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PREDICTORS OF PRETERM BIRTH AMONG WOMEN OF PASTORALIST COMMUNITIES IN MARSABIT COUNTY, KENYA

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Abstract

Preterm birth (PTB) is a major cause of neonatal mortality worldwide. The prevalence of PTB in Africa (about 12%) is more than twice that in developed countries (about 5%). In Kenya the prevalence is about 17% which is way more than the average in Africa, pointing to the need for targeted interventions to reduce its burden. District Medical Officer of Health (DMOH) of Moyale Sub-County, reported an increasing trend in Preterm Birth (PTB) in the region from 40% in 2012 to 60% in 2014. This study sought to establish the factors associated with PTB among mothers delivered in public hospitals in Moyale Sub-County. This was a cross-sectional study that involved 370 mothers with infants recruited at the post-natal clinics (PNC) from eight facilities in the region, selected purposively; Moyale Referral Hospital, Sololo Mission Hospital, Taqwa Nursing Home, Bilal Nursing Home, Uran Health Centre, Moyale Nursing Home, Afya Nursing Home and Dabel Health Centre. Stratified systematic sampling method with stratum-proportional size allocation was used to select the study participants. Information on their socio-demographic characteristics, obstetric and antenatal history was collected from the participants using a structured interviewer-administered questionnaire. Data was analyzed using STATA version 15. Chi-square test of association was used to determine the crude associations between the mothers' characteristics and preterm birth status. Log binomial regression model was used to estimate the adjusted

prevalence ratio (PR) of PTB with respect to the maternal factors. The mothers in this study were aged between 18 and 46 years with median 29 years (IQR=25-35years). Majority (63.0%) of the participants were from rural parts of the study area. The prevalence of PTB in this population was 38.7% (95% CI: 30.8%-40.8%). ANC attendance (1-3 visits vs none, PR=0.53 [0.40-0.71] & ≥4 visits vs none, PR=0.55 [0.39-0.76]), having UTI during pregnancy (PR=0.64 [0.45-0.91]), history of miscarriage (PR=1.29 [1.07-1.56]), history of underlying medical conditions during pregnancy (PR=1.56 [1.17-2.08), parity (PR=1.56 [1.12-1.62]), and employment status of the mother (PR=1.79 [1.16-2.78]) were significantly associated with the risk of PTB. The study evidently shows that the prevalence of PTB in Moyale sub-county is high, almost 3 times higher than the National estimate. Among the factors found to have a significant effect on PTB prevalence, some like ANC attendance can be addressed through community sensitization on the importance of making such visits to improve attendance and detect potential complications that would lead to PTB in advance. Special attention should be accorded to mothers with history of underlying medical conditions and miscarriages to enhance survival of the neonates. Mothers who are self-employed were found to have a higher risk of PTB compared to the unemployed; a possible explanation for this would be exposure to extraneous physical activities during pregnancy.

Key Words: *Mothers, Obstetric, Antenatal, Preterm Births, Pastoralist Socio-Demographic*

Introduction

World Health Organization (WHO) defined preterm as birth before 37 completed week of gestation or fewer than 259days from first day of the last menstruation period (WHO, 2014). There are few tales of preterm birth in ancient history since almost all the gestational age was not known. However through the Hippocratic writer (450-350 BC) described quite accurately the length of normal pregnancy (Obladen, 2011).

Prematurity is a major factor of neonatal mortality and morbidity as well as significant contributor to long term advance health outcome, of the estimated 130 million babies born each year globally , approximately 15 million are born preterm. World Health Organization estimates 3.1 million neonatal deaths that occurred globally in 2010, about 1.08 million (35%) were directly related to preterm birth. The magnitude of preterm birth is particularly heavy for Africa and Asia where 85% of all preterm birth occur. In developed countries, the prevalence of preterm birth range between 5% and 7%, while in Africa it is estimated to be 11.9 % of live births (Beck *et al*., 2010). The national prevalence of PTB in 2010 for Kenya, Uganda, Ethiopia, Eritrea, Rwanda, Somalia & Sudan stood at 20.3%, 13.6%, 10.1%, 12.2%, 9.5%, 12.0% & 13.2 % respectively (Blencowe H *et al.,*2010). PTB is a major obstacle in attainment of Sustainable Development Goal (SGD-3) target given its high contribution to neonatal mortality (Beck *et al*., 2010). Despite numerous efforts in improvement of neonatal care, PTB is now the biggest cause of mortality and long term disability among under-five-year old children globally (Liu *et al*., 2016). In 2015, cases of mortality rate among children under five years in low income countries was 76/1000 live births, about 11 times the average rate in high income countries (7/1000) (WHO, 2017). According to KDHS 2014 estimates, childhood mortality rate was 52/1000 live births in Kenya, which remains high as compared to developed countries. Children born prematurely have high rates of learning disabilities, psychomotor problems and recurrent respiratory illness compared to children born on term. Their growth and development milestones are negatively affected and often extended to later life, resulting in educational, psychological, social and medical problems (Blencowe *et al.,* 2010). PTB babies require prolonged hospital stay after birth, frequent hospital visits in first year of life and increased risk of chronic diseases, putting parents in social psychological and financial crisis. Some of the factors of influencing PTB in the general population include: having previous premature birth, family history of PTB, an interval of less than six months between pregnancies, premature rapture of membrane,

history of abortion, infection, drug abuse during pregnancy and maternal diseases in pregnancy such as hypertension and diabetes mellitus (Fraser and Cooper, 2008). Moyale sub-County in Marsabit County, Kenya faces harsh climatic weather conditions with frequent prolonged droughts where women experience frequent PTB. However, there is a paucity of studies on factors influencing occurrence of PTB in the county. This study will be an eye-opener on the potential risk factors of PTB in this region.

Problem Statement

Preterm birth is a global problem with WHO estimating the prevalence to range between 5% and 18% across 184 countries worldwide. Brazil, USA, India and Nigeria are among the top ten countries with the highest number (Blencowe *et al*., 2010). The prevalence of PTB in Africa (about 12%) is more than twice that in developed countries (about 5%). The prevalence in Kenya of about 17%, (Wangura, 2018) is way more than the average in Africa (12%), pointing to the need to put preventive measures to reduce the burden of PTB.

Marsabit County experiences numerous hardships; it only has one county hospital. However the number of preterm births in Moyale sub-county among the women is a problem that has been on the rise lately. As the Community Health Extension Workers and the Chiefs report (2014) indicates that in 2013, out of every 10 deliveries, 6 were premature births an increase from the previous year (2012) where only 4 out of 10 births were premature deliveries. Many women in both towns and local communities in Moyale continuously give birth before term. This problem continues to baffle many as even in the most affluent sections of the Moyale sub-county community still experience premature births. In a wake to address this PTB issue the researcher decided to undertake the study.

Objectives of the Study

The specific objectives of the study were:

(i) To describe the socio-demographic characteristics of pastoralist mothers attending PNC at health facilities in Moyale sub-county.

(ii) To establish the obstetric and antenatal history of the pastoralist mothers attending PNC at health facilities in Moyale sub-county.

(iii) To determine factors associated with preterm births among pastoralist mothers attending PNC at health facilities in Moyale sub-county.

Null Hypothesis

(i) There is no significant relationship between socio-demographic characteristics, antenatal and obstetric history of the mothers and preterm births among pastoralist mothers attending PNC at health facilities in Moyale sub-county.

Materials and Methods

A cross sectional design was adopted in this study to assess the predictors of PTB among mothers of pastoralist communities in Moyale sub-county, Kenya. The data was collected from the sampled participants in each of the health facilities which offers PNC services for a period of two months. The study selected all women of reproductive age in Moyale Sub-county of Marsabit County attending PNC services at any of the selected health facilities. The study focused on nursing mothers with less than 1 year old babies, seeking PNC services at any of the eight health facilities listed above. These were all women of reproductive aged between 15 and 49 years old residing in Moyale sub-County.

Sample size was calculated using Cochrane's formula (1963) for estimation of a population proportion.

$$n \geq \frac{Z^2_{\alpha/2} p(1-p)}{d^2}$$

Where; n = the required minimum sample size; $Z_{\alpha/2}$ = Standard normal distribution critical value at α-type I error for a two sided test (α=0.05, $Z_{\alpha/2}$ = 1.96); $p(1-p)$ = Standard deviation of the population proportion being estimated (P=0.6 based on the DMOH report in 2014); d = Margin of error or measure of precision (d=0.05).

Based on this on the formula, as defined, the minimum sample size required was 369 mothers. Purposive sampling was used to identify eight health facilities which offer MCH services in Moyale sub-county. Stratified systematic sampling method was used to select respondents from each stratum (Facility). Proportional sample size allocation was done to determine the number of respondents to be selected in each facility using the formula.

$$n_f = \left(\frac{N_f}{N}\right) * n$$

Where, N=662; is the total study population size (total number of mothers that attended PNC clinics in the eight facilities combined in the past 2 months preceding the study period) and n=369; is the required total sample size. $\mathbf{N_f}$ and $\mathbf{n_f}$ are defined in the table below.

In each facility, the first respondent was selected randomly on the first day of the study and subsequent mothers selected at K-interval of 2 (K=N/n) until the required sample size for a given facility was attained. The recruitment was done at the PNC clinic of each facility during the immunization clinic days.

A structured questionnaire with closed ended questions was designed and used to collect data from the respondents for the study. The questionnaire was pre-tested at Godoma Model health Centre and amendments done where appropriate prior to the actual study. Key Informant Interview was used to collect data on preterm deliveries from the health care services providers for the study to have more weight.

Data collected was entered and stored in Epi-Data version 3.1. The data was exported, cleaned, coded and analysed using STATA version 13. Univariate analysis was done to explore and summarize the data; for categorical data such as education level, marital status, bar/pie charts were plotted to show the distribution. Frequencies and proportions were reported in tables. For continuous/discrete data such as mother's age, number of children ever born, histograms were plotted to show the distribution. Mean/median/mode and SD/IQR were reported depending on the distribution of the data.In bivariate analysis, Chi-square tests of association were done to evaluate the crude association between the respondents' characteristics and having preterm birth. Chi-square test statistics and corresponding P-values were reported. To determine the adjusted effect of each factor on the prevalence of preterm births based on the respondents' characteristics, obstetric and antenatal history, multiple log-binomial regression model was used. Prevalence ratios (PR), 95% confidence intervals corresponding p-values were reported.

Multiple log-binomial model

$$ln(p) = \beta_0 + \beta_i X_i \ldots + \beta_k X_k$$

Where, β_i is the coefficient of predictor X_i and e^{β_i}**= PR,** adjusted prevalence ratio with respect to a given factor.

Results

Introduction

In this chapter the result of the study are described and the analysis of the data presented. A total number of 370 mothers from eight health facilities in Moyale sub-county were interviewed. The results were presented according to objectives of the study, that is; description of the socio-demographic characteristics, obstetric and antenatal history of the respondents, and evaluate the factors associated with preterm births among mothers of pastoralist communities in Moyale sub-County, Kenya.

Socio-Demographic Characteristics of Respondents

Almost two-thirds (63.0%) of the respondents were residing in the rural parts of Moyale sub-County. Majority (67.6%) were married and the rest were either single or widowed or separated. Literacy level was low, with only about a third (32.2%) having completed at least primary level education. Three quarters of the respondents were unemployed (75.4%), the rest were either self-employed (19.5%) and in formal employment (5.1%).

Table 1: Socio-demographic characteristics of the respondents (n=370)

Socio-demographic characteristic	Category	Count (Percent)
Age group (years)	18-24	68(18.4)
	25-29	121(32.7)
	30-34	83(22.4)
	35-46	98(26.5)
Highest Education level	No formal education	251 (67.9)
	Primary	93 (25.1)
	Secondary	19 (5.1)
	Tertiary	7 (1.9)
Marital status	Married	250 (67.6)
	Not married	120 (32.4)
	Unemployed	279 (75.4)
Employment status	Employed (formal)	72 (19.5)
	Self employed	19 (5.1)
Type of residence	Urban (Township, Biashara street, Sessi)	137 (37.0)
	Rural (Butiye, Manyata, Gurumesa)	233 (63.0)

Obstetric history of the respondents

Most (80.8%) of the respondents had at least two children. Preterm births were very common, with about half (49.8%) of the mothers reporting having given birth previously before 38 weeks of gestation. It was interesting to note that, more than half of the mothers conceived their current infant before the recommended 2 year- birth interval between successive births. Approximately a quarter (24.0%) of the respondents reported having experienced miscarriage; with majority experiencing 1 miscarriage. Still births were reported by a few (7.3%) of the respondents (table 2).

Table 2: Obstetric history of the mothers

Obstetric characteristic	Category	Count (Percent)
Is this your first child?	Yes	71 (19.2)
(n=370)	No	299(80.8)
History of preterm birth	Delivery before 38 weeks	149 (49.8)
(n=299)	Term deliveries	150 (50.2)
Birth interval between current	≥24 months	110 (36.8)
and previous child (n=299)	<24 months	189 (63.2)
History of miscarriage (n=370)	No	281 (76.0)
	Yes	89 (24.0)
History of still birth (n=370)	Yes	27(7.3)
	No	343(92.7)

The respondents largely had moderate parity. However, the distribution was negatively skewed implying few had high parity. The median parity of the study population was 4 children with Inter quartile range (IQR: 2-6), ranging from 1 to 12 children (figure 1).

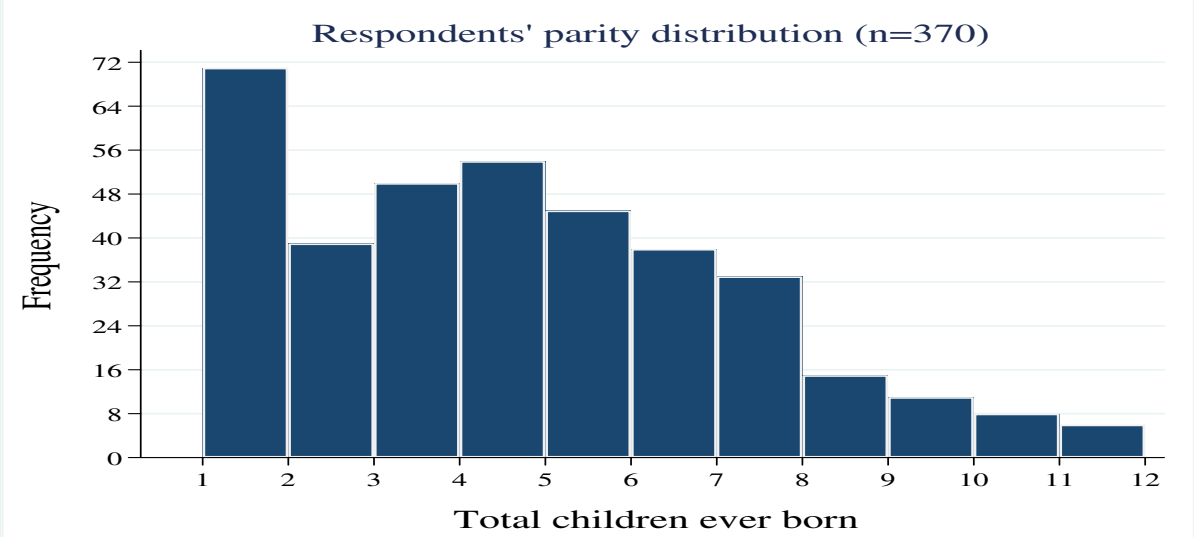

Figure 1: Respondents' parity

Antenatal history of the respondents

A most of clients (37.3%) made no ANC visit in their last pregnancy. Less than one-third (29.2%) of the respondents made the recommended number (at least 4) of ANC visits during their last pregnancy while an almost similar proportion (33.5%) made one to three visits (Figure 2).

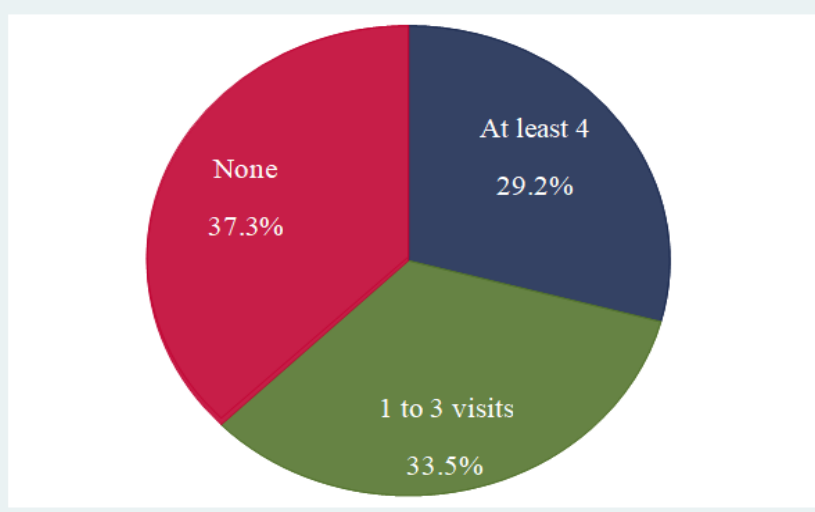

Figure 2: Frequency of ANC visits made by respondents during their last pregnancy

More than one-third (38.7%) of the respondents had preterm births in their last pregnancy. Twin births were infrequent (5.4%) in this study population. Similarly, complications during pregnancy were not common (15.4%) with the most prevalent complication being gestational diabetes (57.9% of those with complications). More than one-tenth (14.3%) indulged in drugs and substance abuse during their pregnancy.

Table 3: Practices and experiences during antenatal period

Factor	Category	Frequency	Percent (%)
Drugs and substance abuse	No	317	85.7
	Yes	53	14.3
Gestational age at birth	>37 weeks	238	64.3
	≤37 weeks	132	35.7
Twin pregnancy	No	350	94.6
	Yes	20	5.4
Medical problems during pregnancy	No	286	77.3
	Yes	84	22.7
Violence experience in pregnancy	No	351	94.9
	Yes	19	5.1
Pregnancy complications	No	313	84.6
	Yes	57	15.4
Complications	Gestational diabetes	33	57.9
	Placenta Previa	8	14.0
	Preeclampsia	14	24.6
	Other	2	3.5

Figure 3 illustrates specific medical conditions experienced by respondents. This was a follow up question to the one asking about whether one had any medical problems during their last pregnancy, where 84 answered in the affirmative. The most prevalent disease among the study population during their last pregnancy was tuberculosis (27/84; 32.1%) followed by asthma (25/84; 29.8%). The least common medical problem was hypertension (8/84; 9.5%).

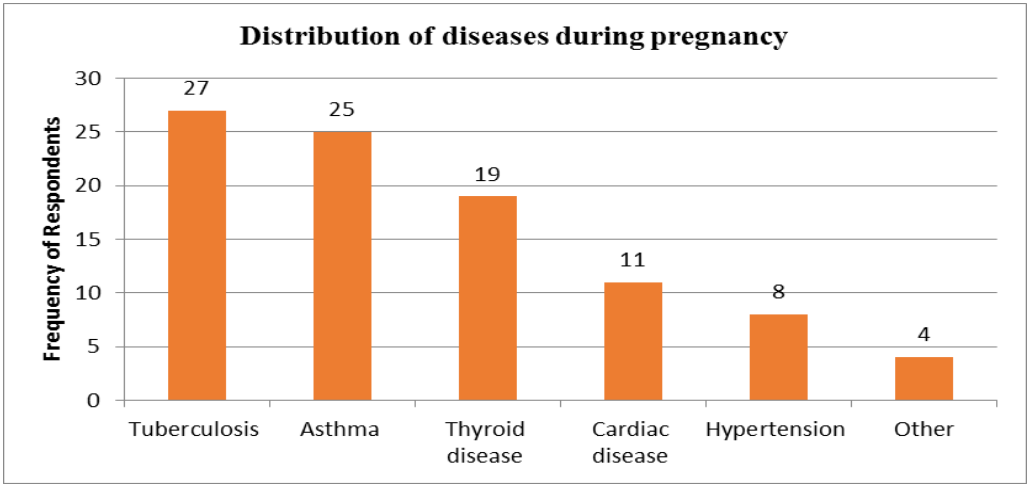

Figure 3: Diseases experienced during last during pregnancy (n = 84)

Association between participants' factors and gestational age at birth

Crude associations

In carrying out tests of association in table 4, it was hypothesized that there was no association between a patient factors (socio-demographic characteristics, obstetric and antenatal history) and having gestational age at birth (term/preterm). All test were performed at 5% level of significance. There was a significant crude association between the number of ANC visits and gestational age at birth (P=0.016). Other factors were not crudely significantly associated with gestational age at birth.

Table 4: Crude associations between gestational age at birth and; obstetric and antenatal history of participants

Variable	Category	Term	Preterm	Total	χ^2 test p-value
Age-group (years)	≤24	40	28	68	0.247
	25-29	82	39	121	
	30-34	48	35	83	
	35-46	68	30	98	
Marital status	Unmarried	78	42	120	0.851
	Married	160	90	250	
Education level	no education	157	94	251	0.695
	primary	62	31	93	
	secondary	14	5	19	
	higher	5	2	7	
Type of place of residence	urban	84	53	137	0.354
	rural	154	79	233	
Occupation	Unemployed	186	93	279	0.062
	Employed	14	5	19	
	Self-employed	38	34	72	
First child	No	196	103	299	0.312
	Yes	42	29	71	

Twin birth	No	224	126	350	0.586
	Yes	14	6	20	
Birth interval	≥24 months	88	49	137	0.978
	<24 months	150	83	233	
Pregnancy complication	No	200	113	313	0.688
	Yes	38	19	57	
ANC visits	None	76	62	138	
	1 to 3	86	38	124	**0.016**
	At least 4	76	32	108	
Disease during pregnancy	No	180	106	286	0.304
	Yes	58	26	84	
Miscarriage	No	177	104	281	0.341
	Yes	61	28	89	
Still birth	No	221	122	343	0.878
	Yes	17	10	27	

Adjusted associations

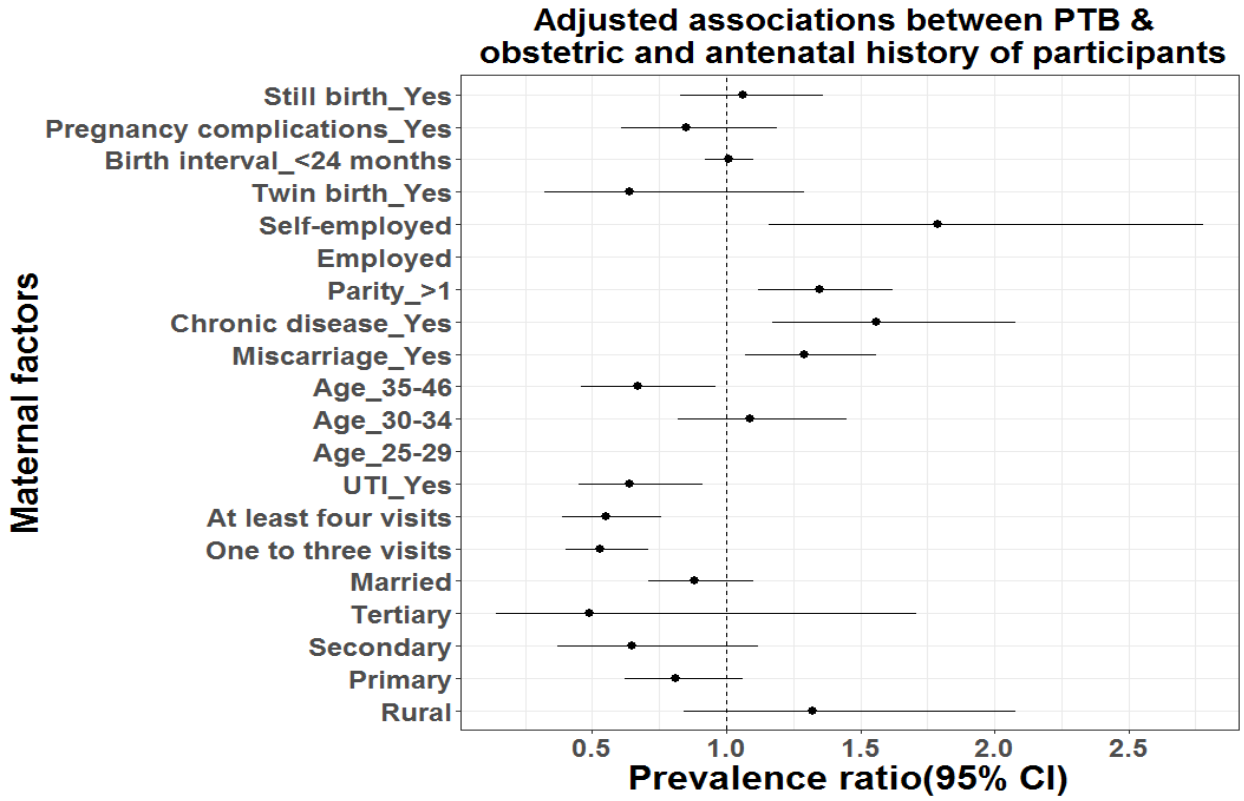

Figure 4: Forest plot showing the adjusted associations between gestational age at birth and; obstetric and antenatal history of participants

Table 5: Adjusted associations between gestational age at birth and; obstetric and antenatal history of participants

	Patient factors	Prevalence ratio	P-value	[95% C.I.]	
Residence (Ref: Urban)	**Rural**	1.32	0.232	0.84	2.08
Education (Ref: None)	**Primary**	0.81	0.131	0.62	1.06
	Secondary	0.65	0.123	0.37	1.12
	Tertiary	0.49	0.262	0.14	1.71
Marital status (Ref: Single)	**Married**	0.88	0.260	0.71	1.10
Antenatal care visits (Ref: None)	**One to three visits**	0.53	**<0.001**	0.40	0.71
	At least four visits	0.55	**<0.001**	0.39	0.76
Urinary tract infection (Ref: No)	**Yes**	0.64	**0.013**	0.45	0.91
Age-group (Ref: Less than 25)	**25-29**	0.83	0.258	0.60	1.15
	30-34	1.09	0.540	0.82	1.45
	35-46	0.67	0.031	0.46	0.96
Ever had miscarriage (Ref: No)	**Yes**	1.29	**0.008**	1.07	1.56
Medical problems during pregnancy (Ref: No)	**Yes**	1.56	**0.002**	1.17	2.08
First child (Ref: No)	**Yes**	1.35	**0.001**	1.12	1.62
Employment (Ref: Unemployed)	**Employed**	0.93	0.871	0.39	2.20
	Self-employed	1.79	**0.009**	1.16	2.78
Twin birth (Ref: No)	**Yes**	0.64	0.213	0.32	1.29
Birth interval (Ref: ≥24 months)	**<24 months**	1.01	0.875	0.92	1.10
Pregnancy complications (Ref: No)	**Yes**	0.85	0.354	0.61	1.19
Ever had still birth (Ref: No)	**Yes**	1.06	0.640	0.83	1.36

Table 5 shows the output of adjusted regression model where the outcome variable was gestational age at birth (reference: Term birth) and the predictors are socio-demographic information, obstetric and antenatal history. Prevalence ratios were reported together with their associated P-values and 95% confidence intervals.

- Adjusting for other maternal factors, those who made one to three ANC visits during their last pregnancy were 47% less likely to have preterm birth compared to those who made none (PR=0.53; CI: 0.40-0.71). Still on ANC visits, those who made at least four ANC visits were 45% less likely to have preterm births compared to those who made no visit at all, adjusting for other factors in the model (PR=0.55; CI: 0.39-0.76).
- Controlling for other maternal factors in the model, respondents who had UTI during their last pregnancy were 36% less likely to have preterm births compared to those who did not have UTI (PR=0.64; CI: 0.45-0.91).
- Participants who had ever had miscarriage were 29% more likely to have preterm birth compared to those who had never had miscarriage, adjusting for other factors in the model (PR=1.29; CI: 1.07-1.56).
- Participants with underlying medical conditions during their last pregnancy were 56% more likely to have preterm birth compared to those who did not, adjusting for other factors in the model (PR=1.56; CI: 1.17-2.08).
- Holding other factors in the model constant, participants whose last pregnancy was their first were 35% more likely to have had preterm birth compared to those whose last pregnancy was not their first (PR=1.35; CI: 1.12-1.62).
- Adjusting for other factors in the model, self-employed participants were 79% more likely to have preterm birth compared to the unemployed (PR=1.79; CI: 1.16-2.78).

Discussion of the Findings

Socio-demographic characteristics and preterm births

The median age of respondents was 29 years (IQR: 25-35) with the eldest being 46 years and the youngest 18 years. This was relatively higher than that of a study done in Malawi where the mean age was 23.0 (SD=5.2). The age difference could be attributed to a difference in the study designs where the Malawi study was community-based, hence could reach out to a larger group including those that do not attend post-natal care (Bekele *et al.,* 2017). There was no association between maternal age and PTB. This is in contrast to the findings of studies in Brazil where adolescents (12-19 years) were at a higher risk of having preterm birth compared to older women (Leal et al., 2016) and India where women younger than 22 years had three times higher odds of having PTB compared to their older counterparts (Anand *et al.,* 2017). This variation could be attributed to differences in access to healthcare in the study populations. More than two-thirds (67.9%) of respondents in this study had no formal education and a mere 7% went beyond primary level. This was not surprising, bearing in mind that the study was carried out in a largely pastoral community where education is lowly prioritized. Consequently literacy level is still below the national average. There was no significant association between education level and having PTB. This finding mirrored that of a hospital-based study in a referral hospital in Kenya where education was not associated with PTB (Wagura *et al.,* 2018). However it differed from the results of a study in Tanzania where participants with no education had a higher risk of having PTB (Temu et al., 2016). More than half of respondents (63.0%) lived in rural areas. No association was found between place of residence and having PTB both crudely and in adjusted analysis, a finding that contrasted with that of a study in Uganda where those living in rural areas were at a higher risk of PTB (Ayebare *et al.,* 2018). The absence of association in this study could be narrowed down to homogeneity in access to ANC services for women in both rural and urban areas. Approximately one-third of participants (67.6%) in this study were married and there was no association between marital status and having PTB. This result was in agreement with that of studies in Kenya (Wagura et al., 2018) and Tanzania (Temu et al., 2016) where there was no relationship between marital status and PTB.

Obstetric history and preterm births

In this study, more than three-quarters (80.8%) of respondents were multiparous (had at least two children). However, the negatively skewed parity distribution implied that most had low to moderate parity, with the median of 4 children (IQR: 2 - 6). After controlling for potential confounders, there was an association between parity and having PTB in the sense that participants who were nulliparous (had never given birth) were at a higher risk of having PTB than those who had ever given births (PR=1.35, 95% CI: 1.12 – 1.62). This finding contradicts that of a study by Kiran et al, where higher parity was associated with the risk of PTB (Kiran et al., 2011). They speculated that multiparous women a likely to have had complications in their previous pregnancies which predispose them to PTB. The lack of association between PTB with parity in this study could not be attributed to a specific factor. It was interesting to note that about one-third (63.2%) of mothers in this study had less than the recommended two-year interval between births. There was no significant association between birth interval and having PTB even after adjusting for confounders. The finding contrasted that of a study in Louisiana, USA by Howard et al who found that 26.8% of mothers had short birth intervals and that these mothers with short birth intervals were at a higher risk of having PTB (Howard et al.,2013). Similarly, the finding in this study did not mirror that of a study in Brazil which established that short inter-pregnancy interval predisposed mothers to preterm births (Liquin et al., 2015). Another study in UAE found that short inter-pregnancy interval was a risk factor of preterm birth after controlling for confounders (Al-Jasmi *et al.,* 2002). The contrast could be attributed to different populations with different physiologic characteristics and also bearing in mind that these are different countries with different races, access to health care and education levels.

Previous preterm births were common, with half (49.8%) of the mothers in the study population having had at least one PTB before having the current infant. This indicates that the burden of complications associated with PTB is enormous in this population. The finding may be attributed to limited access to ANC services, resulting in pregnancy complications being detected late and a possibility of having a preterm birth. This finding was a reflection of that in study in Italy where mothers with previous preterm birth were at a higher risk of PTB compared to those who had never had one. A similar result was also seen in a study in Iran (Rahele *et al.,* 2014) and Brazil (Liquin et al., 2015) where history of PTB was associated with higher odds of preterm birth.

Antenatal care and preterm births

The prevalence of preterm births in the last pregnancy in this study was 38.7% (95% CI: 30.4 - 47.0). This in contrast with the findings in a studies in Belgium where 7.2% of mothers had PTB (Beeckman *et al.,* 2012), in Kenya where prevalence was 18.3% (Wagura *et al.,* 2018) and Iran in which the prevalence was 5.1% (Rahele et al., 2014). The conspicuously high prevalence of PTB in this study compared to those of other studies could be due to the fact that the study population was a pastoralist community, largely residing in rural areas, with relatively low literacy levels and inadequate healthcare facilities - implying limited ANC access. ANC visits was apparently poor since less than one-third (29.2%) made the recommended number of visits (four) during their pregnancy, 37.3% never made any while a third (33.5%) made between 1 and 3 visits. This is not surprising since the study population had low literacy levels and limited resources. As expected, ANC attendance was significantly associated with PTB both crudely and after adjusting for confounders. However, this result was dissimilar to that in a hospital-based study in Kenya where there was no association between ANC attendance and PTB (Wagura *et al.,* 2018) and another in Belgium where there was no association between the number of ANC visits and PTB (Beeckman *et al.,* 2012). The lack of association in these studies may be attributed to wide coverage of ANC services in their study areas, hence ANC attendance would not be a significant risk factor of PTB. Approximately one-fifth (22.7%) of mothers in this study had medical problems (diseases) during pregnancy with the most prevalent diseases being tuberculosis (32.1%) and asthma (29.8%). Other diseases reported include hypertension, thyroid disease, cardiac disease, gestational diabetes and hypertension. There was a significant association between having medical problems during pregnancy and having PTB-those who had at least one disease during pregnancy was at a significantly higher risk of having PTB after controlling for confounders. The result was to some extent comparable to that in a Kenyan study where mothers with pregnancy-induced hypertension had 7.8 times more odds of having PTB compared to those without (Wagura *et al.,* 2018) and in Iran where hypertension was a significant risk factor for PTB (Rahele *et al.,* 2014). The finding should be noted especially by public health officials since they are mandated with control of such illnesses. Early detection and treatment of these diseases would greatly reduce the burden of preterm births.

Factors associated with preterm birth

Holding other factors in the model constant, participants whose last pregnancy was their first were 35% more likely to have had preterm birth compared to those whose last pregnancy was not their first (PR=1.35; CI: 1.12-1.62). Adjusting for other factors in the model, self-employed participants were 79% more likely to have preterm birth compared to the unemployed (PR=1.79; CI: 1.16-2.78). Those who made one to three ANC visits during their last pregnancy were 47% less likely to have preterm birth compared to those who made none (PR=0.53; CI: 0.40-0.71). Still on ANC visits, those who made at least four ANC visits were 45% less likely to have preterm births compared to those who made no visit at all, adjusting for other factors in the model (PR=0.55; CI: 0.39-0.76).

Conclusion

1. The prevalence of preterm births (38.7%) is about three times the national average of 12.3%. This is an indication of high burden of infant mortality and morbidity as a consequence of PTB in this sub county.
2. Despite efforts by the government to improve access to ANC services for all pregnant women in the country, little impact is witnessed in this study population. More than two-thirds either attend fewer that recommended number of ANC visits or fail to attend at all.
3. Parity, employment status, history of miscarriage in previous pregnancies, urinary tract infection during pregnancy and ANC attendance were all associated with preterm births after adjusting for confounders.

Recommendations

1. Community sensitization on the importance of making ANC visits to improve attendance and detect potential complications that would lead to PTB in advance
2. Special attention should be accorded to mothers with history of underlying medical conditions and miscarriages to enhance survival of the neonates and reduce chances of another preterm birth.
3. The county Government of Marsabit to put up more health facilities in addition to equipping the existing ones so as to provide quality ANC and PNC services delivery to the community.
4. Recommendation for further study include to establish the truth behind some traditional herbs being used by pregnant mothers so as the reduce chances of PTB and need for community based research to clarify the magnitude of the problem.

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