

Maternal Factors Associated With Early Spontaneous Singleton Preterm Delivery in Nigeria

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Abstract

Background: Knowledge of the maternal factors predisposing to preterm deliveries should affect the anticipatory care of mothers at risk of delivering preterm babies and improve perinatal outcome.

Objective: To determine the maternal socio-biological characteristics associated with the delivery of early spontaneous singleton preterm babies in a sample of Nigerian Women.

Methods: The study was conducted at a teaching hospital in the Guinea-savannah belt of Nigeria. Two groups of patients were recruited. Group A consisted of women who delivered babies prior to a gestational age of 34 weeks, while Group B were mothers who delivered at 37 or more weeks. Data collected on each subject included maternal post-partum weight, height, obstetric data and social characteristics.

Results: A total of 171 mothers were studied; 69 in Group A and 102 in Group B. There was no significant difference between the socio-demographic profiles of the two groups. Factors significantly associated with preterm delivery were body mass index (BMI) 20.0 [Odds Ratio (OR) 14.6; 95% CI: 3.2-66.1]; previous preterm delivery [OR: 4.5; 95% CI: 1.5-13.3]; parity 1-2 [OR: 2.1; 95% CI: 1.1-4.0] and previous abortion [OR: 1.6; 95% CI: 1.2-2.4]. These associations were still demonstrable after adjusting for confounding variables, with BMI being the strongest determinant of preterm delivery. Maternal height alone and previous uterine curettage were not significantly associated with preterm delivery.

Conclusion: Low BMI, low parity, previous preterm delivery and previous abortions were the maternal factors associated with early spontaneous singleton preterm delivery in a sample of Nigerian women.

Key Words: Maternal, Labour, Preterm Births, Prematurity, Perinatal [Trop J Obstet Gynaecol, 2002, 19: 00-00]

Introduction

Perinatal mortality has remained very high in Nigeria, ranging from 58.6 to 68 per thousand live births in community-based studies and about 119/1000 in a hospital-based study^{1,2,3}. Pre-term babies account for 40-60% of these deaths^{3,4,5}, with mortality rates of 420 to 920 per 1000 live births among those less than 33 weeks^{4,6,7}. It is therefore obvious that reducing preterm mortality would be critical to having a general reduction in perinatal mortality rates. Improvements in the management of preterm babies or controlling their delivery, where possible, would be strategies for achieving this objective. Improved care would require a lot of technical and ancillary support that may not be easy to come by within the context of a developing country like Nigeria that is groaning under the pangs of political instability and an increasing dearth of skilled manpower. Furthermore, it has been previously reported that while early intervention in babies at risk for cardio-respiratory difficulties, sepsis and metabolic derangement produced a significant reduction in mortality in normal birth weight infants, mortality among the low birth weight (mainly preterm) babies remained unchanged, despite these therapeutic interventions^{6,7}.

Against this backdrop, it is rational to judge that the ultimate key to the management of preterm babies would be the application of preventive measures to control their delivery. Such measures would be informed by the knowledge of predisposing factors. In this regard, the findings have often been inconsistent^{8,9,10,11}, with methodological differences accounting for most of these inconsistencies. For retrospective studies based on review of databases, conclusions would be limited by the scope of variables available in the patients' hospital records. For instance Wildschut *et al*¹¹ reviewed a 1958 database which did not include such variables as the maternal weight, body mass index and history of previous preterm delivery. Although they applied newer statistical methods, the non-inclusion of these variables limited the application of their findings, considering the plethora of evidence that these variables may play significant roles in the aetiology of preterm births^{10,12,13}. Another area of possible conflict is the cut-off point for the gestational ages.

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Ancel *et al*¹⁴ reported that risk factors for very and moderate pre-term births are similar, but the strength of association differs, especially for social factors and obstetric history. The implication from the foregoing is that the present understanding of the risk factors predisposing to preterm births is still inconclusive. There is a need for more information from different environments under carefully controlled conditions where confounders would be reduced to the minimum. This study was thus designed to determine, the maternal socio-biological characteristics associated with the delivery of early spontaneous singleton preterm babies among a sample of Nigeria Women.

Patients and Methods

The study was conducted at the University of Ilorin Teaching Hospital, in the Guinea Savannah belt of Nigeria. The hospital provides secondary and tertiary level obstetric and neonatal care. The annual delivery rates range between 1500 and 2000 births. The neonatal unit provides level II care and admits between 700 and 800 babies annually.

The study was a case-control study conducted over one year. Subjects were longitudinally recruited into either of two groups. The first group (Group A) consisted of women who had early preterm babies with gestational age of ≤ 34 weeks, while the second group (Group B) were mothers of term babies. The choice of early preterm versus term deliveries was informed by the need of have two distinct groups of babies and reduce the effect of confounders as much as possible between late preterm and term babies. Mothers with induced labour or instrumental delivery, multiple gestation and those with babies who had major congenital abnormalities were excluded. Mothers of preterm babies were recruited sequentially, once they fulfilled the inclusion criteria. For each preterm delivery that was recruited, the next one or two mothers to have singleton term deliveries within 48 hours were selected as controls.

Data collected included maternal post-partum weight, height, obstetric data and social characteristics. Babies' gestational ages were determined from the maternal dates or first trimester ultrasound reports. The Ballard¹⁵ scoring charts was used to validate the gestational ages so derived. In situations where there is a disparity in excess of two weeks for the gestational age derived from these methods, such babies were excluded. The mothers' body mass index was determined using the formula $\text{weight(kg)/height(m)}^2$. The data collected were recorded on a standard proforma.

Data Analysis: Data was analysed using the SPSS version 9 software package. Data was entered and cleaned for errors. Association between categorical variables was done with the chi square test, or Fisher's exact test where applicable. The odds ratios and 95% confidence intervals were computed to determine association between a risk factor and preterm delivery. Logistic regression was performed to determine the relationship between preterm delivery and significant independent variables. The overall fit of the regression model was tested using the Hosmer-Lemeshow goodness of fit test. For all analyses, p -value < 0.05 was considered significant.

Results

A total of 171 mothers were recruited for the study. There were 69 mothers in Group A while Group B had 102 mothers. The general characteristics of the study group are shown in Table 1. The ages ranged from 16 to 39 years with a mean of 27.8 years. The mean weight of the subjects was 62.7 kg while the mean height was 159.0cm. The parity ranged between 1 and 7, with a mean of 2.6.

Table 1
Socio-Demographic Characteristics

Parameter	Preterm ≤ 34 Weeks		Term		
	Range	Mean [SD]	Range	Mean [SD]	
Age (years)	25-35	30.5 [3.6]	25-38	30.8 [3.1]	
Height (cm)	137-186	160.3 [6.9]	144-175	159.8 [7.1]	
Weight (kg)	33-96	58.9 [10.5]	42-97	66.5 [11.6]	
Parity	Range	Median	Range	Median	
	1-5	2	1-8	3	
Abortions	Range	Median	Range	Median	
	1-3	1	1-4	1	
Occupation	Number	Percent	Number	Percent	
	Sedentary	25	36.2	42	41.2
	Non-sedentary	44	63.8	60	58.8
Socio-economic Class	Number	Percent	Number	Percent	
	Low	45	66.2	78	76.5
	High	23	33.8	24	23.5
Education	Number	Percent	Number	Percent	
	Up to Primary	17	25.0	19	19.0
	Post- Primary	51	75.0	81	81.0

Factors Associated With Early Preterm Delivery

There was no significant difference between the social characteristics, which included the occupation type, level of education and socio-economic class (Table 1).

Table 2

Maternal Anthropometric Characteristics and Preterm Delivery

Parameter	Preterm ≤ 34 Weeks	Term	p
	No. (%)	No. (%)	
Maternal Age			
14-20 years	6 (9.1)	4 (4.0)	
21-30 years	43 (65.2)	69 (69.0)	0.29
> 30 years	17 (28.5)	27 (27.0)	
Maternal Height			
< 155 cm	19 (43.2)	25 (56.8)	0.44
≥ 155 cm	51 (40.5)	75 (59.5)	
Maternal Pre-Pregnancy Weight			
< 55 Kg	28 (40.6)	13 (12.7)	0.0001
≥ 55 Kg	41 (59.4)	25 (87.3)	
Body Mass Index (BMI)			
< 20	16 (23.5)	2 (2.1)	0.0001
≥ 20	53 (76.5)	97 (96.9)	

The relationship between maternal anthropometric factors and preterm delivery is shown in Table 2 while association with previous obstetric history is shown in Table 3. Factors significantly associated with preterm delivery were maternal pre-pregnancy weight less than 55 Kg [odds ratio (OR) 4.6; 95% CI: 2.2-9.7]; body mass index of ≤ 20.0 [odds ratio (OR) 14.6; 95% CI: 3.2-66.1]; previous preterm delivery [OR 4.5; 95% CI: 1.5-13.3]; parity 1-2, [OR 2.1; 95% CI 1.1-4.0] and previous abortion [OR 2.5; 95% CI: 1.2-5.4]. Maternal height alone and previous uterine curettage were not significantly associated with preterm delivery. These variables remained significantly associated with preterm deliveries after adjusting for confounding variables with the regression model. The BMI was the strongest determinant of preterm delivery. The model predicted 69.64% of cases of preterm delivery from the study population. The Hosmer-Lemeshow goodness of fit for the equation gave a χ^2 value of 4.86; df: 4, $p = 0.30$.

Table 3

Maternal Obstetric History

Parameter	Preterm ≤ 34 Weeks	Term	p
	No. (%)	No. (%)	
Maternal Parity			
≤ 2	46 (66.7)	53 (52.0)	0.05
> 2	23 (33.3)	49 (48.0)	
Previous Preterm Birth			
Yes	13 (18.8)	5 (4.9)	0.004
No	56 (81.2)	97 (95.1)	
Previous Abortion			
Yes	21 (30.4)	16 (15.7)	0.018
No	48 (69.6)	86 (84.3)	
Previous Uterine Curettage			
Yes	12 (17.4)	10 (9.8)	0.146
No	57 (82.6)	92 (90.2)	

Discussion

Low maternal pre-pregnancy weight and low body mass index have variously been associated with premature births or delivery of small for gestational age babies^{16,17,18}. This association has been strongly proven in this study. It is postulated that a bigger, heavier woman is likely to have a bigger, heavier uterus. This can translate to the ability of the uterus to allow its contents reach bigger size and therefore higher gestation before reaching the critical volume for labour to start. This association that has been consistently detected however needs further elucidation scientifically.

Parity's relationship with preterm delivery has not been consistent. However, the studies supporting positive association of low parity and preterm birth or SGA are more frequently seen^{5,13}. This study did reveal a statistically significant association between low parity and spontaneous early preterm delivery. The possible reason for this association may be the increased incidence of conditions like pre-eclampsia/eclampsia and low maternal age associated with low parity.

Past history of abortions and previous preterm delivery are significantly associated with preterm births in this study. This is congruent with findings from other studies^{10,19}. The plausible reasons for this association are the fact that the causes of the previous preterm births or spontaneous abortions might be persistent in some women.

Some of these causes may be low maternal weight as earlier discussed and incompetent cervix among others^{20,21}. Previous dilatation and curettage was not significantly associated with premature deliveries in this study. There was however a trend which should not be completely ignored. Many Nigerians obtain dilatation and curettage from unskilled providers and this has been known to contribute significantly to the occurrence of cervical incompetence, which in its late form may present as premature labour²⁰.

The regression analysis done showed that the above factors were independently associated with preterm delivery. However, the regression model did indicate that the BMI was the single most important determinant of preterm delivery. It contributed to over 70% of preterm deliveries. This has implications for developing an algorithm to guide in identifying women at risk for preterm delivery.

This study was conducted with the full consciousness that current trends in relation to predicting preterm deliveries relies more on the measurement of fetal fibronectin levels in cervical secretions²². However, in developing countries like Nigeria, a routine clinical test for such biochemical parameters is not widely available. Even when it becomes available, cost may remain a major handicap to their uniform application. It may therefore become necessary to further streamline the selection of those to have such biochemical test by using the information from studies such as this one to screen for mothers at greatest risk. In this regard, a study to assess if there is any correlation between BMI and fetal fibronectin levels may be helpful in establishing an association between the two and preterm labour and delivery.

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