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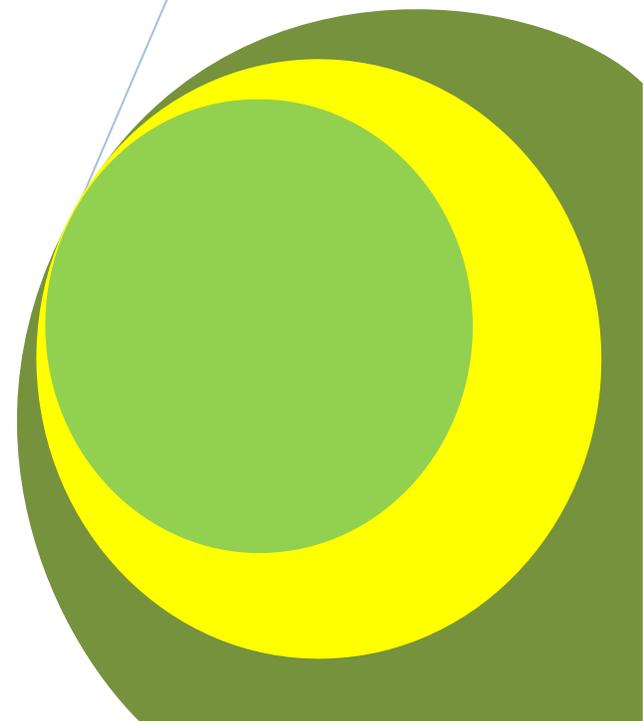
Research Article

Significance of maternal antenatal health care intervention in reducing the occurrence of neonatal low birthweight especially in mothers of low socioeconomic class? Data from Jere community of Borno state, Nigeria

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ABSTRACT

Background: **low birthweight is associated with increased childhood morbidity and mortality particularly in Nigeria where poverty levels are also high, and most individuals are found in low socioeconomic class. There is now growing evidence that low birth weight could be reduced through access to good maternal antenatal health care. This review deals with the role of maternal antenatal health care delivery in lowering neonatal birthweight, especially in mothers who belong to low socioeconomic class.**
Methods: **One hundred and sixty six mother-neonatal pairs were selected using systematic random sampling method. Maternal socioeconomic class was estimated using oyedeji scoring model and neonatal birthweight was determined using bassinet weighing scale.**
Results: **All mothers 166 (100%) had antenatal care. Out of 166 neonates in this study, 84 (50.6%) neonates were males and 105 (63.3%) had normal birthweight. Sixty-nine (41.6%) mothers had primary education, 81 (48.8%) were unemployed and 111 (66.9) had low socioeconomic class. Nineteen neonates (11.4%) had low birthweight and mean birthweight of neonates whose mothers belong to low socioeconomic class was slightly lower than those of high socioeconomic class. This was however not significant (p = 0.459). Association between maternal socioeconomic class and neonatal birthweight was also not significant (p = 0.565).**
Conclusion: **Maternal antenatal health care services are crucial for reduction in number of low birthweight in neonates across maternal socioeconomic classes.**

Keywords: Mother-neonatal pairs, Antenatal care, Birthweight, Socioeconomic class.

INTRODUCTION

Worldwide incidence of low birthweight (LBW) has been reported as 17% per annum, making LBW an important infant health problem globally (Torres-Arreola et al., 2005). The incidence of LBW varies among populations, between 4% and 6% in populations of developed countries and much higher in those of developing countries (Torres-Arreola et al., 2005). The Paediatric Annual conference of Nigeria has estimated that the LBW rate for Nigeria is 14% (Okolo, 2009), whereas the Pan American Health Organization has estimated 6% for Peru and 10% for Bolivia (Castillo-Salgado, 2000). In 2002, Jefferis et al. (2002) in London have identified a link between LBW with increased incidence of neurological deficits or poorer cognitive skills in childhood compared with counterparts having normal birthweight. More recent, in mexico, Torres-Arreola et al. (2005) have added that, LBW could be associated with heighten risk of infection, malnutrition and handicapping conditions among others.

The biological processes that affect the fetus in-utero are related to the mother's physiology, including her nutrition, exercise, infections, consumption of tobacco, alcohol and other drugs (Lynch and Kaplan, 2000; Kramer,

1987). During the fetal phase, growth depends on the nutritional condition of the mother, indicating that pregnant women should not only increase their weight but also consume essential nutrients. For many women in the developing world, however, social and economic factors make it difficult for them to obtain the necessary food and healthcare, which are closely interrelated (UNICEF, 2003). Studies conducted mainly in advanced societies have shown that antenatal care services (ANC), and other maternal health care interventions have reduced immensely the risk of LBW deliveries (Michael, 1995). Nigeria is a country with a population density of 142 people per square kilometer and most of these people are living below the poverty line, however, adult literacy rate is put at 66.8% (WHO, 2006).

Relationship between antenatal health care intervention and the possible reduction in the occurrence of neonatal LBW especially in mothers of low socioeconomic class (SEC) have been of interest to many investigators. In two publications, Marmot et al. (1996) and Wadsworth (1999) considered health as an important determinant of opportunities in life via a process called selection by health (Marmot and Shipley, 1996; Wadsworth, 1999). They suggested that health selects people in different social strata of life. Yet dearth of data on ANC health intervention in lowering neonatal LBW occurrences still exists in this part of the world. Thus, the major objectives of this present study were two fold:

1) To provide scientific data on the contributory role of maternal ANC delivery in lowering neonatal birthweight outcome.
2) To provide information that would have public health significance and relevance to policy development and program implementation, as it relates to the overall maternal and fetal wellbeing in Nigeria and other developing nations.

MATERIALS AND METHODS

Study Area

The study was carried out at the Department of Paediatrics and Obstetrics unit of the University of Maiduguri Teaching Hospital (UMTH), Nigeria. The UMTH is a tertiary centre located in North-Eastern Nigeria and a centre of excellence for infectious diseases and immunology. Apart from being the largest health facility in the area, UMTH serves as a referral centre for the six North-Eastern States and neighboring countries of Chad, Cameroon and Niger Republics.

Ethical Considerations

The study protocol was reviewed and authorised by the Medical Research and Ethics Committee of the UMTH. The approval was on the agreement that patient anonymity must be maintained, best clinical practice be ensured, and that every finding would be treated with utmost confidentiality and for the purpose of this research only. All work was performed according to the international guidelines for human experimentation in clinical research (World Medical Association Declaration of Helsinki, 2000).

Sampling Technique/Study Population

The minimum sample size was determined using statistical formula that computes 10% prevalence for LBW at 95 confidence interval and alpha levels of 0.05 (Torres-Arreola et al., 2005; Naing et al., 2006). This equalled 138; however, 20% of this was added to maximize power. Therefore, the study population comprised of 166 mother-neonatal pairs. A pregnant woman was eligible for participation in the study if she delivered at labour ward of UMTH and met the following study inclusion criteria:

(i) did ANC and had an uncomplicated singleton birth at term (based on fundal height or Obstetric ultrasound scan or Eregie[15] estimate of gestational age),
(ii) Had no known underlying chronic illness and not on drugs other than the ones used for routine ANC.
Mothers who smoke cigarette and drink alcoholic beverages or coffee were also excluded from this study. Mother-neonatal pairs were enrolled in this study using the systematic random sampling method where the first of every three mother-neonatal pairs were picked at the labour ward. Where the first mother-neonatal pair did not fulfil the inclusion criteria above, the immediate next mother-neonatal pair that qualified was selected.

Following informed consent, at delivery, information was obtained on the delivery outcome including baby's sex, and birth weight (kg). The birth weight was determined using the bassinet weighing scale immediately after childbirth. Neonates weighing < 2.5 (kg) were considered LBW, those weighing > 3.99 kilograms (kg) were classified as macrosomia and those weighing between 2.5 – 3.99 (kg) as normal, similar to other publications elsewhere (Torres-Arreola et al., 2005; Uche, 2007). Demographic, antenatal care and SEC indicators of the participants were obtained from case files of each individual and by interview.

Maternal socioeconomic class scoring model

Maternal SEC was assessed based on their occupation and educational attainment using the Oyedeji scoring model (Oyedeji, 1985). Maternal SEC that is Class I-III was considered as high SEC, with class I higher than class II and class II higher than class III. Class IV-V was considered to be low SEC with class V being lower than class IV. Each mother-neonatal pair was allotted a serial number at birth.

Statistical Analysis

The data obtained from the study were entered into a computer for statistical analysis using statistical package for social science (SPSS) statistical software version 16, Illinois, Chicago USA. Values were expressed as percentages, means and standard deviations (SD). Differences in means were evaluated using Student t test and analysis of variance ANOVA, while differences between proportions were evaluated using Chi-square (χ^2) tests. Statistical significance were achieved at $P<0.05$. Tables were used for illustrations.

RESULTS

Table 1 below shows birth profile and the sociodemographic characteristics of mother-neonatal pairs. Of the 166 neonates 84 (50.6%) were males, and 105 (63.3%) had normal birthweight. All mothers had ANC health intervention. Sixty-nine of them 69 (41.6%) had primary education, 81 (48.8%) were unemployed and 111 (66.9) had low SEC.

Nineteen neonates (11.4%) had LBW and the overall mean neonatal birth weight was 3.05 ± 0.58 (95% CI, 2.96 – 3.13). Although the mean birth weight of neonates whose mothers belong to low SEC was lower than those of high SEC mothers (table 2), this was however not significant (p = 0.459).

Table 3 revealed the relationship between maternal education, occupation and mean neonatal birthweight. Comparing mean neonatal birthweight according to the different classes of maternal education and occupation were insignificant (p = 0.594) for maternal education, and (p = 0.417) for maternal occupation.

Table 4 shows the distribution of maternal SEC and birthweight of the neonates. Association between maternal SEC and birthweight of the neonates was not significant (p = 0.565).

Table 1: Birth profile and Socio-demographic characteristics of mother-neonatal pairs

Parameters	Frequency	Percentage (%)
Sex of neonates		
Male	84	50.6
Female	82	49.4
Neonatal birthweight		
Low birthweight	19	11.4
Normal birthweight	105	63.3
Macrosomia	42	25.3
Maternal education		
Class I: University graduate or equivalent	12	7.2
Class II: School certificate (GCE/SSCE) holders	20	12.1
Class III: School certificate or grade II teachers' certificate holders	52	31.3
Class IV: Those with primary six certificates	69	41.6
Class V: Those who could just either read and write or illiterate	13	7.8
Maternal occupation		
Class I: Senior public servants, professionals, large-scale businessmen	5	3.0
Class II: Intermediate grade public servants, and senior school teachers.	7	4.2
Class III: Junior school teachers, drivers and artisans.	13	7.8
Class IV: Petty traders, labourers, messengers and similar grades.	60	36.2
Class V: Unemployed, full housewives, students, subsistence farmers.	81	48.8
Maternal socioeconomic class	55	33.1
High		
Low	111	66.9

Table 2: Maternal socioeconomic class and neonatal birthweight of the study group

Maternal SEC	Birthweight of the neonates (kg)		
	Mean (SD)	95% CI	
High	3.20 (0.62)	3.03 – 3.37	
Low	3.12 (0.67)	2.99 – 3.24	
p value [a]	0.459	-	

SEC = Socioeconomic class p value [a] = Student t test

Table 3: Relationship between maternal education, occupation and mean neonatal birthweight

Maternal variables	Neonatal birthweights (kg)	
	Mean (SD)	95% CI
Education		
Class I: University graduate or equivalent	3.08 (0.67)	2.66-3.51
Class II: School certificate (GCE/SSCE) holders	2.90 (0.97)	2.45-3.35
Class III: School certificate or grade II teachers' certificate	3.17 (0.62)	3.00-3.35
Class IV: Those with primary six certificates	3.17 (0.57)	3.04-3.31
Class V: Those who could just either read and write or illiterate	3.08 (0.95)	2.50-3.65
p = value [b]	0.594	-
Maternal occupation		
Class I: Senior public servants, professionals, large-scale businessmen	3.00 (0.71)	2.12-2.88
Class II: Intermediate grade public servants, and senior school teachers.	3.14 (0.69)	2.50-3.78
Class III: Junior school teachers, drivers and artisans.	3.46 (0.52)	3.15-3.78
Class IV: Petty traders, labourers, messengers and similar grades.	3.07 (0.71)	2.88-3.25
Class V: Unemployed, full-time housewives, students and subsistence farmers.	3.15 (0.64)	3.01-3.29
p = value [b]	0.417	-

p value [b] = Analysis of variance (ANOVA)

Table 4: Association between maternal socioeconomic class and birthweight of the neonates

Maternal SEC	Neonatal birthweight (kg) (%)			Total
	LBW (< 2.5)	NBW (2.5-3.99)	Macrosomia (≥ 4.0)	
High	6 (3.6)	33 (19.9)	17 (10.2)	56 (33.7)
Low	13 (7.8)	72 (43.4)	25 (15.1)	110 (66.3)
Total	19 (11.4)	105 (63.3)	42 (25.3)	166 (100)

SEC = Socioeconomic class LBW= Low birth weight NBW= Normal birth weight

DISCUSSION

Maternal SEC has been reported to influence reproductive performance of mothers and neonatal birth weight outcome. In this light, low maternal SEC would result to LBW in neonates and vice-versa. However, if mothers were given ANC, there could be a reduction in the number of neonates that are born with LBW. Our study revealed that 11.4% of the neonates had LBW and maternal social variables (education and occupation) did not contribute to this. This is consistent with the observation made by another abroad (Michael, 1995). Possible reason for this could be that these maternal social variables are likely to be artifacts based on certain instinct, and may not give reliable results despite the existence of social inequalities in a given population. Colleagues elsewhere have pointed out that low ranking of maternal education and occupation among other social indices are less likely to yield neonates with LBW, if each of these definitions are held constant (Michael, 1995). The reason for this is not fully understood (Torres-Arreola et al., 2005).

However, some researchers argued that Low maternal SEC may lead to LBW based on social selection. Social selection holds that people who are ill or capable of becoming sick are assumed to be from low social status, while healthy people are from high social strata (Michael, 1995; Stern, 1983). Because of lack of enough evidence, social selection remains rather a hypothesis than a proved fact (Townsend et al., 1988). Moreover, all humans have the tendencies to be sick irrespective of social ranking as such, social selection may not hold true in all circumstances. Still, many other investigators are of the view that low maternal social parameters early in life may have tremendous impact on the behaviours of prospective mothers as an adult (Spencer and Logan, 2002). Some of these behaviors, which can lead to LBW in neonates of prospective mothers, are cigarette smoking and alcoholism. For instance a woman whose parents were disadvantaged is more likely to have been low birth weight herself, to have experienced more childhood ill health with adverse effect on her growth (Michael, 1995; Spencer and Logan, 2002). She is most likely to indulge in alcoholism and smoking as an adolescence and more likely to be pregnant and give birth to neonates with LBW (Spencer and Logan 2002).

Of significance was the use of two social indicators to construct our SEC model in order to reduce the possible error of misclassifying our subjects. That was done by combining maternal education and occupation, which is similar to a previously published study (Torres-Arreola et al., 2005). Low maternal SEC in current study has no significant impact on LBW and in general, association between maternal SEC and neonatal birthweight outcome was not significant. This conformed to a finding of a study, in which household infrastructure that included poor sanitation or water facilities and electricity when used as low SEC indicators (Hughes and Simpson, 1995). However, other workers have observed that less or no ownership of goods and not being gainfully employed resulted to LBW in neonates (Torres-Arreola et al., 2005). Differences observed in all these results about the effect of maternal SEC on LBW are probably due to the use of various maternal SEC indicators. Of emphasis, however, is that obtaining accurate information which will reflect maternal social and economic characteristics can be difficult. On the basis of this, proxy variable were generated for use in this study. Thus, maternal education and occupation have been used as proxies for social class, and the duo combination was used as proxy for SEC in present study. This methodology was in agreement with the ones used by many other researchers (Torres-Arreola et al., 2005; Lynch and Kaplan, 2000; Kramer, 1987; Nordstrom and Cnattingius, 1996).

Most importantly, all mothers in this study had health intervention by way of ANC services during pregnancy. This could be the reason why the proportion of neonates with LBW was the least. To add, this could also explain the lack of association between low maternal SEC and LBW in our neonates. Even though slight insignificant decreased in mean birthweight was noticed in neonates of low SEC mothers compared to those of high SEC mothers. Numerous workers have demonstrated that SEC has an effect on health outcomes because mothers at the bottom of the SEC scale suffer from deprivation, and are part of a culture in which the predominant forms of health behaviors are considered harmful (Michael, 1995). Maternal deprivation would mean lack of quality access to health care services among others, which puts the foetus at risk of starting out with LBW.

Our inability to assess other possible factors such as maternal anthropometry, nutrition and parity which may contribute to LBW in neonates in the present study population was a drawback to this investigation and remains a limitation of this study. These limitations may have affected the adequate assessment of the contributory role of maternal ANC health intervention in lowering LBW occurrences in our neonates. Future research incorporating these aspects is advocated.

CONCLUSION

Although many socioeconomic factors related to LBW have been identified, the specific role of each of them is not known, limiting the ability to use preventive actions in exposed populations. This has made health interventions aimed at reducing the number of LBW in neonates of limited success in the past nonetheless; however, some of this health intervention are of benefits now in pregnant women. To decrease the incidence of LBW in neonates, it is important to consider ANC health services in order to give quality health care for pregnant women. Health care investments in a population, most especially that of pregnant women and children is important in order for a society to achieve high human development index.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

BUA conceived and designed the study, BUA, MY, and ART assessed and interpreted the data. All authors are involved in critical revision of the paper, writing draft report and final approval of the manuscript.

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