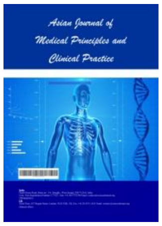

Asian Journal of Medical Principles and Clinical Practice

4(2): 18-28, 2021; Article no.AJMPCP.64938

The Association between Maternal Demographic Factors and Birth Weight

Ikobho Ebenezer Howells[1*] and Ikeanyi Eugene Maduabuchukwu[1]

[1]*Department of Obstetrics and Gynecology, Niger Delta University Teaching Hospital, Bayelsa State, Nigeria.*

Authors' contributions

This work was carried out in collaboration between both authors. Author IEH designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author IEM managed the analyses and literature search of the study. Both authors read and approved the final manuscript.

Article Information

Editor(s):
(1) Dr. Suprakash Chaudhury, Dr. D. Y. Patil Medical College -Hospital & Research Center, India.
Reviewers:
(1) Seema Rai, Guru Gobind Singh Medical College, India.
(2) Vaibhav Anjankar, Datta Meghe Institute of Medical Sciences (DMIMS), India.
Complete Peer review History: http://www.sdiarticle4.com/review-history/64938

Original Research Article

Received 17 November 2020
Accepted 21 January 2021
Published 15 February 2021

ABSTRACT

Background: Fetal weight at birth is of paramount importance to the obstetrician and neonatologist; it's a key factor in management decisions. The major determinants of birth weight are obstetrics, genetic, and maternal demographic factors.
Objective: The objective of this study is to determine the influence of maternal demographic factors on birth weight. Specifically, it would determine the effects of body mass index, parity, tribe, maternal age, gestational age at delivery, educational level, height and occupation on birth weight.
Materials and Methods: It was an observational cross-sectional study of 1620 booked pregnant women who delivered at the Niger Delta University Teaching Hospital. Their case notes were retrieved and relevant information such parity, educational level, maternal age, tribe, and occupation was obtained. Others were maternal height and weight at booking, gestational age at delivery, and birth weight. Body mass index (BMI) was calculated from height and weight and categorized. Data was analyzed with Chi square, Pearson's correlation coefficient, simple linear regression, and multivariate analysis
Results: The mean birth weight was 3.11 ± 0.5kg, and a great majority of the babies (88.7%) were of normal birth weight; the prevalence of low birth weight (LBW) and fetal macrosomia were 6.8% and 4.1% respectively. Fetal macrosomia was associated with advanced maternal age (> 40

**Corresponding author: E-mail: ikobhoebenezer@yahoo.com;*

years), X2= 32.32, p = 0.0001, employment, Odds ratio = 3.15(1.03. 9.62), and obesity class 1 and 11, p = 0.004, and p = 0.003 respectively. LBW was significantly associated with underweight women, Odds ratio = 7.63(3, 09. 18, 88), and delivery of very low birth weight (VLBW) babies was higher among women from Igbo tribe, Odds ratio = 4.64 (1.85, 11.56).
Using multivariate analysis, maternal demographic factors could only explain 19.6% of the factors responsible for birth; the most important predictors were gestational age at delivery, maternal height, educational level and BMI.
Conclusion: Though maternal demographic factors significantly affects birth weight, the bulk of the determinants (80.4%) are outside these factors, and it could be from genetic, obstetrics or environmental factors.

Keywords: Maternal demographic factors; birth weight.

1. INTRODUCTION

When taking decisions to deliver pregnant women, estimated fetal weight is of paramount importance to obstetricians. From the obstetrics perspective, the most suitable birth weight for delivery is 2.5 kg – 3.9 kg. Delivery of birth weight below 2.5 kg is often associated with increased perinatal morbidity and mortality from complications of prematurity and intracranial hemorrhage, [1, 2] while genital tract lacerations and severe hemorrhage remains the most outstanding complications associated with delivery of birth weight of 400 grams and above. [3]

In general terms, low birth weight is diagnosed when fetal weight at birth is < 2500 grams, and the corresponding gestational age (GA) is < 37 weeks. [4] However, birth weight has been classified into four main categories: extreme low birth weight (ELBW) (≤ 1000grams), very low birth weight (VLBW) (1000 – 1499 grams), low birth weight (LBW) (1500 – 2499 grams), normal fetal weight (2500 – 3999 grams), and fetal macrosomia or large birth weight (≥ 4000 grams). [4]

The effect of maternal demographic factors on birth weight has been widely studied globally, with varying degree of results. Some of these factors are maternal height, body mass index, parity, age, socioeconomic status, educational level, tribe and race. [5, 6, 7]

The association between maternal age and birth weight has been reported from studies in various centers. Reports from a previous study revealed a significant variation in birth weight with maternal age (p<0.01). [5] In a study in Bradford Royal Infirmary in the UK, delivery of extreme low birth weight was significantly higher in adolescents, Odds ratio = 4.18[1.41, 12.11]. [8] Findings form a study in Ayder comprehensive specialized hospital in Ethiopia; advanced maternal age was significantly associated with low birth weight Odds ratio = 3.137[1.324, 7.433], p = 0.009. [9] On the contrary, evidence from a similar study indicates that there was no significant association between maternal age and birth weight. [10]

Parity has also been reported as a risk factor for birth weight. In a study to determine the association between parity and birth weight, birth weight was found to increase linearly from para 1 - 4, when compared to para 0, β= 0.34 [0.31, 0.37]. [7] Report from a similar study in Addis Ababa, Ethiopia, revealed that grand multiparous women delivered more LBW babies than multiparous women, Odd ratio = 3. 89[2.19, 6.93)], while primiparous and nulliparous women had less risk. [11]

Maternal height is another factor that has been reported to significantly affect birth weight. Evidence from a study in Japan revealed that short maternal height of 131.0 – 151.9cm was associated with LBW, Odds ratio = 1.91[1.64, 2.22]. [12] Findings from a study on the effect of maternal height on birth weight in Northeastern Brazil revealed that women with short stature (height ≤ 152cm) had more babies with LBW (OR: 1.88, 95% CI: 1.07 - 3.29). [13] Similarly, results from a study comparing birth weight of women whose heights were 150 – 157 cm to taller women (168-175 cm), the infants of the shorter women were symmetrically smaller. [14]

Body mass index is another key factor that significantly affects birth weight. Using multivariate analysis, overweight was reported as a predictor of birth weight at Tongji University School of Medicine, Shanghai, China β = 144.8 [144.5, 145], while infants of underweight women had low birth weight β = −104.2 [-104.4, - 104.0]. [15] Findings from a similar study in Tamil Nadu in India revealed that women who were underweight significantly had more low birth weight babies. [16]

Race and geographic region are major factors that have significant impact on birth weight. Evidence from a systematic analysis on national, regional and worldwide estimate on LBW has proven that over 20.5 million live births were of LBW, and a great majority, (about 91%) were from poor resource countries; mainly southern Asia (48%), and Sub-Saharan Africa (24%). [17] In a study on racial difference on birth weight in California, it was reported that Chinese, Asian Indians, and Hispanics had lower mean birth weight, they also had shorter mean length and mean head circumference than white babies. [18]

There is evidence that maternal education reduces the risk of preterm birth, and LBW, this could be due to the fact that educated women have more access to good antenatal care, and they are more likely to be economically buoyant to care for their pregnancies. Results from a meta-analysis on the level of maternal education on birth weight revealed that high educational level was 33% protective on LBW. [19] A similar study in Lombardy in Italy revealed that women with high educational level had reduced odds of preterm delivery, Odds Ratio = 0.81(0.77, 0.85), and 0.78 (0.70, 0.81) for LBW. [20]

Few studies have established an association between occupation, employment status and birth weight. A study in Jos in Nigeria reported that mothers occupation was associated with LBW, p = 0.015. [21] Findings from a study to determine the effect of employment on LBW reported an increased rate among pregnant mothers engaged in stressful jobs such as: food services, textile, personal appearance, materials dispatching and distribution. [22] A similar study carried out in California reported an increased rate of LBW, when compared to office workers. Odds ratio = 3.03[1.21, 7.62] for food preparation and servicing jobs, and 2.63[1.01, 6.82] for production occupation. [23]

With respect to delivery of large birth weight babies (fetal macrosomia), the influence of maternal demographic risk factors have also been reported in various studies. Publication from an article at University Hospital in Bratislava, Slovakia, indicates that maternal obesity was associated with fetal macrosomia, (AOR = 1.7; 95% CI 1.3, 2.1). [24] Findings from a similar study at Balikesir University School of Medicine, Turkey; risk factors for fatal macrosomia were identified as Maternal age p = (0, 0003), parity (p = 0.0001), pre-pregnancy BMI (p = 0.0001), and gestational weight gain of mothers (p = 0.0001) [25]. A study at St Martin's de pores Hospital in Ghana, reported that obesity was the main predictor of fetal macrosomia, Odds ratio = 11.9, p = 0.019, others predictors were multiparty, and maternal age of 21 – 30 years. [26] A similar study at N'Djamena Mother and Child Hospital in Chad, reported gestational age >41 weeks as a risk factor for fetal macrosomia. [27]

Evidence from the various studies documented above leaves no doubt that maternal demographic factors play a major role to determine fatal weight at birth. Literatures search however indicates that these studies were done elsewhere, with little impute from our environment. The intent of this study is to determine the influence of these factors on birth weight in our environment.

1.1 Objective

The objective of this study is to determine the influence of maternal demographic factors on birth weight. Specifically, it would determine the effects of body mass index, parity, maternal age, gestational age at delivery, educational level, and occupation on birth weight.

2. MATERIALS AND METHODS

2.1 Study Site

The study was carried out in the delivery unit, department of Obstetrics and Gynaecology, Niger Delta University Teaching Hospital (NDUTH), the hospital is located in Yenagoa, the capital of Bayelsa state, southern Nigeria. It serves as a referral center; it receives patients from all parts of Bayelsa State, and parts of the neighboring states, such as Rivers, Delta, Edo, and Abia states.

2.2 Study Design

It was an observational cross sectional study of 1620 pregnant women who registered for antenatal care and delivered from January 2015 to January 2019.

2.3 Inclusion Criteria

Those who were included in this study were women who registered for antenatal care, and had spontaneous vaginal delivery at NDUTH. Also included were women who were already in labour, but had emergency caesarean section for complications. Women who had elective caesarean section from 38 completed weeks were also included.

2.4 Exclusion Criteria

Excluded from this study were women who had induction of labour before 38 completed weeks, and women who had caesarean section from antenatal complications that potentially shortens the length of gestation and birth weight, such as severe antepartum haemorrhage, severe preeclampsia, and eclampsia. Unbooked patients were excluded because of non-availability of information concerning maternal weight and height in their case notes. Those who delivered before 28 weeks gestation were also excluded; fetal viability in Nigeria is 28 weeks and above. Also excluded were women with antenatal complications that could have direct effect on birth weight, such as gestational diabetes, multiple gestation, and intrauterine growth restriction.

2.5 Measurement of Maternal Height, Weight and Body Mass Index (BMI)

Maternal height measurement was carried out in the antenatal clinics using the Leicester height measuring scale. The patients were asked to mount the scale with their shoes off; using the calibrated scale, their respective heights were measured in centimeters and recorded. Women whose heights were below 150cm were assumed to be of short stature.

Maternal weight was measured with an adult weighing scale, and body mass index was calculated for each parturient using the formula: Body mass index (BMI) = weight in kilograms divided by height in meter square (kg /m^2), this was accomplished using transformation on SPSS statistical software. BMI was then categorized as follows:

< 18.5 kg /m^2	under weight
18.5 – 24.9 kg /$m.^2$	normal weight
25.0 – 29.9 kg /$m.^2$	over weight
30.0 – 34.9 kg /$m.^2$	obesity class 1
35.0 – 39.9 kg /$m.^2$	obesity class 2
> 40.0 kg /m^2	obesity class 3

2.6 Data Collection

Data was retrieved from the delivery registry of the labour ward, and obstetrics theatre, a total of 2,578 women who delivered during the study period were identified. The case notes of a total of 1620 women who fulfilled the inclusion criteria were retrieved from the hospital record department. Data relevant to this study was obtained, these include: maternal age, parity, tribe, educational level, and occupation. Other information obtained was: gestational age at booking, and at delivery, maternal height and weight at booking, and birth weight.

2.7 Data Analysis

Data collected from each subject was entered into SPSS version 20 for windows, and EPI info version 7 software. Categorical variables were compared with chi square and odds ratio, and the degree of association for quantitative variables was determined using Pearson’s correlation coefficient. Simple linear regression and multivariate analysis was employed to identify the predictor variables, confidence interval was set at 95%, and statistical significance was set at p value of < 0.05.

3. RESULTS

The mean birth weight was 3.11 + 0.50 kg, with a range of 1.50 – 4.90kg. A great majority of the babies 1420(87.7%) had normal birth weight, only few 6.8%, and 4.1 % had low birth weight and fetal macrosomia respectively.

The mean maternal age was 28.57+ 5.01 years, the minimum age was 15 years, and the maximum was 44 years. The mean parity was 1.93+1.53, and the mean maternal height was 161.07 + 6.53cm. The range for gestational age at delivery was 28 – 43 weeks, with a mean of 38.62+ 2.36 weeks, and the mean BMI was 26.44+ 4.52 kg/m2.

Most of the low birth weight 69(9.7%), and macrosomic babies 35(4.9%) were from women aged 25.0 – 29.9 years. Advanced maternal age ≥ 40 years was significantly associated with fetal macrosomia when compared to delivery by young women age 25.0 – 29.9 years, X^2 = 32.31, P = 0.0001.

High parity ≥ para 5 has no influence of fetal macrosomia when compared to para 1, p = 0.11. There was also no effect on LBW P = 0.07.

Women who were employed (civil servants) significantly delivered more babies with fetal macrosomia than unemployed women (housewife), Odds ratio = 3.15[1.03, 9.62], P = 0.034. However unemployment did not have influence on the rate of LBW p = 0.11

Table 1. Frequency distribution of the demographic factors

Variable	Number (n = 1620)	Percentage
Maternal age (in years)		
15.0 – 20.0	66	4.1
20.1 - 24.9	204	12.6
25.0 - 29.9	713	44.0
30.0 - 34.9	422	26.0
35.0 - 39.0	190	11.7
> 40	25.0	1.5
Parity		
Para 0	321	19.8
Para 1	406	25.1
Para 2	385	23.8
Para 3	237	14.6
Para 4	111	6.9
> 5	160	9.9
Educational level		
None formal	5	0.3
Primary	178	11.0
Secondary	774	47.8
Tertiary	663	40.9
Occupation		
Fishing	269	16.6
Farming	318	19.6
Petty trader	334	20.6
Housewife	164	10.1
Business	191	11.8
Student	125	7.7
Civil servant	219	13.5
Tribe		
Ijaw	949	58.5
Igbo	410	25.3
Urhobo/Isoko	101	6.2
Hausa/Fulani	64	4.0
Yoruba	62	3.8
Other tribes	36	2.2
Gestational age at delivery		
Preterm delivery (< 37 weeks)	158	9.8
37 – 40 weeks	1230	75.9
Postdate (above 40 weeks, up to 6 days)	195	12.0
Postterm (42 weeks and above)	37	2.3
Maternal height		
Short stature (< 150cm)	78	4.8
Normal height (150cm and above)	1542	95.2
Body mass index		
Underweight (<18.5 kg /m^2)	25	1.5
Normal weight (18.5 – 24.9 kg /m.^{2})	620	38.3
Over weight (25.0 – 29.9 kg /m.^{2})	638	39.4
Obesity class 1 (30.0 – 34.9 kg /m.^{2})	261	16.1
Obesity class 2 (35.0 – 39.9 kg /m.$^{2)}$	68	4.2
Obesity class 3 (> 40.0 kg /m^2)	8	0.5
Birth weight		
Extreme low birth weight (< 1.00kg)	-	-
Very low birth weight (1.00 – 1.49kg)	23	1.4
Low birth weight (1.50 – 2.49kg)	110	6.8
Normal birth weight (2.5 – 3.9kg)	1420	87.7
Fetal macrosomia (4.0kg and above)	67	4.1

Table 2. Maternal demographic factors and birth weight

Variable	VLBW	LBW	Normal weight	Macrosomia	Total
Maternal age					
15.0 – 20.0	-	-	66(100)	-	66(100)
20.1 – 24.9 years	14(6.9)	9(4.4)	173(84.8)	8(3.9)	204(100)
25.0 – 29.9 years	-	69(9.7)	609(85.4)	35(4.9)	713(100)
30.0 – 34.9 years	9(2.1)	24(5.7)	373(88.4)	16(3.8)	422(100)
35.0 – 39.9 years	-	8(4.2)	182(95.8)	-	190(100)
≥ 40 years	-	-	17(68.0)	8(32.0)	25(100)
Total	23(1.3)	110(6.8)	1420(87.7)	67(4.1)	1620(100)
Parity					
Para 0	6(1.9)	24(7.5)	291(90.7)	-	321(100)
Para 1	-	45(11.1)	336(82.8)	25(6.2)	406(100)
Para 2	-	8(2.1)	369(95.8)	9(2.3)	385(100)
Para 3	8(3.4)	9(3.8)	220(92.8)	-	237(100)
Para 4	-	4(3.6)	80(81.1)	17(15.3)	111(100)
Para5	9(5.6)	20(12.5)	115(71.9)	16(10.0)	160(100)
Total	23(1.3)	110(6.8)	1420(87.7)	1620(100)	67(4.1)
Educational level					
Non formal	-	5(100)	-	-	5(100)
Primary	8(4.5)	3(1.7)	147(93.8)	-	178(100)
Secondary	6(0.8)	57(7.4)	686(88.6)	25(3.2)	774(100)
Tertiary	9(4.0)	50(7.4)	562(84.8)	42(6.3)	663(100)
Total	23(1.3)	110(6.8)	1420(87.7)	67(4.1)	1620(100)
Occupation					
Fishing	3(1.1)	19(7.1)	239(88.8)	8(3.0)	269(100)
Farming	7(2.2)	24(7.5)	276(86.8)	11(3.5)	318(100)
Petty trader	8(2.4)	15(4.5)	299(89.5)	12(3.6)	334(100)
Housewife	3(1.8)	13(7.9)	144(87.8)	4(2.4)	164(100)
Business	-	14(7.3)	166(86.7)	11(5.88)	191(100)
Student	-	14(5.0)	106(84.8)	5(4.0)	125(100)
Civil servant	2(0.9)	11(75.4)	190(86.8)	16(7.3)	219(100)
Total	23(1.3)	110(6.8)	1420(87.7)	67(4.1)	1620(100)
Tribe					
Ijaw	14(1.5)	65(6.9)	831(87.8)	37(3.9)	947(100)
Igbo	7(1.7)	32(9.8)	350(85.4)	21(5.1)	410(100)
Yoruba	2(3.2)	2(3.2)	56(90.3)	2(3.2)	62(100)
Isoko/Urhobo	-	5(5.0)	93(92.1)	3(3.0)	101(100)
Hausa/Fulani	-	3(4.7)	58(90.6)	3(4.7)	64(100)
Other tribes	-	3(8.3)	32(88.9)	1(2.8)	36(100)
Total	23(1.3)	110(6.8)	1420(87.7)	67(4.1)	1620(100)
Maternal height					
Short stature	-	9(11.5)	69(88.5)	-	78(100)
Normal height	23(1.5)	101(6.5)	1351(87.6)	67(4.3)	1542(100)
Total	23(1.3)	110(6.8)	1420(87.7)	67(4.1)	1620(100)
Body mass index					
Under weight	6(24.0)	8(32.0)	-	11(44.0	25(100)
Normal weight	8(1.3)	36(5.8)	552(89.0)	24(3.9)	620(100)
Overweight	9(1.4)	44(6.9)	550(86.2)	35(5.5)	638(100)
Obesity class 1	-	12(4.6)	249(95.4)	24(10.0)	240(100)
Obesity class 2	-	10(14.7)	50(73.5)	8(11.8)	68(100)
Obesity class 3	-	-	8(10.0)	-	8(100)
Total	23(1.3)	110(6.8)	1420(87.7)	67(4.1)	1620(100)
Gestational age at delivery					
Preterm	22(100)	62(39.2)	65(41.1)	8(5.1)	158(100)
37 – 40 weeks	-	46(3.7)	1136(92.4)	48(3.9)	1230(100)
Postdate	-	-	186(95.4)	9(4.6)	195(100)
Postterm	-	2(5.4)	33(89.2)	2(5.4)	37(100)
Total	23(1.3)	110(6.8)	1420(87.7)	67(4.1)	1620(100)

Comparing the two major ethnic groups that utilize this facility (Ijaw and Igbo) there was no difference in the rate of fetal macrosomia p = 0.30, LBW p = 0.54. However delivery of VLBW was significantly higher among babies delivered by women of Igbo tribe, Odds ratio = 4.64[1.85, 11.56], p = 0.0003.

With respect to BMI, underweight women were 7 times more likely to deliver LBW babies when compared to women with normal BMI, Odds ratio = 7.63[3.09, 18.88]. On the contrary, women with obesity class 1 and 2 significantly delivered more macrosomic babies. P = 0.004 Odds ratio = 0.36[0.20, 0.65] and p = 0.003, Odds ratio = 0.30[0.13, 0.70] respectively.

Table 3. Correlation between demographic factors and birth weight

Demographic factor	Pearson's correlation coefficient
Maternal age	0.000
Parity	0.040
Educational level	0.118
Occupation	0.004
Tribe	0.014
Maternal height	0.152
Body mass index	0.110
Gestational age at delivery	0.406

Besides gestational age at delivery, the association between most of the maternal demographic factors and birth weight was relatively weak.

Gestational age at delivery, maternal height, educational level, and body mass index were the main predictors of birth weight, accounting for 16.5%, 2.3%, 1.4% and 1.2% respectively.

Nineteen point six percent (19.6%) of the variation in fetal weight at birth was accounted for by variation in the maternal demographic factors (gestational age at delivery, maternal height, educational level, and BMI).

4. DISCUSSION

Accurate estimation of the fetal weight by ultrasound scan around the time of delivery is crucial in obstetrics practice; it has significant influence on the mode of delivery, neonatal management, and fetal survival, especially in premature babies. The perinatal mortality rate among LBW babies was reported as 53 per 1000 live births in Burkina Faso, [28] and 110/1000 live births in Ethiopia.[29] In a study in Eastern Nigeria, the mortality rate for ELBW was 80%, 41% for VLBW, and 17% for LBW babies [30].

Table 4. Simple linear regression of the demographic factors and birth weight

Predictor variable	r^2 (%)	F-ratio	P value
Maternal age	0.00	0.000	0.997
Parity	0.20	2.648	0.104
Educational level	1.40	22.95	0.000
Occupation	0.20	3.196	0.74
Tribe	0.00	0.069	0.793
Maternal height	2.30	38.44	0.000
Body mass index	1.20	19.718	0.000
Gestational age at delivery	16.50	318.98	0.000

Table 5. Stepwise multivariate analysis of demographic factors and birth weight

Predictor variable	Step 1	Step 2	Step 3	Step 4
Gestational age at delivery	0.406	0.406	0.406	0.402
Maternal height		0.423	0.423	0.423
Educational level			0.427	0.427
Body mass index				0.442
Constant	- 0.192	- 0.600	- 1.520	- 2.20
r^2	16.5	17.9	18.2	19.6
F-ratio	318.99	176.17	119.80	98.28
P value	0.000	0.000	0.000	0.000

The determinants of birth weight have been widely studied globally, however evidence from literature search revealed that the attention of the research community on this subject matter is skewed towards LBW and fetal macrosomia; little attention has been paid to normal birth weight. As a result, the factors associated with normal birth weight may not have been completely unraveled, and further studies may be needed.

The mean birth weight in this study was at par with the results from other centers in Nigeria; 3.10 ± 0.5kg in Jos University Teaching Hospital [31] and 3.08 ± 0.61 kg in Makurdi. [32] However, it was expectedly lower than average birth weight in European countries; 3.628kg in Finland, and 4.305kg in Norway. The reason for the disparity may be multifactorial; most probably nutritional, genetic factors or environmental factors. [33]

The National Demographic Survey in Nigeria reported the prevalence rate of LBW as 7.3%, [34] this did not deviate widely from what was obtained in this study. However much higher rates were reported in Northern Nigeria: 16.9% in Maiduguri, [35] 19.8% in Kano, [36] and 11.30% in another centre in the North. [37] This trend is in concordance with data from the 2013 – 2018 Nigeria Demographic and Health Survey (NDHS), where it was established that LBW was significantly more prevalent in the Northern Nigeria, while fetal macrosomia was more common in the Southern part. [38] Variations in regional exposure to urbanization was proposed as the most probable reason.

Maternal age has been reported to have significant influence on LBW from a study in Nigeria, P = 0039 [39]. Similar results were obtained in Ibadan, also in Nigeria, [40] in Ethiopia, [6] and in the UK. [8] Maternal age seems to have little impact on birth weight in this environment, as we did not find significant difference in our study. However, we observed that advanced maternal age was significantly associated with fetal macrosomia, and this was similar to the findings in Chad (p = 0.02), [14] and in Mekelle city in Ethiopia [41].

With respect to the effect of parity on birth weight, some studies have established a linear relationship; birth weight was reported to be higher in women with high parity. [7, 11] A meta-analysis carried out to determine the effect of parity on birth weight revealed that nulliparity was associated with increased risk of LBW, Odds ratio = 1.41 (1.26, 1.58), and small for gestational age, Odds ratio = 1.89 (1.82, 1.96). [42] The reason why parity and maternal age significantly alter birth weight is not very clear, and further studies mat be required to unveil the mechanism.

However in contrast to the findings above, we did not find any significant association between parity and birth weight in our study.

Employment status as a factor for birth weight is not frequently reported, and there are few publications on this issue. However, it's logical to assume that employed women are more nutritionally nourished than the unemployed. Therefore their fetuses are expected to receive more nutrients, minerals and vitamins (including blood precursors) necessary for fetal growth and development. Besides they are expected to receive better antenatal care for obvious financial reasons. It is therefore not suppressing that in this study, LBW was not associated with employed status, but fetal macrosomia was; Odds ratio = 3.15. It's possible that the risk posed by unemployment may be mitigated in women whose husbands were employed. However husband's employment status was not within the scope of this study.

The effect of BMI on birth weight has been well documented, and our findings are not different from the ones reported in other centers. [15, 16] Though birth weight has been reported to be largely influenced by geographic region, tribe and race [17, 18] we did not consider race because the hospital is located in a black community and it is utilized by mainly blacks; it is not multiracial or multinational. Also, geographic region was beyond the scope of this study, as it was not a multicentre study. With respect to tribe, the results from this study points to the fact that tribe does not play a major roll on birth weight determination among our babies, except for VLBW; there was no influence on LBW and high birth weight.

The regression model employed in this study is designed to explain the maternal demographic factors that predict birth weight, irrespective of the category (ELBW, VLBW, LBW, and fetal macrosomia). Evidence from the regression model indicates that the strongest factor was gestational at delivery, followed by maternal height, educational level and BMI. However, all these factors put together could only explain 19.6%. This implies that the bulk of the factors that determines fetal weight at birth are outside these maternal demographic factors.

5. CONCLUSION

Though maternal demographic factors significantly affects birth weight, the bulk of the determinants (80.4%) are outside these factors, and it could be from genetic, obstetrics and environmental factors.

CONSENT

As per international standard or university standard, patient's written consent has been collected and preserved by the authors.

ETHICAL APPROVAL

Approval to proceed with this study was granted by the ethical committee of NDUTH.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Ojumah N, Ramdhan RC, Wilson C, Loukas M, Oskouian RJ, Tubbs RS. Neurological neonatal birth injuries: A Literature Review. Cureus. 2017;9(12). DOI:10.7759/cureus.1938
2. Dumpa V, Kamity R. Birth trauma. In: Stat Pearls [Internet]. Treasure Island (FL): Stat Pearls Publishing LLC; 2020. Available:https://www.ncbi.nlm.nih.gov/books/NBK539831/
3. Gangaram Akangire, Brian Carter. Birth injuries in neonates. Pediatrics in Review - Journal of the American Academy of Pediatrics. 2016;37(11):451-62.
4. Joyce A. Martin, Brady E. Hamilton, Michelle JK. Osterman, Anne K. Driscoll. Births: Final Data for 2018. Centre for Disease Control and Prevention - National Vital Statistics Reports. 2019;68(13):1-47.
5. Suyash Goel, Roshni Abichandani. Correlation of maternal age with birth weight: need to reemphasize. International Journal of Reproductive Contraception, Obstetrics and Gynaecology. 2020;9(1). DOI: http://dx.doi.org/10.18203/2320-1770.ijrcog20196017
6. Morisaki N, Kawachi I, Oken E, et al. Social and anthropometric factors explaining racial/ethnical differences in birth weight in the United States. Sci Rep. 2017;7:46657. Available:https://doi.org/10.1038/srep46657
7. Stefanie NH, Paul SA, Pauline M, Lindsey AS, Edwina Y, Nansi SB, Katherine L. The association between parity and birth weight in a longitudinal consecutive pregnancy cohort. Paediatr Perinat Epidemiol. 2014; 28(2):106–15.
8. Marvin-Dowle K, Kilner K, Burley VJ, et al. Impact of adolescent age on maternal and neonatal outcomes in the Born in Bradford cohort. BMJ Open. 2018;8:e016258. Doi: 10.1136/ bmjopen-2017-016258
9. Mehari-ab Maeruf, Hayat Maeruf, Carmen C. Robles. et al. Advanced maternal age pregnancy and its adverse obstetrical and perinatal outcomes in Ayder comprehensive specialized hospital, Northern Ethiopia, 2017: a comparative cross-sectional study. BMC Pregnancy Childbirth. 2020; 20(6). Available:https://doi.org/10.1186/s12884-020-2740-6
10. Bekir Kahveci, Rauf Melekoglu, Ismail Cuneyt Evruke, Cihan Cetin3.The effect of advanced maternal age on perinatal outcomes in nulliparous singleton pregnancies. BMC Pregnancy and Childbirth. 2018;18:343. Available:https://doi.org/10.1186/s12884-018-1984-x
11. Alehegn Bekele, Girma Seyoum, Kiflome Tesfaye, Yitbarek Fantahun. The effects of maternal age and parity on the birth weight of newborns among mothers with singleton pregnancies and at term deliveries. Ethiop. J. Health. 2019;33(3):183–7.
12. Inoue S, Naruse H, Yorifuji T, et al. Association between short maternal height and low birth weight: a hospital-based study in Japan. J Korean Med Sci. 2016;31(3):353-9.
13. Britto RPDA, Florêncio TMT, Benedito Silva A. A, Sesso R, Cavalcante J. C, et al. Influence of maternal height and weight on low birth weight: a cross-sectional study in poor communities of northeastern Brazil. PLoS ONE. 2013;8(11):e80159. DOI:10.1371
14. Witter F R, Luke B. The effect of maternal height on birth weight and birth length. Early Hum Dev. 1991;25(3):181-6.
15. Xiao L, Ding G, Vinturache, A. et al. Associations of maternal pre-pregnancy body mass index and gestational weight

gain with birth outcomes in Shanghai, China. Sci Rep. 2017;7:41073.
Available:https://doi.org/10.1038/srep41073

16. Bhuvaneshwari. K, Gayathri. N, Prema Priya. G, Dhingra S, Vimala D.A study on pre pregnancy body mass index and its effect on maternal and perinatal outcome. Obs Rev: J obstetGynecol. 2019;5(4):1819- 5.
17. Hannah Blencowe, Julia Krasevec, Mercedes de Onis, Robert E Black, Xiaoyi An, Gretchen A Stevens, Elaine Borghi, Chika Hayashi, et al. National, regional, and worldwide estimates of low birth weight in 2015, with trends from 2000: a systematic analysis. The Lancet Glob Health. 2019;7:e849–60.
Available: http://dx.doi.org/10.1016/S2214-109X(18)30565-5
18. Madan A, Holland S, Humbert J, et al. Racial Differences in Birth Weight of Term Infants in a Northern Californip. Population Journal of Perinatology. 2002;22:230–5.
19. Silvestrin S, da Silva CH, Hirakata VN, Goldani AA, Silveira PP, Goldani MZ. Maternal education level and low birth weight: a meta-analysis. J Pediatr (Rio J). 2013;89:339-45.
20. Anna C, Matteo F, Matteo MC, Luca M, Giovanni C. Mother's education and the risk of several neonatal outcomes: an evidence from an Italian population-based study. BMC Pregnancy and Childbirth. 2017;17:221.
DOI: 10.1186/s12884-017-1418-1
21. Chingle M. P, Bupwatda P, Afolaranmi T, Odunze P, Dami N, Yiltok E, Yilgwan C*, et al.*Factors associated with low birth weight babies delivered in comprehensive health centre, Gindri, North Central Nigeria. Journal of Medical Science and Medical Research. 2017;5(5).
DOI:https://dx.doi.org/10.18535/jmscr/v5i5.176
22. John D Meyer, Ginger H Nichols, Nicholas Warren, Susan Reisine. Maternal occupation and risk for low birth weight delivery: assessment using state birth registry data. J Occup Environ Med. 2008;50(3):306-15.
23. Ondine S. von Ehrenstein, Michelle Wilhelm, Beate Ritz. Maternal occupation and term low birth weight in a predominantly latina population in Los Angeles, California. J Occup Environ Med. 2013;55(9):1046–51.
24. Martin S, Adrian Totka, Diana V, Martin S, Jana J, Michal T, Anna C, Juraj S, Lubica A. Maternal Body Mass Index and Gestational Weight Gain and Their Association with Pregnancy Complications and Perinatal Conditions. Int. J. Environ. Res. Public Health. 2019;16:1751.
DOI: 10.3390/ijerph16101751
25. Akin Usta, Ceyda Sancakli Usta, Ayla Yildiz, Ruhsen Ozcaglayan, Eylem Sen Dalkiran, Aydin Savkli et al. Frequency of fetal macrosomia and the associated risk factors in pregnancies without gestational diabetes mellitus. The Pan African Medical Journal. 2017;26:62.
DOI:10.11604/pamj.2017.26.62.11440
26. Kweku Bedu-Addo, Richard K. D. Ephraim, Comfort Tanoe-Blay, Linda Ahenkorah-Fondjo, Kwame Osei-Darkwah, Mabel Ephraim, Kate A. Kontoh & Albert Abaka-Yawson. Prevalence and associated factors of fetal macrosomia in a rural community in Ghana, Cogent Medicine. 2020;71:1746602.
27. Madoue GB, Sile SN, Lhagadang F, et al. Foetal macrosomia: risk factors, maternal and foetal outcome in N'Djamena mother and child hospital, Chad. Obstet Gynecol Int J. 2018;9(3):153-5.
28. Coulibaly A, Baguiya A, Millogo T, Meda IB, Koueta F, Kouanda S. Predictors of mortality of low birth weight newborns during the neonatal period: A cohort study in two health districts of Burkina Faso. Int J Gynaecol Obstet. 2016;135(1):89-92.
DOI: 10.1016/j.ijgo.2016.08.006
29. Akine E, Abebe A, Taddes AZ. Magnitude and risk of dying among low birth weight neonates in Rural Ethiopia: A Community-Based Cross-Sectional Study. International Journal of Pediatrics; 2019.
Available:https://doi.org/10.1155/2019/9034952
30. Osuorah DI. Chidiebere, Ekwochi, Ndu IK, Ifediora C, Asinobi IN, Amadi OF, Ani OS, Okeke I. The low-birth weight infants: Pattern of morbidity and mortality in a tertiary healthcare facility in the South Eastern Nigeria. Ann Med Health Sci Res. 2018;8:4-10.
31. Yilgwan CS, Utoo TB, Hyacinth HI. Maternal characteristics influencing birth weight and infant weight gain in the first 6 weeks post-partum: A cross-sectional study of a postnatal clinic population. Niger Med J. 2012;53:200-5.

32. Swende TZ. Term birth weight and sex ratio of offspring of a Nigerian obstetric population. Int J Biol Med Res. 2011;2(2): 531-2.
33. Graafmans, Wilco C. et al. Birth weight and perinatal mortality: A comparison of 'optimal' birth weight in seven western European countries. Epidemiology. 2020;13(5):569–74.
34. Dahlui M, Azahar N, Oche OM, Aziz NA. Risk factors for low birth weight in Nigeria: Evidence from the 2013 Nigeria demographic and health survey. Glob Health Action. 2016;9.
DOI: 10.3402/gha. v9.28822
35. Takai IU, Bukar M, Audu BM. A prospective study of maternal risk factors for low birth weight babies in Maiduguri, North-Eastern Nigeria. Niger J Basic Clin Sci. 2014;11:89-98.
36. Osuhor PC, Bashir Adam Yakasai. Low birth weight in Kano City, Northern Nigeria. Public Health. 1981;95(1):36-42.
37. Hassan O, Muhammad Z. Trends in incidence of LBW deliveries in a tertiary hospital in Northern Nigeria. Sahel Medical Journal. 2011;14(2):100-7.
38. Fayehun O, Asa S. Abnormal birth weight in urban Nigeria: An examination of related factors. PLoS ONE. 2020;15(11).
Available:https://doi.org/10.1371/journal.pone.0242796
39. Oladeinde HB, Oladeinde OB, Omoregie R, Onifade AA. Prevalence and determinants of low birth weight: the situation in a traditional birth home in Benin City, Nigeria. Afri Health Sci. 2015;15(4): 1123-9.
Avalilable:http://dx.doi.org/10.4314/ahs.v15i4.10
40. Joel-Medewase Victor Idowu, Aworinde Olufemi Opeyemi, Bello-Zion Olukayode Samuel, Alabi Ayobami Oyetunji. Determinants of birth weight in Southwestern Nigeria. The Journal of Medical Research. 2019;5(2):79-83.
41. Freweini GT, Afework MB, Amaha KA, Kidanemariam BT. Fetal macrosomia and its associated factorsamong singleton live-births in privateclinics in Mekelle city, Tigray, Ethiopia. BMC Pregnancy and Childbirth. 2019;19:219.
Available:https://doi.org/10.1186/s12884-019-2379-3
42. Prakesh S. Shah. Parity and low birth weight and preterm birth: a systematic review and meta-analyses. Acta Obstetricia et Gynecologica. 2010;89:862–75.

Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sdiarticle4.com/review-history/64938