

# Effect of Educational Program on Nurses' knowledge and Practices Regarding Prevention of Puerperal Sepsis

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DOI: 10.47750/pnr.2023.14.03.111

## Abstract

**Background** Puerperal sepsis is one of the dangerous postpartum infections. It is the third most common cause of maternal deaths worldwide. **The aim of this study** was to determine the effect of educational program on nurses' knowledge and practices regarding prevention of puerperal sepsis. **Subjects and Method** The study was conducted at antenatal, postnatal ward and labor unit in Obstetric and Gynecological Department of Tanta University Hospital. All nurses (50 nurses) were included in the study: (35 nurses who were working in antenatal and postnatal ward and 15 nurses who were working in labor unit). **Two tools** were used for data collection: **Tool I Structured interview questionnaire for nurses** included a. Socio-demographic characteristics of nurses, b. Nurses' Knowledge Assessment Sheet regarding prevention of puerperal sepsis. **Tool II An observational checklist for nurses' practices.** **Results** The mean score of knowledge as well as mean score of practices of the studied nurses regarding prevention of puerperal sepsis were increased immediately and three months after educational program with a statistical significant differences ( $p < 0.05$ ). **Conclusion and Recommendations** The finding of the present study revealed there was significant improvement of nurses' knowledge and practices regarding prevention of puerperal sepsis during antepartum, intrapartum and postpartum period immediately and three months after educational program implementation. **Consequently**, it is recommended that planning in-service training programs for all nurses should be conducted in order to improve, update and refresh their knowledge and practices regarding prevention of puerperal sepsis.

**Keywords:** Nurses, Prevention of puerperal sepsis, Educational program.

## INTRODUCTION

**Postnatal period** is a critical time for women and newborns during which the body organs revert back approximately to the pre-pregnant state both anatomically and physiologically. The burden of maternal and neonatal mortality and morbidity remains unacceptably high during this period due to complications such as postpartum hemorrhage, thrombophlebitis, pulmonary embolism and puerperal sepsis. Puerperal sepsis is also associated with many long-term complications for woman and newborn such as chronic pelvic pain, pelvic inflammatory diseases (PIDs), secondary infertility, septicemia which may be leading to septic shock, and neonatal septicemia and pneumonia. <sup>(1-5)</sup>

World Health Organization (WHO) defined puerperal sepsis as an infection of the genital tract occurring any time during labor to 42-days postnatal associated and with two or more of the following criteria; pelvic pain, fever, abnormal vaginal discharge or delay in uterine involution. Puerperal sepsis is caused by aerobic gram-positive organisms such as haemolytic streptococcus or aerobic gram-negative organisms such as Escherichia coli (E. coli). <sup>(6, 7)</sup>

**Incidence** of puerperal sepsis extremely varied according to regions, with higher incidence in low and middle-income countries (up to 7%) compared with 1–2% among high-income countries. It occurs in about 1 to 8% of vaginal deliveries, and it is 5 to 10 times higher following a caesarean section. Puerperal sepsis is the major cause of maternal morbidity and mortality worldwide. Globally, it is the 3<sup>rd</sup> most common cause of maternal death after haemorrhage and abortion. WHO estimated that puerperal sepsis accounts for 15-20% of maternal deaths annually. In Egypt, the maternal mortality rate was 33 deaths/100,000 live births according to WHO 2018 due to

bleeding and sepsis. In 2022, the average number of postpartum infection was 120– 180 women at obstetric and gynecological department of Tanta University Hospital. <sup>(8-12)</sup>

The pregnancy and puerperium are physiological states of immunosuppression so pregnant women may have an impaired immune response to infection. Also, there are multiple predisposing factors contributing to puerperal sepsis such as; home birth in unhygienic condition, uncompliant of infection control measures during delivery and postpartum period, low socioeconomic status, anemia, premature rupture of membrane, prolonged labor, excessive unneeded vaginal examinations, instrumental delivery and postpartum hemorrhage. <sup>(13-18)</sup>

Early **recognition and diagnosis** of puerperal sepsis is the most crucial step in the management of puerperal sepsis. This is done through *detailed history* of personal and medical complaints as well as presence of any high-risk factors for infection. Also, *examination* must be done including parameters such as; general well-being and appearance, cardiovascular examination, abdominal examination, wound site examination of the cesarean scar or episiotomy scar to look for signs of inflammation or abnormal discharge, examination of lochia as well as lower limbs examination to rule out venous thrombophlebitis. <sup>(19-22)</sup>

Routine **investigations** are recommended to determine the causative organism of puerperal sepsis such as: blood culture, serum biochemistry such as complete blood count, blood sugar, inflammatory markers such as C-reactive protein; culture studies such as wound swab, high vaginal swab and imaging studies such as chest X-ray and pelvic ultrasound. On the other hand, broad-spectrum antibiotics must be administered within 1 hour of diagnosis of puerperal sepsis and after collecting the culture specimens. <sup>(23-25)</sup>

Nurses play a privileged role to prevent the occurrence of puerperal sepsis during ante, intra and postnatal period. Through, identifying women at risk for puerperal sepsis and providing comprehensive nursing care associated with the follow of strict aseptic technique and administration of prophylactic antibiotic as prescribed especially with high risk women to infections such as endometritis, urinary tract infection and other serious infections. <sup>(18,26)</sup> So, periodic in-service training programs for all nurses regarding prevention of puerperal sepsis is needed in order to improve, update and refresh their knowledge and practices dependent on recent evidence based practices in obstetrics units.

#### **The aim of this study was to**

Determine the effect of educational program on nurses' knowledge and practices regarding prevention of puerperal sepsis

#### **Research Hypothesis**

Nurses' knowledge and practices are expected to be improved after implementation of the educational program regarding prevention of puerperal sepsis.

#### **Study Design**

A quasi-experimental research design was used to conduct this study.

#### **Setting**

This study was carried out at antenatal, postnatal ward and labor unit in Obstetric and Gynecological Department of Tanta University Hospital.

#### **Subjects**

All nurses (50 nurses) were included in the study: 35 nurses working in antenatal and postnatal ward and 15 nurses working in labor unit.

#### **Tools of data collection**

To achieve the aim of this study the following two tools were used for data collection:

##### **Tool I Structured interview questionnaire for nurses**

It was developed by the researcher after reviewing the recent related literatures <sup>(12, 24, 25)</sup>, and included the following two parts

##### **Part (1) Socio-demographic characteristics of nurses**

This part was used to collect the following data: age, marital status, level of education, years of experience, attendance of previous training program regarding prevention of puerperal sepsis and presence of educational aids on infection control during pregnancy, childbirth and after childbirth

##### **Part (2) Nurses' Knowledge Assessment Sheet regarding prevention of puerperal sepsis**

It was used to collect nurses' knowledge before, immediately and three months after implementation of the educational program. It included two parts:

##### **a. Nurses' basic knowledge regarding puerperal sepsis as follow**

Puerperal sepsis definition, predisposing factors include; antepartum, intrapartum and postpartum factors, causative organism, investigations and laboratory tests for puerperal sepsis, possible sites of puerperal infection, mode of transmission, signs, symptoms, maternal and neonatal complications as well as nurses'

knowledge about algorithm tool and its components through the presence of the following features (high fever, lower abdominal pain, pelvic pain and abnormal or foul-smelling vaginal discharge) which was used for identifying the suspected cases of puerperal sepsis. Also, this part comprised question regarding levels of prevention of puerperal sepsis.

**b. Nurses' knowledge regarding prevention of puerperal sepsis during antepartum, intrapartum and postpartum period as follow**

- 1. Prevention during antepartum period** this part included definition, importance and schedule of antepartum care. In addition to, the components of antepartum care during the first visit which included: detailed history collection, checking height and weight, measuring vital signs, physical examination and investigation. As well as, the components of antepartum care during follow up visits which included: checking vital signs & weight, testing urine for the presence of albumin, glucose and ketones; listening fetal heart tones, measuring fundal height and estimating gestational age by ultrasound and abdominal examination and repeating laboratory tests if necessary. This part also comprised the health education that should be given to the women for the prevention of infection during pregnancy which included; personal hygiene, perineal care, breast care, dental care, preparation for lactation, nutrition, immunization, prevention of urinary tract infections, avoid people who have infection and how to manage any source of infection.
- 2. Prevention during intrapartum period** this part included the following items; **standard precautions of infection control** which comprised: hand hygiene, personal hygiene, using personal protective equipment (Apron, gloves, masks, eye protection and face shields) and safe sharps/waste disposal); **prevention of prolonged labor** through identification of risk factors, giving the necessary medicines to stimulate contraction according to the doctor's orders and assessing fetal head descent; **management of premature rupture of membranes** through avoiding frequent vaginal examinations, complete bed rest, continuous observation of fetal heart sound, continuous assessment of maternal vital signs and giving antibiotics according to the doctor's orders. As well as, **practices recommendation regarding prevention of puerperal sepsis during intrapartum period** through avoiding pubic hair shaving, unneeded excessive vaginal examinations, unnecessary episiotomy and catheterization.
- 3. Prevention during postpartum period** this part included; standard precautions of infection control, components of immediate postpartum care, schedule of postpartum follow up visits and necessary health education that should be given to the women to prevent infection during the postpartum period (personal hygiene, nutrition, breast and perineal care, baby care, cesarean wound dressing, methods of family planning, follow up visits and warning signs during postpartum period).

**The scoring system for the answers was as follow** Correct and complete answers were scored as (2), correct and incomplete answers were scored as (1) and incorrect answers and did not know were scored as zero.

**The total score level of knowledge was calculated by (26 questions ×2=52) which was categorized as follows**

1. High level of knowledge  $\geq 85\%$ . **(44-52)**
2. Moderate level of knowledge 70 % - <85%. **(36-43)**
3. Low level of knowledge <70%. **(0-35)**

**Tool II An observational checklist for nurses' practices**

It was developed by the researcher after reviewing of the recent related literatures <sup>(10,13,15)</sup>, to assess nurses' practices before, immediately and three months after implementation of the educational program regarding prevention of puerperal sepsis. It included the following:

**Part (1) Nurses' practices during antepartum period:** it included the following; **physical examination** (checking vital signs, height and weight and examining women from head to toe in a systematic manner).As well as, teaching techniques of **hygienic care** during pregnancy (personal hygiene, dental care, breast care, genital tract care and general care for pregnant woman during pandemic).

**Part (2) Nurses' practices during intrapartum period:** it included the nurses' practices of standard precautions of infection control during the first, second, third and fourth stages of labor through; **using of personal protective equipment** (which comprised washing hands by using aseptic technique, maintaining personal hygiene and wearing; apron, sterile gown, surgical mask, overshoes and sterile gloves) **preparing the woman for delivery;** **applying operating room precautions** (using safe zone sharp handling, avoiding the presence of more than ten persons in a single room, closing the operating room door at all times) and **safe sharps/waste disposal** (which comprised preventing needle sticks/sharps injuries, managing needle stick injuries, practicing safe injection, safe handling of blood and bodily fluids, disposal of waste & linen safely, sterilization of instruments and devices as well as cleaning labor & delivery room).

**Part (3) Nurses' practices during postpartum period:** this part included applying the routine postpartum care in the form of assessing fundal height and lochia immediately after delivery, perineal care, breast care, episiotomy care, urinary catheter care, wound dressing for caesarian section and baby cord care.

**Scoring system for nurse's practice was as follow**

1. Done correctly and completely were scored as (2).
2. Done correctly and incompletely were scored as (1).
3. Done incorrect or not done at all were scored as (0).

**The total score level of practice was calculated and classified as follow:**

1. Satisfactory practice  $\geq 75\%$
2. Unsatisfactory practice  $< 75\%$

## METHOD

1. Official permission and approval was obtained from the responsible authorities from the Faculty of Nursing Tanta University, clarifying the purpose of the study directed to hospital administrator of obstetric department at Tanta University Hospital to obtain his approval and cooperation for carrying out the study
2. **Ethical and legal consideration:** Approval of Ethical Committee of Faculty of Nursing, Tanta University was obtained. All participants were informed about the purpose of the study. An informed consent was taken from every participant in the study included the right to withdraw at any time. The researcher ensured that the nature of the study didn't cause any harm or pain for the entire sample. Also, confidentiality and privacy were taken into consideration regarding data collection.
3. **Tool I and Tool II** were developed by the researcher after reviewing the recent related literature <sup>(12, 24, 25)</sup>; **Tool I** was translated into Arabic and both tools were tested for content and construct validity by 5 experts in obstetric and gynecological nursing field. Accordingly, corrections and modifications were done.
4. **Pilot study:** After the development of the tools, a pilot study was carried out on 10% of the sample (5 nurses) from the previously mentioned setting to ascertain the clarity, feasibility and applicability of the developed tools. The pilot study was conducted before the actual data collection. Accordingly, no necessary modifications were done according to the results of this pilot study, then the tools made ready for use. Data obtained from the pilot study were not excluded from the real sample
5. **Tool I and Tool II** were used to assess nurses' knowledge and practice before, immediately and three months after implementation of the educational program.
6. **Data collection** was conducted in a period of seven months from the beginning of May 2021 to the end of November 2021. Data were collected from Tanta University Hospital at antenatal and postnatal ward as well as labor unit of the Obstetric and Gynecological Department in the morning and the afternoon shifts 5 days per week. (The researcher met nurses at the morning and the afternoon shifts because most of the nurses were available at the morning shift).
7. **The educational program was conducted through the following four phases**

### Phase I Assessment phase

This phase was done before giving sessions. The researcher met nurses at the morning and the afternoon shifts at antenatal and postnatal ward as well as labor unit of Tanta University Hospital. Nurses were asked to participate in the study after explaining its aim. Then, nurses were assessed using Tool (I) part 1 to collect socio-demographic data and Tool I part (2) to assess nurses' knowledge regarding prevention of puerperal sepsis before implementation of the educational program. This tool was distributed and conducted individually for each nurse by through an interview that lasted from 20-25 minutes. Nurses' practices regarding prevention of puerperal sepsis before the educational program was assessed individually using Tool II while providing nursing care.

### Phase II Planning phase

#### a. Preparation of the educational program sessions:

The educational program included 5 sessions for each group (two sessions for theoretical part and three sessions for practical part) and was carried out at the previously mentioned setting. The total number of nurses was (50 nurses); they were divided into 10 groups. Each group consisted of (5) nurses. The content was presented during 5 days per week for each group. The duration of each session ranged from 30 to 45 minutes including periods of discussion.

#### b. Setting the goals and objectives of the program

**The goal of the program was to**

Improving the knowledge and practices of nurses regarding prevention of puerperal sepsis.

#### c. Preparing the content of the program

An educational Arabic booklet was developed by the researcher based on nurses' needs and data from the assessment phase, using recent relevant literatures available locally and internationally

(books and magazines). The booklet was distributed to every nurse to be used as a guide for self-learning and retention of information. Clarified photographs and diagrams were included in this booklet. Additionally, different methods of teaching were prepared to clarify the information and procedures as lecture, group discussion, posters, power point presentation and demonstration and re-demonstration. Adequate time was offered for interpretation and re-demonstration by the nurse.

### **Phase III Implementation phase**

The educational program was conducted by the researcher through five sessions

#### **The first session**

In this session the researcher firstly, explained the goal of the educational program and provided the nurses with basic knowledge about puerperal sepsis including; definition, predisposing factors, causative organism, investigations and laboratory tests for puerperal sepsis, possible sites of puerperal infection, mode of transmission, clinical features, maternal and neonatal complications as well as algorithm tool and its components which was used for identifying the suspected cases of puerperal sepsis and also provided them with knowledge about levels of prevention of puerperal sepsis.

#### **The second session**

In this session the researcher provided all nurses with knowledge regarding prevention of puerperal sepsis during antepartum, intrapartum and postpartum period. It included: definition, importance and schedule of antepartum care in addition to the components of antepartum care during the first visit and follow up visits. This session also comprised the health education that should be given to the women for the prevention of infection during pregnancy. In addition to, prevention of puerperal sepsis during intrapartum period that included; standard precautions of infection control, prevention of prolonged labor, management of premature rupture of membrane as well as practices recommendation regarding prevention of puerperal sepsis during intrapartum period. Moreover, this session included; knowledge regarding prevention of puerperal sepsis during postpartum period which included standard precautions of infection control, components of immediate postpartum care, schedule of postpartum follow up visits, and necessary health education to prevent infection during the postpartum period.

#### **The third session**

The aim of this session was to provide the nurses working at antenatal unit with the proper and needed practical skills about prevention of puerperal sepsis during antepartum period regarding physical examination and teaching techniques of hygienic care during pregnancy.

#### **The fourth session**

The aim of this session was to provide the nurses working at intranatal unit with the proper practical skills regarding prevention of puerperal sepsis during intrapartum period which included; practices of standard precautions of infection control during the first, second, third and fourth stages of labor through using of personal protective equipment, preparing the woman for delivery, applying operating room precautions and safe sharps/waste disposal.

#### **The fifth session**

The aim of this session was to provide nurses working at postnatal unit with the practical routine and postpartum skills needed to prevent puerperal sepsis during postpartum period which included assessing fundal height and lochia flow immediately after delivery, perineal care and breast care. As well as, episiotomy care, urinary catheter care, wound dressing for caesarian section and baby cord care.

### **Phase IV: Evaluation phase**

1. In this phase, nurses' knowledge was evaluated individually three times using Tool I part II before, immediately and three months after implementation of the educational program.
2. Evaluation of nurses' practice was done by using Tool II (observation checklist for nurses' practices). Each nurse was observed individually three times to assess their practices regarding prevention of puerperal sepsis before, immediately and three months after implementation of the educational program.
3. Comparison was done three times before, immediately and three months post program to identify the effect of the educational program on nurses' knowledge and practice regarding prevention of puerperal.
4. The collected data were organized, tabulated and statistically analyzed using SPSS software (Statistical Package for Social Sciences, version 26, SPSS (Armonk, Ny, IBM corp).
5. For quantitative data, the range, mean and standard deviation were calculated. For qualitative data, which describe a categorical set of data by frequency, percentage or proportion of each category, comparison between two groups and more was done using Chi-square test ( $\chi^2$ ).

6. For comparison between means of two groups of parametric data of independent samples, student t-test was used. For comparison between more than two means of parametric data, F value of ANOVA test was calculated. For comparison between more than two means of non-parametric data, Kruskal-Wallis ( $\chi^2$ ) was calculated.
7. For comparison between means of three related groups (before, immediate after and three months after educational program),  $\chi^2$  value of Friedman test was calculated for non-parametric data. Correlation between variables was evaluated using Pearson's correlation coefficient (r). Significance was adopted at  $p < 0.05$  for interpretation of results of tests of significance.

## RESULTS

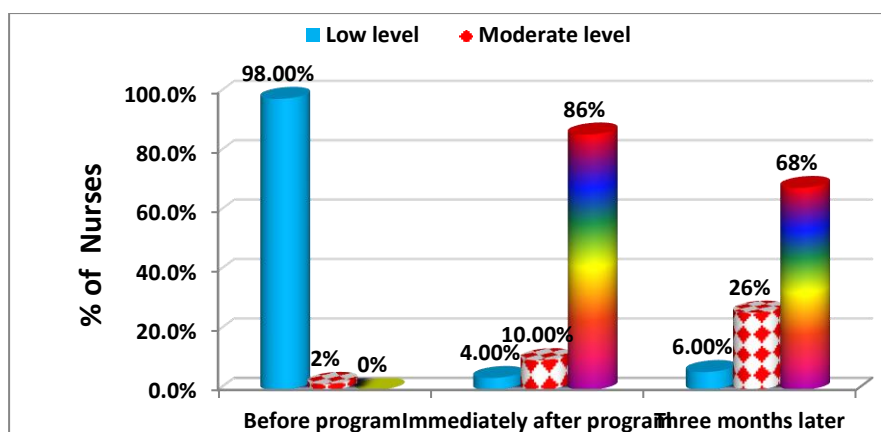
**Table (1)** Distribution of the studied nurses according to their socio-demographic characteristics (n=50).

Scio-demographic characteristics	Studied nurses (n=50)	
	N	%
<b>•Age in years</b>		
20-<40	13	26.0
40-58	37	74.0
Range	22-59	
Mean±SD	43.38±11.28	
<b>•Marital status</b>		
Married	40	80.0
Single	5	10.0
Widow	5	10.0
<b>Level of education</b>		
Nursing technician diploma	43	86.0
Health technician diploma	6	12.0
Bachelor of nursing	1	2.0
<b>•Years of experience</b>		
1-<20	16	32.0
20-40	34	68.0
Range	1-40	
Mean±SD	22.78±12.17	
<b>•Attendance of previous training regarding prevention of puerperal sepsis</b>		
No	50	100
<b>•The department have educational aids</b>		
No	28	56.0
Yes	22	44.0
<b>-If yes, mention it:</b>		
Booklets	10	45.4
Posters	10	45.4
Brochures	2	9.1

**Table (1)** Shows the socio-demographic characteristics of the studied nurses. It was observed that nurses' age ranged from 22-59 years with a mean of 43.38±11.28. As regards their marital status, four fifths (80.0%) of the studied nurses were married while, the same percent 10.0% and 10.0% of them were single and widow.

Concerning the educational level of the studied nurses, slightly more than four fifths (86.7%) completed nursing technical diploma. While, slightly less than one eighth (12.0%) had completed health technical diploma and only 2.0% of them had completed bachelor of nursing.

In relation to their years of experience, this table demonstrates that the years of experience of the studied nurses ranged from 1- 40 years with a mean of 22.78±12.17. Also, the entire sample (100%) didn't take any training courses regarding prevention of puerperal sepsis.



**Figure (1)** Distribution of the studied nurses according to their total score level of knowledge regarding prevention of puerperal sepsis before, immediately and three months after implementing the educational program (n=50).

**Figure (1)** shows total score level of knowledge among the studied nurses regarding prevention of puerperal sepsis before, immediately and three months after implementing the educational program. It revealed that the majority (98%) of the studied nurses had low level of knowledge about prevention of puerperal sepsis before educational program implementation. Which, significantly improved to high level (86% and 68% respectively) immediately and three months after implementing the educational program.

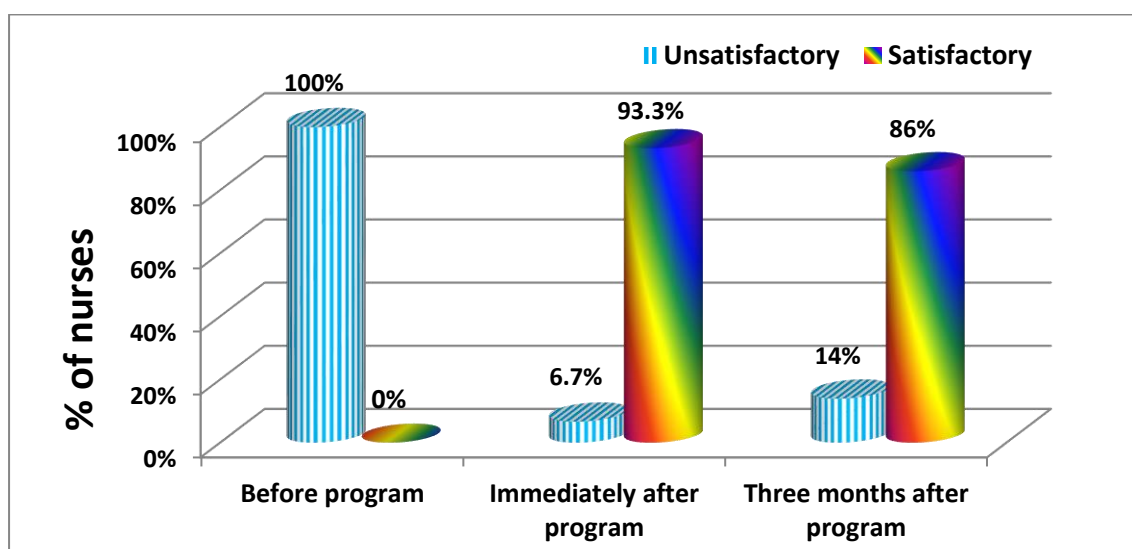
**Table (2)** Distribution of the studied nurses according to their scoring system of practices regarding physical examination and hygienic care at antenatal unit before, immediately and three months after implementation of the educational program (n=15).

Main practice steps	Scoring system of practices of the studied nurses (n=15)						P value
	Before		Immediately after		Three months later		
	n	%	n	%	n	%	
I-Sum of practices steps of physical examination							
Done incorrect or not done	4	26.7	0	0	1	6.7	
Done correctly & incomplete	5	33.3	2	13.3	2	13.3	0.003*
Done correctly & complete	6	40.0	13	86.7	12	80.0	
II-Hygienic care during pregnancy							
1-Personal Hygiene							
Done incorrect or not done	1	6.7	0	0	1	6.7	
Done correctly & incomplete	2	13.3	0	0	0	0	0.254
Done correctly & complete	12	80.0	15	100	14	93.3	
2- Dental care							
Done incorrect or not done	5	33.3	2	13.3	4	26.7	
Done correctly & incomplete	5	33.3	0	0	0	0	0.005*
Done correctly & complete	5	33.3	13	86.7	11	73.3	
3-Breast Care:							
Done incorrect or not done	5	33.3	0	0	0	0	
Done correctly & incomplete	3	20.0	1	6.7	1	6.7	0.003*
Done correctly & complete	7	46.7	14	93.3	14	93.3	
4-Genital Care:							
Done incorrect or not done	4	26.7	0	0	1	6.7	
Done correctly & incomplete	5	33.3	1	6.7	2	13.3	0.012*
Done correctly & complete	6	40.0	14	93.3	12	80.0	
5-General care for pregnant woman during pandemic							
Done incorrect or not done	4	26.7	0	0	1	6.7	
Done correctly & incomplete	6	40.0	1	6.7	2	13.3	0.001*
Done correctly & complete	5	33.3	14	93.3	12	80.0	
Sum of practices steps of hygienic care during pregnancy							
Done incorrect or not done	4	26.7	0	0	1	6.7	

Done correctly & incomplete	4	26.7	1	6.7	1	6.7	0.012*
Done correctly & complete	7	46.7	14	93.3	13	86.7	
Total of both practices steps							
Done incorrect or not done	4	26.7	0	0	1	6.7	
Done correctly & incomplete	5	33.3	2	13.3	2	13.3	0.005*
Done correctly & complete	6	40.0	13	86.7	12	80.0	

\*Significant ( $P < 0.05$ )

**Table (4)** Illustrates the scoring system of observed practices among the studied antenatal nurses regarding physical examination and hygienic care before, immediately and three months after implementing the educational program. It was observed that two fifths and slightly more than two fifths (40% and 46.7% respectively) of the antenatal nurses carried out the steps of physical examination and hygienic care during pregnancy correctly and completely before the educational program implementation compared to (86.7%, 93.3%, 80% and 86.7% respectively) immediately and three months after implementing the educational program.



**Figure (2)** Distribution of the studied nurses according to their total score level of practices regarding standard precautions of infection control during the first, second, third and fourth stages of labor at intranatal unit before, immediately and three months after implementation of the educational program (n=15).

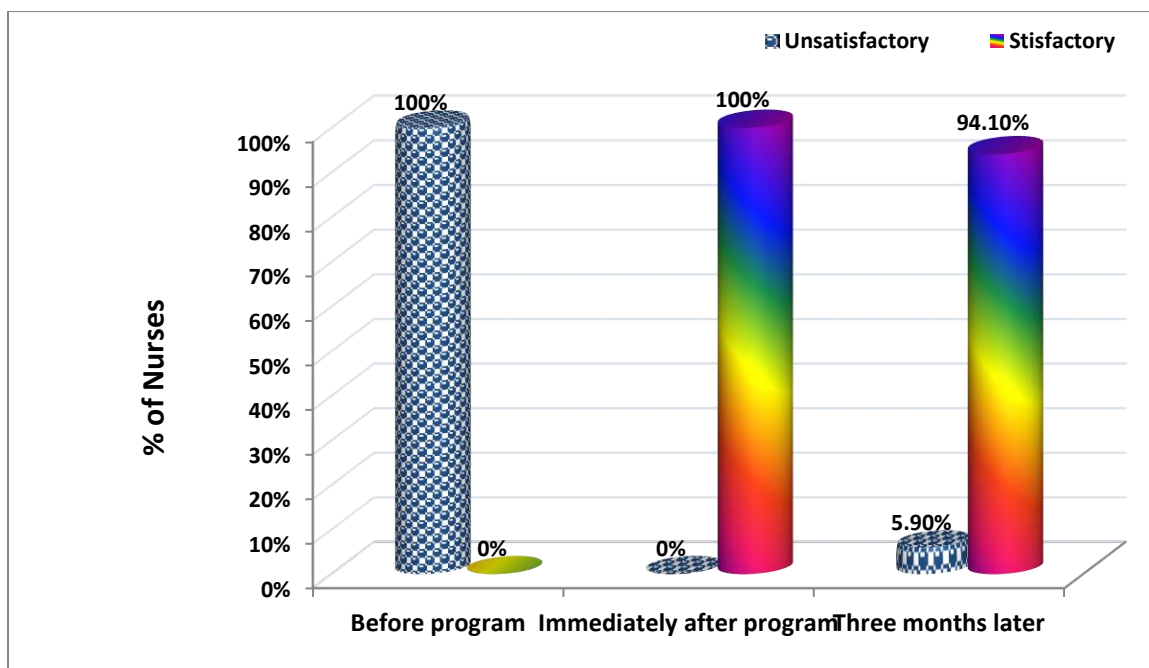
**Figure (2)** Shows total score level of practices regarding standard precautions of infection control during the first, second, third and fourth stages of labor at intranatal unit before, immediately and three months after implementation of the educational program. It demonstrates that the entire intranatal nurses (100%) had unsatisfactory practices regarding standard precautions of infection control during the first, second, third and fourth stages of labor before the educational program implementation. Which significantly improved to satisfactory practices among (93.3% and 86% respectively) immediately and three months after implementing the educational program.

**Table (3)** Distribution of the studied nurses according to their scoring system of practices regarding routine postpartum care at postnatal unit before, immediately and three months after implementation of the educational program (n=20).

Main practice steps	Scoring system of practices among the studied nurses (n=20)						P value
	Before		Immediately after		Three months later		
	n	%	n	%	n	%	
<b>1-Sum of practice steps of assess the height of fundus immediately after delivery&amp; assess the lochia steps)</b>							
Done incorrect or not done	4	20.0	1	5.0	2	10.0	
Done correctly & incomplete	6	30.0	1	5.0	4	20.0	0.001*
Done correctly & complete	10	50.0	18	90.0	14	70.0	
<b>2- Sum of practice steps of perineal care</b>							
Done incorrect or not done	4	20.0	0	0	2	10.0	
Done correctly & incomplete	7	35.0	4	20.0	6	30.0	0.001*
Done correctly & complet	9	45.0	16	80.0	12	60.0	
<b>3- Sum of practice steps of breast Care</b>							
Done incorrect or not done	4	20.0	1	5.0	2	10.0	
Done correctly & incomplete	10	50.0	1	5.0	3	15.0	0.0001*
Done correctly & complete	6	30.0	18	90.0	15	75.0	
<b>4- Sum of practice steps of episiotomy care</b>							
Done incorrect or not done	4	20.0	1	5.0	1	5.0	
Done correctly & incomplete	9	45.0	2	10.0	5	25.0	0.002*
Done correctly & complete	7	35.0	17	85.0	14	70.0	
<b>5- Sum of practice steps of urinary catheter care</b>							
Done incorrect or not done	6	30.0	1	5.0	2	10.0	
Done correctly & incomplete	6	30.0	2	10.0	3	15.0	0.001*
Done correctly & complete	8	40.0	17	85.0	15	75.0	
<b>6- Sum of practice steps of wound dressing for caesarian section</b>							
Done incorrect or not done	4	20.0	1	5.0	2	10.0	
Done correctly & incomplete	7	35.0	1	5.0	4	20.0	0.021*
Done correctly & complete	9	45.0	18	90.0	14	70.0	
<b>7- Sum of practice steps of baby cord care</b>							
Done incorrect or not done	5	25.0	1	5.0	4	20.0	
Done correctly & incomplete	5	25.0	1	5.0	1	5.0	0.0001*
Done correctly & complete	10	50.0	18	90.0	15	75.0	
<b>Total practices steps:</b>							
<b>Done incorrect or not done</b>	<b>4</b>	<b>20.0</b>	<b>1</b>	<b>5.0</b>	<b>2</b>	<b>10.0</b>	
<b>Done correctly &amp; incomplete</b>	<b>8</b>	<b>40.0</b>	<b>2</b>	<b>10.0</b>	<b>4</b>	<b>20.0</b>	<b>0.002*</b>
<b>Done correctly &amp; complete</b>	<b>8</b>	<b>40.0</b>	<b>17</b>	<b>85.0</b>	<b>14</b>	<b>70.0</b>	

\*Significant (P <0.05)

**Table (3)** Demonstrates the scoring system of observed practices of the studied nurses regarding routine postpartum care at postnatal unit before, immediately and three months after implementation of the educational program. As regarding to assess the height of fundus & assess the lochia, perineal care, breast care, episiotomy care, urinary catheter care, wound dressing for caesarian section, and baby cord care it was observed that about (50%, 45%, 30%, 35%, 40%, 45% and 50% respectively) of the studied postnatal nurses had done the steps correctly and completely before implementation of the educational program. Which, improved to (90%, 80%, 90%, 85%, 85%, 90% and 90% respectively) immediately after implementing the educational program and become (70%, 60%, 75%, 70%, 75%, 70% and 75% respectively) three months after implementation of the educational program.



**Figure (3)** Distribution of the studied nurses according to their total scores level of practices regarding prevention of puerperal sepsis before, immediately and three months after implementation of the educational program (n=50).

**Figure (3)** Shows total scores level of practices of the studied nurses regarding prevention of puerperal sepsis before, immediately and three months after implementation of the educational program. It was displayed that the entire sample (100%) had unsatisfactory level of practice before implementing the educational program. Which, obviously improved to satisfactory practices among (100% and 94.1% respectively) immediately and three months after implementation of the educational program.

**Table (4)** Correlation between total score of knowledge and total score of practices among the studied nurses regarding prevention of puerperal sepsis before, immediately and three months after implementation of the educational program (n=50).

Total score of practices among the studied nurses	Total score of knowledge among the studied nurses (n=50)					
	Antenatal unit nurses (n=15)		Labor unit nurses (n=15)		Postnatal unit nurses (n=20)	
	r	P	R	P	r	P
Before the program	0.031	0.913	0.420	0.119	0.081	0.735
Immediately after program	0.741	0.002*	0.588	0.021*	0.531	0.016*
Three months later	0.656	0.008*	0.676	0.006*	0.631	0.003*

r=Correlation Coefficient

\*Significant (P < 0.05)

**Table (4)** Shows correlation between total score of knowledge and total score of practices among the studied nurses. A positive significant correlation was found between total score of knowledge and total score of practices of the studied antenatal, intranatal and postnatal nurses where (P=0.002\*, 0.021\*and 0.016\* respectively) immediately after implementing the educational program compared to ((P=0.008\*,0.006\*and 0.003\*respectively) three months after implementation of the educational program.

## DISCUSSION

Puerperal sepsis is one of the dangerous postpartum infections that is accounting for maternal mortality and morbidity. It can cause chronic health problems such as chronic pelvic inflammatory disease (PID) and infertility as well as contributes to extended hospital stays, long-term disabilities, and financial burden for the health system and families. Puerperal sepsis is caused by the transfer of an infectious agent from the cervix or vagina to the uterus during labor or pelvic examination or by the transfer of bacteria from skin, nostrils, and perineum by contaminated fingers or instruments. The main causative organisms are Chlamydia, Eschechria coli and other gram negative bacteria commonly found within the vagina. The risk of puerperal sepsis is higher among women

with sexually transmitted diseases, premature rupture of membranes, retained products of conception and postpartum hemorrhage. <sup>(5,27)</sup> Therefore, this study was undertaken to provide the nurses with adequate and up-to-date knowledge about puerperal sepsis and its prevention in order to provide high quality and competent nursing care practices. Hence, reducing maternal mortality and morbidity.

In relation to **the total score level of knowledge among the studied nurses regarding prevention of puerperal sepsis**, in the present study the majority of nurses had a low level of knowledge about prevention of puerperal sepsis before implementation of the educational program. Compared to more than four fifths of nurses who had good knowledge level immediately after implementation of the educational program, while the percentage decreased to three fifths but still significant three months after the educational program. This finding is in line with **Mohammed M et al., (2020)** <sup>(28)</sup> who examined the effect of designed educational program on midwives knowledge and practice regarding post natal sepsis management. They revealed that the majority of the studied nurses had a poor knowledge about puerperal sepsis pre-test, while most of them had a very good knowledge in the post-test after receiving the program. Similar finding were found by **Yumlembam B and Beshra A (2021)** <sup>(29)</sup> who assessed the effectiveness of information booklet on knowledge regarding puerperal sepsis and its prevention among nurses.

Moreover, **Qasim A and Chyad S (2020)** <sup>(30)</sup> who examined the effectiveness of educational program on nurses-midwives' preventive measures about puerperal sepsis. They reported that the studied sample had low level of knowledge regarding preventive measures of puerperal sepsis at pre-test, while they had high level of knowledge at post-test. Other finding was compatible with the study's finding conducted by **Abdelhakm E and Said A (2017)** <sup>(31)</sup> who explored developing nursing management protocol for maternity nurses regarding emergency obstetric care. They stated that more than half of the nurses included in the study had inadequate knowledge before applying the management protocol compared to adequate knowledge after management protocol application. From the researcher s' point of view, this lack of knowledge about prevention of puerperal sepsis before implementation of the educational program may be due to absence of in-service training programs regarding prevention of puerperal sepsis in the unit. Also, this may be related to low level of education, as most of the studied nurses were nursing diploma and graduated since long period of time. This might led them to lose too much of their basic graduation knowledge and skills. While, improvement of knowledge post program in the current study may be attributed to the effect of the educational program as well the ability and interest of the studied nurses to gain and update their knowledge.

On the other hand, this finding is dissimilar to **Parthasarathy K et al., (2019)** <sup>(32)</sup> who assessed the level of knowledge of staff nurses working at emergency obstetric management. They stated that most of the studied nurses had adequate knowledge regarding puerperal sepsis management. Again, **Kaur B & Kaur P (2016)** <sup>(33)</sup> who assessed the knowledge and practices regarding prevention of puerperal sepsis among staff nurses working in maternity wards. They stated that slightly less than half of the staff nurses had good knowledge regarding prevention of puerperal sepsis and slightly more than half of them had average knowledge regarding prevention of puerperal sepsis. From the researcher s' point of view, this difference between the finding of current study and other studies might be related to the fact that most of the nurses in their studies had attended workshops regarding puerperal sepsis management.

Concerning, **the studied antenatal nurses' score of practices regarding the steps of physical examination and hygienic care**, in the current study three fifths of the studied antenatal nurses had either incorrect or incomplete practices before implementing the educational program. Compared to more than four fifths of nurses who had correct and complete practices immediately after implementation of the educational program, while the percentage slightly decreased to four fifths but still significant three months after the educational program. This finding matches with **El-Bahy A et al., (2013)** <sup>(34)</sup> they found that the majority of nurses before the training program had incorrect practices regarding daily hygienic care for women. While, the studied nurses' practices improved after the training program among the majority of them. In the same line, **Abu Shabana K et al., (2018)** <sup>(35)</sup> who found that all nurses did not perform correctly the procedures of daily hygienic care for the mothers as mouth care and back care. From the researcher s' point of view, these incorrect practices before implementing the educational program may be due to absence of in-service training programs and refreshing courses regarding physical examination and hygienic care during pregnancy. While, the correct practices after implementing the educational program might be due to the effectiveness of the educational program sessions.

Referring to, the **studied intranatal nurses' total score of practices regarding standard precautions of infection control** during the first, second, third and fourth stages of labor at intranatal unit, in the current study all the intranatal nurses had unsatisfactory practices regarding standard precautions of infection control during labor before implementation of the educational program. Compared to the majority of nurses who had satisfactory practices immediately after implementation of the educational program, while the percentage slightly decreased to four fifths but still significant three months after the educational program. This result agreed with **Mahmoud E et al., (2021)** <sup>(36)</sup> who evaluated the effect of educational program on nurses' performance regarding infection control

precautions. They revealed that the majority of the nurses had unsatisfactory practices regarding precautions of infection control before program while more than half of them had satisfactory practices after program. Similar finding had been reported by **Said A et al., (2021)**<sup>(37)</sup> who assessed the effect of educational program for maternity nurses regarding precautionary and preventive measures at labor unit during Covid 19. They revealed that the majority of nurses in their study had satisfactory self-reporting infection control practices and preventive measures in labor unit during Covid 19 post program compared to preprogram. Also, similarly with **Mohammed M et al., (2020)**<sup>(28)</sup>'s finding. Moreover, this finding is also in line with **Ibeid E et al., (2021)**<sup>(38)</sup> who assessed nurses' knowledge and performance regarding infection control using mind map at obstetric and gynecological departments. They reported that most of the nurses had unsatisfactory level of practices for the principles of infection control. From the researcher s' point of view, these unsatisfactory practices before implementation of the educational programs may be due to lack of continuous training programs for nurses on proper infection prevention measures. As well as, shortage of adequate facilities and supplies needed to improve infection control measurements. While, the satisfactory practices post program in the current study and other studies may be attributed to the effect of the educational programs.

On contrary, this finding is disagreeing with **Fahmy S et al. (2021)**<sup>(39)</sup> who assessed nurse's practices regarding infection control measures during the second stage of labor. They stated that most nurses' practices regarding infection control in the delivery room was satisfactory. Again, **Kabir H (2010)**<sup>(40)</sup> who assessed nurse's knowledge and practice regarding prevention of surgical site infection. She reported that the nurses had satisfactory practices regarding infection control precautions. From the researcher s' point of view, these differences between the finding of current study and other studies might be related to the fact that nearly half of the nurses in their studies attended infection control courses regularly

According to the **studied postnatal nurses' scoring system of practices regarding routine postpartum care, concerning, assessment the height of fundus immediately after delivery and assessment of lochia**, half of the studied postnatal nurses had either incorrect or incomplete practices before implementation of the educational program. Compared to the majority of the nurses who had correct practices immediately after implementation of the educational program, while the percentage slightly decreased to three fifths but still significant three months after the educational program. This finding is strongly in line with **Said S et al., (2022)**<sup>(41)</sup> who revealed that after implementation of the program the studied nurses had correct practices regarding assessment of fundus and lochia flow compared to before implementation of the program. Similar result was found by **Elsayed H et al., (2019)**<sup>(42)</sup> who evaluated the effect of implementing nursing management protocol regarding early recognition of maternal sepsis. This result is also supported by **Hashem S (2012)**<sup>(43)</sup> who illustrated that all nurses in the obstetric ward at Tanta University Hospital had poor nursing practices regarding the assessment of the height of fundus and lochia flow.

While, the results of the present study is dissimilar to **Khamis H (2009)**<sup>(44)</sup> who assessed nursing management during fourth stage of labor. She pointed out that assessment of fundus and lochia was performed completely by the nurses. Moreover, the findings also disagreed with **Kebalepile T (2001)**<sup>(45)</sup> who evaluated the quality of care midwives provided during the postpartum period. He stated that, the majority of nurses in his study were able to check for uterine involution. From the researcher s' point of view, the incorrect or incomplete practices regarding assessment of the height of fundus and lochia flow may be due to nurses' lack of preparation, awareness and limited access to practices training .While, improvement of practices post programs may be attributed to the effect of various educational programs.

Concerning, postpartum **breast care ,episiotomy care and baby cord care**, in the current study slightly less than three quarter, more than three fifths, and half of the studied postnatal nurses respectively had either incorrect or incomplete practices before implementation of the educational program. Compared to majority, more than four fifths and majority of them respectively who had correct practices immediately after implementation, while the percentage slightly decreased to three quarters, less than three quarters and three quarters respectively but still significant three months after the educational program. This finding is in line with **Said S et al., (2022)**<sup>(41)</sup> who stated that nurses' total practices regarding breast care, episiotomy care and baby cord care were improved post implementation than pre implementation of the program. Also, this finding matches with **El-Khawaga et al., (2019)**<sup>(46)</sup> who studied the effect of implementation of a teaching program about immediate postpartum care on nurses' knowledge and practices. They stated that after implementation of the teaching program most of the steps regarding breast care, episiotomy care and baby cord care were obviously and significantly improved in comparison with the findings before implementation of the educational program.

Regarding postpartum **urinary catheter care and perineal care**, in the current study three fifths and more than half respectively of the studied postnatal nurses had either incorrect or incomplete practices before implementation of the educational program. Compared to more than four fifths and four fifths of them respectively who had correct practices immediately after implementation, while the percentage slightly decreased to three quarters and three fifths respectively but still significant three months after the educational program. This

finding is in line with **Said S et al., (2022)**<sup>(41)</sup> and **Mohammed M et al., (2020)**<sup>(28)</sup> and **El-Bahy M et al., (2013)**<sup>(34)</sup>. who stated that high proportions of nurses and midwives in their studies had incorrect practices regarding perineal care in the pretest. While, these scores changed to correct practices in the post test after receiving the training programs with highly statistically significant differences.

Also, **Elsayed H et al., (2019)**<sup>(42)</sup> revealed that there were improvement in practices regarding urinary catheter care and perineal care after implementation of management protocol compared to before implementation of it. Additionally, this result also agreed with **Fahmy S et al., (2021)**<sup>(39)</sup> and **Abu Shabana K et al., (2018)**<sup>(35)</sup> they mentioned that the majority of nurses in their studies had incorrect practices regarding urinary catheter care and perineal care.

Concerning, the steps of **wound dressing for caesarian section** in the current study more than half of the studied postnatal nurses had either incorrect or incomplete practices before implementation of the educational program. Compared to more than four fifths of nurses who had correct practices immediately after implementation of the educational program, while the percentage slightly decreased to slightly less than three quarters but still significant three months after the educational program. This finding congruent with a study done by **Elsharkawy N et al., (2019)**<sup>(47)</sup> who evaluated the effect of educational module on nurse's knowledge and practices regarding prevention of cesarean section surgical site infection. They illustrated that the studied nurses in their study had poor practice regarding wound dressing in the pretest, while this practice become good in the post test.

Additionally, **Aldousari N et al., (2022)**<sup>(48)</sup> who assessed nurses' knowledge and practices regarding wound dressing. They reported that more than three quarters of the studied nurses had incorrect practices of wound dressing. Other finding was compatible with the study's finding conducted by **Najm H and Hussein R (2018)**<sup>(49)</sup> who assessed wound dressing practices among nurses. They reported that more than half of participants had incorrect practices of wound dressing. Also, the result of the current study was congruent with a study done by **Mohammed A et al., (2018)**<sup>(50)</sup> on wound dressing performance among nurses in Saudi Arabia. They reported that the majority of the studied nurses had incorrect wound dressing practices.

However, the result of present study was not congruent with a study done by **Dhanasundari G (2018)**<sup>(51)</sup> that aimed to assess the practice of aseptic techniques on surgical wound dressing in Indian. They stated that most of the nurses had correct practice regarding wound dressing. The findings are also inconsistent with a study done by **Tela S (2018)**<sup>(52)</sup> who assessed nurses' practice regarding post-operative wound care in Ethiopia. They reported that more than half of nurses had correct practice regarding wound dressing.

From the researcher s' point of view, the incorrect or incomplete practices regarding wound dressing for caesarian section may indicate that the studied nurses did not receive the needed training to perform this procedure. Also, it may be related to shortage of vital equipment and supplies needed for providing immediate postpartum care. This view agrees with **Chodzaza E (2008)**<sup>(53)</sup> who assessed quality of care rendered to women with major obstetric complications. She pointed out that, health managers should ensure availability of appropriate structures, equipment and supplies for management, and they should promote and monitor their use through supervision and providing necessary feedback. On the other hand, the improvement of nurses' practices post programs may probably be due to the immediate effect of the educational programs.

Referring to, the **total scores level of practices among the studied nurses regarding prevention of puerperal sepsis**, all nurses had unsatisfactory level of practices before implementing the educational program. On the other hand, immediately after implementation of the educational program the entire sample had satisfactory level of practices, while the percentage slightly decreased to the majority of them but still significant three months later. The result of the current study was in line with **Said S et al., (2022)**<sup>(41)</sup> who revealed that after implementation of the educational program the total score of practices were improved compared to pre-implementation. Similar results by **Elsayed H et al., (2019)**<sup>(42)</sup> who clarified that there were highly statistical significant differences before and after management protocol regarding nurses' level of practices toward management of maternal sepsis.

From the researcher s' point of view, this unsatisfactory practices regarding prevention of puerperal sepsis before implementation of the educational programs may be due to lack of a system for supervision and evaluation of nursing practices. While, the findings significantly improved immediately and three months after implementation of the educational programs may probably due to the use of different audiovisual material, colored booklet and power point presentation which enhanced the retention of the information and has positive impact on their practices. However, three months later, the nurses' scores were somewhat reduced but still significant which may probably due to nurses' work overload and lack of the resources.

Regarding, **correlation between total score of knowledge and total score of practices** among the studied nurses about prevention of puerperal sepsis, the current study illustrated that a positive significant correlation was found between total score of knowledge and total score of practices of the studied nurses immediately and three months after implementation of the educational program. This result was consistent with **Elsayed H et al., (2019)**<sup>(42)</sup> and **Abdelhakm E and Said A (2017)**<sup>(31)</sup> They found statistically significant correlation between total scores of

nurses' knowledge and practices before and after nursing management protocol. Additionally, **Kaur B & Kaur P (2016)** <sup>(33)</sup> revealed that there was positive correlation between total scores of knowledge and practices regarding prevention of puerperal sepsis. From the researcher's point of view, this agreement between the finding of the current study and other studies might be explained by the fact that, when nurse's knowledge improved the practices also improved.

## CONCLUSION

**Based on the findings of the present study, it can be concluded that:** there was obviously significant improvement of nurses' knowledge as well as their practices regarding puerperal sepsis and its prevention during antepartum, intrapartum and postpartum period immediately and three months after implementation of the educational program. Consequently, it is confirmed that the educational program regarding prevention of puerperal sepsis is an effective strategy to improve the knowledge and practices among the studied nurses.

## RECOMMENDATIONS

**Based on the findings of the present study, the following recommendations are suggested**

1. Reactivating the role of the head nurse in supervising, guiding and evaluating the nursing care provided for women who are at high risk for developing puerperal sepsis, in order to identify weak points and manage them.
2. Periodic educational training programs for staff nurses at obstetrical and gynecological units regarding application of Universal Precautions of Infection Control.
3. An Arabic booklet and posters containing basic needed information regarding prevention of puerperal sepsis should be in all public services hospital, and maternal and child health centers to increase parturient women's awareness regarding prevention of puerperal sepsis.
4. Implement an educational program on postnatal women's awareness regarding prevention of puerperal sepsis in different geographical areas in Egypt, with large sample size.

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