Journal of Clinical Medicine and Research Vol. 2(7), pp. 114-118, July 2010
Available online http://www.academicjournals.org/JCMR
ISSN-2141-2235 ©2010 Academic Journals

Full Length Research Paper

Risk factors of preterm delivery of low birth weight (plbw) in an African population

Claude Bayingana[1,2*], Claude Mambo Muvunyi[2] and Charlene W. J. Africa[1]

[1]Department of Medical Biosciences, Faculty of Science, University of the Western Cape, Modderdam Road, Belville 7535, South Africa.
[2]Department of Clinical Biology, National University of Rwanda, Centre Hospitalier Universitaire-Butare, Rwanda.

Accepted 22 June, 2010

More than 20 million infants in the world (15.5% of all births) are born with low birth weight. Ninety-five percent of them are in developing countries. The objective of this study was to examine different factors which may contribute to preterm delivery of low birth weight (PLBW) in a recent sample of Rwandan birth. The study sample included 200 randomly selected women admitted to the department of obstetrics-gynecology of the teaching hospital of Butare in Rwanda. Mothers were asked to complete a questionnaire and obstetrics records were used in order to identify factors which might pose a health risk to them and their infants. Maternal weight, height, history of previous preterm and healthy conditions of the children in the family showed a significant relationship with PLBW. Maternal level of education, number of pregnancies of the mother, urinary tract infection, sexually transmitted disease, antibiotic administration, diabetes, history of heart disease, alcohol consumption and smoking showed a relationship with PLBW but the relationship was not significant. More studies are required for a better understanding of the mechanism leading to preterm delivery of low birth infants.

Key words: Africa, pregnancy, preterm delivery, low birth weight infants,.

INTRODUCTION

Preterm birth is defined as birth before 37 weeks of gestation and low birth weight infants are those who weigh less than 2500 g at birth (Offenbacher et al., 1996). Preterm delivery of low birth weight infants (PLBW) is increasing extensively and becoming an important problem in both developing and developed countries (McGaw, 2002). More than 20 million infants in the world (15.5% of all births) are born with low birth weight. Ninety-five percent of them are in developing countries (United Nations Children's Fund and World Health Organization, 2004) with the rate of low birth weight in developing countries being more than double that of developed countries (16.5 and 7% respectively). In Sub-Saharan Africa, the rate is around 15% (United Nations Children's Fund and World Health Organization, 2004). It is known that PLBW infants are exposed to serious health problems, including, neurodevelopmental health problems, including, neurodevelopmental disturbances, ear infections, respiratory infections, asthma and death (Shapiro et al., 1980). Ten percent of neonatal mortality wold-wide is caused by prematurity (Child Health Research Project Special Report, 1999). In the US, 25% of neonatal mortality is due to prematurity (Mathew and MacDorman, 2006). Preterm delivery is a significant cost factor in healthcare resulting in a considerable cost of long-term care for children with disabilities as a result of it. A study in US showed a neonatal cost of $224, 400 for a newborn at 500 - 700 g while only $1,000 for a newborn at over 3,000 g (Gilbert et al., 2003).

Factors that have been linked to a higher risk of preterm delivery include low socio-economic standards, edu-cational level, single motherhood, age at the upper (> 35 years) and lower end (< 18 years), multiple pregnancies (twins, triplets etc…), smoking and alcoholism during pregnancy, maternal medical conditions such as

*Corresponding author. E-mail: cbayrw2000@yahoo.fr. Tel: +27 0734553734.

Table 1. Details of mothers.

	Normal birth n (%)	PLBW n (%)	P value
Age (years)			0.557
< 20	8 (8.2)	9 (9.3)	
20 – 25	28 (28.6)	32 (33.0)	
26 – 30	31 (31.6)	27 (27.8)	
31 – 35	22 (22.4)	15 (15.5)	
≥ 36	9 (9.2)	14 (14.4)	
Weight (Kg)			0.006
≤ 50	7 (7.01)	9 (10.0)	
51 – 55	13 (13.3)	22 (24.4)	
56 – 60	21 (21.4)	24 (26.7)	
61 – 65	18 (18.4)	21 (23.3)	
> 65	39 (39.8)	15 (16.6)	
Height (cm)			0.041
≤ 150	15 (15.6)	15 (17.0)	
151 – 155	20 (20.8)	21 (23.9)	
156 – 160	16 (16.8)	27 (30.7)	
160 – 165	23 (24.0)	17 (19.3)	
> 165	22 (22.9)	8 (9.1)	
Level of education			0.355
No formal education	6 (6.1)	12 (12.1)	
Primary school	59 (60.2)	62 (62.6)	
High School	24 (24.5)	19 (19.2)	
university	9 (9.2)	6 (6.1)	

high blood pressure, diabetes and heart disease (Prazuck et al., 1993; Shiono et al., 1995; Martius et al., 1998; Parazzini et al., 2003; Feresu et al., 2004; Rosenberg et al., 2005; Goldenberg et al., 2008). Infections play a major role in the cause of PLBW (Goldenberg et al., 2000). In most cases of PLBW, the aetiology is unknown and no method to prevent pre-term labour has proven effective (Schellenber, 2003). Data of prematurity from developing is still limited (feresu et al., 2004). The objective of this study was to examine different factors which may contribute to PLBW in a recent sample of Rwandan birth.

MATERIALS AND METHODS

The study sample included 100 cases of PLBW and 100 controls obtain from all sequential deliveries which occurred from May to December 2008 in the department of obstetrics and gynecology of the teaching hospital of Butare in Rwanda. Medical records were used and mothers were asked to complete a questionnaire within 48 h after delivery in order to identify factors which might pose a health risk to them and their infants. The stage of gestation was determined by recording the last date of menstruation of the patient. Medical records and all questionnaires were entered into Excel 2003 and then transferred in SPSS 14.0 for analysis. Frequencies, means and standard deviations were calculated using descriptive statistics. The significance of associations was determined using chi-squared and Fisher's exact test. A p value of < 0.05 was considered significant.

RESULTS

Age of the mother

Of the mothers who responded, (n = 195), the majority were between the ages of 20 - 30 (60%) and although, a slight increase in PLBW was observed in mothers ≥ 36 years of age, this was not statistically significant (p = 0.557). The mean age was 28.02 ± 6.089 (Table 1).

Weight of the mother

One hundred and eighty-eight mothers recorded their weights. Of these, PLBW was significantly increased (p = 0.006) in mothers who weighed less than 60 Kg (Table 1). The mean weight was (61.92 ± 9.569) Kg. A significant correlation (p = 0.006) was observed between maternal weight and PLBW (Table 1).

Table 2. Medical history of the mothers.

Characteristics	Normal birth (%)	PLBW (%)	P value
Diabetic history			
Yes	1 (1.0)	2 (2.1)	0.496
No	97 (99.0)	95 (97.9)	
Family heart disease history			0.528
Yes	9 (9.4)	10 (10.1)	
No	87 (90.6)	89 (89.9)	
Urinary tract infection			0.107
Yes	18 (19.1)	27 (27.8)	
No	76 (80.9)	70 (72.2)	
Sexually transmitted disease			0.080
Yes	10 (10.3)	18 (18.4)	
No	87 (89.7)	80 (81.6)	
History of antibiotics use			0.079
Yes	24 (24.7)	34 (35.1)	
No	73 (75.3)	63 (64.9)	
Alcohol use			
Never	46 (48.4)	52 (55.9)	0.337
Daily	10 (10.5)	14 (15.1)	
weekly	18 (18.9)	11 (11.8)	
Special occasions	21 (22.1)	16 (17.2)	
Smokers			0.506
Yes	5 (5.1)	4 (4.1)	
NO	93 (94.9)	93 (95.9)	

Height of the mother

A significant correlation (p = 0.041) was observed also between the height of the mother and PLBW. Mothers with a height ≤ 160 cm were more likely to deliver full term and normal weight (Table 1). A significant correla tion (p = 0.041) was observed between maternal height and PLBW (Table 1).

Level of education

The majority (60.5%) of the population had completed their primary school, followed by high school (21.5%) with 9.0% having had formal education and 7.5% having reached the university level (Table 1).

Although, the number pf PLBW increased in mothers with no formal education, no significant association (p = 0.355) could be observed between level of education and PLBW.

Medical history of mothers

The majority of mothers reported no history of urinary tract infection, sexually transmitted diseases, diabetes, heart disease or smoking, while half of them admitted to alcohol consumption (Table 2). Only 29% had recently received antibiotic therapy. No correlation was found between urinary tract infection or STD and PLBW (p = 0.107 and p = 0.080 respectively), nor was a correlation observed between diabetes, heart disease and PLBW (p = 0.496 and p = 0.528 respectively). Alcohol consumption and smoking did not appear to influence term of delivery in these subjects and although, more of the mothers who reported antibiotic usage during pregnancy delivered preterm, this figure did not differ significantly from the number who delivered normal birth infants (p = 0.079)

Table 3. History of previous deliveries.

Characteristics	Normal birth n (%)	PLBW n (%)	P value
Condition of children in the family			0.003
Healthy	71 (100.0)	53 (88.3)	
Not Healthy	0 (0.0)	7 (11.7)	
History of previous pregnancies			0.078
First pregnancy	32 (33.0)	43 (43.9)	
Multiple pregnancies	65 (67.0)	55 (56.1)	
Previous pre-term birth			0.000
Yes	8 (11.1)	24 (39.3)	
No	64 (88.9)	37 (60.7)	

(Table 2).

Health condition of children

Only 131 mothers gave information on the health condition of their children. Healthy infants in the family were reported by 62% of the mothers with 3.5% indicating that their children were not healthy. A significant difference ($p = 0.003$) was observed between the health condition of the children in the family and PLBW. Only children born PLBW were reported to be unhealthy (Table 3).

History of previous pregnancies

First pregnancy was reported by 37.5% and multiple pregnancies were reported by 60%, with 16% indicating a history of pre-term delivery. Although, women in their first pregnancy appeared to be more likely to deliver PLBW than women who reported multiple pregnancies, this difference was not found to be statistically significant ($p = 0.078$). A very good correlation ($p = 0.000$) was observed between history of previous PLBW and present PLBW (Table 3). Mothers with a history of previous PLBW were more likely to deliver PLBW infants in subsequent pregnancies.

DISCUSSION AND CONCLUSION

The aim of this study was to examine different factors which may contribute to PLBW in a recent sample of Rwandan birth. Two hundred women who were admitted to the obstetric and gynecology unit of the teaching hospital in Rwanda constituted the sample group for this study. One hundred delivered full-term normal weight infants, while the other hundred delivered PLBW infants. Unfortunately, not all of the 200 mothers responded to many of the questions in the questionnaire with the result that we were not able to determine whether their response were indeed negative or whether they were reluctant to provide the information requested. As far as the physical condition of the mothers who responded to the questions on age, height and weight go, age appeared to influence pregnancy outcomes but not significantly so ($p = 0.557$). An earlier study showed that the frequency of preterm delivery was higher in mothers below 18 years and above 35 years old (Astoffi and Zonta, 1999). A significant correlation was observed between maternal weight and PLBW ($p = 0.006$), and maternal height and PLBW ($p = 0.041$). Similar results have been reported previously (Sekiya et al., 2007; Chan and Lao, 2009). This can be expected because the thinner the mother, the weaker she would be and thus less able to carry full term. It has been documented that women with a poor nutritional status are at greater risk for preterm birth (Hendler et al., 2005). Although there are reports of mothers with no formal education being more likely to deliver PLBW (Goldenberg et al., 2008), no significant correlation ($p = 0.355$) was observed between level of education of the mothers and PLBW in this study group. Those who attended secondary school and university were more likely to deliver full term and normal weight than PLBW infants.

Earlier researches reported a relationship between diabetes, heart disease and PLBW (Hedderson et al., 2003), but no correlation was found in this group. However, the response to the question on diabetes was too small to make any final conclusion. No correlation was found between alcohol consumption ($p = 0.337$), smoking ($p = 0.506$) and PLBW in this group although, a relationship has been reported in a previous study (Moore and Zaccaro, 2000). Although, the results show that mothers who took antibiotics while pregnant had more PLBW deliveries than those who did not, no significant correlation ($p = 0.079$) was observed in this study between antibiotic administration and PLBW. Other studies examining the use of antibiotics have also provided mixed results, with some showing no major benefit while

others do (McDonald et al., 2007; Iams et al., 2008).

No significant correlation was found (p = 0.078) between first, multiple pregnancies and PLBW, but the results concur with previous studies which showed that PLBW seemed to be more likely to occur when women were in their first pregnancy (Astoffi and Zonta, 1999). Mothers with a history of previous PLBW were seen to be at risk for another preterm birth (Mercer et al., 1999) as was also demonstrated in this study where a significant association (p = 0.000) was observed. A good correlation (p = 0.003) was observed between the health condition of the children in the family and PLBW. In the normal birth group, no unhealthy children were reported. Previous studies showed that maternal nutrition is very important ((Hendler et al., 2005) and that vaginal infections have been reported to be associated with preterm birth (Goldenberg, 2002). In this study no correlation was found between urinary tract infection, sexually transmitted disease and PLBW in this study.

Most interventions to prevent preterm birth have in the past been unsuccessful and in the few cases that reported success these are not known to be universally effective and are only applicable to a small number of women at risk for preterm birth (Goldenberg et al., 1998). The quest for a better understanding of the mechanism leading to preterm delivery continues. In the meanwhile, pregnant women are required to fulfill the basic rules of proper hygiene and nutrition, weight control and regular visits to a gynecologist to ensure that they maintain good health throughout their pregnancies and deliver healthy infants.

ACKNOWLEDGEMENTS

This study has been funded by the NRF. The authors would like to thank late Dr Claude SIBOMANA and all the staff of the department of obstetric-gynecology of the teaching hospital of Butare in Rwanda for their co-operation and assistance in patient selection and pregnant women for their willing co-operation in the study. Also, we would like to thank Mr. Theogene Bahizi for his assistance for the management of all the questionnaires.

REFERENCES

Astoffi P, Zonta LA (1999). Risk of preterm delivery and association with maternal age, birth order, and fetal gender. Human Reproduction, 14(11): 2891-4.

Chan BC, Lao TT (2009). Maternal height and length of gestation: does this impact on preterm labour in Asian women? Aust NZ J. Obstet Gynecolol., 49(4): 388-92.

Child Health Research Project Special Report (1999). ""Reducing Perinatal and Neonatal Mortality."". 'Meeting Report,. Baltimore, Maryland, 3(1): 10-12.

Feresu SA, Harlow SD Woe GB (2004). Risk factors for prematurity at Harare Maternity Hospital, Zimbabwe. Int. J. Epedemiol., 33(6): 1194-1201.

Gilbert WM, Nesbitt TS, Danielsen B (2003). The Cost of prematurity: Quantification by Getstational Age and Birth Weight. Obstet. Gynecol.,102: 488-92.

Goldenberg RL, Iams JD, Mercer BM (1998). The preterm prediction study: the value of new vs standard risk factors in predicting early and all spontaneous preterm births. NICHD MFMU Network. Am. J. Public. Health. 88(2): 233-8.

Goldenberg RL, Hauth JC, Andrews WW (2000). Intrauterine infection and preterm delivery. N Engl. J. Med., 342: 1500-07.

Goldenberg RL (2002). The management of preterm labor. Obstet Gynecol., 100(5): 1020-37.

Goldenberg RL, Culhane JF, Iams JD, Romero R (2008). Epidemiology and causes of preterm birth. Lancet, 371: 75-84.

Hedderson MM, Ferrara A, Sacks DA (2003). Gestational diabetes mellitus and lesser degrees of pregnancy hyperglycemia: association with increased risk of pontaneous preterm birth.Obstet. Gynecol., 102(4): 850-6.

Hendler I, Goldenberg RL, Mercer BM, et al (2005). The preterm prediction study: association between maternal body mass index (BMI) and spontaneous preterm birth. Am. J. Obstet. Gynecol., 192: 882-6.

Iams JD, Romero R, Culhane JF, Goldenberg RL (2008). Primary, secondary, and tertiary interventions to reduce the morbidity and mortality of preterm birth. lancet, 371(9607): 164-75.

Mathew TJ, MacDorman MF (2006). ""Infant Mortality Statistics from the 2003 Period Linked Birth/Infant Death Data Set."". 'National Vital Statistics Reports, Hyattsville, Maryland: National Center for Health Statistics, pp. 54-16.

Martius JA, Steck T, Oehler MK, Wulf KH (1998). Risk factors associated with preterm (<37+0 weeks) and early preterm birth (<32+0 weeks): univariate and multivariate analysis of 106 345 singleton births from the 1994 statewide perinatal survey of Bavaria". Eur. J. Obstet. Gynecol. Reprod. Biol., 80(2): 183-9.

McDonald HM, Brocklehurst P, Gordon A (2007). Cochrane Database systematic reviews. p. 1.

McGaw T (2002). Periodontal disease and preterm delivery of low-birth-weight infants. J. Can. Dent. Assoc., 68(3): 188-92.

Mercer BM, Goldenberg RL, Moawad AH (1999). The preterm prediction study: effect of gestational age and cause of preterm birth on subsequent obstetric outcome. Am. J. Obstet. Gynecol., 181: 1216-1221.

Moore ML, Zaccaro DJ (2000). Cigarette smoking, low birth weight and preterm births in low-income African-American women. J. Perinatol., 20(3): 176-80.

Offenbacher S, Katz V, Fertik G, Collins J, Boyd D, Maynor G, McKaig R, Beck J (1996). Periodontal infection as a possible risk factor for preterm low birth weight. J. Periodontol., 67(10): 1103-1113.

Parazzini F, Chatenoud L, Surace M, Tozzi L, Salerio B, Bettoni G, Benzi G (2003). Moderate Alcohol Drinking and Risk of Preterm Birth. Europ. J. Clin. Nutr., 57: 1345.

Prazuck T, Tall F, Roisin AJ, Konfe S, Cot M (1993). Risk factors for Preterm Delivery in Burkina Faso (West Africa). Int. J. Epedemiol., 22(3): 489-494.

Rosenberg TJ, Garbers S, Lipkind H, Chiasson MA (2005). Maternal obesity and diabetes as risk factors for adverse pregnancy outcomes: differences among 4 racial/ethnic groups. Am. J. Public Health, 95(9): 1545-51.

Schellenber JC (2003). Preterm Delivery. [Online]. Available: http://www.gfmer.ch/Endo/Lectures_10/Whoptdel.htm

Shiono PH, Klebanoff MA, Nugent RP, Cotch MF, Diana G, Rollins DE, Carey JC, Behrman RE (1995). Fetus-Placenta-Newborn: the Impact of Cocaine and Marijuana Use on Low Birth Weight and Preterm Birth: a Multicenter Study. Am. J. Obset. Gynecol., 172: 19-27.

Shapiro S, Mccormick MC, Starfield BH, Krisher JP, Bross D (1980). Relevant of carrelates of infant death for significant morbidity at 1 year of age. Am. J. Obstet. Gynecol., 136(3): 363-373.

Sekiya N, Anai T, Matsubara M, Miyazaki F (2007). Maternal Weight Gain Rate in the Second Trimester Are Associated with Birth Weight and Length of Gestation. Gynecol. Obstet. Invest., 63:45-8.

United Nations Children's Fund and World Health Organization (2004). Low Birthweight: Country, regional and global estimates. UNICEF, New York.