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CESAREAN WOUND OUTCOME WITH SUBCUTICULAR ABSORBABLE SUTURES

RESULTADOS DA CICATRIZAÇÃO DA FERIDA DE CESARIANA COM SUTURAS ABSORVÍVEIS SUBCUTICULARES

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Abstract
Objectives: To determine the wound outcome after elective cesarean section closed with subcuticular absorbable sutures in terms of frequency of wound closure, post-operative pain score, and frequency of wound infection. Study type: Descriptive, cross-sectional study. Settings: Obstetrics and Gynaecology Department of Hilal e Ahmar Hospital, Faisalabad Duration of study: October 2025 to January 2026. Methodology: Toal 178 patients undergoing elective cesarean sections who were 20–40 years old and of any parity at term were included. Any underlying skin conditions, emergency procedures, and contaminated wound spills were not included. To guarantee uniformity in surgical technique, all CS were carried out by the same surgical team, which included consultants with a minimum of three years of post-fellowship experience. On the

Resumo
Objetivos: Determinar o resultado da cicatrização após cesariana eletiva fechada com suturas subcuticulares reabsorvíveis em termos de frequência de fechamento da ferida, índice de dor pós-operatória e frequência de infecção da ferida. Tipo de estudo: Estudo descritivo transversal. Local: Departamento de Obstetrícia e Ginecologia do Hospital Hilal e Ahmar, Faisalabad Duração do estudo: Outubro de 2025 a janeiro de 2026. Metodologia: Foram incluídas 178 pacientes submetidas a cesáreas eletivas, com idades entre 20 e 40 anos e de qualquer paridade, em gestação a termo. Não foram incluídos casos com condições cutâneas pré-existentes, procedimentos de emergência e derramamentos de ferida contaminada. Para garantir a uniformidade na técnica cirúrgica, todas as

tenth post-operative day, patients were asked to come back for a clinical assessment. During the follow-up, a general physical examination was performed to evaluate the surgical wound for signs of infection, wound closure and pain assessment using VAS. Results: In terms of post-operative discomfort, 131 patients (73.60%) in our study reported no pain, whereas 29 patients (16.30%) reported light pain, 14 (7.90%) reported moderate pain, and 04 (2.20%) reported severe pain. In our study, there were 23 cases (12.90%) of surgical site infection (SSI) and 21 cases (11.80%) of wound dehiscence among patients receiving subcuticular sutures. Conclusion: This study found that subcutaneous tissue closure reduces wound complications during elective cesarean sections.

Keywords: Cesarean Section. Pain. Subcuticular Absorbable Sutures.

cesáreas foram realizadas pela mesma equipe cirúrgica, que incluía consultores com um mínimo de três anos de experiência pós-especialização. No décimo dia pós-operatório, as pacientes foram solicitadas a retornar para uma avaliação clínica. Durante o acompanhamento, foi realizado um exame físico geral para avaliar a ferida cirúrgica quanto a sinais de infecção, fechamento da ferida e avaliação da dor utilizando a Escala Visual Analógica (EVA). Resultados: Em termos de desconforto pós-operatório, 131 pacientes (73,60%) em nosso estudo relataram ausência de dor, enquanto 29 pacientes (16,30%) relataram dor leve, 14 (7,90%) relataram dor moderada e 04 (2,20%) relataram dor intensa. Em nosso estudo, houve 23 casos (12,90%) de infecção do sítio cirúrgico (ISC) e 21 casos (11,80%) de deiscência da ferida entre as pacientes que receberam suturas subcuticulares. Conclusão: Este estudo constatou que o fechamento do tecido subcutâneo reduz as complicações da ferida durante cesáreas eletivas.

Palavras-chave: *Cesariana. Dor. Suturas Subcuticulares Absorvíveis.*

1 INTRODUCTION

Cesarean section is one of the most common surgical procedures carried out on women worldwide. Over the past few decades, it has become much more common, making up between 20 and 25 percent of all deliveries in the majority of affluent countries.[1] The best method for skin closure during CS has not yet been thoroughly investigated, despite the fact that CS procedures have significantly evolved due to evidence-based practices and findings from multiple clinical studies.[2] The optimal method for attaining the optimum wound outcomes is currently up for debate.[3]

In both elective and emergency CS situations, selecting the right skin closure technique is critically important, especially for women who have a history of repeated surgeries, anemia, malnutrition, or chronic medical issues. One of the most common complications following cesarean delivery is wound infection.

Sutures, staples, sticky strips, and tissue adhesives are among the mechanical techniques used to close wounds.[4]

The risk of post-operative problems, especially infections, can be significantly impacted by the type of suture used and whether the subcutaneous layer is closed. Even with continuous study, there is still not enough data to tell clinicians with certainty which course of action is optimal. Staple closure was found to have a higher rate of wound complications than subcuticular sutures in one comprehensive review that included both randomized and observational studies. But when the analysis was limited to randomized controlled trials only, this difference vanished.[5] Absorbable sutures are typically preferred because they can lessen wound problems, even if the best kind of skin suture is still up for debate. By preserving tissue proximity until adequate tensile strength is recovered, they also aid in initial healing.[6]

A randomized controlled trial evaluating several suture types for subcuticular skin closure was carried out by Kolaib et al. Four incidences (13.3%) of wound dehiscence and surgical site infection (SSI) occurred in patients undergoing subcuticular sutures. Five patients (16.7%) had mild pain following surgery, while the majority of patients (25, 83.3%) reported no pain at all. Interestingly, there were no instances of moderate or severe discomfort (0.0%).[7]

After CS, skin closure is accomplished using a variety of approaches; however, absorbable sutures are becoming more and more popular because of their ability to lessen wound problems, do away with the need to remove sutures, and enhance patient comfort. Compared to other skin closure methods, subcutaneous absorbable sutures are linked to better cosmetic healing and a decreased risk of wound infection. Despite these possible advantages, there is no local evidence evaluating the safety and efficacy of subcuticular absorbable sutures, particularly in the Pakistani population. Variability in surgical technique and wound care is frequently caused by the absence of evidence-based practice in this field. This study's objective is to assess wounds with subcuticular absorbable sutures. In order to lower post-operative morbidities, this study will contribute to the generation of local evidence that could direct clinical practice and policy-making toward standardized, safer, and more efficient skin closure techniques.

2 METHODOLOGY

Approved by the ethical review committee, this descriptive cross-sectional study involved 178 women and ran from October 2025 to January 2026. Using the WHO sample size calculator, the sample size of 178 is determined for a single percentage with the following parameters: P = 13.3%[7], absolute precision = 5%, confidence level = 95%, and sample size = 178. Patients undergoing elective cesarean sections who were 20–40 years old and of any parity at term were included. Any underlying skin conditions, emergency procedures, and contaminated wound spills were not included.

Non-probability consecutive sampling was utilized to choose patients who satisfied the inclusion criteria. Prenatal history, co-morbid conditions, demographics, and delivery information were all documented. To guarantee uniformity in surgical technique, all CS were carried out by the same surgical team, which included consultants with a minimum of three years of post-fellowship experience. Three to four minutes before to the procedure, povidone iodine was used to clean each patient's skin. All patients received prophylactic antibiotics prior to surgery. For every patient, the Pfannenstiel approach was applied. If the thickness of the subcutaneous tissue was greater than 1 cm, it was closed with interrupted sutures (Plain catgut 2-0). The absorbable suture material utilized to close the skin was Monocryl 3-0. At discharge, each patient's phone number was noted for future reference. On the tenth post-operative day, patients were asked to come back for a clinical assessment. During the follow-up, a general physical examination was performed to evaluate the surgical wound for signs of infection (redness, skin discoloration, swelling, discharge (watery, bloody, pussy), and fever (temperature <98.6 C) within 10 days of the C-section); wound closure (the wound was observed if the margins were approximated and there was no gap between two margins); and pain assessment using VAS (the patient was asked to rate on a scale of 1 to 10). After a day after delivery, the pain was noticed. On the VAS, pain was categorized as mild (0–3), moderate (4-6), and severe (7–10). A pre-made data collecting proforma was used to document all of the information gathered.

SPSS 25 was used to enter and evaluate the data. For quantitative characteristics such as age, height, weight, BMI, gestational age, parity, and pain, the mean and standard deviation were computed. For qualitative factors including co-morbidities, SSI, wound

closure, and indication for cesarean section, frequency and percentage were computed. The chi-square test was used to compare wound closure, wound infection, and pain intensity. Stratification was used to adjust for effect modifiers like as age, BMI, gestational age, parity, indication for cesarean delivery, and co-morbidities. The chi-squared post-stratification test was used. A p-value of 0.05 or less was considered significant.

3 RESULTS

Participants in the study were between the ages of 18 and 40, with a mean age of 29.86 ± 5.66. Table 1 indicates that 108 (60.71%) of the patients were in the age range of 31 to 40. 38.96 ± 1.40 weeks was the average gestational age. 2.83 ± 1.10 was the average parity. The BMI was 29.08 ± 3.14 kg/m2 on average. The patient distribution by variable is shown in Table 1. The average VAS score was 4.32 ± 2.18.

In terms of post-operative discomfort, 131 patients (73.60%) in our study reported no pain, whereas 29 patients (16.30%) reported light pain, 14 (7.90%) reported moderate pain, and 04 (2.20%) reported severe pain (Figure 1). In our study, there were 23 cases (12.90%) of surgical site infection (SSI) and 21 cases (11.80%) of wound dehiscence among patients receiving subcuticular sutures (Table 2). Tables 3, 4, and 5 display the stratification of wound closure, wound infection, and post-operative pain in relation to confounders.

Table 1

Distribution of variables (n=178)

		Frequency	**%age**
Age (years)	18-30	70	39.30
	31-40	108	60.70
Gestational age (weeks)	37-39	107	60.10
	40-41	71	39.90
Parity	≤3	115	64.60
	>3	63	35.40
BMI (kg/m^2)	≤30	113	63.50
	>30	65	36.50
GDM	Yes	61	34.30
	No	117	65.70
GH	Yes	37	20.80
	No	141	79.20

Indication	Fetal distress	47	26.40
	Malpresentation	69	38.80
	Placenta previa	45	25.30
	Failed induction	13	7.30
	Pre-eclampsia	04	2.20

Figure 1

Post-operative pain (n=178).

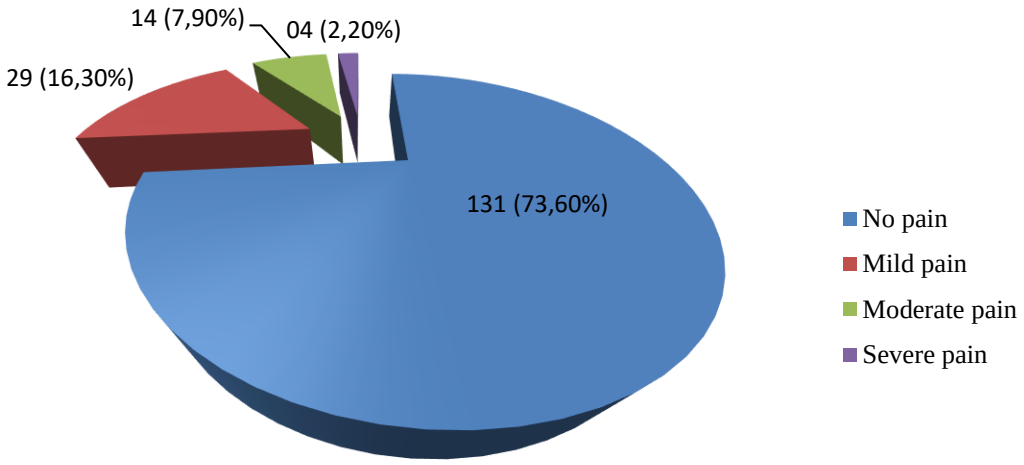

Table 2

Wound infection and wound closure (n=178)

		Frequency	%age
Wound infection	Yes	23	12.90
	No	155	87.10
Wound closure	Yes	157	88.20
	No	21	11.80

Table 3

Stratification of post-operative pain with respect to confounders.

		No pain	Mild	Moderate	Severe	P-value
Age (years)	18-30	54 (77.14%)	8 (11.43%)	08 (11.43%)	00 (0.0%)	**0.097**
	31-40	77 (70.0%)	21 (19.09%)	06 (5.45%)	04 (3.64%)	
Gestational age (weeks)	37-39	83 (77.57%)	15 (14.02%)	08 (7.48%)	01 (0.93%)	**0.316**
	40-41	48 (67.61%)	14 (19.72%)	06 (8.45%)	03 (4.23%)	
Parity	≤3	89 (77.39%)	17 (14.78%)	09 (7.83%)	00 (0.0%)	**0.039**

	>3	42 (66.67%)	12 (19.05%)	05 (7.94%)	04 (6.35%)	
BMI (kg/m^2)	≤30	82 (72.57%)	16 (14.16%)	12 (10.62%)	03 (2.65%)	**0.249**
	>30	49 (75.38%)	13 (20.0%)	02 (3.08%)	01 (1.54%)	
GDM	Yes	57 (93.44%)	04 (6.56%)	00 (0.0%)	00 (0.0%)	**0.0002**
	No	74 (63.25%)	25 (21.37%)	14 (11.97%)	04 (3.42%)	
GH	Yes	30 (81.08%)	03 (8.11%)	04 (10.81%)	00 (0.0%)	**0.279**
	No	101 (71.63%)	26 (18.44%)	10 (7.09%)	04 (2.84%)	
Indication	Fetal distress	47 (100.0%)	00 (0.0%)	00 (0.0%)	00 (0.0%)	**0.0001**
	Malpresentation	55 (79.71%)	10 (14.49%)	04 (5.80%)	00 (0.0%)	
	Placenta previa	21 (46.67%)	15 (33.33%)	09 (20.0%)	00 (0.0%)	
	Failed induction	08 (61.54%)	00 (0.0%)	01 (7.69%)	04 (30.77%)	
	Pre-eclampsia	00 (0.0%)	04 (100.0%)	00 (0.0%)	00 (0.0%)	

Table 4

Stratification of wound infection with respect to confounders.

		Yes (n=23)	**No (n=155)**	**P-value**
Age (years)	18-30	07 (10.0%)	63 (90.0%)	**0.349**
	31-40	16 (14.81%)	92 (85.19%)	
Gestational age (weeks)	37-39	21 (19.63%)	86 (80.37%)	**0.001**
	40-41	02 (2.82%)	69 (97.18%)	
Parity	≤3	18 (15.65%)	97 (84.35%)	**0.142**
	>3	05 (7.94%)	58 (92.06%)	
BMI (kg/m^2)	≤30	13 (11.50%)	100 (88.50%)	**0.457**
	>30	10 (15.38%)	55 (84.62%)	
GDM	Yes	00 (0.0%)	61 (100.0%)	**0.0002**
	No	23 (19.66%)	94 (80.34%)	
GH	Yes	09 (24.32%)	28 (75.68%)	**0.020**
	No	14 (9.93%)	127 (90.07%)	
Indication	Fetal distress	09 (19.15%)	38 (80.85%)	**0.293**
	Malpresentation	10 (14.49%)	59 (85.51%)	
	Placenta previa	04 (8.89%)	41 (91.11%)	

	Failed induction	00 (0.0%)	13 (100.0%)	
	Pre-eclampsia	00 (0.0%)	04 (100.0%)	

Table 5

Stratification of wound closure with respect to confounders.

		Yes (n=157)	No (n=21)	P-value
Age (years)	18-30	60 (85.71%)	10 (14.29%)	**0.407**
	31-40	97 (89.81%)	11 (10.19%)	
Gestational age (weeks)	37-39	92 (85.98%)	15 (14.02%)	**0.259**
	40-41	65 (91.55%)	06 (8.45%)	
Parity	≤3	99 (86.09%)	16 (13.91%)	**0.237**
	>3	58 (92.06%)	05 (7.94%)	
BMI (kg/m^2)	≤30	100 (88.50%)	13 (11.50%)	**0.873**
	>30	57 (87.69%)	08 (12.31%)	
GDM	Yes	50 (81.97%)	11 (18.03%)	**0.063**
	No	107 (91.45%)	10 (8.55%)	
GH	Yes	37 (100.0%)	00 (0.0%)	**0.012**
	No	120 (85.11%)	21 (14.89%)	
Indication	Fetal distress	40 (85.11%)	07 (14.89%)	**0.044**
	Malpresentation	65 (94.20%)	04 (5.80%)	
	Placenta previa	35 (77.78%)	10 (22.22%)	
	Failed induction	13 (100.0%)	00 (0.0%)	
	Pre-eclampsia	04 (100.0%)	00 (0.0%)	

4 DISCUSSION

Although there are differing opinions in the literature about the advantages and disadvantages of subcuticular closure, this approach is still emphasized for its many advantages over other closure methods. Numerous studies have clarified its benefits, especially with regard to encouraging the best possible wound healing, producing excellent cosmetic results, and raising overall patient satisfaction levels.[8]

Suture closure is the recommended method for skin closure in cesarean incisions, as reported in multiple research. The relative advantages of subcuticular closure—whether using absorbable or nonabsorbable materials—in terms of wound healing, cosmetic results, and patient satisfaction are still up for debate, though. One significant advantage of the POSAS is its ability to incorporate patient self-evaluation of scarring-related symptoms and physical characteristics.[9]

The average age in this study was 29.86 ± 5.66 years. The current study's results are consistent with research by Ramadan MS et al[10], Verma et al[11], Hasdemir et al[12], Poperzncy et al[13], and Kolaib et al.[7]

The study group's mean BMI was 29.08 ± 3.14. Ramadan MS et al.[10] found that the mean BMI for absorbable sutures was 26.3±4.2 kg/m2, while the mean BMI for non-absorbable sutures was 26.7±5.4 kg/m2. Verma et al[11] found that the mean BMI of females using absorbable suture was 27.24±4.48 kg/m2, while the mean BMI of those not using absorbable suture was 28.38±4.88 kg/m2.

In a study by Hasdemir et al[12], scar pain severity was verbally graded on a scale from 1 to 10 using the NR Spain scale. In terms of postoperative pain, there was no statistically significant difference between the absorbable and non-absorbable suture groups (pvalue-0.099). In our study, 131 patients (73.60%) reported no pain following surgery, compared to 29 patients (16.30%) who reported light pain, 14 patients (7.90%) who reported moderate pain, and 4 patients (2.20%) who reported severe pain.

For women undergoing CD, wound problems are crucial to their postoperative treatment. In our study, there were 23 occurrences (12.90%) of surgical site infection (SSI) and 21 cases (11.80%) of wound dehiscence in patients who received subcuticular sutures. To lower the incidence of problems, a number of research[3,9] attempted to determine the best skin closure method. Madsen et al. showed no changes in wound problems when utilizing absorbable subcuticular staples compared to subcuticular sutures[14], despite the fact that wound difficulties were shown to be less common with subcuticular staple closure than with regular staple closure.[15]

Closing subcutaneous tissue may lower the likelihood of hematomas and seromas, according to Islam et al.[16] To learn more about how these outcomes impact the patient's rehabilitation and overall health, more study is required. Theoretically, hematomas and seromas might be avoided by suturing the fat tissue and sealing the subcutaneous dead space, according to Chelmow et al.[17] This would prevent wound disruption. This study found no statistically significant difference between the two groups in terms of wound inflammation. In their meta-analysis, Chelmow et al.[17] discovered that the baseline incidence of complications in the

absence of subcutaneous tissue closure was 1.6% for hematomas, 8.5% for seromas, 7.1% for wound infections, and 14.3% for wound disruption. The incidence of hematomas, seromas, and wound disruption decreased.

By randomly assigning 438 women following cesarean delivery to groups with or without an approximate Camper's fascia, Del Valle et al.[18] investigated the occurrence of wound disruption. A continuous 3-0 simple gut suture was inserted. The group with sutures had a lower incidence of wound disruption (7.4 vs. 2.7 percent; p =.03). The depth of the subcutaneous space was not compared between the two groups. Both groups had the same body mass index, frequency of repeat caesarean procedures, and mean duration of ruptured membranes. Higher body mass index and many vaginal exams were also linked to higher risk.

In their prospective investigation, Naumann et al.[19] also found a comparable rate of superficial wound disruption. Two hundred and forty-five women with subcutaneous fat deeper than two centimeters were randomly assigned to either non-closure or subcutaneous closure using a 3-0 polyglycolic acid horizontal running suture. The fat thickness (4.0 + 1.4 versus + 2.0 cm) was the same. Compared to the group that did not receive closure, the subcutaneous closure group experienced a considerably decreased rate of seroma formation (5.1 vs. 17.2 percent, p =.0003). Subcutaneous drains were not used in either of the aforementioned investigations, and stainless steel staples were used to seal the skin.

In a study[20], the average age was 27.40 ± 3.795 years. A BMI of 21.492 +-3.987 kg/m2 was the average. The average skin closure time was 4.96±1.382 minutes.

At post-operative day five, the mean pain score was 5.05+1.451; 13 cases (8.7%) experienced mild pain, 57 cases (38%), and 5 cases (3.3%), experienced moderate pain. Nine (6%) instances had seroma at the six-week follow-up, five (3.3%) had an infection, and five (3.3%) had dehiscence. Just two (1.3%) of the three (2%) instances had hematomas and hypertrophic scars. Cosmetic scar evaluation was done using the POSAS score. The observer's scar score was 6.173+-2.891, while the patient's mean score was 6.128 ±1.291.[20]

Obese patients with a subcutaneous tissue depth greater than 6 cm have a 40% chance of developing wound infection problems, according to Zaman S et al.[21] Although the minimum and highest fat thicknesses in our study were 2 and 6 cm, respectively, patients with wound gapes brought on by infection or seroma development had subcutaneous fat ranging from 2 to 3 cm. According to Han D et al., wounds with significant dead space stay hypoxic.[22] Furthermore, more dead space could result in more wound fluid serving as an appropriate growth medium for microbial contamination.

Compared to the group that received either subcutaneous suture closure or subcutaneous drain, Kushwaha SS et al. found that women who had neither had a greater incidence of significant problems (disruption or infection) or an overall complication rate.[23]

There were a number of limitations to this study. Due to the small sample size of the study, some of the secondary end measures could not be completely addressed, even though the study was powered to answer the key outcome measures. Furthermore, since all prior surgical scars were removed, the study did not assess the impact of those scars on the surrounding skin and subcutaneous tissue. To address the potential influence of the skin closure technique on the increased risk of wound infection in this patient group, the optimal wound closure approach in patients with immunosuppression and other wound healing mitigating factors must be clarified.

5 CONCLUSION

This study found that subcutaneous tissue closure reduces wound complications during elective cesarean sections. Therefore, in order to lower the rate of wound problems and the morbidity of these specific patients, we advise that subcutaneous tissue closure be performed on all women undergoing cesarean sections.

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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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