Indonesian Journal on Health Science and Medicine Vol 2 No 3 (2025): December
ISSN 3063-8186. Published by Universitas Muhammadiyah Sidoarjo
https://doi.org/10.21070/ijhsm.v2i3.320

Examining Maternal Health in Cesarean Section and Vaginal Delivery: Jordanian Royal Medical Services Context

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Abstract. Particularly in healthcare systems with limited resources, maternal health outcomes after various delivery procedures continue to be a serious public health problem. Concerns regarding the effects of cesarean sections (C-sections) on maternal health have been raised by the fact that their rates have been increasing globally, frequently exceeding WHO guidelines. Evidence on postpartum outcomes by delivery mode is still lacking in the Middle East, especially in Jordan, and especially in military healthcare facilities. This study's main goal is to assess and contrast the health outcomes for mothers in the Jordanian Royal Medical Services after vaginal delivery versus cesarean section. To provide region-specific evidence to support clinical decision-making and policy in maternal healthcare. 200 women who gave birth at Royal Medical Services hospitals in Jordan between August 2023 and August 2024-100 by caesarean section and 100 vaginally-were examined using a retrospective cohort design. Patients undergoing cesarean section experienced substantially prolonged hospitalization, a higher incidence of post-procedural complications, and a greater prevalence of postpartum opioid analgesic use. Furthermore, the cesarean cohort exhibited a higher baseline prevalence of certain comorbidities, including gestational diabetes. A notably increased rate of surgical site infections was also observed in this group compared to those who delivered vaginally. The study findings are consistent with the previous study.

Highlights

1. Cesarean section was associated with significantly longer hospital stays, higher postoperative complications, and greater opioid use compared to vaginal delivery.
2. Surgical site infections and overall maternal morbidity were markedly higher among women undergoing cesarean section, even after adjusting for comorbidities.
3. Findings support stricter adherence to WHO cesarean section guidelines and improved infection control and pain management protocols in military healthcare settings.

Keywords: Maternal health, cesarean section, vaginal delivery.

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Introduction

Maternal health is a key pillar of sustainable development and an essential part of global public health systems. Maternal outcomes not only reflect the quality of obstetric care but also significantly impact both maternal physical and mental well-being, as well as neonatal health [1]. Despite notable progress in medical science and technology, maternal morbidity and mortality remain urgent global health issues, especially in resource-limited settings where the development and application of evidence-based clinical protocols are critically important [2].

Within the spectrum of obstetric care, the mode of delivery represents a critical determinant of maternal outcomes. Vaginal delivery, regarded as the natural physiological process, has historically been considered the reference standard [3]. Conversely, cesarean section has become an essential surgical intervention, particularly in circumstances where maternal or fetal well-being is compromised, such as cases of fetal distress, cephalopelvic disproportion, or antepartum hemorrhage [4].

Over the past decades, a concerning epidemiological trend has been observed worldwide: cesarean section rates have continued to rise, often without medical justification. In numerous countries, reported rates exceed the 10–15% range recommended by the World Health Organization (WHO). This divergence from international guidelines raises significant concerns regarding the over-medicalization of childbirth and the associated risk of iatrogenic complications [5].

Although cesarean section is a safe procedure when indicated, it is inherently associated with higher immediate medical risks compared to vaginal delivery. Extensive scientific evidence consistently demonstrates a link between cesarean delivery and increased severe maternal morbidity, including hemorrhage, thromboembolic events, surgical site infections, and anesthesia-related complications. Moreover, cesarean delivery is associated with a more prolonged and often more painful postpartum recovery [6, 7].

However, the implications of cesarean delivery extend beyond the immediate postoperative period, affecting both the medium and long term. Women are at an increased risk of complications in subsequent pregnancies, including placenta previa, placenta accreta, and uterine rupture. These factors not only complicate future deliveries but also increase the

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likelihood of requiring repeat cesarean sections, thereby perpetuating a cycle of surgical intervention [8].

Investigations into maternal outcomes indicate that the mode of delivery encompasses multiple layers of clinical and demographic factors. However, there remains a substantial knowledge gap in the Middle East, particularly in Jordan. Generalizing findings from socio-economic contexts and health systems that differ markedly is methodologically problematic, highlighting the urgent need for locally relevant evidence.

This knowledge gap is particularly pronounced within specific healthcare settings, such as military health systems. The Jordanian Royal Medical Services (JRMS) provides care to a large and demographically diverse population, including military personnel and their families. The operational dynamics and clinical protocols within these institutions may differ substantially from those in the civilian sector, necessitating a focused analysis of their obstetric outcomes.

Therefore, this study is designed to address this critical gap in the literature. Its primary objective is to examine and compare maternal health outcomes following vaginal and cesarean delivery within the unique context of the Jordanian Royal Medical Services. Particular attention is given to key indicators, including length of hospital stay, the incidence of infectious and non-infectious complications, and the management of postoperative pain.

By providing empirically robust and locally contextualized evidence, this study aims to inform and optimize clinical practices, institutional protocols, and maternal health policies within this critical institution. The findings are intended to serve as a foundation for evidence-based clinical decision-making and the ongoing enhancement of the quality of care provided to women in Jordan, while also contributing to the broader strengthening of the national health system.

Literature Review

The existing literature underscores a fundamental distinction between vaginal delivery as a physiological process and cesarean section as a major surgical intervention, each carrying distinct implications for maternal health. Previous studies have focused on immediate postpartum risks, consistently demonstrating that cesarean section is associated with raised short-term maternal morbidity, including hemorrhage, surgical site infection, thromboembolism, and extended hospital stay [9]. On the other hand, perineal complications, consisting of tearing and acute pelvic pain, are more commonly associated with vaginal delivery. Traditionally, the assessment of maternal outcomes has been based on this contrasting risk profile [10].

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Recovery procedures keep evolving after the hospital period. There is evidence that indicates that, in comparison to women who give birth vaginally, women who have cesarean sections frequently experience more severe and prolonged postpartum pain, as well as a delayed return to their daily routines. Conversely, other studies highlight long-term functional complications associated with vaginal delivery, such as pelvic floor disorders and stress urinary incontinence. Research also suggests that cesarean section may offer some protection against these conditions, creating a clinical paradox in which each mode of delivery mitigates one set of risks while amplifying another [11].

The psychological dimension of childbirth further complicates the picture. Traumatic or perceived uncontrolled birth-regardless of delivery mode-has been identified as a major risk factor for posttraumatic stress symptoms and postpartum depression. Several studies link unplanned cesarean sections to higher rates of negative emotions and reduced birth satisfaction. In contrast, findings indicate that the absence of severe perineal trauma and the predictability of planned cesarean delivery may, for some women, be associated with enhanced body image and lower postpartum anxiety. These conflicting observations illustrate the complex relationship between delivery mode and psychological well-being [12].

Breastfeeding outcomes add yet another layer of complexity. A partial consensus suggests that cesarean delivery, particularly in emergencies, may delay breastfeeding initiation and shorten overall duration, often due to maternal-infant separation, postoperative pain, and delayed lactogenesis [13]. However, more recent longitudinal studies emphasize that supportive hospital practices-such as immediate skin-to-skin contact-can mitigate or even eliminate these disparities, highlighting the importance of institutional policies in shaping breastfeeding success [14].

Despite the extensive research, significant gaps remain. Most studies treat cesarean sections as a uniform category, rarely distinguishing between elective and emergency procedures, even though their physiological and psychological impacts differ considerably [15]. Moreover, few investigations adopt a holistic, longitudinal approach that simultaneously evaluates physical, psychosocial, and quality-of-life outcomes beyond the first six postpartum weeks. This fragmented perspective restricts the ability to generate a comprehensive understanding of the maternal experience [16].

In summary, current evidence presents a nuanced yet often contradictory picture: neither vaginal nor cesarean delivery is free from risks or long-term consequences. The central issue is not to label one mode as inherently superior, but to clarify how each influences different

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dimensions of maternal health over time. Addressing these knowledge gaps requires studies that differentiate between elective and emergency cesarean sections and employ multidimensional, longitudinal frameworks to guide personalized clinical practice and informed prenatal counseling.

Methodology

In the Jordanian Royal Medical Services (RMS), the current paper employs a retrospective cohort approach to investigate maternal health outcomes after vaginal delivery and cesarean section. The information about deliveries that occurred between August 2023 and August 2024 will be taken from the electronic medical records of the Princess Haya Bint Al-Hussein Military Hospitals. 200 women (100 C-sections and 100 vaginal deliveries) will be chosen using a stratified random sampling technique to guarantee equal representation for both delivery methods. Complications following surgery are an important consideration, such as those of maternal health, including the duration of stay in the hospital, the use of medications for pain, the length of recovery, and the incidence of infection and bleeding. In addition, to account for possible confounding factors, maternal demographic data, such as age, BMI, and preexisting conditions (such as diabetes, hypertension), will also be obtained.

In order to minimize bias, two independent reviewers will cross-validate records, and data extraction will adhere to a structured protocol to ensure consistency. On the basis of recorded follow-up visits, recovery time will be evaluated, and postoperative complications will be categorized using the Clavien-Dindo grading system. Multivariate logistic regression to account for covariates, chi-square tests for categorical variables, and descriptive statistics (means, percentages) will all be used in the statistical analyses. The RMS Institutional Review Board has granted ethical clearance, guaranteeing adherence to the principles of the Helsinki Declaration.

Results

The study analyzed 200 women (100 C-section, 100 vaginal deliveries) from Princess Haya Bint Al-Hussein Military Hospital. As shown in Table 1, the groups were comparable in age (C-section: 28.5±4.2 years; vaginal: 27.8±3.9 years, p=0.21) and parity (C-section: 2.1±1.3; vaginal: 2.3±1.1, p=0.32). However, C-section patients had higher rates of preexisting conditions (32% vs. 18%, p=0.02), particularly gestational diabetes (18% vs. 9%) and hypertension (14% vs. 5%).

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Table 1. Maternal Demographic Characteristics

Characteristic	C-Section (n=100)	Vaginal (n=100)	p-value
Age (years)	28.5 ± 4.2	27.8 ± 3.9	0.21
Parity	2.1 ± 1.3	2.3 ± 1.1	0.32
Gestational Diabetes (%)	18	9	0.04*
Hypertension (%)	14	5	0.02*

C-sections were associated with significantly longer hospital stays (4.2±1.1 days vs. 1.8±0.6 days, $p<0.001$) and higher postoperative complication rates (24% vs. 8%, $p=0.001$). The most common complications were surgical site infections (12% C-section vs. 2% vaginal, $p=0.006$) and postpartum hemorrhage (8% vs. 3%, $p=0.08$). Pain management needs also differed markedly, with 68% of C-section patients requiring opioids compared to 22% of vaginal delivery patients ($p<0.001$).

Table 2. Maternal Health Outcomes

Outcome	C-Section (n=100)	Vaginal (n=100)	p-value
Hospital Stay (days)	4.2 ± 1.1	1.8 ± 0.6	<0.001*
Postoperative Complications (%)	24	8	0.001*
Opioid Use (%)	68	22	<0.001*

Multivariate logistic regression (Table 3) confirmed that C-sections independently predicted complications (OR=3.4, 95% CI: 1.6–7.3, $p=0.002$) after adjusting for age, parity, and comorbidities. Length of stay correlated strongly with delivery mode ($\beta=2.1$, $p<0.001$) and preexisting diabetes ($\beta=0.8$, $p=0.03$). These findings align with global data on C-section risks [4] but highlight Jordan-specific trends, such as higher infection rates than Western cohorts [6].

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Table 3. Predictors of Maternal Complications (Logistic Regression)

Variable	Adjusted OR	95% CI	p-value
C-Section (vs. Vaginal)	3.4	1.6–7.3	0.002*
Preexisting Diabetes	2.1	1.1–4.0	0.02*
Age >35 years	1.5	0.8–2.9	0.21

According to the findings, C-sections are necessary in high-risk situations, but in Jordan's RMS context, they place a greater burden on maternal health. Stricter compliance with WHO's C-section guidelines is necessary, as evidenced by the 3× higher complication rates and 2.3-fold longer hospitalization compared to vaginal deliveries [3]. Interestingly 68% of patients who have had a C-section use opioids indicating an over-reliance on prescription painkillers and urging research into non-opioid alternatives [10]. These findings provide Jordanian physicians with useful evidence to enhance postpartum care protocols and delivery mode selection.

Discussion

In the current study, the evidence is rich and context-dependent, suggesting that in the realm of the Jordanian Royal Medical Services (RMS), cesarean section (C -C-section) has significantly worse short-term maternal health outcomes than vaginal birth. The empirical research results of the study indicate clearly that the cohort of C-section patients had significantly longer hospitalization, complication rates, and opioid analgesia needs. These results are in line with available world literature that defines C-section as a significant abdominal procedure that includes surgical site infections (SSIs) as a major complication and a long, painful, and slow recovery process. This uniformity supports the generalized tenet that cesarean delivery is not to be used as a matter of choice but as a measure that is medically proven to occur due to specific reasons, and this issue has been strongly voiced by the World Health Organization. Therefore, the study will present this international agreement in practical, location-specific information to the Jordanian military medical professionals.

The current research shows a significant difference between the rates of postoperative infection, where surgical site infections (SSIs) were observed at 12,000-12,000 after a caesarean section and 2,000 after vaginal delivery. These numbers are much higher than the international values of reference and could be related to institution-specific or regional effects in the RMS context. The possible causes of this high level are differences in the operative protocols, antibiotic prophylaxis, and wound-care practices after the operation. In turn, urgent quality-enhancement measures are justified, in particular, the systematic audit and enforcement

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of strict sterile technique and the use of evidence-based SSI prevention bundles. Since SSI is a significant maternal morbidity cause, an effort to mitigate the use of antibiotics, and increasing the health-care costs, there is a need to reduce their occurrence.

Additionally, the current paper indicates an important information regarding pain treatment: in contrast to 22% of women who gave birth vaginally, 68% of patients who had a cesarean section needed opioid painkillers. Important clinical and population health implications, which include the possibility for negative side effects, addictions, and misuse, result from such an acute reliance on opioids. Therefore, the results strongly encourage the implementation of additional studies of improved recuperation after surgery protocols designed for obstetrics. In order to successfully control postpartum pain and limit opioid exposure, these guidelines should emphasize multimodal, non-opioid analgesic measures, such as scheduled acetaminophen, non-steroidal anti-inflammatory medications, and regional nerve blocks. This will enable a safer recovery for the mother and, ultimately, optimal care for the infant.

Contextualizing these findings necessitates acknowledging that the cesarean section cohort has a markedly higher prevalence of comorbidities, such as gestational diabetes and hypertension. This demonstrates that RMS clinicians appropriately perform cesarean sections in high-risk pregnancies, which undoubtedly contributes to the observed variation in outcomes. When these confounders were taken into account, the multivariate logistic regression analysis showed that the delivery mode was an independent predictor of complications. In turn, despite the contributing patient risk profile, the surgical procedure has a high and independent morbidity burden. Therefore, rather than assuming surgical intervention is the standard, programs that aim to reduce unnecessary cesarean deliveries should concentrate on the proactive control of comorbidities in prenatal practice, which will help the patient to a possible vaginal delivery.

Finally, the current research makes an important contribution to the small body of literature, some of which addresses the problem of maternal outcomes in Middle Eastern military hospitals. It makes compelling arguments that should persuade Jordanian physicians and decision-makers to strengthen comprehensive surgical infection control protocols, implement regular, opioid-free analgesic protocols, and better adhere to WHO recommendations regarding Caesarean section rates. While qualitative research should look at the decision-making processes that lead to Caesarean deliveries in this particular setting, longer-term outcomes, such as the onset of subsequent placental complications and patient-reported quality-of-life indices, should be monitored in future studies using longitudinal designs. Ultimately, the results are a powerful motivator for the Royal Medical Service to optimize obstetric care, with the

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ultimate objective being to ensure that the chosen delivery method has the greatest positive impact on the mother's and child's safety and well-being.

Conclusion

In conclusion, the current paper presents significant empirical insights into maternal health outcomes in the specific environment of the Royal Medical Services in Jordan. The findings clearly demonstrate that in comparison with vaginal birth, cesarean section delivery is linked to a significantly higher burden of maternal morbidity, which includes longer stays in the hospital, higher rates of complications after surgery, and a greater need for opioid analgesics for managing pain. Beyond clinical observation, the study's implications provide practical strategies to obstetric care enhancement. An urgent audit and reinforcement of the hospital's sterile procedures, antibiotic prophylactic instructions, and postoperative wound care practices are required due to the startlingly high rate of surgical site infections.

Ultimately, the current paper presents an adequate foundation for establishing clinical policy and procedure in the military healthcare system of Jordan. In addition, encouraging an increased emphasis on controlling comorbidities preemptively during pregnancy to facilitate healthier vaginal deliveries, it offers clinicians with strong local evidence to encourage informed decision-making in delivery mode choosing. Building on these results, additional investigations could examine the sociological factors influencing cesarean rates as well as long-term outcomes. The Jordanian Royal Medical Services may significantly enhance maternal healthcare quality, offering mothers better medical conditions and strengthening the country's healthcare system overall, through transforming these evidence-based findings into enhanced clinical procedures.

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