Original Article

Preterm Births and Associated Factors among Women who Delivered in a District Hospital in Eastern Province, Rwanda: A retrospective study

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Cite as: Hakizimana C, Ogendi J, Habtu M. Preterm births and associated factors among women who delivered in a District Hospital in Eastern Province, Rwanda: a retrospective study. Rwanda J Med Health Sci. 2023;6(3): 269-279. https://dx.doi.org/10.4314/rjmhs.v6i3.1

Abstract

Background
Preterm birth is the primary cause of infant fatalities and is a global public health issue. In 2020, approximately 13.4 million babies were born preterm globally. Preterm birth was potentially associated with different socio-demographic factors as well as clinical and gynaeco-obstetrical factors. This study aimed at assessing the prevalence of preterm births and factors associated with them among women who delivered in Gahini District Hospital.

Methods
This study employed a cross-sectional retrospective study design and the sample size was 312 mothers. SPSS version 21 was used for data analysis. Univariate and bivariate analysis with Chi-square tests were performed. Multivariable logistic regression analysis was performed to figure out factors that were independently associated with preterm birth.

Results
This research revealed that the preterm birth prevalence in Gahini hospital was 9.6% and independently associated factors included mothers' age >35 (AOR: 9.56; 95% CI: 1.38–66.33), being unmarried (AOR: 18.19, 95% CI: 2.96–111.59) and maternal BMI of 25–30 (AOR: 6.25, 95% CI: 1.34–29.12).

Conclusion
Preterm birth was found to be associated with different factors. Therefore, intervention strategies related to maternal and child health need to be developed and strengthened to address factors associated with preterm births.

Rwanda J Med Health Sci 2023;6(3):269-279

Keywords: Preterm birth, Prevalence, Associated factors

Introduction

Preterm birth was defined by the World Health Organization as giving birth before 37 weeks of gestation. Preterm delivery is a severe global public health concern due to high newborn morbidity and mortality it causes.[1]

Globally, Preterm births (PTB) occurred in 13.4 million newborns in 2020 and the major causes of deaths for children under the age of five were problems related to preterm delivery accounting for 900,000 deaths in a year of 2019.[1]

The three classifications under PTB are moderate to late preterm (32–37 weeks), very preterm (28–32 weeks), and extremely preterm (less than 28 weeks). The sooner the preterm, the more difficulties there will be, even though there is an increased risk of morbidity, death, and long-term consequences for all preterm newborns.[1] Risk factors of PTB include the age of the mother, educational level, smoking, numerous deliveries, fewer than four ANC visits, living in a remote area, antepartum hemorrhage, preterm premature rupture of membranes (PPROM), multiple pregnancies, and anemia.[2] Short birth interval, being unmarried, previous caesarian section (C/S) delivery are also risk factors for PTB.[3]

South Asian and Sub-Saharan African countries account for more than 60% of PTB and 80% of the 1.1 million deaths worldwide caused by PTB complications.[3] In Ethiopia, a study conducted revealed that the PTB magnitude was 15,5%.[4] Other studies also conducted in Ethiopia, showed that 12.3%, and 13.2% births were respectively preterm.[5,6] Prevalence of PTB in Ghana has been reported to be 37%,[7] in Kenya, one of the countries that constitute East African Community, PTB rate was 18.3%.[8] In Tanzania, PTB have been shown to be 11% and PTB is considered to be responsible for 10% of under-five deaths in Tanzania.[9] In the Democratic Republic of the Congo, 341,400 PTB per year and premature infant mortality rate of 50% have been recorded.[10]

In Rwanda, a national longitudinal study revealed that preterm birth prevalence was 13.8%.[11] According to a study done in Gasabo district in Kigali city, the overall PTB rate was 10.1%.[12]
To the best of my knowledge, there have been a few local studies on preterm births and associated factors. Besides, different previously conducted studies concentrated more on the prevalence of PTB and missing relevant associated clinical factors. Additionally, no research was carried out in Gahini hospital, which has a high prevalence of preterm delivery.

In order to create successful intervention strategies, it is essential to know the factors associated with preterm birth. Therefore, the purpose of this study was to assess the prevalence of preterm births and associated factors among women who delivered in Gahini Hospital. The results of this study will assist in making decisions based on the most recent scientific data.

Methods

Research Design and setting

This study employed a cross-sectional retrospective study design with quantitative approach based on secondary data of mothers who delivered in Gahini hospital in six months from May 2021 to October 2021.

Sample Size and Sampling Technique

A sample size for this research was determined based on a formula developed by Taro Yamane.[13]

$$n = \frac{N}{1+N(e)^2} = \frac{1420}{1+1420(0.05)^2}$$

where, n=Sample size, N=Population of the study, e=Margin of error
n=312

Considering the nature of the research, the sampling technique that was used in this study was the systematic sampling technique.

Data Collection Instrument and procedures of data collection

Data abstraction tool was used to gather the information that was used in this study. Gahini hospital's administration provided permission for conducting this study. Study participants were tracked from delivery registers of maternity department. Patients' files were used for medical records review to get data.

Validity and Reliability of Research tool

Research tool was based on a previous study that concentrated on risks of PTB.[12] A pilot study of 30 participants was used to evaluate the tool following which the corrections were made to the tool to improve clarity of the questions.

Data Analysis

The SPSS version 21 software was used to analyze the statistical data. Univariate analysis was done and Microsoft Excel was used to report the results as frequencies and percentages. Bivariate analysis with Chi-square tests were performed to find out factors associated with PTB. Multivariable logistic regression analysis was performed for factors that had a significant association with PTB in bivariate analysis in order to determine factors that were independently associated with PTB after controlling potential confounding factors where p-value was set at 5% with 95% confidence interval and adjusted odds ratio.

Ethical Consideration

The Mount Kenya University Ethical Review Board provided the ethical clearance with reference number MKU/ETHICS/2023/001. Then MKU authorized the research to be conducted by issuing a permission letter. The administration of the study setting also gave its approval for the research to be conducted. This research was conducted with high level of confidentiality whereby anonymity of study participants was observed

Results

Demographic Characteristics of Study Participants

Table1 presents the socio-demographic characteristics of respondents. A total number of 312 participants were recruited in this study. Socio-demographic characteristics that were considered in this study include Mother's age, Marital status, Level of formal education, Occupation and Residence.

Table 1. Demographic Characteristics of Study Participants

Variables	Frequency (n=312)	Percentage (%)
Mother's age		
<20	26	8.3
20-35	275	88.1
≥35	11	3.5
Total	312	100.0
Marital status		
Married	303	97.1
Unmarried	9	2.9
Level of formal education		
None	66	21.2
Primary	236	75.6
Secondary or Higher	10	3.2
Occupation		
Employed/ Paying job	33	10.6
Unemployed/ Farmer	279	89.4
Residence		
Urban	21	6.7
Rural	291	93.3

Source: Data from this study.

Table 1 points out that the majority of the participants 275(88.1%) were in the age bracket of 20-35 years and 26(8.3%) of the participants were less than 20 years old. Besides, the minority of mothers 11(3,5%) were at least 35 years old. Regarding marital status, majority 303(97.1%) were married and 9(2.9%) of participants were not married. In terms of education, approximately three quarter 236(75.6%) of the participants had attended primary level of education and only 10(3.2%) of the participants had attended secondary school or higher. Furthermore, 21.2% of participants did not attend formal education. Regarding the occupation, the majority of the participants 279(89.4%) were unemployed and only 33(10.6%) of the participants were employed. Regarding the residence, an overwhelming majority 291(93.3%) of the participants were residing in rural area and only 21(6.7%) of the participants were residing in urban area.

Preterm birth prevalence in Gahini Hospital

This research evaluated the PTB prevalence using information from mothers who gave birth in Gahini hospital from May 2021 to October 2021. This study revealed that PTB were 30 among 312 live births.

Figure 1 shows that over the total sample size of 312 mothers who delivered at Gahini hospital during the period starting from May 2021 to October 2021, a total of 30(9.6%) babies were born less than 37 weeks of pregnancy whereas a large majority 282(90.4%) of the participants gave birth to term babies.

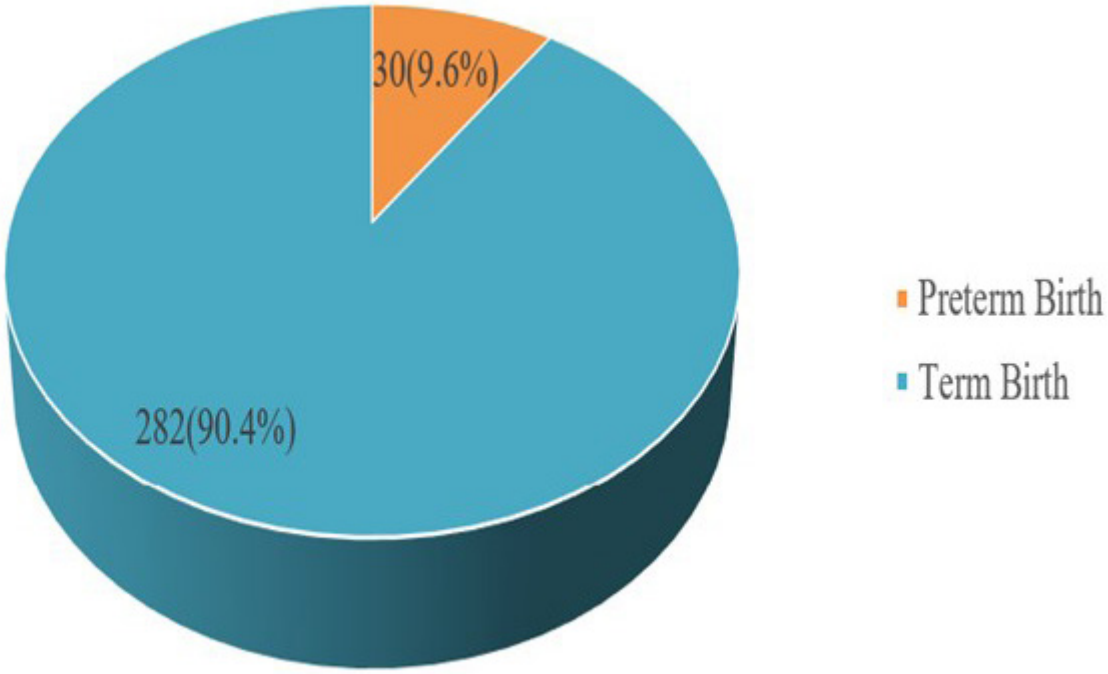

Figure 1. Preterm birth prevalence in Gahini hospital

Preterm Birth associated Socio-demographic factors

Table 2. Socio-demographic Factors Associated with Preterm Birth

Factors	Preterm Birth		p-value
	Yes, n (%)	No, n (%)	
Mother's age			
<20	3(10.0)	23(8.2)	<0.001
20-35	21(70.0)	254(90.1)	
≥35	6(20.0)	5(1.8)	
Marital status			
Married	24(80.0)	279(98.9)	<0.001
Unmarried	6(20.0)	3(1.1)	
Level of formal education			
Never Schooled	10(33.3)	56(19.9)	0.098
Primary	18(60.0)	218(77.3)	
Secondary or Higher	2(6.7)	8(2.8)	
Occupation			
Employed/Paying job	4(13.3)	298(10.3)	0.606
Unemployed/Farmer	26(86.7)	253(89.7)	
Residence			
Urban	5(16.7)	16(5.7)	**0.022**
Rural	25(83.3)	266(94.3)	

Source: Data from this study.

The bivariate analysis with Chi-square tests were executed to find out maternal Socio-demographic factors associated with PTB with p-value set at 0.05 as significance level as illustrated in the below Table 2.

Table 2 shows that age of the mother (p<0.001), marital status (p<0.001) and residence (p=0.022) were significantly associated with PTB. Socio-demographic factors not significantly in association with PTB include level of formal education (p=0.098) and occupation (p=0.606).

Clinical and Gynaeco-Obstetrical Factors Associated with Preterm Birth

Bivariate analysis with Chi-square tests were used to identify the clinical and gynaeco-obstetrical factors in association with PTB. Table 3 shows that clinical and gynaeco-obstetrical factors that were significantly associated with PTB include the number of ANC visits (p<0.001), parity (p<0.001), maternal BMI (p<0.001), PPROM (p<0.001), hemoglobin level (p<0.001), and UTI/STI (p=0.001). Other factors such as history of previous C/S (p=0.101), abortion history (p=0.052), and mode of delivery (p=0.172) did not demonstrate significant association with PTB.

Table 3. Preterm Birth associated Clinical and Gynaeco-Obstetrical factors

	Preterm Birth		p-value
Factors	**Yes, n (%)**	**No, n (%)**	
Number of ANC Visits			
1-3	30(100.0)	171(60.6)	<0.001
≥4	0(0.0)	111(39.4)	
Parity			
Primiparous	8(26.7)	25(8.9)	<0.001
Multiparous	21(70.0)	256(90.8)	
Grand Multiparous	1(3.3)	1(0.4)	
BMI (Kg/m²)			
<18.5	6(20.0)	34(12.1)	<0.001
18.5-25	16(53.3)	239(84.8)	
25-30	8(26.7)	9(3.2)	
History of Previous C/S			
No	25(83.3)	260(92.2)	0.101
Yes	5(16.7)	22(7.8)	
History of abortion			
No	29(96.7)	281(99.6)	0.052
Yes	1(3.3)	1(0.4)	
PPROM			
No	27(90.0)	282(100.0)	<0.001
Yes	3(10.0)	0(0.0)	
Hemoglobin (g/dl)			
≥11	27(90.0)	281(96.6)	<0.001
<11	3(10.0)	1(0.4)	
UTI/STI			
No	28(93.3)	281(96.6)	0.001
Yes	2(6.7)	1(0.4)	
Mode of delivery			
Vaginal	22(73.3)	235(83.3)	0.172
C/S	8(26.7)	47(16.7)	

Source: Data from this study.
Abbreviation: ANC, antenatal care; BMI, Body mass index; C/S, caesarian section; PPROM, Preterm premature rupture of membranes; UTI/STI, Urinary tract infections/sexually transmitted infections.
Notes: Primiparous woman has given birth once. Multiparous woman has given birth more than once. Grand multiparous woman has given birth five or more times.

Multivariable logistic regression analysis of Preterm birth and Associated Factors

Table 4. Multivariable logistic regression analysis of preterm birth associated factors

Factors	COR	95% CI		p-value	AOR	95% CI		p-value
		Lower	Upper			Lower	Upper	
Mother's age								
<20	Ref				Ref			
20-35	0.63	0.17	2.28	0.486	0.49	0.11	2.18	0.353
>35	9.20	1.69	49.85	0.010	9.56	1.38	66.33	0.022
Marital status								
Married	Ref				Ref			
Unmarried	23.25	5.46	98.86	<0.001	18.19	2.96	111.59	0.002
Residence								
Urban	Ref				Ref			
Rural	0.30	0.12	0.89	0.030	0.43	0.10	1.87	0.262
Parity								
Primiparous	Ref				Ref			
Multiparous	0.25	0.10	0.63	0.003	0.58	0.16	2.12	0.415
Grand Multiparous	3.12	0.17	55.88	0.439	13.86	0.59	320.63	0.101
BMI (kg/m^2)								
<18.5	Ref				Ref			
18.5-25	0.37	0.13	1.03	0.059	0.39	0.121	1.31	0.131
25-30	5.03	1.38	18.27	0.014	6.25	1.34	29.12	0.02
Hemoglobin (g/dl)								
≥11	Ref				Ref			
<11	31.22	3.13	310.59	0.003	5.57	0.26	115.85	0.267
UTI/STI								
No	Ref				Ref			
Yes	20.07	1.76	228.37	0.016	4.34	0.111	170.32	0.433

Source: Data from this study.
Abbreviation: BMI, Body mass index; UTI/STI, Urinary tract infections/sexually transmitted infections.
Notes: Primiparous woman has given birth once. Multiparous woman has given birth more than once. Grand multiparous woman has given birth five or more times.

The Multivariable logistic regression analysis was performed with p-value set at 5%, 95%CI and adjusted odds ratio for controlling potential confounders to obtain the independent factors in association with PTB as demonstrated in Table 4.

The Table 4 shows that different factors such as mothers age >35 years (AOR: 9.56, 95%CI: 1.38–66.33), being unmarried (AOR: 18.19, 95%CI: 2.96–111.59) and being overweight with maternal BMI of 25–30 (AOR: 6.25, 95% CI: 1.34–29.12) were independently associated with PTB.

On the other hand, other factors that include mother's age 20–35 years, urban residence, parity, BMI of 18.5–25, hemoglobin level and UTI/STI were not independently in association with PTB.

Discussion

The purpose of this research was to assess the PTB prevalence and factors associated with it amongst women who delivered in Gahini district hospital.

Prevalence of Preterm Birth

The results of this study pointed out that PTB prevalence was 9.6%, which is almost similar to the results of a study carried out in Tanzania where it was 11%,[9] and to total PTB prevalence in Asian countries at 10.0%.[14] Our study's PTB prevalence however, was lower than 13.2% found in Ethiopia,[6] 18.3% found in Kenya,[8] and 37% in Ghana.[7] This discordancy is likely to be due to different interventions related to maternal and child health which were put in place by the government of Rwanda such as affordable package of antenatal care services, providing iron supplements for all pregnant women during antenatal care services, strengthening the capacity of community health workers in charge of maternal health at the village level, and providing social support for poor families. Besides, the other studies were conducted in referral and tertiary hospitals where complicated obstetrical cases were referred to and managed thereby possibly increasing the prevalence of PTB. On the other hand, the prevalence of PTB in this study was higher than the prevalence of PTB revealed by the study conducted in Sub Saharan African countries where the overall prevalence of PTB was 5.33%,[3] implying that more intervention strategies are needed to lower further the prevalence of PTB in the study area.

Sociodemographic characteristics as risk factors of Preterm Birth

According to the findings of this study, PTB has higher odds of occurring among mothers who were above 35 years compared to those who were between the ages of 20 and 35. This is consistent with the findings of the Northern Italian investigation,[15] and in Eastern Ethiopia,[5] where mothers with advanced age above 35 years had higher odds of having PTB. This might be caused by structural alterations of the uterus, placenta praevia, gestational diabetes and other co-morbidities, use of caesarian section and other invasive procedures usually associated with PTB, and most common among those aged over 35 years.[16]

Significant association was found between marital status and PTB with increased odds amongst unmarried mothers. This is consistent with the study conducted in Uganda in which mothers who were not married ran a higher risk of having preterm babies.[17] Psychological stress and lack of social support are likely to contribute to PTB among unmarried mothers.[18] Surprisingly, there was no significant relationship between education level and PTB (p-value=0.098) which contradicts with the findings from a study conducted in the United Arab Emirates, whereby maternal education below the secondary level was positively associated with PTB.[19] This discrepancy with our findings could be attributed to the small number (10) of those with secondary or higher education compared to 302 including those with primary and no formal education. Those with no formal education or having just primary level tend to have low social-economic status and low income both of which are known to adversely influence pregnancy outcome.[20] Likewise, in this study occupation was not associated with PTB outcome contrary to other study findings where working women were more likely to deliver preterm babies.[21] The plausible explanation for this inconsistence is that given the low level of education of most of the participants, their type of occupations and hence income levels were not so different as to convey disparity in birth outcome.

Clinical and gynaeco-obstetrical characteristics as risk factors of Preterm Birth

Number of ANC visits of less than four was associated with PTB, whereby in this study, all mothers who had PTB had attended less than four antenatal care visits. This is in accordance with the results from a study carried out in Uganda, where PTB was associated with missing ANC appointments or attending less than 4 ANC appointments. [16]

Similar results were found in Ethiopia,[22] and East Africa.[23] This could be attributed to missing the package of differed services provided to mothers who completed the recommended ANC visits.[24] Surprisingly, parity was not independently associated with PTB. This could be due to the small number of PTB compared to term birth in this study. [8] This contradicts with the result of a study which showed that multiparous women were more likely to have PTB, probably due to uterine alterations such as myometrial stretching from prior pregnancies.[8] Maternal BMI of 25-30 was independently associated with PTB, which is consistent with the findings of a study done in China where mothers who were overweight had higher odds of having PTB.[25] We also found that PTB was unrelated to a number of parameters connected to obstetric history most probably due to the small number of PTB in the sample.[8] For instance, history of cesarean delivery was not associated with PTB unlike,[26] history of abortion unlike [27] was also not associated with PTB.

All mothers with PPROM delivered preterm babies and this is consistent with the result of a research carried out in the United States of America, where 40–50% of babies were preterm from mothers with PPROM. [28] This could have occurred because endogenous prostaglandins, which trigger uterine contractions and cause premature birth are released during membrane rupture.[28] Hemoglobin less than 11 g/dl was associated with PTB and this is consistent with the results of other studies. [12,23] Anemia leads to decreased oxygen supply to tissues and adversely affects maternal and fetal wellbeing. UTI/STI was associated with PTB. This is similar to result of a study conducted in East Africa where urinary tract infection and presence of vaginal discharge were significantly associated with PTB.[23] Infection may intensify inflammatory processes generally, resulting in early labor and PTB. The mode of delivery was not associated with PTB though, this contradicts with the study conducted in Ghana where women who underwent C/S were more likely to develop PTB than mothers who gave birth vaginally. [29]

Conclusion

This study revealed that the prevalence of PTB was 9.6% in Gahini hospital. Factors that were independently associated with PTB include mother's age >35, being unmarried and maternal BMI of 25-30. Antenatal care services and attendance need to be strengthened at different levels especially the health centers and community levels so that the mothers can benefit from information, education and communication provided during ANC visits as well as other health promotion and disease prevention services that are expected to be provided to the pregnant women during ANC appointments. More emphasis should be oriented towards unmarried couples for health promotion. Couples should be encouraged to get married before pregnancy for enhancing shared responsibilities and promoting the health of pregnant woman and fetus. People should be advised to prevent pregnancy during advanced age due to the associated poor pregnancy outcome like preterm births. Maternal nutrition during pregnancy should be part of the main focus for ensuring that mothers have good nutritional status with normal BMI for promoting the wellbeing of the mother and growing fetus. Therefore, intervention strategies related to maternal and child health need to be developed and strengthened to address factors associate with preterm birth.

Limitations of the study

This study is subject to some limitations. Firstly, the study design with secondary data was a limitation as it was based on medical records in the patients' files with documentation for the purpose of treatment and hence not all characteristics desirable for the study could be obtained.

Secondly, the study was based on deliveries that occurred in the hospital and it did not include deliveries which could have occurred outside the hospital; and therefore the results should be interpreted with caution. Lastly, a small sample size for some factors may have led to an unstable estimate.

Authors' contribution

CH designed and conducted the study, and wrote the first draft of the paper; JO and MH supervised the work and made corrections to the draft manuscript. All authors have contributed for revising the manuscript until its publication.

Conflicts of interest

No competing conflicts of interest to declare

Source of funding

There were no funds obtained to complete this research

Acknowledgement

We express our appreciation to the administration of Mount Kenya University and Gahini hospital's administration for giving the permission for conducting this research and for their kind support.

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