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Original Research Article

Bleeding in the First Half of Pregnancy and Foetal Outcome: A Retrospective Cohort Study in Two Hospitals in Cameroon

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Abstract: ***Background*:** Vaginal bleeding is the most common reason for consultation in early pregnancy and its effects on pregnancies that survive are still unclear. ***Objective*:** Our aim was to study the relationship between bleeding in the first half of pregnancy (BFHP) and foetal outcome (birth weight, gestational age at delivery, and 5th minute Apgar score) in a resource-limited setting. ***Methods*:** We conducted a retrospective cohort study in two hospitals in Yaoundé, Cameroon. Medical records of pregnant women who gave birth between January 2020 and May 2023 were reviewed. Participants were categorized into exposed (had vaginal bleeding <20 weeks of gestation) and unexposed groups. Foetal outcome (birth weight, gestational age at delivery, and Apgar score) was the primary outcome. Linear regression analysis was used to examine the contributions of variables to changes in foetal outcome. ***Results*:** Of the 200 women included, 35 (17.5%) experienced BFHP. The mean birth weight was significantly lower among women who bled compared to those who did not (2,813 ± 1,008g versus 3,276 ± 566 g; p <0.001). Similarly, the mean gestational age at delivery was smaller in the exposed group (36.3 ± 4.1 weeks versus 38.7 ± 2.4 weeks; p <0.001). The risk of low birth weight was nearly fivefold higher among women with BFHP (RR = 4.7; 95% CI: 2.4–9.3; p <0.001). Among women with BFHP, neither the duration (<1 day or >1 day) nor the gestational age at onset (<10 weeks or >10 weeks) influenced birth weight or gestational age at delivery. While regression analysis suggested a potential decrease in birth weight by 116 grams in the exposed group, this association was not statistically significant (p = 0.326). ***Conclusion*:** This study's findings suggest significant contribution of BFHP, and a history of BFHP in a previous pregnancy, to low birth weight and prematurity. However, further research to elucidate effect of duration and timing of BFHP, with larger samples or a prospective approach, is needed to better elucidate this relationship and the need to anticipate management, particularly in resource-limited settings, like Cameroon.

Keywords: Bleeding in Pregnancy, Prematurity, Low Birthweight, Yaoundé.

BACKGROUND

Bleeding in the first half of pregnancy (BFHP) refers to vaginal bleeding occurring in a pregnant woman before 20 completed weeks of gestation [1]. It includes bleeding in early pregnancy (BEP), a terminology usually applied for bleeding that occurs in the first 3 months of pregnancy or first trimester (up to 12 + 6/7 weeks from the first day of the last menses) [2].

Vaginal bleeding is the most common reason for consultation in early pregnancy [3]. However, it is a common event at all stages of pregnancy. Globally, 20% to 40% of all pregnant women experience vaginal bleeding during the first trimester of pregnancy [4]. In developed countries, the reported frequency of first-trimester bleeding varies between 11% and 35% [5]. In sub-Saharan Africa, studies have shown a narrower range of occurrence of bleeding in the first trimester of 21% to 27%, making it a public health problem [6,7].

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BFHP may result from disruption of blood vessels in the decidua, or discrete cervical or vaginal lesions [1]. The primary causes of pregnancy-related BFHP include the "abortion spectrum", ectopic pregnancy, and gestational trophoblastic diseases [8]. Some of these impose the need to terminate the pregnancy. Meanwhile, about 50-60% of pregnancies with BEP terminate in spontaneous abortions [9]. However, for pregnancies that survive, first- and second-trimester vaginal bleeding is reported to be a predictor of adverse foetal outcomes like preterm labour, prematurity, low birth weight, intrauterine growth retardation (IUGR), stillbirth, and neonatal death [10]. It is hypothesized that first-trimester bleeding may indicate an underlying placental dysfunction, which may manifest later in pregnancy with complications, such as pre-eclampsia, preterm labour, preterm pre-labour rupture of membranes, placental abruption, and IUGR [11].

A few studies carried out in Africa have evaluated BEP for the following pregnancy outcomes: placental abruption, placenta praevia, antepartum haemorrhage, abortion, low birth weight, preterm birth, and post-partum haemorrhage [12,13]. Findings from these studies reported that BEP is a predictor of preterm birth and placental abruption in both the index and future pregnancies. However, in Cameroon, we found no studies evaluating the association between BFHP and birth weight. Understanding this relationship could provide clinicians with valuable insight for anticipating potential complications and optimizing management strategies, especially in our context where obtaining optimum care for low birthweight infants is challenging. We, therefore, conducted this study to assess the impact of BFHP on birth weight in our context.

MATERIALS AND METHODS

Study Design and Setting

We conducted a retrospective cohort study at the Gynaeco-Obstetric and Paediatric Hospital of Yaoundé (GOPHY) and the Central Hospital of Yaoundé (CHY) using delivery records from January 2020 to May 2023. The exposed group (BFHP group) consisted of women who experienced vaginal bleeding before 20 weeks, while the non-exposed group included women without such bleeding. Records were selected consecutively and reviewed progressively until the required sample size for each group was achieved. We excluded files of women with a history of smoking during pregnancy, underlying chronic conditions (chronic hypertension, diabetes, HIV, sickle cell anaemia), significant infections during pregnancy (clinical malaria, hepatitis, toxoplasmosis, syphilis, rubella, chlamydia, cytomegalovirus, and herpes simplex virus), bleeding not from the cervical os, and cases with still-birth.

Data Collection and Analysis

Sociodemographic, obstetrical and foetal outcome variables were collected from these patients' records using a questionnaire and were entered into a Microsoft Excel spreadsheet and cleaned to ensure consistency and accuracy prior to analysis. Statistical analyses were performed using the IBM SPSS (statistical package for social sciences) version 23.0 (Chicago, Illinois, USA). Descriptive statistics were expressed as means with standard deviation (quantitative) and proportions (qualitative). A multivariate linear regression model was applied to assess for association between BFHP (and its characteristics) and birth weight, as well as with gestational age at birth. Variables were included in the model based on clinical relevance and bivariate analysis results. A p-value of less than 0.05 was considered statistically significant.

Ethical Considerations

Prior to recruitment we obtained ethical approval from the Institutional Review Board of the Faculty of Medicine and Biomedical Sciences of the University of Yaoundé I, and research authorization from the management of the two study hospitals. Data collected were anonymized and the computer used was code-protected to ensure confidentiality.

RESULTS

We had 200 women in our cohort, 35 of who were exposed (BFHF group), while 165 did not have BFHP (non-exposed).

Sociodemographic Characteristics

The mean age of our study participants was 28.7 (± 5.70) and 28.6 (± 6.35) in the exposed and non-exposed groups, respectively. Women were predominantly single in both groups, 62.9% and 53.3% in the exposed and non-exposed groups, respectively (p=0.740). Concerning the level of education, most women in both groups had a tertiary level of education, with 34.3% in the exposed group and 41.8% in the non-exposed group (Table I).

Obstetrical Characteristics of the Study Population

Most women had had 1-2 pregnancies in both groups (51.4% in the exposed group and 52.1% in the non-exposed). Similarly, women in both groups were predominantly primiparous (62.9% in the exposed and 69.7% in the non-exposed groups). Regarding history of BFHP, 17.1% of women in the exposed group reported this in their past (a pregnancy before the indexed one) compared to 0.61% in the non-exposed group (Table II).

Table I: Distribution of study participants according to sociodemographic characteristics

Characteristic	Exposed *n (%); N=35*	Non-Exposed *n (%); N=165*	Total *n (%); N=200*	p – value
Marital status: n (%)				
Married	10 (28.6)	58 (35.2)	68 (34.0)	0.740
Single	22 (62.9)	88 (53.3)	124 (88.1)	
Cohabitation	2 (5.7)	15 (9.1)	17 (8.5)	
*Others	1 (2.9)	4 (2.4)	5 (2.5)	
Formal education level: n (%)				
None	0 (0.0)	2 (1.40)	2 (1.0)	0.126
Primary	3 (8.6)	20 (12.1)	23 (11.5)	
Secondary	9 (25.7)	52 (31.5)	61 (30.5)	
University	12 (34.3)	69 (41.8)	81 (40.5)	
Religion: n (%)				
Christian	32 (91.4)	119 (72.1)	151 (75.5)	0.052
Muslim	1 (2.9)	10 (6.1)	13 (6.5)	

*Others: widowed, divorced, not specified

Table II: Obstetrical characteristics of our study population

Variable	Categories	Exposed *n (%); N=35*	Non-exposed *n (%); N=165*	Total *n (%); N=200*
Gravidity				
	1-2	18 (51.4)	86 (52.1)	104 (52.0)
	3-4	6 (17.1)	39 (23.6)	45 (22.5)
	5-6	11 (31.4)	29 (17.6)	40 (20.0)
	≥7	0 (0.0)	11 (6.7)	11 (5.5)
Parity				
	0-2	22 (62.9)	115 (69.7)	137 (66.5)
	3-4	9 (25.7)	29 (17.6)	38 (19.0)
	5-6	4 (11.4)	16 (9.70)	20 (10.0)
	≥7	0 (0.00)	5 (3.03)	5 (2.5)
BFHP in previous pregnancy				
	No	29 (82.9)	164(99.4)	193 (96.5)
	Yes	6 (17.1)	1 (0.6)	7 (3.5)

Comparison of Foetal Outcome Variables between Women with and Without BFHP

Birth Weight:

The mean birth weight in the exposed (BFHP) group was 2,813g; lower than that in the unexposed group (3,276g), with a p-value <0.001. Furthermore, neonates born to participants with BFHP were 4.7 times more likely to have low birth weight (RR= 4.71; 95% CI: 2.40 – 9.28, p< 0.001). Among exposed women, those who bled for more than one day had a lower mean birth weight of 2,813 ± 1301.3g (versus 2,994.3 ± 926.4g for the unexposed).

Considering the timing of bleeding, mean birth weight was lower among women who bled before 10 weeks compared to those who bled later, even though this difference was not statistically significant. Meanwhile, a BFHP duration of more than one day was associated with a higher risk of low birth weight (RR=2.15), a relationship that was not statistically significant (p= 0.254, 95% CI: 0.82 – 5.65). Similarly, women with onset of BFHP before 10weeks had a higher proportion of low birthweight, though the difference was statistically not significant. (Table III).

Table III: Relationship between BFHP and low birthweight at two hospitals in Yaoundé

Exposure	Low birthweight *n (%)*	No low birthweight *n (%)*	Relative Risk (RR)	95% CI	p – value
Presence of BFHP					
Yes	13 (37.1)	22 (62.9)	**4.71**	**2.40 – 9.28**	**< 0.001**
No	13 (7.9)	152 (92.1)			
BFHP duration					
> 1 day	2 (18.2)	1 (4.8)	2.15	0.82 - 5.65	0.254
< 1 day	9 (81.8)	20 (95.2)			
BFHP onset					
10+ weeks	5 (38.5)	14 (63.6)	0.53	0.22 – 1.30	0.174
<10 weeks	8 (61.5)	8 (36.4)			

BFHP: Bleeding in the first half of pregnancy

Gestational Age at Delivery and Apgar score

The mean gestational age at delivery was lower in the exposed group (36.26 versus 38.7 weeks; p<0.001) and the risk of prematurity was four times higher in the same cohort (RR= 4.04; 95% CI: 2.06 – 7.93; p<0.001). Among exposed women, those who bled for more than one day had a lower mean gestational age at delivery of 32.0 ± 6.2 weeks (versus 37.0 ± 3.3 weeks). Considering the timing of bleeding (before or after 10 weeks), the mean gestational age at delivery was similar between the two groups (35.5 ± 5.3 weeks versus 36.8 ± 4.3 weeks) with p = 0.972.

No significant association was observed between the duration of BFHP and prematurity (RR=1.07; P=1.0; 95% CI: 0.2 – 5.82). Similarly, the onset of BFHP did not significantly influence the likelihood of premature birth (RR= 0.842; 95% CI: -.34 – 2.1) with p=0.734 (Table IV).

With respect to Apgar score at the 5th minute of life, a higher proportion of neonates born to exposed women had APGAR scores of ≤7 at 5 minutes of life, compared to the unexposed (11.4% versus 8.48%). However, the difference was not statistically significant.

Table IIV: Relationship between BFHP and gestational age at birth

Exposure	Prematurity *n (%)*	No prematurity *n (%)*	Relative Risk (RR)	95% CI	p – value
Presence of BFHP					
Yes	12 (34.3)	23 (65.7)	**4.04**	**2.06 – 7.93**	**< 0.001**
No	14 (8.5)	151 (91.5)			
BFHP duration					
> 1 day	1 (10.0)	2 (9.1)	1.07	0.2 – 5.82	1.0
< 1 day	9 (90.0)	20 (90.9)			
BFHP onset					
10+ weeks	6 (50.0)	13 (56.5)	0.842	0.34 – 2.1	0.734
<10 weeks	6 (50.0)	10 (43.5)			

Using a linear regression model to investigate the influence of factors associated with birth weight and gestational age at delivery in this study, the results obtained are presented on table V below. BFHP and a history of BFHP in a previous pregnancy were associated with an average decrease in birth weight of 463g and 720, respectively. Similarly, the analysis reveals that BFHP and BFHP in a previous pregnancy may decrease gestational age at delivery by 2.4 weeks and 2.8 weeks, respectively. Maternal age showed no statistically significant impact on both foetal outcome variables.

Table V: Linear regression model investigating factors associated with low birth weight and prematurity

Outcome variable	Model Covariates	Estimate	2.5%	97.5%	p-value
Birthweight	Maternal age	14.366	-2.796	31.527	0.06
	BFHP in previous pregnancies	-720.461	-1305.882	-135.1	0.006
	BFHP	-462.88	-741.181	-183.395	<0.001
Gestational age at delivery	Maternal age	-0.25	-0.99	0.48	0.440
	BFHP in previous pregnancies	-2.791	-5.293	0.290	0.013
	BFHP	-2.434	-3.599	-1.268	<0.001

DISCUSSION

This study was a retrospective cohort study in two hospitals in Yaoundé, Cameroon and aimed to evaluate the impact of bleeding in the first half of pregnancy (BFHP) on foetal outcome. In this cohort of 200 women, BFHP was observed in 17.5% of cases and occurred predominantly in the first trimester. Sociodemographic and obstetric characteristics were comparable between exposed and non-exposed groups. However, bleeding in early pregnancy was associated with significantly poorer outcomes, including lower mean birth weight, and reduced mean gestational age at delivery, and higher risks of low birth weight and prematurity. Additionally, multivariable analysis showed that both current and prior bleeding episodes contributed to reductions in birth weight and gestational age at birth.

Socio-Demographic and Obstetric Profile of Our Study Population

In our study, there was no substantial variation between the two groups with regards to sociodemographic characteristics. The mean age of women was similar in both groups (28.7 in exposed group versus 28.6 in non-exposed). Studies done in 2019 in Sri lanka, and in 2020 in India reported such a similarity [14, 15]. However, other studies reported a higher incidence of bleeding with increased maternal age [13-16]. This discrepancy may be attributed to the larger sample sizes in those studies compared to ours. Advancing maternal age is a well-established risk factor for miscarriage, primarily due to a decline in oocyte quality, while changes in uterine and hormonal function may also contribute. However, our methodology eliminated these cases.

In both groups, women were predominantly single with 62.9% in the exposed group and 53.3% in the non-exposed group, the small difference was not statistically significant (p=0.740). These findings differ from those reported in Sri Lanka in 2019. In their study, they found a slightly higher percentage of married women in the exposed group (99%) compared to 98.6% the unexposed group, a difference that was not statistically significant [14]. Very few women in the non-exposed group (1.4%) were illiterate, while no one in the exposed group was illiterate. This study was done in two tertiary hospitals in an urban setting, which could explain this low proportion of women with a low level of formal education. This reflects the literacy situation in Cameroon where 73.12% of the adult female population are literate [17]. Most women in both groups had a gravidity between one and two (51.4% in BFHP group and 52.1% in the no BFHP). This is, however, different from the findings of Bala *et al*., which revealed that the majority of patients with BFHP were multigravida (58%) [15]. The absence of a statistically significant differences in sociodemographic variables supports the comparability of our study groups and minimizes the potential for confounding by baseline characteristics.

With respect to the obstetric history of BFHP, 17.1% of women in the exposed group reported a previous episode of bleeding during early pregnancy compared to only 0.61% in the non-exposed group. This difference was statistically significant ($p < 0.001$). These findings are consistent with one in Iran, which reported that 33.3% of women with bleeding in early pregnancy had a history of similar episodes in prior pregnancies [18]. These findings suggest that a constitutional or a permanent environmental factor could be playing a role in the occurrence of BFHP.

Characteristics of Bleeding in the First Half of Pregnancy

The majority of participants bled before 14 weeks (85.7%), which is similar to the findings of Bala *et al*., [15]. This is expected, as the first trimester represents the critical phase of implantation and placental development, during which the decidua and trophoblastic tissues are highly vascular and fragile [19]. Minor disturbances at this stage, such as subchorionic hematoma or incomplete implantation, can easily result in bleeding [20]. Bleeding occurred spontaneously in 85.7% of women and was caused by infection in only 5.7% of cases. Most women (85.7%) bled for a day or less. This is in line with the study conducted by Bala *et al*., [15].

Perinatal Outcomes in Women with and Without Bleeding in the First Half of Pregnancy

Our study revealed a statistically significantly higher proportion of preterm birth in women with BFHP ($P<0.001$) and the mean gestational age at delivery amongst those who had BFHP (36 weeks) was lower than in those without BFHP (39 weeks). This is in line with findings from previous studies [14-22]. It has been speculated that the presence of blood after threatened miscarriage, with the disruption of the chorioamniotic space and the resultant chronic inflammatory reaction, might precipitate preterm labour [23]. A hematoma could also form a nidus for intrauterine infection, which, in turn, could stimulate uterine contractions [24].

Additionally, though not statistically significant, we found increased proportions of poor APGAR scores in women with BFHP, as 11.4% of women with BFHP had an APGAR score at 5 minutes less than 7, compared to 8.48% amongst women without bleeding. This is similar to studies done in India and in Sri Lanka [14-21]. This observation may be attributed to the higher rates of preterm delivery within the exposed group.

There was a statistically significant decrease in mean birth weight in women exposed to BFHP (2813g) compared with those unexposed (3276g). Several studies also reported a statistically significant decrease in birth weight in women with BFHP [14-22]. Additionally, the risk for low-birth-weight babies among women with BFHP was nearly fivefold higher compared to women with no BFHP and this association was statistically significant. A study conducted in Peradeniya, Sri Lanka, revealed a similar association with a RR of 4.7 (95% CI = 2.4–9.3; $P < 0.001$). A similar finding was also reported in Benin City, Nigeria, where the relative risk of low birth weight in women with BEP was 7.3 (95% CI: 3.24–16.59; $p = 0.001$). This strong association between BFHP and low birth weight could be explained by a disruption in maternal-foetal perfusion leading to foetal growth restriction, and hence low birth weight.

It is also reported that the risk of adverse pregnancy outcomes in women who experience ‘light’ versus ‘heavy’ bleeding may be different [25]. However, in this study, the duration and timing of bleeding did not show a statistically significant association with most/any foetal outcomes, although certain trends were observed. Women who bled for more than one day tended to have lower mean birth weights and shorter gestational ages at delivery compared with those whose bleeding lasted a day or less. Similarly, women who experienced bleeding before 10 weeks of gestation had infants with slightly lower mean birth weights than those who bled after 10 weeks. These findings, though not statistically significant, suggest a possible relationship between the extent or timing of bleeding and the severity of adverse foetal outcomes. The lack of statistical significance in our analysis may be due to the small number of women in the subgroups, limiting statistical power.

Several other studies have equally investigated on the relationship between early pregnancy bleeding and infant outcomes [26, 27]. A 2018 prospective cohort study of more than 2,300 healthy pregnant women in the United States found that first-trimester vaginal bleeding

lasting more than one day was statistically associated with lower estimated foetal weight and increased risk of delivering an infant small for gestational age, compared with women who did not bleed or who bled for one day only [28].

Following linear regression, bleeding in early pregnancy was found to lower birth weight and increase risk of prematurity. The association between bleeding in early pregnancy and birth weight was significant in this model, similar to what is found in other studies [22].

Limitations of the Study

Since this study was retrospective and hospital-based, it was limited by incomplete documentation and potential selection bias, as only women who delivered at the study hospitals were included and incomplete files excluded. Details on bleeding severity and recurrence were often unavailable, and the small number of exposed women reduced statistical power. These factors may have underestimated the true impact of early pregnancy bleeding on perinatal outcomes.

CONCLUSION

Bleeding in the first half of pregnancy is common, with the great majority (86%) before the 15th week of pregnancy. It is associated with a significant reduction in mean birth weight and an increased risk of low birth weight and preterm delivery among women who reach foetal viability. A history of BFHP was also observed to alter negatively these foetal outcome variables. However, duration of bleeding or timing of BFHP did not alter these variables significantly, possibly in relation to our modest sample size.

These findings emphasize the importance of early recognition, close monitoring, and appropriate anticipation of perinatal challenges in women presenting with bleeding in early pregnancy, especially in resource-limited settings like Cameroon.

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Authors' Contributions

Designed the study. Data collection. Performed statistical analysis. Drafted the manuscript. Critically read the manuscript. Supervision. All authors gave their approval for publication.

Ethical Approval

The study was ethically approved by the Institutional Ethics Review Board of the Faculty of Medicine and Biomedical Sciences of the University of Yaoundé 1.

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