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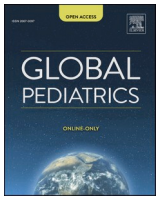

Risk factors of preterm birth in greater Accra regional hospital, ridge

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ABSTRACT

Objectives: This study aimed to investigate the sociodemographic, psychological, cultural, environmental, and occupational risk factors associated with preterm birth at the Greater Accra Regional Hospital.
Study Design: A case-control study.
Methods: The study employed a case-control design and used the Chi-square test to assess associations between various risk factors and preterm birth. Sociodemographic, psychological, cultural, environmental, and occupational factors were examined to determine their relationship with preterm birth.
Results: The findings revealed a significant association between depression and preterm birth, with a Chi-square value of 12.115 and a p-value of 0.001. Moderate exercise was also associated with preterm birth, showing a significant relationship (p-value of 0.039). However, the mothers' occupation, including posture at work, hours spent in a specific position, and exposure to heat, chemicals, dust, or smoke, did not demonstrate significant associations with preterm birth.
Conclusions: The study emphasizes the need for enhanced maternal and child healthcare efforts in the country and underscores the importance of public education, particularly regarding the role of partner support in reducing the risk of preterm birth.

Introduction

Globally, preterm birth, defined as the delivery of a baby before 37 weeks of gestation, remains a major challenge in maternal and neonatal health.[1] This condition is categorized into three groups: extremely preterm, very preterm, and late preterm. It accounts for a significant proportion of neonatal deaths and long-term complications. Each year, approximately 15 million babies are born prematurely, making preterm birth the leading cause of neonatal mortality.[2,3] Despite advancements in medical care, the prevalence of preterm birth has continued to rise worldwide over the past two decades, with Africa recording a rate of 7.4 %.[4]

In the United States, disparities in preterm birth rates highlight persistent inequities in maternal and infant health. Non-Hispanic Black women are at a significantly higher risk, with a preterm birth rate nearly 1.5 times that of their non-Hispanic White and Hispanic counterparts.[5] Data from the Centers for Disease Control and Prevention (CDC) indicate that in 2022, the preterm birth rate among non-Hispanic Black women was 14.6 %, compared to 9.4 % for non-Hispanic White women and 10.1 % for Hispanic women. These disparities are even more pronounced for very preterm births. The underlying causes are multifaceted, involving social, genetic, and environmental factors. The consequences of preterm birth are severe, accounting for 75 % of infant mortality and increasing the risk of neurodevelopmental impairments, respiratory complications, and gastrointestinal disorders.[6]

In Ghana, preterm birth remains a pressing concern. Although existing studies have largely focused on obstetric determinants, there is limited data on the broader range of factors contributing to preterm birth in Ghanaian contexts.[7,8] The Greater Accra Regional Hospital (GARH), a key secondary referral facility, reports a high frequency of preterm cases, often associated with conditions such as premature rupture of membranes (PROM) and pre-eclampsia. A recent report from the 2024 Paediatric Society of Ghana's Prematurity Awareness Month launch highlights that Ghana's preterm birth rate has risen to 14.5 %, surpassing the global average of 10 %.

The impact of preterm birth extends beyond immediate medical concerns. Families with preterm infants often experience significant emotional and psychological distress, which can have lasting

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consequences for both parents and newborns. Preterm infants are at higher risk of developmental delays, cognitive impairments, and chronic health conditions.[9,10] In Ghana, these challenges are further compounded by a lack of comprehensive data and targeted interventions to address preterm birth and its associated complications.

Understanding preterm birth in Ghana requires a broader investigation beyond obstetric factors. Sociodemographic variables such as maternal age and education, psychological stressors like depression and anxiety, and environmental exposures including workplace conditions and chemical exposure are all potential contributors. The observed frequency of preterm births at GARH underscores the need for a detailed examination of these risk factors.

This study aims to fill critical knowledge gaps by investigating the risk factors associated with preterm birth at the Greater Accra Regional Hospital. By exploring sociodemographic, psychological, environmental, and cultural determinants, the research will provide a clearer understanding of the multifaceted influences on preterm birth in this region. Identifying and addressing these risk factors could contribute to reducing preterm births and their associated complications, ultimately improving maternal and neonatal health outcomes in the Greater Accra Region.

Methods

Study design/settings

A case-control study was conducted at the Greater Accra Regional Hospital, commonly known as Ridge Hospital, located in the Greater Accra Region. The facility occupies approximately 15.65 acres of land and falls within the Osu Klottey Sub-Metro of the Accra Metropolitan Area. As a secondary healthcare facility with some tertiary services, it serves as a referral center for district hospitals and clinics throughout the Greater Accra Region, providing specialized care. However, it is not the primary tertiary hospital in Ghana. The hospital is a modern institution with a capacity of over 600 beds and offers specialized services in maternal and child health, surgery, internal medicine, and emergency care. It has a modern maternity and delivery ward capable of managing both routine and high-risk deliveries, along with comprehensive services such as prenatal care, labor, postpartum support, and specialized neonatal care if necessary. The hospital serves over 800 outpatients and 250 inpatients daily. (Source: Greater Accra Regional Hospital). Fig 1, shows the location of the Greater Accra Regional Hospital in the Accra Regional Map.

Ethical consideration

Ethical approval was obtained from the Ghana Health Service Ethics Review Committee and the Greater Accra Regional Health Directorate for using the Greater Accra Regional Hospital as the study site. Written informed consent were obtained from participants and legally authorized representatives of the participants. Participants who agreed signed or thumb printed the consent form. Permission was sought before conducting face-to-face interviews and administering questionnaires, and participants were informed of their right to withdraw at any time.

Study population and subject selection

Using a simple randomized sampling technique, a total of 180

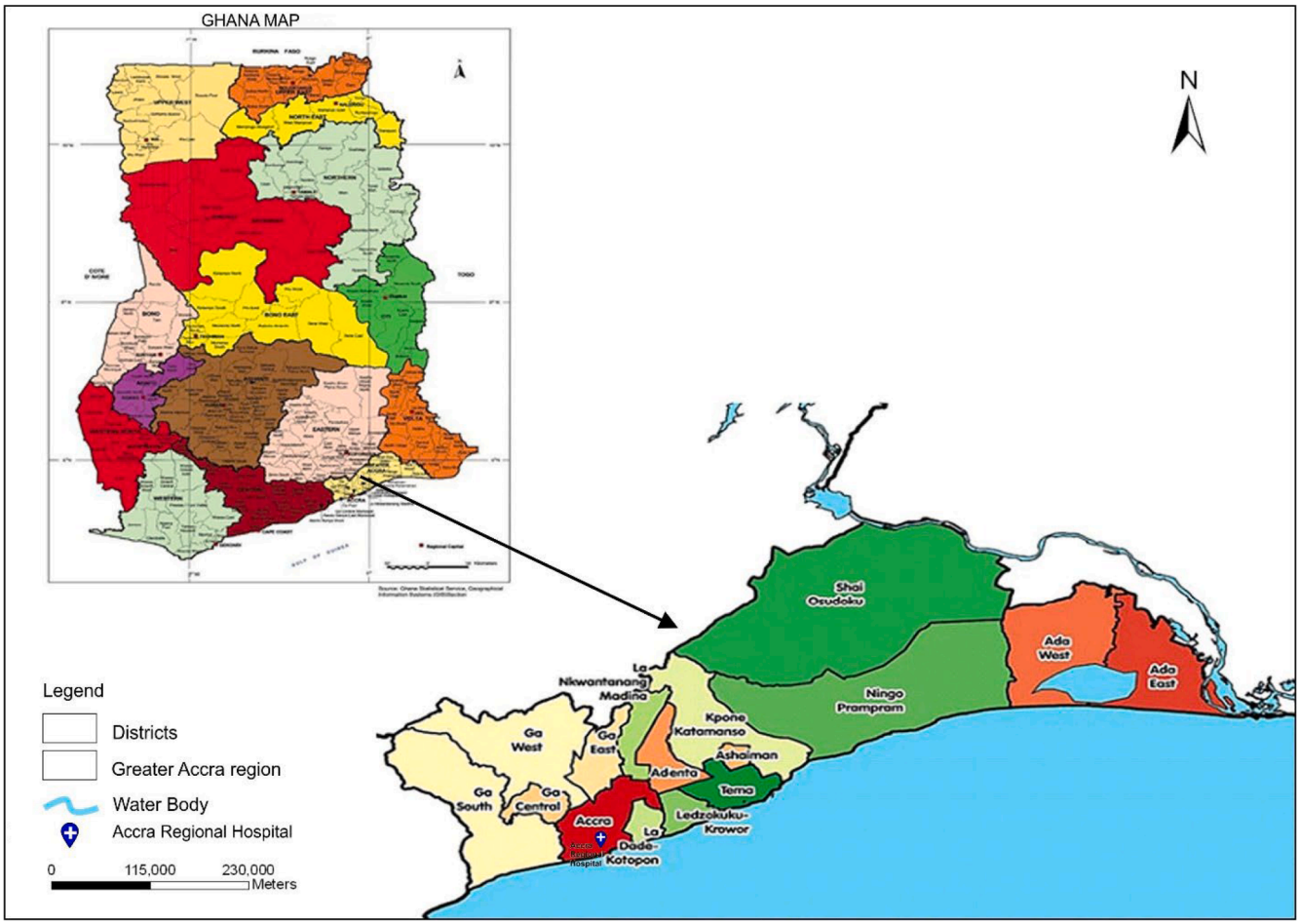

Fig. 1. Point location map showing greater Accra region hospital, ridge.

singleton pregnant women aged 13 to 36+ years who delivered at the labor ward from January to July were selected for the study. The study included all term and preterm births at the Greater Accra Regional Hospital, with preterm and term classifications made by a qualified consultant gynecologist. Preterm births which occurred during the study period were classified as cases, while term births immediately before and after each preterm birth served as controls. Cases, defined as deliveries between 28 and 36 weeks of gestation, were compared with controls, defined as deliveries between 37 and 42 weeks, in a 1:2 ratio due to the rarity of preterm births compared to term births. Gestational age (GA) was determined in weeks based on menstrual history, clinical examination, and first-trimester ultrasonography, measuring the crown-rump length. An administered structured questionnaire was used to collect sociodemographic data such as age, marital status, education level, and employment status. This was done through a face-to-face interview. Clinical and obstetric histories were obtained from patient folders and the hospital database. Pregnant women who did not consent, were medically unstable, or had twin pregnancies were excluded.

Sample size calculation

A ratio of 1 case to 2 Controls was adopted and 95% Confidence Interval at 5% level of significance was applied.

$$n = Z^2_{1-\alpha/2}\frac{\frac{1}{[Pc^*_e(1-c^*_e)]}+\frac{1}{[Pc_e(1-Pc_e)]}}{[\log_e(1-\varepsilon)]^2}$$

$$\textbf{Let} Pc_e = \frac{Pc^*_e OR}{1+Pc^*_e(OR-1)}$$

α = 5% (0.05)
Power = 80%
Pce*= Proportion of controls exposed =50% Pce= Proportion of cases exposed = 66%
OR = 2

$$(1.96)^2 \times \left[\frac{0.5(1-0.50)}{0.66(1-0.66)}\right] \times [\log_e(1-\mathcal{E})]^2$$

n = 149

Hence, sample size was 149. To account for potential non-response and data loss, the sample size was adjusted to a total of 180 mothers, comprising 60 mothers with preterm births (cases) and 120 mothers with term births (controls). The increase to 180 was a prudent measure to ensure sufficient power and reliability of the study results.

Statistical analysis

Data collected were entered, coded, edited, and cleaned in Microsoft Excel 2019, and statistical analyses were done using Statistical Package for Social Sciences (SPSS) Version 20.0. Tables were used to present sociodemographic, psychological, and environmental factors, while a bar graph illustrated cultural risk factors. Chi-square tests were used to analyze associations and determine the significance of factors such as maternal age, education, partner support, depression, and environmental exposures on preterm birth.

Results

Table 1 summarizes the distribution of births and preterm statistics at the Greater Accra Regional Hospital, Ridge. The study involved 180 mothers, comprising 60 preterm cases and 120 full-term births. Of the total births, 2 (1.1 %) were extremely preterm (<28 weeks), 18 (10 %) were very preterm (28 to <37 weeks), 40 (22.2 %) were late preterm (32 to 36 weeks), and 120 (66.7 %) were term births (≥37 weeks). From January to July 2020, the hospital recorded 4471 deliveries, including 692 preterm births (15.5 %), with a gender distribution of 47.8 % female and 52.2 % male.

Table 1
Distribution of births and preterm statistics at greater Accra regional hospital, ridge.

Category	Number	Percentage
Total Mothers in Study	180	100 %
Preterm Births in Study	60	33.3 %
Term Births in Study	120	66.7 %
Gestational Age		
Extremely Preterm (<28 weeks)	2	1.1 %
Very Preterm (28 - <37 weeks)	18	10 %
Late Preterm (32 - 36 weeks)	40	22.2 %
Term Births (≥37 weeks)	120	66.7 %
Total Deliveries (Jan - July 2020)	4471	100 %
Preterm Deliveries	692	15.5 %
Female Deliveries	331	47.8 %
Male Deliveries	361	52.2 %

Sociodemographic data of participants

Table 2 presents the sociodemographic risk factors of the participants in the study. Out of the 180 mothers, 8 (4.4 %) were teenagers aged 13–19 years, 26 (14.4 %) were 36 years or older, 41 (22.9 %) were between 20 and 25 years, 44 (24.4 %) were aged 31–35 years, and 61 (33.9 %) were aged 26–30 years. The majority of the mothers, 152 (84.4 %), were married, while 26 (14.4 %) were single, and 1 (0.6 %) each were divorced and widowed. Among the married mothers, 48 (31.6 %) had preterm births, while 104 (68.4 %) had term births. For single mothers, 16 (61.5 %) had term births, and 10 (38.5 %) experienced preterm births.

Association between sociodemographic risk factors and preterm birth

Among the mothers, 90 (50 %) had secondary education, while 42 (23.3 %) had tertiary education. Of the 143 employed mothers, 93 (77.5 %) had term births. In contrast, among the 37 unemployed mothers, 16.7 % had preterm births and 22.5 % had term births. Sociodemographic risk factors associated with preterm birth are detailed in Table 3. The Chi-square test revealed that maternal age ($X^2 = 15.237$, $p < 0.004$) and educational level ($X^2 = 8.829$, $p < 0.032$) significantly affect preterm birth. Marital status ($p = 0.211$) and employment status ($p = 0.361$) did not show significant associations with preterm birth.

Table 2
Sociodemographic risk factors.

Maternal age (years)	Frequency	Percentage
13–19	8	4.4
20–25	41	22.9
26–30	61	33.9
31–35	44	24.4
36 and above	26	14.4
Total	**180**	**100**
Marital status		
Married	152	84.4
Single	26	14.4
Divorced	1	0.6
Widowed	1	0.6
Total	**180**	**100**
Highest educational level		
Primary	30	16.7
Secondary	90	50.0
Tertiary	42	23.3
None	18	10.0
Total	**180**	**100**
Employment status		
Employed	143	79.4
Unemployed	37	20.6
Total	**180**	**100**

Table 3
Association between sociodemographic risk factors and preterm birth.

Variable	Term (%) N=120	Preterm (%) N=60	P-Value	Chi-square Test
Maternal age (years)			**0.004**	48 (80)
13 – 19	4 (3.3)	4 (6.7)		
20 – 25	30 (25)	11 (18.3)		
26 – 30	48 (40)	13 (21.6)		
31 – 35	28 (23.4)	16 (26.7)		
36 and above	10 (8.3)	16 (26.7)		
Marital Status			0.211	
Married	104 (86.7)	48 (80)		
Single	16 (13.3)	10 (16.6)		
Divorced	0	1 (1.7)		
Widowed	0	1 (1.7)		
Educational level			**0.032**	**8.829**
Primary	13 (10.8)	17 (28.3)		
Secondary	64 (53.4)	26 (43.3)		
Tertiary	30 (25)	12 (20)		
None	13 (10.8)	5 (8.4)		

Psychological data of participants

Table 4 presents the psychological data on participants. Out of the 180 mothers, 136 (75.6 %) received partner support, with 101 (74.3 %) delivering at term and 35 (25.7 %) experiencing preterm births. Among the 44 mothers (24.4 %) who did not receive partner support, 56.8 % had preterm births, while 25.7 % had term births. Additionally, 57.8 % of the mothers received family support, and 32.8 % reported experiencing depression due to factors such as family or partner issues, work-related stress, or pregnancy-related challenges.

Table 5 below presents psychological risk factors associated with preterm birth. Chi-square tests revealed significant associations between partner support (X^2=14.454, p=0.001) and depression (X^2=12.115, p=0.001) with preterm birth. Moderate exercise also showed a significant association with preterm birth (p=0.039). However, family support (p=0.915), major life events (p=0.325), fear or anxiety (p=0.315), and alcohol intake (p=0.078) did not have significant associations with preterm birth.

Table 4
Psychological risk factors.

Variable	Frequency	Percentage (%)
Partner Support		
Yes	136	75.6
No	44	24.4
Total	180	100
Family Support		
Yes	104	57.8
No	76	42.2
Total	180	100
Depression		
Yes	59	32.8
No	121	67.2
Total	180	100
Major Life Events		
Yes	21	11.7
No	159	88.3
Total	180	100
Maternal Fear or Anxiety		
Yes	139	77.2
No	41	22.8
Total	180	100
Lifestyle (Alcohol intake)		
Yes	6	3.3
No	174	96.7
Total	180	100
Lifestyle (Exercises)		
Yes	112	62.2
No	68	37.8
Total	180	100

Table 5
Association between psychological risk factors and preterm birth.

Variable	Term (%) N=120	Preterm (%) N=60	P-Value	Chi-square Test
Partner Support			**0.001**	**14.454**
Yes	101 (84.2)	35 (58.3)		
No	19 (15.8)	25 (41.7)		
Family Support			0.915	
Yes	69 (57.5)	35 (58.3)		
No	51 (42.5)	25 (41.7)		
Depression			**0.001**	**12.115**
Yes	29 (24.2)	30 (50)		
No	91 (75.8)	30 (50)		
Major Life events			0.325	
Yes	12 (10)	9 (15)		
No	108 (90)	51 (85)		
Maternal fear or anxiety			0.315	
Yes	90 (75)	49 (81.7)		
No	30 (25)	11 (18.3)	1	
Lifestyle or Behavior Alcohol intake			0.078	
Yes	2 (1.7)	4 (6.7)		
No	118 (98.3)	56 (93.3)		
Moderate exercise			**0.039**	**4.266**
Yes	81 (67.5)	31 (51.7)		
No	39 (32.5)	29 (48.3)		

Cultural and religious data of participants

Fig. 2 below presents culture and religions of participants of the study. The majority of mothers were Christians (86.1 %), followed by Muslims (13.3 %). Akans were the largest ethnic group, comprising 45 % of the mothers, while foreigners made up 2.8 %. Additionally, 22 mothers (12.2 %) were prohibited from eating certain foods due to cultural or religious beliefs, including eggs, palm oil, snails, and yam.

Association between cultural risk factors and preterm birth

To ascertain the association between cultural risk factors and preterm birth, a chi-square test was conducted. The associations of cultural risk factors with preterm birth are presented in Table 6. The analysis showed that the mother's religion, ethnicity, and culturally prohibited foods had no significant associations with preterm birth, with p-values of 0.366, 0.722, and 0.748, respectively. As these p-values were greater than 0.05, the associations were considered statistically insignificant.

Occupational and environmental data of participants

As found in Table 7, traders represented the largest occupational group, accounting for 68 (37.8 %) of the participants, while nurses made up the smallest group at 2.8 %. A total of 34 mothers (18.9 %) were housewives with no formal employment. Mothers whose jobs required prolonged standing were more common, with 84 (46.7 %) standing frequently at work, compared to 41 (22.8 %) whose work involved extensive walking. Additionally, 14.4 % of mothers reported exposure to heat, while 23.9 % were exposed to chemicals. Only 10 mothers mentioned living in smoky areas, whereas 41 mothers reported living in dusty environments.

Discussion

This study from Greater Accra Regional Hospital highlights the prevalence and risk factors of preterm birth in the region. In our study, the proportion of preterm births at the facility from January 2020 to July 2020 was 15.5 %. This higher-than-expected rate is likely due to the hospital being the primary secondary referral facility in the Greater Accra Region (GAR). Additionally, other nearby regions, such as the

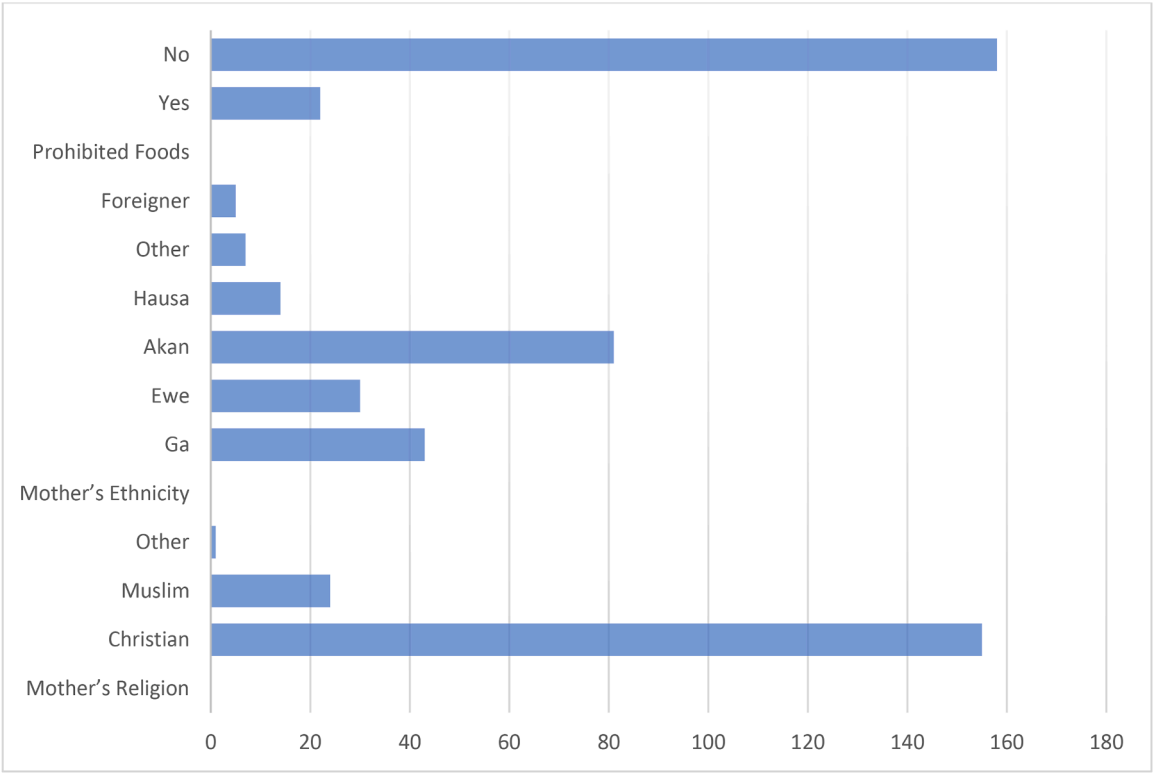

Fig. 2. Cultural risk factors.

Table 6
Association between cultural risk factors and preterm birth.

Variable	Term (%) N=120	Preterm (%) N=60	P-Value	Chi-Square test
Mother's Religion Christian	104 (86.7)	51 (85)	0.366	
Muslim	16 (13.3)	8 (13.3)		
Other	0 (0)	1 (1.7)		
Mother's Ethnicity Ga	29 (24.2)	14 (23.4)	0.722	
Ewe	22 (18.3)	8 (13.3)		
Akan	54 (45)	27 (45)		
Hausa	8 (6.6)	6 (10)		
Other	5 (4.2)	2 (3.3)		
Foreigner	2 (1.7)	3 (5)		
Prohibited Foods Yes	14 (11.7)	8 (13.3)	0.748	
No	106 (88.3)	52 (86.7)		

Central and Eastern Regions, refer pregnancy and delivery complications to the hospital, further contributing to the increased proportion. The preterm birth rate in this study was higher compared to Korle-Bu Teaching Hospital, where a study reported that 9.3 % of 4731 singleton births were preterm.[7] The difference could be due to Greater Accra Regional Hospital's recent renovations and more modern equipment, which makes it a preferred choice over Korle-Bu Teaching Hospital.

This study also examined the association between maternal age and preterm birth. We found a significant association, consistent with other studies. For example, a study conducted in Chile found a similar relationship.[8] Additionally, a cross-sectional study in Spain identified maternal age as a significant factor, particularly in mothers aged 19 and 35 years, who were more likely to give birth to low birth weight or preterm babies.[9] However, our study did not find a significant association between marital status and preterm birth, which contrasts with findings that indicated a notable correlation between these factors.[10]

Regarding educational level, our findings were in line with most other studies. We found a significant association between maternal education and preterm birth, with lower educational attainment increasing the risk. Similar findings have been reported in other studies, noting that women with primary or secondary education had a higher risk of preterm birth.[9] Contrary to some studies, we did not find a significant association between employment status and preterm birth. For instance, a study showed that pregnant women working more than 42 h a week had a higher risk of preterm birth,[11] but our results may have been influenced by the small sample size caused by the COVID-19 pandemic. Many women were reluctant to participate due to fear of infection, and restrictions from the facility further limited recruitment. A larger sample size may have revealed a significant association.

Our study revealed that partner support was significantly associated with preterm birth. Women who received emotional and financial support from their partners were less likely to experience preterm birth, likely because such support encourages attendance at antenatal care clinics. This finding aligns with previous research, which also reported that partner support plays a protective role in pregnancy.[12] However, we found no significant association between family support and preterm birth, a finding that contradicts some studies that emphasized the importance of family support during pregnancy.[12]

Depression was significantly associated with preterm birth in our study, consistent with findings that maternal depression increases the risk of preterm birth.[13] On the other hand, we found no significant association between major life events, such as accidents or the death of a loved one, and preterm birth, which contradicts other findings that identified an association between major life events and preterm birth, especially in the first and second trimesters.[14]

Maternal anxiety was also not significantly associated with preterm birth in our study, which contrasts with findings that recommended screening for psychological disorders in pregnant women.[15] Similarly, lifestyle factors such as excessive alcohol intake showed no significant association with preterm birth in our study, despite previous studies reporting an increased risk for women who consume alcohol during

Table 7
Environmental and occupational risk factors.

Variable	Frequency	Percentage (%)
Mother's Occupation		
Trader	68	37.8
Nurse	5	2.8
Teacher	8	4.4
Office work	18	10
Hairdresser	15	8.3
Seamstress	18	10
Food Vendor	14	7.8
No work	34	18.9
Total	**180**	**100**
Work Posture (Standing)	84	46.7
Yes		
No	96	53.3
Total	**180**	100
Work Posture (Walking)	41	22.8
Yes		
No	139	77.2
Total	**180**	**100**
Exposure to Heat	26	14.4
Yes		
No	154	85.6
Total	180	100
Exposure to Chemicals	43	23.9
Yes		
No	137	76.1
Total	**180**	**100**
Use of Coil	57	31.7
Yes		
No	123	68.3
Total	180	100
Dusty Environment	41	77.2
Yes		
No	139	22.8
Total	180	100
Smoky environment	10	5.6
Yes		
No	170	94.4
Total	**180**	**100**

pregnancy.[2,16] In Ghana, alcohol consumption among pregnant women is relatively uncommon, and those who consume it may not disclose it.

Our study found that moderate exercise during pregnancy was significantly associated with a reduced risk of preterm birth, which supports findings by other studies, which reported that women who exercised had a lower risk of preterm birth compared to non-exercisers.[17] We found no significant association between religious attendance and preterm birth, which contrasts with studies that found that religious attendance protected against preterm birth.[18] Another study also noted the interconnection between religiosity and health in Africa, where spiritual beliefs often influence health outcomes.[19]

Ethnicity was not significantly associated with preterm birth in our study, consistent with findings in the USA.[20] Additionally, we found no significant association between food taboos and preterm birth, despite studies linking food restrictions in pregnancy to preterm birth.[21]

There was no significant association between maternal occupation and preterm birth in our study, which contrasts with studies that found that women who worked more than 42 hours per week had a higher risk of preterm birth.[22] However, we did find that standing for long periods at work was significantly associated with preterm birth, aligning with findings that reported an increased risk for women standing for more than three hours per day.[23]

In terms of environmental factors, we found no significant association between exposure to heat or chemicals and preterm birth, which contrasts with previous studies that reported significant associations.[17,24] However, we found a significant association between the use of mosquito coils and preterm birth, which supports findings by another study.[25] Lastly, no significant association was found between dusty or smoky environments and preterm birth, a finding that contrasts with other research that noted environmental pollutants could increase the risk of preterm birth.[17]

Study limitations

While this study provides an understanding of the risk factors associated with preterm birth, the following limitations were acknowledged:

- Since the study was conducted at a single tertiary hospital, there may be a potential for selection bias. The findings may not be fully generalizable to the entire Ghanaian population.

Conclusion

The study revealed a high preterm birth rate of 15.5%. Preterm births are more common among teenagers and women over 36 years old. There is a significant association between maternal educational level and preterm birth, underscoring the need to empower women through education. Partner and family support are protective factors, with incentives for partners attending antenatal care potentially enhancing support. Despite the lack of significant association found with family support in this study, other research highlights its importance. Standing for long hours at work increases preterm birth risk, consistent with findings that long working hours are a risk factor. Additionally, the use of mosquito coils, due to their toxic effects, is associated with a higher risk of preterm birth. Moderate exercise during pregnancy is beneficial and reduces preterm birth risk. Overall, increased efforts and resources are needed to enhance maternal and child health care in the country.

Funding

The study was self-funded

Data availability

The datasets generated and/or analyzed in this study are not publicly accessible but can be made available by the corresponding author upon reasonable request.

Ethics approval and consent to participate

Ethical approval was obtained from the Ghana Health Service Ethics Review Committee (GHS-ERC) prior to the commencement of the study. Permission to conduct the research was granted by the Ga South Health Directorate. Informed consent was obtained from all participants, with confidentiality assured. For those unable to read the consent form, it was explained in the presence of an impartial witness. Participants' questions were answered, and those willing to participate signed or thumb printed the consent form.

Consent for publication

Not applicable.

CRediT authorship contribution statement

Immanuel Adom-Miah: Writing – original draft, Project administration, Methodology, Conceptualization. **Williams Ampadu Oduro:** Writing – review & editing, Visualization. **David Boateng Appiah:** Formal analysis, Data curation. **Theodocea Nortey:** Validation, Formal analysis, Data curation.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence

the work reported in this paper.

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