ANTHROPOMETRIC MEASUREMENTS OF NEWBORNS IN LADY READING HOSPITAL

Mohsin Hayat, Mohammad Irshad, Syed Kaleem ur Rehman, Muhammad Hussain, Musa Kalim

ABSTRACT

Objective: Determination of anthropometric variables of newborns in a tertiary care hospital

Methodology: This cross sectional study was conducted in Neonatology unit of Pediatric Department, Lady Reading Hospital, Peshawar, from September 2013 to January 2014. A total of 201 full term, normal and singleton neonates were included. Different anthropometric variables like weight, length, occipito frontal, mid arm, chest and abdominal circumferences were recorded within 72 hours of birth.

Results: Overall mean birth weight, head circumference, crown-heel length, mid-arm circumference, chest circumference and abdominal circumference of the study were 2.95kg, 33.95cm, 49.07cm, 9.48cm, 30.83cm and 28.32cm. Corresponding mean values of male neonates were 2.97kg, 34.00cm, 49.22cm, 9.45cm, 30.93cm and 28.50cm and female neonates were 2.90kg, 33.84cm, 48.70cm, 9.34cm, 30.61cm and 27.90cm respectively.

Conclusion: Male neonates were lengthier with larger head circumference and abdominal circumference than female neonates at birth. However, mean birth weight was found to be almost equal with slight difference in mid arm and chest circumferences.

Key Words: Anthropometry, Newborns, Measurements.

INTRODUCTION

Anthropometric measurements have been remarkably changed over the centuries due to geographical, cultural, genetic and environmental factors as well as worldwide mingling of races. It is the basic technique that deals with the study of body proportions and dimensions.[1] The assessment of neonatal body composition is essential for understanding nutritional status, growth and development of diseases later in life.[2]

Newborns at risk are screened by anthropometric measurements as fetal hypotrophy and hypertrophy are known factors of increased perinatal mortality.3 Fetal, maternal, placental and environmental factors may all influence growth. Periodic measurements of anthropometric variables in different populations and regions of a country reflect changes in children's nutrition and health status and is a reliable tool to evaluate social health.[4]

Commonly used anthropometric measurements as indices of growth and development for infants include weight, length, and head circumference.[5] Mid-arm and chest circumferences have been demonstrated as anthropometric surrogates of birth weight in different studies.[6]

Globally, about one-sixth of all newborns are low birth weight (LBW, <2500 grams), which is single most important underlying risk factor for neonatal deaths. Most newborns in developing countries die at home while they are being cared by mothers, relatives, and traditional birth attendants. Only about half of them are weighed at birth.[7]

Measurements of weight, height and head circumference at any given time will indicate the status of a child with respect to other children of the same age, though sequential measurements are more indicative of growth potential of each child.

All health personnel involved in pediatric care should be sufficiently familiar with the normal patterns of growth in order to recognize minor deviations from the normal range as early as possible.[8]

The present study aimed at identification of various anthropometric variables in normal healthy neonates at birth which can be used in future to draw a growth chart.

MATERIALS AND METHODS

This cross-sectional study was carried out in Neonatology Unit of Pediatric department, Post graduate medical institute, Lady Reading Hospital, Peshawar, from September 2013 to January 2014 and completed in five months. Two hundred and one live born, full term, singleton babies with no congenital anomalies and dysmorphic features were included. Newborns of women diagnosed with gestational diabetes mellitus, hypertension or pre eclampsia were excluded. An informed consent was obtained from mothers to examine their babies. Gestational age was calculated from the

Address For Correspondence:
Dr. Mohsin Hayat
Senior Registrar, Paeds "B" Unit
Lady Reading Hospital Peshawar
Cell# 03349077238
E-mail Address: mohsin_hayatsafi@yahoo.com

last menstrual period, first trimester ultrasonography and post- natal examination of newborns with clinical scoring using modified Ballard method. Anthropometric measurements were taken within 72 hours of birth and two consecutive measurements with mean values were recorded for each variable. Babies were weighed naked in supine position on infant weighing scale which was calibrated daily by known standard weight. Crown-heel length was measured on infantometer with the baby supine, knees fully extended, soles held firmly against foot board and head touching the fixed board. Head circumference was measured around maximum occipitofrontal circumference. Mid upper-arm circumference was taken at the mid- point between tip of acromion process and olecranon process in left upper arm. Chest circumference was measured at nipple level at the end of expiration. Abdominal circumference was measured at the level of umbilicus. All the circumference measurements were taken with a plastic, non-stretchable measuring tape. All these informations were entered into a structured proforma and analyzed using SPSS version 16.0 for windows.

RESULTS

This study included 201 full term neonates of whom there were 140 male and 61 female neonates. The mean birth weight, head circumference, crown-heal length, mid-arm circumference, chest circumference and abdominal circumference of the study were 2.95kg (SD 0.4249), 33.95cm (SD 1.4095), 49.07cm (SD 2.4213), 9.48cm (SD 0.9952), 30.83cm (SD 2.0206), 28.32cm (SD 2.2746) respectively (Table 1).

The mean birth weight, head circumference, crown-heel length, mid-arm circumference, chest circumference and abdominal circumference of male neonates were 2.97kg, 34.00cm, 49.22cm, 9.45cm, 30.93cm and 28.50cm. Corresponding mean values of female neonates were 2.90kg, 33.84cm, 48.70cm, 9.34cm, 30.61cm and 27.90cm respectively (Table 2).

There was not much difference in mid-arm and chest circumferences, while the mean weight was found to be almost equal in male and female neonates. Males were taller with larger head and abdominal circumferences as compared to female neonates.

DISCUSSION

Anthropometric measurements of growth parameters form an integral part of pediatric practice and research. It is important to know the norms of basic parameters in order to recognize abnormalities when they arise.

The mean birth weight (2.95 kg), occipito frontal circumference (33.95 cm) and crown-heel length (49.07 cm) of our study were compared with a local study by Ashraf S et al [9] who found mean values of 2.89 kg, 34.23 cm and 48.24 cm respectively. As evident, mean values of birth weight and OFC are almost comparable because both studies included full term and healthy neonates. However the difference in mean length is significant which might be not only due to large sample size of our study population but also because Ashraf S et al studied only the urban neonates of Karachi. In a study by Bertino E et al[10], boys were found to be heavier than girls in contrast to our study where mean birth weight of

Table 1: Growth parameters of full term neonates (n=201)

Variables	Minimum	Maximum	Mean	Std.Deviation
Weight (kg)	1.9	4.2	2.9552	0.42495
OFC (cm)	29.00	37.70	33.9537	1.40950
Length (cm)	34.00	55.00	49.0716	2.42139
MAC (cm)	6.00	13.00	9.4184	0.99529
CC (cm)	25.10	35.10	30.8343	2.02061
AC (cm)	22.00	35.00	28.3269	2.27466

OFC = Occipito frontal circumference; MAC = Mid-arm circumference;
CC = Chest circumference; AC = Abdominal circumference

Table 2: Gender Distribution of Growth parameters (Mean values)

Gender	OFC	Weight	Length	MAC	CC	AC
Male	34.00 SD 1.424	2.97 SD 0.421	49.22 SD 2.175	9.45 SD 1.027	30.93 SD 1.938	28.50 SD 2.198
Female	33.84 SD 1.381	2.90 SD 0.432	48.70 SD 2.896	9.34 SD 0.921	30.61 SD 2.199	27.90 SD 2.40

OFC = Occipito frontal circumference; MAC = Mid-arm circumference
CC = Chest circumference; AC = Abdominal circumference
SD = Standard deviation

male and female neonates is almost equal. Their study included thousands of babies of Italian origin only.

The mean chest circumference recorded by Mullany LC et al[11] was 31.6 cm, while we found it to be 30.8 cm. There is clear difference in methodology as they measured it at mid expiration and we measured it at the end of expiration. Moreover, their study population consisted only of neonates from rural areas.

Yajnik CS et al[12] compared term babies in six villages of India with babies in Southampton, UK. The mid upper arm circumferences were 9.7 cm (rural India) and 11.5 cm (UK). Abdominal circumference was found to be 28.6 cm (rural India). The mean MAC (9.4cm) and AC (28.3 cm) of our study are not much different from those of rural Indian babies as we belong to same geographical area, similar nutritional status and socio economic conditions. Higher MAC values of babies in Southampton, UK are explained by their white Caucasian race and birth in an industrialized country.

In a study from United States by McGrath Jhon J et al[13], the finding of OFC (34.0 cm) was similar, with considerable differences in weight and length as their babies were heavier (3.33 kg) and taller (50.55 cm) than ours. They studied a larger population in four different seasons of the year to see the impact of seasonal fluctuation on anthropometric variables while we completed our study in four months.

Among the anthropometric variables, chest circumference has been proposed as the best surrogate of birth weight by Dhar B et al[14] who found almost same mean birth (2.88 kg). This study conducted in Dhaka, Bangladesh aimed at finding the appropriate proxy index for birth weight and included both term and preterm neonates. However in another study, Muthayya S et al[15] concluded that birth weight (mean = 2.80 kg) was significantly related to the triceps and sub scapular skin fold thickness of babies.

In contrast to our study, Bradley P et al[16] measured a larger mean abdominal circumference of 30.8 cm because they included infants of women with hypertention, diabetes mellitus and gestational diabetes as well.

A cross-sectional study was under taken by Khalanda B.F et al[17] in southern Malawi where malaria transmission is holoendemic. Mean anthropometric values of Malwian and Swedish newborns were compared. Results of birth weight and OFC were parallel to us but lower than Swedish babies. It was proposed that maternal malaria was responsible for fetal growth restriction.

CONCLUSION

It is concluded from this study that males are lengthier with larger head circumference and abdominal circumference than female neonates, although with the same weight at birth.

Determination of these basic anthropometric variables requires accurate and reproducible measurements using standardized techniques.

Different charts for male and female babies should be employed, not only for the meaningful assessment of health and nutritional status but also for early detection of deviation from normal growth pattern.

REFERENCES

1. Koirala S, Shah S, Baral P. A comparative anthropometric study of mongoloid and Tharu ethnic races in Eastern Nepal. Webmedcentral 2012;3(6):WMC003512.
2. Deierlein AL, Thornton J, Hull H, Paley C, Gallagher D. An anthropometric model to estimate neonatal fat mass using air displacement plethysmography. Nutr Metab (Lond) 2012;9:21.
3. Roje D, Banovic I, Tadin I, Vucinović M, Capkun V, Barisic A, et al. Gestational age--the most important factor of neonatal ponderal index. Yonsei Med J 2004;45(2):273-80.
4. Telatar B, Comert S, Vitrinel A, Erginöz E. Anthropometric measurements of term neonates from a state hospital in Turkey. East Mediterr Health J 2009;15(6):1412-9.
5. Shajari H, Marsoosy V, Aslani M, Mohammady MR. Heshmaty P. The effect of maternal age, gestational age and parity on the size of the newborn. Acta Med Iran 2006;44(6):400-4.
6. Sajjadian N, Shajari H, Rahimi F, Jahadi R, Barakat M. Anthropometric measurements at birth as predictor of low birth weight. Health 2011;3(12):752-6.
7. Sreeramareddy CT, Chuni N, Patil R, Singh D, Shakya B. Anthropometric surrogates to identify low birth weight Nepalese newborns: a hospital-based study. BMC Pediatr 2008;8:16.
8. Alshemeri KDH. Some anthropometric measurements of normal full term newborns at birth. Iraq Postgrad Med J 2008;7(1):6-11.
9. Ashraf S, Abbas K, Rahman AJ. Anthropometric measurements: newborns in urban Karachi population. Professional Med J 2012;19(2):150-4.
10. Bertino E, Spada E, Occhi L, Coscia A, Giuliani F, Gagliardi L, et al. Neonatal anthropometric charts: the Italian neonatal study compared with other European studies. J Pediatr Gastroenterol Nutr 2010;51(3):353-61.
11. Mullany LC, Darmstadt GL, Khatry SK, Leclerq SC, Tielsch JM. Relationship between the surrogate anthropometric measures, foot length and chest circumference and birth weight among newborns of Sarlahi, Nepal. Eur J Clin Nutr 2007;61:40-6.
12. Yajnik CS, Fall CH, Coyaji KJ, Hirve SS, Rao S, Barker DJ, et al. Neonatal anthropometry: the thin-fat Indian baby. The Pune Maternal Nutrition Study. Int J Obes Relat Metab Disord 2003;27(2):173-80.

13. McGrath JJ, Saha S, Lieberman DE, Buka S. Season of birth is associated with anthropometric and neurocognitive outcomes during infancy and childhood in a general population birth cohort. Schizophr Res 2006;81(1):91-100.

14. Dhar B, Mowlah G, Nahar S, Islam N. Birth-weight status of newborns and its relationship with other anthropometric parameters in a public maternity hospital in Dhaka, Bangladesh. J Health Popul Nutr 2002;20(1):36-41.

15. Muthayya S, Dwarkanath P, Thomas T, Vaz M, Mhaskar A, Mhaskar R, et al. Anthropometry and body composition of south Indian babies at birth. Public Health Nutr 2006;9(7):896-903.

16. Stetzer BP, Thomas A, Amini SB, Catalano PM. Neonatal anthropometric measurements to predict birth weight by ultrasound. J Perinatol 2002;22(5):397-402.

17. Kalanda BF, van Buuren S, Verhoeff FH, Brabin BJ. Anthropometry of Malawian live births between 35 and 41 weeks of gestation. Ann Hum Biol 2005;32(5):639-49.

ONLINE SUBMISSION OF MANUSCRIPT

It is mandatory to submit the manuscripts at the following website of KJMS. It is quick, convenient, cheap, requirement of HEC and Paperless.

Website: **www.kjms.com.pk**

The intending writers are expected to first register themselves on the website and follow the instructions on the website. Author agreement can be easily downloaded from our website. A duly signed author agreement must accompany initial submission of the manuscript.