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Original Research Article

Maternal factors influencing birth weight of term babies among women who received antenatal care at a Nigerian voluntary agency health care facility

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ABSTRACT

Background: Birthweight is an important indicator of babies' health status and a reliable predictor of their postnatal survival. Maternal factors are regarded as major contributors to birthweight outcome due to their direct effects on foetal growth. Proper knowledge of these factors is essential for implementing preventive measures against suboptimal birthweight. Objective of the study sought to determine the proportion of term babies with normal birthweight and identify the maternal factors that influence birthweight.
Methods: This cross-sectional study was conducted on 257 booked pregnant women and their newborns delivered at the Sacred Heart Hospital (SHH), Abeokuta, Nigeria between August and November 2017. Selection was by systematic random sampling method. Data were collected with a pre-tested interviewer-administered questionnaire and analyzed with SPSS version 21 program.
Results: The mean age of the women was 30.73±5.17 years. Among the women, 95.7% had at least senior secondary education, 95% of them were married and employed. The mean birthweight was 3.25±0.47 kg and male babies had higher mean weight (male: 3.30±0.54 kg; female: 3.21±0.39 kg). NBW was recorded among 92.6% of the babies with 3.5 and 3.9% as LBW and HBW, respectively. Only maternal booking BMI (p=0.005) and chronic hypertension (p=0.007) were significantly associated with birthweight.
Conclusion: Most babies in this study had normal birthweights reflecting the influence of optimal maternal biological and socio-demographic characteristics. Chronic hypertension and subnormal booking BMI undermined achievement of optimal birthweight, underscoring the need for pre-conception care for intending mothers.

Keywords: Birthweight, Term babies, Maternal factors, Ante-natal care, Pre-conception care

INTRODUCTION

Globally, birth weight is measured routinely as it provides an early indication of a baby's health status and is reliably predictive of his/her survival postpartum.[1-4] The influence of birthweight on an individual also spans into adulthood as suboptimal birthweight has been linked to the development of chronic medical diseases like hypertension, type 2 diabetes mellitus as well as coronary artery disease in adults.[5-7] Babies born in developed countries are reported to be heavier than those in less developed countries as a result of a better state of maternal health care which significantly affects pregnancy outcomes and newborn's chance of survival.[8] Babies within the normal birth weight (NBW) range are likely to have fewer health complications. Low birth weight (LBW) babies, on the other hand, need more support postnatally to survive and are a significant

contributor to overall neonatal mortality rate. Similarly, babies with high birth weight (HBW) have a higher likelihood of perinatal complications, birth trauma and operative deliveries.[4, 9,10]

Several factors including foetal, placental, environmental, and parental, have been associated with babies' birthweights.[1-4] Maternal factors, however, are of great importance as mothers' health status, to a larger extent, determines the health of the family and dictates the survival of every child in the home.[1-4,11] Maternal age, level of education, occupation and income are some of the socio-economic factors reported to influence birthweight outcome.[11,12] Higher level of education and having a source of income were noted to affect the uptake of ANC among women with resultant positive influence on maternal health and their babies' birthweight.[11-14]

Maternal anthropometry like height, pre-pregnancy body mass index (BMI) and gestational weight gain (GWG) are also important factors that affect birthweight.[3,11,15] Abubakari et al in Ghana reported increase in birthweight of babies as the BMI and GWG of the mothers increased.[3] The height of a child is a reflection of her nutritional state in the early childhood and, thus, reflects the importance of girl-child nutrition to enhance adequate growth that will affect their pregnancy outcome during their child bearing age.[15] Factors such as access to ANC, parity, nutritional and cultural practices, maternal health status before and during pregnancy have also been identified as influencers of birthweight in other studies.[11,13,16] Some of the identified maternal health conditions include anaemia, hypertension, malaria, retroviral infection and diabetes mellitus.[10-12,17]

The second target of the third sustainable development goal (SDG-3) is to end preventable death of newborns and keep its rate at least as low as 12/1000 live births.[18] However, the neonatal mortality rate for Nigeria in 2018 according to the world bank data, was 36/1000 live births.[19] Thus, there is a gap that needs to be covered to meet this target by 2030. The aim of this study is therefore, to determine the proportion of term babies with normal birthweight and identify maternal factors that contribute to birthweight of term babies in this environment. This will hopefully facilitate the development and institution of targeted interventions that will enhance the survival of babies and improve care given to women before conception and during the antenatal period.

METHODS

The study was a hospital-based cross-sectional study conducted among women who received ANC and delivered at the SHH, Abeokuta. SHH is a Catholic mission hospital in South-West Nigeria and the first hospital in Nigeria established in 1895.[20] It is a secondary health care facility located in Abeokuta, south-west Nigeria and well reputed for her efficient obstetric and neonatal services. The hospital runs postgraduate training in family medicine and is accredited by both the National Postgraduate Medical College of Nigeria and the West African college of physicians. It also serves as an internship centre for different fields of medicine and owns a reputable school of nursing. Ethical clearance was obtained from the ethical review committee of the institution.

Sample size was calculated using the formula for descriptive study.[21]

$$n = \frac{z^2 pq}{d^2}$$

n=Sample size
z=Standard normal deviate which correspond to 95% confidence interval=1.96
p=Prevalence of NBW in a study in Ibadan, Nigeria (79.5%).[11]
q=1.0-p
d=Degree of accuracy desired=0.05

Thus, $n = \frac{z^2 pq}{d^2} = n = \frac{(1.96)^2(0.795)\,(0.205)}{(0.05)^2} = 250.434$

The sample size obtained was adjusted for population less than 10,000 using the formula for non-finite sample[21] i.e. $nf = \frac{n}{\{1+nN\}}$

n=Sample size calculated=250.434
N=Total population size (all pregnant women who had ANC in 2015) =3013

Thus, $nf = \frac{n}{\{1+nN\}} = \frac{250.434}{\{1+\,250.434\times3013\}} = 231.241$

A total of 11% attrition rate was added for an incomplete response. Thus, 257 women were recruited.

The selected women booked for ANC before 20 weeks estimated gestational age (EGA), delivered singleton term babies (EGA of 37-42 weeks) with no congenital anomalies and consented to participate in the study. They were recruited within 24 to 48 hours post-delivery in the postnatal ward using systematic random sampling technique. EGA was confirmed based on last menstrual period (LMP) or first ultrasound done early in pregnancy.

Birthweight was measured within 24 hours of birth with the baby unclothed using Camry® baby weighing scale. The weighing scale was calibrated with a known weight. Babies' weight was measured in kilograms (kg) to the nearest 0.1 kg and the gender was recorded. An interviewer-administered questionnaire was used to collect data on maternal characteristics. Booking information and care received during ANC were confirmed from patients' antenatal records and recorded in the questionnaire. Maternal data collected were on sociodemographic characteristics (age, marital status, level of education and occupation) and biomedical characteristics. Biomedical characteristics included the

booking characteristics [EGA, parity, weight, height, BMI, retroviral status, past medical history and booking packed cell volume (PCV)], medical conditions developed and managed in pregnancy (malaria, anaemia, hypertension, diabetes, urinary tract infection) and parameters measured on the mother at presentation for delivery (PCV, GWG).

Data were analysed with statistical package for social sciences version 21 programme (SPSS Inc. Chicago, Illinois) computer software. Birthweight was categorized as LBW (weight <2.5 kg), NBW (weight of 2.5-3.9 kg) and HBW (weight ≥4.0 kg). The mean birthweight was also determined. Birthweight was the dependent variable while maternal characteristics were the independent/explanatory variables. Bivariate analysis using chi-squared test was done to determine the association between birthweight and each independent variable. The level of significance was determined with p value ≤0.05.

RESULTS

Maternal characteristics

The mean age of the women was 30.73±5.17 years (Range: 17-49 years). Majority of the women (67.7%) were in the age range of 25-34 years while only 1.6% of them were teenagers. Two hundred and forty-six (95.7%) of the women had at least senior secondary education. Two hundred and forty-four (95.0%) of them were married and the same proportion were employed (Table 1).

Table 1: Socio-demographic characteristics of the mothers.

Categories	Frequency (%)
Age (years)	
<20	4 (1.6)
20-24	18 (7.0)
25-29	85 (33.1)
30-34	89 (34.6)
≥35	61 (23.7)
Marital status	
Single	7 (2.7)
Married	244 (95.0)
Engaged	6 (2.3)
Widow	0 (0.0)
Level of education	
No formal education	3 (1.2)
Primary	3 (1.2)
Junior Secondary	5 (1.9)
Senior Secondary	71 (27.6)
Post-Secondary	175 (68.1)
Occupation	
Unemployed	13 (5.0)
Artisan	30 (11.7)
Trading	110 (42.8)
Civil servant	104 (40.5)

The mean EGA at booking was 15.2±3.3 weeks. More women (n=133 (51.8%)), however, registered their pregnancy after 16 weeks gestational age. A larger proportion of the women (57.6%) were multiparous. The mean booking weight of the mothers was 64.16±12.17 kg (Range: 42-107 kg) while the mean height was 1.60±0.63 metres (Range:1.46-1.79 metres). Almost half of the women had normal BMI (50.2%) at booking, while 3.1% had low BMI and 46.7% had above normal value (Mean BMI: 25.32±4.89 kg/m^2) (Table 2).

Table 2: Booking characteristics of the mothers.

Categories	Frequency (%)
Booking EGA (weeks)	
<16	124 (48.2)
≥16	133 (51.8)
Parity	
Nulliparous	103 (40.1)
Multiparous	148 (57.6)
Grand multiparous	6 (2.3)
Booking weight (kg)	
≤49.9	21 (8.2)
50.0-69.9	151 (58.8)
≥70.0	85 (33.1)
Height (metres)	
<1.45	0 (0.0)
1.45-1.59	115 (44.7)
≥1.6	142 (55.3)
Booking BMI (kg/m^2)	
<18.5	8 (3.1)
18.5-24.99	129 (50.2)
25.0-29.99	68 (26.5)
≥30	52 (20.2)
History of hypertension	
Yes	9 (3.5)
No	248 (96.5)
History of diabetes mellitus	
Yes	1 (0.4)
No	256 (99.6)
Retroviral status	
Reactive	6 (2.3)
Non-reactive	251 (97.7)
Booking PCV (%)	
<30	20 (7.8)
≥30	237 (92.2)

Chronic hypertension was reported in 9 (3.5%) of the women and 37 (14.4%) had pregnancy induced hypertension (PIH). Only 1 (0.4%) of the women had pre-existing diabetes while 2 (0.8%) developed gestational diabetes mellitus. Twenty women (7.8%) were anaemic (PCV <30%) at booking and 25 (9.3%) were managed for anaemia (PCV <30%) developed in pregnancy. Other medical condition managed in pregnancy were malaria {n=116 (45.1%)}, urinary tract infection [n=24 (9.3%)] (Table 2 and 3).

Table 3: Medical conditions developed and managed during pregnancy.

Categories	Frequency (%)
Pregnancy induced hypertension	
Yes	37 (14.4)
No	220 (85.6)
Gestational diabetes	
Yes	2 (0.8)
No	255 (99.2)
Urinary tract infection	
Yes	24 (9.3)
No	233 (90.7)
Anaemia in pregnancy	
Yes	25 (9.7)
No	232 (90.3)
Malaria in pregnancy	
Yes	116 (45.1)
No	141 (54.9)
Malaria parasite at delivery	
Positive	90 (35.0)
Negative	167 (65.0)
PCV at delivery (%)	
<30	12 (4.7)
≥30	245 (95.3)
Gestational weight gain (kg)	
<7	30 (11.7)
7-11.5	143 (55.6)
>11.5	84 (32.7)

Babies' characteristics

Their EGA at birth ranged between 37-42 weeks (mean of 39.19±1.18 weeks). The mean birth weight was 3.25±0.47 kg [Range=1.50-4.75 kg]. Two hundred and thirty-eight babies (92.6%) had NBW while 9 (3.5%) and 10 (3.9%) had LBW and HBW, respectively. There were more female babies [n=132 (51.4%)] in the study. Male babies weighed heavier than the female babies (3.30±0.54 kg versus 3.21±0.39 kg) although, this was not statistically significant (p=0.149) (Table 4).

Table 4: Babies' birthweight characteristics.

Mean (SD)	Range	Categories	Frequency (%)
Birth weight (kg)			
Total: 3.25 (0.47)	1.50-4.75	LBW	9 (3.5)
Male: 3.30 (0.54)		NBW	238 (92.6)
Female: 3.21 (0.39)		HBW	10 (3.9)

SD: standard deviation.

Bivariate analysis

Applying the chi-square test to determine the relationship between birthweight and maternal factors, statistically significant associations ($p<0.05$) were found between birthweight and maternal booking BMI ($p=0.005$) and chronic hypertensions ($p=0.007$) (Table 6). There was no significant association between birthweight and the other maternal factors examined (Table 5 and 6). LBW was higher among underweight mothers (BMI<18.5 kg/m^2), 25%, and this decreased with increase in maternal BMI. Similarly, babies with LBW were prevalent (22.2%) among babies whose mother had chronic hypertension. There was a similar trend in mothers with PIH although, it was not statistically significant. Mothers who had malaria in pregnancy had lower proportion of babies with NBW [n=103 (88.8%)] and a higher number of LBW (4.3%) but these differences were not significantly significant ($p=0.060$). There was also no significant association between birthweight and GDM, pre-existing diabetes, HIV infection, urinary tract infection in pregnancy, and anaemia at booking of pregnancy.

Table 5: Relationship between birth weight and maternal socio-demographic factors.

Categories (maternal)	Birth weight			X^2	df	P value
	LBW (<2.50 kg) (%)	NBW (2.50-3.99 kg) (%)	HBW (≥4.00 kg) (%)			
Age (years)						
<20	0 (0.0)	4 (100.0)	0 (0.0)	6.093	8	0.637
20-24	0 (0.0)	16 (88.9)	2 (11.1)			
25-29	3 (3.5)	77 (90.6)	5 (5.9)			
30-34	3 (3.4)	84 (94.4)	2 (2.2)			
≥35	3 (5.0)	57 (93.4)	1 (1.6)			
Marital status						
Single	0 (0.0)	7 (100.0)	0 (0.0)	1.093	4	0.815
Married	9 (3.7)	225 (92.2)	10 (4.1)			
Engaged	0 (0.0)	6 (100.0)	0 (0.0)			

Continued.

Categories (maternal)	Birth weight			X^2	df	P value
	LBW (<2.50 kg) (%)	NBW (2.50-3.99 kg) (%)	HBW (≥4.00 kg) (%)			
Level of education of education						
No formal education	0 (0.0)	3 (100.0)	0 (0.0)	1.560	8	0.992
Primary	0 (0.0)	3 (100.0)	0 (0.0)			
Junior secondary	0 (0.0)	5 (100.0)	0 (0.0)			
Senior secondary	2 (2.8)	67 (94.4)	2 (2.8)			
Post-secondary	7 (4.0)	160 (91.4)	8 (4.6)			
Occupation						
Unemployed	1 (7.7)	10 (76.9)	2 (15.4)	12.187	6	0.058
Artisan	0 (0.0)	29 (96.7)	1 (3.3)			
Trading	1 (0.9)	105 (95.5)	4 (3.6)			
Civil servant	7 (6.7)	94 (90.4)	3 (2.9)			

X^2-Chi square; df -Degree of freedom

Table 6: Relationship between birth weight and maternal biomedical characteristics.

Categories	Birth weight			X^2	df	P value
	LBW (< 2.50 kg) (%)	NBW (2.50-3.99 kg) (%)	HBW (≥4.00 kg) (%)			
Parity						
Nulliparous	6 (5.8)	92 (89.3)	5 (4.9)	3.515	4	0.476
Multiparous	3 (2.0)	140 (94.6)	5 (3.4)			
Grand multiparous	0 (0.0)	6 (100.0)	0 (0.0)			
Height (m)						
1.45-1.59	4 (3.5)	108 (93.9)	3 (2.6)	0.918	2	0.632
≥ 1.6	5 (3.5)	130 (91.5)	7 (5.0)			
Gestational weight gain (kg)						
<7	1 (3.3)	29 (96.7)	0 (0.0)	3.013	4	0.556
7-11.5	4 (2.8)	135 (93.7)	5 (3.5)			
>11.5	4 (4.8)	74 (89.2)	5 (6.0)			
Booking BMI (kg/m^2)						
<18.5	2 (25.0)	6 (75.0)	0 (0.0)	18.482	6	0.005
18.5-24.99	5 (3.9)	121 (93.8)	3 (2.3)			
25.0-29.99	2 (3.0)	64 (94.0)	2 (3.0)			
≥30	0 (0.0)	47 (90.4)	5 (9.6)			
Chronic hypertension						
Yes	2 (22.2)	7 (77.8)	0 (0.0)	9.918	2	0.007
No	7 (2.9)	231 (93.1)	10 (4.0)			
PIH						
Yes	2 (5.4)	35 (94.6)	0 (0.0)	2.147	2	0.342
No	7 (3.2)	203 (92.3)	10 (4.5)			
History DM						
Yes	0 (0.0)	1 (100.0)	0 (0.0)	0.080	2	0.961
No	9 (3.5)	237 (92.6)	10 (3.9)			
Gestational DM						
Yes	0 (0.0)	2 (100.0)	0 (0.0)	0.161	2	0.923
No	9 (3.5)	236 (92.5)	10 (4.0)			
HIV infection						
Present	0 (0.0)	6 (100.0)	0 (0.0)	0.490	2	0.783
Absent	9 (3.6)	232 (92.4)	10 (4.0)			
Malaria in pregnancy						
Yes	5 (4.3)	103 (88.8)	8 (6.9)	5.635	2	0.060
No	4 (2.8)	135 (95.8)	2 (1.4)			
Anemia in pregnancy						
Yes	0 (0.0)	23 (92.0)	2 (8.0)	2.173	2	0.337
No	9 (3.9)	215 (92.7)	8 (3.4)			

Continued.

Categories	Birth weight			X^2	df	P value
	LBW (< 2.50 kg) (%)	NBW (2.50-3.99 kg) (%)	HBW (≥4.00 kg) (%)			
Urinary tract infection						
Yes	0 (0.0)	22 (91.7)	2 (8.3)	2.272	2	0.321
No	9 (3.9)	216 (92.7)	8 (3.4)			
Booking PCV (%)						
<30	0 (0.0)	19 (95.0)	1 (5.0)	0.841	2	0.657
≥30	9 (3.8)	219 (92.4)	9 (3.8)			
Delivery PCV (%)						
<30	0 (0.0)	12 (100.0)	0 (0.0)	1.005	2	0.605
≥30	9 (3.7)	226 (92.2)	10 (4.1)			

Significant level at p<0.05, PIH-Pregnancy induced hypertension, DM-Diabetes mellitus; HIV-Human immunodeficiency virus

DISCUSSION

A focused look at the socio-demographic and biological characteristics of the women who participated in this study revealed that most of them were married, well educated, gainfully employed, belonged to the optimal reproductive age range and were well nourished. Except that they did not receive formal preconception care, very few pregnant mothers in sub-Saharan Africa can beat this record. This profile may have resulted from the fact that, although, SHH is a faith-based health care facility, patients still pay for all the services-and many of those at the lower level of the socioeconomic rung may have been effectively kept out of their patronage. Thus, the hospital may have unintentionally selected the well-to-do as her parturient. In such a circumstance, pregnancy outcomes should be expected to be as close to optimal as possible.

The mean birth weight of the babies in this study (3.25±0.47 kg) was similar to the mean birth weight of term babies in a retrospective study in Sagamu (3180±501 gm), a suburban area close to the study location.[14] However, a lower mean birth weight was reported in a multicentre cross-sectional study in the same locality of the index study with a mean of 2.64±0.31 kg and this could be attributed to the inclusion of preterm babies in that study.[13] The higher mean birthweight in the male babies is in consonance with other studies.[14,22] This has been attributed to the effect of androgen secretion by male foetus, while in utero, on the development of high lean body mass and lower fat cells compared to the female foetuses.[22,23] Having most of the babies within the NBW range is expected considering that they were all term babies. The same reason will explain the lower rate of LBW (3.5%) recorded in this study. It is reasonable to assume that the common causes of LBW in this environment would have prevented most of such babies from getting to term. It is noteworthy that the LBW rate in this study is lower than the rate reported among term babies studied in Sagamu (5.7%).[14] This rate also met the WHO target of having rate of LBW babies below 10% of total delivery.[10]

Two factors were found to be significantly associated with birthweight in this study. Booking maternal BMI had a positive relationship with birthweight as birthweight increased with BMI. This finding is similar to other studies on birthweight where the risk of LBW was reported to be higher among women who are underweight and a better birthweight outcome in those with higher BMI.[2,10,24] Mothers with BMI of ≥ 30 kg/m^2 had a four times risk/chance of having HBW babies compared to women with normal BMI range (9.6 versus 2.3%). This finding is comparable to that of a prospective study done in Italy which reported about 3 times chance of mothers with normal BMI having babies with HBW compared with underweight mothers (5.9 versus 2.0%) with a higher rate reported among overweight and obese mothers.[25] Maternal booking BMI reflects the nutritional status of the mothers before conception. Foetal growth in utero is dependent on maternal nutrients supplied to the utero-placental bed. Malnutrition in the mothers will directly affect foetal growth and this would be reflected in the birthweights of the babies at delivery. Conversely, maternal obesity may also increase the risk of complications in affected mothers as many of them would require assisted deliveries and many may develop medical complications like anaemia and diabetes. Thus, assessing maternal BMI prior to pregnancy is essential. In the long run, gestational weight gains and corresponding birthweights (and other pregnancy outcomes) could be derived that can serve as a guide in recommending appropriate gestational weight gain for each BMI category in our locality.[25]

The presence of pre-existing hypertension in the women studied had a negative association with birthweight in this study (p=0.007). Chronic hypertension has been linked to suboptimal birth weight outcome in most studies.[16,26,27] Mothers with chronic hypertension had more babies with LBW and fewer with NBW when compared with those without chronic hypertension. Although, the proportion of LBW babies was also higher among mothers who developed PIH in this study, it was not statistically significant. The retrospective study conducted by Feresu et al in Zimbabwe also reported a 47% risk of LBW deliveries in women with chronic hypertension and this effect was reported to be more pronounced in term babies compared to the effect of PIH.[26] The reason for this was the long term effect of chronic hypertension on the blood vessels with resultant IUGR unlike the effect of

PIH/preeclampsia that is thought to be acute and with the causal effect on suboptimal weight caused more via preterm deliveries.[26] Thus, proper control of chronic hypertension prior to pregnancy is very essential in reducing the effect it will have on both the mother's health and that of her baby.

Malaria in pregnancy is an important area of concern especially in the sub-Saharan African countries as it contributed significantly to delivery of smaller babies in this region of the world.[11,28] This study, however, did not find a significant association between birth weight and malaria in pregnancy (p=0.060). Notably, the proportion of babies who had NBW was higher in women with no malaria infection in pregnancy and a higher rate of LBW babies (3.6%) occurred among the mothers who were managed for this in pregnancy. This finding agrees with that of a multi-centre study in Enugu which also reported a similar finding and this was attributed to access to preventive therapy for malaria by the mothers during ANC period.[22] This observation will also hold for the participants in the index study bearing in mind that all of them were booked for ANC in a hospital where instituting intermittent preventive therapy against malaria has become routine. Perhaps a significant difference would have been observed in the index study if a larger sample size were studied, considering the closeness of the p value obtained to 0.05.

Maternal HIV infection had no significant association with birth weight in this study (p=0.783). All HIV infected mothers in this study had babies with NBW. A similar finding was also reported in a prospective cross-sectional study in Kano where HIV positivity had no effect on LBW.[12] However, in a meta-analysis of cohort studies conducted in 2015, it was summarised that maternal HIV infection had a moderate association with LBW but no relationship was found with adverse pregnancy outcome.[29] Although, the mechanism through which HIV causes IUGR is poorly understood, it has been linked with altered immune status of the women.[29] Having all babies of mothers with HIV infection record NBW in this study could be accounted for by the ready access to prevention of maternal to child transmission (PMTCT) services available in the study centre which contributed to improved health status of these women as reflected in the babies' birth weight.

Unlike this study, most studies found a relationship between birthweight and maternal socio-demographic characteristics.[11-14] This may be attributed to the high level of maternal education and fewer numbers of teenage mothers unlike the other studies. Also, the inclusion of only mothers who had ANC could have contributed to this finding as improved socio-demographic status contributes to adoption of ANC by women[30] and, thus, did not give room for comparison with mothers who do not have access to ANC care.

The limitation of this study was that as a cross-sectional study, it could not ascertain causal relationship between birthweight and the factors associated with it. Also, the inclusion of only booked women did not give room for comparison with those who did not receive ANC in pregnancy. Additionally, the influence of BMI on birthweight may have been more pronounced if it was obtained pre-pregnancy or during the first trimester.

CONCLUSION

The study found maternal chronic hypertension and booking BMI as factors that were significantly associated with birthweight. Further, this study has shown that if Nigerian women of reproductive age would be encouraged before pregnancy to attain optimal biological and socio-demographic status-be married, become well educated, get gainfully employed, be in the optimal reproductive age range and give attention to good nutrition-then, they stand a very good chance of achieving optimal pregnancy outcomes, including having most babies in the NBW range.

Therefore, the government should continue efforts to provide quality education for our women even up to the tertiary level. Policies to provide adequate nutrition for children-and particularly the girl child-should be pursued to achieve optimal height and weight. The health systems should continue to emphasize the importance of preconception care as it is essential for the identification of women at risk and in need of appropriate intervention prior to conception.

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