

Caesarean Section at the Order of Malta Hospital, Djougou, Benin: Indications, Operative Modalities, Maternal-Fetal Outcome and Factors Associated with Maternal Complications in 2022

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Abstract

Introduction: The safety of caesarean section in sub-Saharan Africa depends on the appropriateness of its indications and the quality of its performance. The aim was to describe its indications and maternal-fetal outcomes. **Study method:** A cross-sectional descriptive and analytical study with retrospective data collection was carried out at the maternity unit of the Order of Malta Hospital, Djougou, from 1 January to 30 June 2022. The analysis covered the 649 women who delivered by caesarean section and their 685 newborns. Occurrence of a maternal complication was the dependent variable of the analytical component. Data were collected on KoboCollect and analysed with R version 3.6.0 at the 5% level. **Results:** Caesarean section was performed as an emergency in 76.73% of cases, under spinal anaesthesia in 87.37% and through a Joel Cohen incision in 57.16%. The three leading indications were acute fetal distress (30.66%), scarred uterus (22.19%) and gestational hypertension (15.25%). A maternal complication occurred in 9.85% of women, dominated by anaemia, and six maternal deaths were recorded (0.92%). Among the 685 newborns, 28.61% had a first-minute Apgar score below seven and 31.97% weighed less than 2 500 grams; neonatal mortality reached 18.54% and still-birth 2.19%. Previous hypertension was the only factor associated with maternal complications (OR 2.44; 95% CI: 1.35 to 4.43). **Conclusion:** Maternal morbidity remains contained but neonatal outcome is poor. Fetal distress and

scarred uterus dominate the indications.

Keywords

Caesarean Section, Indications, Neonatal Outcome, Benin

1. Introduction

Cesarean section is a life-saving procedure for both mothers and fetuses; however, it remains a major surgical intervention whose safety is closely dependent on the conditions under which it is performed. Minani *et al.* in 2024 [1], in sub-Saharan Africa, showed that the cesarean section rate remained below the recommendations of the World Health Organization. Whether the procedure is elective or performed as an emergency is a major determinant of maternal and neonatal outcomes. Jombo *et al.* in 2022 [2], in Nigeria, reported that 64.7% of cesarean sections were performed as emergencies and that neonates delivered by emergency cesarean section had significantly higher rates of low Apgar scores at both the first and fifth minutes (27.6% and 11.0%, respectively, versus 6.4% and 2.0% following elective cesarean section), with perinatal mortality rates of 6.1% and 1.3%, respectively. Bharati *et al.* in 2024 [3], in a descriptive study of 400 cesarean sections performed in Nepal, reported a similar gradient, with fever, urinary tract infection, surgical-site infection, need for neonatal resuscitation, and low Apgar scores all significantly more frequent following emergency cesarean section. Complications directly related to the procedure represent the second major concern. Nunes *et al.* in 2023 [4] pointed out that hemorrhage associated with cesarean delivery had become an important cause of maternal hemorrhagic death in many low- and middle-income countries. Omara *et al.* in 2024 [5], in a prospective cohort of 204 women who underwent cesarean section at Mubende Regional Referral Hospital in Uganda, reported a surgical-site infection incidence of 16.18%.

In a faith-based hospital in northern Benin, where data of this type are scarce, the present study aimed to describe the indications, operative characteristics, and maternal and fetal outcomes of cesarean section, and to identify factors associated with the occurrence of maternal complications.

2. Materials and Methods

2.1. Study Setting, Design, and Period

The study was conducted in the maternity unit of the Order of Malta Hospital in Djougou, a faith-based referral facility in the Donga Department of northwestern Benin. This was a retrospective cross-sectional study with descriptive and analytical components, covering the six-month period from January 1 to June 30, 2022.

2.2. Study Population and Eligibility Criteria

The study population consisted of all records of women who delivered by cesarean

section in the maternity unit during the study period, together with those of their newborns.

Records of women who had delivered elsewhere and were admitted for another complication were not included. Incomplete or unusable records were excluded. Recruitment was exhaustive. The final analysis included 649 women who underwent cesarean section and the 685 newborns delivered from these procedures.

2.3. Study Variables

The dependent variable for the analytical component was the occurrence of an intraoperative or postoperative maternal complication, considered as a binary qualitative variable. Independent variables were grouped into four categories. Maternal characteristics included age, place of residence, occupation, gravidity, parity, medical and surgical history, mode of admission, and gestational age. Procedure-related variables included preoperative assessment, pre-anesthetic consultation, emergency or prophylactic status of the procedure, indications for cesarean section, associated procedures, operator qualification, type of anesthesia, type of incision, intraoperative incidents and accidents, and blood transfusion.

Neonatal variables included the number of newborns, sex, birth weight, condition at birth, Apgar scores at 1, 5, and 10 minutes, need for resuscitation, transfer to the pediatric unit, and presence of congenital malformations.

Outcome variables included postpartum course, hemorrhagic, anesthetic, visceral, infectious, digestive, and thromboembolic complications, death, and length of hospital stay.

2.4. Data Collection, Processing, and Analysis

Data were collected through manual review of medical records using a study-specific data collection form. Data were entered using the KoboCollect application and processed and analyzed using R version 3.6.0. Microsoft Excel 2013 was used to organize the data into tables and graphs. After data entry, potential data-entry errors and data consistency were checked, and variables were subsequently coded. Quantitative variables were described using means with standard deviations or medians, while qualitative variables were summarized using frequencies and proportions.

Proportions were compared using Pearson's chi-square test or Fisher's exact test, while means were compared using Student's *t*-test. The strength of associations between maternal characteristics and the occurrence of complications was estimated using odds ratios (ORs) with 95% confidence intervals (95% CIs). Statistical significance was set at 5%.

2.5. Ethical Considerations

Authorization was obtained prior to data collection from the dean's authorities of the Faculty of Medicine of the University of Parakou, the administration of the Order of Malta Hospital in Djougou, and the head of the maternity unit.

The study protocol was submitted to the Local Ethics Committee for Biomed-

cal Research of the University of Parakou before implementation. Data were collected anonymously. Given the retrospective and non-interventional nature of the study, individual informed consent was not required.

3. Results

3.1. Pregnancy-Related Conditions

Among the 649 women who underwent cesarean section, 43.45% had experienced no pathological condition during pregnancy. Among those with a reported condition, hypertension was by far the most common (28.51%), followed by anemia (11.86%), preeclampsia (8.78%), and premature rupture of membranes (6.16%). Eclampsia occurred in 4.31% of women, while placental abruption accounted for 2.77% (**Table 1**).

Table 1. Distribution of women who underwent cesarean section according to pregnancy-related conditions at the maternity unit of the Order of Malta Hospital in Djougou, 2022 (n = 649).

Pathology	n	Frequency (%)
None	282	43.45
Hypertension a	185	28.51
Anemia	77	11.86
Preeclampsia	57	8.78
Premature rupture of membranes	40	6.16
Fever	31	4.78
Eclampsia	28	4.31
Premature rupture of membranes	18	2.77
Oligohydroamnios	11	1.69
Placenta previa	11	1.69
Post-term pregnancy	10	1.54
Prolonged pregnancy	9	1.39
Infection*	8	1.23
High leak	8	1.23
Anhydramnios	5	0.77
Polyhydramnios	5	0.77
Vulvovaginal condyloma	4	0.62
Sickle cell disease	2	0.31
Other****	3	0.46

*Genital infection (4), urinary tract infection (3), and ovular infection (1). *HIV infection, uterine fibroid, and diabetes mellitus, one woman each. Multiple-response variable: several conditions could coexist in the same woman.

3.2. Indications for Cesarean Section

Acute fetal distress was the leading indication for cesarean section, accounting for 30.66% of women, followed by a scarred uterus (22.19%) and hypertensive disorders of pregnancy (15.25%).

Among the 144 women with a previous uterine scar, a single-scar uterus predominated (68 women), followed by a double-scar uterus (57), triple-scar uterus (16), and quadruple-scar uterus (3).

Indications related to pelvic dystocia or abnormal presentation remained uncommon, with generally contracted pelvis accounting for 2.77% of cases and breech presentation for 4.62%. Strictly maternal indications were rare, with maternal salvage cited in only 2.00% of women (**Table 2**).

Table 2. Distribution of women who underwent cesarean section according to indications for cesarean section at the maternity unit of the Order of Malta Hospital in Djougou, 2022 (n = 649).

Indication	n	Frequency (%)
Fetomaternal indications		
Acute fetal distress	199	30.66
Previous cesarean section/scarred uterus**	144	22.19
Hypertensive disorders of pregnancy	99	15.25
Placental abruption	39	6.01
Impending uterine rupture syndrome	29	4.47
Placenta previa	26	4.01
Macrosomia	24	3.70
Cord prolapse	19	2.93
Intrauterine growth restriction	2	0.31
Abnormal presentations		
Breech presentation	30	4.62
Transverse presentation	23	3.54
Face presentation	5	0.77
Brow presentation	3	0.46
Shoulder presentation	2	0.31
Pelvic dystocia		
Generally contracted pelvis	18	2.77
Primary dystocia	17	2.62
Borderline pelvis	11	1.69
Cephalopelvic disproportion	9	1.39

Continued

Borderline pelvis with a scarred uterus	5	0.77
Transversely contracted pelvis	3	0.46
Asymmetrical pelvis	3	0.46
Other obstetric indications		
Premature rupture of membranes	29	4.47
Arrested cervical dilatation	22	3.39
Failure of descent	22	3.39
Oligohydramnios	9	1.39
Post-term pregnancy	9	1.39
Unfavorable Bishop score	8	1.23
Unfavorable obstetric history	7	1.08
Retained twin	7	1.08
Anhydramnios	5	0.77
High leak	5	0.77
Cervical dystocia	4	0.62
Chorioamnionitis	4	0.62
Dehiscence of previous uterine scar	4	0.62
Polyhydramnios	3	0.46
Short interpregnancy interval	3	0.46
Uterine rupture	2	0.31
Maternal indications		
Maternal salvage	13	2.00
Hemoglobinopathy	11	1.69
Vulvovaginal condyloma	2	0.31
HIV infection with membrane rupture >72 hours	2	0.31
Other**	3	0.46

*Single-scar uterus (68; 10.48%), double-scar uterus (57; 8.78%), triple-scar uterus (16; 2.47%), and quadruple-scar uterus (3; 0.46%). *Heart disease, diabetes mellitus, and polymyomatous uterus, one woman each. Multiple-response variable: several indications could be recorded for the same woman.

3.3. Operative Characteristics

Cesarean section was performed as an emergency in more than three quarters of cases (76.73%), whereas prophylactic procedures accounted for only 22.80%. Spinal anesthesia was by far the most commonly used anesthetic technique (87.37%), while general anesthesia was used in only 11.71% of cases.

The Joel-Cohen incision predominated (57.16%) over the Pfannenstiel incision (39.29%), whereas the infraumbilical midline incision was uncommon (3.08%) (**Table 3**).

Table 3. Distribution of women who underwent cesarean section according to type of cesarean section, type of anesthesia, and type of incision at the maternity unit of the Order of Malta Hospital in Djougou, 2022 (n = 649).

Operative characteristic	n	Frequency (%)
Type of cesarean section		
Emergency	498	76.73
Prophylactic	148	22.80
No specified	3	0.46
Type of anesthesia		
Spinal anesthesia	567	87.37
General anesthesia	76	11.71
Epidural anesthesia	6	0.92
Type of incision		
Joël Cohen	371	57.16
Pfannenstiel	255	39.29
Infraumbilical midline	20	3.08
Not specified	3	0.46

3.4. Maternal Outcomes

Intraoperative complications were uncommon, with hemorrhage occurring in four women (0.62%) and Mendelson syndrome in one woman (0.15%). Postoperatively, 64 complications were recorded, corresponding to an overall complication rate of 9.85%. Anemia was the most frequent complication (2.93%), followed by infectious complications considered as a whole (19 women; 2.93%) and postoperative hemorrhage (1.23%). Visceral complications remained rare, including two cases of intestinal obstruction and one case of vesicovaginal fistula. Six women were referred to higher-level facilities, two to Tanguiéta and four to Parakou. Six maternal deaths were recorded among the 649 women who underwent cesarean section, corresponding to a maternal case-fatality rate of 0.92% (**Table 4**).

3.5. Neonatal Outcomes

The 649 cesarean sections resulted in 685 live births, with 620 women delivering a singleton (95.53%), 25 delivering twins (3.85%), three delivering triplets (0.46%), and one delivering quadruplets (0.15%). An Apgar score below 7 was recorded in

28.61% of newborns at one minute, decreasing to 19.71% at five minutes and 11.39% at ten minutes. The condition at birth was considered good in 82.04% of newborns, whereas apparent death was observed in 16.35%. Birth weight was below 2500 g in 31.97% of newborns. Neonatal infection was the most frequent complication (48.18%), followed by perinatal asphyxia (39.56%) and jaundice (19.85%). One hundred and twenty-seven neonatal deaths were recorded, corresponding to a neonatal mortality rate of 18.54%, while 15 stillbirths were recorded, corresponding to a stillbirth rate of 2.19% (**Figure 1**, **Figure 2** and **Table 5**).

Table 4. Distribution of women who underwent cesarean section according to postoperative complications at the maternity unit of the Order of Malta Hospital in Djougou, 2022 (n = 649).

Postoperative complication	n	Frequency (%)
Hematological complications		
Anemia	19	2.93
Postoperative hemorrhage	8	1.23
Infectious complications		
Unexplained infectious syndrom	9	1.39
Septis	4	0.62
Endometritis	3	0.46
Wound infection	3	0.46
Visceral complications		
Intestinal obstruction	2	0.31
Vesicovaginal fistula	1	0.15
Other complications		
*Persistent gestational hypertension	6	0.92
Puerperal psychosis	2	0.31
Persistent eclampsia	2	0.31
Eclamptic status	2	0.31
Moderate hemoperitoneum	1	0.15
Hypotonia of the right lower limb	1	0.15
Thoracic syndrome in a woman with hemoglobinopathy	1	0.15
Total complications	64	9.85

Intraoperative complications, not reported in this table, occurred in five women: intraoperative hemorrhage (4; 0.62%) and Mendelson syndrome (1; 0.15%). Six maternal deaths were recorded, corresponding to a maternal case-fatality rate of 0.92%. *Persistent gestational hypertension: gestational hypertension excluded negative proteinuria.

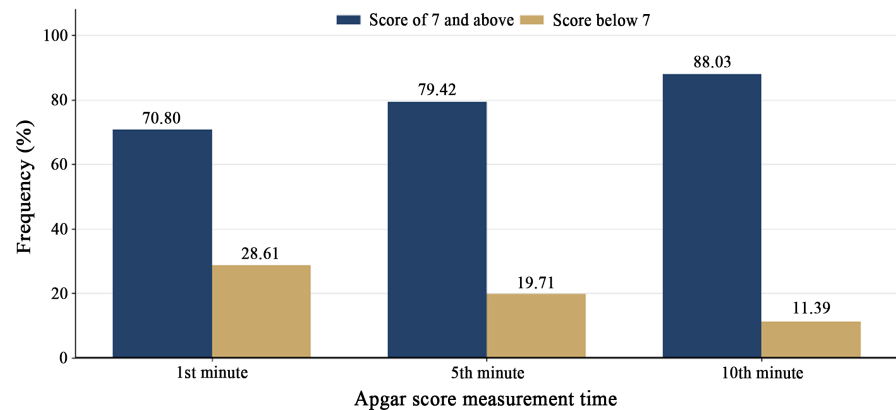


Figure 1. Changes in Apgar scores between the first and tenth minutes among neonates delivered by cesarean section at the maternity unit of the Order of Malta Hospital in Djougou in 2022 (n = 685).

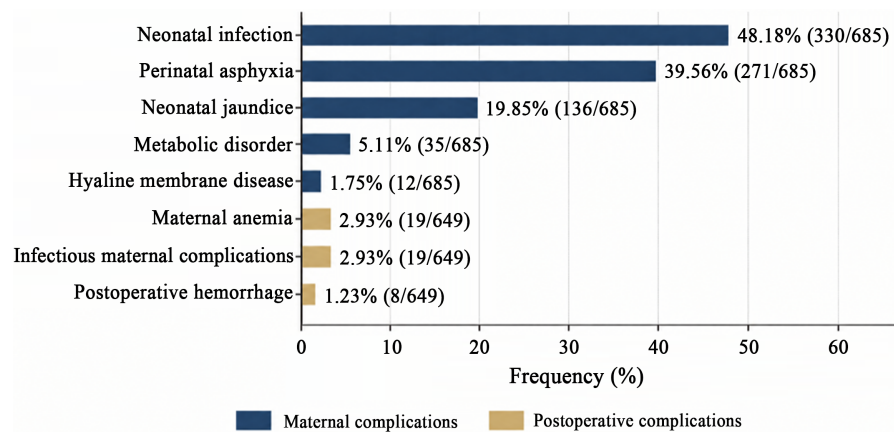


Figure 2. Main neonatal and maternal complications observed after cesarean section at the maternity unit of the Order of Malta Hospital in Djougou in 2022.

Table 5. Distribution of newborns delivered by cesarean section according to Apgar score, condition at birth, sex, and birth weight at the maternity unit of the Order of Malta Hospital in Djougou, 2022 (n = 685).

Characteristic	n	Frequency (%)
Apgar score at 1 minute		
≥7	485	70.80
<7	196	28.61
Not specified	4	0.59
Apgar score at 5 minutes		
≥7	544	79.42
<7	135	19.71
Not specified	6	0.87

Continued

Apgar score at 10 minutes		
≥7	603	88.03
<7	78	11.39
Not specified	4	0.58
Condition at birth		
Good	562	82.04
Apparent death	112	16.35
Not specified	11	1.61
Sex		
Female	384	56.06
Male	284	41.46
Not specified	17	2.48
Birth weight (g)		
2500 - 4000	450	65.69
<2500	219	31.97
>4000	7	1.02
Not specified	9	1.31
Neonatal complications*		
Infection	330	48.18
Perinatal asphyxia	271	39.56
Jaundice	136	19.85
Metabolic disorder	35	5.11
Hyaline membrane disease	12	1.75
Respiratory distress	6	0.88
Secondary apnea	2	0.29
Other**	3	0.44
Outcome		
Neonatal death	127	18.54
Stillbirth	15	2.19

*Multiple-response variable: several complications could coexist in the same newborn.

**One case each of right shoulder obstetric trauma, facial trauma, and imperforate anus associated with sexual ambiguity.

3.6. Factors Associated with the Occurrence of Maternal Complications

Neither age, place of residence, occupation, gestational age, gravidity, parity, general condition at admission, status of the membranes, mode of admission, nor history of cesarean section was associated with the occurrence of maternal complications. Only one factor was associated with maternal complications: a history of hypertension. Women with a history of hypertension experienced a complication in 17.31% of cases, compared with 7.89% among women without such a history, corresponding to a risk ratio of 2.44 (95% CI: 1.35 - 4.43; $p = 0.003$). Two trends should nevertheless be noted, although they did not reach statistical significance: pauciparous women had the lowest frequency of complications (5.95%; $RR = 0.39$; $p = 0.054$), whereas women whose occupation was not documented had the highest frequency (26.92%; $RR = 2.49$; $p = 0.086$) (**Table 6**).

Table 6. Factors associated with the occurrence of maternal complications among women undergoing cesarean section at the maternity unit of the Order of Malta Hospital in Djougou, 2022 ($n = 649$).

Factors	N	Maternal complication		RP	IC 95%	p
		Yes n (%)	No n (%)			
Age group						
30 à 39 years	177	16 (9.04)	161 (90.96)	1	-	-
14 - 19 years	90	14 (15.56)	76 (84.44)	1.85	0.86 à 3.99	0.115
20 - 29 years	374	31 (8.29)	343 (91.71)	0.91	0.48 à 1.71	0.768
≥40 years	8	0 (0.00)	8 (100.00)	-	-	0.970
Residence						
Urban	157	17 (10.83)	140 (89.17)	1	-	-
Rural	430	40 (9.30)	390 (90.70)	1.24	0.68 à 2.25	0.488
Not specified	68	4 (5.88)	64 (94.12)	0.61	0.21 à 1.76	0.360
Occupation						
Artisane	101	13 (12.87)	88 (87.13)	1	-	-
Housewife	416	32 (7.69)	384 (92.31)	0.56	0.28 à 1.12	0.101
Trader	70	6 (8.57)	64 (91.43)	0.63	0.23 à 1.76	0.382
Civil servant	29	2 (6.90)	27 (93.10)	0.50	0.11 à 2.36	0.383
Student	6	1 (16.67)	5 (83.33)	1.35	0.15 à 12.52	0.790
Gestational age (weeks)						
≥37	491	48 (9.78)	443 (90.22)	1	-	-
<28	14	2 (14.29)	12 (85.71)	1.54	0.33 à 7.08	0.580

Continued

28 - 32	28	1 (3.57)	27 (96.43)	0.42	0.06 à 3.18	0.401
33 - 36	111	10 (9.01)	101 (90.99)	0.91	0.45 à 1.87	0.805
Medical history						
History of hypertension	104	18 (17.31)	86 (82.69)	2.44	1.35 à 4.43	0.003
Previous cesarean section	203	15 (7.39)	188 (92.61)	0.69	0.38 à 1.27	0.239
Mode of admission						
Self-referred	233	20 (8.58)	213 (91.42)	1	-	-
Referred	364	40 (10.99)	324 (89.01)	1.31	0.75 à 2.31	0.342
Referred from outpatient consultation	47	1 (2.13)	46 (97.87)	0.23	0.03 à 1.77	0.159
Gravidity						
High multigravida	118	12 (10.17)	106 (89.83)	1	-	-
Primigravida	166	23 (13.86)	143 (86.14)	1.42	0.68 à 2.98	0.354
Paucigravida	229	13 (5.68)	216 (94.32)	0.53	0.23 à 1.21	0.130
Multigravida	136	13 (9.56)	123 (90.44)	0.93	0.41 à 2.13	0.871
Parity						
High multipara	57	8 (14.04)	49 (85.96)	1	-	-
Nullipara	183	25 (13.66)	158 (86.34)	0.97	0.41 à 2.29	0.943
Primipara	119	9 (7.56)	110 (92.44)	0.50	0.18 à 1.38	0.180
Paucipara	185	11 (5.95)	174 (94.05)	0.39	0.15 à 1.02	0.054
Multipara	105	8 (7.62)	97 (92.38)	0.51	0.18 à 1.43	0.197
Condition at admission						
Good general condition	622	60 (9.65)	562 (90.35)	1	-	-
Poor general condition	25	1 (4.00)	24 (96.00)	0.39	0.05 à 2.94	0.361
Membrane status						
Intact membranes	469	40 (8.53)	429 (91.47)	1	-	-
Ruptured membranes	176	21 (11.93)	155 (88.07)	1.45	0.83 à 2.54	0.190

4. Discussion

4.1. Cesarean Delivery as Predominantly Emergency Surgery

More than three out of four cesarean sections were performed as emergency procedures (76.73%), whereas prophylactic cesarean sections accounted for only 22.80% of procedures. This predominance has also been reported in African studies, although at lower levels. In 2022, Jombo *et al.* [2], in a two-year retrospective

review of 705 cesarean sections performed at the Federal Medical Centre in Asaba, Nigeria, reported that 64.7% were emergency procedures. Hussein *et al.* [6], in 2023, reported that among 2703 cesarean sections performed between 2015 and 2021 at a tertiary hospital in Somalia, 59.2% were emergency procedures compared with 40.8% scheduled procedures.

This difference of 12 to 17 percentage points is clinically relevant because the emergency nature of the procedure directly affects outcomes. Jombo *et al.* [2] demonstrated in 2022 that neonates delivered by emergency cesarean section were significantly more likely to have a low Apgar score at both the first and fifth minutes, 27.6% and 11.0%, respectively, compared with 6.4% and 2.0% following scheduled cesarean section. Perinatal deaths were also four times more frequent, at 6.1% versus 1.3%. Bharati *et al.* [3], in 2024, reported a similar gradient among 400 cesarean deliveries performed in Nepal, with regard to fever, urinary tract infection, wound infection, and the need for neonatal resuscitation. The high proportion of emergency procedures observed in the present study therefore represents, in itself, a major determinant of the unfavorable neonatal outcomes described below and may reflect inadequate antenatal care, which limits the anticipation of high-risk situations.

4.2. Indications Predominated by Fetal Distress and Scarred Uterus

Acute fetal distress was the leading indication for cesarean section (30.66%), followed by a scarred uterus (22.19%) and hypertensive disorders of pregnancy (15.25%). This triad is also observed in comparable series, although the ranking varies. Hussein *et al.* [6], in 2023, identified previous cesarean section and fetal distress as the two most frequent indications in Somalia, accounting for almost equal proportions, 22.3% and 22.1%, respectively. Jombo *et al.* [2], in 2022, reported repeat cesarean section as the leading indication in Nigeria (27.8%), whereas cephalopelvic disproportion was the most common indication for emergency procedures (12.3%).

Two features distinguish the present series. First, the frequency of cesarean delivery for acute fetal distress was markedly higher than that reported elsewhere. This finding should be interpreted cautiously because, in the absence of continuous cardiotocographic monitoring, the diagnosis of fetal distress was based on intermittent fetal heart rate auscultation, a method with limited specificity that may lead to an excessive number of cesarean deliveries. Second, mechanical dystocia remained uncommon in the present study, with clinically contracted pelvis accounting for only 2.77% of cases, whereas Jombo *et al.* [2] identified it as the leading indication for emergency cesarean delivery. This difference may suggest that clinical pelvic assessment was less systematic, as further supported by the high proportion of women admitted without any antenatal care. Finally, the importance of a scarred uterus, with 144 women having a previous cesarean section, including 76 with at least two uterine scars, deserves emphasis. Simsek *et al.* [7], in 2021,

analyzed women undergoing a fourth or subsequent cesarean section at a Turkish center with 46,048 deliveries and showed that repeated cesarean deliveries increased maternal and fetal complications, particularly abnormal placental implantation.

4.3. Operative and Anesthetic Techniques

Spinal anesthesia was used in 87.37% of procedures, whereas general anesthesia was used in only 11.71% of cases. This choice is consistent with available evidence regarding neonatal outcomes. Ozden *et al.* [8], in 2023, analyzed 883 cesarean sections performed over one year and observed that admission to neonatal intensive care was more frequent among neonates whose mothers received general anesthesia. Apgar scores were lower, and umbilical cord blood pH and lactate levels were less favorable in this group, although neonatal mortality remained comparable between the two techniques. The authors concluded that both methods could be used safely, but that neonatal effects appeared less pronounced with spinal anesthesia. The proportion observed in the present study therefore reflects an appropriate anesthetic practice.

The Joel-Cohen incision was predominant (57.16%) over the Pfannenstiel incision (39.29%). The superiority of one technique over the other remains debated. McCurdy *et al.* [9], in 2024, conducted a randomized controlled trial comparing the two incisions in women with a body mass index ≥ 35 kg/m² but were unable to draw definitive conclusions because recruitment was discontinued after only 72 participants. Nunes *et al.* [4], in 2023, in the International Federation of Gynecology and Obstetrics (FIGO) good practice recommendations on cesarean surgical techniques, discussed the respective indications for different abdominal incisions and emphasized that technical proficiency is essential to reducing complications [10]-[12]. The low proportion of infraumbilical midline incisions observed in the present study (3.08%) is consistent with these recommendations.

4.4. Maternal Morbidity and Mortality

A postoperative complication occurred in 9.85% of women, mainly anemia (2.93%) and infectious complications (2.93% overall). This frequency was substantially lower than that reported in African series specifically addressing surgical site infection. Omara *et al.* [5], in 2024, in a prospective cohort of 204 women undergoing cesarean delivery at Mubende Regional Referral Hospital in Uganda and followed for 28 days, reported a surgical site infection incidence of 16.18%. Risk factors included referral in an unstable condition, obstructed labor, chorioamnionitis, and prolonged rupture of membranes. Ali *et al.* [13], in 2025, reported from Addis Ababa that the incidence of surgical site infection reached 7.3% in sub-Saharan Africa and up to 10.4% in Ethiopia, compared with a global prevalence of 5.63% following cesarean section. The difference between these figures and the 0.46% incidence of wound suppuration observed in the present study is considerable and is probably explained by the duration of follow-up: the retro-

spective data collection documented only complications occurring during hospitalization, whereas Omara *et al.* [5] in 2024 and Hambisa *et al.* [14] in 2026 followed their cohorts for several weeks after discharge. The actual frequency of infectious complications is therefore very likely underestimated.

Maternal case fatality was 0.92%, corresponding to six deaths. This level compares favorably with the 1.7% reported by Hussein *et al.* [6] in 2023 in Somalia, but exceeds the 0.6% case fatality reported by Jombo *et al.* [2] in 2022 in Nigeria and contrasts with the absence of deaths reported by Bharati *et al.* [3] in 2024 among 400 cesarean deliveries performed in Nepal. Zuleta-Tobón *et al.* [15], in 2025, nevertheless emphasized, based on an analysis of maternal deaths occurring in Antioquia, Colombia, between 2011 and 2020, that the association between cesarean delivery and maternal mortality is strongly affected by confounding by indication: among deaths occurring after cesarean delivery, 58.9% were unrelated to the procedure, 21.5% were associated with it, and 13.5% were directly attributable to it. The case fatality observed in the present study therefore reflects both the prognosis of the clinical conditions leading to cesarean delivery and the intrinsic risks of the procedure itself.

The only factor associated with the occurrence of maternal complications was a history of hypertension, which odd ratio 2.44 (IC 95%: 1.35 to 4.43 ; $p = 0.003$). This association is consistent with the nature of the complications observed, as persistent gestational hypertension, persistent eclampsia, and status epilepticus due to eclampsia together accounted for ten of the 64 recorded complications. The absence of an association with previous cesarean section is noteworthy, as it contrasts with the findings of Simsek *et al.* [7] in 2021. This discrepancy may be explained by the small number of women with multiple uterine scars in the present series, with only three women having four previous cesarean scars.

4.5. Concerning Neonatal Outcomes

The most concerning finding in this series was the neonatal outcome. Nearly one in three neonates had an Apgar score below 7 at the first minute (28.61%), and one in five had a score below 7 at the fifth minute (19.71%); apparent death at birth was observed in 16.35% of neonates. Neonatal mortality was 18.54%, while stillbirth accounted for 2.19%. These rates were substantially higher than those reported in comparable series. Jombo *et al.* [2], in 2022, reported 4.2% perinatal mortality in Nigeria, whereas Bharati *et al.* [3], in 2024, reported no neonatal deaths among 400 cesarean deliveries in Nepal, with 16% of neonates admitted to the neonatal intensive care unit.

Three factors may have contributed to this excess mortality. The first was prematurity and low birth weight, with 31.97% of neonates weighing less than 2500 g. Ajibo *et al.* [16], in 2022, in a case-control study conducted at Wolaita Sodo University Hospital in southern Ethiopia, demonstrated that a birth weight below 2500 g increased the likelihood of a low Apgar score at the fifth minute by 8.17-fold, together with the interval between skin incision and fetal extraction (adjusted

odds ratio, 5.27) and pregnancy-induced hypertension (4.58). The second was the emergency nature of most procedures, whose neonatal impact was documented by both Jombo *et al.* [2] and Bharati *et al.* [3]. The third concerned maternal characteristics. Damtew *et al.* [17], in 2024, in a multicenter case-control study involving 318 mother-neonate pairs in northwestern Ethiopia, identified maternal age >35 years, the presence of danger signs during pregnancy, and a non-reassuring fetal heart rate as independent determinants of adverse neonatal outcomes following emergency cesarean delivery; women aged >35 years had a 3.6-fold higher risk.

The substantial frequency of neonatal complications, including infections in 48.18% and perinatal asphyxia in 39.56%, should nevertheless be interpreted cautiously. These proportions, calculated among all 685 neonates, are considerably higher than those usually documented by systematic examination in a neonatal unit and suggest that the diagnosis of neonatal infection was based on presumptive rather than bacteriologically confirmed criteria. Nevertheless, these findings identify the immediate neonatal period as the most vulnerable component of care.

4.6. Study Limitations

The retrospective and documentary nature of data collection represents the main limitation of this study, as follow-up ended at hospital discharge, potentially leading to an underestimation of maternal infectious complications, which often occur after discharge, as demonstrated by the prospective cohorts of Omara *et al.* [5] in 2024 and Hambisa *et al.* [14] in 2026. Several internal inconsistencies should also be noted: the total number of maternal complications was 64 in the descriptive analysis but 61 in the analytical tables, and the sample sizes for some categories varied between tables. Length of hospital stay, decision-to-delivery interval, and operator qualification, all of which had been included in the study protocol, could not be analyzed, although Ajibo *et al.* [16] in 2022 specifically identified the interval between skin incision and fetal extraction as an independent determinant of Apgar score. The analysis of factors associated with maternal complications remained bivariate and was not adjusted for potential confounding factors, although the occurrence of 61 events would have allowed for a parsimonious multivariable model.

5. Conclusion

Cesarean delivery was performed as an emergency procedure in more than three out of four cases at the maternity unit of the Order of Malta Hospital in Djougou, with indications predominantly consisting of acute fetal distress, a scarred uterus, and hypertensive disorders of pregnancy. The operative and anesthetic techniques were consistent with current recommendations, with spinal anesthesia and the Joel-Cohen incision being widely predominant. Maternal morbidity remained relatively limited, with complications occurring in approximately one in ten women and a case fatality rate of 0.92%; the only factor associated with maternal compli-

cations was a history of hypertension. Neonatal outcomes, however, were poor: nearly one in three neonates had an Apgar score below 7, approximately one in three weighed less than 2500 g, and nearly one in five died. This contrast between relatively controlled maternal surgical outcomes and high neonatal mortality highlights the reduction of the decision-to-delivery interval, strengthening immediate neonatal resuscitation, and improving antenatal care for early identification of high-risk pregnancies as key priorities for improving outcomes. A prospective study documenting operative delays, operator qualification, and neonatal outcomes beyond the delivery room, combined with multivariable analysis of factors associated with neonatal mortality, would help determine the potentially preventable component of this mortality.

Author Contributions

All authors participated in the care of patients and newborns. They were involved in the conception, execution, writing, and revision of the manuscript.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

- [1] Minani, P. and Ross, A. (2024) Strengthening Caesarean Birth: Sub-Saharan Africa Health System Evaluation: Scoping Review. *African Journal of Primary Health Care & Family Medicine*, **16**, e1-e11. <https://doi.org/10.4102/phcfm.v16i1.4128>
- [2] Jombo, S., Ossai, C., Onwusulu, D., Ilikannu, S. and Fagbemi, A. (2022) FETO-Maternal Outcomes of Caesarean Delivery in Federal Medical Centre, Asaba: A Two-Year Review. *African Health Sciences*, **22**, 172-179. <https://doi.org/10.4314/ahs.v22i1.22>
- [3] Bharati, S., Dangal, G., Tiwari, K.D., Maharjan, S., Bhandari, S., Karki, A., *et al.* (2024) Fetomaternal Outcome of Pregnant Women at Term Undergoing Cesarean Section. *Journal of Nepal Health Research Council*, **22**, 21-24. <https://doi.org/10.33314/jnhrc.v22i01.4599>
- [4] Nunes, I., Nicholson, W. and Theron, G. (2023) FIGO Good Practice Recommendations on Surgical Techniques to Improve Safety and Reduce Complications during Cesarean Delivery. *International Journal of Gynecology & Obstetrics*, **163**, 21-33. <https://doi.org/10.1002/ijgo.15117>
- [5] Omara, S., Kasujja, M., Okot, G., Okello, P., Okello, M., Mulumba, R., *et al.* (2024) Predictors of Post-Caesarean Surgical Site Infections at Mubende Regional Referral Hospital, Central Uganda: Prospective Cohort Study (July-September 2023). *International Journal of Women's Health*, **16**, 1939-1945. <https://doi.org/10.2147/ijwh.s482864>
- [6] Hussein, A.I., Kurtay, S., Omar, A.A., Yusuf, A.A. and Mohamud, R.Y.H. (2023) An Analysis of the Rate, Indications, and Associated Maternal Mortality for Cesarean Sections at a Tertiary Care Hospital, First Report from Somalia. *International Journal of Women's Health*, **15**, 225-233. <https://doi.org/10.2147/ijwh.s383122>
- [7] Simsek, D., Urun, C. and Altekin, Y. (2021) Determinants of Cesarean-Related Complications: High Number of Repeat Cesarean, Operation Type or Placental Patholo-

- gies? *The Journal of Maternal-Fetal & Neonatal Medicine*, **34**, 3768-3774. <https://doi.org/10.1080/14767058.2020.1765332>
- [8] Ozden, M.G.N., Koruk, S., Collak, Z. and Panik, N. (2023) Comparison of the Effects of General and Spinal Anesthesia for Cesarean Delivery on Maternal and Fetal Outcomes: A Retrospective Analysis of Data. *Northern Clinics of Istanbul*, **10**, 575-582. <https://doi.org/10.14744/nci.2023.25593>
 - [9] McCurdy, R.J., Harding, S., Felder, L., Beáta, A., Schnatz, P. and Berghella, V. (2024) Cohen vs Pfannenstiel Cesarean Skin Incision for Body Mass Index ≥ 35 kg/m²: A Randomized Controlled Trial. *American Journal of Obstetrics & Gynecology MFM*, **6**, Article 101528. <https://doi.org/10.1016/j.ajogmf.2024.101528>
 - [10] Reis Santos, M., Dagge, A., Nunes, R., Fonseca, A.R., Silva, F., Dias, J., *et al.* (2026) Prediction of Cesarean Delivery after Trial of Labor in Pregnancies Complicated by Fetal Growth Restriction: A Clinical Model for Individualized Counseling. *European Journal of Obstetrics & Gynecology and Reproductive Biology*, **324**, Article 115270. <https://doi.org/10.1016/j.ejogrb.2026.115270>
 - [11] Barnea, E.R., Ramasauskaite, D., Ubom, A.E., Di Simone, N., Mueller, M., Borovac-Pinheiro, A., *et al.* (2025) FIGO Good Practice Recommendations for Vaginal Birth after Cesarean Section. *International Journal of Gynecology & Obstetrics*, **171**, 17-31. <https://doi.org/10.1002/ijgo.70406>
 - [12] Mascarenhas Silva, C.H., Soares Laranjeira, C.L., Barros de Melo, C.S., Brandão, L.V., Oliveira, G.C., Brandão, A.H.F., *et al.* (2023) Perinatal Complications of the Maternal-Fetal Dyad in Primiparous Women Subjected to Vaginal Delivery versus Elective Cesarean Section: A Retrospective Study of Clinical Results Associated with Bioethical Precepts. *PLOS ONE*, **18**, e0292846. <https://doi.org/10.1371/journal.pone.0292846>
 - [13] Ali, N., Neway, S. and Desta, K. (2025) Post-Caesarean Section Infection Burden, Antimicrobial Resistance Pattern, and Associated Factors at All Africa Leprosy Rehabilitation and Training Center Comprehensive Specialized Hospital, Addis Ababa, Ethiopia. *PLOS ONE*, **20**, e0326935. <https://doi.org/10.1371/journal.pone.0326935>
 - [14] Hambisa, M.A., Fite, M.B., Getachew, R.G., Tilahun, T., Chala, D., Merdasa, E., *et al.* (2026) Predictors of Surgical Site Infections Following Cesarean Delivery in Public Hospitals of West Ethiopia: A Cohort Study. *PLOS ONE*, **21**, e0339930. <https://doi.org/10.1371/journal.pone.0339930>
 - [15] Zuleta-Tobón, J.J. and López-Martínez, J.S. (2025) Cesarean and Maternal Mortality: Risk Factor and Indication Bias. *International Journal of Gynecology & Obstetrics*, **170**, 1317-1323. <https://doi.org/10.1002/ijgo.70119>
 - [16] Ajibo, B.D., Wolka, E., Aseffa, A., Nugusu, M.A., Adem, A.O., Mamo, M., *et al.* (2022) Determinants of Low Fifth Minute Apgar Score among Newborns Delivered by Cesarean Section at Wolaita Sodo University Comprehensive Specialized Hospital, Southern Ethiopia: An Unmatched Case Control Study. *BMC Pregnancy and Childbirth*, **22**, Article No. 665. <https://doi.org/10.1186/s12884-022-04999-z>
 - [17] Damtew, B.S., Gudayu, T.W., Temesgan, W.Z. and Hailu, A.M. (2024) Effect of Decision-to-Delivery Time of Emergency Cesarean Section on Adverse Newborn Outcomes at East Gojjam Zone Public Hospital, Ethiopia, March 2023: Multicenter Prospective Observational Study Design. *International Journal of Women's Health*, **16**, 433-450. <https://doi.org/10.2147/ijwh.s451101>