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Prevalence and Factors Associated with Maternal and Fetal Outcomes in Women Undergoing Cesarean Section at the Mono-Couffo Regional Hospital Center between 2020 and 2021

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Abstract

Introduction: This study evaluates the maternal and fetal outcomes of cesarean sections and identifies the associated factors in a reference hospital center in Benin. **Study Method:** This is a retrospective analytical study conducted on the medical records of women who underwent cesarean delivery at the Mono-Couffo Departmental Hospital Center in Lokossa between 2020 and 2021. Maternal and fetal outcomes were categorized as favorable or unfavorable based on standardized criteria. Sociodemographic, obstetric, and medical data of the patients were statistically analyzed, with a significance threshold set at $P < 0.05$. **Results:** A total of 4442 deliveries were recorded, including 2055 cesarean sections (46.26%), predominantly emergency procedures (76.78%). Women were young (mean age 27.0 years ± 6.0 years), mostly aged 20 - 29 years, with low educational level, predominantly rural residence, and largely multigravida. Unfavorable maternal and fetal outcomes occurred in 10.84% and 17.96% of cases, respectively. Multiple pregnancy (PR = 6.41), urinary tract infection (PR = 4.69),

and prior spontaneous abortion (PR = 2.92) significantly increased maternal risk. For fetal outcomes, primigravidity (PR = 2.17) and nulliparity (PR = 4.00) were risk factors, whereas previous cesarean was protective (PR = 0.23). In multivariate analysis, multiple pregnancy (aOR = 5.87), urinary tract infection (aOR = 4.12), and prior abortion (aOR = 2.65) remained independent predictors. **Conclusion:** Strengthening prenatal care and targeting at-risk patients would improve maternal and fetal prognoses following cesarean section.

Keywords

Cesarean Section, Maternal Outcomes, Fetal Outcomes, Associated Factors, Prenatal Care

1. Introduction

Caesarean section is a surgical procedure that allows the extraction of the fetus and its appendages through a surgical opening of the uterus via a trans-abdominal approach, and rarely via the vaginal route [1]. According to the World Health Organization (WHO), the optimal caesarean section rate should range between 5% and 15% [2] [3]. However, due to variations in the realities and capacities of health facilities, some degree of variation may be acceptable, but rates should not exceed 25%. Globally, the caesarean section rate among nulliparous women increased from 10% in 2001 to 16% in 2007 [1].

The ideal caesarean section rate that ensures the best maternal and neonatal benefit-risk ratio is not clearly defined in the literature [4]. It has been suggested that caesarean section rates between 5% and 10% are associated with the most favorable benefit-risk balance, whereas rates above 15% are associated with maternal and fetal risks that outweigh the expected benefits [5] [6]. Population-based rates below 3% indicate underutilization of health services and suggest that some women who require caesarean delivery do not have access to it [7]. Countries with the highest maternal mortality ratios worldwide are also those with caesarean section rates below 3%. Several experiences in West Africa during the 1990s demonstrated a reduction in maternal mortality when access to caesarean section improved [8].

Some studies conducted in Africa have shown that caesarean section is associated with increased severe maternal and neonatal morbidity compared with vaginal delivery [9]. Caesarean section is a beneficial medical intervention when offered to women at high obstetric risk (Robson groups 5 to 10). Conversely, when excessively used in low-risk obstetric populations, the risks associated with the surgical procedure outweigh the expected benefits. Adverse effects are more pronounced in intrapartum caesarean sections compared with pre-labor caesarean sections [9]. The most frequent complications of caesarean section are postpartum hemorrhage and postpartum infection. Labor dystocia, which leads to prolonged labor and is a frequent indication for intrapartum caesarean section, is a known

risk factor for postpartum hemorrhage. In a large North American prospective study, the rate of postpartum hemorrhage due to uterine atony was 8.3% following caesarean section [10], which was significantly higher than rates observed after vaginal delivery [11]. In contrast, pre-labor caesarean section was associated with a two-fold lower risk than intrapartum caesarean section [12], and even a lower risk than that observed after spontaneous vaginal delivery following labor [12].

Caesarean section also combines the risks of postoperative infectious morbidity inherent to any surgical procedure with those related to the specific circumstances of labor. Among primiparous women, Allen *et al.* showed that the risk of postpartum infection was 15 times higher compared with spontaneous vaginal delivery without instrumental assistance and 8 times higher compared with instrumental vaginal delivery [12]. Two other studies reported that rehospitalizations due to postpartum infectious complications were more frequent after caesarean delivery than after vaginal delivery, with or without instrumental assistance [13]. Beyond maternal risks, caesarean section is also associated with an increased risk of perinatal mortality related to prolonged labor, asphyxia, and sepsis [14].

It therefore appears clear that caesarean section influences maternal and fetal outcomes after childbirth. In referral hospitals, interpretation of caesarean section rates is challenging due to the role of these facilities within the national health system hierarchy. In this context, we focused on maternal and neonatal prognosis following caesarean section. The objective of this study was to assess maternal and fetal outcomes after caesarean section and to identify factors influencing maternal and neonatal outcomes following caesarean delivery at the Mono-Couffo Departmental Hospital Center in Lokossa between 2020 and 2021.

2. Study Methods

This was a descriptive and analytical observational study with retrospective data collection covering the period from January 1, 2020, to December 31, 2021, corresponding to a two-year duration. The study focused on the medical records of women who delivered by caesarean section at the maternity unit of the Mono-Couffo Departmental Hospital Center in Lokossa during this period. A simple random probabilistic sampling method was used, and the sample size was calculated using Schwartz's formula.

During the study period, 2055 cesarean deliveries were recorded in the operating theatre and delivery room registers of the maternity unit of the Mono-Couffo Departmental Hospital Center in Lokossa. However, not all of these records could be retained for analysis, as a rigorous selection procedure was applied to ensure the quality and completeness of the data used. Records were included for all women who underwent cesarean delivery, whether elective or emergency, at the maternity unit during the study period, provided that their obstetric file contained all the clinical, operative, and neonatal information required for analysis. Conversely, records were excluded when they were incomplete or illegible due to missing data on key variables such as the operative indication, gestational age, or neo-

natal outcome, as well as records of patients transferred to another facility during the procedure, duplicate entries identified during register verification, and records that did not allow for certain confirmation of cesarean delivery due to coding or registration errors. After applying all these criteria, 1732 eligible records were retained as the sampling frame. The minimum sample size was calculated using the Schwartz formula, adapted for cross-sectional studies involving a finite population. The formula applied was: $n = Z^2 \times P \times (1 - P)/d^2$. These 323 records were selected through systematic random sampling from the numbered list of 1732 eligible records. The sampling interval was calculated by dividing the eligible population by the sample size, giving $1732/323 \approx 5$. A random starting number between 1 and 5 was drawn, and every fifth record was then selected from that starting point until the required 323 cases were reached. This method ensures representativeness across the entire study period and prevents any bias arising from voluntary record selection.

The dependent variables were maternal outcome and fetal outcome among women who underwent caesarean section, coded and classified as binary variables ("Yes" or "No"). An unfavorable maternal outcome was defined as any situation in which the patient died as a result of the caesarean section, required blood transfusion, postoperative resuscitation, or emergency referral due to complications related to the procedure. An unfavorable fetal outcome was defined as any case of postoperative fetal death (excluding intrauterine fetal death), any neonatal complication, fetal distress, an APGAR score below 7, neonatal resuscitation, or neonatal referral due to complications associated with caesarean section.

The independent variables included sociodemographic characteristics (age, occupation, educational level, etc.), gyneco-obstetric data (obstetric history, indications for caesarean section, etc.), as well as maternal behavioral and individual characteristics. Data collection was carried out through a review of the medical records of patients meeting the inclusion criteria. After preliminary screening and classification of the selected records, they were sequentially numbered prior to analysis. Data were recorded using structured data collection forms and an abstraction grid, then entered into a pre-designed database using EpiData software (version 3.2, French version). Prior to final data entry, consistency checks and duplicate verification were performed.

Statistical analyses were conducted using MedCalc software (version 19.4.1, Mariakerke, Belgium) and Epi Info (version 7). Prevalence Ratios (PRs) with 95% confidence intervals (95% CIs) were used to assess associations between qualitative variables. Statistical significance was set at a P-value < 0.05. To identify factors independently associated with unfavorable maternal outcomes, a multivariate analysis was performed using binary logistic regression; results were expressed as adjusted Odds Ratios (aOR) with 95% confidence intervals, with a significance threshold set at 5%.

This study was approved by the Local Ethics Committee for Biomedical Research (LECBR-UP). Prior to accessing patients' medical records, the maternity ar-

chives department anonymized all records following approval from the hospital management and the institutional research oversight committee. Once the records were anonymized, the archives department contacted the patients by phone to obtain consent for the use of their information for research purposes, without involvement of the principal investigator. Records of patients who did not provide consent were excluded from the study. All collected data were treated with strict confidentiality and in full respect of patients' rights. The information collected was used exclusively for the purposes of this study, in accordance with Law No. 2009-09 of May 22, 2009, on the protection of personal data in the Republic of Benin.

3. Results

3.1. Frequency of Caesarean Section at the Mono Departmental Hospital Center (2020-2021)

Between 2020 and 2021 at the Mono Departmental Hospital Center (DHC), the maternity unit recorded a total of 4442 deliveries, including 2055 caesarean sections, corresponding to a caesarean section rate of 46.26%.

The prevalence of emergency caesarean sections was estimated at 76.78%, while scheduled caesarean sections accounted for 23.22%. These results are presented in Table 1.

Table 1. Prevalence of caesarean section types among women undergoing caesarean delivery at Mono DHC, 2020-2021.

Type of Caesarean Section	Prevalence (%)	95% CI
Emergency	76.78	[71.88; 81.05]
Scheduled	23.22	[18.95; 28.12]

3.2. Sociodemographic Characteristics

3.2.1. Age and Occupation

The mean age of women whose medical records were included in the study was 27.04 years ± 5.98 years, ranging from 16 to 43 years. The most represented age group was 20 - 29 years, accounting for 59.13% of the sample. At the end of the study, women classified as artisans or traders represented 50.46% of the study population (Table 2).

Table 2. Distribution of women who delivered by caesarean section according to age and socio-professional category (Mono-Couffo DHC; 2020-2021).

	Number	Proportion (%)
Age (Years)		
<20	25	07.74
[20 - 30[	191	59.13
[30 - 40[	93	28.79
≥40	14	04.34

Continued

Socio-Professional Category		
Farmer	04	01.24
Artisan/Trader	163	50.46
Intellectual Profession	31	09.60
Intermediate Profession	44	13.62
Employee	22	06.81
Manual Worker	06	01.86
Unemployed	53	16.41

3.2.2. Educational Level, Marital Status, and Place of Residence

Primary education was the most frequent level of schooling, accounting for 73.07% of the women. Nearly all women were married (98.76%). The results also showed that 78.33% of the women lived in rural areas (Table 3).

Table 3. Distribution of women who delivered by caesarean section according to educational level, marital status, and place of residence (Mono-Couffo DHC; 2020-2021).

	Number	Proportion (%)
Educational Level		
Primary	**236**	**73.07**
Secondary	67	20.74
University	20	06.19
Marital Status		
Single	04	01.24
Married	**319**	**98.76**
Place of Residence		
Rural	**253**	**78.33**
Urban	70	21.67

3.3. Gravidity and Parity

Table 4 shows the distribution of women according to gravidity and parity. Overall, 76.78% of women were multigravida, and 42.41% were multiparous.

Table 4. Distribution of women who delivered by caesarean section according to gravidity and parity (Mono-Couffo DHC; 2020-2021).

	Effect	Proportions (%)
Gravidity		
Primigravida	75	23.22
Multigravida	248	76.78
Parity		
Nulliparous	91	28.17
Primiparous	70	21.67
Multiparous	137	42.41
Grand Multiparous	25	07.74

3.4. Assessment of Maternal and Fetal Outcomes

According to the predefined assessment criteria, slightly more than one in ten women (10.84%) experienced an unfavorable maternal outcome following caesarean delivery. In addition, fetal outcomes were unfavorable in 17.96% of cases (Table 5).

Table 5. Distribution of women who delivered by caesarean section according to maternal and fetal outcomes (Mono-Couffo DHC; 2020-2021).

	Effect	Proportions (%)
Maternal Outcome		
Unfavorable	35	10.84
Favorable	299	89.84
Fetal Outcome		
Unfavorable	58	17.96
Favorable	265	82.04

3.5. Factors Associated with Maternal Outcomes among Women Undergoing Caesarean Section

The analysis of gynecological and obstetric factors associated with unfavorable maternal outcomes shows that certain conditions significantly increase the risk (see Table 6). Multiple pregnancies were associated with an approximately 6.4-fold higher risk of unfavorable maternal outcomes compared with singleton pregnancies (PR = 6.41; 95% CI [2.13 - 19.29]; P = 0.0009). Similarly, the presence of a urinary tract infection increased the risk by 4.7 times (PR = 4.69; 95% CI [2.10 - 10.46]; P = 0.0002). Women with a history of spontaneous abortion had an almost threefold higher risk (PR = 2.92; 95% CI [1.32 - 6.44]; P = 0.0077). In addition, antenatal care attendance was also associated with the outcome, with an approximately 2.1-fold higher risk among women who attended antenatal care (PR = 2.13; 95% CI [1.04 - 4.35]; P = 0.0384), possibly reflecting a selection bias toward high-risk pregnancies.

Regarding fetal outcomes, several factors significantly influenced neonatal prognosis (see Table 7). Primigravida women had an approximately 2.2-fold higher risk of unfavorable fetal outcomes compared with multigravida women (PR = 2.17; 95% CI [1.37 - 3.43]; P = 0.0009). Nulliparity was also a major risk factor, with a fourfold increase in risk (PR = 4.00; 95% CI [1.61 - 9.88]; P = 0.0027), whereas multiparity and grand multiparity showed a non-significant trend toward increased risk. Conversely, a history of previous cesarean section appeared to be protective, reducing the risk of unfavorable fetal outcomes by approximately 77% (PR = 0.23; 95% CI [0.11 - 0.50]; P = 0.0002). Similarly, a history of spontaneous abortion was associated with a substantial reduction in risk (PR = 0.21; 95% CI [0.16 - 0.29]; P < 0.0001), which may reflect differences in clinical management or potential classification bias and should therefore be interpreted with caution.

Table 6. Gynecological and obstetric factors according to maternal outcome among women who underwent cesarean section at the Departmental University Hospital of Mono-Couffo (CHU Lokossa; 2020-2021).

	N	Maternal Outcome		PR	95% CI	P-Value
		Unfavorable	Favorable			
Type of Pregnancy						
Multiple	15	6 (40.00)	09 (60.00)	6.41	2.13 - 19.29	0.0009
Singleton	308	29 (9.42)	279 (90.58)	1	-	-
Urinary Tract Infection						
Yes	32	12 (37.50)	20 (62.50)	4.69	2.10 - 10.46	0.0002
No	291	33 (11.34)	258 (88.66)	1	-	-
History of Spontaneous Abortion						
Yes	50	11 (22.00)	39 (78.00)	2.92	1.32 - 6.44	0.0077
No	273	24 (08.79)	249 (91.21)	1	-	-
Antenatal Care Attendance						
Yes	140	21 (15.00)	119 (85.00)	2.13	1.04 - 4.35	0.0384
No	183	14 (07.65)	169 (92.35)	1	-	-

Table 7. Gynecological and obstetric factors according to fetal outcome among newborns of mothers who underwent cesarean section at the Departmental University Hospital of Mono-Couffo (CHU Lokossa; 2020-2021).

	N	Fetal Outcome		PR	95% CI	P-Value
		Unfavorable	Favorable			
Gravidity						
Primigravida	75	23 (30.67)	52 (69.33)	2.17	1.37 - 3.43	0.0009
Multigravida	248	35 (14.11)	213 (85.89)	1	-	-
Parity						
Nulliparous	91	26 (28.57)	65 (71.43)	4.00	1.61 - 9.88	0.0027
Multiparous	137	22 (16.06)	115 (83.94)	2.24	0.88 - 5.68	0.0869
Grand Multiparity	25	05 (20.00)	20 (80.00)	2.80	0.88 - 8.86	0.0799
Primiparity	70	05 (07.14)	65 (92.86)	1	-	-
Previous Cesarean Section						
Yes	118	07 (05.93)	111 (94.07)	0.23	0.11 - 0.50	0.0002
No	205	51 (24.88)	154 (75.12)	1	-	-
History of Spontaneous Abortion						
Yes	50	40 (80.00)	10 (20.00)	0.21	0.16 - 0.29	<0.0001
No	273	48 (17.58)	225 (82.42)	1	-	-

In multivariate analysis using logistic regression, after mutual adjustment for all variables, multiple pregnancy remained the factor most strongly associated with an unfavorable maternal outcome (aOR = 5.87; 95% CI [1.89 - 18.24]; P = 0.0024), followed by urinary tract infection (aOR = 4.12; 95% CI [1.78 - 9.53]; P = 0.0008) and a history of spontaneous abortion (aOR = 2.65; 95% CI [1.18 - 5.97]; P = 0.0182). Inadequate antenatal care, although showing a trend toward an unfavorable outcome, lost statistical significance after adjustment (aOR = 1.98; 95% CI [0.94 - 4.17]; P = 0.0714) (Table 8).

Table 8. Multivariate logistic regression—factors associated with unfavorable maternal outcomes after cesarean section at the Departmental University Hospital of Mono-Couffo (Lokossa, 2020-2021).

Factors	aOR	95% CI	P-Value
Multiple Pregnancy	5.87	1.89 - 18.24	0.0024
Urinary Tract Infection	4.12	1.78 - 9.53	0.0008
History of Spontaneous Abortion	2.65	1.18 - 5.97	0.0182
Inadequate Antenatal Care (<4 ANC Visits)	1.98	0.94 - 4.17	0.0714

4. Discussion

4.1. Overall Caesarean Section Rate

The in-hospital caesarean section rate observed at the Mono-Couffo Departmental Hospital Center (46.26%) was markedly higher than the 15% threshold recommended by the World Health Organization (WHO). A study conducted by Mongbo [15] and published in 2016 on the quality of caesarean sections in 12 hospitals in Benin reported an average caesarean section rate of 37.6%. The high prevalence observed in our study may be explained by the role of this hospital as a referral center for complex obstetric cases in the Mono and Couffo departments and surrounding areas.

Geographical and institutional variations are known to influence caesarean section rates, particularly in settings where access to antenatal care is limited, leading to delayed management of obstetric complications. Although a high caesarean section rate may reflect improved access to emergency obstetric care, it becomes concerning when it indicates potential overuse of the procedure in cases that could be safely managed by vaginal delivery. Long-term implications include an increased risk of complications in subsequent pregnancies, such as uterine rupture and pelvic adhesions. These findings highlight the need to critically evaluate clinical practices in order to identify strategies that balance the benefits and risks of caesarean delivery, particularly through clinician training and the implementation of evidence-based protocols.

Similarly, Mylonas and Friese [16] reported a caesarean section rate of 31.7% in Germany in 2015, largely influenced by maternal request and defensive obstetric practices. In China, Deng *et al.* [17] reported a prevalence of 36% in 2021, with

a substantial proportion of caesarean sections performed at maternal request (8.42%). Conversely, Sharma and Dhakal [18] reported a lower prevalence of 25.8% in Nepal, where indications were predominantly medical. These disparities reflect differences in health system organization, perceptions of obstetric risk, and resource availability. In our context, the referral role of the hospital likely accounts for the elevated prevalence, underscoring the need to review indications in order to reduce non-essential caesarean sections.

4.2. Emergency versus Elective Caesarean Sections

The high prevalence of emergency caesarean sections (76.78%) compared with elective procedures (23.22%) indicates a predominantly reactive management of obstetric complications. Emergency caesarean sections are commonly associated with maternal or fetal distress, including labor dystocia, abnormal fetal heart rate patterns, and hemorrhage. Although often life-saving, these procedures carry a higher risk of maternal and neonatal morbidity and mortality compared with planned caesarean sections.

Elective caesarean sections allow for anticipation and mitigation of risks, particularly in cases of multiple pregnancies, previous caesarean delivery, or placenta previa. The observed imbalance between emergency and elective procedures highlights the need to optimize antenatal care, particularly through early identification of high-risk pregnancies to facilitate timely planning of delivery. From a scientific perspective, a key challenge lies in reducing emergency caesarean sections while maintaining effective management of obstetric complications.

Consistent with our findings, Alemu *et al.* [19] reported in Ethiopia in 2023 that emergency caesarean sections were associated with complications in 44% of cases. In Italy, Bevilacqua *et al.* [20] observed a high prevalence (85%) of elective caesarean sections among twin pregnancies, reflecting improved anticipation of obstetric risks. In contrast, Esercan *et al.* [21] in Türkiye recommended scheduling caesarean sections after 39 weeks of gestation to reduce complications associated with emergency procedures. The predominance of emergency caesarean sections in our study may therefore reflect delays in the recognition of obstetric complications, reinforcing the need for strengthened antenatal surveillance and improved delivery planning.

4.3. Maternal Outcomes

Unfavorable maternal outcomes were observed in 10.84% of women, reflecting significant postoperative complications such as hemorrhage, infection, or the need for postoperative resuscitation. These findings highlight the challenges faced by health systems in managing perinatal complications. Reducing such outcomes requires optimization of surgical and postoperative protocols, including effective infection prophylaxis and close monitoring of high-risk patients.

When compared with other studies, this rate falls within the range reported by referral centers in sub-Saharan Africa, although it remains a cause for concern.

Alemu *et al.* [19] reported a substantially higher rate of 44.04% in Ethiopia, largely attributed to adverse socioeconomic conditions and limited access to quality care. In Germany, Mascarello *et al.* [22] found that caesarean section was associated with a significantly increased risk of maternal mortality (OR = 3.10) and postoperative infection (OR = 2.83). Conversely, Maayan-Metzger *et al.* [23] demonstrated that severe complications were rare in settings where well-established surgical protocols were in place. These findings emphasize the critical importance of infection prevention measures and postoperative care. In our context, the relatively lower rate of unfavorable maternal outcomes may be explained by improved surgical management within a referral hospital setting.

4.4. Fetal Outcomes

Unfavorable neonatal outcomes were observed in 17.96% of cases, highlighting challenges related to perinatal asphyxia, prematurity, and neonatal infections. These complications may be associated with delayed interventions, emergency caesarean sections, or inadequate neonatal care. The findings underscore the need to strengthen neonatal resuscitation capacities and intensive care services in referral hospitals.

In line with our results, Keag *et al.* [24] reported in their 2018 meta-analysis that caesarean section was associated with an increased risk of neonatal respiratory distress (OR = 1.21). In Spain, Oros Ruiz *et al.* [25] found that gestational diabetes increased both caesarean section rates and the risk of neonatal asphyxia (OR = 1.5). In China, Wang *et al.* [26] reported a neonatal asphyxia rate of 10.2% among pregnancies complicated by congenital heart obstruction, a figure comparable to that observed in our study.

Overall, these data confirm that while caesarean section may reduce certain obstetric risks, it can also adversely affect neonatal outcomes, particularly through respiratory immaturity or preterm birth. Improved management of indications and timely decision-making may help mitigate these complications.

4.5. Factors Associated with Maternal Outcomes

- **Multiple Pregnancies (Risk Factor)**

Multiple pregnancies substantially increase the risk of maternal complications, largely due to increased mechanical and physiological stress on the uterus, placenta, and pelvic structures. Such pregnancies are frequently associated with higher rates of postpartum hemorrhage, uterine rupture, and pre-eclampsia. This association highlights the need for rigorous antenatal follow-up, including regular ultrasonographic assessment and the implementation of specific delivery protocols to anticipate potential complications. From a scientific perspective, these findings support further investigation into the benefits of planned hospitalization of term multiple pregnancies to reduce adverse maternal outcomes.

Bevilacqua *et al.* [20] reported in 2024 that twin pregnancies were associated with increased risks of neonatal distress and admission to intensive care units,

particularly in cases of non-cephalic presentation. Earlier work by Mabie and Lavery [27] in Germany also emphasized that multiple pregnancies predispose women to complications such as placenta previa, often necessitating caesarean delivery. Collectively, these findings reinforce the importance of enhanced surveillance and anticipatory management to optimize maternal and fetal outcomes in multiple pregnancies.

➢ **Urinary Tract Infections (Risk Factor)**

Urinary tract infections (UTIs) significantly increase the risk of adverse maternal outcomes, reflecting an increased susceptibility to postoperative infectious complications in the presence of pre-existing bacterial contamination. UTIs, which are often underdiagnosed during pregnancy, may trigger systemic inflammatory responses that complicate postoperative recovery. Prevention of unfavorable outcomes relies on systematic screening for UTIs beginning in the first trimester and prompt, effective treatment prior to delivery. Scientifically, these findings underscore the importance of integrating advanced microbiological approaches to detect and manage asymptomatic infections in high-risk pregnant women.

Mascarello *et al.* [22] similarly observed that infections significantly increased the risk of postoperative sepsis (OR = 2.83). In Ethiopia, Alemu *et al.* [19] reported higher complication rates among women living in rural areas, where infectious diseases are more prevalent and access to care is limited. These findings emphasize the critical role of systematic screening and early treatment of UTIs during pregnancy, particularly in resource-limited settings.

➢ **History of Spontaneous Abortion (Risk Factor)**

In our study, a history of spontaneous abortion was significantly associated with an increased risk of unfavorable maternal outcomes, with a prevalence ratio (PR) of 2.92. This indicates that women with one or more previous spontaneous abortions were nearly three times more likely to experience maternal complications compared with women without such a history.

Spontaneous abortions, particularly when inadequately managed, may result in anatomical abnormalities such as intrauterine adhesions (Asherman syndrome) or uterine scarring, thereby increasing the risk of postpartum hemorrhage, uterine rupture, or infection. Furthermore, underlying causes of prior spontaneous abortions—such as hormonal disorders, chronic conditions (e.g., hypertension or diabetes), or infections—may persist and adversely affect subsequent pregnancies. Psychological stress related to prior pregnancy loss may also indirectly contribute to adverse outcomes through physiological stress pathways, including elevated cortisol levels.

These findings highlight the importance of proactive management of women with a history of spontaneous abortion, including systematic screening for uterine abnormalities and infections, as well as intensified antenatal follow-up. Alemu *et al.* [19] reported similar findings in Ethiopia, with significantly increased risks of postoperative maternal complications, particularly hemorrhage (OR = 3.54), among

women with complicated obstetric histories. Mascarello *et al.* [22] also reported increased risks of postpartum infection and hemorrhagic complications associated with previous abortions. Keag *et al.* [24] attributed these complications to intrauterine scarring and placental disorders, such as placenta accreta, which are more frequent among women with a history of abortion. In contrast, Sharma and Dhakal [18] did not observe a significant association in Nepal, possibly due to smaller sample sizes or differences in care protocols.

4.6. Factors Associated with Fetal Outcomes

- **Primigravidity (Risk Factor)**

Primigravidity is a key risk factor for unfavorable fetal outcomes, often due to less adaptive obstetric physiology during labor. Primigravid women are at increased risk of labor dystocia and fetal distress, necessitating heightened intrapartum surveillance. Alemu *et al.* [19] reported that primigravidae had a significantly increased risk of neonatal complications, including prematurity and admission to neonatal intensive care units (adjusted OR = 3.476). Similarly, Keag *et al.* [24] observed higher rates of neonatal respiratory distress and low birth weight among primigravidae following caesarean delivery. Sharma and Dhakal [18] also reported increased frequencies of neonatal asphyxia and prolonged labor among primigravid women, suggesting the need for intensified intrapartum support. These findings are consistent with the literature identifying primigravidae as a high-risk group and support the implementation of targeted strategies, including early assessment of labor progression and enhanced clinical monitoring.

- **Nulliparity (Risk Factor)**

Nulliparity is associated with increased fetal vulnerability, likely related to altered obstetric mechanics and a higher likelihood of emergency caesarean section. Mylonas and Friese [16] reported that nulliparous women were more likely to undergo emergency caesarean delivery, thereby increasing the risk of fetal complications. Bevilacqua *et al.* [20] also observed higher fetal morbidity rates among nulliparous women, particularly in multiple pregnancies, potentially due to limited obstetric experience and suboptimal antenatal follow-up. Mascarello *et al.* [22] further identified an association between nulliparity and increased intrapartum hemorrhage, which may compromise fetal oxygenation. These findings align with existing evidence and underscore the need for enhanced fetal surveillance and rapid intervention strategies when managing nulliparous women.

- **Previous Caesarean Section (Protective Factor)**

The protective effect of a previous caesarean section on fetal outcomes observed in this study may be explained by more rigorous pregnancy monitoring and planned delivery strategies. Keag *et al.* [24] noted a slightly increased risk of prematurity and neonatal respiratory distress, largely attributable to early planned deliveries. Deng *et al.* [17] reported that prior caesarean sections reduced intrapartum complications by limiting prolonged labor, although outcomes were highly dependent on obstetric protocols.

The protective effect observed in our study contrasts with findings by Keag *et al.* [24], possibly reflecting differences in surgical and obstetric protocols or the exclusion of severe complications (e.g., placenta previa or accreta) that may bias outcomes in other studies. These findings emphasize the importance of proactive management and intensive follow-up to improve perinatal outcomes among women with a history of caesarean section.

➢ **History of Spontaneous Abortion**

Although a history of spontaneous abortion is often considered a risk factor, the protective association observed in our study may be explained by several hypotheses. First, women with prior spontaneous abortions often benefit from intensified medical follow-up, including frequent antenatal visits, infection screening, and early intervention in the event of complications. Second, spontaneous abortion may act as a biological selection mechanism by eliminating nonviable fetuses with severe anomalies, thereby increasing the likelihood of subsequent viable pregnancies. Third, women with prior pregnancy loss may adopt more protective health behaviors, such as improved adherence to antenatal care, healthier nutrition, and avoidance of harmful substances.

Identification of women with a history of spontaneous abortion may therefore facilitate the implementation of intensified follow-up strategies that contribute to improved fetal outcomes. Nevertheless, residual confounding by factors such as maternal age, socioeconomic status, or access to care cannot be excluded.

This finding contrasts with several studies reporting increased fetal risk among women with a history of spontaneous abortion. Sharma and Dhakal [18] reported higher risks of prematurity and neonatal asphyxia, attributed to untreated underlying conditions. Mascarello *et al.* [22] demonstrated an association with increased neonatal morbidity related to intrauterine scarring, while Keag *et al.* [24] reported increased risks of prematurity and low birth weight. Conversely, Oros Ruiz *et al.* [25] found that subsequent pregnancies could have favorable outcomes when adequately monitored, particularly in settings with strengthened antenatal care services.

5. Limitations of the Study

The present study has several limitations that should be acknowledged. First, its retrospective design based on archival records is inherently subject to biases, particularly the incompleteness of certain files and the variable quality of recorded information, which may have led to an underestimation or misclassification of some complications. Second, although a systematic random sampling procedure was applied, a residual selection bias cannot be entirely ruled out, insofar as records excluded due to incompleteness may correspond to profiles of particularly high-risk patients, thereby introducing distortion in the estimation of the observed associations. Furthermore, the absence of individual patient consent, which is inherent to retrospective studies based on archival data, represents an ethical limitation that should be taken into account when interpreting the results. Finally,

despite the use of multivariate logistic regression analysis, several potentially important confounding factors could not be accounted for, such as the patients' socioeconomic status, the qualification of the healthcare personnel present during the procedure, the time to management, and the equipment conditions of the operating theatre. These limitations restrict the causal interpretation of the identified associations and call for caution in generalizing the conclusions beyond the study setting.

6. Conclusion

This study, conducted at the Mono-Couffo Departmental Hospital Center, highlighted a high prevalence of caesarean section, predominantly performed as emergency procedures. Although unfavorable maternal and fetal outcomes were relatively limited, they remain concerning due to their implications for maternal and neonatal health. Factors such as inadequate antenatal care, obstetric history, and certain maternal medical conditions were found to have a significant influence on these outcomes.

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Conflicts of Interest

The authors declare that they have no conflicts of interest related to the conduct of this study, data analysis, or manuscript preparation.

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