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Original article

Anthropometric measurements of singleton live full-term newborns in Aden, Yemen

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A B S T R A C T

Background: Neonatal anthropometry is the single most portable, universally applicable cheap, and non-invasive technique that deals with a variety of human body measurements. The anthropometric data for newborns, infants and children reflect their general health, nutritional status, and future survival by tracking trends in growth and development over time.
Patients and methods: The present study was conducted on 1000 Yemeni singleton live full-term newborns (37–42 weeks gestation), 488 males and 512 females during first 24 h of delivery at Al-Sadaqa Teaching Hospital, Aden, Yemen during the years 2002–2003.
Results: The data analysis of seven anthropometric values for 1000 Yemeni term newborns of both sexes revealed the mean birth weight and SD was 3113.04 g (±519.52), crown-heel length, head, chest, mid-arm, abdominal and calf circumferences were 48.91 (1.62), 33.78 (1.13), 32.09 (1.48), 10.09 (1.02), 30.10 (1.92), and 10.94 (1.04) respectively. The Ponderal Index was calculated with mean value of 2.65 (0.40). This study showed significant sex differences in all the anthropometric measurements principally in the birth weight (3187.66 versus 3039.04) and crown-heel length CHL (49.28 versus 48.53). ($P < .001$). The best cut-off point to determine LBW was calf circumference (8.5 cm), which showed the most significant correlation with birth weight ($r = 0.5$) followed by chest ($r = 0.44$) and mid-arm circumference ($r = 0.41$).
Conclusions: This study of normal reference values will provide basic step for future standardization of Yemen anthropometric parameters to be used for accurate assessment, development and maturity of newborn births that would lead to identify newborns at risk and help in better management.

1. Introduction

Anthropometric measurements of the new-born population is an important scientific research tool to study the determinants and consequences of impaired or excessive foetal growth [1,2]. It is a non-invasive and cheap universal technique to assess the body size, proportions, and human composition [3]. Value of anthropometric measurement is the basic gold standard technique to describe growth at individual and population level [4].

Birth weight, the most widely used anthropometric indicator of size at birth, does not only indicate the baby's growth, development, and survival but also a valuable indicator of maternal health, nutrition, genetics, socioeconomic status, environmental influences, and quality of antenatal services [5–9]. It is particularly strongly associated with fetal, neonatal, post-neonatal mortality, and with infant and child morbidity [10–12]. Birth length and head circumference may provide important diagnostic and prognostic information beyond that provided by birth weight alone. Because of technical difficulties in measuring birth weight in developing countries, several studies have shown that different anthropometric measurements can predict birth weight and used as valid indicators of low birth weight [13]. It is well recognized that in each country, normal neonatal anthropometric measurements vary both in mean and spread values at different gestational ages [14,15]

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Head, chest, mid-arm, and calf circumferences are easier, cost-effective, and reliable to identify risk neonate and have better correlation with birth weight [11,16].

Growth is assessed by plotting accurate values on growth charts and compared with previous measurements. Deviations in growth patterns are indicators of serious medical disorders [13]. Because valid assessment of the gestational age, size at birth, particularly birth weight and other anthropometric measurements have not been studied during the neonatal period in Aden city, Yemen; this study was conducted to estimate the seven anthropometric measurements of singleton full-term live newborns including birth weight, crown-heel length and head, chest, mid-arm, abdomen and calf circumferences and Ponderal index.

1.1. Patients and Methods

This cross-sectional study was conducted prospectively on 1000 Yemeni singleton live full-term newborns (37–42 weeks) of gestation of both sexes free of any illness after obtaining a verbal consent from their mothers to participate in this research within few hours before they gave birth at Al-Sadaqa Teaching Hospital, Aden, Yemen during years 2002–2003. The clinical examination was performed within 24 h of birth and the gestational age (GA) was estimated by maternal last menstrual period, Ballard assessment and foetal ultrasound. All measurements were carried out three times consecutively by the authors personally and the mean was used in analysis of the recorded data. Newborn was weighed without clothes on digital electronic weighing scale with accuracy of 5 g in the labour room. The birth weight was stratified as 1500–2499 gm, 2500–3999 gm, 4000 gm and more. Infantometer calibrated in mm was used to measure the crown-heel length and a non-stretchable plastic measuring tape for the head, chest, mid-upper arm, abdominal and calf circumferences. The statistical analysis was performed using frequency distribution, calculating percentages with arithmetic mean and standard deviation (SD) and confidence intervals (95%CI) using Epi. Info by the authors with help of a statistician professor. The research approval was taken by the ethical committee at Faculty of Medicine and Health Sciences, University of Aden.

2. Results

The present study included 1000 singleton live full-term newborns $\geq$ 37–42 weeks of completed GA with 512 females and 488 males. The mean and SD of birth weight (BW), crown-heel length (CHL), head (HC), chest, (CC) mid-arm (MUAC), abdominal (AC), calf circumferences (CaC) and ponderal index of both sexes are shown in Table 1. Sex difference in all measurements were recorded with significant higher values in males than females mainly in BW (3187.66 versus 3039.04) and CHL (49.28 versus 48.53) ($P < .001$). (Table 1).

There was a gradual continuous significant increase in the mean values of all neonatal anthropometric measurements of BW, CHL, HC, CC, MUAC, AC, CAC in the term newborns of both sexes from 37 to 42 weeks GA with clustering of higher numbers (488) at 40 weeks GA and minimum numbers (81 versus 54) recorded at both extremes of GA 37 and 42 weeks respectively (Table 2).

Males had higher mean BW at all GA, except at 37 weeks with females being only heavier than males. The mean BW at 38 and 40 GA weeks revealed significant differences between males and females ($X^2 = 10.80$ and $X^2 = 14.33$ and $P < 0.001$). Males were taller than females with significant difference at 38, 39 and 40 GA weeks ($X^2 = 16.12$, 18.76, 54.85, and P values < 0.0001). (Table 3).

Males had higher mean HC and CC values except at 37 weeks where females had higher values than males. The mean HC differed between both sexes at 39, 40 and 42 weeks with significant values of ($X^2 = 50.59$, 3.89, 5.11 and P values $< .05$). At 40 weeks, the difference was highly significant between the HC and CC ($X^2 = 24.50$, $X^2 = 9.54$; P values $< .0001$).

Females had higher values of MUAC than males at 37 weeks but above 37 weeks males had predominant values with significant difference only at 40 weeks of GA ($X^2 = 11.07$; P values $< .001$). Males had lower AC than females only at 37 GA with significant difference at 40 weeks ($X^2 = 7.81$; P values $< .005$). The mean values of CAC were significant at 38 and 40 weeks ($X^2 = 5.0$ and 9.92 with $P < 0.001$; P values $< .03$ and .001) (Table 4) (see Fig. 1, Fig. 2, Fig. 3).

Newborns were clustered around 40 weeks GA in the three centile distributions with highest number 747 between 10th and 90th percentiles while minimum numbers (127) less than 10th centile and (126) above 90th.centile(Table 5). The newborn mean values of BW, CHL and HC were highly clustered within AGA groups. LGA groups depicted higher numbers of newborn when compared with SGA in three above parameters(Table 6). The highest mean values of BW (3869.72 gm) CHL (52.16 cm), and HC (36.16 cm) were noticed in LGA group. A significant correlation of various newborn anthropometric measurements was observed with BW and CAC having best correlation (r = 0.5) followed by CC (r = 0.44) and MUAC (r = 0.41). (Table 7). The best cut-off point to determine LBW was Ca C (8.5 cm), followed by CC, MUAC and HC (Table 8).

3. Discussion

"Children's health is tomorrow's wealth" is one of the WHO's slogan of recent years [17,18]. Birth weight is a crude summary of foetal growth, and the same birth weight maybe the outcome of many different paths of growth [19]. The importance of developing empirical standard for growth parameters at birth for individual population has been stressed in the literature [1,4,7–9,14]. This is the first report of its kind on seven anthropometric measurements of healthy singleton live term newborns conducted in Aden city, Yemen.

The results revealed body proportions of BW, CHL, HC quite

Table 1
Anthropometric parameters of term newborns by sex.

Parameters	Male Mean (SD)	Female Mean (SD)	Total Mean (SD)	Confidence Interval (CI)
Gestational age/week	39.66 (1.22)	39.48 (1.22)	39.5 (1.23)	39.49–39.65
Weight/gm	3187.66 (516.41)	3039.04 (522.63)	3113.04 (519.52)	3112.01–3114.07
Crown-heel length/cm	48.28 (1.82)	48.53 (1.53)	48.91 (1.62)	48.87–49.01
Head circumference	33.99 (1.15)	33.59 (1.07)	33.78 (1.13)	33.71–33.85
Chest circumference	32.30 (1.45)	31.85 (1.48)	32.09 (1.48)	32.0–32.18
Mid-arm circumference	10.21 (1.01)	9.98 (1.01)	10.09 (1.02)	10.03–10.15
Abdomen circumference	30.29 (1.79)	29.85 (2.02)	30.10 (1.92)	29.98–30.12
Calf circumference	11.06 (1.04)	10.78 (1.35)	10.94 (1.04)	10.88–11.01
Ponderal index	2.65 (0.38)	2.64 (0.41)	2.65 (0.40)	2.63–2.68

Table 2
Neonatal anthropometric measurements by gestational age.

GA (week)	Basic neonatal parameters in mean (SD) by GA							
	Total N. (%)	BW (gm)	CHL (cm)	HC (cm)	CC (cm)	MUAC (cm)	AC (cm)	CAC (cm)
37	81 (8.1)	2755.56 (488.62)	47.31 (1.38)	33.14 (1.06)	31.34 (1.50)	9.80 (1.02)	29.01 (1.99)	10.18 (1.04)
38	124 (12.4)	2962.50 (499.74)	48.22 (1.26)	33.42 (1.03)	31.76 (1.48)	9.91 (0.89)	29.60 (1.90)	10.63 (0.97)
39	151 (15.1)	3004.64 (450.16)	48.34 (1.33)	33.56 (1.07)	31.79 (1.36)	9.93 (1.05)	29.86 (2.99)	10.83 (1.87)
40	488 (48.8)	3157.27 (515.68)	49.34 (1.53)	33.81 (1.20)	32.18 (1.46)	10.18 (1.28)	30.23 (1.93)	11.00 (0.97)
41	102 (10.2)	3323.04 (483.58)	49.89 (1.78)	34.37 (1.07)	32.54 (1.40)	10.54 (1.15)	30.62 (1.75)	11.45 (1.06)
42	54 (5.4)	3374.07 (606.63)	50.74 (1.70)	33.40 (1.79)	32.78 (1.48)	10.58 (1.00)	30.74 (1.81)	11.48 (1.20)

Table 3
Neonatal Birth weight, Crown –Heel length and Head Circumference by Gestational Age and Sex.

GA (Week)	Male N (%)	Mean ± (SD)	Female N (%)	Mean ± (SD)
Birth weight by gestational age and sex				
37	36 (3.6)	2691.67 (499.93)	45 (4.5)	2806.67 (478.82)
38	58 (5.8)	3046.83 (405.89)	66 (6.6)	2828.79 (492.33)
39	63 (6.3)	3114.66 (467.17)	88 (8.8)	2974.43 (479.34)
40	239 (23.9)	3248.33 (490.52)	249 (24.9)	3069.99 (525.02)
41	65 (6.5)	3355.00 (512.66)	37 (3.7)	3233.33 (621.41)
42	27 (2.7)	3514.82 (568.20)	27 (2.7)	3266.22 (428.51)
Crown-heel length by gestational age and sex				
37	36 (3.6)	47.32 (1.71)	45 (4.5)	47.30 (1.07)
38	58 (5.8)	48.70 (1.27)	66 (6.6)	48.80 (1.09)
39	63 (6.3)	48.79 (1.44)	88 (8.8)	48.01 (1.37)
40	239 (23.9)	49.81 (1.38)	249 (24.9)	48.90 (1.53)
41	65 (6.5)	50.14 (1.84)	37 (3.7)	49.46 (1.62)
42	27 (2.7)	50.98 (1.91)	27 (2.7)	50.50 (1.55)
Head circumference by gestational age and sex				
37	36 (3.6)	33.07 (0.96)	45 (4.5)	33.20 (1.15)
38	58 (5.8)	33.60 (1.12)	66 (6.6)	33.27 (1.92)
39	63 (6.3)	33.80 (1.07)	88 (8.8)	33.39 (1.04)
40	239 (23.9)	34.09 (1.27)	249 (24.9)	33.54 (1.06)
41	65 (6.5)	34.53 (1.10)	37 (3.7)	34.10 (0.97)
42	27 (2.7)	34.98 (2.10)	27 (2.7)	33.81 (1.21)

Table 4
Neonatal chest, mid-arm, abdominal and calf circumferences by gestational age and sex.

GA (Week)	Male N (%)	Mean ± (SD)	Female N (%)	Mean ± (SD)
Chest circumference by gestational age and sex				
37	36 (3.6)	31.29 (1.38)	45 (4.5)	31.38 (1.61)
38	58 (5.8)	31.92 (1.27)	66 (6.6)	31.52 (1.51)
39	63 (6.3)	32.03 (1.41)	88 (8.8)	31.70 (1.43)
40	239 (23.9)	32.40 (1.42)	249 (24.9)	31.96 (1.47)
41	65 (6.5)	32.72 (1.46)	37 (3.7)	32.22 (1.26)
42	27 (2.7)	33.15 (1.39)	27 (2.7)	32.41 (1.49)
Mid-arm circumference by gestational age and sex				
37	36 (3.6)	9.15 (1.05)	45 (4.5)	9.58 (1.02)
38	58 (5.8)	9.97 (0.87)	66 (6.6)	9.64 (1.01)
39	63 (6.3)	9.98 (1.01)	88 (8.8)	9.98 (0.91)
40	239 (23.9)	10.31 (0.90)	249 (24.9)	10.07 (1.55)
41	65 (6.5)	10.69 (1.05)	37 (3.7)	10.35 (1.30)
42	27 (2.7)	10.72 (0.96)	27 (2.7)	10.38 (0.90)
Abdominal circumference by estational age and sex				
37	36 (3.6)	28.63 (1.75)	45 (4.5)	29.32 (2.14)
38	58 (5.8)	29.79 (1.85)	66 (6.6)	29.42 (1.94)
39	63 (6.3)	30.06 (1.66)	88 (8.8)	29.72 (1.78)
40	239 (23.9)	30.54 (1.64)	249 (24.9)	29.93 (2.13)
41	65 (6.5)	30.67 (1.78)	37 (3.7)	30.48 (1.73)
42	27 (2.7)	31.00 (1.89)	27 (2.7)	30.54 (1.70)
Calf circumference by gestational age and sex				
37	36 (3.6)	9.94 (0.98)	45 (4.5)	10.37 (1.06)
38	58 (5.8)	10.83 (0.98)	66 (6.6)	10.46 (0.93)
39	63 (6.3)	10.88 (2.36)	88 (8.8)	10.76 (0.79)
40	239 (23.9)	11.14 (0.92)	249 (24.9)	10.86 (0.99)
41	65 (6.5)	11.58 (1.09)	37 (3.7)	11.00 (0.99)
42	27 (2.7)	11.74 (1.14)	27 (2.7)	11.22 (1.25)

different from other counties due to racial influences on neonatal parameters beside other factors [3,6,12,13]. Newborn babies in Aden were proportionately smaller with LBW, CHL and HC than the newborns in Santiago, Sweden, Birmingham, Egypt, Saudi Arabia, Iraq and Turkey except for CHL among Turkish newborns who were shorter than the Yemeni newborns, but higher measurements of BW, CHL and HC than Sudanese newborns depicted in Table 9 [3–7,11,15,19,20]. Disproportionate relationship between the anthropometric measurements was observed among newborns in the present study comparable to Indian newborns who were taller with larger HC (Table 9) while smaller CC and larger MUAC were observed among Kenyan newborns in contrast to the neonatal anthropometric measurements in Aden city. Table (10) [3–5,21,22]. Males had smaller AC than females only at 37 gestational weeks, and the sex difference was significant at 40 weeks GA comparable to a study in Latvia [14].

The neonatal anthropometric measurements in this study including BW, CC and MUAC did not reveal any remarkable differences to the parameters in Singapore newborns shown in Table (10). AC of the newborn is not routinely used globally that showed smaller values in this study compared to studies in Birmingham and Egypt [20,21]. The Ponderal index that reflects IUGR showed a value of 2.65 in this study and was comparable to a study in Nigeria (2.7) but relatively higher than that in India (2.2) [4,11,12].

According to the aforementioned studies, the Yemeni newborn anthropometric measurements were observed to be lower than in developed countries but revealed some relative differences when compared with developing countries which may be explained by the fact that the body size difference is attributable to the different rates of growth, gestational age, nutritional status, ethnicity, socioeconomic and geographical distribution, moreover this further demonstrates the race specific differences in anthropometric measurements.

Genetic differences exist among races regarding growth and body composition [4,7]. There is a sex significant dimorphism in all measures at birth with males heavier, longer and linear than females [4,5,7,23–25], and this sex difference in anthropometric parameters was observed in utero [24]. Foetal sex has a major effect on a number of aspects of human pregnancy, as intrauterine growth, late foetal death, preterm birth and necessity for emergence of caesarean delivery [23,24]. In this study newborn anthropometric parameters were stratified as females versus males representing 51.2% and 48.8% respectively.

The analysis of all neonatal anthropometric parameters demonstrated a significant sex difference; females were thinner, shorter, with smaller HC, CC and MUAC than male newborns similarly reflected in European and Asian countries depicted in Table (11). These observations suggest that the appearances at birth also reflect differences in the sex steroid environment, although the influence of other metabolic factors cannot be excluded [25,26]. Gestational age is a major contribution to birth size. Birth size generally reflects longitudinal growth, although the time peak

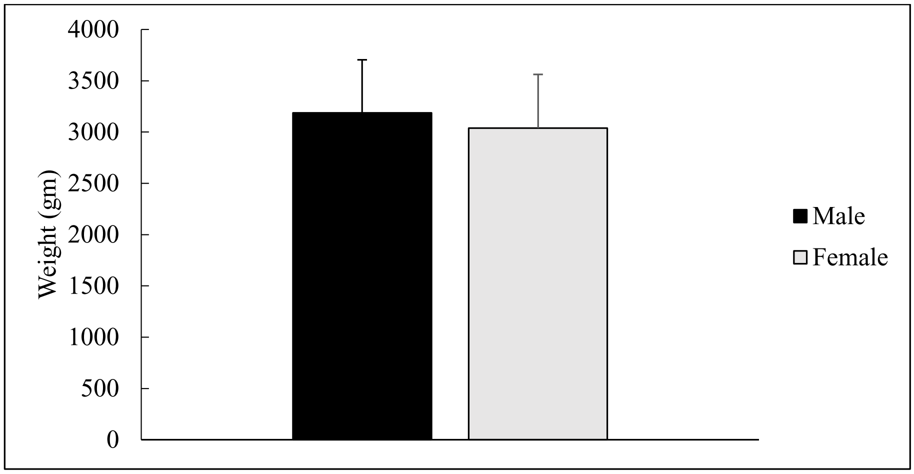

Fig. 1. Neonatal birth weight by sex.

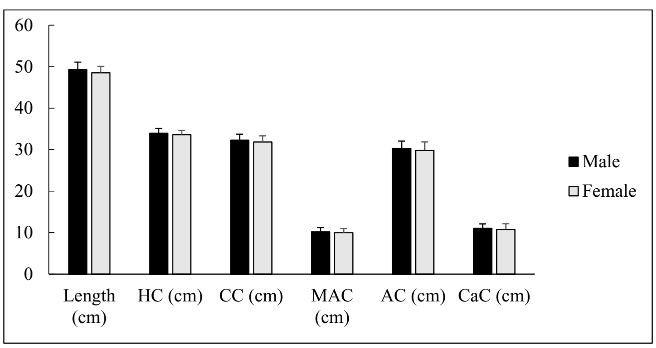

Fig. 2. Neonatal crown-heel length, head, chest, mid-arm, abdominal and calf circumference by sex.

length and weight velocity differs in utero and based on this observation it has been suggested that alteration in growth pattern at different GA will lead to different anthropometric phenotypes at birth [26].

In the present study, the mean BW, CHL and HC showed progressive increase in these values in both sexes which were significant with increasing GA and the majority were clustered around 40 weeks. These characteristics were in concordance with studies demonstrated in developed countries [26,27]. Variations in mean BW, CHL and HC for GA are the result of numerous factors that influence foetal growth. The relationships are associated with a predisposition to certain disorders in the neonatal period and to outcomes later in life.

The mean and spread values at different GA of ***SGA, AGA, LGA*** in the present study using Lubchenco growth curve [28] were lower than the regional variations reported in Saudi Arabia for the mean BW, CHL and HC with the exception of mean HC at LGA was higher in Aden than Riyadh, which may be due to some related genetic and ethnic factors [29].

Neonatal MUAC within 72 h of birth is a valid proxy for BW in developing countries were the bulk of LBW is due to IUGR [5,10,12,16,18,31,32]. The CAC in this study was best correlated with the BW with a correlation coefficient of (r = 0.50) followed by CC (r = 0.44) and MUAC (r = 0.41) with similar relationships observed in India and Iran but excluding the CC in Iran. In situations where

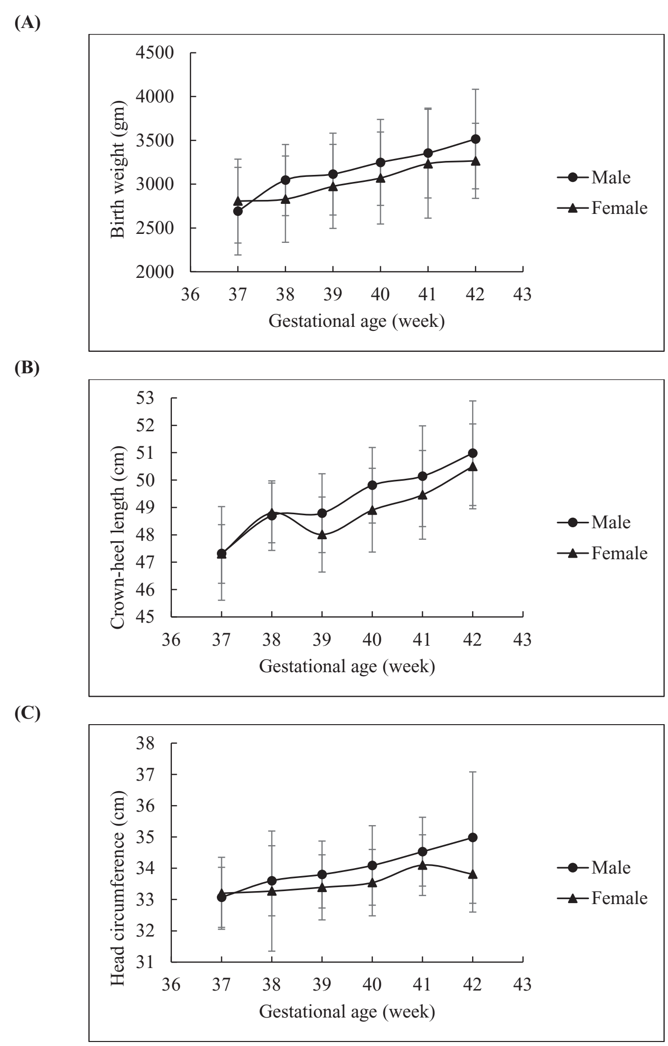

Fig. 3. Neonatal birth weight (A), crown-heel length (B) and head circumference (C) by gestational age (week) and sex.

Table 5
Distribution of birth weight (percentiles) by gestational age.

GA (weeks)	SGA No (%) <10th percentile	AGA N0 (%) 10th-90th percentile	LGA No (%) >90th percentile	Total No (%)
37	11 (1.1)	65 (6.5)	5 (0.5)	81 (8.1)
38	14 (1.4)	101 (10.1)	9 (0.9)	124 (12.4)
39	11 (1.1)	132 (13.2)	8 (0.8)	151 (15.1)
40	75 (7.5)	340 (34.0)	73 (7.3)	488 (48.8)
41	9 (0.9)	75 (7.5)	18 (1.8)	102 (10.2)
42	7 (0.7)	34 (3.4)	13 (1.3)	54 (5.4)
Total	127 (12.7)	747 (74.4)	126 (12.6)	1000 (100)

Table 6
Neonatal parameters by gestational age (percentile).

Newborn parameters	SGA	AGA	LGA
	Mean + (SD)	Mean + (SD)	Mean + (SD)
Weight (gm)	2140.714 (200.91) No = 112	3094.09 (161.17) No. = 731	3869.72 (142.51) No. = 157
Crown-heel length (cm)	44.09 (1.94) No. = 34	48.85 (1.19) No. = 900	52.16 (0.98) No. = 66
Head circumference (cm)	31.15 (0.84) No. = 26	33.00 (0.11) No. = 898	36.16 (0.97) No. = 76

Table 7
Correlation coefficient between sizes at birth of term newborns.

Parameters	Weight	Length	Head	Chest	MAC	Calf
Weight		0.21	0.35	0.44	0.41	0.50
Length	–		0.19	0.20	0.15	0.18
Head			–	0.51	0.25	0.26
Chest				–	0.30	0.35
MAC					–	0.52
Calf						–

Table 8
Cut-off point for predicting low birth weight.

Parameters	Cut off Point
Calf circumference	8.5 cm
Chest circumference	29.5 cm
Mid –arm circumference	7.7 cm
Head circumference	31.6 cm

Table 9
Newborn parameters of mean birth weight, length and head circumference in different countries.

Country	Newborn parameter		
	Weight (gm)	Length (cm)	Head circumference (cm)
Yemen	3113.04	48.91	33.78
Birmingham	3272	50.8	34.1
Egypt	3463.3	50.93	35.13
Santiago	3440	51	35.3
Saudi Arabia	3293	51.1	34.3
India	2810	50	33.3
Sudan	2909.8	45.3	33.3
Sweden	3740	51.8	35.9
Nigeria	3223	49	34.6
Turkey	3334	48.3	34.4
Iraq	3200	49.9	34.3
Bangladesh	2770.4	49	33.7

scales are not available at delivery place, CAC followed by CC could be used in the interpretation of LMW with good results [13,16,22].

Anthropometric parameters can be taken into consideration to be a beneficial technique to identify LBW using their cut-offs in conditions where scales for weight measurements are not feasible as in rural areas [12–14,16,18,22,31,32]. The percentage of LBW in this study was 9.3%. The linear regression analysis showed the most important variable predicting LBW was CAC which can be identified with fair degree of accuracy followed by CC, MUAC and HC. The cut-off points for LBW in this study were CAC 8.5 cm, followed by CC 29.5 cm, MUAC 7.7 cm and HC 31.6 cm comparable to reports in Iran whereas in India the MUAC had the highest cut-off point [13,16]. Thus, based on the present study using a simple cheap tape measurement for determining CAC with a cut-off point of 8.5 cm appears to be a probable useful appropriate means to improve the detection of risk neonates with LBW in this community [29–31]. It is likely that there are some complex interactions between genetic and environmental factors of parental, placental and foetal origin. Several epidemiological studies estimate that environmental influence account for about 25% BW variance and genetic influences account for 38–75 BW variance [18,30–32].

The newborns in the present study were thinner, shorter with smaller circumferences in both sexes than the newborn parameters reported in developed and some developing countries. Males were significantly heavier and taller, with larger circumferences than females but with no remarkable difference in other nations. Mean birth anthropometric measurements increased progressively with increasing gestational age as reflected in literature. This study is a first step contributing towards the future standardization of Yemen newborns' anthropometric parameters which would be of great help in assessment of normal infants and those at high risk on neonatal morbidity and mortality and could be used as a nucleus for Yemeni infant and health development program.

Further future studies for assessment of neonatal anthropometric parameters are recommended from all governorates of Yemen with a working team of health professionals to establish a local reference for Yemeni newborn chart. Birth weight, crown-heel length and head circumference should be assessed routinely after delivery and booked in each birth certificate. Enforcement on improvement of maternal and child health services with emphasis on better accessibility to antenatal care.

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Table 10
Newborn parameters of mean birth weight, chest, abdominal and mid-arm circumference in different countries.

Country	Newborn parameters			
	Weight (gm)	Chest circumference (cm)	Abdominal circumference (cm)	Mid-arm circumference (cm)
Aden	3113.04	32.09	30.1	10.09
Birmingham	3272	33	32.3	10.8
Singapore	3103	32	–	10.1
Nairobi	2957	30.8	–	10.4
Bangladesh	2770.4	31.4	28.8	9.6
India	2387	29.5	–	10.1

Table 11
Newborn parameters of mean birth weight, length and head circumference by sex in different countries.

Sex	Aden	Birmingham	Iran	London	Saudi	Egypt	Pakistan	Turkey	Iraq
Mean birth weight (gm)									
M	3187.66	3239	3300	3520	3293	3380	3030	3387	3240
F	3039.04	3080	3150	3340	3220	3320	2980	3276	3170
Mean birth length (cm)									
M	49.28	50.9	49.4	50.5	51.1	49.8	48.0	48.6	50.0
F	48.53	50.1	48.8	49.7	50.7	48.9	47.54	47.9	49.8
Mean head circumference (cm)									
M	34.0	34.1	34.6	34.9	34.3	34.8	34.44	34.6	34.4
F	33.6	33.5	34.2	34.3	34.9	34.2	34.16	34.1	34.2

Conflicts of interest

None declared.

Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ijpam.2019.08.003.

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