Original Research Article

Medical and obstetric factors associated with preterm deliveries among women of childbearing age at Pumwani maternity hospital, Nairobi County, Kenya

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ABSTRACT

Background: The rate of pre-term birth (PTB) in Kenya stands at 12.3%. Preterm deliveries are associated with high neonatal mortality and have a huge financial burden on the parents and the government. Prematurity is also associated with chronic diseases like diabetes and hypertension in adult life. The study objective was to determine the medical and obstetric factors associated with preterm deliveries among women of childbearing age (15-49 years) at Pumwani maternity hospital (PMH).

Methods: A hospital-based cross-sectional study was conducted among 191 mothers of reproductive age (15-49 years) who delivered at PMH during the study period. Data was collected using a questionnaire and a data abstraction tool. Descriptive statistics were used to summarize categorical variables. Chi-square was used to test for the strengths of associations. Prevalence adjusted odds ratios (PAOR) were used to estimate the strengths of associations.

Results: The study found that the association between past pregnancy (p=1.0), history of surgery (p=1.0), medication (p=1.0), urinary tract infection (p=0.453), miscarriage (p=1.0) and chronic disease (p=0.395) and preterm delivery among women of child bearing age (15-49 years) at PMH was not statistically significant. The association between premature delivery (p=0.021), parity (p=0.000), premature rapture of membranes (PROM) (p=0.000), antepartum hemorrhage (APH) (p=0.045), cervical incompetence (p=0.001), pre-eclampsia toxemia (PET) (p=0.000), and placenta abruption complications (p=0.009) and preterm delivery was statistically significant.

Conclusions: The association between premature delivery, parity, PROM, APH, cervical incompetence, PET and placenta abruption complications and preterm delivery was statistically significant.

Keywords: Medical and obstetric factors, Preterm deliveries, APH

INTRODUCTION

Preterm delivery (PTD) is defined as all births before 37 completed weeks of gestation or fewer than 259 days since the first day of a woman's last menstrual period. Of the estimated 130 million babies born each year globally, approximately 15 million are born preterm which is about 11% of all deliveries.[1] Prematurity is a major determinant of neonatal mortality and morbidity as well as a significant contributor to long term adverse health outcome.[2] For instance, of the estimated 3.1 million neonatal deaths that occurred globally in 2010, about 1.08 million (35%) were directly related to preterm birth.[3] Complications of preterm birth are the single largest direct cause of neonatal deaths and the second most common cause of under-5 deaths after pneumonia. Prematurity is a major hindrance to the

attainment of the sustainable development goal (SDG) number 3-formerly MDG-4 target given its contribution to neonatal mortality.[4]

Worldwide, almost 1 million die due to complications associated with prematurity. More than 60% of the 15 million preterm deliveries occur in Africa and South Asia.[5] In contrast, the United States is among the top 10 nations which have many preterm births. In Africa, around 12% of births are premature compared with 9% in the developed countries with a high number of preterm deliveries per year are in the Asian continent with India at 3,519,100 and China at 1,172,300 preterm deliveries in 2012. African countries with high rates of preterm deliveries are Nigeria at 773,600, the democratic republic of Congo at 341,400 while Kenya is at 193,000. For countries in Africa, the rate is double or triple compared to developed countries and this creates pressure on the parents and the health system. The rate per 100 live births is higher in Sub Saharan Africa (SSA) countries with Malawi leading at 18.1%, Congo at 16.7%, Zimbabwe at 16.6%, and Kenya at 12.3%. Developed countries have a low PTD rate per 100 live births with countries such as Belarus at 4.1, Finland at 5.5, and Japan and Sweden at 5.9 per 100 live births.[6]

Preterm birth is a global problem with world health organization estimating the prevalence to range between 5-18% across 184 countries. Locally, studies conducted in Kenyatta national hospital found the rate of preterm deliveries to be at 15.7% in 2001 and 18.3% in 2014 while nationally it stands at 12.3%.[7] There are multiple factors associated with PTD but understanding the epidemiology of these factors remains limited in Kenya. The factors can be maternal medical, obstetrics, social, foetal, economic, and demographic related. PTD causes a lot of emotional problems, coupled with financial constraints to the family. Prematurity is also associated with poor neurodevelopment, autism spectrum disorders, and chronic illnesses in adulthood like hypertension and type II diabetes. To contribute to a significant reduction in the number of preterm deliveries, it will be important to determine the associated factors with a view of designing suitable interventional programs. Pumwani maternity hospital was selected since it is an obstetric and referral hospital for delivery of expectant mothers in Nairobi, and adjoining counties. It is the largest maternity hospital in the country. To accelerate achievement of this SGD, there is a need to determine factors associated with preterm birth in order to reduce preterm births. The objective of the study was to determine medical and obstetric factors associated with preterm deliveries among women of childbearing age (15-49 years) at PMH.

Medical and obstetric factors and preterm births

Mothers who have any medical illness are prone to getting a preterm birth.[8] Diseases like HIV infection, malaria, anemia, obesity, malnutrition, urinary tract infection, diabetes, and hypertension increased incidences of PTD. According to a hospital-based cross-sectional study, HIV patients were twice likely to have PTD 8.3%.[9] On the other hand, anemia which is common in developing countries is a major contributor.[10] Urinary tract infection has been shown to increase the chances of one having preterm birth and that's why the mother needs to attend ANC. When one has a BMI of over 30, chances of having a PTD are increased while on the other hand undernutrition and a low BMI is also a major cause of PTD.

A study on the factors associated with preterm, early preterm and late preterm birth in Malawi used data from The APPLe study was for secondary analysis. In the APPLe study, the primary outcome was the incidence of preterm delivery, defined as <37 weeks gestation. Secondary outcomes were mean gestational age at delivery, perinatal mortality, birth weight, maternal malaria, and anaemia.[11] The study found that women who gave birth preterm were more likely to report a history of previous preterm birth (13.2% vs. 6.1%, p=0.001) and previous neonatal death (8.1% vs. 4.1%, p=0.02) compared to women who delivered at term. Compared to women who gave birth at term, a significantly greater proportion of women with preterm births were less than 20 years old (33.6% vs. 27.9%, p=0.03) and had lower mean BMI (22.3 vs. 22.8, p=0.006). During pregnancy women who had a preterm birth had lower mean weight gain (kg) between the first (booking <24 weeks gestation) and subsequent assessment (28-32 weeks gestation) (2.95 vs. 3.39, p=0.008). More women who delivered preterm were anaemic (73.5% vs. 64.2%, p=0.001) or had malaria (36.4% vs. 28.5%, p=0.004) at least once during their pregnancy. A significantly greater proportion also had persistent malaria (7.5% vs. 4.7%, p=0.04). No statistical differences were noted for the prevalence of syphilis or HIV positive status between those who delivered preterm versus term. Increasing BMI (Adjusted OR 0.91 (0.85-0.97), p=0.005) and weight gain (Adjusted OR 0.89 (0.82-0.97), p=0.006) had an independent, protective effect. Persistent malaria (despite malaria prophylaxis) increased the risk of late preterm birth (Adjusted OR 1.99 (1.05-3.79); p=0.04). Age <20 years (Adjusted OR 1.73 (1.03-2.90); p=0.04) and anaemia (Adjusted OR 1.95 (1.08-3.52); p=0.03) were associated with early preterm birth (<34 weeks).

Obstetric factors are those that happen during the progression of a pregnancy. Conditions that affect the normal functioning of the placenta are a major cause of preterm births.[12] They include premature rupture of membrane (PROM), placenta previa, pregnancy-induced hypertension (PET) intrauterine infections, and multiple gestations (twins, triplets). Cervical incompetence may lead to PROM. Polydrominios and any other uterine anomaly increase the risk for one to have a preterm birth.[13] In Tanzania, a corroborative hospital-based study found that the incidence of preterm delivery was 2.7 more if the mother had a previous PTD.[14]

A study on the analysis of risk factors and neonatal outcome was conducted. The study was a retrospective

observational study conducted for a period of 5 years. The incidence of preterm birth is found to be 10.23%. It was found that the incidence of spontaneous preterm labour is 56.05%, preterm premature rupture of membranes is 21.82% and iatrogenic preterm birth is 22.1%. It was found that the most common risk factor associated with preterm births is first trimester bleeding, amounting to 40% of total preterm births.[15]

An assessment by Domingues and Gama on the prevalence and risk factors related to preterm birth in Brazil. Data are from the 2011-2012 "birth in Brazil" study, which used a national population-based sample of 23,940 women. The rate of preterm birth was 11.5%, (95% confidence 10.3% to 12.9%) 60.7% spontaneous-with spontaneous onset of labor or premature preterm rupture of membranes-and 39.3% provider-initiated, with more than 90% of the last group being pre-labor cesarean deliveries. Other factors were previous preterm birth (OR 3.74; 95% CI 2.92-4.79), multiple pregnancies (OR 16.42; 95% CI 10.56-25.53), abruptio placentae (OR 2.38; 95% CI 1.27-4.47) and infections (OR 4.89; 95% CI 1.72-13.88). In contrast, provider-initiated preterm birth was associated with private childbirth healthcare (OR 1.47; 95% CI 1.09-1.97), advanced-age pregnancy (OR 1.27; 95% CI 1.01-1.59), two or more prior cesarean deliveries (OR 1.64; 95% CI 1.19-2.26), multiple pregnancies (OR 20.29; 95% CI 12.58-32.72) and any maternal or fetal pathology (OR 6.84; 95% CI 5.56-8.42).[16]

METHODS

Sampling and sample size

This study employed a hospital-based cross-sectional study design. In cross-sectional designs the outcomes of the participants and the exposures are measured. This study was conducted at Pumwani maternity hospital (PMH). The hospital is the largest obstetric hospital in the republic of Kenya started in the year 1928 to serve the population of Nairobi. The target population was all mothers aged between 15 to 49 years who delivered at Pumwani maternity hospital during the study period. The sample was determined through the use of Fishers' formula of 1998.

$$n=Z^2Pq/d^2$$

Hospital delivery records were used to identify and select eligible 191 study participants. Systematic random sampling was adopted in sampling the study participants. Pumwani maternity hospital had 50-70 deliveries per day on average. The desired sample size per day was 20 mothers. The 1st mother was randomly selected and then every 3rd mother was systematically selected.

Data collection tools

The main instrument was a pretested and structured questionnaire which was administered to the mothers and data abstraction for abstracting information from medical records (maternal file, neonatal file, and maternal antenatal booklet). A pilot study was conducted at Kayole 1 health center to test the validity of the questionnaire. The reliability was checked through the test-retest method during piloting. The reliability was tested using Cronbach alpha to enable the researcher to find out whether a respondent provided the same score on a variable when the variable was administered repeatedly to the same respondent. All the variables had a Cronbach's alpha value of above 0.7 hence the instrument was reliable.

Data analysis

Quantitative data was cleaned then coded and uploaded to the SPSS version 23 software database. Descriptive statistics, proportions were used to summarize categorical variables. Chi-square of Fishers' exact tests was used to test for the associations between categorical variables. Prevalence odds ratios (PORs) at 95% confidence interval (CI) was used to estimate the strengths of associations between the independent and dependent variable.

RESULTS

Prevalence of preterm deliveries

The prevalence of preterm delivery among women of child bearing age (15-49 years) at PMH was assessed. From findings, 166 women of child bearing age (15-49 years) at PMH participated in study out of which 37 had preterm deliveries. This presented a prevalence of 22.3%.

Medical and obstetric factors associated with preterm deliveries

The study sought the medical and obstetric factors associated with preterm delivery. Odds ratios (PORs) and 95% confidence interval (CI) was used to assess the factors. Chi-square of Fishers' exact tests is used to test the significance of the association. The results were as presented in Table 1.

Table 1 shows that among the mothers who had been pregnant before,77.6% had term deliveries and 22.4% had preterm deliveries, from the 20 mothers who had a history of surgery, 78.9% had term deliveries and 21.1% had preterm deliveries. Out of the nine mothers who were on some medication 7 had term deliveries and 2 had preterm deliveries. The study found that 70% of the mothers who had a chronic disease had term deliveries and 16.2% had preterm deliveries. The odds of preterm delivery were 1.894 times greater for mothers who had previous preterm delivery as compared to those who did not which was statistically significant (p=0.021). The odds of preterm delivery for mothers who had previous premature delivery were high as compared to those who did not.

Table 1: Association between medical and obstetric factors and preterm delivery.

Variables		Terms, (n=127)	%	Preterms, (n=37)	%	OR (95% CI)	P value
Previous pregnancy	Yes	76	77.6	22	22.4	1.023	1.00
	No	53	77.9	15	22.1		
History of surgery	Yes	15	78.9	4	21.1	0.921	1.00
	No	114	77.6	33	22.4		
On any medication	Yes	7	77.8	2	22.2	0.996	1.00
	No	122	77.7	35	22.3		
Chronic disease	Yes	14	70	6	30	1.590	0.395
	No	115	78.8	31	21.2		
Previous premature baby	Yes	37	69.8	16	30.2	1.894	0.021
	No	92	81.4	21	19.6		
Parity	<3	67	87	10	13	0.100	0.000
	≥3	8	40	12	60		
UTI	Yes	55	74.3	19	25.7	1.401	0.453
	No	73	80.2	18	19.8		
PROM	Yes	4	26.7	11	73.3	13.221	0.000
	No	125	82.8	26	17.2		
Placenta abruption	Yes	1	75	3	25	15.515	0.009
	No	128	79	34	21		
Miscarriage	Yes	22	78.6	6	21.4	0.941	1.00
	No	107	77.5	31	22.5		
Cervical incompetence	Yes	1	14.3	6	85.7	24.774	0.001
	No	128	80.5	31	19.5		
APH	Yes	3	42.9	4	75.7	5.091	0.045
	No	126	79.2	37	22.3		
PET	Yes	4	26.7	11	73.3	13.221	0.000
	No	125	82.8	26	17.2		

The mothers with parity of less than three were 0.1 times more likely to get preterm deliveries as compared to those with a parity of three or more which was statistically significant (p=0.000).

The odds of preterm delivery were 1.401 times greater for mothers who suffered from UTI during pregnancy as compared to those who did not which was statistically significant (p=0.453). The mothers with a PROM complication during pregnancy were 13.221 times more likely to get preterm delivery as compared to those without which was statistically significant (p=0.000). The mothers with a placenta abruption complication during pregnancy were 15.515 times more likely to get preterm deliveries as compared to those without which was statistically significant (p=0.009).

The odds of preterm delivery were 0.941 times greater for mothers who had a miscarriage as compared to those who did not but the association was statistically insignificant. Mother with cervical incompetence was 24.774 times likely to get preterm deliveries as compared to those without and the association was statistically significant (p=0.001).

The odds of preterm delivery were 5.091 times greater for mothers who suffered from APH during the pregnancy as compared to those who did not and the association was statistically significant.

The odds of preterm delivery were 13.221 times greater for mothers who suffered from PET during pregnancy as compared to those who did not and the association was statistically significant (p=0.000).

The findings show that there was a statistically significant difference between preterm and term delivery in terms of a previous premature baby (p=0.021) parity (p=0.000), PROM (p=0.000), placenta abruption (p=0.009), cervical incompetence (p=0.001), APH (p=0.045) and PET (p=0.000). This shows that previous preterm delivery, parity, PROM and placenta abruption, cervical incompetence, APH and PET were statistically significantly associated with preterm delivery.

A further comparison of the significant factors associated with preterm deliveries show that 43.2% of preterm deliveries were associated with previous premature delivery, 29.7% preterm deliveries were associated with PROM and PET in each case, 27% were associated with parity, 16.2% preterm deliveries were associated with cervical incompetence, 10.8% were associated with APH and 8.1% of preterm deliveries were associated with placenta abruption.

DISCUSSION

The association between the history of premature delivery and the likelihood of preterm delivery was statistically significant. Similar findings were established by Temu et al that the chances of preterm delivery were almost three times more than those who had previous preterm delivery.[17] The associations between history of surgery, medication, chronic disease, miscarriage and preterm delivery were however not statistically significant. Although the history of surgery, medication and chronic disease had an insignificant relationship with preterm delivery, their presence increased the likelihood of preterm delivery. Consistent with the findings, a report by WHO outlines that mothers with medical illnesses like UTI are susceptible to getting preterm delivery.[18]

The mothers with a parity of less than three were more likely to get preterm deliveries as compared to those with parity of three or more. The association between parity and preterm delivery was statistically significant. The mothers with PROM, APH, cervical incompetence and PET complication during pregnancy were more likely to get preterm deliveries as compared to those without. The associations between PROM, APH, cervical incompetence and PET and preterm delivery were statistically significant. In support of the findings Abaraya et al found that complications during pregnancy such as APH and PROM increase the risk for one to have a preterm birth.[19]

The mothers with a placenta abruption complication during pregnancy were more likely to get preterm deliveries as compared to those without. The association between placenta abruption complication and preterm delivery was statistically significant. The findings concur with the study by Ghaheh et al that placenta abruption was highly associated with preterm delivery.[20]

CONCLUSION

The association between past pregnancy, history of surgery, medication, urinary tract infection miscarriage and chronic disease and preterm delivery among women of child bearing age (15-49 years) at PMH was not statistically significant. Mothers who had previous premature delivery, parity of less than three, PROM, APH, cervical incompetence, PET and placenta abruption complications had a high likelihood of getting preterm deliveries. The association between premature delivery, parity, PROM, APH, cervical incompetence, PET and placenta abruption complications and preterm delivery was statistically significant.

The study recommends that the ministry of health should intensify the efforts of eradicating obstetric complications and also create awareness on the prevention of medical conditions especially among pregnant mothers so as to reduce the likelihood of preterm delivery among the mothers.

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