

Role of Preoperative Chlorhexidine Bathing in Prevention of Surgical Site Infections among Women Undergoing Obstetric and Gynecological Procedures

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Abstract

Objective: To evaluate the role of preoperative bathing with chlorhexidine solution in reducing surgical site infections among women undergoing obstetric and gynecological operative procedures.

Methodology: A comparative observational study was conducted at Muhammad Shahbaz Sharif Hospital Campus, Lahore, from 1st of July, 2023 to 28th of February, 2024, where data was collected in the Obstetrics and Gynecology department, after obtaining ethical consent. A total of 1341 patients undergoing either elective or emergency procedures were included, by consecutive non-probability sampling technique and further divided into two groups. In group 1 were all patients (963) who took whole body bath with chlorhexidine solution, while in group 2 were patients (423) without bath before the procedure. The collected data was entered and analyzed for clinical characteristics like anemia, diabetes and operative characteristics whether primary or previous surgery and emergency or elective surgery by using SPSS version 21.0.

Results: Surgical site infection rate (SSI) was significantly low in preoperative bathing with chlorhexidine group 1 (0.32%) as compared to non-bathing group 2 (1.89%). The clinical characteristics like diabetes, emergency and previous surgery patients showed statistically significant SSI rate in patients who did not take bath as compared to bath group.

Conclusion: Our study showed that chlorhexidine pre operative bath is safe for SSI prevention. however further research analysis is required for its role in clean surgery before implementing it in health policy especially in developing countries.

Keywords: Chlorhexidine, Surgical site infection, Preoperative bath.

Introduction

Surgical site infection (SSI) is wound infection that occur after performing a surgical procedure within 30 days, and ranked as the third most common type of nosocomial infection acquired in hospitals worldwide.¹ It may present as discharge from wound. The organism may or may not be present in an aseptically obtained culture. SSI may be only superficial at incision site in skin or subcutaneous tissues), while in deep SSI there is soft tissue or organ involvement. There are various strategies for prevention of surgical site infection which includes the bath before surgery, hair removal, intranasal screening for *staphylococcus aureus* and antibiotics prophylaxis. Chlorhexidine bathing is the process of cleaning the body

using a solution containing chlorhexidine, an antiseptic that reduces bacteria on the skin.² It is commonly used in hospitals to prevent infections, especially in patients at high risk, such as those with surgical wounds or medical devices like catheters.² Chlorhexidine bathing can involve either a whole-body bath or targeted cleaning of specific areas, depending on the clinical need. In most hospital settings, especially for infection prevention, a whole-body bath is recommended to reduce bacteria on the entire skin surface.³ Its use as antiseptic bath prior to surgery has emerged as renewed interest as an additional safety measure for prevention of surgical site infections and hospital stay cost.³

Recent clinical studies showed that chlorhexidine use as a standardized protocol demonstrated sufficient skin surface concentrations to inhibit or kill skin colonizing flora.⁴ This study focused on one such strategy: the preoperative skin bathing. The safety of chlorhexidine gluconate formulations has been demonstrated in studies involving elective general, orthopedic, cardiothoracic, and obstetrical surgeries.⁵ This observational study explores evidence-based literature and contributes additional findings on the role of preoperative bathing with chlorhexidine solution for prevention of surgical site infections in women after surgical procedures at Muhammad Shahbaz Sharif Hospital Campus located in Lahore, Punjab, Pakistan.

Methodology

This comparative observational study was approved by the institutional review committee with reference no IHHN_IRB_2023_03_011. According to hospital policy, all patients undergoing elective or emergency surgery are provided with the facility for preoperative whole body bathing using chlorhexidine solution (CHG) free of cost to every patient. However, in many cases, patients undergoing emergency surgeries do not have sufficient time to undergo CHG bathing before the procedure. The data was collected at the Department of Obstetrics and Gynecology, Muhammad Shahbaz Sharif Hospital Campus of IHHN from 1st July 2023 to 28th Feb 2024. A total of 1341 patients undergoing either elective or emergency

procedures were included, by consecutive non-probability sampling technique and further divided into two groups. In group 1 were all patient (963) who took whole body bath with chlorhexidine solution, while in group 2 were patients (423) without bath before the procedure. Any patients with any evidence of skin disease at surgical site were excluded from study. All data entry and analysis were done on SPSS version 21.0. The descriptive statistics test analysis was done to find the link between different demographic and clinical characteristics clinical like BMI, anemia, diabetes and operative characteristics whether primary or previous surgery and emergency or elective surgery.

Result

Out of total 1341 patients in this study, 68.5% preoperative bathing with chlorhexidine solution (mostly elective

procedures) as compared to 31.5% who did not take bath (majority emergency procedures), as shown in Table 1. Surgical site infection rate (SSI) was significantly low in preoperative bathing with chlorhexidine group (0.32%) as compared to non-bathing group (1.89%). The emergency surgery patients had higher SSI rate in non-bath group as compared to bath group. The Table 2 shows SSI rate with operative characteristics of primary or previous surgery in both groups. In previous surgery patients with pre operative bath group the less SSI rate was observed as compare to non-bath group (Table 2). Chlorhexidine preoperative bath was statistically more effective than non-bath group for prevention of SSI. The associated clinical observational characteristics like anemia and diabetes were analyzed in both groups and showed statistically significant SSI rate in patients who did not took bath as compared to the bath group, as shown in Table 3.

Table 1: Impact of Chlorhexidine Bath on Surgical Site Infection Rates in Total, Emergency, and Elective Procedures

Descriptive Analysis	Patient take chlorhexidine bath n=918	Surgical site rate n=3	Patient did not take chlorhexidine bath n=423	Surgical site rate n=8	Odds Ratio, Confidence Interval, P Value
Total Procedures n =1341	68.5%	3(0.32%)	31.5%	8(1.89%)	Odds ratio 0.172895 % CI:0.0456 to 0.6546 P value= 0.0098
Emergency Procedure n=569	13.3%	1	29.1%	7	Odds ratio 0.142995 % CI:0.0175 to 1.1649 P value = 0.0691
Elective Procedure n=779	55.1%	1	2.4%	2	Odds ratio 0.276495 % CI:0.0730 to 1.0465 P value = 0.0583

Table 2: Inter-Group Comparison of Surgical Site Infections (SSI) in Primary and Previous Surgeries

Variable	Group 1 (n=918)	SSI	Group 2 (n=423)	SSI	Odds Ratio (OR), Confidence Interval, P value
Primary surgery n=439	334	1	105	2	OR 0.3267 95% CI:0.0776 to 1.3760 P = 0.1273
Previous surgery n=902	584	2	318	6	OR 0.1815 95 % CI:0.0364 to 0.9046 P = 0.0373

Table 3: Effect of Chlorhexidine Bath on Surgical Site Infections (SSI) in Patients with Diabetes Mellitus and Anemia

Variables	Group 1 (n=918)	SSI	Group 2 (n=423)	SSI	Statistical significance
Associated DM	209	3	117	8	OR 0.209995 % CI:0.0546 to 0.8066 P = 0.0230
Anemia	194	4	148	7	OR 1.111595 % CI:0.3167 to 3.9005 P = 0.8689

Discussion

Surgical site infections can be prevented through various strategies, one of which is preoperative skin bathing. This study focused on evaluating the effectiveness of preoperative chlorhexidine bathing in reducing SSIs. In our comparative analysis, the SSI rate was significantly lower (Table 1) in the chlorhexidine bath group (0.32%) compared to the non-bath group (1.89%). Additionally, the study examined the role of preoperative chlorhexidine bathing across various demographic, clinical characteristics. Our study findings showed significant reduction in SSI rates in patients with anemia, diabetes, elevated BMI, previous surgeries, and those undergoing emergency procedures in the bath group (Table 3).

A 2023 study published in JAMA demonstrated that using 4% CHG after showering resulted in significantly higher concentrations of CHG at different sites of skin as compared to immediately rinsing off the antiseptic agent.⁶ In a meta-analysis of four clinical trials found that chlorhexidine significantly reduced the total infection incidence to 1.69%. The reduction was particularly notable in moderate and high-risk patients.⁷ These findings align with our study, where the SSI rate decreased to 0.32% following preoperative chlorhexidine bathing. In our study, the reduction in SSI rates was particularly evident in the high-risk category within the chlorhexidine group compared to the non-bath group. A review by Edmiston showed compliance for preoperative showering with chlorhexidine and impregnated wipes as low-cost intervention.⁸ The study on compliance of SSI prevention standards showed that nursing staff with five years of experience, only 43.7% compliance to protocols.⁹ In a Military Medical-Surgical Unit, the implementation of a 4-day preoperative bathing protocol using 4% CHG for surgical patients led to a reduction in surgical site infection (SSI) rates, decreasing from 7.2 to 3.5 infections per 1,000 surgeries over the following year,¹⁰ which are similar to our study where SSI rate was reduced to 0.32% as compared to 1.89% in non-bath group.

Cruz-López et al. (2022) demonstrated that carbapenem-resistant *Acinetobacter baumannii* can persist on healthcare surfaces, highlighting its role in infection transmission and the need for effective disinfection protocols.¹¹ Fan et al. (2019) in a systematic meta-analysis demonstrating that chlorhexidine bathing significantly reduces colonization and infection rates of *Acinetobacter baumannii* in healthcare settings.¹² Prayugo et al. (2022) evaluated the effectiveness of a chlorhexidine pre-operative bath for surgical site infections prevention, their finding showed that the intervention significantly reduced the infection rate. This study supports the use of chlorhexidine bathing as an effective measure to improve surgical outcomes.¹³ Mezemir et al. (2020) conducted a cross-sectional study for identifying the associated risk factors in surgical site infections, cases which were largely attributed to inadequate infection control practices and patient-related factors. The findings emphasize the need for improved preventive measures and healthcare protocols to reduce SSI rates in similar settings.¹⁴

Curcio et al. (2019) studied SSIs in elective surgeries in developing countries, finding higher infection rates in clean-contaminated procedures. The study highlights the need for better infection prevention in these settings.¹⁵

Among a study on 145 patients in Jinnah Post graduate medical center, Karachi, in 2020 showed 35 (24.1%) surgical

site infection in emergency cesarean section cases.¹⁶ In our study SSI rate was 0.32% in emergency surgeries who took chlorhexidine bath as compared to 2.9% in non-bath group. In another study a significant association of surgical site infection was found with anemia, diabetes mellitus, and prolonged hospital stay.¹⁶ Their results correlate with our study associated factors like diabetes, previous elective and emergency surgery (Table 2, 3). A cross-sectional study on 143 cases showed that diabetes, smoking and obesity as independent associated factors for SSI. A significant result was noted on analysis for the presence of risk factors, and SSI occurrence.¹⁷ Our study showed a reduction in SSI in these diabetics who take chlorhexidine bath as compared to non-bath group (Table 3).

Dégbey et al. (2021) examined the prevalence and factors associated with surgical site infections by identifying key factors contributing to infection rates.¹⁸ They evaluated errors in patient care, medical errors and financial hindrance as factors which may lead to surgical site infections and suggested low-cost implementation in health care facility.¹⁸ In Pakistan different sub specialties of surgery showed 9.3% to 33.6% range of SSI.¹⁹ Sattar et al. (2019) evaluated with a finding of a notable incidence of SSIs. The study highlights the need for improved infection prevention strategies in post-operative care within the region.²⁰ Different associated factors also contribute SSI occurrence.²¹ Our study showed association among clinical risk factors in patients and SSI. Nursing care of patient play a vital role in prevention of SSI. One study reported a poor knowledge and practices among nurses for SSI compliance safety checklist.²² Martin et al. (2016) in a meta-analysis to assess the relationship between diabetes and the surgical site infections, concluded that diabetes significantly increases the likelihood of SSIs. The study emphasizes the importance of managing diabetes effectively to reduce infection risks in surgical patients.²³ In a study on 1471 patients in teaching hospital in Peshawar the prevalence was 12.5% in elective surgeries and 17.7% in emergency cases, which are similar to our study.²⁴ The chlorhexidine pre-operative bath seems to have role in surgical site infection prevention, contributing to improved management of surgery by shortening hospital duration and helps reduce the financial cost of surgery, especially in developing countries.

Limitations

There are a few limitations in the study like different behaviors for hand hygiene and bath compliance. As the follow-up period was relatively short, and the infection rate may have been thus underestimated.

Conclusion

The study showed that pre-operative chlorhexidine bath is safe for SSI prevention. However further research analysis is required for its role in clean surgery before implementing it in health policy especially in developing countries.

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Authors' Contribution: RB: Data analysis, interpretation with clinical significance, critical revision, and final approval of the manuscript; study design. RA & SS: Drafting, data editing, refer-

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