AFRICAN JOURNAL OF MEDICINE
and medical sciences

VOLUME 21, NUMBER 1, OCTOBER 1992

EDITOR: B.O. ONADEKO
ASSISTANT EDITORS:
B.O. OSOTIMEHIN and A.O. UWAIFO

SPECTRUM BOOKS LIMITED
Ibadan • Owerri • Kaduna • Lagos

ISSN 1116–4077

Afr. J. Med. med. Sci. (1992) 21, 33-39

A prospective study on some factors which influence the delivery of low birth weight babies in a developing country

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Summary

The study was prospective in design and carried out in Ibadan, Nigeria. It was undertaken in order to provide more information on the low birth weight deliveries seen here and to evaluate some factors associated with their births. 600 randomly selected gravid women who presented to the antenatal booking clinics for the first time in this pregnancy were followed up till delivery of their babies. Data on 492 women who produced normal, singleton babies were analysed. The mean birth weight was 3167g ± 451g (males; 3205g ± 469g and significantly higher than of females of 2991g ± 468g).

The incidence of low birth weight (LBW) weight of 2500g and less was 8.3% and comprised of 18 males, 22 females and 1 unknown sex. 80% of these LBW babies were term (37 - 41 wks gestation) at delivery, while 20% were pre-term (< 37 wks).

There was seasonal variation in the incidence of LBW, the risk being highest during the peak of dry season and lowest during the rainy season. The mothers age, parity, height, ponderal index at delivery, and total maternal weight gain as well as birth interval were each significantly related to the incidence of LBW in these mothers (P <0.01). Maternal education as well as socio-economic class were not significant (P >0.5).

Résumé

L'étude était prospective et elle était effectuée au Nigeria, à Ibadan, afin d'obtenir beaucoup d'information sur les, facteurs qui s'associent avec l'accouchement des bébés dont le poids est 2500 grammes et mains au moment de naissance.

Six cent femmes ont été choisies au hassard pour des cliniques prénatales réservées, pour la primière fois, et leurs grossesses ont été soigneusement étudiées jusqu'au moment d'accouchement. Les données sur 492 femmes qui ont donne naissance aux bébés uniques ont été analysées. Le moyen poids total de naissance etait 3167g ± 451g. (Males 3205g ± 469g étant d'une manière significative, plus haut que celui des femelles; 2991g ± 468g).

L'incidence du poids de naissance bas (LBW) 2500g était 8.3%, consistant en 18 males, 22 femelles et 1 dont le sexe est inconnu. 80% de ces bébés de poids bas au moment de naissance (LBW) étaient de terme (37-41) semaines de gestation au moment d'accouchement, tandis que 20% étaient proterme (37 semaines).

Il a eu une variation saisonier sur l'incidence de poids de naissance bas (LBW) et le risque est que le bébé prend le poids pendant la saison des pluies et ce poids diminue pendant la saison sèche.

Il y avait un rapport significatif entre l'incidence de poids de naissance bas (LBW) de ces meres en question (P <0.01) et l'age de la mere, le parité, (parity) la taille, l'index ponderal a l'accouchement et le poids total maternel gagne aussi bien que l'interval de naissance. L'éducation maternelle aussi bien que la classe socio-economique n'étaient pas significatives. (P > 0.5).

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Introduction

Low birth weight (LBW) babies represent one of the greatest public health problems in most developing countries. Studies have shown that 95% of LBW babies born every year in the world come from developing countries[1]. Estimates made showed the rate of LBW babies in developing countries to be around 19%[2]. In Nigeria, the incidence has been put between 9.4%[3] and 19.8%[4]. In Africa as a whole, it was put at 16.8%[5].

The magnitude of the problem is better appreciated when one compares these rates with those obtained from the developed world. In the USA, LBW rate is put at around 6% for whites[6] in Ireland 4.7%[7] and in most industrialised countries at 7.4%[8]. LBW babies have consistently been placed as one of the top factors associated with the high perinatal and neonatal mortality rates in Nigeria [9, 10, 11]. Studies on LBW children have shown that 40-60% of these children had retarded motor development and neurological abnormalities[12,13] and were associated with congenital abnormalities and mental retardation[14].

Most studies done on LBW have failed to distinguish between term and pre-term low birth weight babies, particularly those in the developing countries. Many also had assumed that socio-

economic factors and maternal education played an important role in the pathogenesis of LBW as it did in the developed world.

Materials and methods

This study was carried out in Ibadan, the capital city of Oyo State of Nigeria, West Africa. In order to obtain a fair representation of pregnant women, all hospitals within the city were stratified into 2 major groups namely: government owned and non-government owned. The government hospitals were then regrouped into State owned and Federal Government owned. The non-government hospitals were regrouped into private individual/group owned and mission owned. With data obtained from the State Ministry of Health, a hospital from each of the 4 sub-groups was randomly selected for the study. The total number of deliveries obtained from records of the previous year from the 4 hospitals were calculated and based on this, the proportion of total births expected for the year for each hospital were systematically admitted into the study until the quota for that hospital was attained.

A detailed explanation of the study was made to all subjects admitted and their consent obtained. They were encouraged to participate till term. Information was obtained on all women by interview and physical examination. The following indicators were assessed: maternal age and height, maternal education, socio-economic class, birth interval since last delivery and history of previous LBW or premature delivery. Gestational age by fundal height, was assessed at every clinic visit till delivery of the baby when the birthweight was recorded within 6 hours of delivery to the nearest 100g. Gestational age was also calculated from the number of completed weeks elapsing from the date of the first day of the last normal menstrual period and in over 60% of cases confirmed by sonogram. The study extended over a period of 11 months when the first and the last mothers in the study delivered.

Results

The mean birth weight for all singleton deliveries was 3167g ± 451g. The mean for males was 3205g ± 469g and 2991g ± 468g for females. Mean maternal weight gained in pregnancy was 13.05kg. Mothers who delivered LBW babies gained 9.14kg.

The incidence of LBW was 8.3% and consisted of all babies weighing 2500g and less at birth. The incidence of LBW was highest during the dry harmattan season and lowest during the rainy season. ($P < 0.001$) Table 1.

Total maternal weight gain

As seen in Table 2 all mothers who gained ≤ 5kg delivered LBW babies. As mean maternal weight gained in pregnancy increased, the incidence of LBW correspondingly decreased. ($P < 0.001$). This predicts 29% of the variance in LBW.

Age

The incidence of LBW was highest in the youngest age group of mothers (15-19 years) and fell gradually with increasing maternal age ($P < 0.001$). No LBW baby was delivered by mothers 36 years and above. (Table 3). Following multiple systematic regression analysis, this variable was the single most important one following total maternal weight gain and accounted for 22.4% of the variance in low birth weight.

Parity

Nulliparous women had the highest incidence of LBW. As parity increased the incidence of LBW was found to drop till mothers para 4, when it begin to rise again. ($P < 0.01$). When all nulliparous mothers were considered by age, the youngest age group still had the highest percentage of low birth weight babies. This risk dropped gradually with increasing age till age 30-34 years when it rose sharply again ($P < 0.001$). (Figure 1, Tables 4 and 5).

Height

Women of height 5ft and less (≤152cms) had the highest incidence lf LBW. As maternal height increased the incidence of LBW decreased ($P < 0.001$). This is shown in Table 6.

Ponderal index

weight at delivery (kg)/height^2 (m^2).

The risk of LBW babies decreased as this index increased ($P < 0.001$). No mother with a ponderal index over 35 (considered obese for height) has a LBW baby (Table 7).

Birth interval

The risk of LBW as seen in Table 8 was highest when birth interval was less than 3 years. The risk fell sharply for birth interval of 4 years and more. Following multiple systematic regression analysis, this accounted for 11.7% of variance in LBW.

Table 1 Incidence of low birth weight deliveries per month of study

		Total Births	No. LBW	% LBW
April	1987	16	3	18.8
May	"	101	14	13.9
June	"	78	5	6.4
July	"	80	5	6.2
August	"	29	0	0
September	"	35	1	2.8
October	"	29	2	6.9
November	"	7	0	0
December	"	16	2	12.5
January	1988	86	8	9.3
February	"	15	1	6.6
	Total	492	41	

($X^2 = 40.69$ P <0.001)

Table 2 Total maternal weight gain in pregnancy and incidence of LBW delivery

Weight gain (Kg)	% LBW
0-5.0	100%
5.1-10.0	14.8%
10.1-15.0	2.9%
15.1-20.0	0
20.1-25	0

($X^2 = 90.48$ P <0.001)

Table 3 Maternal age and LBW deliveries

Age in years	No. of mothers	No. of LBW	% LBW
15 - 19 years	24	9	37.5
20 - 24 years	116	14	13.1
25 - 29 years	183	7	3.8
30 - 34 years	117	8	6.8
35 - 39 years	40	3	7.5
40 - 44 years	8	0	0
45+	2	0	0
Unknown	2	-	-
Total	492	41	

($X^2 = 48.78$ P <0.001)

Table 4 Effect of parity on LBW deliveries

Parity	No	No. LBW	% LBW
0	136	21	15.4
1	98	9	9.2
2	91	4	4.3
3	78	5	6.4
4	53	0	4.0
5	23	1	4.3
6	11	1	9.1
7	2	0	-

($X^2 = 36.11$ $P < 0.01$)

Table 5 Incidence of LBW deliveries in nulliparous women of different age group

Age (years)	Total No	No. LBW	%LBW
15 - 19	20	8	40
20 - 24	65	8	12.3
25 - 29	39	1	2.5
30 - 34	12	2	16.6
35 - 39	0	0	0
40 - 44	0	0	0
45+	0	0	0
Unknown			

($X^2 = 32.8$ $P < 0.0001$)

Socio-economic class (SEC)

This was based on husband's occupation. The highest SEC mothers, wives of the higher professionals, had the lowest incidence of low birth weight babies. The lower SEC wives of unskilled workers had the highest incidence of LBW. There was however no significant association between socio-economic class and low birth weight delivery. ($P > 0.5$.)

Maternal education

Mothers with university education had the lowest incidence of LBW. As maternal education decreased, the incidence of low birth weight increased. There was however no significant relationship between maternal education and the incidence of LBW ($P > 0.50$).

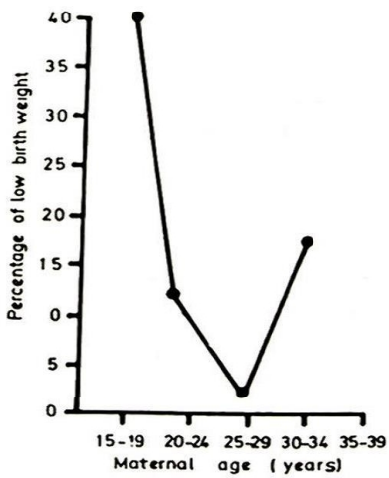

Fig 1. Percentage of low birth weight babies in nulliparous women of different age groups

Table 6 Maternal height and incidence of LBW

Maternal Height(cm)	Total births	No. LBW	% LBW
113 - 122	8	3	37.5
123 - 132	1	0	0
133 - 142	2	0	0
143 - 152	109	14	12.8
152 - 162	236	14	5.9
163 - 172	95	5	5.2
173 - 182	1	0	0
Unknown	40	5	12.5
Total	492	41	

($X^2 = 134.6$ P <0.0001)

Table 7 Ponderal index and the incidence of LBW

P I	No.	No. LBW	% LBW
<20	5	2	40
20 - 24.9	109	11	11
25 - 29.9	173	8	4.6
30 - 34.9	77	3	3.9
35 - 39.9	15	0	0
40+	3	0	0
	492	41	

($X^2 = 134.6$ P <0.001)

Table 8 Birth interval and incidence of LBW

Birth Interval	No. of Births	No. LBW	% LBW
Nulliparous	136	21	15.4
1 year	14	1	6.6
- 2 years	93	6	6.5
- 3 years	119	8	6.7
- 4 years	78	3	3.8
- 5 years	51	2	3.9
- 6 years	0	0	0
- 7 years	1	0	0
Total	492	41	

Discussion

The mean birth weight obtained were surprisingly similar to those obtained in 1977[3] eleven years before this study, inspite of the time lag and advancements in technology within the country. The study weights were however found to be higher than those obtained in the Northern parts of the country[4,15]. The harmattan season in the Northern parts have been observed to be more severe and drier than in the Southern parts of the country.

With recent advancements in the last few decades, prematurity has accounted for the majority of LBW babies born in the developed world[16] while only a small proportion of their LBW babies are term babies. On the contrary in most developing countries the large proportion of babies below 2500g at birth have been shown to be term babies that were small for gestational age (SGA) [4,14,17,18]. 80% of the LBW babies in the data presented were found to be term SGA babies, a figure far higher than previously cited or expected. Factors found to have a direct influence on birth weights are: The duration of the pregnancy and the presence of intra uterine growth retardation. Diet has no doubt been shown to play a major contributory role to the development of LBW in developing countries[19]. This is confirmed by the fact that the incidence of LBW decreased during the rainy season when a wider variety and a greater quantity of food is available as well as cheaper than during the dry harmattan season. Maternal malnutrition may therefore be an attending factor in the high SGA/Premature ratio among the LBW babies in this community. If nutrition is an important factor in the development of LBW deliveries, the possibility of a successful intervention is high with appropriate nutritional education programmes as well as with increased storage facilities for food produced in excess during the rainy seasons most of which have been known to be wasted. Mechanised farming with irrigation implementation will also increase the yield in food supply the year round.

In this community, from the data presented the best age for a woman to have her first baby is between the ages of 25 years and 29 years. The next best age range was found to be between 20 and 24 years. Below and above these ages, the incidence of LBW babies born was significantly higher.

Social class determine life styles, the ways of living, habits and behaviour patterns that are so critical for health and normal and abnormal functions of a person. Socio-economic class (SEC) however was not shown to be a significant factor in the development of LBW babies in this study. Previous studies have shown that the effect of social class on birth weight rather than being direct was indirect[20] and of relative unimportance in the determination of birth weight in some communities[21]. Maternal education also showed no significant association with the delivery of LBW babies. This is similar to findings in another developing country[22] and it appears that the huge emphasis laid upon the effect of these two factors in the developed world[7] may not necessarily be justifiable to the developing world. Regardless of income, profession or education, all mothers should be routinely counselled at every clinic visit on health matters pertaining to pregnancy and childbirth.

Birth interval 0-1 year, 2 years, 3 years carried essentially the same risk for LBW babies. The higher risk which was exclusively seen in mothers with an interval of one year and less is now seen in mothers with a birth interval of up to 3 years. Birth interval has been shown to be critical in determining the nutritional status of the mothers which in turn affect the birth weight of the baby[23]. The more poorly nourished a woman is, the longer the interpregnancy intervals need to be. Presently as the country is going through trying economic times, the possibility of the degree of depletion being more marked cannot be overlooked, and this may explain the extension of the risk for LBW to more years following a previous pregnancy. Diet has been shown to be directly related to maternal weight gain and fetal growth[23]. Nutritional counselling again will help to decrease the high SGA/Premature ratio among our LBW babies and this is an easier, and cost effective method of reducing LBW in this environment. From the data, more attention should therefore be paid to the age at marriage and particularly to the age at first pregnancy. The birth interval should be more than 2 years, and a total maternal weight gain by the mother in pregnancy should be around 13kgs. The mother should be given adequate information in order to obtain knowledge of the local food stuff that can be taken during pregnancy for a calorie adequate and nutritionally balanced diet. In addition, there should be general improvement in the living conditions, water supply and sanitation before any lasting reduction in the incidence of LBW in this community can be achieved.

Acknowledgements

The authors are most grateful to Professor A. O. Ladipo, Dr. M. Deane, Dr. B. A. Olusanya, Dr. Ayandiran for use of facilities and to Dr. E. A. Bamgboye for his advice on the statistical analysis and Mr. A. Adetunji for the analysis of data.

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(*Accepted* 30 *March* 1990)