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Original Research Article

Association between maternal socio-demography, socio-economic status, lifestyle and neonatal birth weight: A hospital-based cross-sectional study in South East, Nigeria

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Abstract

Background: Maternal characteristics such as socio-demography, socioeconomic status and lifestyle have been reported severally to be associated with infant birth weight.
Aim and Objectives: This study aimed at determining the association between maternal socio-demography, socio-economic status, lifestyle and neonatal birth weight among parturients with the objective of finding their lifestyle (exercise, smoking and alcohol consumption) pattern and its association with neonatal birth weight.
Materials and Methods: This is a hospital-based cross-sectional descriptive study of 130 participants selected using a systematic random sampling method with data obtained using a semi-structured, pre-tested interviewer administered questionnaire. Data on variables were collected using a standard procedure and were summarized using proportions while Chi square test was used to explore association between categorical variables. Predictors of birth weight were determined using logistic regression. The level of statistical significance was set at $p<0.05$.
Results: The maternal delivery weight had significant moderate correlation with neonatal birth weight ($r=0.45$, $p<0.005$). The maternal age and parity had significant association with neonatal birth weight ($p<0.01$ and $p<0.02$ respectively). Only maternal leisure related moderate to vigorous physical activity had significant association with neonatal birth weight ($p=0.04$). Only social class and education status were predictors of neonatal birth weight ($p=0.03$), (OR=0.09, 95% CI=0.01-0.75) and ($p= 0.01$), (OR=8.37, 95% CI= 1.59-44.31).
Conclusion: Maternal alcohol use and smoking were not associated with neonatal birth weight. Age, parity and maternal leisure-related moderate to vigorous physical activity are good predictors of neonatal birth weight. These maternal factors can be recommended for use as screening tool in poor resource setting in order to reduce the risks associated with these extremes of weight.

Keywords: Neonatal, Lifestyle, Birth weight, Maternal, Socio-demography.

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1. Introduction

Literature have shown that decreased weight at birth is associated with high death rate and morbidity in infancy as well as later life.[1] Furthermore, about 56 million Nigerian children were reported to be affected by low birth weight

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every year.[2] The incidence was up to 16.9% in Maiduguri,[3] 12.15% in Jos[4] and about 11.4% in Ogun.[3] Weight gain by mother in pregnancy, parity, fetal sex, ambient altitude, paternal height, cigarette smoking, alcohol use and glucose intolerance are factors that determine fetal weight at birth.[5] Maternal weight is a potentially valuable tool in the evaluation of pregnancy status and prediction of fetal birth weight.[6] A significant association between weight of a mother and neonatal weight has been documented.[7] It has been found that birth weight is positively and significantly influenced by the mother's, socioeconomic status, education level and antenatal care, but negatively influenced by mother's smoking of tobacco and malaria infection.[8,9] Maternal age, level of education, social class, and income have been used as individual and household based socioeconomic indicators in comparative studies on birth weight.[8]

With increasing parity, risks of low birth weight and prematurity decreased, while risk of macrosomia increased. So there is a need to improve maternal education, employment generation to improve socio economic status and improve the antenatal care.[10] Maternal education affects birth weight by improving the probability and/or productivity of health investment, and improves the financial resources available to the child directly and indirectly through the choice of partner, timing of fertility, and umber of offspring.[11]

A study has shown occupation to be significantly associated with low birth weight.[12] Maternal working hours and various socio-economic factors have been identified to be associated with a higher risk of abnormal birth weight.[13] Sedentary lifestyle during pregnancy has been positively associated with a risk of gestational diabetes mellitus which in turn increases the risk of adverse health in mothers.[14] The relationship between lifestyle risk factors and birth weight is complex and is affected by psychosocial, socioeconomic, and biological factors.[15] A healthy pregnancy is also a function of physical activity, as it is recommended that healthy pregnant women should engage in moderate exercise of 30 minutes or more, preferably all days of the week.[16] However, a recent study reported only a modest decreased risk of large neonates related to exercise during pregnancy, whereas others have reported no influence of physical activity during pregnancy on birth weight.[17]

Alcohol consumption during pregnancy is a significant social problem that has been associated with increased risk of low birth weight by almost two-fold, but did not show associations with small for gestational age or preterm birth.[18]

However, there was greater risk of low birth weight and preterm birth among mothers who were both smokers and drinkers. Some facts about the deleterious effects of alcoholism during pregnancy have been documented.[1] Some studies found an association between alcohol intake and small for gestational age and preterm birth at all levels of exposure, while others reported no association even at high levels of alcohol intake. Again, maternal smoking during pregnancy is known to restrict intrauterine growth, leading to low birth weight.[19]

2. Materials and Methods

2.1. Study population

These were pregnant women aged 18 years and above who presented at 37 completed weeks for delivery in the latent phase of labour that progressed to spontaneous vertex delivery. Included in this study were pregnant women as described above, singleton full term neonates, delivered through spontaneous vaginal delivery and mothers who accepted to participate in the study. Excluded from the study were participants with chronic medical conditions.

2.2. Study design

This was a hospital-based cross-sectional descriptive study

2.3. Sample size determination

Sample size was determined by applying[20] $n = Z^2pq/d^2$

Where: n = minimum sample size when the population is more than 10,000; z = standard normal deviate corresponding to the level of significance taken as 95% confidence interval (CI), d = desired level of precision taken as 5%, p = the estimated proportion of population with the attribute, q = 1-p

The incidence of low weight of baby at birth in our locality (p) is 8.4% from a previous study.[21]

Therefore, p=0.084 and q= 1-0.084=0.916

Applying the formula, the minimum sample size was 118 but in order to allow for non-responders during recruitment, an attrition value of 10% was added to the minimum sample size. This gave a sample size of 130 participants.

2.4. Sampling technique

A systematic random sampling technique was utilized to select respondents over a two-month data collection period. Two research assistants were trained for the study. Pretesting was done by administering the questionnaire to 10 pregnant women who attended antenatal clinic at St Vincent Hospital Ndubia by the researcher. The feedback received was discussed with the supervisors and appropriate revisions were made accordingly.

2.5. Data collection instrument

Data was collected using a questionnaire and anthropometric measurements were obtained using standard procedure. The questionnaire was developed following review of WHO guidelines recommendations for control of non-communicable diseases and modified WHO STEP wise approach to non-communicable disease risk factor surveillance questionnaire.[22] It was translated into Igbo, the

local language and back-translated to English to ensure validity. Face-validation of the questionnaire was done by expert panel of 2 consultants.

2.6. Assessment of the socio-economic class of the mothers

Nnajito socio-economic class was used for this assessment.[23] It scored the occupation and educational attainment of the mothers into three classes namely: Upper Class, middle Class and lower Class**.**

2.7. Anthropometric measurements

The maternal weight was taken immediately after delivery using a standard weighing scale to the nearest 0.1kg using standard procedure. Neonatal weights were obtained immediately after delivery in the labour ward to the nearest 0.01kg.

2.8. Data analysis

Data was analysed using Statistical Package for Social Sciences software (version 20, IBM SPSS). Descriptive statistics were used to summarize data and was presented in tables, graphs and figures. Association between the categorical variables was tested using the Chi-square test. Pearson's correlation coefficient was used to correlate maternal weight with the neonatal birth weight. The P-value <0.05 was considered significant for test of association. Multivariate logistic regression was done to identify maternal predictors of low birth weight and macrosomia.

3. Results

3.1. Socio-demographic characteristics of respondents

This study had a response rate of 100% with a mean age of 28.6±5.1 years and a mean weight of 72.2 ±11.2 kg. Majority of them were multiparous, married and predominantly had tertiary education. (**Table 1**)

3.2. Smoking practice by the mothers

Only 1.5% reported current history of smoking and none reported smoking in the past. On the other hand, 57.7% have been exposed to passive smoking. (**Table 2**)

3.3. Alcohol use by respondents

Ninety per cent of them had ever used alcohol, while 33.1% used alcohol in the last 12 months. Most of them used alcohol infrequently. (**Table 3**)

3.4. Association between maternal lifestyle and neonatal birth weight

Being involved in leisure-related MVPA (χ^2=6.66, p=0.04) had statistical and significant associated with weight of the baby at birth. (**Table 4**)

Table 1: Frequency distribution of the socio-demography of respondents

Characteristic	Frequency (N=130)	Percentage (%)
Age (in years)		
≤24	25	19.2
25-34	90	69.3
≥35	15	11.5
Marital Status		
Single	3	2.3
Married	125	96.1
Separated	1	0.8
Widowed	1	0.8
Educational Status		
Primary	23	17.7
Secondary	52	40.0
Tertiary	55	42.3
Parity		
Primipara	46	35.4
Multipara	64	49.2
Grandmultipara	20	15.4

Table 2: Smoking and alcohol use by the mothers

Smoking practice	Frequency (N=130)	Percentage (%)
Currently smoking		
No	128	98.5
Yes	2	1.5
History of passive smoking		
No	55	42.3
Yes	75	57.7
Ever smoked		
No	54	41.5
Yes	76	58.5

Table 3: Alcohol use by the mothers

Alcohol Use	Frequency (N=130)	Percentage (%)
Ever used alcohol		
No	13	10.0
Yes	117	90.0
Used alcohol in the last 12 months		
No	87	66.9
Yes	43	33.1
Frequency of alcohol use		
Daily	1	2.3
3-4 times weekly	3	7.0
1-2 times weekly	2	4.7
Weekly	12	27.9
Monthly	25	58.1

Only parity (p=0.02) and current use of alcohol (p=0.02) were found to be significantly associated with neonatal low birth weight. Age (p= 0.001) was significantly associated with neonatal macrosomia. (**Table 5**)

Table 4: Maternal lifestyle and fetal weight at birth

Lifestyle	Birth Weight			χ^2	p value
	LBW N=15 (%)	Normal N=108 (%)	Macrosomia N=7 (%)		
Ever smoked					
No	4 (7.4)	46(85.2)	4 (7.4)	2.12	0.35
Yes	11(14.5)	62(81.6)	3 (3.9)		
Alcohol use in last 12 months					
No	14 (16.1)	68 (78.2)	5 (5.7)	5.56	0.06*
Yes	1 (2.3)	40 (93.0)	2 (4.7)		
Involvement in work-related MVPA					
No	7(9.9)	62 (87.3)	2 (2.8)	2.64	0.27*
Yes	8 (13.6)	46 (78.0)	5 (8.5)		
Involvement in leisure-related MVPA					
No	11(17.7)	46 (74.2)	5 (8.1)	6.66	0.04*
Yes	4 (5.9)	62 (91.2)	2 (2.9)		
Involvement in MVPA					
No	5 (22.7	16 (72.7)	1 (4.5)	3.25	0.20*
Yes	10 (9.3)	92 (85.2)	6 (5.6)		

*Fischer exact; MVPA= Moderate to vigorous physical activity

Table 5: Maternal characteristics associated with low birth weight/macrosomia

Maternal characteristics	Low birth weight				Macrosomia			
	Yes	No	$\chi2$	p-value	Yes	No	$\chi2$	p value
Age(years)								
≤24	4(16%)	21(84%)			1(4%)	24(96%)		
25-34	8(8.9%)	8(8.9%)	2.16	0.34	2(2.2%)	88(97.8%)	15.99	0.001*
≥35	3(20%)	12(80%)			4(26.7%)	11(73.3%)		
Educational status								
Primary	8(14.5%)	47(85.5%)			1(1.8%)	54(98.2%)		
Secondary	2(3.8%)	50(96.2%)	5.85	0.05*	4(7.1%)	48(92.9%)	2.41	0.30*
Tertiary	5(21.7%)	18(78.3%)			2(8.7%)	21(91.3%)		
Marital status								
Currently married	13(10.4%)	112(89.6%)	1.74	0.18*	7(5.6%)	118(94.4%)	0.22	0.64*
Not currently married	2(40%)	3(60%)			0(0.0%)	5(100%)		
Social class								
High	8(15.4%)	44(84.6%)			0(0.0%)	52(100%)		
Middle	6(10.3%)	52(89.7%)	1.67	0.43*	5(8.6%)	53(91.4%)	0.21	0.64*
Low	1(5.0%)	19(95%)			2(10.0%)	18(90%)		
Parity								
Primipara	10(21.7%)	36(78.3%)			2(4.3%)	44(95.7%)		
Multipara	4(6.3%)	60(93.7%)	7.28	0.02*	2(3.1%)	62(96.9%)	4.37	0.11*
Grandmultipara	1(5%)	19(95%)			3(15.0%)	17(85.0%)		
Ever smoked								
No	4(7.4%)	50(92.6%)	1.54	0.21	4(7.4%)	50(92.6%)	0.74	0.45*
Yes	11(14.5%)	65(85.5%)			3(3.9%)	73(96.3%)		
Alcohol use in the last 12 months								
No	14(16.1%)	73(83.9%)	5.34	0.02*	5(5.7%)	82(94.3%)	0.07	1.00*
Yes	1(2.3%)	42(97.7%)			2(4.7%)	41(95.3%)		
Involvement in work-related MVPA								
No	7(9.9%)	64(90.1%)	0.43	0.51	2(2.8%)	69(97.2%)	2.03	0.24*
Yes	8(13.6%)	51(86.4%)			5(8.5%)	54(91.5%)		
Involvement in leisure-related MVPA								
No	11(17.7%)	51(82.3%)	4.46	0.05*	5(8.1%)	57(91.9%)	1.67	0.26*
Yes	4(5.9%)	64(94.1%)			2(2.9%)	66(97.1%)		
Involvement in MVPA								
No	5(22.7%)	17(77.3%)	3.45	0.15	1(4.5%)	21(95.5%)	0.04	1.00*
Yes	10(9.3%)	98(90.7%)			6(5.6%)	102(94.4%)		

*Fischer exact, MVPA=moderate to vigorous physical activity

Table 6: Logistic regression of maternal characteristics associated of neonatal low birth weight/macrosomia

Maternal characteristics	Low birth weight		Macrosomia	
	p-value	OR (95%CI)	p-value	OR (95%CI)
Age	0.23	2.11 (0.62-7.19)	0.07	8.41 (0.85-83.23)
Parity	0.09	0.30 (0.07-1.21)	0.82	1.24 (0.20-7.67)
Marital status	0.33	1.96 (0.32-8.22)	0.89	1.89 (0.32-9.77)
Social class	0.03	0.09 (0.01-0.75)	0.23	3.28 (0.48-22.33)
Ever smoked	0.34	2.09 (0.46-9.51)	0.56	1.95 (0.21-18.25)
Alcohol use in the last 12 months	0.18	0.23 (0.02-2.08)	0.32	0.28 (0.02-3.40)
Involvement in work-related MVPA	0.22	4.25(0.42-43.44)	0.31	5.75 (0.19-167.66)
Involvement in leisure-related MVPA	0.66	0.64 (0.09-4.69)	0.98	1.03 (0.07-14.54)
Involvement in MVPA	0.28	0.22 (0.01-3.46)	0.69	0.42 (0.01-29.71)

None of the factors analysed was found to be significantly associated with low birth weight or macrosomia among the neonates. (**Table 6**)

4. Discussion

4.1. Socio-demographics of the mothers

Most of the respondents were between age ranges of 20-34 years with a mean age of 28.6±5.1 years. This is not unlikely as the study population was entirely of reproductive age limit. Isaiah *et al* reported a mean age of 28 years which is comparable with this finding. While other similar studies reported lower mean,[4,24] others reported higher mean ages.[25,26] Mothers who were 35 years and above were found to deliver babies with sub-normal birth weight, and macrosomia. Other studies also reported that advance maternal age and low birth weight has a strong link and attributed it to increased risk of age-related medical disorders which is commoner among pregnant women.[27,28] Maternal age was also significantly associated with neonatal macrosomia in this study, as was corroborated by another study.[29] However, a study by Atuahene *et al* documented no relationship.[30] This demonstrates that maternal age alone may not be an independent determinant of birth weight.

In this study, grand-multiparous women were most likely to deliver macrosomic babies. Yilgwan *et al*., and Elshibly *et al*., reported that as the birth order increases beyond the third pregnancy, the birth weight tends to drop especially if the spacing is poor.[4,31] There is a positive correlation between birth weight and increasing birth order. Maternal marital status and social class had no significant relationship with birth weight. This finding was collaborated by Takai *et al*.,[32] and Altenhoner *et al*.[13] Africans generally tends to have strong social support during pregnancy irrespective of social strata. Other researchers have demonstrated that low maternal social class may lead to low birth weight based on social selection.[33] The maternal income indirectly affects birth weight, and through its direct and positive effect on working conditions and nutrition, may be a risk for low birth weight,[34] however, this relationship was not demonstrated in this study.

Significant association did not exist between lifestyle of mothers and fetal weight at birth except for maternal involvement in leisure-related moderate-vigorous physical activity (MVPA). Low birth weight was commoner among mothers who smoked and were less involved in physical activity, while macrosomia was commoner among those who used alcohol in the last 12 months and engaged in more physical activity. A study has shown that physical activity in pregnancy is associated with a modest decrease in the risk of delivering a large neonate.[15] Another study did not report any influence of physical activity.[35] Majority of the modifiable determinants of neonatal birth weight are related to a woman's life style. It was also noted that maternal smoking habits (active or passive) was not associated with birth weight. This is at variance with findings in temperate regions where smoking has been reported to be associated with low birth weight.[22] The reason for this indifference may be related to the proportion of women who smoke in our environment. Heavy drinking in pregnancy is associated with an increased risk of low birth weight; however, this study did not demonstrate any such significant relationship.

5. Conclusions

This study has shown that there is increasing prevalence of neonatal low birth weight and macrosomia in our environment. Age, parity and maternal leisure-related moderate to vigorous physical activity are good predictors of neonatal birth weight. These maternal factors therefore can be recommended for use as screening test in poor resource setting by Family Physicians in order to reduce the risks associated with these extremes of weight.

6. Author Contributions

CS Anyigor-Ogah (conceptualization, methodology, data analysis, drafting of manuscript), CO Nweke (conceptualization, literature review, supervision, data acquisition), O Anyigor-Ogah (data acquisition, data analysis, manuscript drafting), JO Egede (methodology, data analysis, manuscript review), IM Idika (literature review, validation, supervision, manuscript drafting), CC Duru (data acquisition, literature review, result writing), CM Ovuoba (literature review, data analysis, manuscript review), CC

Agunanne (literature review, data analysis, methodology, manuscript review), HU Oboke (data acquisition, visualization and validation, manuscript drafting), CB Agunanne (data analysis, visualization, manuscript review)

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The authors received no financial support for this work. The authors bore the funding of the study and not the participants.

8. Conflict of Interest

There was no conflict of interest recorded in the study.

9. Availability of Data and Materials

The sets of data generated and analyzed in this study are available from the corresponding author on reasonable request through the e-mail address of ogahstanly90@yahoo.com or ogahstanly90@gmail.com.

10. Ethical Consideration/consent to Participate

Ethical approval was obtained from the hospital ethical review and research committee (FETHA/REC/VOL.1/2017/625). This research work complied with the Helsinki declaration 2013 on human research. Verbal and written consent was obtained from the participants and permission to carry out the study was obtained from the Head of the Department, Family Medicine, AEFUTHA. In the consent letter, participants were assured of confidentiality.

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