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Impact of Changing Gloves during Cesarean Section on Postoperative Wound Infection

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Author`s Contribution

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ABSTRACT

Objective: To compare the frequency of postoperative wound infection with or without changing gloves in women undergoing cesarean section.

Methodology: This comparative study was conducted in the Department of Obstetrics and Gynecology, Sir Ganga Ram Hospital, Lahore, from August 2023 to February 2024. Women aged 18–40 years, with parity <5 and gestational age >32 weeks, undergoing cesarean section were included and randomly divided into two groups. In Group A, the surgical team changed gloves during the procedure, while in Group B, the cesarean section was performed without changing gloves. During follow-up, the cesarean wound was evaluated for healing. Data were analyzed using SPSS version 25.0.

Results: The mean age of the participants was 28.07 ± 6.67 years, and the mean BMI was 24.97 ± 3.88 kg/m². Overall, postoperative wound infection occurred in 13 (16.25%) patients—3 (7.5%) in the glove-changing group and 10 (25%) in the no-glove-change group—showing a statistically significant difference (p = 0.034).

Conclusion: Changing gloves during cesarean section significantly reduces the incidence of postoperative wound infection compared to not changing gloves.

Keywords: Cesarean section, postoperative infection, surgical gloves, clinical practice.

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Introduction

Cesarean section (CS) is among the most frequently performed surgical procedures globally.[1] It serves as a life-saving intervention for the mother, fetus, or both in various obstetric situations such as obstructed labor, abnormal placentation, obstetric hemorrhage, fetal distress, and abnormal presentation or the position of fetus.[1] Throughout the world, the rate of cesarean section is estimated to be around 21.1% and continues to rise.[2] Women undergoing cesarean delivery face a five to twenty fold higher risk of developing infectious morbidity compared to those who have a vaginal birth,[2] and contribute to considerable morbidity, extended hospital stays, and increased rates of readmission.[3]

Several factors contribute to an increased risk of infectious complications following cesarean section, including extremes of maternal age, overweight, diabetes mellitus, a previous history of cesarean delivery, pre-existing genital tract infections, premature rupture of membranes, multiple vaginal examinations, and prolonged labor prior to surgery.[1,4]

On the other hand where the use of surgical gloves represents as a fundamental practice in maintaining aseptic conditions, preventing the transfer of skin microorganisms from the surgeon and protecting the surgical team from the biological fluids of the patients;[5,6] the glove replacement during operations is crucial for minimizing bacterial contamination.[7] It has been reported that the transfer of microorganisms from the vaginal canal into the otherwise sterile surgical field during cesarean delivery can cause postoperative infections.[8]

Gloves worn by the surgeon, which come into contact with the maternal genital tract during the procedure, may serve as a potential source of bacterial transfer from the reproductive organs to the incision site.[8] Replacing surgical gloves after placental removal and prior to abdominal wall closure can help minimize cross-

contamination between the genital tract and the surgical wound, thereby decreasing the likelihood of postoperative wound complications following cesarean delivery.[9,10]

In the context of developing countries, the higher incidence of SSIs is not unexpected and likely reflects the common circumstances faced by resource-limited healthcare facilities.[11] Where certain common factors contribute to this issue, the most significant being poor compliance with standard infection control protocols and the widespread presence of suboptimal clinical practices in many healthcare facilities.[11] The such situations however further aggravated by the widespread misuse and overuse of antibiotics.

Collectively literature showed that the chances of postoperative wound infection reduced significantly after practicing changing gloves during cesarean section.[9-12] But conflicting data has been observed in literature, showing no significant impact of changing gloves on occurrence of postoperative wound infection.[13] Also due to the limited work in this regard specifically at local level. Hence this study has been planned to get more evidence for local setting and to improve or knowledge and practice.

Methodology

This comparative study was carried out at the department of obstetrics and Gynecology, sir Ganga Ram Hospital, Lahore. Study was done during a period of six months from August 2023 to February 2024. By using WHO calculator, sample size of 80 cases; 40 in each group was calculated with 5% significance interval, 90% power of study and percentage of postoperative wound infection i.e. 5.5% with changing groves and 25.5% without changing gloves.[6] Non-probability, consecutive sampling was used. All the women of age 18-40 years, parity <5, gestational age >32 weeks, undergoing cesarean section were included. Women with chronic or gestational hypertension, diabetes, anemia, premature rupture of membranes, chorioamnionitis, urinary tract infection were excluded. Study was done after approval from hospital ethical board and CPSP Ref no: CPSP/REU/OBG-2021-059-10743, on 80 patients who fulfill the selection criteria. The informed consent was obtained from each woman after explaining the purpose of the study. After taking demographic information including name, age, BMI, parity, gestational age, booking status, type of cesarean (emergency or elective), the females were randomly divided in two groups by using lottery method. In group A, females were undergoing cesarean and during cesarean gloves were changed after delivery of fetus and placenta. In group B, cesarean section was continuing without changing gloves.

All surgeries were done under spinal anesthesia by a single surgical team with assistance of surgeon. After cesarean, females were shifted in post-surgical wards and prescribed same antibiotics and opioids was also given for 5 days. All females were discharged on 3rd post-operative day and followed-up in OPD on 10th day. During follow-up, cesarean wound was evaluated for healing and if there was presence of pus discharge, along with pain, and tenderness at wound site, and fever, then postoperative wound infection was labeled. Females with postoperative wound infection were managed as per standard protocol. All the data was recorded in proforma.

Data analysis was done in SPSS version 25.0. Numerical data like was presented as mean and standard deviation, while categorical data was presented as frequency and percentage. Both groups were compared for postoperative wound infection by using chi-square test, taking p-value $\leq$ 0.05 as significant. Additionally, the data was stratified for age, BMI, parity, gestational age, type of cesarean and operative time.

Results

The overall mean age of the women changing Gloves group was 29.15 ± 7.16 years, while in the not changing Gloves group it was 27.00 ± 6.03 years (p = 0.151). Correspondingly the mean BMI was 25.37 ± 4.23 kg/m² and 24.57 ± 3.51 kg/m² in the both groups respectively (p = 0.360). Overall gestational age was almost similar between groups, 38.40 ± 1.76 weeks and 38.35 ± 1.75 weeks (p = 0.899). According to the parity, most women were primiparous in both groups (45.0% vs. 55.0%), with no significant difference observed (p = 0.497). Similarly based on booking status, 77.5% of the Changing Gloves group and 75.0% of the not changing Gloves group being booked p = 0.793. Furthermore, In the changing Gloves grou**p,** emergency C-section rate was 30.0% while in non-**c**hanging Gloves group it was 27.5% without significant difference *p = 0.805, as shown in table 1.*

Table I: Comparison of C-section type between study groups.

Type of C-section	Study Groups		Total	p-value
	Changing Gloves	No Changing Gloves		
Elective	28	29	57	0.805
	70.0%	72.5%	71.2%	
Emergency	12	11	23	
	30.0%	27.5%	28.8%	

	40	40	80
Total	100.0%	100.0%	100.0%

The average operative time was statistically insignificant across the groups as 47.65 ± 8.85 minutes in the Changing Gloves group and 47.55 ± 7.89 minutes in the non-Changing Gloves group (p = 0.958). However, the mean intraoperative blood loss was slightly lower in the Changing Gloves group (613.12 ± 82.43 ml) compared to the No Changing Gloves group (632.50 ± 99.39 ml), (p = 0.346). Table II

Table II: Comparison of operative time and intra-op blood loss between study groups. (n=80)

VARIABLES	Study Groups	Mean	SD	p-value
Operative time (Minutes) n=40	Changing Gloves	47.65	8.85	0.958
	No Changing Gloves	47.55	7.89	
Intra-op blood loss (ml) n=40	Changing Gloves	613.12	82.43	0.346
	No Changing Gloves	632.50	99.39	

In the Changing Gloves group, only 3 women (7.5%) developed wound infections, whereas in the no changing gloves group, 10 women (25.0%) experienced postoperative wound infections (p = 0.034). Table III

Post-op wound infection	Study Groups		Total	p-value
	Changing Gloves	No Changing Gloves		
Yes	3	10	13	0.034
	7.5%	25.0%	16.2%	
No	37	30	67	
	92.5%	75.0%	83.8%	

Furthermore, incidence of postoperative wound infection found insignificant in relation to age (p = 0.151). It was higher among women undergoing elective or emergency C-sections in the non-changing Gloves group versus changing group (27.6% vs 10.7%), and (18.2% vs. 0.0%), while the difference was were not statistically significant p->0.05). Similarly, infection incidence increased with longer operative time (>45 minutes) in the No Changing Gloves group (26.9%) compared to the Changing Gloves group (8.0%), but the difference was not significant (p = 0.140); the same pattern was observed for ≤45 minutes (21.4% vs. 6.7%, p = 0.249). Infections were more frequent among un-booked patients (40.0% vs. 0.0%, p = 0.087) than booked cases (20.0% vs. 9.7%, p = 0.256), without significance, while there was significant association was found with BMI ≤ 25 kg/m², where the infection rate was markedly higher in the No Changing Gloves group (28.0%) than in the Changing Gloves group (0.0%) (p = 0.012), while no significant difference was observed for BMI > 25 kg/m² (p = 0.677), as shown in table IV.

Discussion

The postoperative wound infection among females undergoing cesarean section, with or without changing gloves, is a critical consideration in obstetric care. Cesarean sections, while common and generally safe, carry a risk of postoperative complications, including wound infections. The practice of changing gloves during surgical procedures is often debated in terms of its impact on infection rates. Although the present study was conducted on 80 women undergoing cesarean section, after dividing into two comparative groups, where the incidence of wound infection was found to be significantly lower in the glove-changing group 7.5%

Table IV: Comparison of postoperative wound infection between study groups stratified by age. (n=80)

Age (Years)		Wound Infection	STUDY GROUPS		Total	p-value
			Changing Gloves	No Changing Gloves		
Age groups	≤ 30	Yes	1(4.8%)	7(25.0%)	8(16.3%)	0.058
		No	20(95.2%)	21(75.0%)	41(83.7%)	
	>30	Yes	2(10.5%)	3(25.0%)	5(16.1%)	0.350
		No	17(89.5%)	9(75.0%)	26(83.9%)	
BMI (Kg/m²)	≤ 25	Yes	0 (0.0%)	7 (28.0%)	7 (15.9%)	0.012
		No	19 (100.0%)	18 (72.0%)	37 (84.1%)	
	> 25	Yes	3 (14.3%)	3 (20.0%)	6 (16.7%)	0.012
		No	18 (85.7%)	12 (80.0%)	30 (83.3%)	
C-section Type	Elective	Yes	3 (10.7%)	8 (27.6%)	11 (19.3%)	0.107
		No	25 (89.3%)	21 (72.4%)	46 (80.7%)	
	Emergency	Yes	0 (0.0%)	2 (18.2%)	2 (8.7%)	0.122
		No	12 (100.0%)	9 (81.8%)	21 (91.3%)	
Operating time	≤ 45 minutes	Yes	1 (6.7%)	3 (21.4%)	4 (13.8%)	0.249
		No	14 (93.3%)	11 (78.6%)	25 (86.2%)	
	> 45 minutes	Yes	2 (8.0%)	7 (26.9%)	9 (17.6%)	0.140
		No	23 (92.0%)	19 (73.1%)	42 (82.4%)	
Booking status	Booked	Yes	3 (9.7%)	6 (20.0%)	9 (14.8%)	0.256
		No	28 (90.3%)	24 (80.0%)	52 (85.2%)	
	Un-booked	Yes	0 (0.0%)	4 (40.0%)	4 (21.1%)	0.087
		No	9 (100.0%)	6 (60.0%)	15 (78.9%)	

compared to the no glove-changing group 25% p=0.034.

These findings were supported by the study of Hameed N et al[7] where in gloves changed group wound infection occurred in 5.0% women, while in the group without glove change, the infection was significantly higher 18.8% p=0.013. Consistently Abbas MM et al[14] reported that the postoperative wound issues were significantly more frequent in patients where sterile gloves were not changed (28.0%) compared to those where gloves were changed (9.8%). Scrafford JD et al[15] also observed that the intraoperative replacement of gloves resulted in a marked reduction of total wound-related complications, decreasing from 13.6% among controls to 6.4% in the group where gloves were changed p = 0.008. in the study by Glove replacement during cesarean section was linked to a significantly reduced risk of wound infection complications (RR = 0.41, 95% CI 0.26–0.65, p < 0.0001), based on moderate-quality evidence according to the GRADE assessment. Few other studies were also reported that the replacing gloves after placental delivery by all members of the surgical team significantly decreases the incidence of postoperative wound infections.[10,16-18]

In contrast to our findings Resende LDA et al[19] and Bitar G et al[13] observed that the among low-risk women undergoing elective cesarean delivery, replacing gloves during the procedure did not lead to a decrease in surgical site complication rate. On the other hand, according to a systemic review Kim K et al[20] demonstrated that the 8 studies reported glove contamination rates ranging from 3.4% to 30%, with several recommending glove changes after draping, before implant handling, or every hour regardless of surgical stage. Others advised changing gloves after bone resection or within 20–90 minutes to reduce the risk of perforation and contamination. Generally, most of the available studies indicate that replacing gloves during elective cesarean delivery can help reduce the risk of postoperative infection. Though, a few recent international studies have reported contrasting results. These discrepancies may be attributed to differences in sample size, surgical environment, and sterilization techniques. Although existing evidence suggests that glove changing may lower the likelihood of postoperative infections following cesarean section. However, the findings cannot yet be considered conclusive due to several limitations such as small sample sizes, lack of evaluation of the exact timing or specific stages of glove change, and absence of microbiological culture testing for removed gloves or surgical site infections. Hence, larger and longer-term studies addressing these shortcomings are recommended to establish stronger evidence for the routine implementation of this practice in obstetric surgeries.

Conclusion

Present study revealed that the changing surgical gloves before wound closure significantly reduces the incidence of postoperative wound infection following the C-section, with overall decreased infection 7.5% in the changing gloves group (compared to the no changing gloves group 25.0%, indicating that the simple intraoperative practice of changing gloves prior to wound closure can effectively minimize postoperative wound infections and improve maternal surgical outcomes. Hence, routine glove change before wound closure should be encouraged as a cost-effective and practical infection control measure in the surgeries of obstetrics.

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