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Risk Factors for Preterm Birth among Women Who Delivered Preterm Babies at Bugando Medical Centre, Tanzania

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1 Abstract

1.1 Background

Preterm birth is the leading cause of infant morbidity and mortality globally. Infants who are born preterm suffer long term health consequences. There only few studies done on risk factors for prematurity in Tanzania. This study aimed to determine the risk factors for preterm birth among women who delivered preterm babies at Bugando Medical Centre in Mwanza, Tanzania.

1.2 Methods

A matched case-control study was conducted at the Bugando Medical Centre from May to June 2015. A total of 50 women with preterm birth (cases) were matched with 50 women who had term births (controls). Cases were matched with controls by date of delivery. We excluded mothers with multiple gestations and those who were sick and unsuitable for the interview. A structured questionnaire was used to collected relevant information from all participants. Data analysis was performed using SPSS version 20.0. Odds ratios with 95% confidence interval were estimated in a multivariate regression model to determine factors associated with preterm delivery.

1.3 Results

The preterm birth rate was 13%. Numerous factors were associated with increased odds of preterm birth. These include regular menstrual cycle (OR 5.8; 95% CI: 2.3-14.9); planned abortion (OR 3.8; 95% CI: 1.1-13.1); use of fertility treatment during the index pregnancy (OR 7.0; 95% CI: 1.9-27.3); inadequate ANC visits (OR 9.0; 95% CI: 3.2-28.3); antepartum haemorrhage (OR 3.1 95% CI: 1.1-8.8); uterine pain during the index pregnancy (OR 5.0 95% CI: 1.7-14.4); urinary tract infections during the current pregnancy (OR 5.7 95% CI: 2.1-14.9); abnormal vaginal discharge in the current pregnancy (OR 7.4; 95% CI:2.6-20.7) and use of traditional medicine (OR 5.6; 95% CI: 2.1-14.9). The association between preterm birth and previous miscarriage, chronic hypertension, physical abuse during pregnancy and previous preterm birth disappeared after controlling for other covariates.

1.4 Conclusions

The rate of preterm birth in our study corresponds with the national prevalence. A number of maternal factors increase women likelihood of having preterm delivery. Early identification of these factors during prenatal care and provide with appropriate care may reduce the risk of preterm birth.

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2 Keywords

Giant oocyte; meiotic spindle; polarization microscopy

3 Abbreviations

PROM: premature rupture of membrane; HIV: human immune deficiency virus; MDG4: Millennium Development Goal 4; BMC: Bugando Medical Centre; LMP: last menstrual period; UTI: urinary tract infection; SPSS: statistical package for social science; χ^2:chi-square test; OR: Odds ratio; CI: Confidence Interval; P: probability; SD: Standard deviation; ANC: antenatal care; WHO: World Health Organization; KCMC: Kilimanjaro Christian Centre.

4 Background

Worldwide 15 million babies are born premature every year) [1]. Preterm birth is the leading cause of new-borns death globally, it accounts to about 28% of neonatal deaths; and the second leading cause of death after pneumonia in children under the age of five years [1]. Preterm infants suffer long term health consequences later in life including learning, visual and hearing problems. Majority (over 60%) of preterm births occur in sub Saharan Africa and South Asia [1]. Prevalence of preterm birth has been reported to be higher in developing countries compared with developed countries (12% vs. 9%) [1]. There is also a differential in survival among preterm infants between developing and developed countries, with high survival rate among those born in developed countries than those who are born in developing countries due to differences in care of the new-borns [2].

Numerous factors have been associated with increased risk of preterm birth. These include extreme maternal age (<20 and >35 years), obesity, parity, history of miscarriage, history of preterm delivery, period on titis history of abortion, low social economic status and alcohol use, living in rural areas, use of herbal medicine, maternal anaemia, diabetes mellitus, shoulder dystocia, hypertension, premature rupture of membrane (PROM), untreated bacterial vaginosis, human immune deficiency virus infection (HIV) and Escherichia coli infection [3, 4-18].

Tanzania is among the countries that have succeeded in achieving the United Nations Millennium Development Goal 4 (MDG4) [19]. Despite this achievement, the neonatal mortality rate is still high. In 2013 the neonatal mortality rate was 21 per 1000 live births which is still higher as compared to the target which is 19 per 1000 live births by 2015 [19,10]. Tanzania ranked twenty-fifth in the world for the number of preterm births with 11.4% of babies born in 2010 being preterm. One out of four deaths of new-borns is due to prematurity [13]. It is estimated that 23% of all neonatal deaths in Tanzania are due to complications of prematurity [10].

The aim of this study was to determine the risk factors for preterm birth among women who delivered preterm babies at Bugando Medical Centre in Tanzania. Identification of risk factors for preterm birth would facilitate the formulation of appropriate interventions that could help prevent these complications.

5 Methods

5.1 Study design and study setting

This was matched case control study which was conducted from May to June 2015 c at Bugando Medical Centre (BMC) in northwestern Tanzania. BMC is a referral and teaching hospital located in Nyamagana District in Mwanza along the shores of Lake Victoria in Tanzania. It serves a catchment population of over 14 million people. On average 30 deliveries occur per day.

5.2 Study population, sample size and sampling procedure

This study included mothers who gave birth to preterm and term babies at BMC during the study period. A total of 400 women gave birth during the study period. Of these, 52 had preterm birth giving a prevalence of 14%. We excluded mothers with multiple gestations and those who were severely ill and thus unsuitable for the interview. Two mothers were excluded on the basis of severity of their illness leaving 50 mothers with preterm birth met the inclusion criteria.

5.2.1 *Definition of cases and selection of controls*

All mothers who had preterm delivery were considered to be cases. Controls were selected from the list on mothers who had term births (n=348). The final analysis was done for 100 subjects (50 cases and 50 controls). This constitutes a case to control ratio of 1:1. Cases and controls were matched by date of birth.

The estimation of gestational age was based on dates of the last menstrual period (LMP). Preterm birth was defined as giving birth at less than 37 completed weeks of gestation.

5.3 Data collection methods and tools

Data collection was performed using a pre-tested questionnaire. The questionnaire was divided into two sections: “background information of the mother/socio demographic characteristics”. “Medical history”, “details of the previous conceptions”, “medical complications in the current pregnancy”. The background information of the mothers included age, occupation, education, marital status and area of residence. Medical history and previous conceptions information including previous miscarriage, previous still birth, previous preterm birth, chronic hypertension, menstrual cycle and planned abortion. Medical complications in the current pregnancy include: fertility pregnancy use, antepartum haemorrhage, uttering pain, abnormal vaginal discharge, urinary tract infection (UTI) and physical abuse. Risk factor for preterm birth were categorised into two categories: maternal medical history and maternal conditions during the current pregnancy.

5.4 Ethical considerations

This study was approved by the Kilimanjaro Christian Medical University Research and Ethics Committee. Permission to conduct the study was sought from Bugando Medical Centre administrative authority. Both written and verbal consents were sought from individual mothers prior to the interview after they had been fully explained about the objectives of the project. Participants were

Table 1 Socio-demographic characteristics of the study participants

Characteristics	Total N	Cases n (%)	Controls n (%)	OR	(95% CI)	P-Value
Maternal age (years)*	25.4	23.3(5.2)	27.5(5.8)			<0.001
Maternal age (years)						
<30	81	46 (92)	35 (70)	4.92	(1.516.15)	0.005
>30	19	4 (8)	13 (30)			
Education level						
Primary and none	52	16 (32)	36 (72)	0.18	(0.070.43)	<0.001
Secondary and above	48	34 (64)	14 (28)			
Maternal Occupation						
Employed	40	23(46)	17 (34)	1.65	(0.733.70)	0.22
Non employed	60	27 (54)	33 (66)			
Marital status						
Married	83	40 (80)	47 (94)	0.25	(0.660.99)	0.037
Non married	13	10 (20)	3(6)			
Residence						
Urban	55	18(36)	37 (74)	0.19	(0.080.46)	<0.001
Rural	45	32 (64)	13(26)			

also informed that participation in the study was on voluntary basis, and the refusal to participate would not change their hospital care. Both confidentiality and privacy were ensured where participant identification numbers were used instead of names. Interviews were conducted in a privacy place. Participants also consented for the data to be published to ensure that information they provided benefit the public. Data used in this work will be available for sharing with the scientific community in case requested.

5.5 Data analysis

Data was analysed using statistical package for social science (SPSS) version 20.0, (SPSS Inc. Chicago, III). Descriptive statistics were summarized using frequency and proportions for categorical variable; while mean and standard deviation were computed for continuous variables. Student t test was used to compare difference means between groups for continuous variables. We used chi-square test (χ^2) to establish the relationship between various risk factors and preterm birth. Odds ratios (ors) with 95% confidence interval (CI) for factors associated with preterm birth were estimated using multivariate logistic regression models while controlling for the potential confounding. A P-value of less than 0.05 (two sided) was considered to be statistically significant.

6 Results

6.1 Characteristics of the study participants

(Table 1) shows the demographic characteristics of the study population. A total of 100 women participated in this study (50 cases and 50 controls). The mean age (standard deviation) of the participants was 25.4 (SD 5.9) years. Cases had younger age compared with their controls counterparts (23.4; SD 5.2 vs. 27.5; SD 5.8 years p<0.001) respectively. Majority of the cases were more likely to be less than 30 years of age (92% vs. 70%, p= 0.005), living in the rural areas (64% vs. 26%, p<0.001), unmarried (20% vs. 13%, p=0.037), with at least secondary school education (64% vs. 28% p <0.001) and employed (46% vs. 34%, p=0.22). They were non-smokers, non- alcohol drinkers and non-drug users.

6.2 Risk factors for preterm birth by maternal medical history

(Table 2) displays maternal medical history associated with preterm birth. Women with irregular menstrual cycle had nearly 6-folds higher odds of having preterm birth (OR 5.8, 95% CI: 2.3-14.86). Women with previous history of still birth were 2-times (OR 2.1, 95% CI: 1.70-2.61) more likely to have preterm birth. Planned abortion was associated with nearly 4-times (OR 3.8, 95% CI: 1.1-13.10) higher odds of preterm birth as compared to unplanned abortions. Cases also had higher odds of previous history of preterm birth (OR 2.1, 95% CI: 1.75-2.73) as compared to their control counterparts.

6.3 Risk factors for preterm birth by factors during the current pregnancy

(Table 3) summarizes maternal factors associated with preterm birth during the current pregnancy. Several factors were associated with increased odds of preterm birth. These factors include: fertility treatment during the current pregnancy (OR 7.0; 95% CI: 1.9-27.3); inadequate ANC visits (OR 9.0; 95% CI: 3.2-28.3); antepartum haemorrhage (OR 3.1 95% CI: 1.1-8.8); uterine pain during the index pregnancy (OR 5.0 95% CI: 1.7-14.4); urinary infections during the current pregnancy (OR 5.7 95% CI: 2.1-14.9); abnormal vaginal discharge in the current pregnancy (OR 7.4; 95% CI:2.6-20.7) and use of traditional medication (OR 5.6; 95% CI: 2.1-14.9).

Table 2 Risk factors for preterm births by maternal medical history

Factors	Cases n (%)	2Controls n (%)	COR (95% CI)	AOR (95% CI)
Menstrual cycle**				
Regular	18 (36)	40 (80)	7.1 (2.8-17.52)	5.8 (2.3-14.86)*
Irregular	32 (64)	10 (20)	1	1
Previous miscarriage***				
Yes	12 (24)	9 (18)	1.4 (0.54-3.79)	1.6 (0.62-4.49)
No	38 (76)	41 (82)	1	1
Previous still birth				
Yes	5 (10)	0 (0)	2.1 (1.70-2.61)*	-
No	45 (90)	50 (100)	1	
Planned abortion***				
Yes	12 (24)	4 (8)	3.6 (1.0-12.18)	3.8 (1.1-13.10)*
No	38 (76)	46 (92)	1	1
Previous preterm birth				
Yes	8 (16)	0 (0)	2.1 (1.75 2.73)*	-
No	42 (84)	50 (100)	1	
Chronic HTN**				
Yes	6 (12)	1 (2)	6.6 (0.77-57.69)	7.9 (0.89-70.33)
No	49 (98)	44 (88)	1	1

COR: Crude odds ratio (Unadjusted), AOR: Adjusted odds ratio, HTN-hypertension

* p<0.05 ***Adjusted for marital status, **Adjusted for fertility treatment before this pregnancy,

Table 3 Risk factors for preterm births by factors during this pregnancy

Factors	Cases n (%)	Controls n (%)	COR (95%CI)	AOR (95%CI)
Fertility treatment before this pregnancy******				
Yes	15 (30)	3 (6)	6.0 (1.80-24.99)	7.0 (1.9-27.26)*
No	35 (70)	47 (94)	1	1
ANC visits**				
<4	28(57.1)	8 (16)	7.0 (2.72-17.99)	9.0 (3.2-28.31)*
ł4	21(42.9)	42 (84)	1	1
Antepartum haemorrhage***				
Yes	22 (44)	7 (14)	4.1 (1.61-10.55)	3.1 (1.1-8.79)*
No	28 (56)	43 (86)	1	1
Uterine pain in the current pregnancy***				
Yes	25 (50)	7 (14)	6.1 (2.32-16.24)	5.0 (1.7-14.35)*
No	25 (50)	43 (86)	1	1
Abnormal vaginal discharge in the current pregnancy ****				
Yes	30 (60)	8 (16)	7.0 (3.0-20.24)	7.4 (2.6-20.73)*
No	20 (40)	42 (84)	1	1
UTI in the current pregnancy***				
Yes	34 (68)	12 (24)	6.7 (2.7-16.22)	5.7 (2.1-14.93)*
No	16 (32)	38 (76)	1	1
Physical abuse in the current pregnancy				
Yes	4 (8)	0 (0)	2.0 (1.60-2.57)*	-
No	46 (92)	50 (100)	1	
Use of traditional medication in the current pregnancy***				
Yes	32 (64)	6 (12)	7.1 (2.88-17.52)	5.6 (2.1-14.87)*
No	18 (36)	44 (88)	1	1

COR: Crude odds ratio (Unadjusted), AOR: Adjusted odds ratio, ANC-antenatal clinic, UTI-urinary tract infection, HTN-hypertension, * p<0.05 ******Adjusted for chronic HTN, ** Adjusted for residence, ***Adjusted for Abnormal vaginal discharge **** Adjusted for UTI

7 Discussion

This study found that numerous maternal factors were significantly associated with a preterm birth. These include previous history of miscarriage, still birth, planned abortion, and preterm birth; use of fertility treatment, irregular menstrual cycle, chronic hypertension and inadequate ANC visits. In addition, antepartum haemorrhage, uterine pain during in the index pregnancy, abnormal vaginal discharge, urinary tract infections, physical abuse and use of traditional medication were also significantly associated with greater risk of preterm birth.

A previous study in Zimbabwe reported that women with previous history of still birth were nearly two times more likely to have preterm birth [20]. This was consistency with our study where the odds of preterm birth increased by 2-folds among women previous history of still birth as compared to those who had delivered a live infant. This slight difference could be due to a smaller sample size in our study or the nature of women studied between populations. Our result suggests the need for still birth prevention to reduce the risk of future preterm birth.

In the present study history of planned abortion was associated with and increased odds of preterm birth. Similar findings were reported elsewhere [2, 20]. The increased odds or preterm birth among women who experienced abortion in our study could be explained by the differences in the studied populations where most of our study population was less than 30 years of age who were more likely to get unplanned pregnancies which led them to attempt abortion. This implies that practicing illegal abortion should be stopped to prevent the occurrence of preterm birth.

The role of fertility treatment as the risk factor of preterm birth was significant in this study. A study in Israel found that women who reported using fertility treatment in their index pregnancy had more than 4-fold increased risk of preterm birth compared with those who were not using [6]. It's not clear if fertility treatment is really the risk factor of preterm or if the conditions that necessitates the treatment is the risk factor but this was not assessed in our study. Despite this, fertility treatment should be used with care and with clinician prescription.

As would be expected, lack of prenatal care was associated with preterm birth in our study. We found that women who did not use prenatal care services (<4 ANC visits) as recommended by WHO had 9-folds an increased odds of having preterm birth as compared to women who had 4 or more ANC visits. This association was also reported by Passing in Brazil, where the risk of preterm birth due to ANC visits <4 times was found to increase by 1.52 fold [11]. In Washington, it was found that the risk of preterm birth due to ANC visits <4 times increased by 5.7 times [21]. This difference in risk may be due to the fact that most of the women in our study were from rural areas where there is scarcity of health care services as compared to women in the previous studies [11, 21]. The study in Brazil was a multicentre cross-sectional study and hence included a larger sample size as compared to our study. Nevertheless pregnant women should be encouraged to attend to antenatal services as recommended by the World Health Organization (WHO).

In agreement with reports from several studies, conditions like ante-partum haemorrhage and uterine pain were found to increase the risk of preterm birth in this study. This is consistent with a study done in Zimbabwe where ante-partum haemorrhage increased the risk of preterm birth by about three fold [20]. In Brazil ante-partum haemorrhage increased the risk of preterm birth by about two fold [11]. In Australia it was reported that ante-partum haemorrhage increased the risk by 6.4 fold [2]. The difference in these findings could be explained by different sample size and nature of the studied population. It is important that ante-partum haemorrhage be appropriately treated and its causes be addressed to prevent the occurrence of preterm birth. In addition, abnormal vaginal discharge was found to increase the risk of preterm birth in this study. Contrary to our findings, a study in Rwanda could not find any correlation between abnormal vaginal discharge and preterm birth [22].

Like in other studies we found that the risk of preterm birth was fivefold higher among women who had UTI. However, much lower risk has been reported among Zimbabwean [20] and in Brazilian women [11]. The difference in findings could be explained by the difference in exposure to UTI pathogens between these three populations and hence the variations in the chances of acquiring infection. Since pregnant women are prone to infections due to decreased immunity during pregnancy, preventive measures such as drinking a lot of water should be taken to prevent UTI infection and if present it should be aggressively treated to prevent preterm birth.

Use of local medication was also associated with preterm birth in our study. The risk of preterm birth increased 6-foldamong women who reported use of local medication as compared to non-user counterparts. A much higher increase in risk of preterm birth with the use of local medications was also reported in Kenya [4]. The similarities in findings between the two studies could be attributed to similarities in social-cultural among women between these neighbouring countries. Our finding with those of others suggests that community awareness of about the risk of prematurity with local medication use is important, and hence stop this practice.

Despite the important information obtained in this study, our findings are likely to have some laminations. This study was conducted in a referral hospital. Therefore, there is a possibility of studying a selected group of women with high risk pregnancies because most of the women who are diagnosed with risk pregnancy during prenatal care are more likely to be referred or advised by their health care providers to deliver at the tertiary hospital. If this happened in our study it may have introduced selection bias and hence it can overestimate or underestimate the occurrence of preterm and associated risks as compared to other women in the general population.

8 Conclusions

The rate of preterm birth in our study corresponds with the national prevalence. Our study also demonstrated that numerous factors increased women's likelihood of having preterm birth. These include inadequate ANC visits, abnormal vaginal discharge during index pregnancy, use fertility treatment before the index pregnancy, having irregular menstrual cycle, having UTI and use

of traditional medication. Early identification of these factors during prenatal care and provide with appropriate care may reduce the risk of preterm birth.

9 Declarations

9.1 Authors' contributions

JJR and RNP designed the study, participated in data collection, performed the statistical analysis and participated in the writing of the manuscript. SEM contributed in reviewing the manuscript for intellectual content; MJM participated in reviewing and provided guidance in the statistical analysis. All authors read and approved the final manuscript.

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