

Effect of Utilizing Care Bundle on Prevention of Puerperal Sepsis among Post-Natal Women

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Abstract

Background: One of the top five leading causes of women deaths worldwide is puerperal sepsis., preventive care bundle are the best nursing interventions based on evidence applied in clinical practice for prevention puerperal sepsis. **Aim:** The present research aimed to evaluate the effect of utilizing care bundle on prevention of puerperal sepsis among post-natal women. **Design:** A quasi-experimental research design (study/control group, pre/post-test) was utilized. **Sample:** A purposive sample of 100 women (pregnant women at 36 gestational weeks and followed immediately after delivery). **Setting:** The present research conducted at the out-patient clinic of obstetrics & gynecology department and postnatal room (recovery room) at Benha University Hospital. **Tools:** three tools utilized included: I- A structured interview questionnaire, II-part one -knowledge assessment questionnaire, part two-care bundle practices scale, III-the sepsis in obstetric score sheet. **The results:** there were highly statistical significance improvements found at two weeks after delivery and forty days postnatal in the total knowledge score of the study group compared to control ones ($P \leq 0.001$). there was statistically significant difference between study and control group immediately after delivery in all elements of care bundles practices(P -value <0.05), and there was high statistically significant difference in all elements of care bundles practices between study and control group at two week and forty day post-natal ($P \leq 0.001$). there was no significant differences in the Sepsis in Obstetrics Score between the study and control groups at immediately after delivery (P -value >0.05) while there was ahigh statistically significant difference at two weeks and forty days postnatal of the study group compared to control ones ($P \leq 0.001$).**Conclusion:** the majority of the study group had good total knowledge scores and good total care bundle practices scores for prevention of puerperal sepsis compared to less than the half of the control group at two weeks after delivery and 40 days postnatal with highly statistical significance improvements of the study group compared to control group ($P \leq 0.001$). Also, the most of study group had normal sepsis in obstetric scores compared to about two thirds of the control group with highly statistical significance improvements ($P \leq 0.001$). **Recommendations:** Care bundle should recommend as evidence-based nursing interventions applied to postnatal women for prevention of puerperal sepsis.

Keywords: Care bundle, Prevention, Puerperal sepsis, Post-natal women.

Introduction

The infection of the vaginal tract during postpartum period for at least the first six weeks after delivery, is defined as puerperal sepsis, which stated as a major public health issue and the leading cause of women deaths, particularly in underdeveloped countries. (*Gamel et al., 2020*). There are

between 15 and 19 million cases of maternal sepsis worldwide every year, which result in an estimated 75,000 maternal fatalities, particularly in low-income nations. (*Kumar& Yadav, 2020*).

The most causes that afflict puerperal sepsis are endometritis, cesarean section incision infection, and mastitis. It occurs in

conjunction with two or more of the subsequent symptoms : pelvic ache, fever, unfamiliar vaginal discharging, unpleasant discharge odor, and a delay in the uterus shrinking (in the first eight days, less than 2 cm each day). (*Demisse et al., 2019*).

Numerous streptococcal and anaerobic species are the most prevalent infectious agents. Gonococci, coliform bacteria, Clostridia, and Staphylococcus aureus are less prevalent but dangerous pathogenic organisms that can predispose to puerperal sepsis (*Keenan-Lindsa et al., 2022*). Exogenous or endogenous infections can occur depending on the existence of devitalized tissues in the vagina and cervix, while exogenous infections result from the introduction of outside agents (such as helpers, relatives, or non-sterile objects). The uterus (Endo myometrium) is the primary site of infection; from there, it can move through the parametrium to the ovaries and fallopian tubes before entering the circulation (septicaemia). (*Okwudili, et al., 2020*).

Anemia, poor personal hygiene, unsanitary delivery surroundings, low social-economic conditions, several vaginal examinations, premature labor, ruptured membranes, prolonged labor, postpartum hemorrhage, and caesarean section are various risk factors for puerperal sepsis. (*Yumlembam and Beshra, 2021*).

Recent studies emphasized on the role of health practitioners and policies to utilize recent and evidenced modalities of care in applying the preventive measures of puerperal sepsis through educate and equipped postnatal women with health practices during hospital stay and after discharge (*Plante et al., 2019; Refai et al., 2019*).

Care bundles are a collection of steps that, when used consistently and collectively, it will enhance the outcome of patients. Each component of the bundle must be finished to obtain the desired result; failing to finish a component could consequently have an impact on the patient's overall prognosis. In

advance, the use of preventative care bundles for the initial management of sepsis reduces mortality and improves patient outcomes in high-income nations. (*Cheshire et al., 2021*).

Recent studies have encouraged implementing and approving evidence-based practice by introducing care bundles into therapeutic setting to prevent needless delays in the provision of healthcare (*Baghdadi, et al., 2020*). Additionally, it has been demonstrated that nurses play crucial roles in the successful implementation of preventative care packages of puerperal sepsis as soon as feasible to target the intended outcomes (*Abutheraa, et al., 2020*).

Nurses must be able to identify women at risk for puerperal infection through standard screening practices for puerperal sepsis applied during postpartum as sepsis in Obstetrics Score' (SOS) which is the identification tool estimating the probabilities that a woman would experience maternal sepsis or identifying who may need urgent care or early treatment due to infection (*Aarvold, 2016*).

Maternity nurses should promptly provide teaching and counseling before discharge about care bundle prevention of puerperal sepsis and after discharge, telephone follow-up, do hot lines, lactation counselors, home visits by nurses, and teaching materials (videos, written materials) are all interventions that can be applied to prevent or provide recognition of postpartum infections (*Hassan et al., 2021*).

Significance of the study

According to recent research in Upper Egypt conducted by (*Hassan, et al., 2021*), puerperal infection is the fourth direct main cause of death in Egypt, concluded that 2% of the study sample had puerperal sepsis. Additionally, puerperal sepsis imposes a significant social burden because it increases the risk of prolonged hospital stays, septicemia, pelvic inflammatory disease, disseminated intravascular coagulation,

infertility, and death. As a result, prevention measures for this condition imply superior postnatal care for women (*Boushra & Rahman, 2021*).

The routine care provided during postpartum period in the almost official hospitals were lacking planning and tailored practices according women conditions and early detection of puerperal sepsis signs as possible to prevent further complications. care bundle practices could be implemented more promptly as best care practices for prevention possible severe maternal infections, and other serious outcomes for women and babies if it timely applied as early in postpartum period. Sepsis in obstetric scores have been adapted worldwide to good effect in low resource setting besides facilitate earlier identification and timely management of sepsis if occurred. For that concern the present study will be implemented to evaluate the care bundle on prevention puerperal sepsis among post-natal women.

The Study Aim

Evaluate the effect of utilizing care bundle on prevention puerperal sepsis among post-natal women through:

- 1- Assess the knowledge and practices of pregnant women during late trimester regarding care bundle on preventions of puerperal sepsis.
- 2- Design and implement care bundle practices in late trimester of pregnancy and immediately after delivery among postnatal women.
- 3- Evaluate the effectiveness of care bundle on preventions puerperal sepsis among postnatal women through three study phases (immediately after delivery, two weeks postnatal ,at forty days).

Operational definition

Care bundle is a collection of directed and evidence-based practices to provide effective and safe care for prevention of puerperal sepsis.

"Sepsis in Obstetrics Score" (SOS), is created to recognize obstetric women at risk or exhibiting indications of sepsis during the postpartum period, had a greater positive predictive value. Systolic blood pressure, heart rate, and temperature factors are taken into account while calculating the score.

Study Hypotheses:

- The study group women who receive care bundle for prevention of puerperal sepsis will exhibit better knowledge and practices than control group.

-The study group women who receive care bundle for prevention of puerperal sepsis will have normal range in the sepsis obstetric score than control group.

Subject and Methods

Research design: The study was done through a quasi-experimental design that included a study/control group, pre- and post-tests. A quasi-experimental approach tries to establish a causal association between an independent and dependent variable (where the dependent variable is care bundle and the dependent variable is prevention of puerperal sepsis in postnatal women). The subject is divided into the study group or the control group and all subjects had their baseline measurements for the dependent variables completed. Following that, the intervention group's participants only received the suggested intervention. After that, all subjects underwent a post-test to determine how much the dependent variables had changed. (*Flannelly et al., 2018*). The control group received the provided hospital care, while the study group adhered to the care bundle.

Setting: The study was conducted in outpatient clinic of obstetrics& gynecology department and postnatal room (recovery room) and at the Benha University Hospital which is considered the official setting served all the towns and villages around it and received admitted cases for normal &high-risk pregnancy, delivery, post-partum, follow

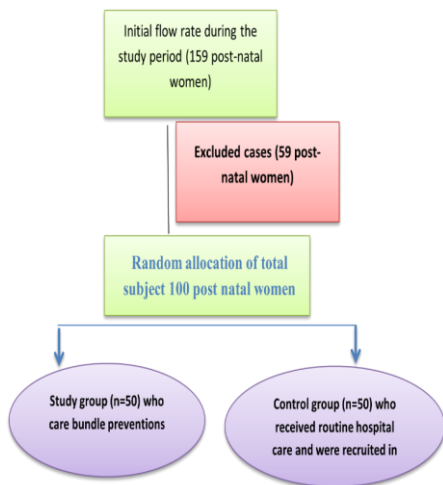
up and other obstetrics and gynecological cases.

Sample type: A non-probability purposive sampling.

Sample Size and technique: 100 women (pregnant women at 36 gestational weeks and followed immediately after delivery) at the previously mentioned setting & met following inclusion and exclusion criteria during the periods October 2021 till March 31, 2022, and the sample were randomly created from two equal groupings (n=50), study group (care bundle) and control group (hospital care).

Primiparous and multiparous women who gave birth naturally or via cesarean section and had no complications during their most recent pregnancy and delivery will meet the inclusion criteria. Women who have been diagnosed with infectious disorders are excluded.

Fig. (1): Flowchart of the sample technique and participants in the study



Tools for data collection:

Tool I: A structured interview questionnaire: This tool was developed by the researchers after reviewing the related literatures and consists of three parts:

Part one; socio-demographic characteristics; it includes data about age, residence, level of education, occupation, telephone No.

Part two; obstetrics data; it included the following items: gravidity, parity, abortion, Follow-up during pregnancy, antenatal visits.

Part three; past and present delivery history: it includes type of past delivery, delivery complications , types of complications and mode of present delivery.

Tool II -part one: Knowledge assessment questionnaire regarding puerperal sepsis: It was adapted from (Lalitha , 2016 ;Kaur &Jairus,2014) and include 20 close- ended questions as definition, causes, contributing factors, sign and symptoms, care bundle for preventions of puerperal sepsis (15 questions).

Scoring system

Every question was answered by yes or no. the yes answer was given a score (1) and no answer was given a score (0), then the total score was calculated from 20 degrees and classified into good knowledge score ($\geq 60\%$ or ≥ 12 degrees) and poor knowledge ($<60\%$ or <12 degrees).

Tool II-part two: Care Bundle Practices scale:

It was a three points scale developed by researchers after reviewing related literatures (Evans, et al, 2021; NICE,2017) and included 28 questions regarding care bundle practices for prevention puerperal sepsis as ;**Personal hygiene** include 9 questions as (Frequent hand washing, Careful dental hygiene, Use Clean and personnel equipment, Frequent clean perineal area with antiseptic solutions in right directions, Drying perineum with clean and dry towel, Observe perineum for signs of infection, Frequent change of perineal pad , Sterilize underwear properly , Change underwear frequently) **Diet** include 2 questions as (Adapt healthy and balanced diet, Frequent drink warm water),

Mobility and environment include 3 questions as (Take enough periods of rest , Careful reduce of visitors, the environment should be free of dust). **Lochia and uterine assessment** include two questions as (Encourage semi-Fowler's position to allow drainage of lochia, observe color, odor, and amount of lochia to identify any complication). **breast feeding** includes three questions as (Start breast feeding immediately after birth, Careful breast care with warm water before and after breastfeeding, Frequent breast feeding to avoid engorgement), **general health practices** include four questions as (Careful attention to signs of puerperal sepsis, seeking immediate care for any wounds or even seasonal diseases, Careful wound care according to given instructions, proper medication use (e.g., with or without meals, take entire course of antibiotic, as prescribed). **Bundle preventions practices after hospital discharge** include 5 questions (avoid perineal/pubic shaving after delivery, avoid adherence of wrong habits or practices in post-partum period as sitting in bathing basin or pool while showering and vaginal douching, Avoid contact visitors with respiratory infection or others, avoid practicing sexual activity before 40 days, avoid unchanged sanitary until being soaked).

Scoring system

The responses will be based on a three-point Likert scale (never scored zero, sometimes scored 1 and always scored 2). Then the total score was calculated 56 degrees and classified into satisfactory practice score ($\geq 60\%$ or > 33.6 degrees) and unsatisfactory practices ($<60\%$ or <33.6 degrees).

Tool III: The Sepsis in Obstetrics Score (SOS) sheet

It was utilized for early recognition of post-natal women at risk of puerperal sepsis and adapted from (Albright *et al.*, 2014; Agarwa, *et al.*, 2021). It included six physiological parameters as temperature, systolic blood pressure, heart rate, oxygen supplementation, respiratory rate correlating

with their divergence from the expected normal values. The researchers assessed it immediately after delivery and then at two weeks and forty days post-natal. The normal range value was given score zero while abnormal taken +1 and its summative produce a score ranged from (0) indicate normal range, (+1,+2) indicate low abnormal range ,while (+3,+4) indicate high abnormal range.

Validity

An exhaustive assessment of the literature on puerperal sepsis and care bundle preventions was conducted to ensure the content validity of the questionnaire sheet. In order to improve the tools' clarity of sentences, appropriateness of content, item sequencing, and accuracy of scoring and recording of items, five experts—two in the field of obstetrics and gynecological nursing, one in the field of obstetrics and gynecological medicine, and two in the field of community health nursing—provided their opinions. Additionally, the modifications were made as categorized the second tool into seven main topics, retyping of some sentences of tools.

Reliability

The internal consistency of the tools was calculated by the Cronbach's alpha coefficient tests. The reliability of the knowledge assessment questionnaire was 0.82 and care bundle preventive practices sheet was 0.79 while reliability of Sepsis in Obstetrics Score (SOS) ranged from 0.86 to 0.91 according to (Rhodes, 2016) and in the present study was 0.87. The Cronbach's alpha scores provided indicated that the tools had acceptable reliability.

Pilot study

A pilot study was conducted on 10% of women (10 postnatal women) to assess the applicability of the study items and verify their clarity and understandability. The pilot sample was incorporated into the overall sample without any alterations.

Ethical considerations

Each participant woman in the study was made aware that all of their information is extremely private, and that anonymity was ensured by giving each one a code number rather than a name to protect their privacy. They were also informed that they had the right to withdraw from the study at any time and without providing a reason. Only the researchers and the participants had access to the data.

Procedure

Before starting the study, official approval from the Dean of the nursing faculty was given to the director of the Benha University hospital. Each postnatal woman enrolled in the study provided written consent. The three steps of the study's design were assessment, implementation, and evaluation.

1. Assessment phase:

The study was given official approval at this phase, and the researchers visited an outpatient clinic and a post-natal ward to assess the settings, observe the prevalence of women, and engage in work together with nurses about the study's objectives. The interview lasted around 20 minutes for each woman to collect data relating to demographic, obstetric history, and present delivery profile after the researchers had described the study's aim to each woman who fit the criteria and obtained written consent.

2. Implementation phase:

A-the study group

Before delivery: the implementation phase was conducted in a prepared room in the mentioned setting in the antenatal clinic to provide more confidentiality as the researchers scheduled two sessions for the study group each lasted 1-2 hours. The researchers answered the women's questions, clarified the booklet's content, and took their phone numbers in order to follow up with them. The researchers used power point lectures, a pamphlet, and debate and demonstration based on the group's understanding. The concept of puerperal sepsis, its causes, risk factors, symptoms, and

signs were some of the subjects covered by the researchers. And then explained care bundle practices for prevention of puerperal sepsis that must be immediately done post-natal as personal hygiene, diet, mobility, lochia, breast feeding, and general health and six practices must be avoided after discharge from hospital. Then the researchers given the illustrated book to the study group to aid in remembering the given instructions and follow the care bundle practices at home.

Immediately after delivery: The researchers obtained present delivery profile from patient records and then implemented the planned care bundle practices beside the given hospital care until the post-natal women discharged from hospital.

B-The control Group; follows the routine hospital care and was first interviewed by the researchers. the health care provider monitored vital signs and gave prescribed medication for mother and fetal and asked post natal women to start breast feeding with limited instructions about puerperal sepsis, risk factors, and preventive care bundle practices.

3- Evaluation phase

After the care bundle practices were applied, the researchers obtained the first evaluated data of tool II "part one knowledge assessment questionnaire – part two care bundle practices "and tool III "Sepsis in Obstetrics Score " at three times of assessments (immediately after delivery ,two weeks post-natal and at forty days) to determine the effectiveness of care bundle in prevention of puerperal sepsis of both groups. Comparison between the collected data throughout study phases between both groups (study and control) was done.

Statistical analysis

The data were analyzed using (SPSS) version 24.0 (a total sample size of 100 postnatal). The presentation of qualitative data included the use of terms like mean, standard deviation, frequencies, and percentages. Using an independent t-test and

the correlation coefficient (person correlation), relationships between several qualitative variables were tested. Probability (p-value) values less than 0.001 were considered highly significant, if under 0.05 were regarded as significant, whereas values over 0.05 were regarded as non-significant.

Results

Table 1 demonstrates that 40%, 36 % of the studied women (study and control group) were in age group between (28 -< 33 years) with mean \pm SD 30.02 \pm 3.05 for the study group and 31.25 \pm 4.12 for control group. 52% and 60% of the study and control group respectively lived in urban area and 50%, 58% of both groups respectively had secondary education, and the majority 68%, 74% of both groups were housewives. Also, there were no statistically significant difference between study and control group regarding all demographic characteristics (p-value >0.05).

Table 2 denotes the 50% & 54% of the studied women (study & control group) were primigravidas, 80%, 86% of the (study & control group) respectively have no history of abortion and 62%, 70% of the (study & control group) respectively had attended antenatal visits during pregnancy for follow up and 34%, 40% of (study & control group) respectively attended 5-10 visits with no statistically significant difference between two groups regarding all items of obstetric history (p-value >0.05) .

Table 3 presents (80.0% & 82.6%) of the study and control groups had delivered cesarean sections and no past delivery complications. moreover 68% & 70% of the study and control groups had delivered caesarean sections with not statistically significance difference (p-value >0.05) regarding all items of present and past delivery history.

Table 4 shows that there was significant difference improvements in total knowledge scores of the study group

compared to the control group immediately after delivery (P-value < 0.05), while there were highly statistical significance improvements found of the study groups in compared of control group at two weeks and forty days post-natal (P \leq 0.001).

Figure 1 illustrates, 45% of study and 62% of the control group had poor total knowledge score immediately after delivery, while at two weeks 68% of the study compared to 40% of the control group had good total knowledge scores and at 40 days post-natal 66% of the study compared to 38% of the control group had good total knowledge score.

Table 5 clarifies that there was statistically significant difference between study and control group immediately after delivery in all elements of care bundles practices (P-value < 0.05), and there was high statistically significant difference between study and control group at two week and forty day post-natal (P \leq 0.001).

Figure 2 presents 42% of the control and 50% of the study group had good care bundle practices immediately after delivery while 76% of the study group compared to 48%) of the control ones had good practices at two weeks and 80% of the study group compared to 50% of the control group had good practices at forty days.

Table 6 highlights that 92% of the study and of 68% the control groups had normal Score of Sepsis in Obstetrics Score immediately after delivery while 96% of study group compared to 66% of the control group reported normal score at two weeks postnatal, besides 98% of the study group compared to 80% of the control ones reported normal scores at forty days post-natal. Added to that there was a high significant difference in the sepsis in obstetrics score between the study and control groups throughout study phases immediately after delivery, two weeks, and forty days postnatal) P \leq 0.001.

Table 7 demonstrates that there was a high statistically significant correlation between total knowledge scores and care bundle practices score of puerperal sepsis throughout the study phases of the study than the control groups ($P \leq 0.001$).

Table 1: Comparison of studied women control and study) groups' socio-demographic characteristics (n=100).

Socio demographic characteristics	Control group (n=50)		Study group (n=50)		X ²	p-value
	No.	%	No.	%		
Age/ years						
18- < 23	10	20.0	10	20.0	2.339	0.505
23- <28	13	26.0	16	32.0		
28 - < 33	18	36.0	20	40.0		
33- <38	9	18.0	4	8.0		
Mean ±SD	31.25±4.12		30.02±3.05			
Residence						
Urban	30	60.0	26	52.0	0.649	0.420
Rural	20	40.0	24	48.0		
Educational level						
Basic education	18	36.0	22	44.0	0.696	0.706
Secondary education	29	58.0	25	50.0		
University education	3	6.0	3	6.0		
Occupation						
Work	13	26.0	16	32.0	0.437	0.509
Housewives	37	74.0	34	68.0		

Table 2: Comparison of studied women study and control) groups regarding the obstetric history n=100).

Obstetric history	Control group (n=50)		Study group (n=50)		X ²	p-value
	No.	%	No.	%		
Gravidity						
Primigravida	27	54.0	25	50.0	0.530	0.76
2-3	19	38.0	16	32.0		
≥4	4	8.0	9	18.0		
Parity	(n=23)		(n=25)			
Once	4	17.4	9	36.0	0.409	0.81
Twice	19	82.6	16	64.0		
Abortion						
No	43	86.0	40	80.0	1.108	0.57
Once	3	6.0	6	12.0		
Twice	4	8.0	4	8.0		
Follow-up during pregnancy						
Yes	35	70.0	31	62.0	0.713	0.39
No	15	30.0	19	38.0		
No of Antenatal visits						
No	15	30.0	19	38.0	4.841	0.18
1-<5	10	20.0	8	16.0		
5-10	20	40.0	17	34.0		
More than10	5	10.0	6	12.0		

Table 3: Comparison of the studied women study and control) groups regarding present and previous delivery history (n=48).

Previous delivery history	Control group (n=23)		Study group (n=25)		X ²	p-value
	no	%	no	%		
Type of past deliveries						
Vaginal delivery	4	17.4	5	20.0	0.496	0.52
Cesarean section	19	82.6	20	80.0		
Delivery complications						
Yes	7	30.4	10	40.0	0.367	0.54
No	16	69.6	15	60.0		
Types of past delivery complications						
No	16	69.6	15	60.0	0.632	0.88
Vaginal bleeding	1	4.3	2	8.0		
Prolonged labour	3	13.2	5	20.0		
Maternal and fetal distress	1	4.3	1	4.0		
Mastitis	2	8.6	2	8.0		
Mode of present delivery						
	Control group (n=50)		Study group (n=50)		3.16	0.20
Vaginal delivery	15	30.0	16	32.0		
Cesarean section	35	70.0	34	68.0		

Table 4: Comparison of the study and control group total knowledge mean score throughout the study phases.

Items	Minimum - Maximum score	Control group		Study group		t-test	p-value
		Mean	±SD	Mean	±SD		
Immediately after delivery		8.18	0.71	12.92	1.0	1.447	0.05 *
Two weeks post-natal	12-20	11.72	1.63	17.91	20.54	13.207	0.000**
40 days postnatal		12.02	1.21	16.07	0.93	14.21	0.001**

* statistical significance <0.05 ,**Highly statistically significant P ≤ 0.001).

Figure 1): percentage distribution of studied women control and study) groups regarding total knowledge score of care bundle prevention of puerperal sepsis throughout the study phases n=100).

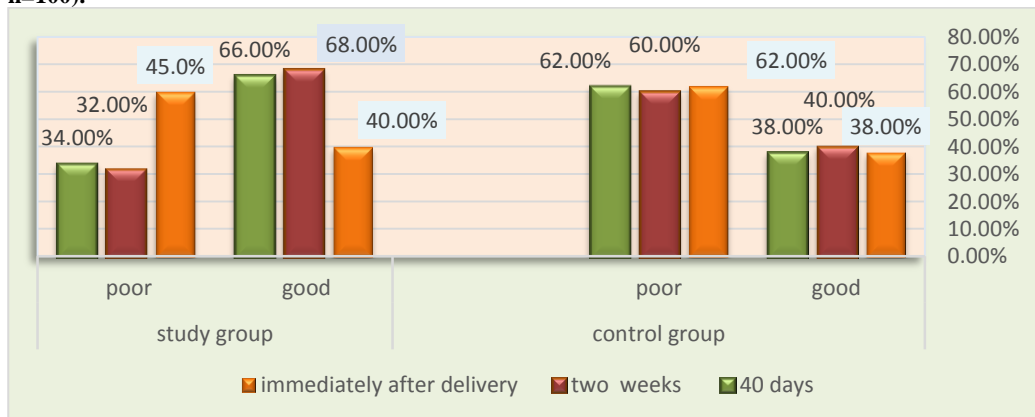


Table 5): Comparison of care bundle practices scores for prevention of puerperal sepsis among studied women study and control groups) (n=100) throughout the study phases.

Dimensions	Score	Control group	Study group	t test	P value
		Mean ±SD	Mean ±SD		
Personal hygiene					
Immediately after delivery	9-18	9.42 ± 1.77	10.13 ± 2.31	0.66	0.05 *
Two weeks postnatal		10.73 ± 1.87	17.62 ± 1.86	14.9	0.000**
At 40 days postnatal		12.20 ± 1.45	16.17 ± 1.36	20.0	0.000**
Diet					
Immediately after delivery	2-4	2.44 ± 1.43	3.62 ± 1.51	0.57	0.05 *
Two weeks postnatal		2.20 ± 2.65	3.48 ± 1.14	9.9	0.000**
At 40 days postnatal		2.68 ± 2.39	3.95 ± 0.05	8.0	0.000**
Mobility and environment					
Immediately after delivery	3-6	3.26 ± 1.37	4.0 ± 2.39	0.91	0.05 *
Two weeks postnatal		4.35 ± 2.23	5.68 ± 1.46	10.7	0.000**
4weeks postnatal		4.84 ± 1.88	5.40 ± 0.60	11.3	0.000**
Lochia					
Immediately after delivery	2-4	2.77 ± 1.47	2.74 ± 2.49	1.08	0.28
Two weeks postnatal		2.48 ± 0.53	3.67 ± 3.75	4.9	0.000**
At 40 days postnatal		3.36 ± 2.18	27.93 ± 2.97	9.8	0.000**
Breast feeding					
Immediately after delivery	3-6	3.57 ± 1.76	3.96 ± 1.65	0.30	0.05 *
Two weeks postnatal		4.77 ± 2.18	4.82 ± 3.49	6.5	0.000*
At 40 days postnatal		5.24 ± 1.70	5.82 ± 2.66	9.7	0.000*
General health					
Immediately after delivery	4-8	4.62 ± 2.18	5.02 ± 2.18	1.30	0.05 *
Two weeks postnatal		5.02 ± 1.88	6.42 ± 2.77	8.7	0.000**
At 40 days postnatal		5.60 ± 1.62	7.04 ± 2.62	9.6	0.000**
Bundle preventions practices					
Immediately after delivery	5-10	6.62 ± 2.18	7.02 ± 2.18	1.30	0.05 *
Two weeks postnatal		7.02 ± 1.88	10.42 ± 2.77	8.7	0.000**
At 40 days postnatal		9.60 ± 1.62	11.04 ± 0.96	9.6	0.000**
Total score					
Immediately after delivery	33.6-56	28.11 ± 5.77	33.64 ± 9.96	0.97	0.05 *
Two weeks postnatal		32.57 ± 11.13	45.73 ± 8.77	12.8	0.000**
At 40 days postnatal		33.06 ± 9.22	52.93 ± 7.09	17.7	0.000**

* statistical significance p<0.05.

**Highly statistically significant P ≤ 0.001.

Figure 2: Percentage distribution of the studied women control and study) groups regarding their total care bundle practices scores throughout the study phases (n=100).

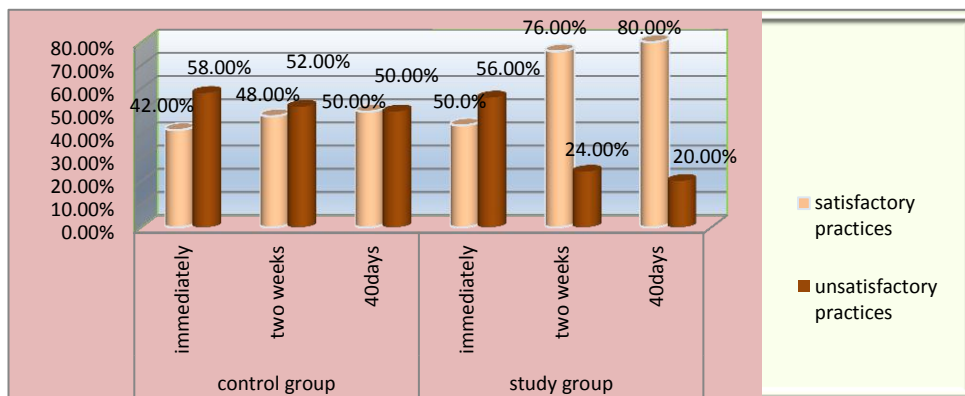


Table 6: Distribution of the Sepsis in Obstetrics total Score (SOS) among study and control group throughout the study phases. (n=100)

Time of assessments	Score*	Control group		Study group		X ²	p-value
		No	(%)	No	(%)		
Immediately after delivery	High abnormal range	3	(6.0%)	1	(2.0)	3.125	0.02**
	Normal	34	(68.0%)	46	(92.0%)		
	Low abnormal range	13	(26.0%)	3	(6.0%)		
Two weeks postnatal	High abnormal range	2	(4.0%)	0	(0.0%)	1.010	0.002**
	Normal	33	(66.0%)	47	(96.0%)		
	Low abnormal range	15	(30.0%)	3	(6.0%)		
At 40 days postnatal	High abnormal range	0	(0.0%)	0	(0.0%)	0.093	0.001**
	Normal	40	(80.0%)	49	(98.0%)		
	Low abnormal range	10	(14.0%)	1	(2.0%)		

*Minimum score 0 - Maximum score +4 **Highly statistically significant P ≤ 0.001).

Table 7: Correlation between total knowledge and total care bundle of the studied women throughout the study phases (n=100).

Items	Total care bundle Score											
	Control group n= 50						Study group n= 50					
	Immediate ly after delivery		Two weeks postnatal		40 days postnatal		Immediately after delivery		Two weeks postnatal		40 days postnatal	
	r	P- value	r	P- value	R	P- value	r	P- value	r	P- value	r	P- value
Total knowledge score	0.45	0.05	0.41	0.00	0.52	0.00	0.41	0.000	0.64	0.000	0.73	0.000
	1		1	0*	2	0*	4	**	7	**	1	**

* Statistically significant difference P ≤ 0.05.

**Highly statistically significant P ≤ 0.001.

Discussion

Puerperal sepsis is an urgent danger situation might result in a postpartum woman's death as well as long-term morbidities as chronic pelvic discomfort, pelvic inflammatory disease, and secondary infertility (Bishaw et al., 2022). Puerperal sepsis is highly preventable; good antenatal care provision, a prompt referral system, and timely availability of early management and therapy are required for prevention. (Peate and Dutton, 2021). A care bundle is a collection of actions that, when applied collectively, greatly enhance patient outcomes. The care bundle's steps are carefully chosen, well-respected procedures that have been packaged up and backed by science (Taksande, 2020). The aim of the current study is to evaluate the effect of

utilizing care bundle on prevention puerperal sepsis among post-natal women.

The findings of the current study revealed about two fifths of the studied women (study and control group) were in age group between 28 - < 33 years with mean ±SD 30.02±3.05 for the study group and 31.25±4.12 for control group. Moreover, half of the study and control group respectively lived in urban area and possessed secondary education, and most of both groups were housewives. Regarding demographic characteristics, there was no statistically significant difference between the study and control group, which reflects homogeneity between both groups. These results may be due to normal childbirth age and all the attendants to hospital were from near places in the Benha City and had secondary education so most of the sample were housewives beside the spread of unemployment in Egypt .

These results agree with *Ismail and Abdullah (2020)* who conducted research on women's attitudes and perceptions on puerperal sepsis prevention at a Turkish hospital in Khartoum, Sudan in 2020 and indicated that most of the age of the women were ranged between 25-31 years and their educational qualification were secondary level of education and more than the half of participants occupation were housewives. This accordance with the present results emphasizes the similarity of demographic characteristic in the studies as this age were the suitable reproductive age for women and were carried in developing countries. also, the current findings agree with *Okwudili et al., (2020)* who conducted research on recurring obstetric sepsis in Port Harcourt, Southern Nigeria, and found that participants' average ages were 29.14 ± 5.02 years old and more than half had a secondary education.

Moreover, the present study consistent with *Demisse et al., (2019)* who investigated the causes of puerperal sepsis in postpartum mothers treated at public hospitals in Ethiopia's west SHOA zone and mentioned that a mean age of $24 (\pm 4)$ years for the study group and $26 (\pm 5)$ years for the control group. Most of the participants were in the age group 25–29. On the other hand, this result incongruent with *Hassan et al., (2021)* who studied knowledge and practices of postnatal mothers regarding prevention of puerperal sepsis and revealed that, most of the studied pregnant women were secondary education.

Regarding obstetric history the present study found that; half of the studied women (study & control group) were primigravida and that the majority of studied women had no history of abortion in both groups respectively, also more than two thirds of the studied women had attended antenatal visits during pregnancy and about two fifths of the study & control groups attended 5-10 visits. Regarding all items of obstetric history, with there wasn't statistical significant difference between two groups (p -value > 0.05). This may be due to increased awareness of pregnant women about the importance of follow-up during pregnancy to maintain their

health and the health of the fetus. These results partially agree with *Nchimbi and Joho (2022)* that conducted research titled " postpartum women's knowledge of puerperal sepsis and reported self-care habits in Tanzania's Dar es Salaam" and indicated $n=260$, 75.8% of them had more than four antenatal care visits., but disagree in this point most of postpartum women $n=183$, 53.4% were multiparous, may be due to difference society area. in contrast, the present results in opposition to *Alharbi et al., (2019)* that evaluated Kegel exercise knowledge and practices, among postnatal women in Al Madinah Al Munawara, Saudi Arabia and reported that more than three quarters were multigravidas. also contrast with *Chepchirchir et al., (2017)* who investigated the causes of puerperal sepsis in women of reproductive age in Nandi County, Kenya and demonstrated that more than half of participants multipara, 56.7% of the subjects had inconsistent or nonexistent prenatal care attendance. According to the study, this might be because of varying levels of their education.

Regarding previous delivery history, the present study shows that half of the studied women had previous parity history and that most of them mode of delivery by cesarean section, more over the current history reveal that more than two-thirds of the women in the study mode of delivery by cesarean section and had not exposed to past delivery complications with no difference in statistical significance between both groups respectively. This may be because a cesarean section can save a mother's or baby's life when a vaginal delivery would be dangerous; also, most of the women who participated in the study had attended antenatal visits help prevention, early detection and treatment complication. These results like *Farzaneh et al., (2017)* who reported through a study about the effect of educational package on lifestyle of primiparous women during the postpartum period that about half of the education and control group delivered via cesarean section and there was no statistical

significance between two groups regarding delivery complications.

Concerning knowledge of care bundle prevention of puerperal sepsis, the present study reveals that the study group had an improvement in knowledge immediately after delivery than control group with a statistical significant difference between two groups, while there were highly statistical significance improvements found post implementation at two weeks post-natal and forty days postnatal in the study group compared to control groups and additionally there were less than half study group and less than two thirds of the control had poor total knowledge score immediately after delivery, while after two weeks more than two thirds of the study compared to less than half of the control had good total knowledge scores and also after 40 days post-natal about two thirds of the study group compared to more than one third of the control group had good total knowledge score. These improvements came back to the effect of illustrated book given to the study group to aid in remember the given information about care bundle preventions of puerperal sepsis. The present findings were similar with *Bishaw et al., (2022)* who studied prevention of puerperal sepsis in northwest Ethiopia in a study titled " Knowledge and practice of postnatal women; A multicenter cross-sectional study" and reported that the about 44.6% of postnatal women presented an adequate knowledge about the preventive measures of puerperal sepsis and rationale that by the majority 86.0% of participated postnatal women had got planned information about puerperal sepsis from the health caregivers.

Also, these results agreed with *Belgundkar & Heikham. (2021)* who conducted A Study to assess the effect of nurse intervention program on knowledge about prevention of puerperal infection among post-natal mothers at Belagavi Karnatak, and mentioned that in pre intervention, 87.5% of post-natal mothers had inadequate knowledge, 12% had moderate

knowledge and 0% had adequate knowledge but in the post intervention 0% of mothers had inadequate knowledge, 26.6% had moderate knowledge and 73.33% had adequate knowledge. Besides, the present study inconsistent with *Sultana et al., (2018)* who studied the knowledge and practices regarding prevention of puerperal sepsis of the postpartum women attending a private hospital in Bangladesh and only 38.7% of participants accurately completed the questionnaire, indicating that there was a lack of understanding on maternal sepsis. and recommended that there is a need for creation awareness of postpartum women about puerperal sepsis, also the health care staff should be holding frequent educational camp. The above results supporting the first research hypothesis which stated, " The study group women who receive care bundle of puerperal sepsis will exhibit better knowledge and practices than control group".

As regard care bundle practices for prevention puerperal sepsis among studied women the present study shows a none statistical significant difference between the and the control group immediately after delivery regarding elements of care bundles personal hygiene , diet ,mobility and environment, lochia, breast feeding ,general health and Bundle preventions practices), while there were high statistical significant difference between study and control group at two weeks and forty days post-natal .These improvements reflected the effect of care bundle preventions in improving the study group practices . These results were congruent with *Taksande et al., (2020)* that studied the early identification and prevention of postnatal complications among the postnatal mothers and reported the postnatal care bundle helps to early identification and prevention of postnatal complications among the postnatal mothers. Also, the present results were consistent with *Ahmed et al., (2021)*, who studied the Effect of implementing care bundle on reducing early postpartum hemorrhage among primiparous and presented a statistical significant difference between the study and control

group regarding all care bundle practices Intervention part). These results also support research hypothesis No.1 which stated, " The study group women who receive care bundle of puerperal sepsis will exhibit better knowledge and practices than control group".

Regarding total care bundle prevention practices score the present study reveals that less than the half of the study and control group respectively had satisfactory practices immediately after delivery pre intervention), meanwhile about three quarters of the study group and near the half of the control group had satisfactory practices at two weeks, also the majority of the study group and half of the control group had satisfactory practices at forty days. This may be due to effect of care bundle intervention and great attention of postnatal women to have normal postpartum and prevent puerperal sepsis. This result incongruent with *Sultana, (2018)* who reported that 43.3% of postnatal women had good practice against puerperal sepsis this may be due to effect care bundle intervention.

The present findings highlighted that more than two thirds of the study and of the control groups respectively had normal Sepsis in Obstetrics Score immediately after delivery while the most of the study group compared to about two thirds of the control group reported normal score at two weeks and forty days postnatal ,added to that there was a high statistically significant difference in the Sepsis in Obstetrics Score at two weeks and forty days postnatal between the study and control groups ($P \leq 0.001$). this section of results supported the second research hypothesis which stated that "The study group women who receive care bundle for prevention of puerperal sepsis will have normal range in the sepsis obstetric score than control group". from the researchers' point of view these results reflected that Sepsis in Obstetrics Score (SOS) is an important tool in identifying the postnatal women at risk of puerperal sepsis and reflected the benefits of the care bundle in prevention of puerperal sepsis especially if applied at the proper time.

The present results congruent with *Bakhtawar et al., (2020)* who found in a study titled "the Risk factors of postpartum sepsis: case-control study" that the majority 81% of cases had normal range of sepsis in obstetrics score as compared to controls were 19.8%. This might be related to care bundle intervention had improved the sepsis in obstetrics score of the cases and also contributed in early identification of the infected mother which was 19% of the cases compared to 80.2 % of the controls. The present results somewhat disagreed with *Stephens et al., (2021)* who conducted study titled " sepsis in obstetrics score (SOS) predicted maternal adverse outcomes " which aimed to assess the pregnant and postpartum women in risk of morbidity due to infection during urgent visits , and reported that 43.9% of the participants had maternal adverse outcomes and 66.3% of the participants with maternal adverse outcomes had a positive abnormal range (SOS) score, 60.7% of them required maternal intensive care unit admission. This difference with the present results may be due to the other study were descriptive study and didn't provide any prevention guidelines or instructions to pregnant and postnatal women about infection so reported more adverse maternal outcomes and on the other side it presented the sepsis in obstetric score as a valuable tool in recognizing the infected cases.

The current study's findings show that there was a high statistically significant correlation between knowledge and care bundles prevention practices score of puerperal sepsis of the study group immediately after delivery, at two weeks and forty days postnatal. This result is provided by *Baharin, & Ghani, (2022)* who investigated mothers' knowledge, attitudes, and practices regarding maternal sepsis in Kuantan, Malaysia, and discovered a strong connection between knowledge and practice ($r = 0.236$, $p = 0.018$). Also congruent with *Bishaw et al., (2022)* who showed that postpartum women who received a formal education and had access to sufficient information were 2.46 and 2.34 times more

likely, respectively, to have good preventative practices against puerperal sepsis than the others. This similarity to the current findings highlighted how knowledge and practice of preventing sepsis in the early postpartum period affect one another broadly, while on the other hand lack of knowledge adversely accompanied by poor practices toward personal hygiene, healthy lifestyle, followed the given instructions toward preventing puerperal infections.

Conclusion

In the light of the present study results, it can be concluded that the majority of the study group had good total knowledge scores and good total care bundle practices scores compared to less than the half of the control group at two weeks after delivery and 40 days postnatal with highly statistically significance improvements of the study group compared to control group ($P \leq 0.001$). Furthermore, the majority of the study group had normal obstetric sepsis scores as opposed to nearly two thirds of the control group, with highly statistically significant improvements ($P \leq 0.001$). The study aims and the hypotheses were supported by the high statistically significant correlation between total knowledge and care bundle practices score between the study and control groups at different times of assessments.

Recommendations

Considering the findings of the current study, the following suggestions have been established:

1. Care bundle should be recommended as evidence-based nursing interventions applied to postnatal women for prevention of puerperal sepsis.
2. Care bundle was a more conservative strategy utilized for prevention of puerperal sepsis.
3. Integrate sepsis in obstetric score as a fundamental tool in early detections and recognition of puerperal sepsis women.

- Further recommendations:
4. Continuous education of the maternity nurses about current trends in preventions of puerperal sepsis as care bundle preventions.
 5. Repeat the research with a bigger sample size and in various research environments.

References

- Aarvold A., (2016)** . Multiple organ dysfunction score is superior to the obstetric- specific sepsis in obstetrics score in predicting mortality in septic obstetric patients, *CriticalCareMedicine*,45(1):e49. doi: 10.1097/CCM.000000000000.[[PMC free article](#)] [[PubMed](#)] [[CrossRef](#)] .
- Abuthera , N., Mullen, B. , Grant, J. and Akram ,G. (2020)** . Qualitative Study Investigating the Barriers to the Implementation of the ‘Sepsis Six Care Bundle’ in Maternity Wards, *Healthcare* 2020, 8, 374; doi:10.3390/healthcare8040374.
- Agarwa R.,Goyal P., Mohta M., and Kar R.,(2021)**. Comparison of Sequential Organ Failure Assessment (SOFA) and Sepsis in Obstetrics Score (SOS) in Women with Pregnancy-Associated Sepsis with Respect to Critical Care Admission and Mortality: A Prospective Observational Study, *Journal Obstetric Gynaecology India*,71(1): 45–51. doi: [10.1007/s13224-020-01375-9](#) PMID: [33814798](#).
- Ahmed S., Ahmed A., Ali H., Mohamed H., Shalaby N., and Khalil K. (2021)**. Effect of implementing care bundle on reducing early Postpartum haemorrhage among primiparous, *Egyptian Journal of Health Care, EJHC* , 12 (3):381- 395.
- Albright C., Ali T., and Lopes V., (2014)**. The Sepsis in Obstetrics Score: a model to identify risk of morbidity from sepsis in pregnancy. *American Journal Obstetric Gynecology* , 211: 39: e1–38. [[PubMed](#)] [[Google Scholar](#)].
- Alharb H., AwadAlrhiely A., Mufleh A., Alharbi N., Ali K., and El- Sabagh M.,(2019)**.Knowledge, Attitude and Practices of Kegel Exercise among Postnatal Women, in *Al Madinah Al Munawarah, Saudi Arabia, International Journal of Nursing Didactics* 2019;9(06):1-10.
- Baghdadi, D., Brook, R., Uslan, Z., Needleman, J., Bell, S., Cunningham, W. E., and Wong, D. (2020)**. Association of a Care Bundle for Early Sepsis Management, *Journal of American Medical Association internal*

- medicine (JAMA), 180(5), 707–716. <https://doi.org/10.1001/jama-ternmed.0183>
- Baharin F. and Ghani A., (2022).** Knowledge, Attitude and Practice on Maternal Sepsis Among Mothers in Kuantan, Pahang, Malaysia. *Asian Journal of Medicine and Biomedicine*, 5(S2), 18-23. <https://doi.org/10.37231/ajmb.2021.5.S2.456>
- Bakhtawar S., Sheikh S., Qureshi R., Hoodbhoy Zahra, Payne B., Azam I., and von D., (2020).** Risk factors for postpartum sepsis: a nested case-control study, *Pregnancy and Childbirth journal* 20:297 <https://doi.org/10.1186/s12884-020-02991-z>.
- Belgundkar B., and Heikham G. (2021).** A Study to Assess the Effectiveness of Nurse Intervention Programme on Knowledge Regarding Prevention of Puerperal Infection among Post Natal Mothers in KLE Prabhakar Kore Hospital at Belagavi Karnatak. *International Journal of Nursing Education*, 13(1), 51–56. <https://doi.org/10.37506/ijone.v13i1.13313>
- Bishaw K., Worku S., and Tilahun M., (2022).** Prevention of puerperal sepsis in northwest Ethiopia: Knowledge and practice of postnatal women; A multicenter cross-sectional study. *SAGE Open Med.* 2022 Mar 30;10:20503121221085842. doi: 10.1177/20503121221085842. PMID: 35371488; PMCID: PMC8972931.
- Boushr M, and Rahman O.,(2021).** Postpartum Infection. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK560804/>
- Chepchirchir M., Nyamari J, Keraka M., (2017).** Associated Factors with Puerperal Sepsis among Reproductive Age Women in Nandi County, Kenya. *Journal of Midwifery and Reproductive Health.*; 5(4): 1032-1040. DOI: 10.22038/JMRH.2017.9348.
- Cheshire, J., Dunlop, C., and Lissauer, D. (2021):** The Continuous Textbook of Women's Medicine Series – Obstetrics Module Volume 15 the puerperium, Glob. libr. women's med. ISSN: 1756-2228; DOI 10.3843/GLOWM.413113. <https://www.glowm.com/article/heading/vol-15--the-puterperium--the-management-of-maternal-sepsis/id/413113>.
- Demisse A., Sifer D., Kedir B., Fekene. B. and Bulto, G.(2019).** Determinants of puerperal sepsis among post-partum women at public hospitals in west SHOA zone Oromia regional STATE, Ethiopia (institution BASEDCASE control study). *BMC Pregnancy Childbirth* 19, 95 <https://doi.org/10.1186/s12884-019-2230-x>.
- Evans L., Rhodes A., Alhazzani W., Antonelli M., and Craig M. (2021),** Surviving sepsis campaign: international guidelines for management of sepsis and septic shock , *Intensive Care Medicine*, volume 47, pages 1181–1247 , <https://doi.org/10.1007/s00134-021-06506-y>.
- Farzaneh K., Mojgan M., Mahin K., Mohammad A., and Mohammad S. (2017).** Effect of educational package on lifestyle of primiparous mothers during postpartum period: a randomized controlled clinical trial, *Health Education Research*, Volume 32, Issue 5, October 2017, Pages 399–411, <https://doi.org/10.1093/her/cyx060>.
- Flannelly K., Flannelly L. and Jankowski K., (2018).** Threats to the Internal Validity of Experimental and Quasi-Experimental Research in Healthcare, *Journal of Health Care Chaplaincy*, DOI: 10.1080/08854726.2017.1421019.
- Gamel A., Genedy E. and Hassan E.,(2020).** Impact of Puerperal Sepsis Self-Care Nursing Guideline on Women's Knowledge and Practices. *American Journal of Nursing Research*, 8(2):132-141. doi: 10.12691/ajnr-8-2-1
- Hassan R., Mohamed, H., and Solimen H.,(2021).** Knowledge and Practices of Postnatal Mothers Regarding Prevention of Puerperal Sepsis, *Minia Scientific Nursing Journal* ,2021; 9 (1) :33-39.
- Ismail K., and Abdullah, E. (2020).** Women's Perception and Attitude toward Prevention of Puerperal Sepsis at A turkey hospital Khartoum-Sudan 2020 , A thesis Submitted for Partial Fulfillment of Requirements for The Award The Master Degree in Obstetrics& Gynecological Nursing Submitted, Al-Neelain University, <http://repository.neelain.edu.sd:8080/xmlui/handle/123456789/16171?show=full>.
- Kaur R., and Jairus R.,(2014).** Enhancement of Knowledge Regarding Puerperal Sepsis among Female Health Worker., *IJSR.* 2014; (3):10:977- 97.
- Keenan-Lindsay L., Sams C., O'Connor L., Perry E. Hockenberry J., Lowdermilk and Wilso D.,(2022):** *Maternal Child Nursing Care in Canada - E-Book* ,3rd ed., Elsevier , Canada,P 541.

- Kumar, N. and Yadav, A .,(2020).** Puerperal sepsis and maternal outcome in developing countries: an observational study, *Int J Community Med Public Health.* 2020 Dec;7(12):4978-4985.
- Lalitha H.,(2016):** A study to assess the knowledge and practice of postnatal mothers on prevention of selected puerperal infections in a selected maternity hospital .*medical science journal.* 2016; 2 (2) 01-03.
- National Institute for Health and Care Excellence (NICE), (2017).** Sepsis: recognition, diagnosis and early management. NICE guideline 51. London: NICE; [https://www.nice.org.uk/guidance/ng51/resources/sepsis-recognition-dia gnosis-and-early-management-1837508256709].
- Nchimbi, B., and Joho A., (2022).**Puerperal sepsis-related knowledge and reported self-care practices among postpartum women in Dar es salaam, Tanzania, *Women’s Health* , 18: 1–9. DOI: 10.1177/17455057221082954 *journals.sagepub.com/home.*
- Okwudili O., Oluwaseun A., & Esther I. , (2020).** Revisiting Puerperal Sepsis in Obsteric Referal Centres in Port Harcourt, Southern Nigeria. *Journal of Advances in Medicine and Medical Research,* 32(5), 9-15. <https://doi.org/10.9734/jammr/2020/v32i53041>
- Peate,I.,and Dutton, H.(2021).** Acute Nursing Care: Recognising and Responding to Medical Emergencies, 2nd edition ,Milton park, Newyork, p 11.
- Plante L.A., Pacheco L.D., Louis J.M.,** Society for Maternal-Fetal Medicine (SMFM) Publications Committee. SMFM Consult Series #47: Sepsis during pregnancy and the puerperium. *American Journal of Obstetrics and Gynecology* 2019, 220 (4), pp. B2-B10.
- Refai, N., Patil , V. and Gomaa, H.(2019)** Update in obstetric maternal sepsis, Update in Anaesthesia doi:10.1029/WFSA-D-18-00029, <https://resources.wfsahq.org/wp-content/uploads/uia34-Update-in-obstetric-maternal-sepsis.pdf>
- Rhodes A, Evans LE, Alhazzani W,2016.** Surviving sepsis campaign: international guidelines for management of sepsis and septic shock: 2016. *Intensive Care Med* 2017; 43: 304–377.
- Stephens A., BakerA., Bell C., Pineles L., lampingA.,and Sibai M. ,(2022).** Sepsis in Obstetrics Score Predicts Maternal Adverse Outcomes, *American Journal of Obstetrics & Gynecology,* 2022; 226 (1), S334-S335.DOI:<https://doi.org/10.1016/j.ajog.2021.11.561>
- Sultana, S., Methe, Z., Muhammad, F., and Chowdhury A., (2018).** Knowledge and practice regarding prevention of puerperal sepsis among postpartum women attending a private hospital in Bangladesh. *International Journal of Research in Medical Sciences,* 6(10), 3264. doi:10.18203/2320- 6012.ijrms4029.
- Taksande, V., Shrivastvas, D., and Sebastian T., (2020).** Care Bundle Approach: Quality Nursing Care. *Int. J. of Advances in Nur. Management,* 8(3):257-259. doi: 10.5958/24542652.2020.00056.6 Available on: <https://ijanm.com/AbstractView.aspx?PID=2020-8-3-15>.
- Yumlembam B., and Beshra A., (2021).** Effectiveness of Information Booklet on Knowledge Regarding Puerperal Sepsis and Its Prevention among Nurses Working in Selected Hospitals of Kamrup (M), Assam: An Evaluative Study, *International Journal of Health Sciences and Research* 2021; 11(9) :142-149. https://www.ijhsr.org/IJHSR_Vol.11_Issue.9_Sep2021/IJHSR022.pdf