DETERMINING THE COMPLICATIONS OF CESAREAN SECTION AND ITS IMPACT ON WOMEN'S PSYCHOLOGY IN SAUDI ARABIA: A SYSTEMATIC REVIEW

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Abstract

Objectives: To review the maternal and fetal complications following cesarean section (CS) among women in Saudi Arabia.

Methods: We conducted a thorough search of PubMed, SCOPUS, Web of Science, and Google Scholar to find pertinent literature. Rayyan QRCI was utilized during the entire process.

Results: We included ten studies with a total of 25,086 Saudi women. Wound infection, adhesions, blood transfusion requirements, placenta previa, bladder injury, and urinary tract infections were the most commonly reported postoperative complications in patients undergoing CS. The anesthetic complications included hypotension and bradycardia. Postpartum hemorrhage was the most common intra-operative complication. A low APGAR score that requires NICU was a common fetal complication following CS. The reported rate of fetal death and distress was very low.

Conclusion: A larger risk is linked to many repeat CS, however, it is not life-threatening. The maternal and fetal morbidity linked to repeated CS must be understood by both doctors and patients. Patients should be informed about the long-term effects of CS throughout their first and future pregnancies. If there are any predictors, more research is needed to determine which patient characteristics lead to better surgical results so that each patient can receive individualized counseling. Therefore, CS must be carried out safely and cautiously, particularly when the advantages outweigh the dangers associated with surgery.

Keywords: Cesarean delivery; Complications; Sequalae; Saudi Arabia; Systematic review.

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Introduction

The procedure used to terminate pregnancies worldwide, known as a C, involves making an incision on both the uterine and abdominal walls and delivering living or dead fetuses [1]. CS has been conducted in recent decades in an effort to improve parturition outcomes and ensure patient safety [2]. The overall maternal mortality rate in the United States ranges from 6 to 22 per 100,000 live births, with one-third to half of these deaths being related to unnecessary CS [3]. The prevalence of CS has increased in numerous nations worldwide [4, 5].

About 10% of births in the Kingdom of Saudi Arabia occur by cesarean delivery, with tertiary centers seeing rates as high as 20% [6]. When in Saudi Arabia, the Ministry of Health stated that, for both medical and elective purposes, the rate of CS has been shown to be the second most often done surgical treatment in Saudi Arabia [7].

Postpartum fetal complications of CS primarily consist of birth asphyxia, transient tachypnea of newborns (TTN), respiratory distress syndrome (RDS), sepsis, and soft tissue injury. Postpartum maternal complications include infection of the wound and chest, complications from blood transfusions, postpartum hemorrhage, burst abdomen, urinary tract infections (UTI), disseminated intravascular coagulation (DIC), fever caused by infection, and other inflammation like endometritis. The World Health Organization said that there is no reason for any region to have CS rates higher than 10-15% due to the inherent hazards [13]. Guidelines were developed and put into practice regarding these numerous and serious issues that affect expectant mothers and fetuses, and a CS should be done when certain clearly defined indicators are present [14].

Changes in maternal preferences, nonclinical factors, and demography are the suggested causes of the rise in the CS rate [10]. Whatever the cause, it is inevitable that related problems like endometritis, the need for a transfusion, or hysterectomy would rise in tandem with the frequency of primary and repeat CS. Therefore, in order to affect the rate, we must have a thorough grasp of CS and the morbidity and mortality that are linked to it. This systematic review investigates the published literature on the complications following CS among women in Saudi Arabia.

Methodology

Study Design and Duration

The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) standards were followed in the conduct of this systematic review [7]. In April 2024, the systematic review got started.

Search strategy

To find relevant material, a comprehensive search was conducted using four key databases: PubMed, SCOPUS, Web of Science, and Google Scholar. We searched through databases that contained only English content, paying attention to the unique requirements of each. To find the relevant papers, we converted the following keywords to PubMed Mesh terms; "Cesarean section," " Cesarean delivery," "complications," and "Saudi Arabia." "OR," "AND," and "NOT," three boolean operators, matched the necessary keywords. Full-text English publications, freely accessible articles, and human trials were among the search results.

Selection criteria

We considered the following criteria for inclusion in this review:

- Any study design that discussed complications following CS among women in Saudi Arabia.
- We did not include any case.
- Only human subjects.
- English language.
- Free accessible articles.

Data extraction

Two output verifications of the search method were conducted using Rayyan (QCRI) [8]. By using inclusion/exclusion criteria, the researchers evaluated how relevant the abstracts and titles were to the combined search results. The reviewers carefully considered every manuscript that met the inclusion requirements. The authors talked about ways to resolve conflicts. A pre-made data extraction form was used to upload the approved study. The authors extracted data on the study title, authors, study year, city, participants, age, parity, and fetal and maternal complications.

Strategy for data synthesis

Summary tables using information from relevant studies were compiled to provide a qualitative assessment of the research's findings and components. The best technique for using the data from the included study articles was chosen after the data for the systematic review was gathered.

Results

Search results

The systematic search produced 816 study articles in total, of which 474 duplicates were eliminated. After 342 studies had their titles and abstracts screened, 289 were not included. After 53 reports were requested to be retrieved, 3 articles were not found. After screening 50 studies for full-text assessment, 21 were rejected due to incorrect study results, 11 were rejected due to incorrect population type, 4 articles were editor's letters, and 4 were abstracts. This systematic review included ten eligible study articles. A synopsis of the procedure for choosing studies is provided in (Figure 1).

Characteristics of the included studies

Table (1) shows the sociodemographic details of the research articles that are included. Our results included ten studies with a total of 25086 participants. Nine studies were retrospective in nature [13-17, 19-22] and only one study was prospective in nature [18]. Seven studies were cohorts [13, 15, 16, 19-22], one was a case-control [14], and two were cross-sectional [17-18]. Four studies were conducted in Jeddah [15, 17, 19, 20], two in Abha [14, 22], two in Riyadh [16, 18], one in Al-Khobar [13], and one in Jazan [21]. The earliest study was conducted in 2001 [18] and the latest in 2023 [19, 21].

Maternal complications

Table (2) presents the clinical characteristics. Wound infection [15, 18, 20] and adhesions [15, 21, 22], blood transfusion requirements [15, 21], placenta previa [15, 22], bladder injury [13, 14, 15, 17], and urinary tract infections [15, 21] were the most commonly reported postoperative complication in patients undergoing CS. The anesthetic complications included hypotension and bradycardia [19]. Postpartum hemorrhage [17, 20] was the most common intra-operative complication.

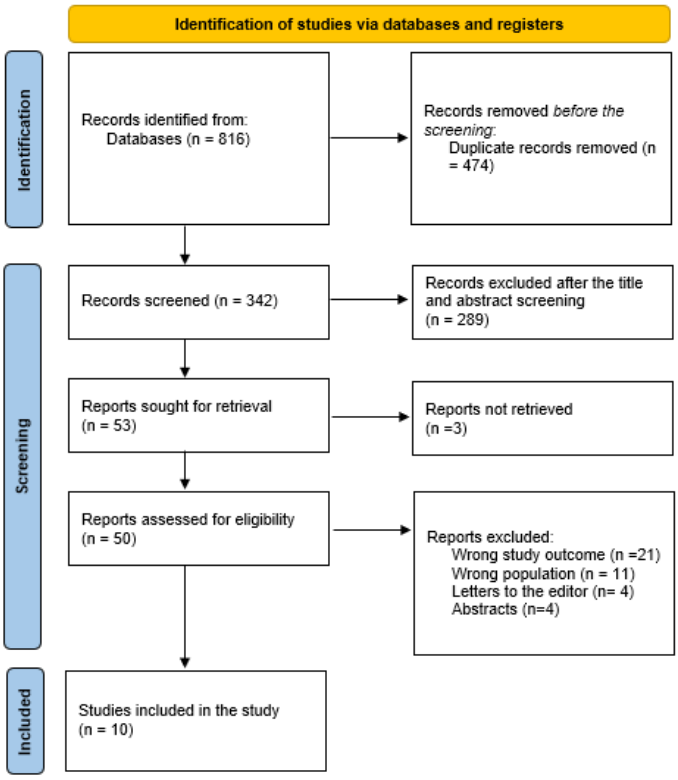

Figure 1. Study selection is summed up in a PRISMA flowchart.

Fetal complications

A low APGAR score that requires NICU was a common fetal complication following CS [17, 21]. The reported rate of fetal death and distress was very low [17] (Table 1, Table 2).

Discussion

Although there is disagreement about the potential causes of the rising number of CS [23-25], it is hard to dispute the perioperative morbidity and mortality as well as the long-term consequences [26, 27]. Clinicians, patients, researchers, and those who develop health policy should be aware of the maternal or neonatal M/M linked to primary CS as well as the trial of labor following CS and elective repeat CS.

Mascarello et al. reported that for bleeding and blood transfusion, the quality of the evidence was deemed low, whereas for postpartum infection and maternal death, it was deemed intermediate [28]. In Iran, Rafiei et al. Muscular pain was the most prevalent consequence for women having CS, and transient tachypnea was the most common fetal problem for neonates delivered via CS [29].

Our review found that wound infection [15, 18, 20] and adhesions [15, 21, 22], blood transfusion requirements [15, 21], placenta previa [15, 22], bladder injury [13, 14, 15, 17], and urinary tract infections [15, 21] were the most commonly reported postoperative complication in patients undergoing CS. CS had greater rates of postpartum infection, infection of the surgical incision, and the requirement for ICU hospitalization, regardless of the infection source, which was not identified in the trials.

Following a CS, SSI is regarded as a sign of high-quality medical treatment. Nonetheless, the high figure suggests that Saudi's health care system's quality is in doubt. Despite the existence of multiple endogenous risk factors, the difficulties may be exacerbated by the inadequate and inefficient application of the CDC's evidence-based SSI prevention initiatives. Thus, it is necessary to apply evidence-based strategies. including the prompt administration of carefully chosen prophylactic antibiotics, the use of preparation based on chlorhexidine and alcohol, the use of sutures for skin closure, the maintenance of glycemic control during the postoperative phase, the full body washing of patients with soap (either antimicrobial or non-antimicrobial) or an antiseptic agent at least one night prior to the operation day, and the maintenance of normothermia in all patients. In order to prevent SSI, patients with normal pulmonary function undergoing general anesthesia with endotracheal intubation should also receive an increased fraction of inspired oxygen during surgery and in the immediate postoperative period after extubation. Transfusion of blood products should also not be denied to surgical patients [30-33].

Skin scars and intra-abdominal adhesions are both products of the wound healing process, which comprises three stages. [34] Inflammatory or substrate phase: polymorphonuclear leukocytes (PMNs) and macrophages are the primary cells engaged, and they last for around three days. [35] Proliferative phase: marked by increased cellular motility and collagen deposition, it starts on day 3 and lasts for six weeks. [36] The remodeling phase is defined by collagen strengthening and remodeling [37]. There may be a correlation between skin scars and intra-abdominal scars due to interpersonal variations in the wound healing process, such as TGF-ß production [38]. Shafti et al. also found that the features of abdominal wounds, including the depressed scar and scar breadth, along with a negative sliding sign after a prior CS, can be used to predict the likelihood of adhesions [39].

Table 1. Sociodemographic characteristics of the included participants.

Study	Study design	City	Participants	Age range
Rahman et al., 2009 [13]	Retrospective cohort	Al-Khobar	7708	22-48
Al-Shahrani, 2012 [14]	Retrospective case-control	Abha	10765	<25 to >35
Alnoman et al., 2016 [15]	Retrospective cohort	Jeddah	5	25-43
Al Rowaily et al., 2014 [16]	Retrospective cohort	Riyadh	4305	15-48
Aljohani et al., 2021 [17]	Retrospective cross-sectional	Jeddah	281	17-46
Mah et al., 2001 [18]	Prospective cross-sectional	Riyadh	735	30.5 ± 6.2 (mean)
Algarni et al., 2023 [19]	Retrospective cohort	Jeddah	261	32
Gadeer et al., 2020 [20]	Retrospective cohort	Jeddah	387	19-51
Murtada et al., 2023 [21]	Retrospective cohort	Jazan	268	20-50
Sobande et al., 2006 [22]	Retrospective cohort	Abha	371	30 ± 5.6 (mean)

*NM=Not-mentioned

Table 2. Clinical characteristics and outcomes of the included studies.

Study	Parity (range)	Fetal complications	Maternal complications
Rahman et al., 2009 [13]	1 - 12	NM	• 34 (0.44%) is the incidence of bladder injury in CS.
Al-Shahrani, 2012 [14]	NM	NM	• Incidence of bladder injury was 24 (0.22%) in CS performed.
Alnoman et al., 2016 [15]	7 – 9	NM	• One instance of uterine dehiscence was reported. • A single instance necessitated a blood transfusion and involved complications such as placenta accreta, bladder injury, urinary tract infection, and an extended hospital stay for the mother, which included admission to the neonatal intensive care unit (NICU). • During surgery, there were moderate to severe adhesions in every patient. • There was a postoperative wound infection in one of the five instances.
Al Rowaily et al., 2014 [16]	2.9 ± 2.9	There were diagnoses of adverse fetal outcomes in 5.06% of deliveries. The most common unfavorable fetal outcome was IUGR (3.25%), which was followed by IUFD and the requirement for ICU stay (0.58% each).	• There were diagnoses of adverse maternal outcomes in 5.09% of deliveries. • The frequency of these outcomes was much greater in emergency rooms (6.06%) than in elective care sections (3.1%).
Aljohani et al., 2021 [17]	1-13	With a low APGAR score of 2.1% and a NICU admissions percentage of 2.1%, fetal problems summed up to almost 6%. The reported rate of fetal death and distress was a very low 0.7%.	• Roughly 7% experienced maternal problems, including 2.1% of hemorrhage and 2.1% of wound extension. • 1.1% and 0.7% of cases were related to uterine atony and urinary bladder damage, respectively.
Mah et al., 2001 [18]	3.8 ± 3.2	NM	• 2.8% was the total rate of incisional SSI. • In the operation room of the obstetric suite, there were insufficient infection control protocols.
Algarni et al., 2023 [19]	0-3	NM	• The sole risk factor linked to spinal anesthesia-induced bradycardia was the location of the SA puncture equivalent to or lower than L2, and the factors connected with SA-induced hypotension during a CS were BMI and the dose of SA.
Gadeer et al., 2020 [20]	2±2	NM	• 3.4% (13/387) of wound infections were reported. Of the 11 cases of WI, the majority were superficial, with E. coli being the predominant pathogen in four cases (36.4%) and Staphylococcus aureus in three cases (27.3%). • Postpartum hemorrhage (18, 44.0%) was the most common intra-operative complication, occurring in only 38 (10%) of the patients.
Murtada et al., 2023 [21]	1 -5	Requiring neonatal resuscitation (2.6%), having a poor Apgar score (19%), and being admitted to NICU were the most frequent problems among new-borns.	• Intraperitoneal adhesions (7.5%) and fused abdominal layers (7.1%) were the most frequent intraoperative complications reported by the repeat CS group in mothers. • Blood transfusion requirements (22%) and urinary tract infections (3%), were the most frequent postoperative complications.
Sobande et al., 2006 [22]	3.4 ± 3	NM	• In 128 (50%) cases, the adhesions were severe. • The prevalence of placenta previa was five times higher than 2.4% vs. 0.5% for the entire obstetric population. Placenta praevia is more common as the rate of CS rises. • There was one instance of uterine rupture, or 4/1000 instances.

*NM=Not-mentioned

Postpartum hemorrhage is a significant risk factor in the form of CS. PPH continues to be a major cause of maternal mortality, accounting for 60% of maternal deaths in developing nations, and is the most common reason for maternal ICU admissions annually [40]. An intervention that can save a life in cases of obstetric hemorrhage is a blood transfusion. The rate of blood transfusion for often occurring reasons, including placenta previa (59.1%), obstructed labor (28%), previous CS (17%), and severe preeclampsia (11.1%), was noted by Eusaph et al. [41].

We also found that a low APGAR score that requires NICU was a common fetal complication following CS [17, 21]. The reported rate of fetal death and distress was very low [17]. Yang et al. reported that compared to elective CS, emergency CS showed noticeably higher maternal and fetal problems and mortality [42]. Fetal distress, cephalopelvic disproportion, inability to induce labor, lack of labor progress, and prior CS are among the indications of an emergent manual labor and delivery procedure emergence CS [43]. Fetal morbidity is a significant concern in addition to the difficulties that a CS may cause for the mother and the baby. According to research conducted in a wealthy nation, the infant mortality rate from CS is almost 13 per 100,000, but the rate from vaginal births is just 3.5 per 100,000 or nearly 25% of the former [44].

Many women believe that CS provides higher-quality medical care and is less hazardous than vaginal deliveries. Women from lower socioeconomic groups started to imitate the actions of upper-class women over time, treating them better and as a standard, which led to an increase in the number of CS performed on this group of women [45]. In the absence of obvious biological hazards, women's requests for CS can frequently seem unreasonable; nonetheless, prior experiences or accounts of traumatic deliveries may support the decision to choose surgery over vaginal delivery [45]. The actual mechanisms linking cesarean birth and postpartum mental disorders remain unclear. We ruled out the potential influence of a higher number of antepartum complications for cesarean women through propensity score matching in the current study. The observed association between cesarean birth and postpartum mental disorders may be related to differences in hormone response or a lack of self-confidence in parenting among women who had cesarean compared with women who had vaginal birth. Oxytocin is important in uterine contraction and lactation. Women who undergo cesarean usually have lower oxytocin levels than those who undergo vaginal birth. In vaginal birth, the amount of oxytocin increases in the maternal brain, which helps reduce stress and elevate feelings of happiness, and thus decreases the possibility of postpartum mental disorders [46-48]. In addition, women who undergo cesarean may have less self-confidence in parenting because they could not give birth naturally by themselves. Women who lack self-confidence may feel nervous in parenting, which in turn is associated with distress, adjustment, and mood-related mental disorders after childbirth. Nonetheless, future study is needed to examine the mechanisms [49].

Previous studies on the relationship between cesarean birth and postpartum mental disorders had mixed results. Most previous studies which revealed insignificant relationships between cesarean birth and postpartum mental disorders had small sample sizes [50-54]. A prospective cohort study of 55 814 Norwegian women found no statistically significant relationship between cesarean birth and postpartum emotional distress after adjusting for confounding factors, although the bivariate association was significant [55]. This insignificant result might have resulted from incomplete information on confounding factors and incomparable vaginal and cesarean birth groups.

A population-based case-control study by Yang et al. reported that the risk of postpartum depression was significantly higher in mothers who delivered by cesarean than those who delivered by vaginal birth. However, this study did not eliminate the influence of mental illness before delivery [50]. Chen et al. found that cesarean birth was significantly associated with an increased incidence of postpartum stress symptoms during the 1-year follow-up period after childbirth. Although differences in anxiety and depression were not statistically significant when evaluated singly, when the three mental disorders (stress symptoms, anxiety, and depression) were combined, a significantly higher incidence was noted in the cesarean group than the vaginal birth group [56].

Cesarean delivery is an important life-saving operation if it is used appropriately. Unnecessary cesarean birth increases health risks for both mothers and infants, as well as health care costs [55, 57]. Taken together, we suggest that strategies are needed to prevent unnecessary cesarean birth. Risks associated with cesarean birth should be conveyed to the public and to health professionals. Mothers who had a cesarean birth should be monitored carefully for development of postpartum mental disorders. Psychological and psychosocial interventions (such as cognitive-behavioral therapy, psychodynamic psychotherapy, or counseling), pharmacological treatments, or hormone therapy could be provided to treat postpartum mental disorders [58].

Since there are no randomized clinical trials assessing the complications related to the mode of delivery in the literature and it is deemed unethical to subject women to ostensibly unnecessary CS, one of the review's limitations is its inclusion of only observational studies. Due to the small number of similar studies, it is also impossible to do a quantitative analysis (meta-analysis) for every result that has been given.

Conclusion

A larger risk is linked to many repeat CS, however it is not life-threatening. The maternal and fetal morbidity linked to repeated CS must be understood by both doctors and patients. Patients should be informed about the long-term effects of CS throughout their first and future pregnancies. If there are any predictors, more research is needed to determine which patient characteristics lead to better surgical results so that each patient can receive individualized counseling. Therefore, CS must be carried out safely and cautiously, particularly when the advantages outweigh the dangers associated with surgery.

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