Hindawi
Advances in Public Health
Volume 2022, Article ID 3955869, 11 pages
https://doi.org/10.1155/2022/3955869

Research Article

Prevalence and Factors Associated with Low Birth Weight and Preterm Delivery in the Ho Municipality of Ghana

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Received 10 December 2021; Revised 30 January 2022; Accepted 3 February 2022; Published 23 February 2022

Academic Editor: Daniel Diaz

Background. Low birth weight and preterm delivery are birth outcomes that can predict newborns' survival, development, and long-term health outcomes. This study assessed the prevalence and factors associated with low birth weight and preterm delivery in the Ho Municipality of Ghana. *Methods*. This retrospective, cross-sectional study analysed data from 680 birth records between October and December 2018. Univariate and multivariate logistic regression models predicted low birth weight and preterm delivery factors. *Results*. The prevalence of low birth weight and preterm delivery was 12.9% and 14.1%, respectively. Increasing maternal age (AOR: 0.52; 95% CI: 0.28–0.98), multiparity (AOR: 0.54; 95% CI: 0.30–0.94) and increasing doses of sulphadoxine-pyrimethamine (AOR: 0.43; 95% CI: 0.22–0.84) significantly reduced the odds of low birth weight. However, caesarean section (AOR: 1.94; 95% CI: 0.1.16–3.27) and hypertension (AOR: 2.06; 95% CI: 1.27–03.33) significantly increased the likelihood of low birth weight. An increasing number of antenatal care visits (AOR: 0.38; 95% CI: 0.18–0.80) and doses of sulphadoxine-pyrimethamine (AOR: 0.43; 95% CI: 0.19–0.97) were significantly associated with decreased odds of preterm delivery, while caesarean section increased the odds of preterm delivery by two folds (AOR: 2.14; 95% CI: 1.15–3.99). *Conclusion*. This study shows that maternal age, parity, number of antenatal care visits, hypertension, SP/IPTp, and caesarean section were independently associated with low birth weight and preterm delivery. Education and interventions should be prioritised as vitally important on these factors to reduce the risk and complications associated with these birth outcomes.

1. Background

Birth weight is an important variable that influences newborns' survival and development. It refers to the first weight taken in the first few hours of birth. Therefore, normal birth weight is crucial for neonatal survival, optimal child development, and healthier life in adulthood [1]. The World Health Organization (WHO) stipulates that the average weight that reaches full term is between 2.7 and 4.1 kilograms with an average weight of 3.5 kilograms. WHO defines low birth weight (LBW) as weight at birth of less than 2.5 kilograms/2500 grams [2]. Epidemiological data influenced this classification that newborns who weigh less than 2.5 kilograms are at increased risk of neonatal mortality compared to their heavier counterparts [3]. Preterm delivery (PTD) is described as birth of babies before 37 weeks of gestation are completed [4]. Preterm babies are at a greater risk of neonatal infections and may require more complex care, resulting in prolonged hospitalisations, increased costs, and high mortality [5].

According to WHO, the main reason for low birth weight is preterm delivery, though its aetiology remains a mystery. However, some researchers argue that morbidities and infections such as malaria, hypertension, syphilis, and HIV can cause preterm delivery [6, 7]. Others argue that preterm delivery is caused by multiple aetiologies such as individual and environmental factors, making its prediction and prevention difficult during antenatal care [8, 9].

Though advances in medical research have improved birth outcomes [10], these birth outcomes remain issues of public health concern, particularly in low- and middle-income countries, as significant contributors to morbidity and mortality during neonatal, infancy, and childhood stages [11]. Different studies have reported different factors which influence low birth weight. For instance, a survey in China identified young maternal age, educational level a history of adverse pregnancy outcomes and maternal morbidities such as hypertensive disorders and gestational diabetes to be associated with low birth weight [12]. Several risk factors have also been reported to influence PTD. These include age, socioeconomic status, gestational diabetes, preeclampsia, and foetal distress [13, 14].

In sub-Saharan Africa, maternal malaria and HIV infections are significantly associated with adverse birth outcomes. In Nigeria, a study found that 14.1% of babies born to HIV-positive women had LBW compared to 1.0% in women with no HIV infection [15]. A secondary analysis of a randomised controlled trial in Malawi reported that preterm babies were born to 36.4% of women with malaria compared to 28.5% without malaria. However, the same study did not find any statistically significant difference between preterm delivery and HIV infection [6]. There are inconsistent results concerning maternal age as a factor for these birth outcomes. For instance, some studies have reported that the risk of delivering low birth weight babies among teenage mothers is higher than that of older women [16, 17]. However, older mothers are more likely to experience these birth outcomes [18, 19].

In Ghana, the 2014 Ghana Demographic and Health Survey (GDHS) reported that 10% of newborns in Ghana had LBW [20]. However, the prevalence of LBW in parts of the country is higher. For instance, 26% was reported in a study in Northern Ghana in 2015 [21] and 21% in the Ashanti region in 2013 [22]. There is no national data on the prevalence of PTD. That notwithstanding, some studies have been conducted to identify factors associated with LBW and PTD. A study in the Greater Accra region found that premature rupture of membrane and preeclampsia/eclampsia were associated with increased risk of preterm delivery while four or more antenatal care visits were protective against PTD [23]. A similar study on LBW reported anaemia, preterm delivery, education, and not taking iron supplements during pregnancy to be significantly associated with LBW [11].

The Volta Region of Ghana is reported to have above-average health indicators regarding antenatal care, hospital-based deliveries, and low malnutrition indices such as underweight, wasting, and stunting. This is corroborated by findings from the 2014 GDHS that suggested the region improved health indicators compared to other regions [20]. However, the region is known to have one of the highest prevalences of teenage pregnancy, which is a known risk factor for LBW and PTD [24]. Based on the different proportions of low birth weight reported by previous research and the dearth of research on this subject matter in the region, it is vital to study the factors that influence these birth outcomes in the region.

Adequate knowledge on factors associated with these birth outcomes is crucial for identifying them and providing appropriate care and attention to at-risk pregnant women. However, little is known about factors that predispose a pregnant woman to deliver low birth weight or preterm babies in the Ho Municipality. Consequently, identifying these factors will considerably contribute to current efforts to address these issues of public health concern, which can jeopardise newborns' future. In that regard, a decline in the incidence of low birth weight and preterm babies will significantly reduce costs associated with catering for such babies, lessen the burden on the health system, and reduce the occurrence of neonatal and childhood morbidity and mortality in the region and the country as a whole. This study assessed the prevalence and factors associated with low birth weight and preterm delivery in the Ho Municipality of Ghana.

2. Methods

2.1. Study Site and Design. We conducted a retrospective cross-sectional study at the Ho Teaching Hospital (HTH) in the Volta Region of Ghana, which serves as the major referral hospital in the region. The hospital was established in December 2000 and was upgraded to a teaching hospital in April 2019. HTH is in the Ho Municipality, one of the 17 districts in the Volta Region. Ho Municipality has a total land area of 2,361 square kilometres. The municipality has about 49 health facilities that provide health services to its population of 177,281. The 300-bed capacity hospital is strategically located to render specialised health services to indigenes of the Volta Region and beyond. Clients also patronise the hospital from the Republics of Togo and Benin and the Federal Republic of Nigeria. The HTH has approximately 103,964 annual outpatients' attendance and provides about forty-one (41) essential services, including maternal and child health services. Pregnancy-related complications, anaemia, and malaria remain the top three causes of all hospital admissions [25]. Professionally trained nurses and midwives at the maternity unit of the HTH record pregnancy and birth outcome information of expectant mothers and demographic information of these mothers in delivery registers. This study examined the birth records of all mothers who delivered live babies at the HTH between October and December 2018 to identify factors associated with low birth weight and preterm delivery.

2.2. Data Extraction and Sample Size. A pretested data extraction sheet extracted maternal and newborn characteristics from paper-based delivery registers. Four trained midwives extracted the data from the registers. These midwives were oriented on the eligibility criteria for inclusion in the study and the data extraction process. Data collection was supervised daily to ensure the extracted data's consistency, completeness, and accuracy. All live births within the study period were considered for this study. However, analysis was conducted on 680 birth records after stillbirths, multiple births, babies born with congenital abnormalities (structural and functional anomalies or malformations identified at birth), and birth records with missing information were excluded. Birth records of babies born with congenital abnormalities and multiple births were excluded based on the assumption that they had different risks and aetiology for low birth weight and preterm delivery. Stillbirths were also excluded because they were few, and a majority had missing information on birth weight and gestational age (Figure 1). This study did not include home deliveries as health professionals did not supervise home deliveries, and as such, data on birth weight, gestation, and other maternal and child health variables used in this study were not available.

2.3. Study Variables. The outcome variables of this study were low birth weight and preterm delivery. Birth weight was dichotomised as a binary variable; 0 "normal weight" when birth weight ≥2.5 kilograms and 1 "LBW" when birth weight was <2.5 kilograms. Similarly, gestational age was also dichotomised into 0 "carried to term" when gestational age at delivery was ≥37 weeks and "PTD" when gestational age at delivery was <37 weeks. Gestational age was determined at birth from birth records documented by midwives. Birth records that documented ultrasound to determine gestational age were included.

Explanatory variables included maternal sociodemographic information, such as age categorised based on [20], educational level, occupation, marital status, religion, and ethnicity. Obstetric characteristics such as parity (0 = nulliparous, 1 = primiparous, 2–4 = multiparous, and ≥5 = grand multiparous), gravidity (1 = primigravida and ≥2 = multigravida), type of delivery, intake of sulphadoxine pyrimethamine (SP) for intermittent preventive treatment of malaria in pregnancy (IPTp) and the number of antenatal care (ANC) visits (<four visits, four visits, and >four visits) were also extracted. Additionally, maternal health conditions such as malaria, hypertension, hepatitis B and syphilis infections, and sickling status were captured. Data on maternal conditions were extracted based on routine testing of pregnant women on their first antenatal care visit. The haemoglobin level of mothers was dichotomised into normal (≥11.0 g/dl) and anaemic (<11.0 g/dl) based on WHO cutoffs [26]. These explanatory variables may influence the occurrence of LBW and PTD, as found in similar previous studies [27–29].

2.4. Data Management and Analysis. The data extraction sheets were checked for accuracy and completeness before passing on for data entry. Data entry was done using EpiData Data Entry Client (v4.4.3.1) and then exported to STATA MP/16.0 (College Station, TX, USA) for analysis. Validity and consistency checks were conducted after the data entry to ensure errors were reduced before data analysis. Descriptive statistics were used for frequencies. Percentages were reported for categorical variables.

Univariate and multivariate logistic regression analyses were performed for outcome variables. The outcomes of interest for the study variables were low birth weight and preterm delivery. Strengths of associations between outcome variables and explanatory variables were determined using crude odds ratios (Model I). Explanatory variables with p values <0.05 in the univariate analysis (Model I) were considered for a stepwise multivariate logistic regression model (Model II). The goodness of fit of Model II was examined using the likelihood ratio test. This was done by examining the likelihood of data under the full model compared to data under an alternative model with reduced explanatory variables. The overall model recorded a p value less than 0.05, and we concluded the model was good. The variable inflation factor (VIF) was used to cater for multicollinearity. Explanatory variables with VIF values exceeding 5 were excluded from Model II as that value indicated high multicollinearity between the outcome variable and other explanatory variables. Adjusted odds ratios and confidence intervals were computed with p values <0.05, considered statistically significant in Model II.

3. Results

3.1. Sociodemographic Characteristics of Women Who Delivered. Six hundred and eighty (680) women were involved in this study with a mean age of 27.5 ± 6.18. Women aged 20–34 years formed the majority of the participants. Few women, 96(14.1%), had no formal education while the remaining 85.9% had varying forms of education ranging from primary school 82 (12.1%) to university education 116 (17.1%). More women, 431 (63.4%), were employed in the private sector, and more than half 445 (65.4%) were married. Christianity 603 (88.7%) was the dominant religion, while Ewe was the dominant tribe (Table 1).

3.2. Maternal Obstetric Characteristics of Women Who Delivered. Maternal obstetric information is summarised in Table 2. The majority of the women were multiparous 238 (35.0%) and multigravida 504 (74.1%). A little more than a third, 238 (35.0%), of the women had taken three doses of SP, while 218 (32.9%) had taken more than three doses of SP. More than half, 519 (76.3%), had more than 4 ANC visits. Based on infectious diseases, 30 (4.4%) had hepatitis B infection, 6 (0.9%) had syphilis, and 135 (19.9%) had malaria. Less than half 102 (15%) had hypertension, while 390 (57.4%) had anaemia.

3.3. Prevalence of Low Birth Weight and Preterm Delivery. Out of the 680 women included in this study, the prevalence of LBW (Figure 2) was 12.9% [95% CI: 10.5%–15.7%] while that of PTD was 14.1% [95% CI: 11.9%–17.3%]. The mean birth weight was 3.03 kg (±0.57) with a range of 0.5–4.6 kg. Similarly, the mean gestation age was 38.7 weeks (±2.48) with a range of 24–44 weeks.

3.4. Factors Associated with Low Birth Weight. Multivariate logistic regression was used to predict the factors associated with LBW (Table 3). In the adjusted analysis, women aged 20–34 years had 48% lower odds of delivering LBW babies (AOR: 0.52; 95% CI: 0.28–0.98; $p < 0.05$) than those younger than 20 years. Additionally, multiparous women had 46% lower odds of having LBW babies (AOR: 0.54; 95% CI: 0.30–0.94; $p < 0.05$) than their nulliparous counterparts. Women who delivered through caesarean section (CS) were 94% more likely to have LBW

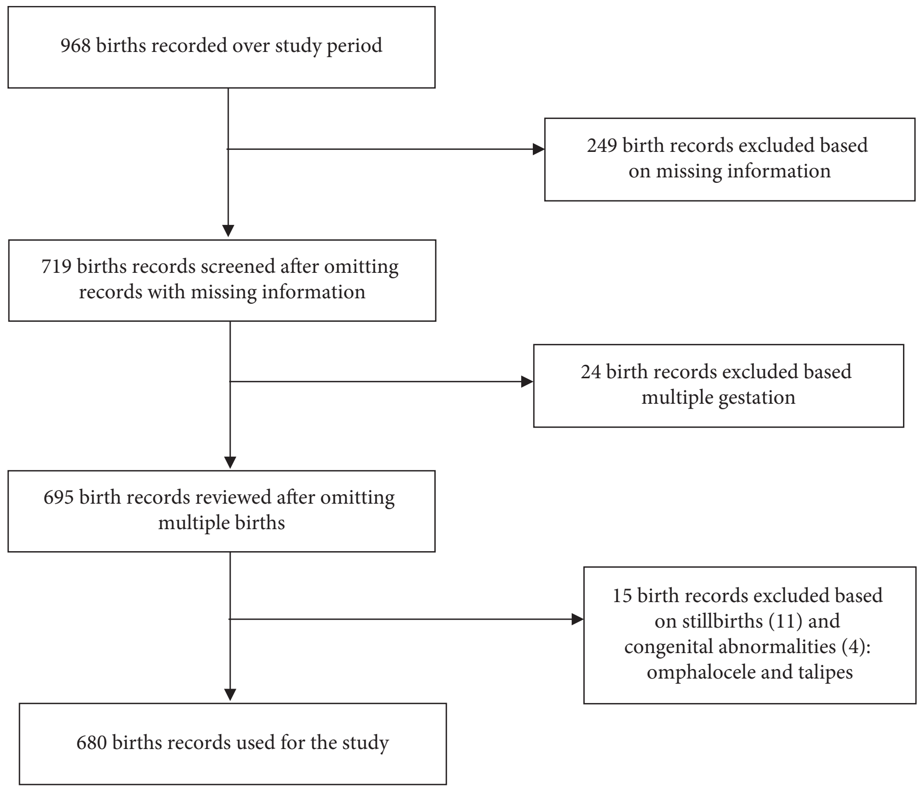

Figure 1: Flow diagram of data extraction.

babies (AOR: 1.94; 95% CI: 0.1.16–3.27; $p < 0.05$) compared to those who had vaginal deliveries. Furthermore, women who took more than three doses of SP for IPTp had 57% lower odds of giving birth to LBW babies than those who took less than three doses of SP (AOR: 0.43; 95% CI: 0.22–0.84; $p < 0.05$). Hypertensive women were two times more likely to have low birth weight babies than normotensive women (AOR: 2.06; 95% CI: 1.27–03.33; $p < 0.05$).

3.5. Factors Associated with Preterm Delivery. Table 4 summarises the factors associated with preterm delivery. Women who had caesarean sections were two times more likely to have PTD than those with vaginal delivery (AOR: 2.14; 95% CI: 1.15–3.99; $p < 0.05$). However, women with more than 4 ANC visits were 62% less likely to experience PTD (AOR: 0.38; 95% CI: 0.18–0.80; $p < 0.05$) than those with less than four visits. Furthermore, women who took more than three doses of SP were also 57% less likely to have preterm delivery than those with less than three doses (AOR: 0.43; 95% CI: 0.19–0.97; $p < 0.05$).

4. Discussion

This study sought to identify the factors associated with LBW and PTD among women in the Ho Municipality of Ghana. Overall, the study found the prevalence of LBW to be 12.9%. This proportion is higher than the 10% national prevalence reported in 2014 by GDHS. The reported prevalence in this study is also higher than the 6% recorded for the Volta Region in the same 2014 by DHS [20]. The prevalence of LBW in this study is also higher than that reported in the United Arab Emirates. That study reported a prevalence of 9.4% [30]. This could be attributed to geographical differences in study sites.

Our study found that women aged 20–34 years were less likely to have LBW babies than those younger than 20 years. This is consistent with data published by Althabe and colleagues, Alemu and Umeta, and Taha and colleagues. These studies reported that teenage mothers have an increased risk of delivering LBW babies compared to older women [16, 17, 30]. However, this finding was inconsistent with [18, 19] who reported older women to have an increased risk of LBW compared to younger women. These results still point to the fact that inconsistent results still exist about maternal age and adverse birth outcomes, particularly LBW. Teenage mothers are most likely to be first-timers with little or no experience with the management of pregnancies. This could explain why women aged 20–34 years had fewer LBW odds than teenage mothers in this study. Additionally, teenage mothers may not be physically and emotionally mature. Thus, their bodies may be unable to deal with the stress of pregnancy [24]. Coupled with this, good maternal nutrition, socioeconomic status, and adequate ANC attendance could have made the 20-34-year-old women less likely to experience LBW.

Low birth weight babies were less likely to be born to multiparous women. This is consistent with a recent study conducted in India that reported that the increased parity of a mother increased the mean birth weight of babies [31].

Table 1: Sociodemographic characteristics of women who delivered.

Characteristics	Frequency ($N = 680$)	Percentage (%)
Age (years)		
< 20	79	11.6
20–34	494	72.7
35–49	107	15.7
Educational level		
No formal education	96	14.1
Primary school	82	12.0
JSS/JHS/middle school	239	35.2
SHS/SSS/vocational	147	21.6
University	116	17.1
Occupation		
Unemployed	146	21.5
Private sector	431	63.4
Public sector	103	15.1
Marital status		
Single	235	34.6
Married	445	65.4
Religion		
Christianity	603	88.7
Islam	48	7.0
African traditional religion	29	4.3
Tribe		
Ewe	484	71.2
Akan	65	9.6
Guan	58	8.5
Others	73	10.7

Table 2: Obstetric characteristics of women who delivered.

Characteristics	Frequency ($N = 680$)	Percentage (%)
Parity		
Nulliparous	225	33.1
Primiparous	191	28.1
Multiparous	238	35.0
Grand multiparous	26	3.8
Gravidity		
Primigravida	176	25.9
Multigravida	504	74.1
Delivery type		
Normal/vaginal	538	79.1
Caesarean section	140	20.6
Vacuum extraction	2	0.3
SP/IPTp dosage		
< 3	218	32.1
3	238	35.0
>3	224	32.9
ANC visits		
<4	80	11.8
4	81	11.9
>4	519	76.3
Hepatitis B infection		
Negative	650	95.6
Positive	30	4.4
Syphilis infection		
Negative	674	99.1
Positive	6	0.9
Hypertension status		
Normotensive	578	85.0
Hypertensive	102	15.0
Anaemia status		
Normal	290	42.6
Anaemic	390	57.4
Sickling status		
Negative	563	82.8
Positive	117	17.2
Malaria infection		
Negative	545	80.1
Positive	135	19.9
Obstetric complications		
Absent	657	96.6
Present	23	3.4

Similarly, another study in Bangladesh also found that increasing parity increases birth weight leading to a reduction in the occurrence of LBW [32]. A plausible explanation for this observation might be that increased parity might lead to increased experience with pregnancy and childcare, ANC attendance, nutritional status, and health-seeking behaviour. However, this finding was incongruent with a similar study conducted in the Brong-Ahafo region of Ghana. That literature suggested that increasing parity significantly increased the odds of low birth weight [33]. Another study in Ethiopia reported similar findings to Mohammed and colleagues [34].

In this study, the odds of delivering a LBW baby were significantly higher among women who delivered their babies through CS than those with vaginal deliveries. This finding resonates with studies conducted in the United Arab Emirates [30] and China [35]. Some studies have reported an epidemic of CS, which these studies have found to increase adverse birth outcomes such as LBW and preterm delivery [36, 37]. A plausible explanation for this finding in this study could be attributed to the abuse of planned CS. A phenomenon that has been documented in an earlier study in Brazil where it was reported that CS was wrongfully associated with LBW, particularly among private hospitals [38]. In that regard, there is the need to adhere to WHO's recommendations that CS birth should not be planned before 39 completed weeks of gestation unless it is medically indicated for the benefit of either the foetus, mother or both [39]. There are inconsistent results regarding the association between LBW and CS. Some studies have reported that CS is protective against low birth weight [40, 41], while others have shown that it increases the likelihood of LBW [42], which is similar to the current findings.

The WHO recommends pregnant women take three or more doses of sulphadoxine pyrimethamine for intermittent prevention of malaria in pregnancy (SP/IPTp) in moderate to high malaria transmission areas [43]. We found that more than three doses of SP/IPTp significantly reduced the odds of LBW. This conforms with several studies conducted in Tanzania [44, 45], Cameroon [46], Nigeria [47], and Ghana [48]. The protective nature of SP against LBW could be explained by its therapeutic effect against both malaria and nonmalaria infections. This is supported by evidence from a Zambian study that reported that SP's bacterial and parasitic effects significantly improved the birth weight of neonates born to women who took more doses of SP during

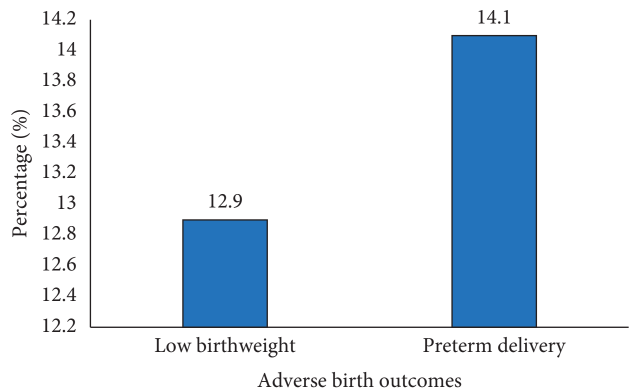

Figure 2: Prevalence of low birth weight and preterm delivery.

pregnancy. The sulphadoxine component of SP provides a broad spectrum of antiparasitic and bacterial activities [49]. Thus, constant exposure via monthly uptakes of SP could reduce microbial density and immunological reactions, leading to reduction in adverse birth outcomes, such as LBW [49–51].

Our findings further indicate that the likelihood of LBW was significantly higher among hypertensive women compared to their normotensive counterparts. This is consistent with the literature in China [52], Ethiopia [53], Brazil [54], and Haiti [55]. Some studies have linked pregnancy-induced hypertension and LBW to intrauterine growth restriction due to the placenta not receiving enough nutrients. This occurs due to poor perfusion of blood containing nutrients via the placenta. The placenta provides blood and essential nutrients for optimal growth and development from the mother to the foetus [53]. Thus, pregnancy-induced hypertension increases the risk of poor foetal nutrition hence poor foetal growth leading to LBW [52, 56].

The current study also identified factors associated with PTD and found that women who took more than three doses of SP had reduced odds of having a preterm birth. This resonates with data published in an earlier study in Northern Ghana, where it was reported that high uptake was significantly associated with delivery at term [57]. The uptake of more doses of SP is known to reduce the prevalence and intensity of placenta malaria and placenta parasitemia, which are significant risk factors for preterm delivery [47, 58, 59]. This finding provides valuable information on the effectiveness of SP, particularly in malaria-endemic settings. Additionally, some researchers have reported that SP may have some secondary effects on bacterial and fungal infections, promoting maternal and fetal health, thereby reducing the occurrence of preterm delivery [60–62].

The importance of antenatal care in the prevention, detection, and treatment of pregnancy-related conditions cannot be underestimated. With this, WHO recommends all pregnant women go for their first ANC visits in the first trimester of their pregnancy. This recommendation will allow for early diagnosis and management of health conditions and identify risk factors that can negatively affect the progress and outcomes of pregnancy [63]. Our study found that women with more than four ANC visits had reduced odds of delivering preterm. In Ghana, ANC services accessed by pregnant women align with WHO's recommendations, including counselling on a healthy diet and good nutrition, tobacco and substance use and physical activity, HIV and malaria prevention, tetanus vaccination, and foetal measurements and advice for dealing with physiological pregnancy symptoms such as nausea, back pain, and constipation [63]. This comprehensive ANC package could have helped identify high-risk pregnancies among the women with more ANC visits. Subsequently, measures would have been implemented to reduce these high-risk pregnancies and thus the lower risk of preterm delivery. Different studies corroborate this assertion by Cunningham and Turienzo, who emphasised how the content and type of ANC packages help reduce adverse birth outcomes [64, 65].

We found that babies born through caesarean section were twice as likely to be born preterm than those born through vaginal delivery. One plausible explanation could be that preterm babies were delivered through CS due to foetal compromises, such as foetal distress [66]. It could also mean that the CS was planned due to a history of previous CS or as a result of pregnancy-induced hypertension. An earlier study evaluated prolonged second-stage labour as a possible risk for subsequent preterm birth and found an association. The study reported that caesarean section done in the second stage increased the risk of preterm delivery [67].

Additionally, some studies have explained the association between second-stage CS and subsequent preterm delivery due to cervical damage. The attributed cervical damage to cervical tissue excision and uterine evacuation for abortion causes cervical trauma [68–70]. There are inconsistent results on the impact of CS on preterm delivery. Some earlier studies reported that CS improves the outcomes of preterm babies [71, 72], while others suggest vaginal birth is protective against preterm delivery [73].

4.1. Strength and Limitation. This is the first study to investigate the factors associated with low birth weight and preterm delivery in the Ho Municipality of Ghana. However, it is not without limitations. First, data used for analysis in this study was collected for routine healthcare services and

Table 3: Association between sociodemographic, obstetric characteristics, maternal health conditions, and the odds of low birth weight.

Characteristic	Low birth weight ($N=88$), n (%)	COR (95% CI), p value model I	AOR (95% CI), p value model II
Age (years)			
< 20	17 (19.3)	Ref.	Ref.
20–34	56 (63.6)	0.47 (0.25, 0.85), 0.013	0.52 (0.28, 0.98), 0.043
35–49	15 (17.1)	0.59 (0.27, 1.28), 0.183	0.65 (0.29, 1.43), 0.286
Educational level			
No formal education	12 (13.6)	Ref.	
Primary school	14 (15.9)	1.44 (0.63,3.32), 0.391	
JSS/JHS/middle school	31 (35.2)	1.04 (0.51, 2.13), 0.907	
SHS/SSS/vocational	21 (23.9)	1.17 (0.54, 2.50), 0.691	
University	10 (11.4)	0.66 (0.27, 1.60), 0.359	
Occupation			
Unemployed	21 (23.9)	Ref.	
Private sector	58 (65.9)	0.92 (0.54, 1.59), 0.778	
Public sector	9 (10.2)	0.57 (0.24, 1.30), 0.182	
Marital status			
Single	41 (46.6)	Ref.	
Married	47 (53.4)	0.56 (0.36, 8.88), 0.012	
Parity			
Nulliparous	38 (43.2)	Ref.	Ref.
Primiparous	24 (27.3)	0.71 (0.41, 1.23), 0.219	0.74 (0.42, 1.29), 0.291
Multiparous	22 (25.0)	0.50 (0.29, 0.88), 0.016	0.54 (0.30, 0.94), 0.031
Grand multiparous	4 (5.5)	0.89 (0.29, 2.74), 0.846	0.84 (0.23, 2.55), 0.757
Gravidity			
Primigravida	28 (31.8)	Ref.	
Multigravida	60 (68.2)	0.71 (0.43, 1.16), 0.174	
Delivery type			
Normal/vaginal	62 (70.4)	Ref.	Ref.
Caesarean section	26 (29.6)	1.76 (1.07, 2.90), 0.025	1.94 (1.16, 3.27), 0.012
Vacuum extraction	0 (0.0)	1.52 (0.07, 3.21), 0.786	1.96 (0.09, 4.20), 0.666
SP/IPTp dosage			
< 3	40 (45.4)	Ref.	Ref.
3	32 (36.4)	0.69 (0.42, 1.15), 0.153	0.91 (0.52, 1.60), 0.739
> 3	16 (18.2)	0.34 (0.18, 0.63), 0.001	0.43 (0.22, 0.84), 0.013
ANC visits			
< 4 visits	12 (13.6)	Ref.	
4 visits	16 (18.2)	1.39 (0.61, 3.17) 0.428	
> 4 visits	60 (68.2)	0.74 (0.38, 1.45) 0.380	
Hepatitis B infection			
Negative	81 (92.1)	Ref.	
Positive	7 (7.9)	2.13 (0.89, 5.14) 0.090	
Syphilis infection			
Negative	85 (96.6)	Ref.	
Positive	3 (3.4)	6.93 (1.38, 34.89) 0.019	
Hypertension status			
Normotensive	53 (60.2)	Ref.	Ref.
Hypertensive	35 (39.8)	1.98 (1.24, 3.16) 0.004	2.06 (1.27, 3.33), 0.003
Anaemia status			
Normal	35 (39.8)	Ref.	
Anaemic	53 (60.2)	1.28 (0.81, 2.03) 0.278	
Sickling status			
Negative	70 (79.5)	Ref.	
Positive	18 (20.5)	1.28 (0.73, 2.24) 0.388	
Malaria infection			
Negative	60 (68.2)	Ref.	Ref.
Positive	28 (31.8)	2.11 (1.28, 3.47) 0.003	1.50 (0.86, 2.64), 0.156

not primarily for research. There is a possibility of measurement errors regarding readings and recordings of critical variables such as birth weight and other explanatory variables occurring during documentation. However, the effects of these errors were random and unlikely to interfere with the results of this study. The study included hospital-based deliveries excluding home deliveries; as such, findings should be interpreted with caution. That notwithstanding,

Table 4: Association between sociodemographic, obstetric characteristics, maternal health conditions, and the odds of preterm delivery.

Characteristic	Preterm delivery [$N = 96$] n (%)	COR (95% CI) p value model I	AOR (95% CI) p value model II
Age (years)			
< 20	21 (21.9)	Ref.	Ref.
20–34	60 (62.5)	0.38 (0.22, 0.67), 0.001	0.63 (0.30, 1.33), 0.231
35–49	15 (15.6)	0.45 (0.21, 0.94), 0.034	0.88 (0.35, 2.21), 0.791
Educational level			
No formal education	21 (21.9)	Ref.	
Primary school	11 (11.5)	0.55 (0.25, 1.23), 0.146	
JSS/JHS/middle school	34 (35.4)	0.59 (0.32, 1.08), 0.090	
SHS/SSS/vocational	18 (18.8)	0.50 (0.25, 0.99), 0.048	
University	12 (12.5)	0.41 (0.19, 0.89), 0.024	
Occupation			
Unemployed	25 (26.0)	Ref.	
Private sector	60 (62.5)	0.78 (0.47, 1.30), 0.346	
Public sector	11 (11.5)	0.58 (0.27, 1.24), 0.158	
Marital status			
Single	46 (47.9)	Ref.	
Married	50 (52.1)	0.52 (0.34, 0.80), 0.003	
Parity			
Primiparous	38 (39.6)	Ref.	
Multiparous	58 (60.4)	0.72 (0.46, 1.12), 0.146	
Gravidity			
Nulliparous	38 (39.6)	Ref.	
Primiparous	22 (22.9)	0.64 (0.36, 1.13), 0.122	
Multiparous	29 (30.2)	0.68 (0.40, 1.15), 0.152	
Grand multiparous	7 (7.3)	1.81 (0.71, 4.61), 0.212	
Delivery type			
Normal/vaginal	69 (71.9)	Ref.	Ref.
Caesarean section	27 (28.1)	1.63 (1.01,2.66), 0.047	2.14 (1.15, 3.99), 0.016
Vacuum extraction	0 (0.0)	1.35 (0.06, 2.84), 0.847	2.40 (0.11, 5.24), 0.578
SP/IPTp dosage			
< 3 doses	52 (54.2)	Ref.	Ref.
3 doses	30 (31.2)	0.46 (0.28, 0.75), 0.002	0.77 (0.41, 1.45), 0.422
> 3 doses	14 (14.6)	0.21 (0.11, 0.40), <0.001	0.43 (0.19, 0.97), 0.041
ANC visits			
< 4	23 (24.0)	Ref.	Ref.
4	22 (22.9)	0.92 (0.46, 1.84), 0.822	0.87 (0.38, 2.01), 0.750
> 4	51 (53.1)	0.27,(0.15, 0.47), <0.001	0.38 (0.18, 0.80), 0.010
Hepatitis B infection			
Negative	92 (95.8)	Ref.	
Positive	4 (4.2)	0.93 (0.31, 2.74), 0.900	
Syphilis infection			
Negative	94 (97.9)	Ref.	
Positive	2 (2.1)	3.08 (0.56, 17.08), 0.197	
Hypertension status			
Normotensive	83 (86.5)	Ref.	
Hypertensive	13 (13.5)	0.94 (0.58, 1.55), 0.836	
Anaemia status			
Normal	37 (38.5)	Ref.	Ref.
Anaemic	59 (61.5)	2.27 (1.27, 4.03), 0.005	1.69 (0.92, 3.10), 0.092
Sickling status			
Negative	77 (80.2)	Ref.	
Positive	19 (19.8)	1.22 (0.71, 2.11), 0.469	
Malaria infection			
Negative	61 (63.5)	Ref.	
Positive	35 (36.5)	2.78 (1.73, 4.43), <0.001	

routine healthcare services data can be used to plan, monitor, and evaluate public health interventions.

5. Conclusion

Evidence from this study indicates that maternal age, parity, number of ANC visits, hypertension, SP/IPTp, and caesarean section were independent factors associated with LBW and PTD. These findings add to the literature on the factors associated with these adverse birth outcomes, particularly in resource-limited environments. Furthermore, this study could serve as a foundation for further research in the study area and develop public health interventions to reduce the risk and complications of these birth outcomes.

Data Availability

All data and materials are available upon reasonable request from the corresponding author.

Ethical Approval

This study received ethical approval from the Research Ethics Committee of the University of Health and Allied Sciences (UHAS-REC A. [6] 18–19).

Disclosure

A preprint of this manuscript has previously been published [74].

Conflicts of Interest

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

Authors' Contributions

WKA, FNB, and MK conceived the study and were responsible for the initial draft of the manuscript. WKA did the data analysis and wrote the methods section. All authors reviewed and approved the final version of the manuscript.

Acknowledgments

The authors are grateful to Dr. John Tampuri and the management and staff of Ho Teaching Hospital for allowing them to conduct this study in their facility. They are grateful to the records staff of Ho Teaching Hospital for their support and assistance. They are also grateful to the research assistants who helped extract the data. Many thanks are also due to Mr. Martin Adjuik for guidance during data analysis.

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