Effect of Pre-elective Cesarean Section Vaginal Cleansing using Povidone-Iodine versus Chlorhexidine on the Incidence of Post-Cesarean Infections

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Abstract

Context*:* The morbidity and mortality rates associated with post-cesarean section (CS) infectious complications prove to be a burden for mothers, their infants, and the healthcare system. ***Aim:*** This study aimed to assess the effect of pre-elective cesarean section vaginal cleansing using povidone-iodine versus chlorhexidine on the incidence of post-cesarean infections. ***Methods:*** This randomized controlled trial involved a simple random sample of 90 women undergoing elective CS who were allocated to either the control, povidone-iodine, or chlorhexidine group. The study was conducted at the Obstetrics and Gynecology Operative Department of Kafrelsheikh University Hospital, Kafrelsheikh Governorate, Egypt. Data were collected using two tools: Structured interview schedule and post-CS infection checklist. ***Results:*** The povidone-iodine group had a significantly lower rate of post-CS fever, endometritis, and wound infection than the control group (p = 0.045, 0.049, and 0.045, respectively). Furthermore, the control group had a significantly higher rate of post-CS fever, endometritis, and wound infection than the chlorhexidine group (p = 0.011, 0.028, and 0.031, respectively). In contrast, no statistically significant difference was observed in the rate of post-CS fever, endometritis, and wound infection between the povidone-iodine and chlorhexidine groups (p = 0.300, 0.128, and 0.447, respectively). ***Conclusion:*** Vaginal cleansing using either povidone-iodine or chlorhexidine immediately before elective CS significantly reduces the rate of post-cesarean infections. **Recommendation:** This simple and cost-effective vaginal cleansing method should be applied by nurses before elective CS.

Keywords: vaginal cleansing, elective cesarean section, povidone-iodine, chlorhexidine, post-cesarean infections

1. Introduction

Cesarean section is considered the most common major surgical procedure in Egypt with a rate of 51.8%, making Egypt ranked the third top country with the highest CS rate worldwide **(Egypt Demographic and Health Survey, 2014; Kandil, 2018)**. On June 16, 2021, the World Health Organization (WHO) has reported that the use of CS continues to rise globally, accounting for more than 21% of all childbirths. This number is set to increase over the coming decade, with nearly a third (29%) of all births likely to occur via CS by 2030. Although, CS can be an essential and lifesaving surgery, it can put women and infants at unnecessary risk of short- and long-term health problems if performed without medical indications **(WHO, 2021)**.

Cesarean section, is one of the major abdominal surgeries that caries medical risks to woman's health including: hemorrhage, need for transfusion, injury to other organs, and infections **(Esteves-Pereira et al., 2016; Keenan-Lindsay & Leifer, 2020).** The risk of infection following CS increases up to ten times than that following vaginal birth. Moreover, surgical site infections (SSIs) are the third most frequently reported hospital-acquired infections **(La Rosa et al., 2018)**. The latest global estimates place sepsis due to obstetric infections as the third most common cause of maternal mortality. Overall, approximately 70 pregnant women per 1000 live births had a maternal infection needing hospital management. Across studies, 11 women with either direct or indirect infection per 1000 live births had severe maternal outcomes; however, in low- and middle-income countries, up to 15 women per 1000 live births were affected **(WHO, 2020)**.

Post-CS infectious complications significantly increase maternal morbidity and mortality along with prolong hospital stay, increase hospital readmission, increase healthcare cost, reduces patient satisfaction, and increase economic burden worldwide. Interestingly, the burden of post-CS infections is greater in

developing countries than in developed countries **(Adeyinka et al., 2018; Anikwe et al., 2019)**. Despite the advancements in technologies and therapeutics, post-CS wound infection and endometritis remain the most frequent clinical complications after CS. Therefore, understanding, preventing, and treating post-CS infectious complications are imperative to improve the recovery and health of women and families during the postpartum period **(Pierson et al., 2018)**.

Currently, administering broad spectrum prophylactic antibiotics before CS is a standard care and the Centers for Disease Control and Prevention has highlighted the importance of prophylactic antibiotics in reducing the risk of infections; however, post-CS infections remain a significant problem, and many women still suffer from these complications. Furthermore, there is evidence that prophylactic antibiotics did not always eradicate all bacteria and therefore do not reduce postoperative infectious morbidity, even for low-risk women and those who choose to undergo elective CS **(Berríos-Torres et al., 2017; Tita et al., 2017)**.

Women undergoing CS are at risk of infection caused by micro-organisms present on the mother's skin or from external sources. Therefore, preventing infections by proper skin preparation before surgery is an important part of the overall care provided to women before CS. Such skin preparation is performed using an antiseptic solution, a substance applied to remove bacteria that can cause harm to the mother or infant when they multiply. Antiseptics include povidone-iodine, alcohol, and chlorhexidine **(Hadiati et al., 2018)**.

1.1. Significance of the study

Maternal morbidities and mortalities in developing countries have been described as a silent tragedy. Postpartum endometritis is the most common maternal infection following delivery. Postpartum endometritis occurs after 1–3% of vaginal births and in up to 27% of CS cases, which is of great concern **(Mackeen et al., 2015; Ngonzi et al., 2018)**. Moreover, among deaths attributed to puerperal sepsis, postpartum endometritis is the most frequent cause of death in the first 3–7 days following delivery **(Say et al., 2014; Rouse et al., 2019)**. In Egypt, **Gomaa at al. (2021)** have conducted a study to assess the incidence of, risk factors for, and management of post-cesarean section surgical site infection (SSI) in a tertiary hospital in Egypt. They reported that, the incidence of post-CS surgical site infection is 5.34%.

Considering the increasing CS rate, besides the increasing evidence regarding antibiotic resistance, we must therefore seek strategies that reduce the risk of post-cesarean infections. This is most important in developing countries where post-cesarean infectious morbidities are more common. **(Adeyinka et al., 2018)**. Fortunately, postoperative infectious morbidities and mortalities are preventable if astute care is provided to women during pregnancy and childbirth **(Ogah et al., 2020)**. Recently, several studies have reported that vaginal cleansing before CS drastically decreases the numbers of bacteria naturally present in the vagina. These bacteria can move inside the uterus during the surgical procedure and cause infection in the uterine lining and surgical wound **(Gillespie et al., 2020; Haas et al., 2020)**.

Therefore, cleaning the vagina may help minimize the bacterial load and prevent SSI and endometritis **(Ogah et al., 2020)**. Unfortunately, vaginal cleaning may not be included in the care provided to women to reduce infection following CS. Interestingly, vaginal cleansing antiseptic solutions, such as chlorhexidine and povidone-iodine, are inexpensive and have few side effects. Hence, it is important to understand whether some antiseptic solutions or methods work better than others **(Gillespie et al., 2020; Haas et al., 2020)**. So, this study was designed to assess the effect of pre-elective cesarean section vaginal cleansing using povidone-iodine versus chlorhexidine on the incidence of post-cesarean infections.

1.2. Aim of the study:

The current study aimed to assess the effect of pre-elective cesarean section vaginal cleansing using povidone-iodine versus chlorhexidine on the incidence of post-cesarean infections.

1.3. Operational definition

In this study, post-cesarean infections was defined as wound infection, endometritis, and fever. These parameters were measured using a post-CS infection checklist.

1.4. Research hypotheses

H.1. Women who receive vaginal cleansing using povidone-iodine before elective CS will have lower incidence of post-CS infections than those who do not.

H.2. Women who receive vaginal cleansing using chlorhexidine before elective CS will have lower incidence of post-CS infections than those who do not.

H.3. There is a difference in the incidence of post-CS infections between women who receive vaginal cleansing using povidone-iodine and those who receive vaginal cleansing using chlorhexidine.

2. Subjects and Methods

2.1 Research design

This study was a randomized controlled trial where the subjects who received vaginal cleansing using povidone-iodine or chlorhexidine immediately before elective CS were compared with those who did not receive vaginal cleansing.

2.2 Setting

This study was conducted at the Obstetrics and Gynecology Operative Department of Kafrelsheikh University Hospital, Kafrelsheikh Governorate, Egypt. It is a university affiliated hospital. The department is located on the third floor of the hospital and consists of three operating rooms. Annually, the department performs approximately 500 CS.

2.3 Sample

A simple random sample of 90 women undergoing elective CS was recruited according to the following inclusion criteria: Age between 18 and 35 years, term gestation (i.e., 37–42 completed weeks of pregnancy), and singleton pregnancy. Meanwhile, the exclusion criteria were as follows: Obese women and those with pre-existing medical conditions, including diabetes, hypertension, anemia, and cardiac disease. Furthermore, women with obstetrical conditions arising during pregnancy, including antepartum hemorrhage, pre-eclampsia, gestational diabetes, premature rupture of membranes, umbilical cord prolapse, and placenta previa.

2.3.1 Sample size calculation

Based on data from the literature **(Barat et al., 2016)**, considering a significance level of 5% and a power of 80%, the sample size can be calculated using the following formula:

$$n = \frac{2(Z\alpha/2 + Z\beta)^2 \times p\,(1-p)}{d^2},$$

Where**,** p indicates pooled proportion obtained from a previous study; d indicates the expected difference; $Z_{\alpha/2}$ = 1.96 (for 5% level of significance) and Z_{β} = 0.84 (for 80% power). Therefore,

$$n = \frac{2(1.96 + 0.84)^2 \times 0.055\,(1-0.055)}{(0.165)^2} = 29.9,$$

Based on the aforementioned formula, the sample size required per group is 30 with a total sample of 90 women.

2.3.2 Sample recruitment and group allocation

In this study, 111 women were invited to participate and screened for eligibility. Nine women of them refused to participate in the study and 12 women did not meet the eligibility criteria. After confirmation of eligibility and obtaining informed written consent, women were divided randomly into three groups by selecting one sealed envelope each, assigning them to povidone-iodine, chlorhexidine, or control group. The assignment was performed at a 1:1:1 ratio (i.e., n = 30 per each group). Eleven women were missed during the follow-up (i.e., four from the control group, two from the povidone-iodine group, and five from the chlorhexidine group) and were replaced. The statistical analysis was performed on 90 subjects. A flowchart of the study groups is presented in Figure 1.

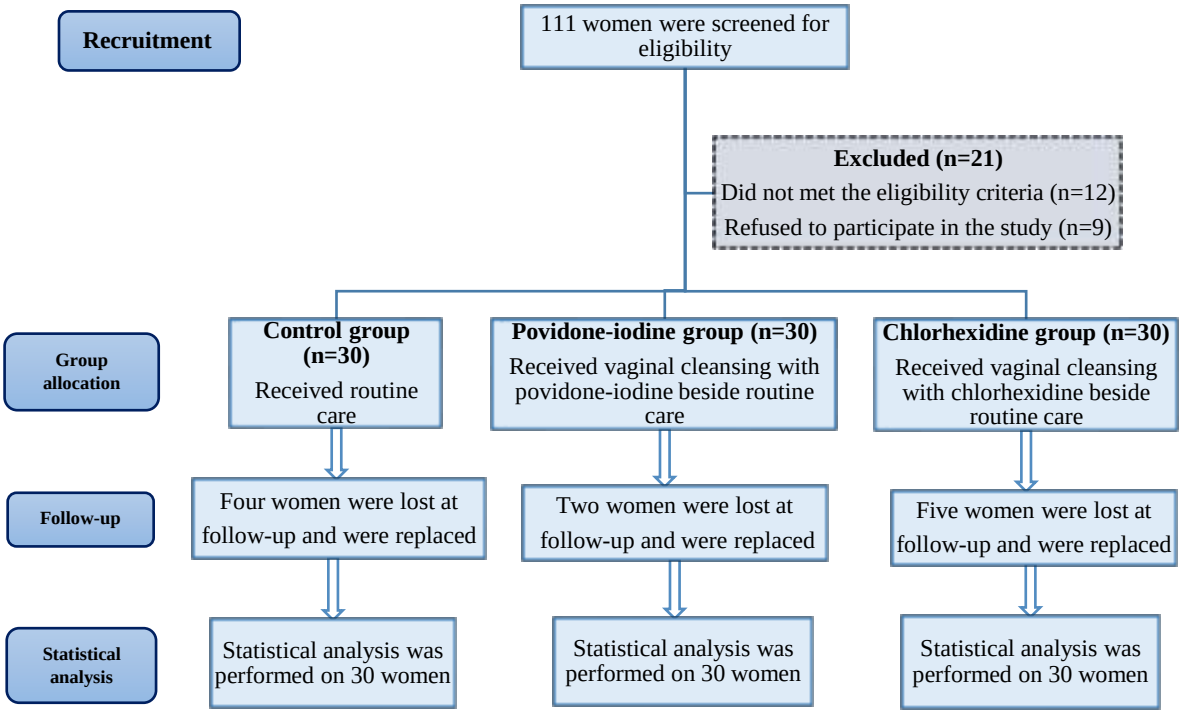

Figure 1. Study flowchart showing the number of women included, excluded, lost to follow-up, and analyzed

2.4 Tools of data collection

To collect data pertinent to the study, two tools were developed by the researchers after reviewing the related literature: structured interview schedule and post-CS infection checklist.

2.4.1 Structured interview schedule

This tool consists of two main sections: ***a. Sociodemographic data:*** This section included data about age, residence, educational level, and occupation. ***b. Past and present obstetrical history:*** This section focused on the obstetric history of the women, such as gravidity, parity, mode of previous delivery, and gestational age.

2.4.2 Post-CS infection checklist

This tool includes data on signs and symptoms of wound infection, such as erythema, swelling, warmth, purulent wound discharge, and partial or total separation of incision. Moreover, it includes signs and symptoms of endometritis, such as fever, foul-smelling vaginal discharge (purulent lochia), and tender uterus on bimanual examination.

2.4.3 Tool validity

The content validity of the tools was tested and confirmed by three scholastic nursing specialists in the field of maternity nursing and obstetrics medicine. The tools were validated for clarity, relevance, and completeness of its contents. Accordingly, the recommended modifications were performed.

2.4.4 Tool reliability

The reliability of the proposed tools was tested using Cronbach's alpha coefficient test. For the structured interview schedule, Cronbach's alpha was 0.83. Meanwhile, for the post-CS infection checklist, Cronbach's alpha was 0.81, suggesting a strong positive correlation between the tool's items.

2.5 Ethical consideration

Informed written consent was obtained from each woman who agreed to participate in this study after explanation of the aim and significance of the study. Likewise, the researchers emphasized that participation in the study is entirely voluntary, and women were

reassured that they had the right to withdraw from the study at any time without having to offer justifications. Anonymity and confidentiality were assured by coding the data.

2.6 Pilot study

A pilot study was conducted on 10% of the predetermined sample size (i.e., nine women) who met the selection criteria. It aimed to assess the feasibility of the study process and the clarity, relevance, and applicability of the study tools. Based on the results of the pilot study, no problems were observed that interfered with the data collection process and no modifications were necessary for the tools. The participants in the pilot study were excluded from the main study sample.

2.7 Procedure

Data were collected over a period of 8 months, from the beginning of March 2021 to the end of October 2021. The researchers visited the study setting 2 days a week from 9:00 am to 1:00 pm. The study was conducted through: Preparation, interview and assessment, implementation, and evaluation.

Preparation for the study: A thorough review of related literature was performed to construct data collection tools. Moreover, an official permission to conduct the study was obtained from concerned authorities (i.e., directors of Kafrelsheikh University Hospital).

Interview and assessment: The researchers held an interview with each woman to obtain their sociodemographic data and obstetrical history using the structured interview schedule. The questions were asked in Arabic, and the responses were documented by the researchers. The interview and assessment were carried out for all women in the three groups. The interview conducted at the waiting room of the operative department, and the time taken to complete this assessment was approximately 10–15 min.

Implementation: The women in the control group received routine care according to the hospital protocol. For the women in the povidone-iodine group, in addition to routine hospital care, vaginal cleansing was performed using three pads of sterile gauze soaked in 7% povidone-iodine solution. Meanwhile, the women in the chlorhexidine group received vaginal cleansing using three pads of sterile gauze soaked in 0.25% chlorhexidine acetate solution in addition to routine hospital care. For both povidone-iodine and chlorhexidine groups, vaginal cleansing was performed immediately before CS at the time of urinary catheter insertion using the same technique. Each gauze was inserted into the vagina and rotated 360° in the vaginal cavity from the cervix down to the vaginal opening for approximately 30 seconds.

Evaluation: The researchers assessed the signs and symptoms of wound infection and endometritis using the post-CS infection checklist and measured temperature using mercury thermometers at the fourth and eighth postoperative days during the routine follow-up when wound care was performed and dressing was changed.

2.8 Statistical analysis

The collected data were organized, coded, tabulated, and analyzed using IBM Statistical Package for the Social Sciences version 20.0 (SPSS, Chicago, IL). For quantitative variables, arithmetic means and standard deviations were used to describe the central tendency of observations and to measure the dispersion of results around the mean. Categorical variables were expressed as frequencies and percentages. The significance of the difference between means was examined using Student's t-test, while categorical variables were compared using the chi-square (χ^2) test. Differences with *p*-values of less than 0.05 were considered statistically significant and those with *p*-values of less than 0.001 were considered highly significant.

3. Results

The results of this study are presented in three main sections: a. sociodemographic data; b. obstetrical history; and c. post-CS infections.

a. Sociodemographic data

The findings of the current study exhibited homogeneity of the women and matching of the three groups, as no significant differences in age, place of residence, educational level, and occupational status were observed between the three groups ($p > 0.05$).

The ages of 53.3%, 30.0%, and 53.3% of the women in the control, povidone-iodine, and chlorhexidine groups, respectively, ranged between 25 and 30 years. Regarding place of residence, 76.7%, 86.7%, and 70.0% of the women in the control, povidone-iodine, and chlorhexidine groups, respectively, lived in rural areas. In relation education, 73.4%, 70.0%, and 60.0% of the women in the control, povidone-iodine, and chlorhexidine groups, respectively, had completed their secondary education. Regarding occupation, 100.0%, 76.7%, and 86.7% of the women in the control, povidone-iodine, and chlorhexidine groups, respectively, were housewives (Table 1).

b. Obstetrical history

Regarding obstetrical history, the findings of this study revealed no significant differences in gravidity, parity, and mode of previous delivery between the three groups ($p > 0.05$). Concerning gravidity, 33.3%, 40.0%, and 36.7% of the women in the control, povidone-iodine, and chlorhexidine groups, respectively, were gravida 2. Regarding parity, 46.7%, 36.7%, and 40.0% of the women in the control, povidone-iodine, and chlorhexidine groups, respectively, were para 1. In relation to mode of previous delivery, 87.5%, 88.0%, and 96.0% of the women in the control povidone-iodine, and chlorhexidine groups, respectively, delivered their infants via CS. The mean gestational age of the control group was 38.5 ± 0.8 weeks, while that of the povidone-iodine and chlorhexidine groups was 38.3 ± 0.9 and 38.6 ±0.7 weeks, respectively (Table 2).

c. Post-CS infections

Compared to women in the povidone-iodine group, women in the control group had a significantly higher rate of post-cesarean fever, endometritis, and wound infection (p=0.045, 0.049, and 0.045 respectively). Furthermore, the control group had a significantly higher rate of post-cesarean fever, endometritis, and wound infection than the chlorhexidine group (p = 0.011, 0.028, and 0.031, respectively). In contrast, no significant differences in the rate of post-cesarean fever, endometritis, and wound infection were observed between the povidone-iodine and chlorhexidine groups (p = 0.300, 0.128, and 0.447, respectively) (Table 3).

Table 1. Comparison of sociodemographic characteristics of women among the study groups.

Variables	Control group (N = 30)		Povidone-Iodine group (N = 30)		Chlorhexidine group (N = 30)		Chi-square	
	Freq.	%	Freq.	%	Freq.	%	X^2	P
Age in years								
< 25	8	26.7	17	56.7	9	30.0		
25–30	16	53.3	9	30.0	16	53.3		
31–35	6	20.0	4	13.3	5	16.7	7.084	0.131
Mean ± SD*	27.6 ±4.0		25.8 ±4.1		26.9 ±4.1		5.825	0.087
Residence								
Urban	7	23.3	4	13.3	9	30.0		
Rural	23	76.7	26	86.7	21	70.0	1.250	0.535
Educational level								
Cannot read and write	3	10.0	1	3.3	2	6.7		
Primary school	1	3.3	3	10.0	4	13.3		
Secondary school	22	73.4	21	70.0	18	60.0		
University	4	13.3	5	16.7	6	20.0	20.701	0.293
Occupation								
Housewife	30	100.0	23	76.7	26	86.7		
Working	0	00	7	23.3	4	13.3	7.664	0.098

**Comparison using Student's t-test.*

Table 2. Comparison of the obstetric history of women among the study groups

Variables	Control group (N=30)		Povidone-iodine group (N=30)		Chlorhexidine group (N=30)		Chi-square	
	Freq.	%	Freq.	%	Freq.	%	X^2	P
Gravida								
1	2	6.7	5	16.7	5	16.7		
2	10	33.3	12	40.0	11	36.7		
≥ 3	18	60.0	13	43.3	14	46.7	1.867	0.393
***Mean ± SD**	2.8 ±0.9		2.5 ±1.1		2.4 ±0.9		1.323	0.272
Parity								
0	6	20.0	6	20.0	5	16.7		
1	14	46.7	11	36.7	12	40.0		
≥ 2	10	33.3	13	43.3	13	43.3	1.916	0.384
***Mean ± SD**	1.2 ±0.6		1.7 ±0.8		1.6 ±0.6		2.708	0.073
Mode of previous delivery								
Vaginal delivery	3	12.5	3	12.5	1	4.0		
CS	21	87.5	22	88.0	24	96.0	1.370	0.504
Gestational Age								
< 39	20	66.7	24	80.0	19	63.3		
> 39	10	33.3	6	20.0	11	36.7	2.222	0.329
***Mean ±SD**	38.5 ±0.8		38.3 ±0.9		38.6 ±0.7		1.052	0.354

**Comparison using Student's t-test.*

Table 3. Comparison of post-CS infections between the study groups

Variables	Control group (N=30)		Povidone-iodine group (N=30)		Chlorhexidine group (N=30)		Control vs. povidone-iodine		Chlorhexidine vs. povidone-iodine		Control vs. chlorhexidine	
	Freq.	%	Freq.	%	Freq.	%	X^2	P	X^2	P	X^2	P
Fever												
Yes	9	30.0	3	10.0	1	3.3						
No	21	70.0	27	90.0	29	96.7	5.648	0.045*	1.071	0.300	7.522	0.011*
Endometritis												
Yes	6	20.0	1	3.3	0	00						
No	24	80.0	29	96.7	30	100.0	4.989	0.049*	2.307	0.128	6.185	0.028*
Wound infection												
Yes	9	30.0	3	10.0	2	6.7						
No	21	70.0	27	90.0	28	93.3	5.648	0.045*	0.576	0.447	6.922	0.031*

4. Discussion

The morbidity and mortality rates associated with postpartum infections create a burden for mothers, their infants, and the healthcare system. The current study aimed to assess the effect of pre-elective cesarean section vaginal cleansing using povidone-iodine versus chlorhexidine on the incidence of post-cesarean infections. The findings of this study will be discussed in the frame of reference of the following hypotheses: H.1. Women who receive vaginal cleansing using povidone-iodine before elective CS will have lower incidence of post-CS infections than those who do not; H.2. Women who receive vaginal cleansing using chlorhexidine before elective CS will have lower incidence of post-CS infections than those who do not; and H.3. There is a difference in the incidence of post-CS infections between women who receive vaginal cleansing using povidone-iodine and those who receive vaginal cleansing using chlorhexidine.

The findings of this study revealed that the three groups were similar in terms of sociodemographic data and obstetrical history (i.e., age, residence, educational level, occupation, gravidity, parity, and mode of previous delivery). These findings are important for the reliability of this study as there are no confounding variables that could interfere with the study results. These findings are corroborated by the findings of **GUL (2021)**, who conducted a study to investigate the effect of vaginal cleansing performed using saline solution or povidone-iodine before elective CS on postoperative infection. His findings also revealed homogeneity of the three groups. In addition, **Göymen et al. (2017)** conducted a randomized controlled trial to determine the effect of vaginal cleansing performed before elective CS on

postoperative infection. Their findings also revealed homogeneity of the intervention and control groups.

The current study findings displayed that, using povidone-iodine before CS showed a statistically significant reduction in post-CS fever, endometritis, and wound infection compared with women in the control group ($p < 0.05$). These findings may be due to vaginal cleansing decreases different types of vaginal bacteria, which ascend from the vagina and initially colonize the innermost layer of the endometrial cavity causing post-CS infections. Therefore, the first hypothesis was accepted. In accordance with our study findings, a study by **Aref (2019)** conducted to examine the effect of povidone-iodine used in preoperative vaginal cleansing on overall post-CS infectious morbidity found a marked significant reduction in the incidence of endometritis in the intervention group. In the same line, **GUL (2021)** has reported that vaginal cleansing using povidone-iodine before CS significantly reduced postoperative fever.

Conversely, the findings of this study disagreed with those of the study by **Bağlı et al. (2021),** who examined the effect of vaginal disinfection using 10% povidone-iodine on the rate of endometritis among pregnant women undergoing elective CS. They have reported that vaginal disinfection using povidone-iodine before elective CS does not significantly reduce post-CS endometritis rates. Similarly, a study by **Barat et al. (2016)** to determine the effect of pre-operative vaginal preparation using povidone-iodine on post-CS infections revealed no significant differences in postoperative fever, wound infection, and endometritis between women with and without preoperative vaginal cleansing.

Perhaps, the differences in the reported post-CS infection rates between this study and other studies could be attributed to various factors, including the technique of vaginal cleansing or the amount of antiseptic solution used, wound closure techniques, and the type and dose of post CS antibiotics. Moreover, the difference in hygienic practice and vaginal colonization by a variety of microorganisms in different cultures and communities could have caused these differences. Such factors may put women at a lower or higher risk of post-CS infections.

The findings of this study revealed that women in the chlorhexidine group had a statistically significant lower incidence of post-CS fever, endometritis, and wound infection than those in the control group ($p < 0.05$). These findings are consistent with those of the study by **Ureña and Reyes (2022),** who examined the effect of vaginal cleansing using chlorhexidine before CS delivery on preventing postoperative endometritis and surgical site infections. They reported that the use of chlorhexidine in vaginal cleansing before CS reduces the risk of endometritis and puerperal fever. Likewise, **Ogah et al. (2020)** have conducted a study to evaluate the efficacy of pre-operative vaginal cleansing using 1.0% chlorhexidine in reducing post-CS infectious morbidities. They reported that infectious morbidity was significantly reduced from 36.8% in the control group to 12.0% in the intervention group ($p = 0.001$).

When comparing Povidone-iodine group and Chlorhexidine group, the current study findings reveled that there were no statistically significant differences between the two groups in relation to the rate of post-cesarean fever, endometritis, and wound infection ($p>0.05$). Thus, the results of this study do not support the third hypothesis: There is a difference in the incidence of post-CS infections between women who receive vaginal cleansing using povidone-iodine and those who receive vaginal cleansing using chlorhexidine. This is a promising result because it provides nurses and obstetricians the chance to use either povidone-iodine or chlorhexidine according to their availability. For example, in low resource settings, povidone-iodine can be used because it is cheaper than chlorhexidine.

Contradicting the findings of this study, **Tewfik et al. (2015)** conducted a study to compare the efficacy of povidone-iodine with that of chlorhexidine in preventing postpartum endometritis and related febrile morbidity. They reported that the use of chlorhexidine seems more effective than povidone-iodine with a three-fold reduction in the risk of postoperative fever (relative risk, 3.07; 95% confidence interval [CI]; 1.07–8.81); the absolute risk reduction was 17.6%; a two-fold reduction in the risk of endometritis and wound infection was also observed (relative risk was

2.04 [95% CI, 0.3–10.62] and 2.04 [95% CI, 0.19–21.7], respectively).

5. Conclusion

Vaginal cleansing using either povidone-iodine or chlorhexidine immediately before elective CS significantly reduces the rate of post-CS endometritis, fever, and wound infection.

6. Recommendations

Based on the findings of this study, the following are recommended:

- Such a simple cost effective pre-operative vaginal cleansing method should be applied by nurses before elective CS.
- Vaginal cleansing immediately before CS should be embedded in the hospital routine care to reduce the risk of post-CS infections.
- Povidone-iodine can be used as an alternative to chlorhexidine for vaginal cleansing because it is an inexpensive detergent.
- The importance of vaginal cleansing immediately before elective CS should be emphasized in nursing syllabus.
- Replication of this study on a larger probability sample and in other settings is necessary.

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