

# A retrospective study of the health profile of neonates of mothers with anemia in pregnancy and pregnancy induced hypertension in Lagos, Nigeria

Olusola Funmilayo Sotunde,<sup>1</sup>

Silifat Ajoke Sanni,<sup>1</sup>

Oluseye Olusegun Onabanjo,<sup>1</sup>

Ibiyemi O. Olayiwola,<sup>1</sup> Mure Agbonlahor<sup>2</sup>

<sup>1</sup>Department of Nutrition and Dietetics;

<sup>2</sup>Department of Agricultural Economics and Farm Management, College of Agricultural Management and Rural Development, University of Agriculture, Abeokuta, Ogun State, Nigeria

## Abstract

Our study assessed the health profile of neonates in relation to anemia in pregnancy and pregnancy induced hypertension (PIH). This was a retrospective study where a systematic random sampling technique was used to select a total of 1046 case records of pregnant women registered for ante-natal care at Lagos Island Maternity Hospital, Lagos, Nigeria, between 2005 and 2009. Socio-demographic characteristics of the mothers, prevalence of anemia and PIH, and neonatal health profile were obtained from the case records and were analyzed using both descriptive and inferential statistics. Pearson product moment correlation was used to show the relationship ( $P \leq 0.05$ ) between maternal complications and neonatal health profile. Majority (68.8%) of the mothers had anemia and 6.7% had PIH. Majority (97.12%) of the neonates were live births and 2.88% of the neonates were still births, 65.4% of the women with still birth pregnancy outcome had anemia, and 34.6% had PIH. Majority (74%) of the neonates had birth weight within normal range (2.5-4.0 kg) and majority (68%) had normal Apgar score at 5 min of birth (7-10). A positive correlation existed between the packed cell volume of the mother and the birth weight of the neonates ( $r=0.740$ ,  $P \leq 0.05$ ). A negative correlation existed between the incidence of PIH and the birth weight of the neonates ( $r=0.781$ ,  $P \leq 0.05$ ), head circumference ( $r=-0.491$ ,  $P \leq 0.05$ ) and the length of the neonates ( $r=-0.480$ ,  $P \leq 0.05$ ). We conclude that nutritional and health care intervention programmes for pregnant women should be intensified especially during ante-natal visits to hospitals.

## Introduction

Pregnancy outcomes rank among the most pressing reproductive health problems in the world.<sup>1</sup> Globally, an annual estimate of 600,000 women aged 15-49 die of pregnancy-related causes, with 99 percent of these coming from the developing world,<sup>1-5</sup> and Nigeria alone accounting for 10 percent of this total.<sup>6</sup> Poor nutritional status among pregnant women has been reported to be responsible for the delivery of low birth weight babies and high incidence of anemia.<sup>7</sup> Maternal and infant mortality depend to a large extent on whether women have access to the information, education and communication resources which they need to provide themselves and their infants with adequate care.<sup>8</sup> This shows that the achievement of safe motherhood among women results from the interaction of several factors in the relevant societies. Apart from the conditions of health centers and the factors that affect their use or non-use, socioeconomic status of women has also been reported to be strongly associated with pregnancy outcomes.<sup>8</sup> Anemia in pregnancy is defined by the World Health Organization (WHO) as a hemoglobin concentration below 11 g/dL.<sup>2</sup> Anemia in pregnancy is associated with increased rates of maternal and perinatal mortality, premature delivery, low birth weight, and other adverse outcomes.<sup>7,9,10</sup> Pregnancy induced hypertension (PIH) includes gestational hypertension and preeclampsia or eclampsia. Gestational hypertension, which develops after mid pregnancy, is a maternal blood pressure of 140/90 mmHg or higher with no proteinuria. Females with gestational hypertension may develop preeclampsia, which is defined as a systolic blood pressure of 140 mmHg or higher or a diastolic blood pressure of 90 mmHg and/or a urinary protein level of 300 mg or more in a 24-h urine sample.<sup>11</sup> PIH if uncontrolled can damage the liver and kidneys, and both mother and fetus may die.<sup>11</sup> It is a high risk disorder which occurs in 5% of pregnancies.<sup>12</sup> Birth weight, head circumference, and body length of newborn infants are important clinical indicators widely used for evaluation of prenatal growth and identification of infants that require detailed assessment and close monitoring during the neonatal period. Birth weight is classified as very low birth weight (VLBW) <1.5 kg; low birth weight (LBW) 1.5-2.49 kg; normal weight 2.5-4.0 kg; and macrosomic neonates >4.0 kg.<sup>11</sup> Standard references for head circumference and birth length are 32-37 cm and 46-54 cm respectively.<sup>2</sup> The Apgar score was devised in 1952 by Dr. Virginia Apgar as a simple and repeatable method to quickly and summarily assess the health of newborn children immediately after childbirth.<sup>13,14</sup> Apgar was an anesthesiologist

Correspondence: Olusola Funmilayo Sotunde, Department of Nutrition and Dietetics, College of Food Science and Health Ecology University of Agriculture, Abeokuta (UNAAB), Ogun State, Nigeria. Tel.: +27781532055 / +2348034460056. E-mail: solaakinwande@yahoo.com

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who developed the score in order to ascertain the effects of obstetric anesthesia on babies. The Apgar score is determined by evaluating the newborn baby on five simple criteria on a scale from zero to two (0 to 2), then summing up the five values thus obtained. The resulting Apgar score ranges from zero to ten (0 to 10). The five criteria (Appearance, Pulse, Grimace, Activity, Respiration) are used as a mnemonic learning aid. The test is generally done at one and five minutes after birth, and may be repeated later if the score is and remains low. Score 3 and below are generally regarded as critically low, 4 to 6 fairly low, and 7 to 10 generally normal. However few studies have been carried out on the prevalence of these complications in relation to the health profile of the neonates in this part of Nigeria. Thus, the aim of this study was to provide information on the prevalence of these complications among pregnant women that registered for ante-natal care at Lagos Island Maternity Hospital Lagos state, Nigeria between 2005 and 2009, and the resultant effects on the neonates.

## Materials and Methods

### Study design/setting

The study is a retrospective study where data were gathered from case records of 1046 patients who registered for Antenatal care at Lagos Island Maternity Hospital, Campbell Street, Lagos between July 2005 and December 2009. The hospital which is one of the foremost maternity hospitals in Nigeria and in sub-Saharan Africa is owned by Lagos State Government. It is a specialist hospital that caters for all aspects of obstetric and gynecological problems and also a referral secondary centre for many private hospitals, other Lagos State Government Hospitals, and also from tertiary institutions from Lagos environs and other states. Data on age, occupation, marital status, religion, parity, hemoglobin/packed cell volume (PCV) values at registration, and incidence of PIH for the mothers; and birth weight, Apgar score at 5 min after birth, length and head circumference for the neonates were all gathered from the case records. Permission was sought from the hospital authority for access into patients' case records which are in the care of the head of health information and record department of the Hospital.

### Sampling selection

The antenatal department of the hospital keeps a register which has a total of 9695 pregnant women registered for ante natal care at the Hospital within July 2005 and December 2009. The systematic random sampling method with sampling interval of 9 calculated using the Kth element,<sup>15</sup> random starting point is between 0 and 9 where 6 was randomly picked which became the first number and every 9<sup>th</sup> number was used. A total number of 1046 case records were selected for the study, excluding case records of women with multiple birth pregnancies as infants of multiple birth pregnancies have a much greater risk of being born premature with intra uterine growth retardation (IUGR) or LBW than do infants of single births.<sup>11</sup> The case records selected from the register were extracted from the records department.

### Data analysis

Information gathered from the case records were immediately imputed into Excel work sheet with the help of trained research assistants. The Statistical Package for Social Sciences version 16 (SPSS; IBM Corp., Armonk, NY, USA) computer program was used to analyze the data. Descriptive statistics such as frequency and percentage tables were used to describe the distribution of pregnancy complications recorded for the period under consideration and the personal characteristics of

the women. Pearson product moment correlation was used to determine the level of relationship and their significance at 5% probability level ( $P \leq 0.05$ ).

## Results

In Table 1, 56.5% of the pregnant women were in the age range of 20-30 years, 40.2% were traders, majority (98.4%) were married, 53.7% were Christians, and majority (84.4%) of the women were between the 0-2 parity range. Table 2 shows that 68.8% of the women have anemia, while 6.7% had pregnancy induced hypertension. It also shows the classification of the anemic status of the pregnant women, PCV values were available for 1001 of the pregnant women out of which most of the women (55.25%) had mild anemia, 31.17% were not anemic, 12.39% had moderate anemia, 1.1% had severe anemia while 0.09% had very severe anemia.

In Table 3, majority (92.5%) of the women

less than 20 years old were anemic and none of them had PIH, 69.3% of the women between 20 and 30 years had anemia while 6.1% of them had PIH, 69.5% between the ages of 31 and 40 had anemia and 8.2% of them had PIH while 53.3% and 6.7% between the ages of 41 and 50 had anemia and PIH respectively. Nine hundred and four (904) singleton babies were delivered of the 1046 pregnant women as the remaining 142 mothers did not present at the hospital at the time of birth hence there was no record of the birth of the remaining 142 babies.

In Table 4, ninety-seven percent (97.12%) of the babies were born alive and 2.88% were still births. Out of the babies, 52.43% were male live births and 44.69% were female live births, with 1.44% male and female still births each.

Table 5 shows the distribution of pregnancy complications in pregnancy outcome of still birth babies, 65.4% of these pregnant women had Anemia, and 34.6% had PIH. In Table 6, majority (74.3%) of the neonates had normal birth weight, 15.3% had LBW and 6.2% had VLBW, while 4.2% had high birth weight

**Table 1. Socio-demographic data of the pregnant women.**

Variables	% (n=1046)
<b>Age group in years</b>	
<20	40 (3.8)
20-30	590 (56.5)
31-40	401 (38.3)
41-50	15 (1.4)
Total	1046 (100.0)
<b>Occupation</b>	
Traders	421 (40.2)
Artisans	151 (14.4)
Students	145 (13.9)
Professionals	236 (22.6)
Unemployed	93 (8.9)
Total	1046 (100.0)
<b>Marital status</b>	
Single	17 (1.6)
Married	1029 (98.4)
Total	1046 (100.0)
<b>Religion</b>	
Islam	478 (45.7)
Christianity	562 (53.7)
Jehovah witness	6 (0.6)
Total	1046 (100.0)
<b>Parity</b>	
0-2	883 (84.4)
3-5	157 (15.0)
>6	6 (0.6)
Total	1046 (100.0)

(macrosomia). Also, 67.9% of the neonates had normal Apgar score at 5 min of birth, 18.8% Neonates' Apgar score were critically low, while 13.3% had fairly low Apgar score.<sup>11,13,14</sup>

In Table 7, 54% of the neonates were males with mean birth weight of  $3.24 \pm 0.57$  kg, mean Apgar score of  $7.34 \pm 1.38$  at 5 min of birth, mean head circumference of  $34.90 \pm 2.41$  cm and mean birth length of  $48.46 \pm 3.07$  cm, with mean age of the mothers at  $29.43 \pm 4.91$  years while 46% of the neonates were females with mean birth weight of  $3.18 \pm 0.54$  kg, mean Apgar score at 5 min of birth of  $7.50 \pm 1.20$ , mean head circumference of  $34.51 \pm 2.40$  cm and mean birth length of  $47.62 \pm 3.62$  cm with mean age of their mothers at  $29.42 \pm 5.03$  years. As evident on the table, majority (84.4%) of the mothers were within the parity range of 0-2 with mean age of  $28.52 \pm 4.62$  years, the mean birth weight of their neonates was  $3.21 \pm 0.53$  kg, their mean Apgar score at 5 min of birth was  $7.43 \pm 1.30$ , mean head circumference of  $34.71 \pm 2.38$  cm and mean birth length of  $48.10 \pm 3.47$  cm. Also, 15% of the mothers were within the parity range of 3-5 with mean age of  $34.47 \pm 4.21$  years, the mean birth weight of their neonates was  $3.21 \pm 0.69$  kg, their mean Apgar score at 5 min of birth was  $7.39 \pm 1.27$ , mean head circumference of  $34.78 \pm 2.65$  cm and mean birth length of  $47.86 \pm 4.36$  cm. While 0.6% of the mothers' parity was greater than 6 with mean age of  $37.83 \pm 1.60$  years, the mean birth weight of their neonates is  $3.33 \pm 0.59$  kg, their mean Apgar score at 5 min of birth was  $6.17 \pm 1.69$ , mean head circumference of  $35.00 \pm 0.82$  cm and mean birth length of  $49.00 \pm 3.37$  cm.

As shown on Table 8, there was a strong positive correlation between the PCV values of the mother and the birth weight of the Neonates while there were strong negative correlations between the incidence of PIH and the birth weight, head circumference and the length of the neonates.

## Discussion

This study assessed the health profile of neonates in relation to anemia in pregnancy and PIH. A relatively high prevalence of anemia in pregnant women in the developing countries has been reported by other studies.<sup>10,16-18</sup> The 68.8% prevalence rate of anemia in pregnancy in this study is higher than 40.4% reported in Enugu, Nigeria<sup>9</sup> which is similar to the prevalence rate of 39.7% presented in a study in Benin.<sup>19</sup> Anemia in pregnancy and PIH has been shown to have the adverse relationship with birth outcome.<sup>7,9-11</sup> According to World Health Organization and Centers for Disease Control and Prevention,<sup>20</sup> one major

**Table 2. Prevalence of pregnancy complications among the women and classification of anemia incidence among the pregnant women.**

Complication	Frequency	%	
Anemia	689	68.83	
PIH	70	6.7	
Classification of anemia	Hemoglobin value (g/dL)	Frequency	%
Very severe anemia	<4	1	0.09
Severe anemia	4-7	11	1.1
Moderate	7.1-9.0	124	12.39
Mild	9.1-10.99	553	55.25
Non anemic	11 and above	312	31.17
Total		1001	100.0

PIH, pregnancy induced hypertension.

**Table 3. Prevalence of pregnancy complications according to the age group of mothers ( $\pm$ standard deviation).**

Age range of pregnant women (years)	Anemia incidence (%)	Pregnancy induced hypertension incidence (%)
<20	92.5	0
20-30	69.3	6.1
31-40	69.5	8.2
41-50	53.3	6.7

**Table 4. Distribution of pregnancy outcome of mothers.**

Pregnancy outcome	Gender	Frequency	Percentage (%)
Live birth	Male	474	52.43
	Female	404	44.69
	Total	878	97.12
Still birth	Male	13	1.44
	Female	13	1.44
	Total	26	2.88
Total no. of neonates		904	100

**Table 5. Frequency of complications that resulted in still birth.**

Complications	Frequency	Percentage
Anemia	17	65.4
Pregnancy induced hypertension	9	34.6

**Table 6. Distribution of the neonates according to birth weight and Apgar score.**

Variables	Frequency	Percentage
Range of birth weight of neonates*		
Very low (<1.5 kg)	56	6.2
Low (1.5-2.49 kg)	138	15.3
Normal (2.5-4.00kg)	672	74.3
Macrosomic (>4.01 kg)	38	4.2
Total	904	100.0
Range of Apgar score**		
Critically low (<3)	170	18.8
Fairly low (4 to 6)	120	13.3
Normal (7 to 10)	614	67.9
Total	904	100.0

\*Mahan and Escott-Stump<sup>11</sup>; \*\*Apgar,<sup>13</sup> Finster.<sup>14</sup>



**Table 7. Health profile of the neonates according to sex and parity ( $\pm$ standard deviation).**

Variable	Frequency	Percentage	Mean birth weight of neonate (kg)	Mean Apgar score of neonate at 5 min of birth	Mean head circumference of neonate (cm)	Mean length of neonate (cm)	Mean age of mother (years)
<b>Gender</b>							
Female	416	46.0	3.48 $\pm$ 0.54	7.50 $\pm$ 1.20	34.51 $\pm$ 2.40	47.62 $\pm$ 3.62	29.42 $\pm$ 5.03
Male	488	54.0	3.24 $\pm$ 0.57	7.34 $\pm$ 1.38	34.90 $\pm$ 2.42	48.46 $\pm$ 3.07	29.43 $\pm$ 4.91
Total	904	100.0	-	-	-	-	-
<b>Parity</b>							
0-2	883	84.4	3.21 $\pm$ 0.53	7.43 $\pm$ 1.30	34.71 $\pm$ 2.38	48.10 $\pm$ 3.47	28.52 $\pm$ 4.62
3-5	157	15.0	3.21 $\pm$ 0.69	7.39 $\pm$ 1.27	34.78 $\pm$ 2.65	47.86 $\pm$ 4.36	34.47 $\pm$ 4.21
>6	6	0.6	3.33 $\pm$ 0.59	6.17 $\pm$ 1.69	35.00 $\pm$ 0.82	49.00 $\pm$ 3.37	37.83 $\pm$ 1.60
Total	1046	100.0	-	-	-	-	-

**Table 8. Correlation analysis.**

Variables	Packed cell volume values of mother in pregnancy			Pregnancy induced hypertension incidence		
	r	P	Decision	r	P	Decision
Birth weight	0.740*	0.027	Reject H <sub>0</sub>	-0.781**	0.00	Reject H <sub>0</sub>
Apgar score	0.019	0.583	Accept H <sub>0</sub>	-0.019	0.581	Accept H <sub>0</sub>
Head circumference	0.025	0.469	Accept H <sub>0</sub>	-0.491**	0.001	Reject H <sub>0</sub>
Length	0.046	0.173	Accept H <sub>0</sub>	-0.480**	0.000	Reject H <sub>0</sub>

\*Correlation is significant at the 0.05 level (2-tailed); \*\*correlation is significant at the 0.01 level (2-tailed).

concern about the adverse effects of anemia on pregnant women is the belief that this population is at greater risk of perinatal mortality and morbidity. Our study also has observed an association between maternal anemia in pregnancy with LBW babies and perinatal mortality. Maternal anemia was present in the majority of the birth outcome that resulted in still births, while anemia was responsible for only 3.8% of still births recorded in a study in Jos, Nigeria.<sup>21</sup> The anemic women had lower birth weight babies whereby the severity of the anemia corresponds with the birth weight of the neonates in contrast to the Benin study where maternal anemia at delivery had no correspondence to the birth weight of the neonate.<sup>19</sup> The prevalence rate of PIH in this study is similar to what has been reported in an American study,<sup>22</sup> while two South African studies reported a higher rate of 12%<sup>23</sup> and 18%.<sup>24</sup> Preeclampsia and eclampsia has been linked to fetal death<sup>11</sup> and this can be one of the reasons why about one third of the mothers who had PIH had still births, while a lower percentage of 6.7 was recorded for still born outcome due to PIH in the Jos study.<sup>21</sup> This present study further corroborates the results of other studies that PIH causes IUGR and LWB neonates.<sup>25,12</sup> In a study in Benin City, Nigeria, PIH was the most significant risk factor identified for low birth weight among term singletons,<sup>25</sup> which supports the strong negative cor-

relation between the incidence of PIH and birth weight of the neonate reported in our study. Our study has some limitations, firstly, the gestational age at onset of hypertension in pregnancy and the particular PIH spectrum that were observed were not included in this present study. Secondly, the research was only carried out at one centre therefore conclusions are theoretically limited to this centre. Thirdly, as it is a retrospective study, the information recorded in the case records is our data source for this study therefore our findings will require confirmation in a prospective study.

## Conclusions

This study has showed that anemia in pregnancy and pregnancy induced hypertension are still major problems in Nigeria, as it carries significant risk to mothers and fetus. Hence, the prevention of anemia through health-facility based approach and control package alone may not be effective in combating anemia among pregnant women. Approaches that integrate health and nutrition education into poverty eradication strategies coupled with education on hematinic drug compliance need to be designed, confirmed and adopted, while the importance of constant monitoring should be reiterated for women with PIH.

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