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TOPIC - Evaluation of Risk Factors for Preterm and Term Deliveries in Lagos.

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Abstract

Background: Preterm birth is a prevalent public health issue responsible for high perinatal mortality and long-term morbidity worldwide. It constitutes a large proportion of medical expenses and imposes an enormous economic burden on healthcare systems, families, and children. Identification of at-risk women and their risk factors for preterm birth is important for targeting services and initiation of risk-specific interventions and/or preventive measures.

Objective: To compare the risk factors associated with preterm and term deliveries.

Method: A retrospective comparative study of one hundred and fifty patients with preterm delivery between 28-36 weeks gestation and one hundred and fifty control subjects with term delivery. Information was obtained on socio-demographic, obstetric, and medical risk factors in

both groups. Data obtained was analyzed using SPSS version 19.

Results: The significant risk factors for preterm delivery were maternal age and married status (P < 0.001), bleeding in pregnancy (P < 0.001), preterm premature rupture of membranes (P < 0.001), multiple (twin) pregnancy (P < 0.001), pathologic vaginal discharge in pregnancy (P = 0.001), previous preterm delivery (P =0.01), significant fever in pregnancy [P < 0.001), malaria (P = 0.01), and hypertensive disorders in pregnancy [Pre-eclampsia P < 0.001), Eclampsia (P = 0.01)]. However, Human immunodeficiency virus infection (P = 0.097), urinary (P = 0.24), and respiratory tract infection (P = 0.14) were not significantly associated risk factors for preterm delivery.

Conclusion: Our study showed that there are several socio-demographic, obstetrics, and medical risk factors for delivery before term. Identification of maternal risk factors, promoting awareness, and implementation of medical interventions to diminish the rate of preterm delivery would be beneficial.

Keywords: Preterm birth, socio-demographic factors, obstetric risk factors, medical risk factors

Introduction

Preterm birth is a prevalent public health issue responsible for high perinatal mortality and long-term morbidity worldwide [1]. In 2014, the estimated worldwide PTB rate was 10·6% [2]. Of the 130 million babies born each year globally, approximately 15 million are born preterm and 60% of preterm occur in developing countries [3]. The greater share (60%) of these PTBs was attributed to sub-Saharan African and South Asia countries where more than half (52%) of worldwide live births occurred [3].

Globally, complications of preterm birth are among the most common cause of neonatal mortality. About a million neonatal deaths occur annually due to preterm birth [4]. It constitutes a large proportion of medical expenses and imposes an enormous economic burden on healthcare systems, families, and children [5]. The risk of neonatal death in African babies is higher than in European babies by at least 12 times due to complications of preterm birth. By comparing economic status, over 90% of extremely preterm babies (< 28 weeks) born in low-income countries die within the first few days of life while only less than 10% of babies of this gestation die in high-income settings [6].

Recent studies have suggested that preterm birth is an independent risk factor for future cardiovascular diseases, cardiac ischemic diseases, and stroke [7]. The morbidity associated with preterm birth often extends to later life, resulting in enormous physical, psychological, and economic costs [8].

Nigeria currently has the highest number of newborn deaths in Africa, and the second highest in the world (coming only after India) [9]. About 270,000 children in Nigeria per year die within the first month of life as a direct consequence of PTB and low birth weight, perinatal asphyxia, and, infections [9]. Considering that over 50% of births are delivered outside the hospital [10], it is possible that these women received little or no perinatal care, a key element in maternal and child health. The use of modern technology allows the survival of many preterm neonates in developed countries, but such care is not widely available in developing countries [11].

Causal factors linked to preterm birth include medical conditions of the mother or fetus, genetic influences, environmental exposure, infertility treatments,

behavioral and socioeconomic factors, and iatrogenic prematurity [12]. Approximately 45–50% of preterm births are idiopathic, 30% are related to preterm rupture of membranes (PROM) and another 15–20% are attributed to medically indicated or elective preterm deliveries. [13]. Other workers have identified obesity, stressful life events, sexual activity, placenta previa, gestational diabetes mellitus, hypertensive disorder complicating pregnancy, history of preterm birth, and reproductive abnormalities as independent risk factors for preterm birth [14].

Identification of at-risk women and their risk factors for preterm birth is important for targeting services and initiation of risk-specific interventions and/or preventive measures. Important insights leading to new discoveries for the prevention and management of preterm births may be derived from the study of risk factors [15].

Following the enormous economic and emotional burden of preterm birth and its associated complications, this study was conducted to examine the association between prenatal risk factors and preterm birth in our tertiary maternity unit.

Methods

This was a retrospective comparative study conducted at the Department of Obstetrics and Gynaecology of Lagos State University Teaching Hospital, Ikeja between July 1st and December 31st, 2018. It involved the study group who had a preterm birth and the control group who had full-term birth in the index pregnancy. While the study group constituted women that had preterm birth from 28 to $36^{6/7}$ weeks, the controls were selected among term pregnant patients who delivered at the same institution on the same day as the preterm delivery or if there were not enough parturients, the period was extended to within 48 hours of the preterm delivery. The gestational age was derived from the LMP for those with certain dates or from the early USS for those who were unsure of their LMP. Our institutional research and ethics committee approved the study protocol.

The sample size was calculated by using the formula:

$$n = \frac{z^2pq}{d^2}$$

where n = number of subjects

z = standard error with the level of confidence at 1.96

p = estimated prevalence in the population i.e., 10%

q = 100 – p

d = accepted sample error at 5%

thus, the sample size for this study was calculated:

$$n = \frac{1.96^2 \times 0.1 \times (1 - 0.1)}{0.05^2}$$

n = 138

In order to account for exigencies, a round figure of 150 samples was collected. The sample size ratio in the study and control group was 1:1 giving a total of 300.

The case records were retrieved from the health management information system (HMIS) and data was collected using a structured proforma. Information obtained included the gestational age at delivery, socio-demography, medical and obstetrical variables which include the onset of labour (spontaneous or indicated), absence or presence of premature rupture of membranes, mode of delivery, reasons for indicated delivery, neonatal outcome; a prior history of preterm births, spontaneous miscarriage, and induced abortion. Other information obtained include fever, malaria, urinary tract infection, respiratory tract infection, vaginal bleeding, vaginal discharge, and abdominal trauma in the index pregnancy at the gestational age they occurred along with treatment received.

Definitions

- Pathologic vaginal discharge in pregnancy was an abnormal vaginal discharge requiring treatment.
- Premature rupture of membranes refers to clinically confirmed drainage of liquor in the absence of labour.
- Indicated delivery referred to delivery necessitated by obstetric or medical reasons

Data analysis

The data obtained were analyzed using statistical packaging for social sciences, SPSS version 16 (Chicago Illinois). Categorical variables were represented as frequency and percentages in tables. The comparison of identified risk factors between preterm and full-term births was done using Pearson's Chi-squared test a P value < 0.05 considered as significant. The confidence interval was set at 95%.

Results

All data from the 300 subjects were analyzed. Among the study group, preterm delivery occurred at 28-32weeks gestation in 22 (15%) cases, and at 32^{+1} – 36^{+6} weeks gestation in 128 cases (85%). Spontaneous preterm delivery occurred in 92 (61%) of cases while the remaining had indicated preterm delivery. The maternal age and marital status were associated with a significant risk of increased preterm delivery (P < 0.001) and (P < 0.001) respectively, as shown in Table 1. Parity, religion, occupation, ethnicity, and educational status were not significant risk factors for preterm delivery. Similarly, social habit like alcohol intake was not found to be significantly associated with preterm delivery (P = 0.21) while none of the subjects in both groups smoked cigarette.

Table 2 showed the obstetrics risk factors associated with preterm delivery. The factors exhibiting increased risk for preterm delivery were, bleeding in pregnancy (P < 0.001), premature rupture of membranes (P < 0.001), twin gestation (P < 0.001), pathologic vaginal discharge (P < 0.001), previous preterm delivery (P = 0.01). Spontaneous miscarriages (P = 0.085) and induced abortion (P = 0.091) were not significantly associated with preterm delivery.

Table 3 showed the medical risk factors associated with preterm delivery. Febrile illness in pregnancy characterized by fever (P < 0.001), malaria (P = 0.01), and Hypertensive disorders in pregnancy characterized by pre-eclampsia (P < 0.001), and eclampsia (P = 0.01) were significantly associated with preterm delivery among our subjects. However, Human immuno deficiency virus infection (P = 0.097), urinary (P = 0.24), and respiratory tract infection (P = 0.14) were not significantly associated risk factors for preterm delivery.

Table 1:1 socio-demographic characteristics Section

Characteristics	Study (n = 150)		Control (n = 150)		Total (n = 300)	
Age (years)	n	%	n	%	n	%
20 - 24	26	17	8	5	34	11
25 - 29	59	39	55	37	114	38
30 - 34	40	27	62	41	102	34
35 and above	25	17	25	17	50	17
Chi-Square 14.42, P < 0.001						

Parity						
0	76	51	62	41	138	46
1	36	24	52	35	88	29
2	20	13	21	14	41	14
3	10	7	7	5	17	6
4	6	4	4	3	10	3
≥ 5	2	1	4	3	6	2
Chi-Square 5.90, P = 0.055						
Gestational Age (week)						
28 - 32	22	15			22	7
32.1 - 36.6	128	85			128	43
37 - 40			150	100	150	50
Marital Status						
Single	15	10	2	1	17	6
Married	135	90	148	99	283	94
Chi-Square 10.54, P < 0.001						
Educational Status						
No formal Education	2	1	1	1	3	1
Primary Education	5	3	3	2	8	3
Secondary Education	108	72	114	76	222	74
Tertiary Education	35	23	32	21	67	22
Chi-Square 1.13, P = 0.078						
Religion						
Christianity	121	81	122	81	243	81
Islam	29	19	28	19	57	19
Chi-Square 0.02, P = 0.34						
Occupation						
Civil Servant	30	20	22	15	52	17
Teaching	13	9	11	7	24	8
Trading	36	24	44	29	80	27
Housewife	14	9	16	11	30	10
Professional	20	13	14	9	34	11
Unemployed	35	23	42	28	77	26
Student	2	1	1	1	3	1

Chi-Square 4.36, P = 0.13						
Ethnicity						
Yoruba	102	68	104	69	206	69
Igbo	20	13	23	15	43	14
Hausa	4	3	3	2	7	2
Others	24	16	20	13	44	15
Chi-Square 0.74, P = 0.28						
Social Habit	Study (n = 150)		Control (n = 150)		Total (n = 300)	
Alcohol	n	%	n	%	n	%
Yes	2	1	1	1	3	1
No	148	99	149	99	297	99
Chi-Square 0.34, P = 0.21						
Smoking						
No	150	100	150	100	300	100

Table 2: obstetric section

Characteristics	Study (n = 150)		Control (n = 150)		Total (n = 300)	
Previous preterm delivery	n	%	n	%	n	%
Yes	31	21	12	8	43	14
No	119	79	138	92	257	86
Chi-Square 9.80, P = 0.01						
Previous induced abortion						
Yes	39	26	28	19	67	22
No	111	74	122	81	233	78
Chi-Square 2.33, P = 0.097						
Previous spontaneous miscarriage						
Yes	27	18	40	27	67	22
No	123	82	110	73	233	78
Chi-Square 3.25, P = 0.085						
Number of Fetus(es)						
Singleton	130	87	147	98	277	92
Twin	20	13	3	2	23	8
Chi-Square 13.61, P < 0.001						
Bleeding in Pregnancy						
Yes	33	22	8	5	41	14

No	117	78	142	95	259	86
Chi-Square 180.5, P < 0.001						
Pathologic Vaginal discharge						
Yes	23	15	6	4	29	10
No	127	85	144	96	271	90
Chi-Square 11.03, P < 0.001						
Premature rupture of membrane						
Yes	58	39	19	13	77	26
No	92	61	131	87	223	74
Chi-Square 26.57, P < 0.001						

Table 3: medical section.

Characteristics	Study (n = 150)		Control (n = 150)		Total (n = 300)	
Fever	n	%	n	%	n	%
Yes	60	40	30	20	90	30
No	90	60	120	80	210	70
Chi-Square 14.29, P < 0.001						
Significant fever						
Yes	26	17	8	5	34	11
No	124	83	142	95	266	89
Chi-Square 10.75, P < 0.001						
Human Immunodeficiency Virus (HIV)						
Yes	12	8	6	4	18	6
No	138	92	144	96	282	94
Chi-Square 2.13, P = 0.097						
Respiratory tract infection						
Singleton	10	7	5	3	15	5
Twin	140	93	145	97	285	95
Chi-Square 1.75, P = 0.14						
Urinary tract infection						
Yes	3	2	2	1	5	2
No	147	98	148	99	295	98
Chi-Square 0.20, P = 0.24						
Malaria						

Yes	12	8	3	2	15	5
No	138	92	147	98	285	95
Chi-Square 5.68, P = 0.01						
Pre-eclampsia						
Yes	32	21	2	1	34	11
No	118	79	148	99	266	89
Chi-Square 29.85, P < 0.001						
Eclampsia						
Yes	6	4	0	0	6	2
No	144	96	150	100	294	98
Chi-Square 6.12, P = 0.01						

Discussion

This study explored the modifiable risk factors for preterm delivery compared to those who delivered at term. Majority of the preterm birth in the study were moderate to late constituting 85%. This was higher than the 72% reported by Azeez et al [16]. While maternal age was associated with an increased risk of preterm birth in this study, seventeen percent of our subjects were older maternal age (≥35 years) which was lower than 23% reported in Lagos [16]. It has been widely reported that advanced maternal age is associated with PTB [17, 18]. Married status was s associated with an increased risk of preterm delivery in this study. This was contrary to the finding of other workers who reported that single women are at a higher risk of delivering preterm when compared to married or co-habiting women [19, 20].

In this study, there was no association between parity and preterm delivery. Our finding was similar to that of Anorlu et al in Lagos [21] but contrary to that of other studies [22-24]. Educational status and occupation had no significant association with preterm delivery in this study which was in agreement with the findings of other workers [19, 25]. Some studies found that preterm birth is related to lower educational levels [26, 27]. Alcohol intake was not a significant risk factor for PTB in this study. However, other workers reported that alcohol during pregnancy increased the risk of preterm delivery [28, 29]. While none of our subjects engaged in smoking, it was a significant risk factor for preterm delivery [30].

Bleeding in pregnancy was a significant risk factor for PTB in our study consistent with the findings of other workers [30, 31]. Early pregnancy bleeding and antepartum haemorrhage in index pregnancy significantly increase the risk of preterm delivery. It can precipitate preterm contractions and subsequent preterm delivery or it can influence the decision to deliver the parturient before 37 weeks gestation.

This study has identified Twin pregnancy as a major risk factor for preterm delivery. Pregnancies with multiple fetuses carry a substantial risk of preterm delivery [32, 33].

Approximately 40% of twins will have spontaneous labor or preterm, premature rupture of the membrane before 37 weeks of gestation [34], while others can have preterm delivery due to maternal medical complications [32, 35, 36]. Uterine over-

distension is considered the causative mechanism for the increased spontaneous preterm birth rate [33]. Preterm rate was also lower in the presence of a single embryo compared with multiple embryos [37, 38].

Previous induced abortion and spontaneous miscarriage were not found to be significant risk factors for preterm delivery in this study. Some studies have shown that one previous induced abortion was not a risk factor for preterm delivery, while two or more induced abortion was a risk factor for preterm delivery [39]. Some other studies have suggested that a previous induced abortion significantly increased the risk of preterm delivery and the risk increased with the number of induced abortions [21, 40]. This may be dependent on the method used for the induced abortion. Other studies have also reported an increased risk of preterm delivery in women with previous spontaneous miscarriages [14, 36].

This study showed a significantly increased risk of preterm delivery in women with pathologic vaginal discharge and spontaneous premature rupture of membranes. There is evidence that pathologic vaginal discharge or cervico-vaginal infection is associated with preterm contraction/labour, spontaneous rupture of membranes, and preterm delivery [41]. Microorganisms produce phospholipase A_2 and activate cyclo-oxygenase 2 leading to increased synthesis of prostaglandins and cytokines. Prostaglandins, cytokines, and activation of monocytes can initiate preterm contraction/labour and delivery [42]. Bacterial proteases secreted by cervico-vaginal flora are capable of degrading fetal membranes increasing the likelihood of their rupture [41].

This study also showed a significant increase in preterm delivery following a previous preterm birth. A history of previous preterm birth is associated with a 17-37% risk of recurrent preterm delivery, and the risk increases with the number of prior preterm births [36, 43, 44]. This study did not explore the relationship between multiple previous preterm births and the risk of recurrent preterm delivery.

Fever was a significant risk factor for preterm delivery in this study. Febrile illness in index pregnancy is a known risk factor for preterm labour and delivery [45]. While HIV infection showed no increased risk of preterm birth in this study, Muchie et al [46] observed a four-fold increase in PTB among HIV carriers compared to their negative counterparts. This might be either the chronic disease itself or the medical treatment causing adverse reproductive outcomes. Though UTI was not associated with an increased risk of PTB in this study, Temu et al [36] posited that woman with urinary tract infections (UTIs) during pregnancy has an increased chance of delivering preterm babies. Maternal malaria infection as a significant risk factor for PTB in this study was similar to the findings of other workers [16, 47].

This study showed that pre-eclampsia was the commonest cause of indicated preterm delivery and increased risk of preterm birth. Studies have revealed that women who experienced PIH were more likely to have PTB [36, 48, 49]. This might be due to the reduction of the uteroplacental blood flow by hypertension leading to intrauterine growth restriction culminating in the interruption of the pregnancy. Furthermore, PIH could result in placental vascular damage by inducing oxytocin receptors, which subsequently result in preterm labor and birth. This will necessitate the need to stop the progression of the disease by delivering the fetus and the placenta before 37 weeks gestation to avert adverse maternal and fetal complications.

While this study provided information on risk factors for preterm delivery in our facility, it has some limitations. The sample size was small which will make the generalization of our result limited and possibly the inability to establish a significant correlation among some established risk factors for preterm deliveries. We did not carry out separate analyses for very preterm births, and risk factors for this vulnerable sub-population may differ from those for moderate and late preterm births at 32–36 weeks of gestation.

Conclusion

Our study showed that there are several socio-demographic, obstetrics, and medical risk factors for delivery before term. We also recognize that the majority of preterm births are late or moderate preterm (during 32–36 weeks gestational age). Thus, it is important to ensure effective planning and design of community-based programs focusing on preterm births, specifically in low-resource settings. Such a focus will require a clearer understanding of associated risk factors, especially those that can be intervened upon. Small reductions in the rates of these categories of preterm birth would mean sizable decreases in the number of overall preterm deliveries. Therefore, the identification of maternal risk factors, promoting awareness, and implementation of medical interventions to diminish the rate of preterm delivery would be beneficial.

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