MATERNAL NUTRITIONAL STATUS AND SOCIO-ECONOMIC CHARACTERISTICS AS CORRELATES OF PREGNANCY OUTCOME IN A SOUTH-WESTERN NIGERIAN COMMUNITY

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Abstract

This is a cross-sectional and descriptive study of pregnant mothers who delivered in four randomly selected health facilities in urban Abeokuta, Nigeria. The study examined the influence of maternal nutritional status and socio-economic characteristics on newborn birth weight and particularly low birth weight (LBW). 512 pregnant mothers were recruited for the study. Half of them were booked for antenatal care while the remaining half were not. Complete physical examination, clinical profile along with weight, biochemical and haematological measurements were carried out. Data were analyzed using descriptive statistics and chi-square test. The overall mean birth weight of all the newborns was 2.64± 0.312kg.Antenatal care during pregnancy, maternal parity, age, education, occupation, average monthly income, weight gain in pregnancy, past obstetric history, maternal haemoglobin, mean corpuscular haemoglobin concentration, serum cholesterol and serum albumin were all found to be significant for LBW ($p<0.001$)

Introduction

Birth weight (BW) is the single most powerful predictor of mortality in the first few months of life (FAO/WHO, 1992). The World Health Organization (WHO) defined low birth weight (LBW) as BW below 2,500gm (Kramer, 1987). It is a major public health problem in most African countries (F.A.O, 1997), and in most developing countries, being associated with a high incidence of neonatal mortality in these regions. In India 85% of neonatal mortality is associated with LBW, 87% in Guatemala and 56% in North Acrot (Asthworth and Feachem, 1985). It is estimated worldwide that 25 million LBW infants were born in 1990, making up to 18% of all live births, 90% of which occurs in developing countries (Belsey, 1993). LBW babies are at the greatest risk in early childhood. BW below 2.5kg reflects intrauterine malnutrition involving micro-nutrient deficiencies, infections such as malaria and syphilis, and maternal malnutrition. The incidence of LBW is therefore a powerful indicator of infant survival, and indirectly of the mother's nutritional status (WHO, 1996). In Nigeria, the average prevalence of LBW is estimated to be about 16%, with a range of 6-21% (FMOH, 2005). LBW newborns in the low socio-economic groups of developing countries are major problems for public health services. The immediate consequences are higher morbidity and mortality rates in the perinatal and neonatal periods (Susser, 1972; Miller, 1972). The late consequences may include prolonged impairment of immunological defense mechanisms (Ferguson, 1978), and neurological sequelae (Davies and Stewart, 1975), which interfere with the normal development of the child and, on a national level, are serious

obstacles to development. Among the causes of LBW, maternal malnutrition has been identified as one of the main determinants (Lechtig, 1975). Maternal morbidity during pregnancy is highly prevalent in the low socio-economic groups (Lechtig, 1976), and protective mechanisms such as the bactericidal zinc peptide system in the amniotic fluid (Schelievert 1976), may be impaired partly because of malnutrition during pregnancy (Naeye, 1977).

This study was therefore designed to investigate the effect of maternal nutritional status and various socio-economic indices on the BW of the newborn in urban Abeokuta, Nigeria.

Materials and Methods

This is a cross-sectional and descriptive study design for both booked and unbooked pregnant mothers who delivered in four randomly selected health facilities in urban Abeokuta, Nigeria.

The subjects were selected from each health facility as they became available. 256 randomly selected pregnant mothers attending antenatal clinics in the health facilities were booked and advised to report regularly for antenatal care. Complete abdominal examination, clinical profile along with height, weight, weight gain in pregnancy, blood pressure, haematological and biochemical examinations were carried out. Another 256 unbooked pregnant mothers (who never had antenatal care anywhere), but coming directly for their deliveries were also randomly selected from the labour wards of the health facilities. All clinical, biochemical and haemotological investigations and check ups were carried out on them as far as possible before they delivered their babies. All the newborns were weighed and their general physical conditions assessed immediately following delivery. All infants weighing below 2.5kg were recorded as low birth weight (LBW) babies.

Statistical Analysis

Data were collated according to the various maternal nutritional and socio-economic characteristics included in the study. Analysis was carried out using descriptive statistics and chi-square test of significance was employed in testing for association between two variables.

Results

The mean birth weight of all the babies was 2.64+ 0.312kg. The unbooked pregnant mothers delivered a significantly higher number of LBW babies (135), with a higher LBW incidence (52.7%),(Table 1)

Table1: Infant BW in Relation to Antenatal Care (ANC)

No of mothers/No of newborns delivered	No of LBW newborns	LBW incidence %	P- Value
256(booked)	59	23.1	P<0.001
256(unbooked)	135	52.7	

Pregnancy outcome was found to be better in those pregnant mothers who reported for antenatal booking in the first trimester of pregnancy (Table2).

Table2: Infant BW in relation to time of Booking for Antenatal Care.

Time of Booking	No of Mothers/ Newborns	No of LBW Newborns	LBW incidence %	P- Value
First Trimester	49	10	20.4	
Second Trimester	109	24	22.0	P<0.005
Third Trimester	98	26	26.5	

The results also showed that the number of antenatal visits by the mother significantly influenced the birth weight of her baby (p<0.001).The pregnant mothers who made few antenatal visits had a higher risk of having LBW babies when compared to those who made 6 or more visits (Table 3).

Table 3: Infant BW in relation to number of visits for antenatal care.

Number of ANC visits	Number of Newborns	Number of LBW babies	LBW incidence %	P-value
<2	20	9	45	
>3-5	144	41	28.5	
>6	92	10	10.9	P <0.001

Table 4: Maternal Socio-economic Status and BW

Maternal education	No of mothers/ newborns		sNo of LBW newborns	LBW incidence (%)	P-value
Illiterate mothers	138		94	68.1	
Primary/ junior secondary	220		70	31.8	
Senior secondary/ tertiary	154		26	16.9	
Maternal Occupation					p<0.001
Full time housewife	328		73	22.3	
Menial jobs/ petty trading	166		112	67.5	
Civil servants	18		2	11.1	
Maternal income category	Monthly income (₦)	No of mothers/newborns	No of LBW newborns	LBW incidence %	P-value
Very low	<5,000	134	110	82.1	
Low	5,001-15,000	158	40	25.3	P< 0.01
Medium	15,001-25,000	124	25	20.2	
High	25,001-45,000	96	13	13.5	

Table 4 shows the relationship between BW of the new born and maternal socio-economic status. LBW incidence of 67.5% was recorded for mothers who engaged in menial jobs/ petty trading. Mothers in the very low and low socio-economic categories were associated with higher incidence and number of LBW babies, in comparison with those mothers with higher average monthly income.

Table 5: Maternal age/Parity and newborn BW

Maternal age(Years)	Number of mothers	Number of LBW newborn	Incidence of LBW%	P- value
< 20	108	46	42.6	
21-25	150	51	34.0	
26-29	116	21	18.1	
30-34	98	13	13.3	
> 35	40	11	27.5	P< 0.001
Maternal Parity				
1	214	106	49.5	
2	176	44	25.0	
3	90	23	22.2	P< 0.001
>4	32	6	18.8	

The relationship between maternal age and parity with newborn BW is shown in Table 5. A higher number of LBW babies were born to mothers below the age of 20 years. A large number of mothers in the study were primiparae with 49.5% LBW incidence. The relationship between maternal age and LBW, and that of parity and LBW were both found to be statistically significant (P< 0.001).

Table 6: Past Obstetric History and BW

Past obstetric history	No of mothers/ newborns	No of LBW newborns	LBW incidence %	P-Value.
Still Births	34	17	50.0	
Abortion	66	37	56.1	
Perinatal Mortality	25	19	76.0	P<0.001
Previous LBW	64	37	57.8	
IUGR	23	9	39.1	
Normal deliveries	300	60	20.0	

Table 6 shows the relationship between newborn BW and past maternal obstetric history. A statistically significant relationship was found when mothers with previous history of still births, abortions and other forms of poor pregnancy outcome like LBW infants, perinatal mortality and intrauterine growth retardation (IUGR) were compared with mothers without such history.

Nutritional Status

The mother's weight was measured before and immediately after delivery of the baby, placenta and membranes. Primiparous mothers were found to weigh significantly less than multiparous mothers ($p<0.05$). Maternal height was slightly but significantly lower in primiparae when compared to multiparae, thus indicating that the first pregnancy took place before the mothers had reached full growth.

Triceps skinfold thickness of the mothers as measured using a Harpenden caliper was expressed as a percentage of normal values (Jelliffe,1966). By this variable, which indicates the amount of adipose tissue in the upper arm, fat stores are markedly below normal values in the study population generally, while primiparous mothers recorded lower percentage than the multiparae.

Table 7: Maternal Weight gain in Pregnancy and BW

Weight Gain in pregnancy (kg)	Number of mothers /new born	Numbers of LBW newborn	LBW incidence %	P-value
<3	19	8	42.1	P< 0.05
4-6	175	31	18.0	
7-8	52	8	15.4	
>9	10	1	10.0	

Table 7 shows the association between maternal weight gain in pregnancy and newborn BW in those 256 mothers who had antenatal care. Weight gain of 3kg or below was associated with 42.1% LBW incidence, while mothers who gained 9kg and above, recorded the lowest LBW incidence of 10.0%

Table 8: Maternal Haemoglobin (g%) and BW.

Maternal Haemoglobin gm%	No of mothers/ newborns	No of LBW newborns	LBW incidence %	P-Value
<7	28	18	64.3	P<0.001
7.1-8	124	51	39.8	
8.1-9	152	42	27.6	
9.1-10	150	16	107	
>10	58	3	5.2	

Table 8 summaries the relationship between maternal haemoglobin (Hb) level and BW of newborns. Mothers with Hb below 7g % had the highest incidence of LBW (64.3%) while those with Hb of 10g% and above recorded the lowest LBW incidence of 5.2% Mothers from lower socio-economic groups

had lower Hb and mean corpuscular haemoglobin concentration (MCHC) levels than those with higher income.

Table 9: Nutritional Status and Hematological Data of the Mothers

Group	Triceps skinfold thickness	Mothers(N)	Hb(g%)	MCHC
1	< 40	152	< 8	32.1
2	40 – 78	152	8.1 – 9.0	32.4
3	79 – 117	150	9.1 – 10.0	32.6
4	> 118	58	> 10	32.9

Those mothers with very low triceps skinfold thickness (<40% of normal value) had significantly lower Hb and MCHC values. (Table 9). Furthermore, anaemic mothers (those with low Hb and MCHC levels), were also found to have lower serum albumin and cholesterol levels than non-anaemic mothers ..

Discussion

Low birth weight (LBW) is a major public health problem due to its association with high morbidity and mortality of infants. Newborn mortality and disease are directly related to birth weight (BW), and insufficient or excess weight at birth is always accompanied by an increase of these risk factors. Most studies carried out on LBW in Nigeria took place about three decades ago (Effiong, 1976; Oduntan 1977; Ladipo and Adelusi 1977); Hussan and Omololu (1983); Rehan and Tafida (1979). There is therefore a need for more current data because of secular trends and change in the socio-economic status of the people.

This study has shown that several maternal factors are related to birth weight: age, parity, socio-economic factors, nutritional parameters (weight, height, weight gain in pregnancy, serum albumin, and anaemia (low haemoglobin level). Primiparous mothers were shown to be at particular risk of delivering LBW babies. Unbooked pregnant mothers gave birth to a greater number of LBW babies, a situation which was also found with those mothers who though registered for ANC, attended antenatal clinics only once or twice throughout the pregnancy period .This compares favourably with the results of studies undertaken by other researchers, Makhija (1989); Amin (1993) and Bachani (1985).Those who made six or more visits to the antenatal clinics however, recorded the lowest LBW incidence. It was also observed that pregnant mothers who registered for ANC in the first trimester of pregnancy recorded the lowest LBW incidence. The report of a 1985 study carried out on pregnant mothers attending ANC services attested to this fact (Ramachandra, 1985). These reports all point to the important role played by antenatal care in the prevention of LBW babies. The illiterate /poorly educated pregnant mothers delivered a greater number of LBW babies. This conforms with results from earlier studies carried

out in other places (Randhawa and Kanwar, 1990; Mavalanker, 1992; and Ferraz, 1990). The fact that better educated pregnant mothers delivered lesser number of LBW of newborns may be due to their increased awareness as regards available medical services which influenced their health seeking -behaviour and nutritional status.

Results from this study also showed that pregnant mothers who engaged in menial jobs and petty trading delivered more LBW babies than others .Reports from earlier studies showed similar result (Mamelle, 1984; Murphy, 1984 and Samuel, 1993). Maternal average monthly income also influenced LBW, as it was seen that with increase in income, LBW incidence decreased. This is in line with previous studies by earlier researchers (Makhija, 1989; Ferraz, 1990; Randhawa, 1990).

Maternal age has been found to be a factor which influences the birth weight of infants (Dougherty and Jones, 1982). It was observed from the results of this study that the percentage of LBW newborns by older mothers was significantly lower than that from mothers 20 years of age and below. This is in agreement with the findings by Dougherty and Jones (1982). Incidence of LBW in this study decreased with increasing maternal age up to age 34years. This is also in agreement with the findings of Rehan and Tafida (1979). Mothers with past history of previous LBW babies, abortions and perinatal death delivered more LBW newborns than those without such experiences. This agrees with findings by earlier researchers (Praguk, 1993; Wolfe, 1987).The relationship between weight gain in pregnancy and newborn birth weight has been known for several decades (Beilly and Kurkland, 1945), and even now its importance to pregnancy outcome is being increasingly recognized. This importance is reflected in the recommendation that pregnant women should be encouraged to gain at least 11kg during gestation (Jacobson, 1975). The results of this study agree with previous works on pregnancy weight gain in that mothers with higher weight gain in pregnancy delivered lesser number of LBW babies . Maternal haemoglobin (Hb) and mean corpuscular haemoglobin concentration (MCHC) levels were other factors found to significantly influence the BW of infants in this study. Mothers whose Hb was below 7g% were associated with the highest percentage of LBW, while with increasing maternal Hb level, LBW incidence decreased. This is also in conformity with earlier studies by Bhatia (1983) and Chadha, (1992).

In conclusion, giving the analysis of development situation in Nigeria in the 1990's up to now, the consistently high incidence of LBW found in this study and over the years, is thus explainable, while the challenge of addressing the problem remains an urgent imperative for development.

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