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Anthropometric parameters of new born babies in a private hospital, southeast Nigeria

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Abstract

Background: Anthropometric parameters are predictive of outcomes in neonatal period and infancy. There is paucity of information on babies' birth length and head circumference. The aim of this work is to describe the anthropometric parameters of term babies delivered in a private hospital southeast Nigeria. **Materials and methods:** This is a retrospective descriptive study. Data on babies' head circumference (HC), weight and length were retrieved from delivery records and analyzed with SPSS version 20. Results are presented as prose and tables. **Results:** There were 823 full-term singleton live deliveries. Out of that, 439, 53.34%, are males and 384, 46.86%, are females. Mean HC is 34.39 ± 1.74 cm. Males have higher HC than females, 34.39 ± 1.74 cm and 34.11 ± 1.76 cm respectively. Mean birth weight is 3.28 ± 0.48 kg and males weigh more than females, 3.31 ± 0.50 kg and 3.25 ± 0.48 kg respectively. Males are longer than females with birth lengths of 50.07 ± 2.54 cm and 49.64 ± 2.39 cm respectively. Mean HC is similar to the Nigerian standard but bigger than the international standard. Mean birth length is higher than the international standard. There is no difference between mean birth weight obtained from this study and the international standard. **Conclusion:** HC from this study is consistent with Nigerian standard but higher than international standard. Males weigh more than females, are longer and have larger head circumference. The average newborn from this study has larger head circumference and longer birth length than international standard.

Keywords: Anthropometric parameters, New born babies, Retrospective descriptive study.

INTRODUCTION

Intrauterine wellbeing reflects on head circumference, weight and length of babies at birth. These anthropometric measurements are predictive of outcomes in neonatal period and infancy. They can also predict long term morbidity and mortality of the baby.

Baby's head circumference, HC, is a measure of the size of baby's head. HC reflects brain development. It is important to the Obstetrician, Pediatrician and Physician (Neurologist). Three factors affect the mechanism of labor: the 'power', 'passenger' and 'passage' [1]. 'Power' represents the mother, 'passenger', the fetus and 'passage', the birth canal. The most important characteristic in the passenger that affects delivery is the head circumference hence Ayinde and Omigbodun concluded in their work that fetal head circumference may be useful in predicting the likely mode of delivery especially in the nullipara [2]. As far back as 1785, Clarke noticed that males were more often stillborn than females and believed it was because their heads were larger than the female newborn heads and this could pose more hazards in delivery of males. He became the first to measure head circumference of newborn babies [3].

Brain volume increases dramatically within the last trimester and first two years of life [4]. HC at birth can thus be a proxy to assess intrauterine brain growth. HC correlates with brain volume and this is the reason why neurological assessment in infancy includes measurement of HC [4]. When HC is outside the normal range, it can be a risk factor of cognitive and motor delays [5-7]. Microcephaly may be significant risk factor for epilepsy, cerebral palsy, intellectual disability, developmental delay, eye and ear disorders [8]. Macrocephaly may be due to hydrocephalus and may be associated with disorders like dwarfism, neurofibromatosis and tuberous sclerosis [9].

Birthweight is a known predictor of postnatal survival [10, 11]. It is classified into low (<2.5kg), normal (2.5 kg – 3.99 kg) and high (≥ 4.0 kg) [12, 13]. Low and high birthweight have increased risk and complications such as asphyxia and birth trauma [14-16]. Baby's length is also of prognostic value. Very long babies have higher risk of perinatal death than babies of normal length [17, 18]. An underweight baby with normal length has less risk of morbidity and mortality than a low birthweight baby with short length [17, 19]. Either way, too long or too short babies have higher risk of morbidity than normal length babies.

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There are international standards for newborn weight, length and HC. The international mean HC is 33.9 ± 1.3cm [20]. This study by International Fetal and Newborn Growth Consortium for the 21st Century (INTERGROWTH-21st) also produced mean birthweight and mean length of 3.3 ± 1.3kg and 49.3 ± 1.8cm respectively. The study included populations from Brazil, Ghana, India, Norway, Oman and USA. It did not include Nigeria [20]. Pam *et al*. produced a standard head circumference with Nigerian variables that could be used for Nigerians [21]. It was from a large data set collected over a period of 10 years from a teaching hospital in Jos, Nigeria. They got mean HC value of 34.4 ± 2.1cm (males 34.6 ± 2.16 cm and females 34.1 ± 2.02 cm [21].

Much work has been done on birthweight but there is paucity of information on babies' birth length and head circumference. Most publications have been from public tertiary institutions. The private sector where many deliveries take in Nigeria rarely contribute to scientific literature. The aim of this work is to describe the anthropometric parameters of term babies delivered in a private hospital southeast Nigeria and to compare the HC of newborn babies with the standard produced by Pam *et al*. and international standard. The objectives are to:

1. Determine the head circumference, weight and length of babies born in a private hospital in Anambra State of Nigeria.
2. Compare the head circumference with the standard set by Pam *et al*. and INTERGROWTH-21st.
3. Compare head circumference of male and female newborns to determine if there is any difference.

MATERIALS AND METHODS

This is a retrospective descriptive study carried out at Obinwanne Hospital and Maternity, a 30-bed health facility that offers primary and secondary care in Nkpor, an urban town in Idemili North Local Government Area of Anambra State of Nigeria. Nkpor is a neighboring town to Onitsha, the commercial center of Anambra State. The hospital has three medical officers and thirty nursing and clerical staff. It has delivery rate of about 400 yearly. Data were retrieved from delivery records from January 1, 2018 to December 31, 2019, a two-year period. The variables extracted are babies' HC, weight and length. Full term-newborn babies mean babies born within 37 and 42 completed weeks of gestation. The gestational age is calculated from the date of the first day of last menstrual period or from the gestational age obtained from scan done during the first trimester of pregnancy. HC is measured by the same medical doctor working in the hospital within 24 hours of birth using an inelastic tape. The tape is passed above the supra-orbital ridges in front, above the ears across to the maximum occipital prominence at the back of the head [21]. It is recorded to the nearest 0.1 cm. The weight, to the nearest 0.01kg, is measured with electric weighing scale that incorporates an infantometer, (seca, mod. 321, CE 0123, made in Germany). The length, from crown to the heal by gently but firmly extending the knee joints and soles of the feet held against the footboard, was measured to the nearest 0.1 cm [22]. Data were analyzed with SPSS version 20 [23]. Results are presented as prose and tables. P-values < 0.05 are taken as significant.

Ethical approval

This study was with secondary data and did not involve live patients. However, strict confidentiality was maintained so as not to divulge privileged information. The study was approved by the ethical committee of Chukwuemeka Odumegwu Ojukwu University Teaching Hospital, Amaku, Awka. No: COOUTH/CMAC/ETH.C/Vol.1/FN.04/0022.

RESULTS

There were 823 full-term singleton live deliveries that met the inclusion criteria. Out of that, 439, 53.34%, are males and 384, 46.86%, are females. The mean head circumference is 34.39 ± 1.74 cm. Males have mean HC of 34.63 ± 1.68 cm and females 34.11 ± 1.76 cm. Males have significantly higher HC than females. Overall mean birth weight is 3.28 ± 0.48 kg and males weigh significantly more than females, 3.31 ± 0.50 kg and 3.25 ± 0.48 kg respectively. Similarly, males are significantly longer than females with birth lengths of 50.07 ± 2.54 cm and 49.64 ± 2.39 cm respectively. See Table 1.

Table 1: Birth weight, length and head circumference of newborns stratified by gender

Variable	All (N = 823)	Male (n = 439)	Female (n = 384)	P-value
Weight kg (sd)	3.28 (0.49)	3.31 (0.50)	3.25 (0.48)	0.031
Birth length cm (sd)	49.86 (2.48)	50.07(2.54)	49.64 (2.39)	0.006
HC cm (sd)	34.39 (1.74)	34.83 (1.68)	34.11 (1.76)	<0.001

HC is head circumference, sd is standard deviation.

If the standard generated by Pam *et al*. from their study at Jos University Teaching Hospital (JUTH) is taken as Nigerian standard, then the mean head circumference obtained from this study is similar to the Nigerian standard p=0.873, but is significantly bigger than the international standard p<0.001. Similarly, the mean birth length obtained from this study is significantly higher than the international standard, p<0.001. There is no significant difference between mean birth weight obtained from this study and the international standard, p=0.231. See Table 2 and Table 3

Table 2: Comparison of head circumference of newborns at JUTH (Nigerian Standard) and study site values.

Variable	Study site value N = 823	Nigerian standard n = 18,282	p-value
HC (sd)	34.39 (1.74)	34.4 (2.1)	0.873

Table 3: Comparison of birth weight, birth length and head circumference of study site values and international standards

Variable	Study site value N = 823	International standard N = 20,486	p – value
Birth weight	3.28(0.49)	3.3(0.5)	0.231
Birth length	49.87(2.48)	49.3(1.8)	<0.001
HC	34.39(1.74)	33.9(1.3)	<0.001

DISCUSSION

Much work has been done on newborn anthropometric parameters but few concentrated on head circumference. This study obtained a mean HC of 34.39 ± 1.74 cm and it is similar to report of 34.4 ± 2.1 cm from Jos [21], 34.6 cm from Lagos [24] and 34.8 cm from Ibadan [2] but less than that from Enugu, 35.29 cm [25]. If the report of Pan et al. [21] is regarded as Nigerian standard then our report is consistent with Nigerian standard. However, the result is higher than the international standard. INTERSWITCH got a mean HC of 33.19 ± 1.3cm as international standard [20] and WHO multicenter Growth Reference Group obtained an earlier international standard of 34.2 ± 1.3cm [26]. Our result is also higher than reports from Malaysia, 32.748 ± 1.3197 cm [27] and India 32.77 ± 1.55 cm [22]. It does seem that Nigerian newborns have bigger head circumference than international standards. This may be due to ethnic differences. Pediatricians ought to be aware of this so as not to misclassify microcephaly and macrocephaly. This result highlights the need for local ethnic growth charts and standards to be used for specific ethnic localities.

Males have bigger HC than females [2, 3, 28, 29]. Our report also shows that males have significantly bigger HC than females. Generally, males

weigh heavier than females [30, 31]. Our finding is consistent with this knowledge. The mean birth weight is found to be 3.28 ± 0.49 kg, males 3.31 ± 0.50kg and females 3.25 ± 0.48kg.

This report found length of males significantly more than that of females. This is similar to the findings of Oluwafemi *et al*. [24] but higher than the international standard as obtained by Villar *et al*. [19]. From Table 3, our report shows that the HC and birth lengths are higher than the international standards though there is no difference in the mean birth wights. Our study did not include chest and abdominal circumferences. If Nigerian newborns are longer and have larger head circumference but same birth weight with international standard, it may be that they have smaller chest circumference and or smaller abdominal girth. More studies will be needed to ascertain this hypothesis.

CONCLUSION

Head circumference from this study is consistent with Nigerian standard but higher than international standard. Males weigh more than females, are longer and have larger head circumference. The average newborn from this study has larger head circumference and longer birth length than international standard.

Recommendation

More studies are needed to determine if truly Nigerian newborns have bigger head circumference and are longer than international standards and reasons for such deviations. Pediatricians ought to be aware of this so as not to misclassify microcephaly and macrocephaly.

This result highlights the need for generation of local ethnic growth charts and standards to be used for specific ethnic localities.

Conflict of interest

The authors declare no conflict of interest.

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