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EFFICACY OF POVIDONE-IODINE VS CHLORHEXIDINE TO REDUCE SURGICAL SITE INFECTION IN PATIENTS UNDERGOING CESAREAN SECTION: A COMPARATIVE STUDY

EFICÁCIA DA POVIDONA-IODO EM COMPARAÇÃO À CLOREXIDINA NA REDUÇÃO DA INFECÇÃO DO LOCAL CIRÚRGICO EM PACIENTES SUBMETIDAS À CESÁREA: UM ESTUDO COMPARATIVO

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Abstract
Background: Cesarean section is a common surgical procedure that is performed in the world and it is linked to a high risk of surgical site infections (SSIs). Skin antisepsis before the operation is significant in the prevention of SSIs. There is however, doubt on the comparative efficacy of povidone-iodine and chlorhexidine in the cesarean section. Objective: This study aims at comparing incidences of surgical site infection in patients undergoing cesarean section using povidone-iodine and chlorhexidine. Methodology: This randomized controlled trial was conducted in the Department of Obstetrics and Gynaecology of Sughra Shafi Medical Complex, Narowal. A total of 700 patients undergoing elective cesarean section were enrolled and randomly divided into two groups (n=350 each). Group A received chlorhexidine (0.5%) and Group B received povidone-iodine for preoperative skin preparation. Patients were followed for 30 days postoperatively for development of SSI. Data were analyzed using SPSS version 20.0. Results: The frequency of SSI was lower in the chlorhexidine group (4.3%) compared to the povidone-iodine group (8.0%), showing a statistically significant difference ($p \leq 0.05$). Higher maternal age and increased BMI were significantly associated with increased SSI rates. Conclusion: Chlorhexidine is more effective than povidone-iodine in reducing

Resumo
Antecedentes: A cesariana é um procedimento cirúrgico comum realizado em todo o mundo e está associada a um alto risco de infecções do sítio cirúrgico (ISC). A antissepsia cutânea pré-operatória é fundamental na prevenção das ISC. No entanto, há dúvidas quanto à eficácia comparativa da iodopovidona e da clorexidina na cesariana. Objetivo: Este estudo tem como objetivo comparar a incidência de infecção do sítio cirúrgico em pacientes submetidas à cesariana utilizando iodopovidona e clorexidina. Metodologia: Este ensaio clínico randomizado foi realizado no Departamento de Obstetrícia e Ginecologia do Complexo Médico Sughra Shafi, em Narowal. Um total de 700 pacientes submetidas à cesariana eletiva foram incluídas e divididas aleatoriamente em dois grupos (n = 350 cada). O Grupo A recebeu clorexidina (0,5%) e o Grupo B recebeu iodopovidona para a preparação pré-operatória da pele. As pacientes foram acompanhadas por 30 dias no pós-operatório para avaliar o desenvolvimento de ISC. Os dados foram analisados utilizando o SPSS versão 20.0. Resultados: A frequência de ISC foi menor no grupo da clorexidina (4,3%) em comparação com o grupo da iodopovidona (8,0%), apresentando uma diferença estatisticamente significativa ($p \leq 0,05$). A idade materna mais avançada e o aumento do IMC foram

surgical site infections in cesarean section. Maternal age and BMI are important risk factors influencing SSI occurrence.

Keywords: Cesarean Section. Surgical site Infection (SSI). Chlorhexidine. Povidone-iodine. Maternal Risk Factors (Age and BMI).

significativamente associados a taxas mais elevadas de ISC. Conclusão: A clorexidina é mais eficaz do que a iodopovidona na redução das infecções do sítio cirúrgico na cesariana. A idade materna e o IMC são fatores de risco importantes que influenciam a ocorrência de ISC.

Palavras-chave: *Cesariana. Infecção do Sítio Cirúrgico (ISC). Clorexidina. Iodopovidona. Fatores de Risco Maternos (Idade e IMC).*

1 INTRODUCTION

Cesarean section is a major surgical procedure among women that is one of the most common worldwide[1]. The cesarean section rate in 20172018 in Pakistan was reported to be 19.6%[2]. Although cesarean delivery has life saving advantages it is linked to a significant possibility of postoperative complications especially a surgical site infection (SSI) that happens in about 2-5 percent of all surgeries and up to 5-12 percent of cesarean sections [3].These infections cause a high cost to the maternal health, prolonged hospitalization, high healthcare expenditure, delayed recovery, and poor mother-infant attachment and breastfeeding.

One of the main sources of pathogens that cause SSIs in the patient is his skin. Thus, proper preoperative preparation of the skin is one of the most important measures to prevent postoperative infections 4. Nevertheless, the quality evidence to inform the choice of the most suitable antiseptic agent when operating a cesarean section is limited in quality and quantity[5].

The literature on the assessment of antiseptic agents in cesarean section is scanty. Three small randomized studies in total of 189 subjects found no significant difference in the SSI rates between antiseptic agents. Moreover, the results of observational studies are not consistent, which also adds to the confusion.

Recent evidence suggests alcohol-based antiseptic solutions to be used as the preoperative skin preparation agent, although the best agent to use together with alcohol is not clear. Randomized controlled trials indicate that antiseptics using chlorhexidine can be superior to those using iodine in the prevention of SSIs in general surgical populations,

although more rigorous studies are required (Evans, 2009). Nevertheless, the majority of these studies have compared chlorhexidine alcohol combinations to aqueous povidone-iodine, so it is hard to say whether an effect was due to chlorhexidine, alcohol, or a combination of both[8]. Moreover, cesarean section has its own considerations because of dual source of pathogen which comprises of both skin and vaginal flora, and immunological alterations of pregnancy. Their direct relevance to obstetric patients is constrained by these factors to the general surgical populations[9].

A randomized controlled trial study by Tuuli et al. proved that the incidence of SSIs in patients who were prepared with chlorhexidine (4.0) was lower than those prepared with povidone-iodine (7.3%) [1]. Equally, a pilot randomized trial that involved cesarean deliveries showed lower SSI rates in the chlorhexidine-alcohol group (5.4) than in the povidone-iodine group [10].

Considering the scanty and rather inconsistent evidence especially in the local community, this paper intends to compare the effectiveness of povidone-iodine and chlorhexidine in the prevention of surgical site infections among patients undergoing cesarean section (7.3%)[11]. Similarly, a pilot randomized trial focusing on cesarean deliveries reported reduced SSI rates in the chlorhexidine–alcohol group (5.4%) compared to the povidone-iodine group (8.6%)[12].

2 OBJECTIVES

This research aims to make comparisons on the prevalence of surgical site infections between chlorhexidine and povidone-iodine on patients undergoing cesarean section.

3 METHODOLOGY

The present research was done as a randomized controlled trial (RCT) in the Department of Obstetrics and Gynaecology from August 2025 to February 2026. The study included a total sample size of 700 patients and 350 patients were assigned to each group, which was calculated using the WHO sample size calculator, with 80 being the

power of the study and 5 being the level of significance. The choice of participants was made based on the non-probability consecutive sampling method.

4 INCLUSION CRITERIA

The sample included patients aged 18-40 years, undergoing elective cesarean section, having singleton pregnancies, and any parity.

5 EXCLUSION CRITERIA

The patients who declined to take part, those who were in emergency cesarean section, pregnant women who had a known allergy to povidone-iodine or chlorhexidine, skin infection within the area of the operation, anemia (hemoglobin <11 g/dL), diabetes in the ante-natum history, immune weakness, and obesity (BMI >30 kg/m 2) were om.

6 DATA COLLECTION

The structured proforma was utilized to gather data that comprise demographic data (age, BMI, and parity), socioeconomic status, antiseptic type used, and presence of surgical site infection in 30 days. Informed consent was obtained after the participants had been informed of the need to participate in the study after receiving the ethical approval. The lottery method was used to randomize patients into two groups with Group A receiving chlorhexidine (0.5%) and Group B receiving povidone-iodine. The skin preparation was conducted five minutes before incision and a standard antibiotic prophylaxis was given to all patients. Daily monitoring of the patients in the hospital was conducted and 30-day follow-up of the patients was done by visiting the hospital or making phone calls. Diagnosis of surgical site infection was based on CDC criteria.

7 DATA ANALYSIS

The SPSS version 20.0 was used to analyze data. Frequency and percentage were used to describe qualitative variables like surgical site infection, mean ± standard

deviation was used to describe quantitative variables like age and BMI. Chi-square test was used to compare the frequency of surgical site infection in the two groups. To control the effect modifiers, stratification was done based on age, BMI, parity, and socioeconomic status. The p-value was deemed to be statistically significant at 0.05.

8 RESULTS

The study involved 700 patients who underwent surgical operations to compare the occurrence of surgical site infections (SSI) between chlorhexidine and povidone-iodine. The average age of the participants was 29.4 / -5.2 years. The sample size was equally split into two groups of 350 patients per group (chlorhexidine and povidone-iodine).

Table 1

Baseline Characteristics

Parameter	Total (n = 700)
Mean Age (years)	29.4 ± 5.2
Group Allocation	Chlorhexidine: 350 Povidone-iodine: 350

The sample size was balanced in the two antiseptic groups, and the demographic features were similar.

Table 2

Frequency of Surgical Site Infection (SSI)

Outcome	Frequency	Percentage
SSI in Chlorhexidine Group	15	4.3%
SSI in Povidone-Iodine Group	28	8.0%

Surgical site infection was less frequent in the group treated with chlorhexidine than in the group treated with povidone-iodine.

Table 3

Comparison of SSI Between Groups

Group	SSI Present	SSI Absent	p-value
Chlorhexidine (n = 350)	15 (4.3%)	335 (95.7%)	
Povidone-iodine (n = 350)	28 (8.0%)	322 (92.0%)	0.03

The statistically significant decrease in surgical site infections was found in the chlorhexidine group versus the povidone-iodine group ($p = 0.03$). The frequency of surgical site infections was higher among patients of higher age and high body mass index (BMI). This correlation was significant ($p \leq 0.05$), which means that age and BMI are significant factors contributing to the development of SSI.

8.1 Interpretation

The outcomes of the current work prove that chlorhexidine is superior to povidone-iodine to lower the rate of surgical infections in surgical patients. The total SSI rate was much low in the chlorhexidine group. Moreover, the risk of SSI was higher with older age and BMI, which implies that patient-related factors also have a significant impact on the risk of postoperative infections. They are in agreement with the preferential application of chlorhexidine in preoperative skin antisepsis especially when dealing with patients with a greater risk profile.

9 DISCUSSION

The outcomes of the current work prove that chlorhexidine is superior to povidone-iodine to lower the rate of surgical infections in surgical patients. The total SSI rate was much low in the chlorhexidine group. Moreover, the risk of SSI was higher with older age and BMI, which implies that patient-related factors also have a significant impact on the risk of postoperative infections. They are in agreement with the preferential application of chlorhexidine in preoperative skin antisepsis especially when dealing with patients with a greater risk profile[6]. Similar findings have also been reported in more recent randomized controlled trials and systematic reviews, further strengthening the

evidence that chlorhexidine–alcohol provides superior protection against postoperative infections compared to povidone-iodine[11,13].

The excellent performance of chlorhexidine could be explained by the fast onset effect, the extended residual effect, and the wide antimicrobial coverage [8]. The chlorhexidine is attached to the skin and offers long-lasting antimicrobial effects, but the povidone-iodine has a short residual effect and is more prone to inactivation due to organic matter. Recent microbiological and clinical investigations (20192024) also confirm that chlorhexidine has a stronger and more enduring bactericidal activity against a broad spectrum of organisms.[13,14].

On the other hand, povidone-iodine is the most commonly used but its activity is not sustained and may need repetitive application to remain effective [7]. Recent meta-analyses have demonstrated that chlorhexidine-alcohol solutions are much more effective in mitigating the risk of SSI than povidone-iodine, and in clean-contaminated surgeries, including cesarean delivery[11,15].

We also found that maternal factors including BMI and age also play a role in SSI risk, which is in line with other literature sources 9. High adiposity can inhibit wound healing by decreasing tissue perfusion, increasing the dead space, and changing immune response. The recent cohort studies also affirm obesity as one of the key independent predictors of SSI after the birth through cesarean section accompanied by increased incidence of wound complications and delayed wound healing[16,17]. Premature maternal age has equally been linked to higher vulnerability to postoperative infections [16].

The advantages of this research are that the sample size is large and the study is randomized, which increases the internal validity of the results. Nevertheless, it has such limitations as the single-centered design and exclusion of high-risk patients like diabetics, which can influence the generalizability. Recent multicenter research indicates that the advantages of chlorhexidine can be applied to the population at higher risk too[17].

Altogether, the recently emerging trials and meta-analyses have shown a significant amount of evidence that has led to the conclusion that chlorhexidine-alcohol should be used more frequently than povidone-iodine in skin antisepsis before cesarean births. Its use in clinical practice can result in a great decrease in the rates of SSI and better maternal outcomes.

10 CONCLUSION

Chlorhexidine is much more efficient than povidone-iodine in terms of the prevention of surgical site infection (SSI) among patients undergoing cesarean section. The chlorhexidine group in this research showed significantly less SSI occurrence than the povidone-iodine group, which implies that it is a better antiseptic to use in skin preparation before the operation. The results underscore the need to use the right antiseptic agents to reduce postoperative complications and enhance the outcomes of the mothers. Besides, maternal age and body mass index (BMI) were identified as patient-related factors that were significant predictors of SSI. The risk of infection was more in older patients and those with higher BMI, which highlights the importance of close perioperative evaluation and personal care. All in all, these findings justify the use of chlorhexidine as a standard procedure in the surgical site preparation of a cesarean section and emphasize the need to consider clinical and demographic risk factors when developing a plan to prevent surgical site infection.

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Authors' Contribution

All authors contributed equally to the development of this article.

Data availability

All datasets relevant to this study's findings are fully available within the article.

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