ORIGINAL ARTICLE

Maternal risk factors for singleton preterm births and survival at the University of Nigeria Teaching Hospital, Enugu, Nigeria

CA Iyoke, LO Lawani[1], EC Ezugwu, KK Ilo[2], GC Ilechukwu[3], IN Asinobi[2]

Departments of Obstetrics and Gynaecology and [2]Paediatrics, University of Nigeria Teaching Hospital, Enugu State, [1]Department of Obstetrics and Gynaecology, Federal Teaching Hospital, Abakaliki, Ebonyi State, Nigeria, [3]Depatment of Paediatrics, Whiston Hospital, St. Helen's and Knowsley Teaching Hospitals NHS Trust, Prescot, Merseyside, England, United Kingdom

Abstract

Context: Risk factors for and survival of singleton preterm births may vary according to geographical locations because of socioeconomic differences and lifestyle.

Aims: The aim was to describe maternal risk factors and survival-to-discharge rate for singleton preterm births at the University of Nigeria Teaching Hospital and determine the relationship between maternal risk factors and the survival of singleton preterm babies.

Subjects and Methods: A comparative retrospective review of singleton preterm and term births from January 2009 to December 2013 was carried out. Statistical analysis involved descriptive and inferential statistics at 95% level of confidence using the Statistical Package for Social Sciences (SPSS) version 15 for Windows. $P \leq 0.05$ was considered significant.

Results: A total of 784 births including 392 singleton preterm births (aged 26 − 36 + 6) and 392 singleton term births were studied. The mean age of mothers who delivered singleton preterm babies did not differ significantly from that of mothers who delivered singleton term babies (30.2 ± 4.9 years vs. 30.8 ± 4.7; $P = 0.06$). Lack of antenatal care (adjusted odds ratio [aOR] = 2.63; 95% confidence interval [CI] 1.92, 6.07), Previous preterm birth (aOR = 5.06; 95% CI: 2.66, 9.12), having pregnancy complications including antepartum hemorrhage, preeclampsia/eclampsia or premature rupture of membranes (aOR = 5.12; 95% CI: 2.4, 11.8), being unmarried (aOR = 2.41; 1.56, 3.71) and nulliparity (aOR = 2.08, 95% CI: 1.22, 4.91) were independent risk factors for singleton preterm births. The average survival-to-discharge rate for preterm babies during the period was 38.4%. The mean duration of admission for singleton preterm babies was 16 ± 5.8 days (range: 2−75 days). Whereas survival was dependent on, gestational age at birth ($P < 0.001$) and mode of delivery ($P = 0.01$), it was not dependent on maternal risk factors of parity, marital status, complications of pregnancy, and antenatal care.

Conclusions: There was a low rate of survival of singleton preterm babies at the study center and survival was dependent on gestational age at birth and mode of delivery, but not on maternal sociodemographic risk factors for singleton preterm births. Active collaboration between the obstetrician and the neonatologist in deciding when and how to deliver these babies may provide improved chances of survival.

Key words: Births, preterm, risk factors, singleton, survival

Date of Acceptance: 24-Feb-2015

Introduction

Preterm birth is associated with health, socioeconomic, and psychological consequences. It exerts enormous strain on

Address for correspondence:
Dr. CA Iyoke,
Department of Obstetrics and Gynaecology, University of Nigeria Teaching Hospital, Enugu State, Nigeria.
E-mail: caiyoke@yahoo.co.uk

Access this article online

Quick Response Code:

Website: www.njcponline.com

DOI: 10.4103/1119-3077.158141

the resources of families, health care systems and the society at large.[1-3] It predisposes to long hospital stay following delivery and increased probability of neonatal death before discharge from hospital.[1,4] It is a leading cause of neonatal death worldwide accounting for 1.1 million neonatal deaths annually and the second most common cause of under-five mortality after pneumonia.[1,4-6]

The etiology of spontaneous preterm birth is thought to include genetic and environmental factors.[1,2,7,8] Some of the risk factors associated with preterm births which have been described in previous studies include previous preterm birth, preterm premature rupture of membranes, maternal diseases (hypertensive diseases of pregnancy, infections, anemia), nulliparity, multiple pregnancy, extremes of maternal age, lack of antenatal care, unmarried status, previous abortion, black race, antepartum hemorrhage, fetal growth restriction, male gender, and cigarette smoking.[1,2,4,8-12]

The exact mechanisms of preterm labor are largely unknown, but certain proximate pathophysiological events are believed to constitute the final common pathway for the different risk factors listed above. These include decidual hemorrhage (such as placental abruption); uterine overdistention (from multiple gestation or polyhydramnios), cervical incompetence (e.g., trauma, cone biopsy), uterine distortion (e.g., müllerian duct abnormalities, fibroid uterus), cervical inflammation (for example, bacterial vaginosis or trichomonas), maternal infection/fever (e.g., urinary tract infection), hormonal changes (e.g., mediated by maternal or fetal stress), uteroplacental insufficiency (e.g., hypertension, insulin-dependent diabetes, drug abuse, smoking, alcohol consumption).[13]

The prevalence of some of the risk factors for preterm birth such as lack of antenatal care, unmarried status, previous abortion, nulliparity, extremes of maternal age, and cigarette smoking may be related to socioeconomic status and lifestyles and may vary from one region of the world to another. This could affect their relative influences on preterm birth in any particular area. The risk factors for preterm births have not been evaluated in our center: The need to identify risk factors is to help understand and fashion preventive strategies or at least make adequate preparation for appropriate care of preterm babies. Besides, there are few recent studies on outcomes of preterm births in Nigeria and these focused largely on mortality among preterm babies.[14,15] Given that the effects of prematurity could last into childhood, and even adulthood, studies on the survival of preterms in this area have become important in order to provide data that may be useful in advocating for greater attention to surviving preterms. The aims of this study were to describe maternal risk factors for singleton preterm births and survival-to-discharge rate at the University of Nigeria Teaching Hospital (UNTH), Enugu and determine the relationship between maternal risk factors and the survival of singleton preterm babies.

Subjects and Methods

The study was carried out at the Departments of Obstetrics/Gynecology and Pediatrics of the UNTH, Enugu. The Pediatrics Department has a Newborn Special Care Unit (NBSCU), which is a neonatal intensive care unit located within the labor ward complex. All preterm babies (except those delivered after 35 weeks and weighed above 2.0 kg, had good APGAR scores at delivery and had no extenuating maternal illness) are by local protocol, admitted into the NBSCU for observation and/or treatment immediately after delivery. Preterms not admitted after delivery could be admitted at any other time if they developed problems. The labor ward of the hospital and the NBSCU render 24-h obstetric and neonatal services and cater for pregnant women and newborn babies from across Enugu state and the neighboring states of Ebonyi, Anambra, Abia, and Imo States of Nigeria.

This was a comparative retrospective review of routinely collected delivery and newborn data. The study was carried out between January 1, 2009 and December 31st 2013. All births that occurred at the UNTH between 2009 and 2013 were examined and all women who delivered between gestational ages 28 weeks and 36 weeks plus 6 days, or below 28 weeks whose babies were born live, whose records were available were selected consecutively from the delivery database of the hospital. After selecting a singleton preterm delivery, the next singleton term delivery following the singleton preterm birth was selected as control. The case records of the selected mothers were retrieved. If the babies were admitted into the NBSCU, the discharge records of their babies were retrieved from the NBSCU for data collection. Women who had documented uncertainty of the date of their last menstrual period were excluded unless there was a first-trimester ultrasound confirmation of gestational age.

Data extracted included maternal age, marital status, ante natal care, parity, educational status, occupation, previous gynecological and obstetric history, antenatal history, intrapartum events, gestational age at delivery, 1st and 5th min Apgar scores, baby's sex, dates of NBSCU admission and discharge and perinatal complications. The data were entered into a structured pro forma.

The statistical analysis was carried out using Statistical Package for Social Sciences (SPSS) version 15.0 for Windows (IBM Corporation, Armonk, NY, USA). Classification of preterm babies according to gestational age was based on the World Health Organization sub-categorization of preterm births.[16] Frequencies, means and proportions of variables were computed. Tests

of significant difference or association were done using Chi-square test or Fisher's exact test where appropriate. To determine the independent risk factors for singleton preterm birth, an initial bivariate analysis was done to determine maternal sociodemographic and obstetric factors that differed significantly between preterm deliveries (cases) and term deliveries (controls). These factors were then selected for multivariate analysis (logistic regression). The Hosmer-Lemeshow goodness-of-fit test was done to determine the fitness of the data to the logistic regression model. The results were reported as adjusted odds ratios (aORs) and 95% confidence limits. For the estimation of survival-to-discharge rate, only in-born babies admitted into the NBSCU were analyzed. Survival of a preterm baby was defined as survival of a preterm baby until medically discharged from the NBSCU (a baby discharged against medical advice was not considered as a survival). For all analyses, $P \leq 0.05$ was considered significant.

Ethical approval for the study was obtained from the Research Ethics Committee of the UNTH.

Results

There were 636 preterm deliveries during the study period. Of these, 529 births were singleton preterm births. Of the 529 singleton preterm births, the complete case records of 392 singleton preterm deliveries could be retrieved: The retrieval rate was 74.1%. The 192 singleton term deliveries were recruited as unmatched controls giving a total of 784 deliveries that were analyzed. A total of 294 out of the 392 singleton preterm babies were admitted into the NBSCU during the study period. The mean duration of admission for preterm babies was 16 ± 5.8 days (range: 2–75 days). On the other hand, 34 of the singleton term babies were admitted into the NBSCU. The mean duration of admission was 5 ± 3.4 days (range: 1–16 days). The difference in the mean duration of admission in the NBSCU between singleton preterm and term babies was significant ($P = 0.02$).

The mean ± standard deviation (SD) age of mothers of the preterm babies was 30.2 ± 4.9 years (range: 16–43 years) while that of mothers of the term babies was 30.8 ± 4.7 years (range: 16–43 years) (P = 0.06). The mean ± SD parity of women who delivered singleton preterm babies was 2.7 ± 1.2 compared to a mean parity of 2.8 ± 1.8 for women who delivered singleton term babies. The difference in mean parities was not statistically significant ($P = 0.4$). The sociodemographic characteristics of the mothers of preterm and term babies are shown in Table 1.

A comparison of obstetric characteristics between women who delivered singleton preterm and singleton term births is shown in Table 2.

Table 1: Comparison of sociodemographic characteristics of cases and controls

Characteristic	Mothers of preterm babies *n*=392(%)	Mothers of term babies *n*=392(%)	*P* value
Age group (years)			
≤20	11 (2.8)	6 (1.5)	0.40
21-30	201 (51.3)	191 (48.7)	
31-40	173 (44.1)	184 (46.9)	
41-50	11 (2.8)	7 (1.8)	
Educational status			
Primary or less	48 (12.2)	16 (4.1)	<0.001*
Secondary education	120 (30.6)	215 (54.8)	
Pot-secondary education	224 (57.1)	161 (41.1)	
Occupation			
Unemployed	41 (10.5)	31 (7.9)	0.01*
Trader/business woman	109 (27.8)	122 (31.1)	
Civil servant	202 (51.5)	171 (43.6)	
professional	40 (10.2)	68 (17.3)	
Marital status			
Married	316 (80.6)	361 (92.1)	0.003*
Single	17 (4.3)	8 (2.0)	
Divorced/separated	8 (2.0)	5 (1.3)	
Widowed	12 (3.1)	2 (0.5)	
Residence			
Urban	324 (82.7)	365 (93.1)	<0.001*
Rural	68 (17.3)	27 (6.9)	

*Significant

Table 2: Comparison of obstetric characteristics

Characteristic	Frequency		*P*
	Cases (*n*=392)	Controls (*n*=392)	
Antenatal care			
No	175 (44.6)	51 (13.0)	<0.001*
Yes	217 (55.4)	341 (87.0)	
Parity			
Nulliparous	76 (19.4)	102 (26.0)	<0.001*
Primiparous	196 (50.0)	111 (28.3)	
Multiparous	119 (30.4)	157 (40.1)	
Grandmultiparous	1 (0.2)	22 (5.6)	
Complications of pregnancy‡			
Antepartum hemorrhage	46 (11.7)	24 (6.1)	0.02*
Preeclampsia/eclampsia	59 (15.1)	11 (2.8)	
PROM	25 (6.4)	13 (3.3)	
Mode of delivery			
Vaginal	199 (50.8)	254 (64.8)	<0.001*
Cesarean	193 (49.2)	138 (35.2)	
Previous preterm delivery			
Yes	54 (13.8)	12 (3.1)	<0.001*
No	338 (86.2)	380 (96.9)	
Previous induced abortion			
Yes	24 (6.10)	19 (4.8)	0.43
No	368 (93.9)	373 (95.2)	

*Significant; ‡Most frequently implicated in preterm births in previous studies in Nigeria. PROM=Premature rupture of membranes

Sociodemographic and obstetric characteristics for which the distribution of women who delivered singleton preterm babies and those who delivered singleton term babies differed significantly were selected for inclusion in the logistic regression model. The Hosmer-Lemeshow goodness-of-fit test showed that the model fitted the data ($P = 0.68$). As shown in Table 3, educational status, occupation, and residence were not significantly associated with the risk of singleton preterm delivery. However previous preterm birth, nulliparity, lack of antenatal care, being unmarried and the presence of complications of pregnancy (antepartum hemorrhage, preeclampsia/eclampsia or premature rupture of membranes) all increased the likelihood of singleton preterm birth. Nulliparous women were at least 2 (aOR = 2.08; 95% CI: 1.22, 4.91) times more likely to experience singleton preterm births compared to grandmutiparous women. Similarly, women who were single were at least 2 (aOR = 2.41, 95% CI: 1.57, 3.71) times more likely to experience singleton preterm births compared to currently married women. Women who had no antenatal care were about 3 times (aOR = 2.63, 95% CI: 1.92, 6.07) more likely to have preterm births compared to booked women. On their part, women with previous preterm delivery and women with any of the complications including antepartum hemorrhage, preeclampsia/eclampsia or premature rupture of membranes were 5 times more likely to experience singleton preterm births compared to those without previous preterm delivery or any of these complications.

Table 3: Logistic regression showing risk factors for singleton preterm births

Variable	B coefficient	OR	95% CI
Antenatal care			
No	1.73	2.63	1.92, 6.07*
Yes			
Parity group			
Nulliparous	2.14	2.08	1.22, 4.91*
Primiparous	0.88	0.50	0.24, 1.02
Multiparous	0.96	0.88	0.64, 1.20
Grandmultiparous			
Educational status			
Primary education	−8.14	0.33	0.12, 1.57
Secondary education	−9.01	0.74	0.44, 1.93
Postsecondary education			
Residence			
Urban	−0.72	0.82	0.59, 1.14
Rural	−0.25	0.78	0.42, 1.25
Occupation			
Unemployed	1.06	2.88	0.91, 9.1
Trader/business woman	−0.02	0.99	0.43, 2.29
Civil servant	0.35	1.43	0.91, 2.25
Professional			
Marital status			
Divorced/widowed/separated	−0.21	0.82	0.59, 1.13
Single	0.88	2.41	1.56, 3.71*
Married			
Pregnancy complications			
Complication present‡	2.18	5.12	2.40, 11.8*
No complication			
Previous preterm delivery			
Yes	3.70	5.06	2.66, 9.12*
No			

Reference predictor variable. *Significant; ‡Complication refers to any of antepartum hemorrhage, preeclampsia/eclampsia or premature rupture of membranes. OR=Odds ratio; CI=Confidence interval

The average survival-to-discharge rate for preterm babies during the period was 38.4% while that for singleton term deliveries was 88.2%: And the difference in proportions of babies that survived was significant ($P = 0.002$). Table 4 shows the yearly trend in survival-to-discharge rates for singleton preterm babies during the study period. The yearly survival rates ranged from 21% to 59%. Survival to discharge rates decreased in the last 2 years of study to levels lower than the first 3 years. Complications observed among surviving singleton preterms included jaundice 65%, sepsis 28% and asphyxia 7%. The most common complications among singleton preterms that died were asphyxia/sepsis 45%, sepsis/jaundice 32%, sepsis 12%, and severe jaundice 12%.

Table 5 shows survival-to-discharge rates of singleton preterm babies according to maternal risk factors for singleton preterm births. Singleton preterms who were delivered by cesarean section had higher survival rates than those who were delivered vaginally. Similarly, booked

Table 4: Yearly trends in survival-to-discharge rates of singleton preterm babies admitted to the NBSCU of UNTH Enugu from 2009 to 2013

Year	Total NBSCU admissions	Total in-born preterms admitted to NBSCU	Singleton in-born preterms admitted to NBSCU	Singleton in-born preterm deaths in NBSCU	Singleton in-born preterms surviving till discharge	Survival to discharge rate for in-born singleton preterms percentage
2009	314	45	40	25	15	37.5
2010	451	64	54	22	32	59.3
2011	791	98	79	45	34	43.0
2012	740	74	57	45	12	21.1
2013	764	82	64	44	20	31.3
Total	3060	363	294	181	113	38.4

NBSCU=Newborn Special Care Unit; UNTH=University of Nigeria Teaching Hospital

Table 5: Survival rate of singleton preterm babies according to maternal and delivery factors

Characteristic	Number of babies (*n*=294)	Number who survived (*n*=113)	Survival rate (%)
Mode of delivery			
Cesarean	197	86	43.7
Emergency cesarean	139	66	47.5
Elective cesarean	58	20	34.5
Vaginal	97	27	27.8
Spontaneous	32	8	25
Induced	65	19	29.2
Complication of pregnancy			
Antepartum hemorrhage	39	18	46.1
Preeclampsia/eclampsia	65	36	55.3
PROM	26	8	30.8
Received antenatal care			
Yes	159	63	39.6
No	135	50	37.0
Marital status			
Married	269	105	39.0
Unmarried	25	8	32.0
Parity			
Nulliparous	44	24	54.5
primiparous	144	54	37.5
Multiparous	106	39	36.8
Gestational age at delivery			
Extreme preterm (26-27+6 weeks)	98	15	15.5
Very preterm (28-31+6 weeks)	81	30	37.0
Moderate to late preterm (32-37 weeks)	115	67	58.2
Previous preterm delivery			
Yes	39	12	30.8
No	255	101	39.6

PROM=Premature rupture of membranes

Table 6: Dependence of survival of singleton preterm babies on maternal risk factors

Maternal characteristic	Died before discharge (*n*=181)	Survived till discharge (*n*=113)	*P*
Had antenatal care			
Yes	96	63	0.65
No	85	50	
Complications of pregnancy			
Antepartum hemorrhage	21	18	0.12
Preeclampsia/eclampsia	29	36	
PROM	18	8	
Parity			
Nulliparous	20	24	0.09
Multiparous	90	54	
Grandmultiparous	67	39	
Marital status			
Married	164	105	0.49
Unmarried	17	8	
Mode of delivery			
Cesarean	111	86	0.01*
Vaginal	70	27	
Gestational age at delivery			
Extreme preterm	83	15	<0.001*
Very preterm	51	30	
Moderate to late preterm	48	67	
Previous preterm delivery			
Yes	27	12	0.29
No	154	101	

*Significant. PROM=Premature rupture of membranes

patients, married women, and nullipara had higher survival rates than unbooked patients, unmarried women, and multipara, respectively.

Table 6 shows a summary of Chi-square test of dependence of survival-to-discharge of singleton preterm babies on maternal and delivery factors. However, there was no statistically significant difference in the survival of singleton preterm babies based on maternal risk factors such as parity, marital status, complications of pregnancy, and antenatal care. Survival was however associated with gestational age and mode of delivery. Further analysis using logistic regression showed that compared to cesarean delivery, vaginal delivery was associated with a decreased likelihood of survival (aOR = 0.51, 95% CI: 0.38, 0.70). Similarly, compared with moderate/late preterm, very preterm (aOR = 0.49, 955 CI: 0.31, 0.56) and extreme preterm (aOR = 0.72, 95% CI: 0.33, 0.89) were associated with decreased likelihood of survival.

Discussion

This study showed that nulliparity, unbooked status, being single and having obstetric complications like preeclampsia, premature rupture of membranes, previous preterm birth and antepartum hemorrhage increased the likelihood of preterm delivery in the study center. These are similar to previous reports from Calabar in South-South Nigeria and Ilorin in North Central Nigeria.[12,17] It however contrasts with a study in Mosul, Iraq that found that the main determinants of preterm birth in Iraq were low socioeconomic status, occupation (heavy manual work, caring for domestic animal), urinary tract infections, and cervical incompetence.[18] The differences in the types of risk factors between Nigeria and Iraq may be a reflection of the factors evaluated in the different studies.

The association between parity and preterm births has been investigated in previous studies with inconsistent results. The results of this study show that nulliparity was an independent risk factor for singleton preterm birth in Enugu. This had been previously identified by Mokuolu *et al*., in their study on singleton preterm births in Ilorin, North Central Nigeria.[17] A study by Etuk *et al*., on all preterm births which employed univariate analysis also found that

nulliparity was a significant risk factor for preterm birth in Calabar, South-South Nigeria.[12] The mechanism through which nulliparity could lead to preterm births is unclear.

The finding that singleton preterm birth was associated with lack of ANC agrees with previous studies in Nigeria.[12,19] In a study by Mokuolu *et al*., on the determinants of preterm births generally, unbooked status was found to be the strongest determinant.[19] Lack of antenatal care was similarly implicated by Etuk *et al*., in Calabar.[12] Lack of antenatal care is a feature of obstetric care in developing countries, and it engenders risks of late detection of complications of pregnancy. Some of these complications can range from gestational hypertension, gestational diabetes, and polyhydramnios to urinary tract infection all of which have been previously implicated as risk factors for singleton preterm delivery.

Single marital status was found as an independent risk factor for preterm births in this study. This finding is similar to the report by Etuk *et al*. that out-of-wedlock pregnancy was associated with preterm delivery in Calabar, Nigeria.[12] Single motherhood is alien to Nigerian culture, and unplanned pregnancies are common among unmarried women. Where teenage unwanted pregnancies occur, such women are often of low socioeconomic class with risks of lack of antenatal care, poor nutrition, increased risk of infections, and undetected complications of pregnancy. Increased psychosocial stress, which has been implicated in the etiology of preterm births in the US would be expected in unwanted pregnancies in this area.[20] Although the mechanism through which single marital status could lead to preterm births is unclear, it would appear that it might be multifactorial given the multiple high-risk attributes of single marital status in this environment.

Complications of pregnancy studied in relation to preterm delivery included hemorrhage, gestational hypertension/preeclampsia/eclampsia, and premature rupture of membranes which were complication most implicated in previous studies in Nigeria.[12,15,17] Both hemorrhage and hypertension can predispose to indicated preterm birth (also referred to as provider-initiated) as a management strategy for these complications. Premature rupture of membranes on its part can trigger preterm labor or be the consequence of cervical incompetence.

The need to study the influence of maternal sociodemographic characteristics on survival of preterms arose in an attempt to identify any modifiable maternal factors that could enhance survival of preterm babies in this area. This study found that there was no association between most of the sociodemographic characteristics of mothers and survival-to-discharge of singleton preterm babies. Although previous studies had determined survival rates of preterm babies in some centers in Nigeria,[14,15] the relationship of maternal risk factors to survival of singleton preterm babies had not been previously explored.

Survival of preterm babies was dependent on gestational age at delivery and mode of delivery with cesarean delivery having a higher survival rate than vaginal delivery. This finding has not been reported before in Nigeria. It could be that very preterm babies were not subjected to cesarean delivery in this center because of the low chances of survival in comparison to moderate to late preterm babies. This could have biased the survival of babies against vaginal deliveries.

The major strength of this study was its comparative nature which controlled for any confounding effect of the singleton pregnancy on maternal risk factors or survival of babies. The subsequent use of multivariate analysis to determine the risk factor enabled us to control for the effects of confounders in the determination of each of the maternal risk factors. The major weakness of the study was the use of secondary data resulting in a large number of babies being excluded due to incomplete records: This could bias the results.

Conclusions

The independent maternal risk factors for singleton preterm births in this center included nulliparity, unbooked status, unmarried status, previous preterm birth, and presence of complications such as antepartum hemorrhage, preeclampsia/eclampsia or premature rupture of membranes. Whereas booking status and marital status are modifiable, the other risk factors are not. There was a moderately low rate of survival of singleton preterm babies. Survival of preterm babies depended on the mode of delivery and gestational age at birth, but not on maternal sociodemographic characteristics or complications of pregnancy. There is a need for women education and empowerment to encourage women to attend antenatal care, and for upgrading the facilities at the NBSCU to enhance the salvage rate of preterm babies at the study center.

References

1. Blencowe H, Cousens S, Chou D, Oestergaard M, Say L, Moller AB, *et al*. Born too soon: The global epidemiology of 15 million preterm births. Reprod Health 2013;10 Suppl 1:S2.
2. Beck S, Wojdyla D, Say L, Betran AP, Merialdi M, Requejo JH, *et al*. The worldwide incidence of preterm birth: A systematic review of maternal mortality and morbidity. Bull World Health Organ 2010;88:31-8.
3. Oloyede OA. Specialized antenatal clinics for women with a pregnancy at high risk of preterm birth (excluding multiple pregnancy) to improve maternal and infant outcomes: RHL commentary. In: The WHO Reproductive Health Library. Geneva: World Health Organisation; 2012.
4. Vogel JP, Lee AC, Souza JP. Maternal morbidity and preterm birth in 22 low- and middle-income countries: A secondary analysis of the WHO Global Survey dataset. BMC Pregnancy Childbirth 2014;14:56.
5. Chang HH, Larson J, Blencowe H, Spong CY, Howson CP, Cairns-Smith S, *et al*. Preventing preterm births: Analysis of trends and potential reductions with interventions in 39 countries with very high human development index. Lancet 2013;381:223-34.

6. Blencowe H, Cousens S, Oestergaard MZ, Chou D, Moller AB, Narwal R, *et al*. National, regional, and worldwide estimates of preterm birth rates in the year 2010 with time trends since 1990 for selected countries: A systematic analysis and implications. Lancet 2012;379:2162-72.
7. Simmons LE, Rubens CE, Darmstadt GL, Gravett MG. Preventing preterm birth and neonatal mortality: Exploring the epidemiology, causes, and interventions. Semin Perinatol 2010;34:408-15.
8. Plunkett J, Muglia LJ. Genetic contributions to preterm birth: Implications from epidemiological and genetic association studies. Ann Med 2008;40:167-95.
9. Lumley J. Defining the problem: The epidemiology of preterm birth. BJOG 2003;110 Suppl 20:3-7.
10. Chiabi A, Mah EM, Mvondo N, Nguefack S, Mbuagbaw L, Kamga KK, *et al*. Risk factors for premature births: A cross-sectional analysis of hospital records in a Cameroonian health facility. Afr J Reprod Health 2013;17:77-83.
11. Goldenberg RL, Culhane JF, Iams JD, Romero R. Epidemiology and causes of preterm birth. Lancet 2008;371:75-84.
12. Etuk SJ, Etuk JS, Oyo-Ita AE. Factors influencing the incidence of pre-term birth in Calabar, Nigeria. Niger J Physiol Sci 2005;20:63-8.
13. Ross MG. Preterm Labor. Available from: http://www.emedicine.medscape.com/article/260998-overview. [Last accessed on 2014 Oct 15].
14. Kunle-Olowu OE, Peterside O, Adeyemi OO. Prevalence and outcome of preterm admissions at the neonatal unit of a tertiary health centre in Southern Nigeria. Open J Pediatr 2014;4:67-75.
15. Onankpa BO, Isezuo K. Pattern of preterm delivery and their outcome in a tertiary hospital. Int J Health Sci Res 2014;4:59-65.
16. World Health Organization. Preterm birth Fact sheet No 363. Available from: http://www.who.int/mediacentre/factsheets/fs363/en/. [Last accessed on 2014 Sep 10].
17. Mokuolu OA, Abdul IF, Adesiyun O. Maternal factors associated with early spontaneous singleton preterm delivery in Nigeria. Trop J Obstet Gynaecol 2002;19:32-5.
18. Al-Dabbagh SA, Al-Taee WY. Risk factors for pre-term birth in Iraq: A case-control study. BMC Pregnancy Childbirth 2006;6:13.
19. Mokuolu OA, Suleiman B, Adesiyun O, Adeniyi A. Prevalence and determinants of pre-term deliveries in the University of Ilorin Teaching Hospital, Ilorin, Nigeria. Pediatr Rep 2010;2:e3.
20. Williamson DM, Abe K, Bean C, Ferré C, Henderson Z, Lackritz E. Current research in preterm birth. J Womens Health (Larchmt) 2008;17:1545-9.

How to cite this article: Iyoke CA, Lawani LO, Ezugwu EC, Ilo KK, Ilechukwu GC, Asinobi IN. Maternal risk factors for singleton preterm births and survival at the University of Nigeria Teaching Hospital, Enugu, Nigeria. Niger J Clin Pract 2015;18:744-50.

Source of Support: Nil, **Conflict of Interest:** None declared.