possible care and achieving the best possible outcomes (**Ahmed, Mohamed, Mahmoud & Zaki, 2014**). Therefore, the researcher believed that educational program and in-service training should lead to improvement in the nurses' level of knowledge.

Regarding total nurses' knowledge about standards of neonatal care in the intermediate care units, the current study at the same table (**table 1**) reflected statistical significant improvement in nurses' knowledge post program implementation and at follow up. This result was in an accordance with **El sayed, et al., (2016)** who conducted a study entitled as "Establishing basic standards of nursing care protocol at neonatal intensive care unit" and indicated an enhancement in nurses' knowledge after application of the neonatal standards care protocol.

The current study also reflected the positive effect of the staff development program on total nurses' knowledge immediate post program implementation and at follow up (**table 1**). From the researcher's point of view, the vital role of nurses in scientific progress within the field of neonatal nursing which in turn has a significant impact on achieving quality neonatal health, reveals the necessity of professional development and the continuing educational training which is the key for acquiring professional competence.

In relation to nurses' practices regarding neonates' admission in the intermediate care unit, the present study (**table 2**) illustrated that, all of the studied nurses achieved incompetent practice pre program implementation, while, this percentage relatively decreased after program and at follow up. This finding was consistent with **Ashor, et al., (2016)** who reported that, nurses had inadequate performance regarding their practices of immediate care upon neonatal admission pre intervention program, while, there was limited improvement in their performance after the program.

Concerning nurses' practices regarding assessment of neonates, the current study (**table 2**) revealed that, none of the studied nurses achieved competent practice pre program implementation. On the other hand, there was an improvement in their practice after program implementation and at follow up. From the researcher's point of view, this result could be owing to lack of orientation and training programs as well as nurses' attitude toward complete physical assessment is the responsibility of doctors only. Therefore, implementing proper nurses' educational training in undertaking neonatal examination to qualify their performance is crucial, furthermore, implementation of the neonatal routine examination should be a part of nurses' job description. **Ormsby, (2018)** emphasized that, ongoing assessment is a vital aspect of neonatal nursing care and it

should be incorporated into daily care given to each neonate and carried out at the commencement of each shift.

On contrary, this finding was versus to a study done in Norway by **Reyes, (2014)**, about the routine neonatal examination in Norway—does it have to be performed by a doctor? and explored that, advanced neonatal nurse practitioners can carry out an adequate examination based on evidence-based practices better than doctors. The researcher attributed this result to difference of cultures regarding paying attention to nurses and their great role such as doctors and different nurses' attitude and practices.

Concerning nurses' practices regarding daily care of neonates in the intermediate care unit, the present study (**table 2**) showed that, all studied nurses achieved incompetent practice pre program implementation. While, practice improvement was noted through limited percentage of nurses after program and at follow up. This result was in an accordance with **El sayed, et al., (2016)** who found that, more than half of nurses had unsatisfactory performance in relation to daily care in neonatal care unit before application of the standard. On the other hand. An improvement in their performance was observed immediate after application of the standard and after three months.

The current study clarified that less than three quarter of the studied nurses achieved competent practice regarding baby bath before program implementation, compared to all of them post program implementation and at follow up (**table 2**). The possible factor that may explain this finding is that the nurses already applying baby bath as a neonatal routine nursing care which consequently means that they have gained experience. In addition, the training program was able to usefully support their performance and providing better quality care. This result was in harmony with

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**Mohammed, Bayoumi and Mahmoud, (2014)** who conducted a study about the effect of developmentally supportive care training program on nurses' performance and behavioral responses of newborn infants and demonstrated that, there was a significant improvement of nurses' performance regarding baby bath and this improvement became apparent after repeated the principles of baby bath for the second and third time after training program implementation.

According to the policy of the study settings, the tub bath was not allowed and the baby bath should be performed inside the incubator. This could be due to applying strategies for thermoregulation or neonates' safety. The way that the nurses bath neonates may not appear to be important in the big scheme of things, but the nurse should better understand why this could be an important factor to the health of neonates.

Additionally, the current study revealed that, none of the studied nurses achieved competent practices in relation to feeding of neonates pre program implementation (**table 2**). This result was in the harmony with **AL-Hawaly, Ibrahim and Qalawa, (2016)** who reported that, three-quarters of the studied nurses had an unsatisfactory level of practice regarding NG feeding administering. Similarly, **Seliman, El-Soussi, Sultan and Othman (2014)** who conducted a study about effect of implementing nursing guidelines for tube feeding on the occurrence of aspiration among critically ill patients who reported in their study that, nursing practices in relation to enteral feeding was unsatisfactory. While, there was an improvement in the studied nurses' practices post program. On the other hand, there was deterioration in their practice at follow up. This finding could be attributed to the absence of continuing educational programs and lack of supervision. In addition, the nursing practice was based primarily on individual past experience and tradition, with senior nurses teaching

procedures to the junior nurses. Evidence-based nursing practice was not the standard of care.

The neonatal nurse practicing in today's world is faced with a huge number of duties and responsibilities involving specialized skills and techniques. Intravenous therapy is one of the major responsibilities the neonatal nurse faces in daily practice and is an area that is continually expanding (**Costa, da Silva & Kimura, 2016**). As regards this aspect, the present study (**table 2**) illustrated that, the majority of the studied nurses practice incompetency regarding intravenous (IV) therapy pre program implementation. This could be due to the fact that the studied nurses were unaware of the correct technique of preparing I.V medication and fluids and didn't follow the aseptic principles during IV therapy. This might be attributed to lack of nurses' opportunities for continuing education in order to be educationally prepared and clinically skilled to be capable of rendering competent scientific care to neonates, which creates a barrier hindering the application of neonatal standard care.

This finding was confronting with **Ahmed et al., (2014)** who showed that, almost all nurses had good performance of intravenous infusion, where this is a routine procedure in neonatal units. Additionally, more than half of them attained formal training courses that played an important role in enhancing and updating their knowledge and performance beside improving the quality of care given to neonates. From this point, the current study reflected an improvement in nurses' practices post program implementation and at follow up. This finding was in an accordance with **El sayed, et al., (2016)** who found that, more than three quarter of nurses demonstrated incompetent level of performance regarding intravenous therapy, while this percentage declined immediately and after three months of standards application.

Additionally, The current study (**table 2**) revealed that, none of the studied nurses achieved competent practices regarding blood sampling collection pre program implementation, compared to more than half of them after program. On the other hand, this percentage decreased at follow up. According to the researcher observations, this finding could be attributed to unawareness of the nurses about the importance of warming the neonates' heel before taking capillary blood samples. Also, they ignored the hazards from intermittent squeezing when collecting blood samples through broken needle and the majority of them did not follow aseptic principles during drawing blood samples. **Lenicek, Dorotic, Grzunov and Maradin, (2015)** recommended that, enhancement of blood flow achieved by holding the puncture site downwards and applying gentle pressure to the tissue near the puncture site. Excessive squeezing or massaging of the puncture site should be avoided in order to prevent hemolysis, contamination of the blood with interstitial and intracellular fluid and obstruction of blood flow. Moreover, warming the area of puncture with warm cloths helps blood vessels dilatation. To minimize risk of infection, all neonates and samples must be managed and handled using standard safety and aseptic precautions.

This finding was in the same line with **O'Connor et al., (2016)** who conducted a study entitled as combined education and skin antisepsis intervention for persistently high blood-culture contamination rates in neonatal intensive care and demonstrated that, there was increased awareness among nurses regarding the procedural skills and expertise necessary for maintaining a sterile field to prevent contamination during taking of blood samples, increased practical phlebotomy training for new nurses entering the unit after intervention program. Moreover, **Al-Hamad et al., (2016)** in their study about nurses' competency in drawing blood cultures and educational intervention

to reduce the contamination rate that reflected improvement in nurses' practices regarding blood samples collection after the educational intervention training.

Oxygen therapy is an essential, life-saving therapy that is relevant for various neonatal health conditions. Achieving good clinical use of oxygen requires skillful trained nurses and a work environment that makes it easy for optimizing use.

Concerning nurses' practices regarding oxygen therapy, the present study clarified that, near two thirds of them practiced incompetency pre program implementation (**table 2**). This finding was in an agreement with a Sudanese study conducted by **Omer, Ibrahim and Nasr, (2015)** about oxygen therapy in neonatal intensive care units in Khartoum state and reported that, there was lack of practice in relation to oxygen therapy. Similarly, **Aziz and Mansi, (2018)** found that, nurses who cared for neonates with respiratory distress syndrome at intensive care unit in AL-Nasiriyah city hospitals in Baghdad had poor practice regarding oxygen therapy.

A significant improvement in the studied nurses' practice regarding oxygen therapy was observed post program implementation and at follow up. This result reflected the significant positive effect of practical training programs on achieving quality performance. As regards to this aspect, **Graham et al., (2017)** in their study about improving oxygen therapy for children and neonates in secondary hospitals in Nigeria: study protocol for a stepped-wedge cluster randomized trial and stated that, projects in Egypt, Laos, Papua and New Guinea provide successful examples of improving healthcare workers use of oxygen through practical training, supportive supervision, and the implementation of evidence - based clinical guidelines. Additionally, **El sayed, et al., (2016)**, reported that nurses demonstrated improved

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level of performance regarding oxygen therapy after establishing the basic standards of care for nurses.

Suctioning is a potentially hazardous procedure that commonly applied in neonatal care units and should only be performed by skillful nurses with following the evidenced based guidelines. The current study (**table 2**) revealed that, all of nurses achieved incompetent practice regarding nasopharyngeal / oropharyngeal suctioning pre program implementation. While, more than half of them and more than two fifth of them achieved competent practice post program and at follow up. This finding was supported by **El sayed, et al., (2016)** who illustrated that, half of nurses were incompetent in performing suctioning before standard application. While, all of them had competent performance immediately and after three months of standards application.

Concerning nurses' practices regarding infection control techniques, the current study (**table 2**) indicated that, all of studied nurses achieved incompetent practice pre program implementation. From the researcher's point of view, there are some factors that may hinder the nurses' compliance with standards precaution of infection control such as shortage of facilities and supplies in the units, increased admission number of neonates, unawareness with the correct steps, or inadequate time to make the procedure correctly such as hand washing and lack of training and constructive supervision.

On the other hand, near one third of the studied nurses followed the standards precautions of infection control immediately post program and at follow up. This finding is compatible with several researches as **Mohammed and Yousif, (2017)** who reported that, the educational program had a significant impact related to the improvement of the nurse's practical skills post application

of the program. Similarly, **Galal, Labib and Abouelhamd, (2014); and Fayed et al., (2016)** where both studies stated that, implementation of educational program for nurses improved their practices toward the infection control universal precautions in pediatric care unit. Additionally, **Adly, Amin and Abd El Aziz, 2014** in their study about improving nurses' compliance with standard precautions of infection control in pediatric critical care units and found that, there was a significant improvement in nurses' compliance as well as their practices toward standard precautions of infection control after the intervention. Moreover, **Abolwafa, Ouda, Mohammed and Masoed, (2013)** who conducted a study entitled about developing educational program for nurses' related to infection control of invasive procedures in neonatal units at EL-Minia university and general hospitals and stated that, an improvement among the majority of nurses' practice was found after training program implementation about infection control.

Concerning the effect of staff development program on total nurses' practices, the current study indicated that, the program implementation had a positive impact on the practices improvement of the studied nurses, while this improvement declined at follow up (**table 2**). This decline of improvement might be due to lack of continuous education, training and feedback. This result is supported by **El sayed et al., (2016)** who reported that, there was a moderate improvement in performance of nurses after application of the standard. Additionally, **Elewa and Elkattan, (2017)** found in their study about effect of an educational program on improving quality of nursing care of patients with thalassemia major as regards blood transfusion that, the educational program had a positive effect on nurses' practice which improved the quality of nursing care.

The current study (**table 3**) revealed that there was no statistical significant relation between total knowledge of nurses and their total practices immediately post and at follow up of staff development program implementation. Similarly, **Johansson, (2015)** who conducted a study entitled as "Nursing clinical supervision project in a neonatal intensive care and a social care baby unit: a best practice implementation project" and reported that, the association between knowledge and practice score were found to be non significant. The gross numerical difference between the knowledge and practice score of the study was indicating that only having adequate knowledge is not sufficient to perform correct practical skills. Additionally, **Hunter, (2015)** identified that most importantly, nurses can learn several skills, but all of that would be a waste if they don't implement the skills in their clinical practice. Therefore, the researcher believes that the studied neonatal nurses need to be encouraged to translate their knowledge into practice and adopt the acceptable guidelines on evidence based practices.

### **Conclusion**

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There was a significant improvement in nurses' knowledge about quality standards of neonatal care after implementation of the staff development program either immediately post or at follow up. This improvement reflect the positive effect of the program on nurses' knowledge. While, there was a limited improvement in their practices either immediately post or at follow up of the program implementation. Additionally, the staff development program had a limited positive effect on the achievement of quality standards of neonatal care.

### **Recommendations**

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Based on the study results, the following recommendations are suggested:

- 1- Emphasize on the importance of conducting periodical continuing staff development programs for neonatal nurses to improve their performance.
- 2- Conduct for educational programs that include orientation for newly appointed nurses, ensuring competency of neonatal care nurses, education to facilitate competency for all new procedures and periodic reviews with authorized personnel to maintain and enhance improvement of neonatal care and outcome.
- 3- Daily nursing round under supervision of nurse supervisors will have a great value to improve knowledge and skills among neonatal nursing staff and provide rewards for competent performance providers.
- 4- Maintain the availability of the essential resources in neonatal care units necessary to achieve the quality standards of neonatal care.
- 5- Periodical appraisal for neonatal services and outcomes improvements to ensure high quality care is being provided and highlight areas for further improvement.
- 6- Enhancement the role of quality team in the neonatal unit.

### **Further studies:**

- 1- Monitor the quality of neonatal nursing care in neonatal care units all over Egypt.
- 2- Monitor barriers hindering nurses' application of neonatal nursing care standards.

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### Acknowledgements

My sincere gratitude to the nursing staff in the study settings for their help and cooperation to facilitate conducting the study.

### Financial Support

No funding was received.

### Conflict of interest:

No Yes

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