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Determinants of Birth Weight in Southwestern Nigeria

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Abstract

Background: Birth weight is an important predictor of an infant's survival and subsequent wellbeing and the likelihood of developing childhood diseases. It is influenced by various maternal and foetal factors affecting the delivery. This study was conducted to determine the factors affecting the delivery of low birth weight (LBW) babies in an urban population in Nigeria. **Methodology:** The study was carried out at Our Lady of Apostle Catholic Hospital, Oluyoro, Ibadan. The birth register and antenatal case files and records of 3013 booked patients with singleton live births between January 2013 and December 2014 were retrospectively analyzed. Socio-demographic and obstetric data were studied using SPSS version 22. Ethical clearance was obtained from the institution's Ethical Review Committee. The results were presented in numbers, percentages, frequency tables and charts and the findings were tested for significance using ANOVA. Student t-test was used to treat continuous variables. Level of significance was set at 0.05. Multiple regression analysis was used to explore the potential predictors of birth weight. **Results:** A total of 3013 singleton deliveries – 1570 (52.1%) males and 1443 (47.9%) females were studied. Presentation was cephalic in the majority – 2821 (93.5%) babies and caesarean section (CS) rate was (41%). There were 234 (7.8%) LBW and 305 (10.1%) macrosomic babies. The maternal ages ranged from sixteen to forty-four years with a mean age of 30.86 ± 4.793 years. The maternal modal age range was 20 to 29 years – 1493 (49.6%) mothers. The mean ± SD maternal age was 30.86 ± 4.793 years. Nulliparity was the mode 32.2% mothers. Most of the mothers 1881 (62.4%) were in the upper social classes. On univariate analysis, maternal age, parity, gestational age at delivery and sex were found to be statistically significant in between groups in determining birth weight. The birth weight was found to increase with parity until the fifth parous experience when it began to decline. The mean birth weight was also found to be higher in male babies than females. On multiple regression, the four factors above retained their association with birth weight. **Conclusion:** It was concluded that maternal and foetal factors influenced the birth weights of the babies. These factors were the ages and parities of the mothers as well as the sexes and lengths of gestation of the babies. These factors were also good predictors of foetal weight. It is necessary to develop proactive measures to reduce the prevalence of LBW babies.

Keywords: Determinant's, newborn, weight.

INTRODUCTION

Birth weight is an important predictor of an infant's survival and the subsequent health or wellbeing; as well as an indicator of intrauterine growth and maternal health during pregnancy [1]. The World Health Organization (WHO) defines low birth weight (LBW) as a birth weight of less than 2.5 kg regardless of gestational age [2]. As of 2018, the prevalence of LBW world-wide was 15.5% of live births; and 96.5% of these babies were being delivered in developing countries which include Nigeria. LBW contributes 60-80% to neonatal mortality and is a precursor of many public health challenges with physical, emotional, psychological, and financial impacts [3, 4].

Duration of pregnancy before delivery and factors that support or impair intrauterine foetal growth are the main factors that determine the weight of a neonate at birth. The birth weight is also influenced by various factors including maternal, fetal and environmental factors [5-7]. This study was conducted to determine some of the factors affecting the delivery of LBW in an urban population in Nigeria. Awareness of these factors can go a long way in reducing the incidence of LBW by correcting the modifiable factors that predispose to the delivery of LBW babies, thereby reducing perinatal, neonatal and infant mortality. In addition, this information will help to reduce the financial burden incurred from the care of LBW babies and reduce hospital stay after delivery especially in the neonatal intensive care unit [8].

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METHODOLOGY

This was a retrospective descriptive study involving review of the birth register of Our Lady of Apostle Catholic Hospital, Oluyoro, Ibadan. The hospital is a faith based private hospital owned by the Catholic Mission. It is a secondary health care institution that caters for the need of a sizable portion of the population in Ibadan, the political headquarter of Southwestern Nigeria. The hospital runs postgraduate training in family medicine and obstetrics and gynaecology and has a school of midwifery attached to it. Ethical clearance was obtained from the institution's Ethical Review Committee. The entries in the birth register and antenatal case files were analyzed. Also, the antenatal case files and records of booked patients with singleton live births from January 2013 to December 2014 were retrieved. From these, the following data were obtained: selected socio-demographic characteristics and maternal characteristics like maternal age, occupation, education, parity, booking status, length of gestation at booking and at delivery and any medical illnesses suffered in pregnancy. The foetal data obtained were the birth weights and sexes of the neonates, presentation of the foetus and type of delivery. A social class was derived for each mother from the socio-demographic data obtained. Birth weight is measured within 30 minutes of delivery in this hospital.

The data obtained was processed using the computer software, Statistical Package for Social Sciences (SPSS Inc, Chicago, Ill) version 22. Data obtained was analyzed for macrosomic babies (birth weight > 4.0 kg), babies with normal birth weight (2.5-4.0 kg) and low birth weight. Frequency tables and charts were constructed and the results were tested for significance using ANOVA and student t-test for continuous variables with the level of significance (x) set at 0.05. Multiple regression analysis was used to explore the potential predictors of birth weight. All variables in the univariate analysis with P value <0.25 were entered into multivariate model using stepwise linear regression. Variables were held in the model if their significance was <0.05.

RESULTS

A total of 3013 singleton deliveries were recorded during the study period. These consisted of 1570 (52.1%) males and 1443 (47.9%) females with a male-to-female ratio of 1.1:1. The encountered types of foetal presentation were cephalic 2821 (93.7%), breech 152 (5.0%), and transverse lie 40 (1.3%). The caesarean section rate was 41%. The number of LBW babies was 234 (7.8%) whilst normal weight babies were 2474 (82.1%), and macrosomic ones 305 (10.1%).

The maternal ages ranged from sixteen to forty-four years with a mean age of 30.86 ± 4.793 years. Twenty three (0.8%) of the mothers were teenagers whilst 1493 (49.6%) were aged 20 to 29 years, 1377 (45.6%) 30 to 39 years, and 120 (4.0%) 40 to 49 years.

Nulliparity was the modal parity (32.2%). Most of the mothers – 1881 (62.4%) were in the upper social classes while 638 (21.2%) were in the lower social classes. The modal age group was 20 to 29 (46.9%).

Predictors of birth weight

The factors that retained an association with birth weight after correlation and multiple regression analyses were conducted to examine their relationship with birth weight at $p < 0.25$ significance were mean maternal age at delivery, parity, gestational age at delivery and sex of the foetus. The results are shown in Tables 1, 2, and 3. All four were positively and significantly correlated with birth weight except sex which was negatively correlated.

Table 1: Comparison of factors affecting birth weight

VARIABLE	TOTAL POPN N=3013	LBW N=234	NORMAL N=2474	MACROSOMIA N=305	F	p value
MATERNAL AGE	30.86±4.793	30.41±5.303	30.83±4.717	31.38±4.959		
<20	23 (0.8%)	8 (3.4%)	13 (0.5%)	02(0.7%)	5.396	**0.001***
20-29	1493 (49.6%)	116 (49.6%)	1234 (49.9%)	143(46.9%)		
30-39	1377 (45.6%)	101 (43.2%)	1133 (45.8%)	143(46.9%)		
40-49	120 (4.0%)	09 (3.8%)	94 (3.8%)	17(5.5%)		
PARITY						
LOW PARITY (≤3)	2674 (88.7%)	205 (87.6%)	2215 (89.5%)	254 (83.3%)	5.601	**0.020⁺**
HIGH PARITY (≥4)	339 (11.3%)	29 (12.4%)	259 (10.5%)	51 (16.7%)		
SOCIAL CLASS					1.771	0.132*
1	1104 (36.6%)	96 (41.0%)	890 (36%)	118 (38.8%)		
2	778 (25.8%)	57 (24.4%)	649 (26.2%)	72 (23.7%)		
3	493 (16.4%)	32 (13.7%)	416 (16.8%)	45 (14.8%)		
4	311 (10.3%)	20 (8.5%)	257 (10.4%)	34 (11.2%)		
5	327 (10.9%)	29 (12.4%)	263 (10.6%)	35 (11.5%)		
GESTATIONAL AGE AT BOOKING	20.20±6.169	19.86±5.680	20.27±6.235	20.01±5.982		
FIRST TRIMESTER	434 (14.4%)	31 (13.2%)	361 (14.6%)	42 (13.8%)	1.789	0.167*
SECOND TRIMESTER	2340 (77.7%)	192 (82.1%)	1907 (77.1%)	241 (79.0%)		
THIRD TRIMESTER	239 (7.9%)	11 (4.7%)	206 (8.3%)	22 (7.2%)		
GESTATIONAL AGE AT DELIVERY	38.62±1.533	37.94±2.331	38.66±1.454	38.83±1.220		**0.000$**
Preterm	146 (4.8%)	35 (15.0%)	108 (4.4%)	3 (1.0%)		
Term	2867 (95.2%)	199 (85.0%)	2365 (95.6%)	302 (99.0%)		
SEX						
MALE	1570 (52.1%)	124 (53.0%)	1245 (50.3%)	201 (65.9%)		**0.000$**
FEMALE	1443 (47.9%)	110 (47.0%)	1229 (49.7%)	104 (34.1%)		

BIRTH WEIGHT	3.205±0.5446	2.4±0.3477	3.202±0.3393	4.123± 0.1621		**0.000***
LBW	234 (7.8%)	-	-	-		
NORMAL	2474 (82.1%)	-	-	-		
MACROSOMIA	305 (10.1%)	-	-	-		
PRESENTATION					7.277	**0.000***
CEPHALIC	2821 (93.7%)	198 (84.6%)	2327 (94.1%)	296 (97%)		
BREECH	152 (5.0%)	29 (12.4%)	120 (4.9%)	03 (1.0%)		
SHOULDER	40 (1.3%)	07 (3.0%)	27 (1.0%)	06 (2.0%)		
ROUTE OF DELIVERY					3.769	0.010*
VAGINAL DELIVERY	1763 (58.5%)	124 (53%)	1500 (60.6%)	139 (45.5%)		
INSTRUMENTAL	15 (0.5%)	02 (0.9%)	11 (0.4%)	02 (0.7%)		
CAESAREAN SECTION	1235 (41%)	108 (46.1%)	963 (39%)	164 (53.8%)		

The figures in parentheses are percentages of total in row

Table 2: Mean birth weight by parity for effect on birth weight

Parity	Frequency	Mean birth weight
0	970	3.131±0.5350
1	788	3.260±0.5396
2	549	3.270±0.5894
3	373	3.278±0.5728
4	204	3.327±0.5311
≥5	129	2.950±0.5192

Table 3: Summary of multiple regression statistics for the predictor variables of birth weight

Predictor variable	B	SE B	B	t	P	95%CI	
Intercept	0.832	0.256				0.415	1.408
Maternal age	0.006	0.002	0.050	2.421	0.016	0.001	0.010
Parity	0.016	0.008	0.042	2.022	0.043	0.001	0.031
Gestational age at delivery	0.060	0.006	0.169	9.449	0.000	0.047	0.071
Sex	-0.093	0.019	-0.086	4.815	0.000	-0.153	0.095

DISCUSSION

Five factors were studied to determine their effect on the birth weight of the babies. These are maternal age, parity, social class, duration of gestation at delivery and foetal sex (Table 1).

Various studies have found birth weight to be influenced by maternal age [9-11]. This is consistent with the findings in the present study. Statistically significant increases in birth weight were found with increasing maternal ages especially for boys from below 20 years through to 39 years (Table 1). Some authors believe that younger mothers who are still growing may compete with the foetus for nutrients leading to a lower birth weight than expected [10]. On the other hand, older women may have previously undiagnosed medical disorders which might affect placental function and result in LBW [11]. It is also believed that the relative infertility in the older women might be responsible for its effect on foetal weight [10]. Restrepo-Mendez *et al*. believe that younger age does not influence birth weight; but rather that it is the socioeconomic challenges which young women are exposed to that are responsible for the effects seen and not the biological effect of maternal age. They however agreed that older age might play a role in the delivery of LBW but that more research needs to be done to determine the mechanism that age uses [12]. Furthermore, Goisis *et al*. in a recent Finnish study disagreed that maternal age is associated with incidence of LBW [13]. They believe that there are yet unobserved factors that are responsible for the high incidence of LBW in older women.

Parity was found to have a positive influence on foetal weight. The birth weights increased progressively from the nulliparous woman (3.131 ± 0.5350) to a woman with four parous experiences (3.327 ± 0.5311), after which there was a decline in the mean birth weight from women with five parous experiences (2.950 ± 0.5192). The findings were found to be statistically significant. This is similar to the findings of earlier authors [14, 15]. It is generally believed that the birth weight increases from the first child up until the fourth child [15]. The reasons adduced for this include the fact that uteroplacental blood flow improves with subsequent pregnancies and the fact that the structural factors that limit uterine capacity decreases with parity leading to increase in size of the uterus and the baby [16, 17].

Social class is a known factor that affects birth weight [12, 18, 19]. Higher social classes tend to be associated with heavier birth weights and vice versa. The findings in the present study seem to be at variance with this tendency. This may be due to the fact that the cohort of the present study was that of booked patients with majority of the babies being born to the women of upper social classes. They attended antenatal care and most of the women were economically buoyant.

The normally expected social class effect is the finding of lower birth weights in babies born to lower social class women. This is explained on the basis of poorer nutritional status of lower social class women together with their poorer attention to antenatal care requirements.

This study shows that despite making up 95.2% of the study population, babies born at term had a lower incidence of LBW with a 6.9% (that is 199 out of 2867) vs 24% (that is 35 out of 146) of the preterm. In addition the mean weight of the term babies of 3.2226 ± 0.5324 was greater than that of the pretrem. Just like in other studies, gestational age at delivery was found to be statistically significantly associated with birth weight. This significant contribution to birth weight is the basis of most customized birth weight charts [20, 21]. The effect of gestational age at delivery is due to the fact that fetal growth increases at an exponential rate. About 70% of total fetal growth occurs in the last trimester of pregnancy with most growth occurring in the last two months of pregnancy [22]. Since the definition of low birth weight is birth weight below 2.5 kg, it is obvious that more LBW babies will be born to women with deliveries at significantly reduced length of gestation below full term.

Sex was found to influence birth weight in this study. The mean birth weight for the males was higher than for the females, 3.270 ± 0.5524 vs 3.163 ± 0.5139. This was found to be statistically significant (p = 0.000). This is consistent with literature which has found that boys have a higher birth weight than girls due to the presence of androgens in them [23]. This information is employed in most customized birth weight charts alongside gestational age at delivery [19, 20].

Among low birth weight babies are the premature and small for gestational age (small for dates) babies. Each of these two groups has immediate (neonatal) and long term complications and ill health effects [24, 25]. As a group LBW babies have immediate and future health needs which should compel us to reduce their prevalence.

All effective methods to mitigate the background causes of delivering LBW babies should be employed. These may include education, improvement of socioeconomic conditions, good antenatal care, etc.

CONCLUSION

Birth weight was found to be influenced by both maternal and fetal factors. The maternal factors were the age of the mother and her parity while the sex of the foetus and the gestational age at delivery were the fetal factors. These factors were also good predictors of fetal weight.

Conflict of interest

No conflict of interest concerning this publication

Authors' Contributions

Joel-Medewase Victor Idowu was responsible for design and write up of the study. Aworinde Olufemi Opeyemi, analyzed the data contributed to the final write up. Bello-Zion Olukayode Samuel, was responsible for data collection and contributed in the final write up of the manuscript. Alabi Ayobami Oyetunji also analyzed the data and contributed to the final write up of the manuscript.

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REFERENCES

1. Wilcox AJ. On the importance-and the unimportance -of birthweight. Int J Epidemiol. 2001; 30(6):11233-1241
2. Metgud CS, Naik VA, Mallapur MD. Factors Affecting Birth Weight of a Newborn-A Community Based Study in Rural Karnataka, India. PLoS ONE 7(7):e40040. doi:10.1371/journal.pone.0040040
3. World Health Organisation. Care of the preterm and low-birth-weight newborn. [Accessed on 20/02/19] https://www.who.int/maternal_child_adolescent/newborns/prematurity/en/
4. Monster D, Lie RT, Markestad T. Long term medical and social consequences of preterm birth. N Engl J Med. 2008; 359:262-273.
5. Lunde A, Melve KK, Gjessing HK, Skjaerven R, Irgens LM. Genetic and Environmental Influences on Birth Weight, Birth Length, Head Circumference, and Gestational Age by Use of Population-based Parent-Offspring Data. Am J Epidemiol. 2007; 165(7):734-741.
6. Hailu LD, Kebede DL. Determinants of Low Birth Weight among Deliveries at a Referral Hospital in Northern Ethiopia. *Biomed Res Int*. vol. 2018, Article ID 8169615, 8 pages, 2018. [Accessed on 20/02/19] https://doi.org/10.1155/2018/8169615.
7. Tema T. Prevalence and determinants of low birth weight in Jimma zone, southwest Ethiopia. East Afr Med J. 2006; 83(7):366-371.
8. Niknajad A, Ghojazadeh M, Sattarzadeh N, Bashar Hashemi F, Dezham Khoy Shahgholi F. Factors affecting the neonatal intensive care unit stay duration in very low birth weight premature infants. J Caring Sci. 2012; 1(2):85-92.
9. Chen XK, Wen SW, Fleming N, Demissie K, Rhoads GG, Walker M. Teenage pregnancy and adverse birth outcomes: a large population based retrospective cohort study. Int J Epidemiol. 2007; 36:368-373.
10. Haldre K, Rahu K, Karro H, Rahu M. Is a poor pregnancy outcome related to young maternal age? A study of teenagers in Estonia during the period of major socio-economic changes (from 1992 to 2002) Eur J Obstet Gynecol Reprod Biol. 2007; 131:45-5.
11. Heffner LJ. Advanced maternal age -how old is too old? The N Engl J Med. 2004; 351:1927-1929.
12. Restrepo-Mendez MC, Lawlor DA, Horta BL, Matijasevich A, Santos IS, Menezes AMB, *et al*. The association of maternal age with birthweight and gestational age: a cross-cohort comparison. Paediatr Perinat Epidemiol. 2014; 29(1):31-40.
13. Goisis A, Remes H, Barclay K, Martikainen P, Myrskyla M. Advanced Maternal Age and the Risk of Low Birth Weight and Preterm Delivery: a Within-Family Analysis Using Finnish Population Registers. Am J Epidemiol. 2017; 186(11):1219-1226.
14. Shah PS. Parity and low birth weight and preterm birth: a systematic review and meta-analyses. Acta Obstet Gyn Scan. 2010; 89:862-875.
15. Hinkle SN, Albert PS, Mendola P, *et al*. The association between parity and birthweight in a longitudinal consecutive pregnancy cohort. Paediatr Perinat Epidemiol. 2013; 28(2):106-15.
16. Prefumo F, Bhide A, Sairam S, Penna L, Hollis B, Thilaganathan B. Effect of parity on second-trimester uterine artery Doppler flow velocity and waveforms. Ultrasound Obst Gyn. 2004; 23:46-49.
17. Hafner E, Schuchter K, Metzenbauer M, Philipp K. Uterine artery Doppler perfusion in the first and second pregnancies. Ultrasound Obst Gyn. 2000; 16:625-629.
18. Maddah M, Karandish M, Mohammadpour-Ahranjani B, Neyestani TR, Vafa R, Rashidi A. Social factors and pregnancy weight gain in relation to infant birth weight: a study in public health centers in Rasht, Iran. Eur J Clin Nutr. 2005; 59:1208-12.
19. Kehinde OA, Njokanma OF, Olanrewaju DM. Parental socioeconomic status and birth weight distribution of Nigerian term newborn babies Nig J Paed. 2013; 40(3):299-302
20. McCowan LM, Harding JE, Stewart AW. Customized birthweight centiles predict SGA pregnancies with perinatal morbidity. Brit J Obstet Gynaec. 2005; 112:1026-1033.
21. Groom KM, Poppe KK, North RA, McCowan LME. Small-for-gestational-age infants classified by customized or population birthweight centiles: impact of gestational age at delivery. Am J Obstet Gynecol. 2013; 197(3):239.e1-239.e5
22. MacKay DF, Smith GCS, Dobbie R, Pell JP. Gestational Age at Delivery and Special Educational Need: Retrospective Cohort Study of 407,503 Schoolchildren. 2010; 7(6): https://doi.org/10.1371/journal.pmed.1000289 [Accessed 25/02/19]

23. Bay K, Asklund C, Skakkebaek NE, Andersson AM. Testicular dysgenesis syndrome: possible role of endocrine disrupters. Best Pract Res CL En. 2006; 20: 77-90.
24. Oyedeji GA, Olamijulo SK, Joiner KT. The Immediate Prospects, Problems and Perils of Sixty-seven Low Birth Weight Babies. J Trop Pediatr. 1983; 29:233-236.
25. Adebami OJ, Joel-Medewase VI, Oyedeji OA, Oyedeji GA. A Review of Neonatal Admissions in Osogbo, Southwestern Nigeria. Nig Hosp Pract. 2010, 5(3-4):36-41.