SJIF Impact Factor: 6.711

WORLD JOURNAL OF ADVANCE HEALTHCARE RESEARCH

ISSN: 2457-0400
Volume: 8.
Issue: 11
Page N. 50-57
Year: 2024

Original Article www.wjahr.com

ANTHROPOMETRIC MEASUREMENTS OF TRUNK AND LIMB DIMENSIONS IN NEWBORNS FROM MOSUL, IRAQ

Omar Akram Qassim*, Bassam Najem Abo and Abdul Aziz Zauba Mansour*****

*M. B. Ch. B. - D.C.H, Al-Shabkhoun PHC, Nineveh Directorate of Health, Mosul, Nineveh, Iraq.
**M. B. Ch. B. - D.C.H, Alhadba'a PHC, Nineveh Directorate of Heath, Mosul, Nineveh, Iraq.
***FIMS. CABP, Al-Khanssa Teaching Hospital, Nineveh Directorate of Heath, Mosul, Nineveh, Iraq.

Article Received date: 28 August 2024 **Article Revised date:** 18 September 2024 **Article Accepted date:** 08 October 2024

***Corresponding Author: Omar Akram Qassim**

M. B. Ch. B. - D.C.H, Al-Shabkhoun PHC, Nineveh Directorate of Health, Mosul, Nineveh, Iraq.

ABSTRACT

Anthropometric measurements play an important role in assessing the physical growth and development of newborns, especially in identifying any unusual features. This study aims to establish normal values for trunk and limb measurements in full-term Iraqi newborns. We carefully collected ten different measurements from 100 newborns (46 males and 54 females) within the first 24 hours after birth, ensuring that only those meeting specific criteria were included. Newborns who did not meet these criteria were excluded from the study. For each measurement, we calculated the means and standard deviation (SD) and created standardized curves to show the distribution. The results show significant differences between males and females in all measurements. The study shows that Iraqi newborns have unique physical features. This means we need to create growth charts that are specific to this region.

KEYWORDS: Anthropometric measurements; Newborns; Birth weight; Crown-heel length; Head circumference.

INTRODUCTION

In anthropology, measuring different parts of the human body, not just height, is common practice. This is because understanding how the body develops is a key focus in the field.[1] These measurements, known as anthropometry, are important for identifying unusual physical traits in children.[2] They are especially useful for genetic specialists in diagnosing various diseases. Measuring newborns is a valuable research tool for studying the factors that affect fetal growth, whether it's too slow or too fast.[3] The differences in these measurements can be influenced by factors like where people live, their ethnic background, and their economic situation. Therefore, it's important for each society to develop its own standard measurements that take these differences into account.[4,5]

Carefully measuring a newborn's weight, height, and head circumference is an essential part of their routine check-up. These measurements are key indicators of a baby's health and development. Tracking birth weight is especially important for identifying infants who are at higher risk, setting normal standards, and monitoring changes over time.[6,7] Babies born with low birth weight (LBW) who survive the early stages are at risk for delayed physical and mental development. Therefore, it's vital to quickly identify and refer these LBW newborns for care to reduce the chances of neonatal deaths. In less-resourced areas, improving care for LBW infants can lower neonatal deaths by 20% to 40%.[8,9]

Measuring a baby's height, head circumference, and other body dimensions provides important information about their bone growth, brain development, and overall health. These measurements help doctors monitor growth, detect problems early, and address any developmental concerns. For babies with unusual features, thorough measurements are crucial for accurately assessing and managing their development. This approach is key to preventing and treating growth-related health issues in newborns.

Dysmorphology, a branch of genetics, focuses on studying birth defects that affect physical appearance.[10] This field is crucial for assessing infants with unusual physical traits and abnormalities.[11] In our study, we follow three key steps for taking measurements: using well-known body landmarks, using simple methods with

standard tools, and comparing the results to growth charts adjusted for age and sex. We have created growth charts for ten measurements in healthy, full-term newborns from Iraq. These charts help doctors distinguish between normal variations and signs of dysmorphic features.[12] Dysmorphology has grown significantly, with more malformation syndromes identified in recent years.[13,14] The main goal in assessing children with these structural issues is to make an accurate diagnosis. This diagnosis is important for informing parents about the chances of recurrence, giving insight into the child's future development, and planning treatments that support the child's potential.[14]

The purpose of this study is to establish normal standards for trunk and limb measurements in Iraqi newborns. These standards will help in evaluating newborns, especially those with unusual features, by providing a baseline for comparison.

SUBJECTS AND METHODS

In this study, we included 100 healthy, full-term Iraqi newborns (46 males and 54 females). The babies were brought to our private medical clinics regularly between April 2022 and April 2024. To determine the babies' due dates and gestational ages, we mainly relied on the mothers' reports of the first day of their last menstrual period, supported by ultrasound data when available, and confirmed through clinical checks.[15] We excluded twins, babies of diabetic mothers, and newborns with major birth defects from the study. Also, we did not measure length or head circumference in newborns with conditions like caput succedaneum or cephalohematoma, as these could affect the accuracy of these measurements.

We took measurements within 24 hours after birth, covering several key body measurements: length, weight, head circumference, chest circumference, hand length, middle finger length, palm length, little finger length, foot length, and penile length for male newborns. To measure length, we laid the babies on their backs on a firm surface, with their feet flexed and held together, making sure their head, back, and heels were flat on the surface, and their eyes were facing upward. We recorded the length to the nearest 0.1 cm. Weight was measured using a standard scale, with the babies undressed.

We measured the head and chest circumferences using a standard, non-stretchable tape, with an accuracy of 0.1 cm. For the head circumference, we measured from the bump at the back of the head to a point 2.5 cm above the eyebrows. Chest circumference was measured at the level of the nipples. Hand length was measured from the crease at the wrist to the tip of the middle finger, while middle finger length was measured from the base of the finger to its tip. Palm length was taken from the wrist crease to the crease at the base of the middle finger. Little finger length was measured from the base of the finger to the tip. Foot length was measured from a line at the back of the heel to the tip of the longest toe. Penile length was measured using a transparent ruler placed against the gently stretched penis. Two researchers performed all these measurements. We then calculated the means, standard deviation, and created a standardized curve showing the means, 5th, and 95th percentiles for both males and females combined.[16]

RESULTS

The study included newborns with gestational ages ranging from 37.5 to 41.5 weeks, focusing on full-term and late preterm infants. The mothers in the study were, on average, 27.54 years old, with ages ranging from 18 to 42 years. The mode of delivery varied: about 62% of the births were normal vaginal deliveries, which included spontaneous births and those assisted by tools like forceps. The remaining 38% of the births were cesarean sections. This mix of delivery methods reflects the diverse maternal and delivery situations in which the newborn measurements were taken, giving a well-rounded view of the demographic and clinical environment.

Table 1: The anthropometric measurements for males, females and combined for the newborns included for the newborns included in the study.

	Male Mean ± SD (Range)	Female Mean ± SD (Range)	p	Combined ± SD (Range)
Gestational Age (week)	39.01 ± 1.11 (37.5 - 41.5)	39.08 ± 1.05 (37.5 - 41.5)	0.652	39.05 ± 1.08 (37.5 - 41.5)
Length (cm)	49.01 ± 1.94 (45.0 - 53.0)	48.27 ± 2.05 (44.0 - 52.0)	0.0004	48.81 ± 2.07 (44.0 - 53.0)
Weight (Kg)	3.34 ± 0.45 (2.5 - 4.2)	3.10 ± 0.69 (2.2 - 3.8)	0.005	3.22 ± 0.60 (2.2 - 4.2)
OFC (cm)	35.03 ± 1.37 (31.8 - 38.0)	33.84 ± 1.29 (31.6 - 37.0)	0.000001	34.43 ± 1.45 (31.6 - 38.0)
Chest (cm)	33.54 ± 1.47 (30.5 - 36.9)	32.33 ± 1.53 (29.5 - 36.2)	0.000001	32.49 ± 1.61 (29.5 - 36.9)
RTH (cm)	6.71 ± 0.30 (5.8 - 7.3)	6.31 ± 0.31 (5.6 - 7.2)	0.000001	6.52 ± 0.36 (5.7 - 7.3)
LTH (cm)	6.71 ± 0.28 (5.9 - 7.2)	6.31 ± 0.31 (5.6 - 7.1)	0.000001	6.50 ± 0.36 (5.6 - 7.2)

RTMF (cm)	2.85 ± 0.19 (2.5 - 3.3)	2.76 ± 0.18 (2.4 - 3.2)	0.001	2.81 ± 0.81 (2.4 - 3.3)
LTMF (cm)	2.85 ± 0.19 (2.5 - 3.2)	2.76 ± 0.18 (2.4 - 3.2)	0.002	2.80 ± 0.19 (2.4 - 3.2)
RTP (cm)	3.83 ± 0.18 (3.3 - 4.2)	3.57 ± 0.19 (3.2 - 4.0)	0.000001	3.70 ± 0.22 (3.2 - 4.2)
LTP (cm)	3.82 ± 0.17 (3.3 - 4.1)	3.56 ± 0.19 (3.2 - 4.0)	0.000001	3.69 ± 0.22 (3.2 - 4.1)
RTLF (cm)	2.37 ± 0.24 (1.9 - 2.8)	2.17 ± 0.23 (1.8 - 2.8)	0.000005	2.27 ± 0.25 (1.8 - 2.8)
LTLF (cm)	2.36 ± 0.23 (1.9 - 2.8)	2.18 ± 0.22 (1.8 - 2.8)	0.000005	2.27 ± 0.24 (1.8 - 2.8)
RTF (cm)	8.17 ± 0.40 (7.3 - 9.0)	7.91 ± 0.30 (7.3 - 8.8)	0.0002	8.04 ± 0.37 (7.3 - 9.0)
LTF (cm)	8.18 ± 0.39 (7.4 - 9.0)	7.92 ± 0.29 (7.3 - 8.8)	0.0001	8.05 ± 0.37 (7.3 - 9.0)
Penile (cm)	3.21 ± 0.47 (2.3 - 4.1)	-	-	-

Table 1 shows a full detail of the newborns' measurements, with data divided into categories for males, females, and all newborns combined. These measurements cover a range of physical characteristics, including the gestational age, body length, weight, head circumference (OFC), chest circumference, various thigh measurements (like circumference and specific sections of the femur), and penile length for male babies.

Both male and female newborns had similar gestational ages, with averages of 39.01 weeks for males and 39.08 weeks for females, and only a small variation between them. This shows that most of the newborns were full-term, and the gestational age was consistent across genders, with a non-significant p-value of 0.652. This consistency is important because it ensures that any comparisons of other body measurements between genders are valid, as the babies were at similar stages of development at birth.

There are clear differences in length and weight between boys and girls. Boys are generally longer and heavier than girls, and these differences are statistically significant, indicating that gender affects these basic body measurements from birth. These findings are important because they suggest that gender-specific growth patterns start before birth and can be seen as soon as a baby is born.

The data shows that male babies have significantly larger OFC and chest circumferences compared to female babies. These differences are important for newborn care because they highlight the need for gender-specific standards when measuring OFC and chest size. These measurements are key indicators of a baby's developmental health, and having accurate norms for each gender can improve health assessments.

Limb measurements, like thigh circumference and femur segments, consistently show that male babies have larger dimensions than female babies. These differences are statistically significant, showing a clear pattern of male babies being bigger in limb-related measurements at birth. This may reflect broader physical differences that could impact health and development, affecting things like clothing sizes and early nutritional needs.

This measurement, specific to male newborns, has a mean of 3.21 cm, with a range from 2.3 to 4.1 cm. Since it only applies to male babies, no comparison with female babies can be made. However, it provides important data for evaluating male newborns and adds to the key measurements needed for assessing their growth and health.

The statistical significance noted in many of the comparisons ($p < 0.05$) implies that these differences are not due to random chance. Furthermore, the use of standard deviations and ranges provides a clear picture of the variability and distribution of each measurement within the populations studied. This comprehensive data allows for the establishment of robust, gender-specific anthropometric norms for newborns, which are vital for pediatric healthcare assessments.

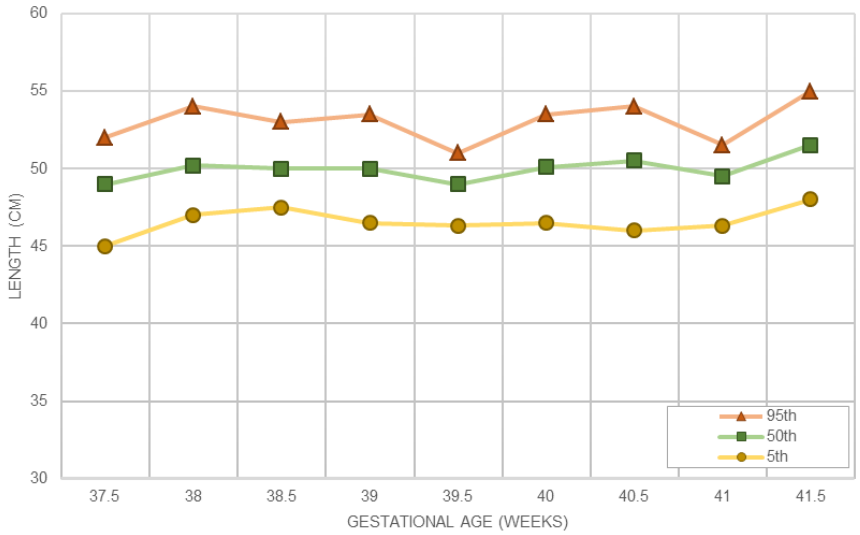

Figure 1: The standardized combined curve of length measurements (cm) for males and females.

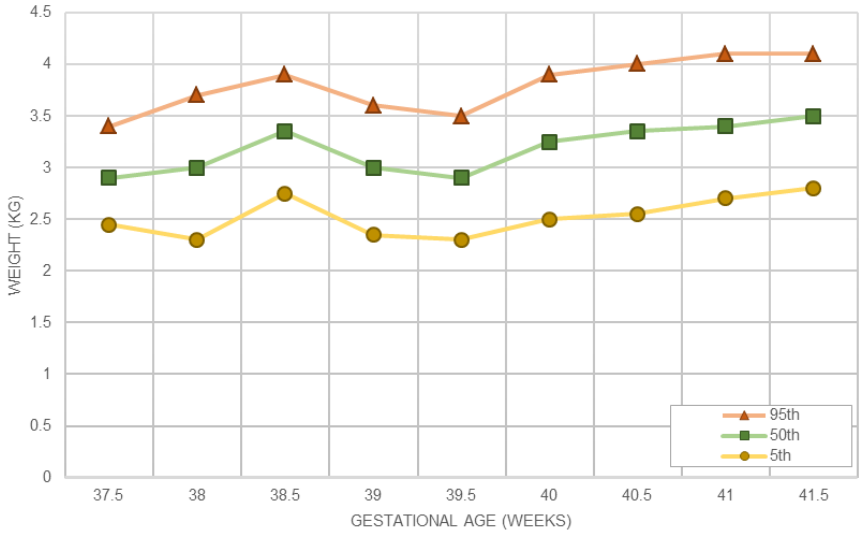

Figure 2: The standardized combined curve of weight measurements (Kg) for males and females.

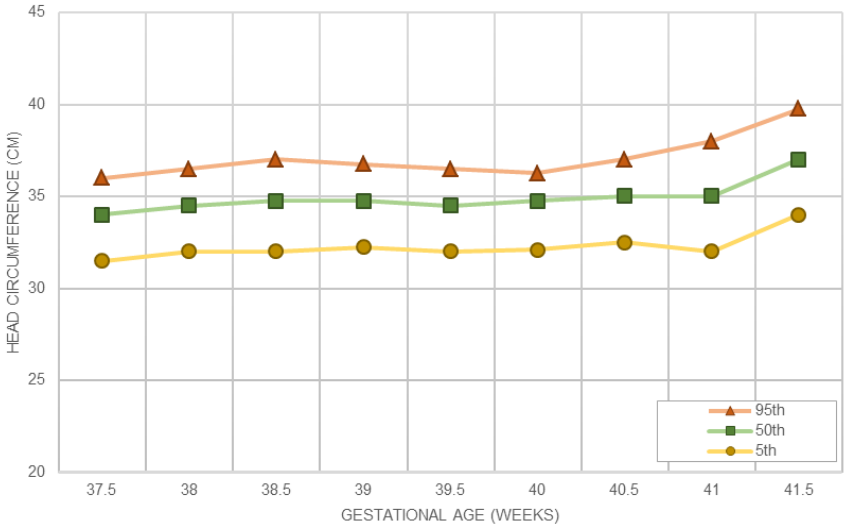

Figure 3: The standardized combined curve of head circumference measurements (cm) for males and females.

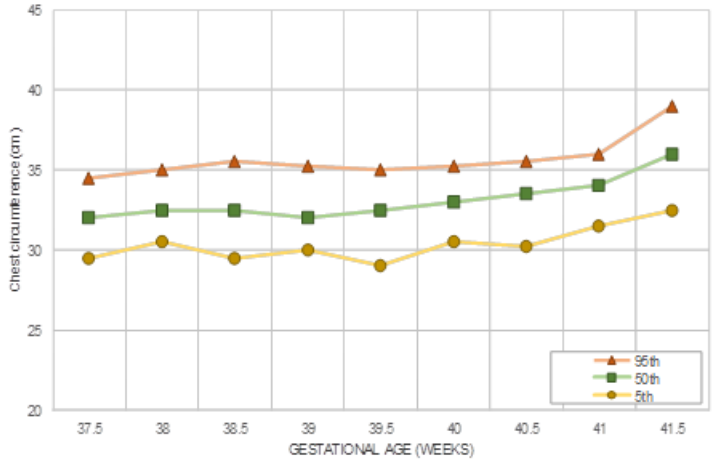

Figure 4: The standardized combined curve of chest circumference measurements (cm) for males and females.

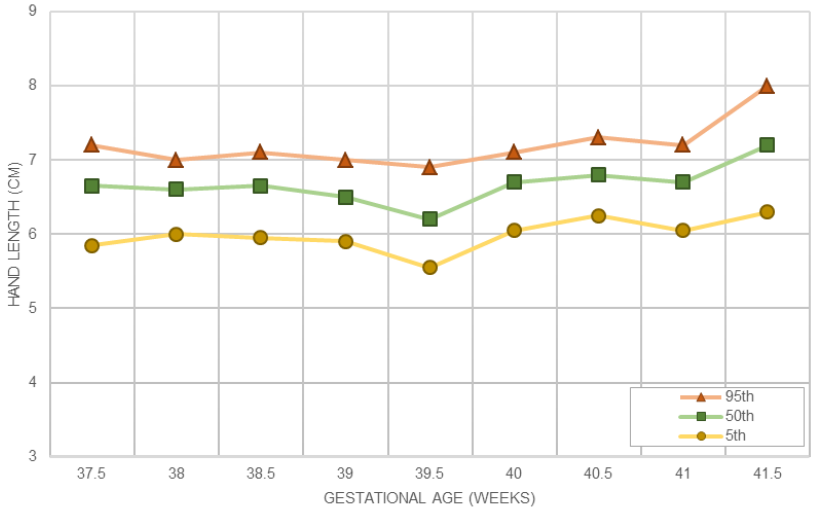

Figure 5: The standardized combined curve of hand length measurements (cm) for males and females.

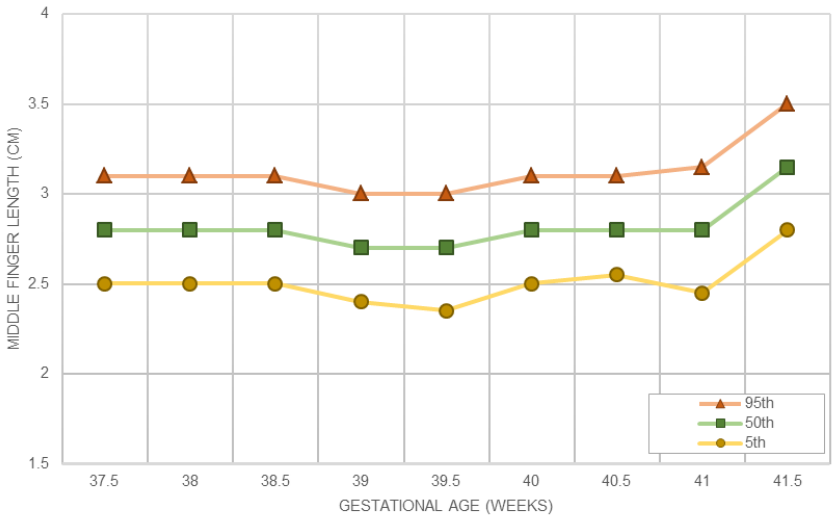

Figure 6: The standardized combined curve of middle finger circumference measurements (cm) for males and females.

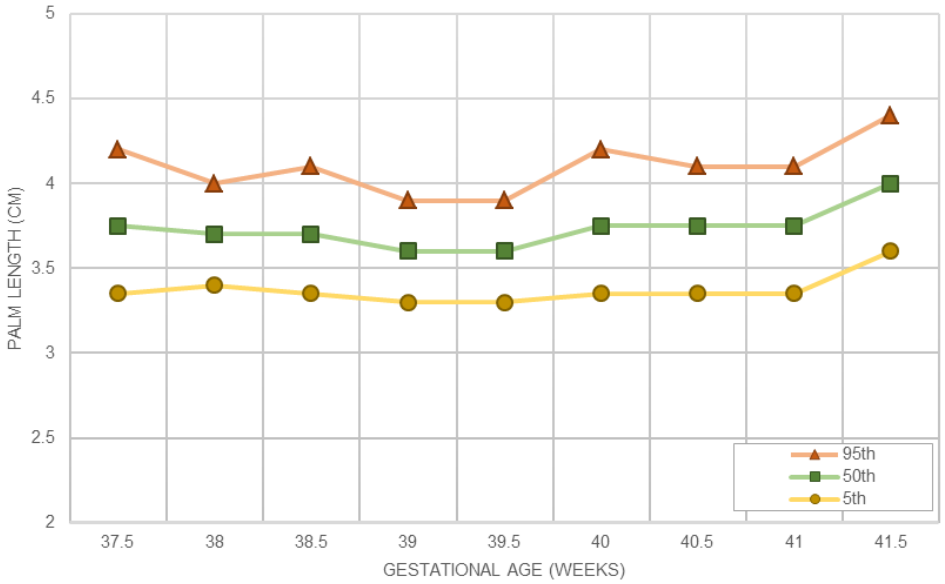

Figure 7: The standardized combined curve of palm length measurements (cm) for males and females.

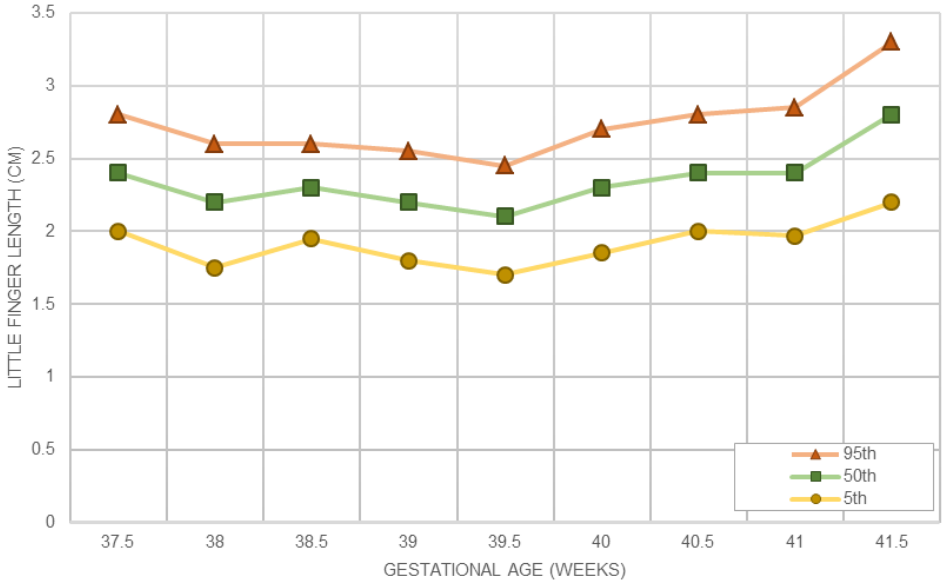

Figure 8: The standardized combined curve of little finger measurements (cm) for males and females.

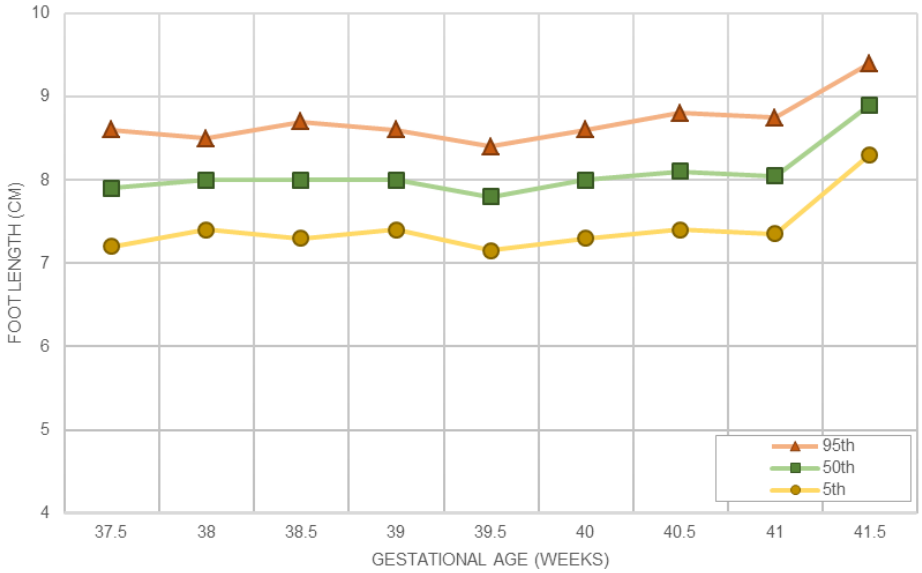

Figure 9: The standardized combined curve of foot measurements (cm) for males and females.

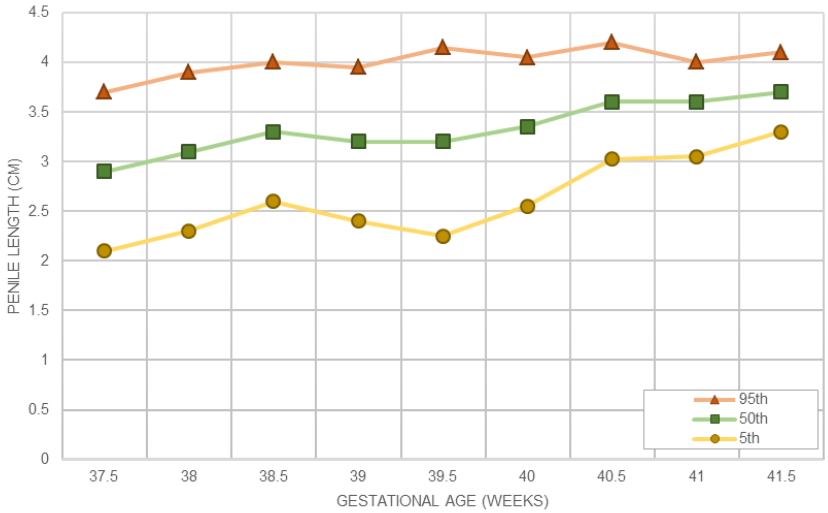

Figure 10: The standardized combined curve of penile measurements (cm) for males.

The anthropometric measurements in Table 1 give important insight into the physical differences between male and female newborns. These findings highlight the need to consider gender in pediatric health assessments and could help guide future research on the developmental, nutritional, and medical needs specific to each gender. This analysis improves our understanding of the natural differences at birth and emphasizes the importance of personalized healthcare from the very beginning of life.

Figures 1 through 9 show the combined growth curves for both male and female newborns, highlighting the developmental trends across the different measurements in the study. These curves visually demonstrate the growth patterns for each gender, making it easier to see how male and female growth compare. Figure 10 specifically focuses on the growth curve for penile length in male newborns, providing detailed information about the normal ranges for this measurement, which is important for assessing male genital development.

DISCUSSION

This research outlines the standard body measurements for the trunk and limbs of healthy, full-term Iraqi newborns, with separate norms for male and female babies. Taking accurate physical measurements is a specialized skill that often requires specific tools. However, simple methods using basic equipment can be very useful during routine check-ups by doctors. These assessments are important for identifying newborns with unusual physical features and deciding if more tests, like chromosome analysis, are needed.

The findings from this study show clear differences between male and female newborns in body length, weight, head, and chest size. These gender-specific differences are supported by the data and align with other

studies that suggest male babies are generally larger than female babies at birth. These differences are not only statistically important but also clinically relevant, as they could impact the medical care and nutrition plans recommended for newborns.

The greater body length and weight seen in male newborns might be due to genetic and hormonal factors that affect how male and female babies grow differently before birth. The differences in head and chest size are especially important because they are linked to later cognitive and physical development. These findings suggest that neonatal growth charts and developmental milestones may need updates to better reflect these gender-specific growth patterns.

The limb measurements show clear differences between genders, with males having larger thigh and femur measurements. These size differences at birth could lead to different growth patterns as the child develops and may help in the early detection of musculoskeletal issues. The cesarean section rate of around 38% in this group is close to global averages, but it's important to note because cesarean deliveries are linked to health issues like respiratory distress in newborns. Future research could explore if the delivery method affects certain body measurements, which could help improve care for babies born via the cesarean section. The standardized growth curves (Figures 1-9) are useful as they provide benchmarks to compare individual newborn measurements to a standard. The curve for penile length (Figure 10) is especially valuable, giving pediatricians a reference to detect any early abnormalities. These tools are important for assessing newborn health. Newborns with measurements outside the 5th to 95th percentiles should be carefully evaluated, as they may be atypical, unless further tests show otherwise.

CONCLUSIONS

This study highlights gender-specific differences in the body and limb measurements of Iraqi newborns, with male infants generally larger than females. Standardized growth charts confirm these differences, which are important for creating gender-specific growth charts and improving newborn health checks. The study also links limb size to future development and stresses the need for personalized care. The cesarean delivery rates match global trends, pointing to the need for more research on how birth methods affect growth. Detailed measurements, like penile length, add to pediatric evaluations. The research calls for more studies in diverse populations to better understand and apply these findings to improve newborn care.

REFERENCES

1. N. A. Tesfa *et al.*, "Anthropometric measurements of singleton live full-term newborns in comparison to who standard at University of Gondar comprehensive specialised hospital, Ethiopia," *J. Mother Child*, Jun., 2023; 27(1): 198–208.
2. B. Siyah Bilgin *et al.*, "Reference values of anthropometric measurements in healthy late preterm and term infants," *Turk. J. Med. Sci.*, Aug., 2018; 48(4): 862–872.
3. I. A. Ba-Saddik and T. O. Al-Asbahi, "Anthropometric measurements of singleton live full-term newborns in Aden, Yemen," *Int. J. Pediatr. Adolesc. Med.*, Sep., 2020; 7(3): 121–126.
4. M. Feingold and W. H. Bossert, "Normal values for selected physical parameters: an aid to syndrome delineation," *Birth Defects Orig. Artic. Ser.*, 1974; 10(13): 1–16.
5. R. A. Stein, "Smith's recognizable patterns of human malformation," *Arch Dis Child*, 2007; 92(6).
6. E. Goto, "Evaluation of anthropometric measurements at birth in predicting birthweight less than 2000 g in African and Asian newborns: a meta-analysis," *Rev. Epidemiol. Sante Publique*, Feb., 2015; 63(1): 43–49.
7. E. M. Elshibly and G. Schmalisch, "Correlation between anthropometric measures and birthweight of infants: value in measuring actual birthweight," *Am. J. Perinatol.* Mar., 2008; 25(3): 135–139.
8. C. T. Sreeramareddy, N. Chuni, R. Patil, D. Singh, and B. Shakya, "Anthropometric surrogates to identify low birth weight Nepalese newborns: a hospital-based study," *BMC Pediatr.*, Apr., 2008; 8(1): 16.
9. G. L. Darmstadt *et al.*, "Evidence-based, cost-effective interventions: how many newborn babies can we save?," *Lancet*, 2005; 365(9463): 977–988.
10. K. J. Marcdante and R. Kliegman, *Nelson essentials of pediatrics*, Eighth edition. Philadelphia, PA: Elsevier, 2019.
11. K. A. Leppig, M. M. Werler, C. I. Cann, C. A. Cook, and L. B. Holmes, "Predictive value of minor anomalies. I. Association with major malformations," *J. Pediatr.*, Apr., 1987; 110(4): 531–537.
12. F. J. Meaney and L. A. Farrer, "Clinical anthropometry and medical genetics: a compilation of body measurements in genetic and congenital disorders," *Am. J. Med. Genet.*, Oct., 1986; 25(2): 343–359.
13. R. Kliegman, B. Stanton, J. W. St Geme, N. F. Schor, R. E. Behrman 1931-, and W. E. Nelson 1898-1997., *Nelson textbook of pediatrics*, 20th edition. Philadelphia, Pennsylvania: Elsevier, 2016.
14. R. Kliegman, B. Stanton, J. W. St Geme, N. F. Schor, R. E. Behrman 1931-, and W. E. Nelson 1898-1997., *Nelson textbook of pediatrics*, Edition 21. Philadelphia, PA: Elsevier Inc., 2020.
15. L. M. S. Dubowitz, V. Dubowitz, and C. Goldberg, "Clinical assessment of gestational age in the newborn infant," *J. Pediatr.*, Jul., 1970; 77(1): 1–10.
16. P. V. V Hamill, T. A. Drizd, C. L. Johnson, R. B. Reed, A. F. Roche, and W. M. Moore, "Physical growth: National Center for Health Statistics percentiles," *Am. J. Clin. Nutr.*, Mar., 1979; 32(3): 607–629.