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Research Article

PREVALENCE AND DETERMINANTS OF PRETERM BIRTH AT NYAMATA DISTRICT HOSPITAL, RWANDA

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Abstract

Background: Preterm birth, defined as childbirth occurring at less than 37 completed weeks or 259 days of gestation from the first day of the last menstrual period, is the major determinant of neonatal mortality and morbidity worldwide and remains a public health concern. Of the estimated 3 million neonatal deaths occurring globally each year, about 1 million are directly related to prematurity. No studies have been carried out locally to determine the prevalence as well as determinants of preterm delivery in Rwanda. This study aimed to determine the prevalence and risk factors associated with preterm birth among women admitted in the delivery service of Nyamata District Hospital located in Bugesera District, Rwanda. **Methods:** This was a health facility-based cross-sectional study that used data collected from July to August 2019 through structured interviews and medical records. A total of 400 women were enrolled into the study at Nyamata District Hospital. Study participants' socio-demographic, psychological and medical characteristics were described using frequency tables. Bivariable and multivariable logistic regression models were fitted to determine factors associated with pre-term birth using SPSS version 21. **Results**: The prevalence of preterm birth in Nyamata Hospital was found to be at 9%. Most of respondents 78.8 % were aged between 20 to 35 years. Almost a quarter of respondents had a Body Mass index below 18.5 and a quarter had Mid-Upper Arm Circumference below 24cm. lower weight gain during pregnancy (OR: 3.89, CI: 1.10–13.77), MUAC below 24cm (OR: 5.85, 1.26-27.24), shorter inter pregnancy interval (OR: 7.60, CI: 1.10–52.43), and perception of high level stress during pregnancy (OR: 7.68, CI:1.37–42.92)were some of the factors associated with preterm birth negatively and having health insurance coverage (OR: 0.27; CI: 0.08-0.83) was a protective factory. **Conclusion and recommendation:** In this study, the prevalence of preterm birth in Nyamata Hospital was found to be high. Factors indicating nutritional deficiency of pregnant mothers such as, lower weight gain during pregnancy and MUAC below 24cm plus shorter inter pregnancy interval and perception of high level of stress during pregnancy were associated with preterm birth. Policy makers and health planners of Rwanda should arrange health system mechanisms which can address good nutritional supplement of pregnant mothers. The health system of Rwanda should also work on improved utilization of family planning methods for optimal spacing of child birth and improved conditions which can relived stress of pregnant mothers.

Keywords: Knowledge; Experiment; Attitude; Waste; Managing, Behavior.

INTRODUCTION

Preterm birth is defined as childbirth happening before 37 completed weeks or 259 days of gestation from the first day of the last menstrual period (1). Preterm birth is the major determinant of neonatal mortality and morbidity worldwide (2,3). Preterm birth remains a public health concern as it continues to be highly prevalent worldwide. More than 15 million babies are born prematurely every year and this number continue to increase (4). World Health Organization (WHO) estimated global rates of 11.1% equivalent to 14.9 million premature babies among 135 million live births worldwide (5). Prematurity itself links to the higher rate of mortality at an early age as well as morbidity which has long-term adverse consequences to the health of the babies and their families and then affects the countries and World's economic status(5). Worldwide preterm complications cause death count more than 1 million babies each year (3). Preterm birth-related complications are known to be the first foremost direct cause of neonatal deaths, accountable of the 3.1million deaths(35%) a year globally, and the second cause of under five deaths(5). Preterm birth ranges between 5% to 18% worldwide (1). This devasted health concern is highly prevalent in Low-and Middle-Income Countries (LMICs). Prevalence and incidence of preterm births vary according to nation's capacity to manage or intervene on the problem (6). In low-income countries (LICs) prematurity counts for(11.8%), while in lower-middle income countries counts for (11.3%), upper middle- income countries count for(9.4%) followed lastly by high-income countries count (9.3%) (7). Furthermore, great number of 60% of preterm birth occurred in sub-Saharan Africa and south Asia with 9.1 million births yearly representing (12.8%) of preterm birth. This expressed the severity of the prevalence of prematurity globally particularly in low-and-middle income countries (4). In Rwanda 35,000 babies are reported to be premature among 363,000 lives birth every year with 2,600 death due to preterm complications among under-5children (8). The previous studies confirmed the remarkable decrease of child mortality due to the fact that Rwanda has achieved the target of Millennium Development Goal 4 (MDG4) that aimed at reducing under-5 years mortality rate by 2/3 between1990 and 2015 (9). In Rwanda from 2005 to 2015 child mortality was reduced significantly from 152 deaths per 1,000 live births up to 50 deaths per 1,000 live births. However, neonatal mortality reduction was not as fast and was reduced from 37 per 1,000 lives birth in 2005 to 20 deaths per1,000 live birth in 2015(10) (11). The Ministry of Health of Rwanda estimated that neonatal deaths continue to present the biggest challenges, with 68% of all under-five deaths occurring as a result of neonatal complications (12).

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It was noticed that the declines in neonatal mortality have been more modest than declines in under-five and infant mortality, thus further investments in neonatal and antenatal care are required (5). Despite these, no recent study conducted among women who delivered for assessing the prevalence and risk of the preterm birth in Rwanda. There is a need to provide recent data on the prevalence and risk factors associated with the prematurity and to provide recommendations for further intervention to reach the Rwanda projection of reducing 8% of neonatal mortality rate by 2030(11).This study aims at determining the prevalence and risk factors associated with preterm birth at Nyamata Hospital of Rwanda in 2019. The results are likely to be a basis of information for health professionals and the public about preterm birth prevalence and risk factors in the study area, in order to inform prevention and further interventions related to preterm birth in Rwanda.

Problem statement

Preterm birth remains the public health issue that has multiple harmful effects on the nations, societies, and families. Low and middle-income countries are most affected by the problem (2). WHO reports show the range of premature birth in 184 which ranges between 5 to 18%. Although significant progress has been made in reducing premature birth through the implementation of various programs taken for promoting maternal and child health nationwide, few scientific studies conducted in Rwanda on preterm births were traced. There is a need to provide recent data on the prevalence and risk factors associated with prematurity and to provide recommendations for further intervention. The study aims at determining the prevalence and associated risk factors with preterm birth among women who gave birth from July 19th to 19th August 2019 at Nyamata district hospital. This study aimed to assess the occurrence and risk factors linked with preterm birth among women who delivered at Nyamata District Hospital in Bugesera District, spanning from July 19th to August 19th, 2019. The primary objective was to ascertain the prevalence and risk factors associated with preterm birth among women receiving delivery services at the hospital during the specified period. Specific objectives included determining the prevalence of preterm birth among these women and examining the correlation between various socio-demographic, medical, and obstetrical factors and preterm birth occurrence. The research questions were twofold: firstly, to establish the prevalence of preterm birth among women utilizing delivery services at Nyamata District Hospital, and secondly, to investigate the association between socio-demographic, medical, and obstetrical factors and preterm birth among women admitted for delivery at the hospital.

METHODOLOGY

This study employed a hospital-based quantitative cross-sectional design conducted at Nyamata District Hospital in Bugesera District, Rwanda. Serving 15 health centers and one prison, the hospital handles over 500 deliveries monthly and serves as the primary facility for a district with a population density of 282 people per km². The study population consisted of all women who gave birth at the hospital during the specified period, regardless of delivery outcome. Inclusion criteria encompassed women delivering at Nyamata Hospital, irrespective of delivery mode and gestational age. Sample size calculation, based on a 50% prevalence, 95% confidence interval, and 5% significance level, yielded 400 participants. Recruitment occurred daily at discharge, supervised by two trained data collectors. Data collection involved questionnaire administration, maternal anthropometrics and left middle upper arm circumference (MUAC) measurement, and tracking of obstetric and socioeconomic factors from medical records. Ethical considerations, including informed consent, confidentiality, and participant autonomy, were ensured throughout the study. Descriptive statistics (frequency and prevalence) were used to describe participants' characteristics, while inferential statistics, including chi-square analysis, were employed to establish associations between preterm birth and various risk factors. Bivariable and multivariate logistic regression analyses were conducted to determine factors independently associated with preterm birth, with the multivariable model constructed using forward regression and including statistically significant variables from the bivariable analyses ($p<0.05$).

RESULTS

Socio demographic characteristics

The findings from the research showed that most of respondents 78.8 % were aged between 20 to 35 years. Among respondents 32.5% had no employment and 16.0% with non-education. Most of respondent, (89%) indicated that they were not exposed to tobacco during pregnancy, respondents exposed to tobacco were 9.8%, and 1.3% had high exposure to tobacco during pregnancy. The majority of respondents (89.3%) didn't use alcohol during pregnant while 10.8% used it. Most of respondents were in normal range of nutrition status based on the measures taken; 68.3% with a BMI between 18.5-24.9, 23.1% had a BMI below18.5 and 8.3% had a BMI above 24.9, while on MUAC, the majority of participants (62.3%) had MUAC between 24-30cm which consider as normal as study state and 28.5% had MUAC below 24 cm which was considered as under nutrition. A quarter of respondents (27.1%) gained below 2kg per month during pregnancy and 66.2% gained around 2kg. About marital status 89% were married /cohabitating and 11.0% were single/ separated. Majority of respondents (92.3%) had health insurance vs. 7.8% without health insurance; also 49% were in "ubudehe" categories 3 while 43.5% and 7.5% were in categories 2 and 1 respectively. Other socio demographic variables are presented in Table 1**.**

Obstetrical characteristic of respondents

The findings from this study showed that the great majority of respondents (93.5%) had less than five pregnancies, while 9.3 % had an inter pregnancy interval of 1 year, 43.8% of respondents had an inter pregnancy interval of 2 years and respondents with

inter pregnancy interval above 2 years represented 37.3%. The majority of respondents (98%) reported no history of previous preterm deliveries. More than half of respondents (57.5%) had spontaneous vaginal delivery and 42.5% delivered by cesarean Section. .Spontaneous labour represented 51.3% of respondents and 48.8% were induced. Only 4.3% of respondents had twin's deliveries, and 9% of all respondents delivered preterm babies. Of all babies delivered, 46.3% were male and 53.8% were Female. Regarding to Antenatal care attendance this study showed that only 32.8% of respondents attended 4 visits in ANC, 3 visits were done by 25% and one to 2 visits done by 11.3% and 31% respectively. Antepartum hemorrhage histories were reported by 13% of respondents. About 5.8% of respondents were admitted due to PROM or PPROM for more than 18 hours. In total 3.3% of respondents have lost their babies during labour or immediately after delivery. No artificial fertilization was reported. Of all respondents 9% had preterm birth and 5.6% were classified as extremely preterm, 16.7% were very preterm, 22.2% were moderate preterm and 55.6% were late preterm. Other obstetrical variables are presented in Table2**.**

Table 1. Socio demographic characteristic of participants

Variable	Term n(%)	Preterm n(%)	Total n &(%)
Age (n=400)			
<20years	6(16.7)	33(9.1)	39(9.8)
20 to 35 years	23(63.9)	292(80.2)	315(78.8)
> 35years	7(19.4)	39(10.7)	46(11.5)
BMI[a](n=398)			
<18.5	80(22.1)	12(33.3)	92(23.1)
18.5 to 24.9	251(69.3)	22(61.1)	273(68.6)
>24.9	31(8.6)	2(5.6)	33(8.3)
MUAC[b](n=400)			
<24 cm	96(26.4)	18(50.0)	114(28.5)
24 to 30 cm	239(65.7)	10(27.8)	249(62.3)
>30cm	28(8.0)	8(22.2)	37(9.3)
Weight gain during pregnancy (n=399)			
< 2kg per month	90(24.8)	18(50.0)	108(27.1)
1 to 2kg per month	251(69.1)	13(36.1)	264(66.2)
>2kg per month	22(6.1)	5(13.9)	27(6.8)
Marital status (n=400)			
Single Divorced/separated	38(10.4)	6(16.7)	44(11.0)
Married/ Cohabiting	326(89.6)	30(83.3)	356(89.0)
Level of education (n=400)			
No education	56(15.4)	8(22.2)	64(16.0)
Primary	170(46.7)	22(61.1)	192(48.0)
Secondary	131(36.0)	5(13.9)	136(34.0)
University	7(1.9)	1(2.8)	8(2.0)
Occupation (n=400)			
No employed	284(78.7)	33(91.7)	317(79.8)
Employed	77(21.3)	3(8.3)	80(20.2)
Smoking during pregnancy (n=400)			
No Exposure	326(89.6)	30(83.3)	356(89.0)
Exposure	33(9.1)	6(16.7)	39(9.8)
High Exposure	5(1.4)	0(0.0)	5(1.3)
Use of alcohol during pregnancy (n=400)			
Yes	36(9.9)	7(19.4)	43(10.8)
No	328(90.1)	29(80.6)	357(89.3)
Health insurance			
Yes	342(94.0)	27(75.0)	369(92.3)
No	22(6.0)	9(25.0)	31(7.8)
Ubudehe Cat			
Categ 1	26(7.1)	4(11.1)	30(7.5)
Categ 2	157(43.1)	17(47.2)	174(43.5)
Categ 3	181(49.7)	15(41.7)	196(49.0)

[a]**BMI** =Body Mass Index
[b]**MUAC** =Mid Upper Arm Circumference

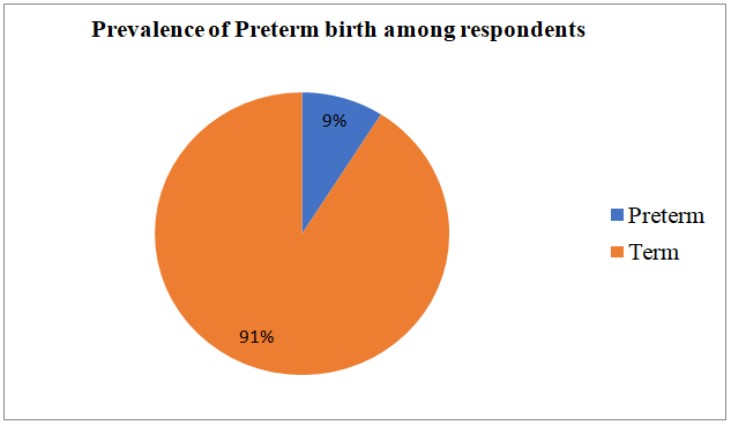

Figure 1. Prevalence of Preterm birth among respondents

Table 2. Obstetrical characteristic of respondent

Variable	Term n(%)	Preterm n(%)	Total n &(%)
Parity (n=399)			
< 5	343(94.5)	30(83.3)	373(93.5)
> 5	20(5.5)	6(16.7)	26(6.5)
Inter pregnancy interval (n=358)			
<1year	31(8.5)	6(16.7)	37(9.3)
1 to 2 years	166(45.6)	9(25.0)	175(43.8)
>2	137(37.6)	12(33.3)	149(33.7)
History of preterm birth (n=400)			
Yes	6(1.6)	2(5.6)	8(2.0)
No	358(98.4)	34(94.4)	392(98.0)
Mode of delivery (n=400)			
SVD[a]	204(56.0)	26(72.2)	230(57.5)
CS[b]	160(44.0)	10(27.8)	170(42.5)
Onset of labor (n=400)			
Spontaneous	184(50.5)	21(58.3)	205(51.3)
Induced labor	180(49.5)	15(41.7)	195(48.8)
Multiple Pregnancy (n=400)			
Yes	13(3.6)	4(11.1)	17(4.3)
No	351(96.4)	32(88.9)	383(95.0)
Sex of the baby (n=400)			
Male	164(45.1)	21(58.3)	185(46.3)
Female	200(54.9)	15(41.7)	215(53.8)
Babies outcomes (n=400)			
Alive	353(97.0)	34(94.4)	387(96.8)
Died	11(3.0)	2(5.6)	13(3.3)
Number attended ANC[c] (n=400)			
Once	41(11.3)	4(11.1)	45(11.3)
2 times	110(30.2)	14(38.9)	124(31.0)
3 times	86(23.6)	14(38.8)	100(25.0)
4 or more times	127(34.9)	4(11.1)	131(32.8)
Ante partum hemorrhage (n=400)			
Yes	44(12.1)	8(22.2)	52(13.0)
No	320(87.9)	28(77.8)	348(87.0)
PROM or PPROM[d](n=400)			
Yes	19(5.2)	4(11.1)	23(5.8)
No	345(94.8)	32(88.9)	377(94.3)
In-Vitro fertilization (n=400)			
Yes	0(0.0)	0(0.0)	0(0.0)
No	400(100.0)	400(100.0)	400(100.0)
Preterm classifications(n=400)			
Extremely preterm(<28WA)	0(0.0)	2(5.6)	2(0.5)
Very preterm(28-31WA)	0(0.0)	6(16.7)	6(1.5)
Moderate preterm(32-33WA)	0(0.0)	8(22.2)	8(2.0)
Late preterm(34-36WA)	0(0.0)	20(55.6)	20(5.0)
Gestation age (n=400)			
<37 Weeks	0(0.0)	36(100.0)	36(9.0)
37-42Weeks	340(93.4)	0(0.0)	340(85.0)
>42 Weeks	24(6.6)	0(0.0)	24(6.0)

[a]**SVD**=Spontaneous Vaginal Delivery
[b]**CS**=Cesarean Section
[c]**ANC**=Antenatal Care
[d]**PPROM**= Prelabor Premature Rupture of Membrane

Medical conditions and psychological aspects of respondents

Only 2.5% of respondents were HIV Positive. The greater part of respondents (84.8%) had normal range of hemoglobin level (Hb) i.e. Hb>12gr/dl and 15.3% of respondents had Hb<12gr/dl. Of all respondents (8%) had Hypertensive disorders (pregnancy induced hypertension, Pre-eclampsia or Eclampsia) and 26.8% of women reported history of burning sensation during urination or UTI during the pregnancy. Cardiopathy cases represented 0.3% of all respondents, asthma cases were 0.3%, and 1% of respondents had gestation diabetes. Malaria during pregnancy period was reported by 8.2% of respondents. An average of 55% of respondent scored no stress and 39.8 reported moderate stress in the month before delivery, while only5.3% showed that they met with high level of stress.

Association between social demographical data and preterm birth

In bivariable analysis, respondents who had gained less than 2kg per month during pregnancy (P=0.004; OR 3.18) are3 times more likely to experience a preterm birth than respondents who gained 2kg or more. Unemployed respondents have less risk of having preterm birth compared to farmer and self-employed respondents (OR: 0.29).Also having health insurance were found to be protective as women with health insurance have less risk of having preterm birth compared to women without health insurance (OR**:**0.19). However, other social demographical variables like maternal age, marital status, BMI, alcohol use during pregnancy (OR: 0.45, CI: 0.186-1.112), smoking during pregnancy (OR: 0.50, CI: 0.19-1.305), having “Ubudehe” categories were not found to be associated with preterm birth (Table 4).

Table 3. Medical and psychological condition of respondents

Variable	Term n(%)	Preterm n(%)	Total n &(%)
HIV status (n=396)			
Positive	8(2.2)	2(5.6)	10(2.5)
Negative	352(97.8)	34(94.4)	386(97.5)
Hypertension or Eclampsia (n=400)			
Yes	28(7.7)	4(11.1)	32(8.0)
No	336(92.3)	32(88.9)	368(92.0)
UTI[a] during the pregnancy (n=400)			
Yes	94 (25.8)	13(36.1)	107(26.8)
No	270(74.2)	23(63.9)	293(73.3)
Diabetes (n=400)			
Yes	3(0.8)	1(2.8)	4(1.0)
No	361(99.2)	35(97.2)	396(99.0)
Asthma (n=400)			
Yes	1(0.3)	0(0.0)	1(0.3)
No	363(99.7)	36(100.0)	399(99.8)
Cardiopathy (n=393)			
Yes	1(0.3)	0(0.0)	1(0.3)
No	357(99.7)	35(100.0)	392(99.7)
Hemoglobin level (n=363)			
<12 g/dl	52(14.3)	9(25.0)	61(15.3)
>12 g/dl	312(85.7)	27(75.0)	339(84.8)
Malaria (n=392)			
Yes	26(7.3)	6(16.7)	32(8.2)
No	330(92.7)	30(83.3)	360(91.8)
Stress level (n=400)			
No stress	35(9.6)	10(27.8)	45(11.3)
Moderate Stress	183(50.3)	9(25.0)	192(48.0)
High level of stress	146(40.1)	17(47.2)	163(40.8)

[a]**UTI**: Urinary Tract Infection

Table 4. Bivariable analysis of the association between social demographical data and preterm birth

	Bivariable analysis			
Factors	**Term (n)%**	**Preterm (n)%**	**CI (95%)**	**P-Value**
Age				
<20	33 (84.6)	6 (15.4)	0.98 (0.30-3.22)	0.983
20-35	292 (92.7)	23 (7.3)	1	
< 35	39 (84.8)	7 (15.2)	2.27 (0.91-5.65)	0.760
BMI				
<18.5	80 (87.0)	12 (13.0)	0.430(0.09-2.03)	0.287
18.5 to 24.9	251 (91.9)	22 (8.1)	1	
>24.9	31(93.9)	2 (6.1)	0.73 (0.16-3.28)	0.688
Weight gain				
< 2kg per month	90(83.3)	18 (16.7)	**4.38(1.43-13.44)** **	**0.010****
2kg per month	251 (95.1)	13 (4.9)	1	
>2 per month	22(81.5)	5(18.5)	1.13(0.38-3.39)	0.819
Marital Status				
single/divorced/separated	326(91.6)	30 (8.4)	0.58(0.22-1.49)	0.260
Married/cohabitation	38(86,4)	6 (13.6)	1	
Education				
No formal Education	56(87.5)	8 (12.5)	3.74 (0.38-36.50)	0.256
Primary	170(88.1)	22 (11.5)	1.10 (0.13-9.40)	0.928
Secondary	131(96.3)	5 (3.7)	1.00 (0.10-9.22)	1.000
University	7(87.5)	1 (12.5)	1	
Occupation				
No employed	121(95.3)	6 (4.7)	**0.29 (0.12-0.74)** *	**0.010***
Farmers	163(85.8)	27 (14.2)	0.99 (0.11-8.67)	0.994
Self-employed/Business	57(96.6)	2 (3.4)	1.41 (0.27-7.22)	0.678
Formal employed	20(95.2)	1 (4.8)	1	
Smoking				
No Exposure	326(91.6)	30 (8.4)	1	
Exposure	33(84.6)	6 (15.4)	0.50 (0.19-1.30)	0.159
High Exposure	5(100)	0 (0.0)	0	0.999
Alcohol use				
Yes	36(83.7)	7 (16.3)	0.45 (0.18-1.11)	0.840
No	328(91.9)	29 (8.1)	1	
Health Insurance				
Yes	342(92.7)	27(7.3)	1	
No	22(71.0)	9(29.0)	**0.19(0.08-0.46)** *	**<0.001***
Ubudehe Cat				
Categ 1	26(86.7)	4(13.3)	0.53(0.16-1.74)	0.303
Categ 2	157(90.2)	17(9.8)	0.76(0.37-1.58)	0.471
Categ 3	181(92.3)	15(7.7)	1	

Association Between obstetrical condition of respondents and preterm birth

In bivariable analysis, the inter pregnancy interval less than 12months (OR: 5.53, CI: 2.01-15.07), and multiple pregnancies (OR: 3.37,CI: 1.04-10.95) were found to be associated with preterm birth (Table 5). Respondents with more than 5 parities have less risks of preterm birth (OR: 0.29, CI: 0.10- 0.78) compare to those with less than 5 parities. Attending 2 and 3 ANC visits was protective of having preterm birth. However, this study did not find any association between preterm birth and antepartum haemorrhage (OR: 0.48; CI: 0.20-1.12) Table 5.

Table5. Bivariable analysis of the association between obstetrical condition of respondents and preterm birth

	Bivariable analysis			
Factors	**Term (n)%**	**Preterm (n)%**	**CI[a] (95%)**	**P-Value**
Parity				
< 5	343 (92.0)	30 (8.0)	**1**	
>5	20 (76.9)	6 (23.1)	**0.29 (0.10- 0.78) ***	**0.014***
Inter pregnancy interval				
<12months	31 (83.8)	6 (16.2)	**5.53 (2.01-15.07) ****	**0.001****
12 to 24 months	163 (94.9)	9 (5.1)	**3.42 (1.32-8.85) ****	**0.011****
>24months	137 (91.9)	12 (8.1)	1	
History of preterm birth				
Yes	6 (75.0)	2 (25.0)	0.28 (0.05-1.46)	0.133
No	358 (91.3)	34 (8.7)	1	
Mode of delivery				
SVD[b]	204 (88.7)	26 (11.3)	0.49(0.23-1.04)	0.065
CS[c]	160 (94.1)	10 (5.9)	1	
Onset of labor				
Spontaneous	184 (89.8)	21 (10.2)	0.73 (0.36-1.46)	0.374
Induced	180 (92.3)	15 (7.7)	1	
Multiple Pregnancy				
Yes	13 (76.5)	4 (23.5)	**3.37 (1.04-10.95) ****	**0.043****
No	351 (91.6)	32 (8.4)	1	
Sex of baby				
Male	164 (88.6)	21 (11.4)	0.58(0.29-1.17)	0.131
Female	200 (93.0)	15 (7.0)	1	
Number attended ANC[d]				
Once	41 (91.1)	4 (8.9)	0.32 (0.07-1.34)	0.121
2 times	110 (88.7)	14 (11.3)	**0.19 (0.06-0.60) ***	**0.005***
3 times	86 (86.0)	14 (14.0)	**0.24 (0.07-0.77) ***	**0.016***
4 or more times	127 (96.9)	4 (3.1)	1	
Ante partum hemorrhage				
Yes	44 (84.6)	8 (15.4)	0.48 (0.20-1.12)	0.090
No	320 (92.0)	28(8.0)	1	
PROM or PPROM				
Yes	19(82.6)	4 (17.4)	0.44(0.14-1.37)	0.158
No	345(91.5)	32(8.5)	1	

[a]:**CI**;Confidential Interval [b]: **SVD**: Spontaneous Vertex Delivery
[c]:**CS**:Cesarean Section [d]:**ANC**: Antenatal Clinic
**: Indicate that p-Value statistically significant
*: Indicate the P value were protective

Association between medical and psycho-social condition of respondents and preterm birth

In bivariable analysis, being stressed with moderate and high level of stress during pregnancy, (OR: 2.24, CI: 1.03-5.82) and (OR: 5.81, CI: 2.20- 15.33) respectively had positive association with preterm birth, also having a MUAC <24cm (OR: 6.59, CI: 2.41-18.03).

However, this study did not find any association between preterm birth and pregnancy induced hypertension or Eclampsia (OR: 0.667, CI: 0.22-2.02), UTI (OR: 0.61, CI: 0.30-1.26), and some chronical disease like Asthma, diabetes and cardiopathy.

Multivariable analysis of factors associated with preterm birth

In multivariable analysis gaining less than 2 kg per month during pregnancy (OR:3.89, CI: 1.10–13.77) inter pregnancy interval below 12 months (OR: 7.60, CI: 1.10–52.43), high level of stress during pregnancy (OR: 7.68, CI: 1.37–42.92) and MUAC (OR: 5.85; CI: 1.26-27.24) were found to be associated with preterm birth (Table 6).

Multiple pregnancies, number of ANC visits, occupation and parity, significant in bivariable analysis were not found to be associated with preterm birth in multivariable analysis.

Table 6. Bivariable analysis of the association medical and psycho-social condition of respondents and preterm birth

	Bivariable analysis			
Factors	**Term (n)%**	**Preterm (n)%**	**CI[a] (95%)**	**P-Value**
MUAC				
<24 cm	96 (84.2)	18 (15.8)	**6.59 (2.41-18.03)** **	**<0.001****
24 to 30 cm	239 (96.0)	10 (4.0)	1	
>30cm	29 (78.4)	8(21.6)	1.47(0.58-3.73)	0.416
HIV status				
Positive	8 (80.0)	2 (20.0)	0.38 (0.79-1.89)	0.241
Negative	352 (91.2)	34 (8.8)	1	
Hemoglobin level				
<12 g/dl	52(85.2)	9(14.8)	0.50(0.22-1.12)	0.093
>12 g/dl	312(92.0)	27(8.0)	1	
Hypertension / Eclampsia				
Yes	28 (87.5)	4 (12.5)	0.66 (0.22-2.02)	0.473
No	336 (91.3)	32 (8.7)	1	
UTI during pregnancy				
Yes	94 (87.9)	13 (12.1)	0.61(0.3-1.26)	0.187
No	270(92.2)	23(7.8)	1	
Diabetes				
Yes	3 (75.0)	1 (25.0)	0.29 (0.02-2.87)	0.290
No	361 (91.2)	35 (8.8)	1	
Malaria				
Yes	26 (81.3)	6 (18.8)	0.39(0.15-1.03)	0.058
No	330 (91.7)	30 (8.3)	1	
Stress level				
No stress	35(77.8)	10(22.2)	1	
Moderate stress	183(95.3)	9(4.7)	**2.24(1.03-5.82)** **	**0.042****
High level of stress	146(89.6)	17(10.4)	**5.81(2.20-15.33)** **	**<0.001****

Table 7. Multivariate logistic regression of significant factors

Factors	**AOR**	**CI (95%)**	**P-Value**
Inter pregnancy interval			
<12months	7.60	1.10-52.43**	0.039**
12 to 24 months	1		
>24months	1.71	0.24-12.18	0.58
Stress level during pregnancy			
No stress	1		
Moderate stress	1.16	0.20-6.53	0.861
High level of stress	7.68	1.37-42.92**	0.020**
Multiple pregnancy			
Yes	0.25	0.05-1.26	0.094
No	1		
Weight gain during pregnancy			
< 2kg per month	3.89	1.10-13.77**	0.035**
2kg per month	1		
>2 per month	1.83	0.46-7.14	0.384
MUAC			
<24 cm	5.85	1.26-27.24**	0.024**
24 to 30 cm	1		
>30cm	3.34	0.60-18.54	0.168
Health Insurance			
Yes	1		
No	0.27	0.08-0.83	0.24
Parity			
<5	1		
>5	2.91	0.84-10.04	0.089
Number attended ANC			
Once	0.16	0.03-0.92	0.041
2 times	0.20	0.05-0.78	0.021
3 times	0.19	0.05-0.74	0.017
4 or more times	1		

**: Indicate that p-Value statistically significant

DISCUSSION

The main findings of this study were hospital based prevalence rate of preterm birth in Nyamata DH was 9 % .This study also showed other prevalence like the prevalence of anemia that was 15.3% which almost comparable to the findings of DHS 2015 and of another hospital-based study conducted in Kigali in the Northern province of Rwanda (26,29,30). The found prevalence of diabetes of 1% was slightly higher compare to the findings of the above mentioned hospital-based study conducted in Kigali and the Northern province of Rwanda (29). This small difference may be explained by the fact that Nyamata hospital has adopted new protocol for detection of all chronic diseases with a full checkup of all pregnant women admitted in hospital even during routine ultrasound check up (Personal communication). HIV positive respondents were 2.5% this is low compare to RDHS and may link to limited time period of the study of one month. Self-reported malaria cases during pregnancy were 8.2%, this may be over

reported by women by confusing other infection with fever to malaria infection. Compared to other studies this study also showed prevalence of preterm classification where extremely preterm count5.6% of all preterm babies in this study, very preterm account for16.7%, moderate preterm for 22.2% and late preterm accounting for 55.6%, this was comparable to the findings of different studies in literature where they showed big number of premature babies were located in late preterm, followed by moderate preterm, very preterm and extremely preterm respectively (2,7). This study also showed socio demographic factors associated with preterm birth like weight gain during pregnancy and obstetrical, factors such as inter pregnancy interval, and higher stress level are independently associated with preterm birth. More women who delivered preterm were under nourished (weight gain and MUAC). No statistical differences were noted for the prevalence of HIV positive status between those who delivered preterm versus term. The high rate of preterm birth in this study is in agreement with a World Health Organization (WHO) shows that the prevalence range between 5% to18% are public health problem(1).

The prevalence of preterm birth of 9% found in this study appears half of those found in African countries. As different study showed a prevalence of preterm birth of 18,1%in Malawi. In Comoros the prevalence of preterm birth was 16.7%,16.7% in Congo, 16.6% in Zimbabwe, 16.5%, in Equatorial Guinea, 16.4%, in Mozambique, 16.3%, in Gabon: and 15.4% in Mauritania ;WHO report 2018(1). The found prevalence in a higher middle- income country outside Africa (Iran), was almost the half of the prevalence found by our study (25). The findings from our study indicated that there is influence of weight gain during pregnancy on preterm birth where result from the study show that there is positive association between weight gain during pregnancy and preterm birth and this was similar to study done in Malawi(18) ,and different to the study conducted in Iran(25).Furthermore the study indicated that other demographical data from study like maternal body mass index find not significant from this study and also not significant in the study mentioned below, but significant in the study done in Brazil, Malawi and Iran (16,18,25). Alcohol use and tobacco exposure in this study are not associated with preterm birth which is similar to result of study in Kenyatta hospital (3). Inter pregnancy interval found to be associated with preterm birth which is different to the finding from study in Kenyatta hospital. Moreover our study indicated that the occurrence of preterm birth among women delivered at Nyamata hospital was associated with the stress level of respondents similar to study in Brazil(16). In addition the respondents who had MUAC below 24 cm were found to have significant association with the preterm birth ,which was different to the study conducted in Kenya (3). The findings from our study indicated that multiple pregnancies isnot associated with preterm birth which is different to the study conducted in Tanzania and study conducted in Kenya which found that multiple pregnancy was associated with the occurrence of preterm birth(3,14). Multiple pregnancies is knowing risk factors associated with preterm birth due to uterine over distension, but in this study found not significant, this may be due to few number of twins in our simple size. The study indicated that ANC attendance were not associated with preterm birth among women who delivered at Nyamata hospital and this was similar to studies conducted in Indonesia, Kenya and Brazil (3,19,24).But in this study ANC attendance found to be protective; means women who attend at least one antenatal care visit have less risk of having preterm birth compare to women who did not attend. This may have been due to the influence of Focused Antenatal Care (FANC) approach in Rwanda which has emphasized the need to have four targeted antenatal visits (31). Pregnancy induced hypertension or eclampsia was not associated with the occurrence of preterm birth among woman delivered at Nyamata hospital. This finding is different from result of studies conducted in Tanzania, Brazil and Iran (6,13,14).This may be due to Rwanda efforts in detection and management of such conditions during antenatal care and every women's visit to health facility.

Conclusion

The prevalence of preterm birth of this study was smaller to the prevalence found in other African countries and higher compared to worldwide prevalence. This prevalence is also higher when compared to the ambition of Rwanda as a country that has managed to reach MDGs 4 and which is now looking forward to reaching SDGs. Factors related to nutritional status such as weight gain during pregnancy and MUAC<24cmhave found to have been found to have a big influence on the occurrence of preterm birth among women delivered at Nyamata Hospital. Furthermore, this study found also different obstetrical and psychological conditions like, inter pregnancy interval and high stress level during pregnancy to be associated with the occurrence of preterm birth among woman delivered at Nyamata Hospital. At risk women should receive special care and designed interventions such as dedicated preterm birth prevention clinics, preconception care package and antenatal care package including nutrition are suggested in order to prevent preterm birth.

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