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Factors Associated with Stillbirths at the Ouélessébougou Referral Health Center

Dicko A[1*], Malle S[2], Dakouo E[3], Souleymane M[1]

[1]Gynecology and Obstetrics Department, Ouélessébougou Referral Health Center
[2]Ophthalmology Department, Ouélessébougou Referral Health Center
[3]Surgery Department, Ouélessébougou Referral Health Center

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***Corresponding author:** Dr. Abdourahmane DICKO
Gynecology and Obstetrics Department, Ouélessébougou Referral Health Center

Abstract | **Original Research Article**

***General Objective*:** To study the factors associated with stillbirths at the Ouélessébougou Referral Health Center from January 1, 2021 to December 31, 2022. ***Materials and Methods*:** This was a retrospective, descriptive and analytical case-control study focusing on the factors associated with stillbirths over a 24-month period from January 1, 2021 to December 31, 2022. ***Results*:** The identified risk factors for stillbirth included: delay in seeking health care exceeding 8 hours (OR=5.93); infectious complications such as malaria (OR=4.55), hyperthermia (OR=3.29), pulse rate >100 bpm (OR=3.82), and anemia (OR=2.59); obstetric complications such as abruptio placentae (OR=4.66) and placenta previa (OR=2.23); lack of antenatal care (OR=2.47); history of stillbirth (OR=2.28); and gestational age between 28 and 37 weeks (OR=2.19).

Keywords: Patient, Stillbirths, Associated factors, Ouélessébougou.

INTRODUCTION

"The loss of a child during childbirth or pregnancy is a devastating tragedy for any family—a trauma often experienced in silence and occurring far too frequently across the world," stated Henrietta Fore, Executive Director of UNICEF [1]. Every 16 seconds, a mother somewhere in the world endures the heartbreaking experience of giving birth to a stillborn child [1].

Despite advancements in healthcare services aimed at preventing or treating causes of child deaths, stillbirth remains a significant obstetric concern globally and a major public health issue, causing emotional trauma for the mother and her family [1]. Between 2000 and 2019, the stillbirth rate declined by only 2.3% annually, compared to 2.9% for neonatal mortality and 4.3% for child mortality (ages 1 to 59 months). The vast majority of stillbirths (84%) occur in low- and middle-income countries [1]. In 2019, 3 out of 4 stillbirths occurred in sub-Saharan Africa or South Asia [1].

According to the 2018 Mali Demographic and Health Survey (DHS-VI), the perinatal mortality rate is estimated at 38 per 1,000 births, with 41 per 1,000 in rural areas and 28 per 1,000 in urban areas [5].

In Mali, Berthé M *et al.* [6] conducted a study using routine data on stillbirths recorded in eight regions over a nine-year period (2008–2016), reporting a national stillbirth rate of 23 per 1,000 births. Sikasso was the most affected region, with a rate of 28.8 per 1,000. Three categories of factors explain the occurrence of stillbirths: the mother's physical condition before and during pregnancy (particularly her nutrition), the epidemiological context, and the quality of obstetric services [7].

Several common risk factors for stillbirth exist in both developing and developed countries, including: maternal age (>35 years or <20 years), lack of education, socio-economic status, lack of prenatal care, history of stillbirth, hypertension, smoking, obesity, and infections such as syphilis and malaria [3].

In 2014, the World Health Assembly set a target of reducing stillbirths to 12 or fewer per 1,000 total births in all countries by 2030 [10].

In this context, Mali has based its health and population sector policy on principles and strategies, with one of the main goals being the reduction of maternal and infant mortality and morbidity. Health care services during pregnancy, childbirth, and the

postpartum period are crucial for the survival and well-being of both mother and child [5].

Despite various strategies, plans, and programs implemented in the country, stillbirth remains alarmingly prevalent in Mali and constitutes a major public health challenge. This study was initiated to highlight the factors associated with stillbirths at the Ouélessébougou Referral Health Center.

Patients and Methods

This was a retrospective, descriptive and analytical case-control study on the factors associated with stillbirths.

The study was conducted over a 24-month period from January 1, 2021 to December 31, 2022.

We recorded all cases of stillbirths in the gynecology and obstetrics department of the Ouélessébougou Referral Health Center from January 1, 2021 to December 31, 2022. For each stillbirth, we selected two controls (the preceding and succeeding live-born neonates). The controls were randomly selected (simple random sampling) from a sampling frame that included only live births during the study period.

Inclusion criteria: All stillbirths after 28 weeks of gestation in the gynecology and obstetrics department of the Ouélessébougou Referral Health Center during the study period were included.

VARIABLES STUDIED

Dependent variable:

The dependent variable was stillbirth (stillborn vs. live-born), which is a qualitative variable.

Independent variables:

These included the mothers' socio-demographic characteristics, access to health care and services, maternal clinical factors, and fetal-related factors.

Results

From January 1, 2021, to December 31, 2022, the Referral Health Center of Ouelessebougou recorded 2,591 deliveries, including 236 controls and 118 stillbirths, representing a frequency of 5%. (Figure 2) In our study, the average age of the mothers was 26.13 years, with extremes ranging from 15 to 48 years. The 20 to 25 age group was the most represented, accounting for nearly 28%. (Figure 3) There was a predominance of referred/evacuated patients among the cases compared to the controls: 60.17% versus 34.75%. This difference was statistically significant (p=0.00). (Table IV) The most common reasons for admission were: bleeding during pregnancy, excessive fundal height, scarred uterus, and premature rupture of membranes. (Table V) In our study, 62.71% of the cases had a delay in seeking health services of more than 8 hours, compared to 13.98% among the controls. This difference was statistically significant (p=0.00). (Table VI) The frequency of a history of cesarean section was slightly higher in the controls than in the cases: 12.7% versus 8.5%. This difference was not statistically significant. (Table VII) A history of stillbirth was reported in 17.80% of cases compared to 3.81% of controls. This difference was statistically significant (p=0.0000). (Table X) The proportion of women who had never attended antenatal care (ANC) was higher among the cases than the controls: 32.9% versus 9.32%. There was a statistically significant difference in the number of ANC visits between the cases and the controls (p=0.0000). (Table XII) Overall, a statistically significant difference was found between cases and controls regarding the occurrence of conditions such as malaria, anemia, chorioamnionitis, retroplacental hematoma, and placenta previa. However, there was no significant difference regarding preeclampsia between the two groups. (Table XIII) Fetal presentation abnormalities were significantly more frequent among cases than controls (p=0.0000). Umbilical cord presentation abnormalities were also more common in cases: 7.63% versus 0.85%, a significant difference (p=0.0001). The proportion of abnormal amniotic fluid color was much higher in the cases than in the controls: 75.81% versus 31.46%, a significant difference (p=0.0000). (Table XIV) The proportion of women who delivered vaginally without intervention was higher among the controls than the cases: 75% versus 60.17%. (Table XV) The proportion of newborns with a birth weight between 2500–4000g was higher in the controls than the cases: 86.86% versus 55.93%. (Table XVII) Among the stillbirths, 56.78% were fresh stillbirths while 43.22% were macerated. (Table XVIII) Malformations were more frequent in the cases than the controls: 4.24% versus 0.43%. This difference was statistically significant (p=0.0090). (Table XIX)

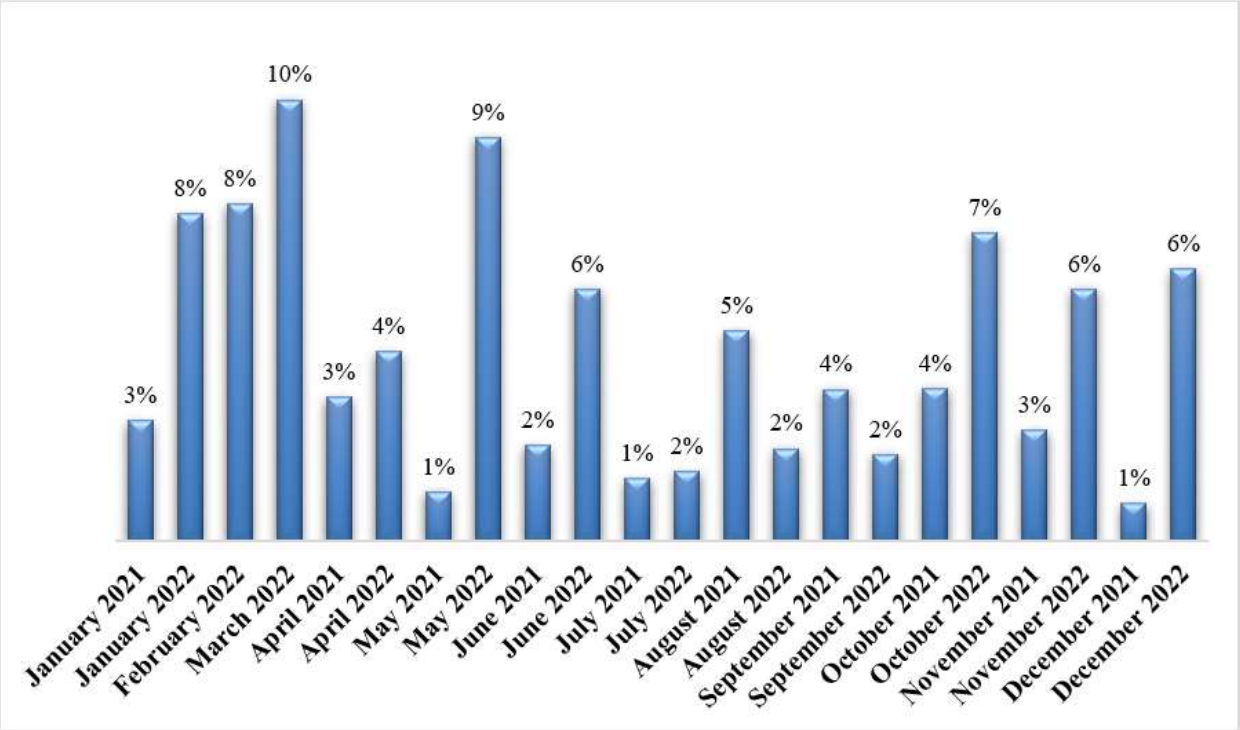

Figure 2: Stillbirth Rate by Month

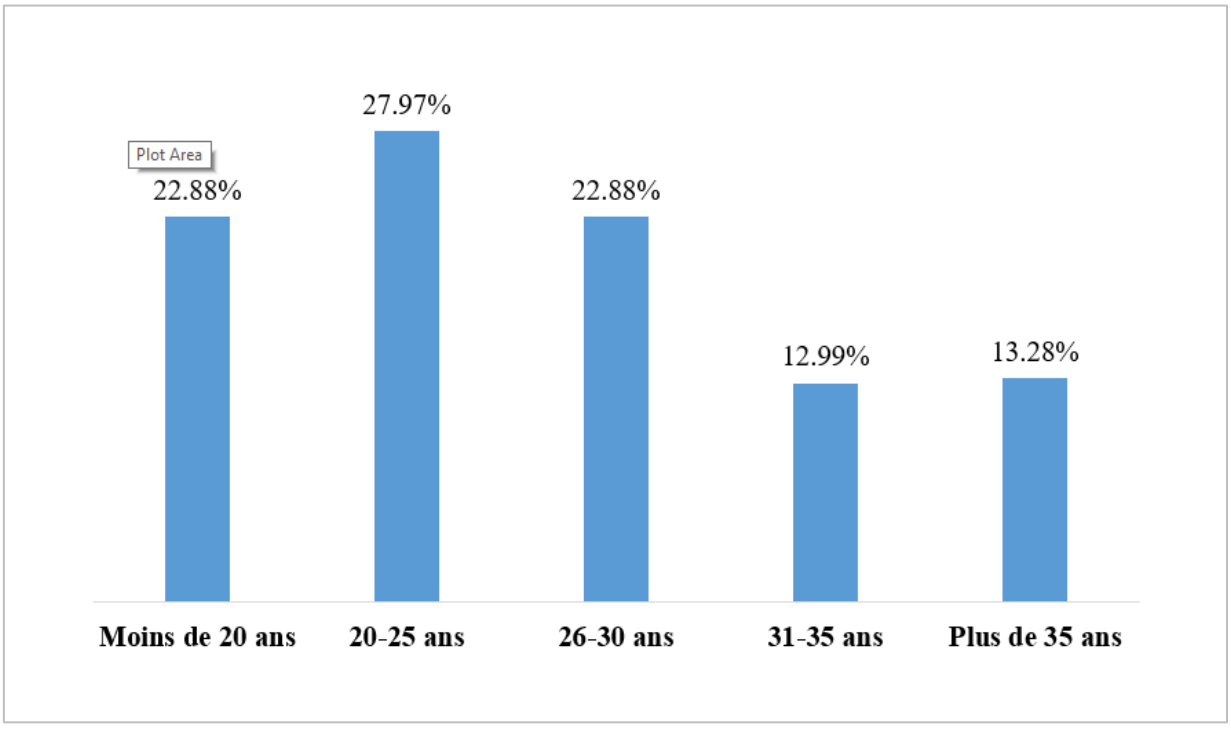

Figure 3: Distribution of Mothers by Age

Table IV: Distribution of Patients by Mode of Admission

Mode of Admission	Cases	%	Controls	%	Total	N	P-value	OR-95% CI
Self-referred	47	39.83	154	65.25	118	100	0.28	0.21 [0.35-0.57]
Referred/evacuated	71	60.17	82	34.75	236	100	0.00	1.75 [2.83-4.59]
Total	118	100	236	100	354			

Table V: Distribution of Patients by Admission Reasons

Admission Reason	Frequency	Percentage
Bleeding during pregnancy	19	12.42
Excessive uterine height (HU)	14	9.15
Scarred uterus	13	8.5
Hypertension / Preeclampsia	10	5.23
Premature rupture of membranes	10	6.54
Prolonged labor	9	5.88
Breech presentation	8	5.22
Absence of active fetal movements	7	4.58
Malpresentation	7	3.27
Cord prolapse	6	3.92
Fetal distress	6	3.92
Other reasons	5	3.25
Stationary dilation	5	3.27
Limited pelvis	4	2.61
Insufficient expulsive efforts	4	2.61
Feto-pelvic disproportion	3	1.96
Grand multiparity	3	1.96
Retroplacental hematoma	3	1.96
Threat of preterm birth	3	1.96
Hemorrhagic placenta previa	3	1.96
Transverse presentation	3	1.96
Painful uterine contractions	2	1.31
Premature rupture syndrome	2	1.31
Height < 150 cm	2	1.31
Dizziness and dyspnea	2	1.31
Total	**153**	**100**

Table VI: Distribution of Patients According to the Delay in Seeking Health Services (in Hours)

Delay in Seeking	Cases	Controls	Total	P-Value	OR-CI
Less than 2 Hours	7 (5.93%)	21 (8.90%)	28 (7.91%)	0.3297	0.23 [0.64-1.64]
2h to 8h	37 (31.36%)	182 (77.12%)	219 (61.86%)	0.0000	0.08 [0.14-0.29]
More than 8 Hours	74 (62.71%)	33 (13.98%)	107 (30.23%)	0.0000	5.93 [10.34-18.09]
Total	**118 (100%)**	**236 (100%)**	**354 (100%)**		

Table VII: Distribution of Patients According to Medical and Surgical History

Medical History	Cases (N=118)	Controls (N=236)	Total (N=354)	P-Value	OR-CI
Diabetes	2 (1.69%)	5 (2.12%)	7 (1.98%)	0.7872	0.07 [0.80-4.96]
Cardiopathy	3 (2.54%)	1 (0.42%)	4 (1.98%)	0.0754	0.48 [6.13-323.12]
Sickle Cell Disease	1 (0.85%)	0 (0.00%)	1 (0.28%)	0.1567	
Caesarean	10 (8.47%)	30 (12.71%)	40 (11.27%)	0.2352	0.27 [0.63-1.40]

Table X: Distribution of Patients According to Stillbirth History

Stillbirth	Cases	Controls	Total	P-Value	OR-CI
NO	97 (82.20%)	227 (96.19%)	324 (91.53%)	0.0000	0.07 [0.18-0.44]
YES	21 (17.80%)	9 (3.81%)	30 (8.47%)	0.0000	2.28 [5.46-13.98]
Total	**118 (100%)**	**236 (100%)**	**354 (100%)**		

Table XII: Distribution of Patients According to the Number of ANC Visits (CPN) by the Parturient

Number of ANC Visits	Cases (N=118)	Controls (N=236)	Total (N=354)	P-Value	OR-CI
0	38 (32.20%)	22 (9.32%)	60 (16.95%)	0.0000	2.47 [4.62-8.70]
1 to 3 ANC Visits	57 (48.31%)	153 (64.83%)	210 (59.32%)	0.0028	0.31 [0.51-0.81]
More than 4 ANC Visits	23 (19.49%)	61 (25.85%)	84 (23.73%)	0.1851	0.39 [0.69-1.22]
Total	**118 (100%)**	**236 (100%)**	**354 (100%)**		

Table XIII: Distribution of Patients According to Pathologies Occurred During Pregnancy

Pathologies	Cases (N=118)	Controls (N=236)	Total (N=354)	P-Value	OR-CI
Malaria	30 (25.42%)	7 (2.97%)	37 (10.45%)	0.0000	4.55 [11.15-30.96]
Severe Anemia	15 (12.71%)	4 (1.69%)	19 (5.37%)	0.0000	2.59 [8.45-35.58]
Chorioamnionitis	6 (5.08%)	0 (0.00%)	6 (1.69%)	0.0005	-
HRP	14 (11.86%)	1 (0.42%)	15 (4.24%)	0.0000	4.66 [31.63-1342.87]
PP	8 (6.78%)	1 (0.42%)	9 (2.54%)	0.0003	2.23 [17.09-761.36]
RU	9 (7.63%)	0 (0.00%)	9 (2.54%)	0.0000	-
DFP	9 (7.63%)	7 (2.97%)	16 (4.52%)	0.0466	0.87 [2.70-8.74]
Preeclampsia	8 (6.78%)	10 (4.24%)	18 (5.08%)	0.3047	0.55 [1.64-4.77]

Table XIV: Distribution of Patients According to Clinical Parameters at Admission

Clinical parameter at admission	Cases (n=118) %	Controls (n=236) %	Total (n=354) %	P-value	OR [CI]
Blood pressure					
Hypertension	7 (5.93%)	7 (2.97%)	14 (3.95%)	0.1771	0.60 [2.06–7.06]
Temperature					
Hyperthermia	20 (16.95%)	5 (2.12%)	25 (7.06%)	0.1771	3.29 [9.43–32.84]
Stage of labor					
Latent phase	35 (33.33%)	45 (20.09%)	80 (24.32%)	0.0090	1.14 [1.99–3.45]
Active phase	70 (66.67%)	179 (79.91%)	249 (75.68%)	0.0090	0.29 [0.50–0.88]
Uterine height (cm)					
26–31	58 (49.15%)	66 (27.97%)	124 (35.03%)	0.0001	1.53 [2.49–4.04]
32–36	46 (38.98%)	153 (64.83%)	199 (56.21%)	0.0000	0.21 [0.35–0.56]
>36	14 (11.86%)	17 (7.20%)	31 (8.76%)	0.1436	0.76 [1.73–3.89]
Fetal heart sounds					
Absent	117 (99.15%)	1 (0.42%)	118 (33.33%)	0.0000	1443.7 [27495–10927]
Present	1 (0.85%)	235 (99.58%)	236 (66.67%)	0.0000	9.15 [0.00–0.00]
Fetal presentation abnormality					
Abnormal presentation	35 (29.66%)	17 (7.20%)	52 (14.69%)	0.0000	2.77 [5.43–10.87]
Membrane status					
Intact	56 (47.46%)	147 (62.29%)	203 (57.34%)	0.0062	0.33 [0.54–0.86]
Ruptured	62 (52.54%)	89 (37.71%)	151 (42.65%)	0.0062	1.16 [1.86–2.99]
Amniotic fluid coloration					
Normal	15 (24.19%)	61 (68.54%)	76 (50.33%)	0.0005	1.09 [6.26–64.09]
Abnormal	47 (75.81%)	28 (31.46%)	75 (49.67%)	0.0000	3.09 [6.82–15.28]
Cord presentation anomalies					
Nuchal cord	6 (5.08%)	2 (0.85%)	8 (2.26%)	0.0114	1.09 [6.26–64.09]
Cord prolapse	9 (7.63%)	2 (0.85%)	11 (3.11%)	0.0005	1.94 [9.66–92.74]

Table XV: Distribution of Patients According to Delivery Method

Delivery Method	Cases (N=118)	Controls (N=236)	Total (N=354)	P-Value	OR-CI
Cesarean Section	46 (38.98%)	50 (21.19%)	96 (27.12%)	0.0004	1.42 [2.38-3.97]
Vaginal Delivery with Maneuver	1 (0.85%)	9 (3.81%)	10 (2.82%)	0.1123	0.00 [0.22-1.60]
Vaginal Delivery without Maneuver	71 (60.17%)	177 (75%)	248 (70.05%)	0.0041	0.31 [0.50-0.83]
Total	118 (100%)	236 (100%)	354 (100%)		

Table XVII: Distribution of patients according to birth weight (in grams)

Birth weight (g)	Cases (n=118) %	Controls (n=236) %	Total (n=354) %	P-value	OR [CI]
[1000–2500[	46 (38.98%)	25 (10.59%)	71 (20.06%)	0.0000	2.99 [5.40–9.81]
[2500–4000]	66 (55.93%)	205 (86.86%)	271 (76.55%)	0.0000	0.11 [0.19–0.33]
> 4000	6 (5.08%)	6 (2.54%)	12 (3.39%)	0.2127	0.53 [2.05–7.85]
Total	**118 (100%)**	**236 (100%)**	**354 (100%)**		

Table XVIII: Distribution of cases by type of stillbirth

Type of stillbirth	Frequency	Percentage
Fresh stillbirths	67	56.78%
Macerated stillbirths	51	43.22%
Total	**118**	**100%**

Table XIX: Distribution of patients according to the presence of external malformation

Malformation	Cases (n=118) %	Controls (n=236) %	Total (n=354) %	P-value	OR [CI]
NO	113 (95.76%)	234 (99.57%)	347 (98.30%)	0.0090	0.00 [0.09–0.88]
YES	5 (4.24%)	1 (0.43%)	6 (1.70%)	0.0090	1.13 [10.35–491.66]
Total	**118 (100%)**	**235 (100%)**	**354 (100%)**		

COMMENTS AND DISCUSSION

Overall Frequency

In our study, we observed a stillbirth prevalence of 5%. This result is lower than those reported by TRAORE B in Mali in 2021 [22] and KAMATE M H in Mali in 2018 [23], who found stillbirth rates of 15% and 36.65%, respectively. This difference may be attributed to better management and continuous training of the staff at the Ouelessebougou Referral Health Center.

Socio-demographic Characteristics

In our study, the mean maternal age was 26.13 years, with a range from 15 to 48 years. The 20–25-year age group was predominant, accounting for 28%. This result is similar to that of KEITA M in Mali in 2020 [9], who found that the 20–35 age group was predominant, at 55.20%. This could be explained by the fact that this age group corresponds to the peak of reproductive activity, rather than it being the most at-risk maternal age group. Patients aged over 35 years accounted for 13.28% in our study. At Ciriri Hospital (Congo, DRC), a study by MULONGO M noted that older women are at higher risk of stillbirth, regardless of parity [24].

According to the mode of admission, two major groups emerged: 60.17% of the patients were referred or transferred from peripheral health structures, while 34.75% came on their own. The risk of stillbirth was significantly higher among referred or transferred mothers, with an OR=1.75. This high rate of referred patients may be due to the fact that the Referral Health Center receives obstetric emergencies from other facilities. CAMARA B in 2021 in Mali [8] found that medical evacuation was the most frequent mode of admission, with 53.25% of the cases versus 5.19% of the controls. DIARRA I *et al.* in 2018 in Mali [28] found that 71% of patients were referred, compared to 29% self-referred.

The most frequent reasons for admission were: bleeding during pregnancy (12.42%), excessive uterine height (9.15%), scarred uterus (8.5%), and premature rupture of membranes (6.54%). A history of cesarean section was the most common surgical history, with a frequency of 12.7% among cases versus 8.5% among controls. This difference was not statistically significant. A history of stillbirth was found in 17.80% of the cases versus 3.81% of the controls, with a statistically significant difference (p=0.00). Our result is higher than that of KEITA M [32], who reported a stillbirth history rate of 10.40%.

Clinical Data

In our study, 60.17% of the mothers in the case group delivered between 37 and 41 weeks of gestation, compared to 83.47% in the control group. According to WHO, 1.3 million stillbirths occur during labor among full-term newborns who could have survived [33]. KEITA M in 2022 [9] observed that 65.60% of stillbirths occurred in patients with a gestational age between 37 and 40 weeks and 6 days. In our study, the proportion of women who had never attended an antenatal consultation (ANC) was higher among the cases than the controls: 32.9% versus 9.32%. We found a significant difference in the number of ANC visits between cases and controls (p=0.0000), similar to CAMARA B in 2021 [8], who reported that 46.75% of the cases had not attended ANC compared to 7.79% of the controls (p=0.001).

Pregnancy-Related Conditions

Malaria was more frequent among cases than controls: 25.42% versus 2.97%. This difference was statistically significant (p=0.0000). According to KEITA M [9] in 2020, malaria was the most common infection, with a frequency of 15.60%. There were more cases of anemia among the cases than the controls: 12.71% versus 1.62%. This difference was also statistically significant (p=0.0000). The association between malaria and stillbirth is documented in numerous publications [32,35]. McClure et al. in 2009 [32] reported malaria and

fever as infections found during their study, while DIALLO F *et al.* in 2016 found a predominance of anemia [31]. We found a significantly higher proportion of retroplacental hematoma among cases compared to controls (p=0.0000). Placenta previa was observed only in the case group: 6.78% versus 0.42% in controls, a statistically significant difference (p=0.0000). All cases of uterine rupture occurred only in the case group, with a significant difference compared to controls (p=0.0000). No significant difference was observed between the two groups regarding preeclampsia. Retroplacental hematoma was reported by KONE M *et al*. in 2010 [36]. Other complications such as uterine rupture, placenta previa, and eclampsia have been described by LANKOANDE *et al.* in 1997 in Burkina Faso [37], BUAMBO-BAMANGA *et al*. in 2004 in Congo [38], and N'Diaye *et al.* in 2017 in Senegal [39]. The management of these complications is poorly defined in developing countries, unlike developed countries where these conditions account for only a small percentage of stillbirth causes [40].

Clinical Examination

The proportion of hypertensive patients was slightly higher among cases than controls: 5.93% versus 2.97%, but the difference was not statistically significant (p=0.078). Pregnancy-induced hypertension makes pregnancy high-risk. KEITA M in 2020 [9] found hypertension and its complications in 16.70% of cases. We can state that hypertension remains a frequent cause of stillbirth; this high rate may be explained by inadequate pregnancy care. Early screening for hypertension during pregnancy and in delivery rooms is crucial before complications become unavoidable.

The proportion of patients with fever was higher among cases than controls: 16.95% versus 2.12%, a statistically significant difference (p=0.00). The active labor phase was significantly more frequent among controls than cases: 79.91% versus 66.67% (p=0.009). Fetal heart sounds on admission were noted in 99.58% of controls versus 0.85% of cases, a significant difference (p=0.00). Abnormal fetal presentation was significantly more frequent among cases than controls (p=0.00). Premature rupture of membranes was more frequent among cases: 52.54% versus 37.71%, a statistically significant difference (p=0.002). Premature rupture of membranes was observed in 11.50% of cases in the study by KEITA M [32]. The high stillbirth rate due to premature rupture of membranes in our study may be explained by the lack or poor quality of ANC and the absence of information given to pregnant women about danger signs.

Cord presentation abnormalities were much more observed among cases than controls: 7.63% versus 0.85%, a statistically significant difference (p=0.0001). The proportion of abnormal amniotic fluid color was higher among cases: 75.81% versus 31.46%, a statistically significant difference (p=0.00). The proportion of patients who delivered vaginally without maneuver was higher among controls than cases: 75% versus 60.17%. This difference was significant (p=0.002). Cesarean deliveries were 38.98% among cases versus 21.19% among controls. This is similar to the findings of KEITA M [9], who reported 60.40% vaginal deliveries and 33.30% cesarean sections.

Newborn Parameters

The proportion of newborns with a birth weight between 2500–4000 g was higher among controls than cases: 86.86% versus 55.93%. A significant difference in birth weight distribution was observed between the groups (p=0.00). Among stillbirths, 56.78% were fresh stillbirths, while 43.22% were macerated stillbirths. Stillbirths had a birth weight between 2500–4000 g in 66.70% of the cases in KEITA M's study [9]. This could be explained by the fact that, in his study, 74% of pregnancies had a gestational age of 37 weeks or more.

There were more cases of malformations among the stillbirths than the live births, at 4.24% versus 0.43%. This difference was statistically significant (p=0.0090). Our result is lower than that of CAMARA B [8], who reported congenital anomalies in 15.58% of cases. Some authors believe that the prenatal diagnosis of morphological anomalies by ultrasound could potentially help prevent them. These fetal deaths are almost always diagnosed late and remain unpredictable.

CONCLUSION

Our study revealed a stillbirth rate of 5% in the gynecology and obstetrics department of the Ouélessébougou Referral Health Center. The identified risk factors for stillbirth included: delayed access to healthcare services beyond 8 hours (OR=5.93); infectious complications such as malaria (OR=4.55), hyperthermia (OR=3.29), and pulse >100 bpm (OR=3.82); anemia (OR=2.59); obstetric complications including placental abruption (OR=4.66) and placenta previa (OR=2.23); lack of antenatal care (OR=2.47); a history of stillbirths (OR=2.28); and gestational age between 28 and 37 weeks (OR=2.19).

These risk factors highlight the need for healthcare professionals to be able to identify, screen, and critically monitor high-risk pregnancies, as well as ensure close surveillance during labor in all health facilities. Such measures would contribute to improving maternal and neonatal health outcomes. Strengthening the use of healthcare services and maternal antenatal care should be encouraged by providing appropriate information to mothers.

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