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Reference values of anthropometric measurements in healthy late preterm and term infants*

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Background/aim: Geographical distribution, ethnicity, and other socioeconomic factors may affect anthropometric measurements, and for that reason each society should determine their own measurements accounting for those factors. In this study, we aimed to determine the anthropometric measurements of healthy late preterm and term infants to compare the results with other national and international studies.

Materials and methods: This sectional study was carried out among 1197 infants born with a gestational age of ≥35 weeks. Chest circumference, ear length, foot length, palmar length, middle finger length, philtrum distance, inner and outer canthal distances, and palpebral fissure length were measured in the first 24 h of life.

Results: All measurements of late preterm infants were smaller than those of term infants ($P < 0.05$). Compared with male infants, the chest circumference, ear length, foot length, palmar length, philtrum distance, and inner canthal distances of the female infants were lower ($P < 0.05$). No significant differences were found between male and female infants' middle finger length, outer canthal distance, and palpebral fissure length measurements. Percentile values for all measurements of 35–42-week male and female infants were described.

Conclusion: These measurements of male and female infants born between 35 and 42 weeks may be useful for early detection of syndromes by detecting anatomical abnormalities in our population.

Key words: Anthropometric measurements, late preterm, term

1. Introduction

Anthropometry is a simple universally performed method to reveal the composition and demonstrate the type and the proportions of the human body. Anthropometric measurements provide numerical values to define the body type and composition. Anthropometry is an important diagnostic tool for evaluating dysmorphic children, and is especially helpful to genetics specialists and dysmorphologists in diagnosing diseases. Malformations in face, hands, and fingers are common in syndromes. Geographical distribution, ethnicity, and other socioeconomic factors may affect anthropometric measurements, and for that reason every single society should determine their own standard measurements (1–3). In the present study, we aimed to determine the anthropometric measurements of healthy late preterm and term infants born at Ege University Medical Faculty and to compare the results with those of other national and international studies.

2. Materials and methods

This study was carried out in the Gynecology and Obstetrics Department between October 2011 and May 2012 with a group of 1197 infants born with a gestational age of ≥35 weeks. There are approximately 3000 deliveries per year in our hospital. The research was reviewed and approved by Ege University Institutional Review Board (report number: 12-1/3, date: 10/10/2011), and participation involved informed consent.

Exclusion criteria were as follows: infants with antenatal or postnatal diagnosis of intrauterine growth retardation, chromosomal or congenital anomaly, multiple pregnancy, patients born to mothers with preeclampsia, diabetes mellitus, autoimmune disorder, cardiac disease, drug use,

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cigarette/alcohol use, moribund condition at birth, babies that were admitted to NICU from the delivery room, and different ethnicity/race of mother and/or father.

All of the measurements were performed by the same physician in the first 24 h of life while the infants were quiet in a separate room, with the room temperature noted after obtaining. Chest circumference, ear length, foot length, palmar length, middle finger length, philtrum distance, inner and outer canthal distances, and palpebral fissure length were measured. Gestational age was determined by the first day of the last menstrual period, ultrasonographic measurement, or by using the new Ballard score.

Chest circumference: The circumference below the xyphoid and scapula was measured using a flexible measuring tape.

Ear length: The distance between the top and the bottom of the auricle was measured with a caliper while the head was in an upright position.

Foot length: The distance between the heel and the tip of the first toe was measured with a caliper.

Palmar length: The distance between the middle finger's tip and the wrist was measured with calipers while the hand was in a neutral position with fingers in the abduction position.

Middle finger length: The distance between the tip and the bottom of the middle finger was measured with calipers while the hand was in a neutral position with fingers in the abduction position.

Philtrum distance: The distance between the bottom of the nose and the upper lip was measured with a caliper.

Inner canthal distance: The straight distance between the inner canthals of both eyes was measured with a caliper.

Outer canthal distance: The straight distance between the outer canthals of both eyes was measured with a caliper while the head was in an upright position and the eyes were wide open.

Palpebral fissure length: The distance between the inner and the outer canthal of the right eye was measured with a caliper while the head was in an upright position and the eyes were wide open. This measurement was repeated for the left eye.

The variables of chest circumference, ear length, foot length, palmar length, middle finger length, philtrum distance, inner and outer canthal distances, and palpebral fissure length were analyzed for normal distribution by using the Shapiro–Wilk test. For the variables that had an abnormal distribution, median (25th–75th percentiles) values are given, while mean ± SD (standard deviation) values were determined for the variables that had a normal distribution. The Kruskal–Wallis nonparametric test was performed for chest circumference, ear length, foot length, palmar length, middle finger length, philtrum distance, inner and outer canthal distances, and palpebral fissure length between 3 groups (35–36 weeks, 37–38 weeks, 39–41 weeks), and results were given as a median (25th–75th percentiles). Bonferroni's post-hoc tests were performed to detect the groups causing significant differences. Comparison of the chest circumference, ear length, foot length, palmar length, middle finger length, philtrum distance, inner and outer canthal distances, and palpebral fissure length considering sex was analyzed using the Mann–Whitney U test. The Kruskal–Wallis nonparametric test was performed in male and female infants separately for the analysis of chest circumference, ear length, foot length, palmar length, middle finger length, philtrum distance, inner and outer canthal distances, and palpebral fissure length between the 3 groups (35–36 weeks, 37–38 weeks, 39–41 weeks), and results are given as medians (25th–75th percentiles). The chi-square comparison test was used to determine whether there were differences between sexes and gestational ages.

The 5th, 10th, 25th, 50th, 75th, 90th, and 95th percentiles and 95% confidence intervals were measured for chest circumference, ear length, foot length, palmar length, middle finger length, philtrum distance, inner and outer canthal distances, and palpebral fissure length. A P value <0.05 was considered significant.

IBM SPSS Statistics 21.0 (released 2012; IBM SPSS Statistics for Windows, version 21.0. IBM Corp., Armonk, NY, USA) program was used for the statistical analysis and measurements. The graphical drawing was performed in the MS Excel 2007 program. R 3.1.2 for Windows program was used for percentiles and confidence intervals.

3. Results

A total number of 1197 infants were included in the study [47.7% (n = 571) female and 52.3% (n = 626) male]. The distribution of the patients by sex and gestational age is shown in Table 1. There was no significant difference between the sexes based on gestational age (P = 0.202) (Table 1).

Mean birth weight of 237 infants with 35–36 gestational weeks was 2574.6 ± 444.6 g, and mean head circumference was 33.22 ± 1.56 cm. Mean birth weight of 476 infants with 37–38 gestational weeks was 3238.5 ± 420.2 g, and mean head circumference was 34.93 ± 1.50 cm. Mean birth weight of 484 infants with 39–42 gestational weeks was 3385.1 ± 420.2 g, and mean head circumference was 34.81 ± 1.32 cm. Percentages of SGA, AGA, and LGA infants were 2.6%, 95.6%, and 1.8%, respectively. Statistically significant differences were detected in all measurements of the infants based on gestational age (P < 0.001) (Table 2).

No statistically significant differences were detected in the middle finger length, palpebral fissure length, and outer canthal distance measurements between the male and the

Table 1. Characteristics of the patients*.

Gestational age (weeks)		Sex		Statistics	
	n (%)	Female n (%)	Male n (%)	χ^2	P
35–36	237 (19.8)	119 (50.2)	118 (49.8)	3.198	0.202
37–38	476 (39.8)	212 (44.5)	264 (55.5)		
39–42	484 (40.4)	240 (49.6)	244 (50.4)		

*Chi-square test was performed.

Table 2. Comparison of anthropometric measurements based on gestational age*.

	Gestational age (weeks)			Statistics	
	35–36 (n: 237)	37–38 (n: 476)	39–42 (n: 484)	χ^2	P
Chest circumference (cm)	30 (29–32)	33 (32–34)	33 (32–34.2)	281.727	<0.001†
Ear length (mm)	33 (31–35)	34 (33–36)	35 (33–37)	97.440	<0.001†
Foot length (mm)	70 (67–74)	75 (72–78)	76 (74–79)	218.297	<0.001†
Palmar length (mm)	33 (31–35)	35 (33–37)	36 (34–38)	85.265	<0.001†
Middle finger length (mm)	26 (24–27)	27 (26–29)	28 (27–30)	143.353	<0.001†
Philtrum distance (mm)	8 (7–9)	9 (8–10)	9 (8–10)	53.463	<0.001‡
Inner canthal distance (mm)	19 (18–20)	20 (19–21)	20 (19–21)	93.051	<0.001‡
Outer canthal distance (mm)	58 (54–64)	63 (59–68)	64 (60–68)	98.144	<0.001‡
Palpebral fissure length (mm)	20 (17–22)	22 (20–23)	22 (20–24)	78.481	<0.001‡

*Data are presented as median (25th percentile–75th percentile). Bonferroni's post-hoc tests were performed.
†P value was significant for pairwise comparisons of all 3 groups.
‡P value of pairwise comparisons was significant between the groups except for 37–38 and 39–42 weeks for each variable.

female infants (P > 0.05). Among the other measurements, there were no significant differences based on sex (Table 3). Statistically significant differences were detected in all measurements of both female and male infants based on gestational age (P < 0.001, P < 0.001, respectively) (Tables 4 and 5).

Chest circumference, ear length, foot length, palmar length, middle finger length, philtrum distance, inner and outer canthal distances, and palpebral fissure length Z scores, and ±1 and ±2 standard deviation values of male and female infants are shown in Tables 6 and 7 and Figures 1 and 2. The 5th, 10th, 25th, 50th, 75th, 90th, and 95th percentiles of all measurements concerning female infants, male infants, and the whole group are shown in supplementary tables S1–9.

4. Discussion

Anthropometric measurements are noninvasive, highly sensitive, and low-cost methods that can be performed in a short time. Their validity is proved for public screening (3). With follow-up for normal growth and development, diseases may be recognized and diagnosed in earlier stages, and anomalies can be identified earlier (4). Genetic differences play a role in differences in growth and body composition among ethnicities (5). While weight, height, and head circumference aid in evaluating somatic growth, face, chest circumference, hand, and feet measurements may help identify syndromes by showing anatomic anomalies.

Chest circumference may vary in many syndromes and congenital anomalies. Chest circumference, intermamillary

Table 3. Comparison of anthropometric measurements based on sex*.

	Sex		Statistics	
	Female (n: 571)	Male (n: 626)	Z	P
Chest circumference (cm)	32.5 (31–34)	33 (31–34)	2.289	0.022
Ear length (mm)	34 (32–36)	35 (33–37)	4.491	<0.001
Foot length (mm)	74 (70–77)	75 (72–79)	5.929	<0.001
Palmar length (mm)	35 (32–37)	35 (34–37)	5.912	<0.001
Middle finger length (mm)	27 (26–29)	27 (26–29)	1.828	0.068
Philtrum distance (mm)	8 (8–9)	9 (8–10)	5.140	<0.001
Inner canthal distance (mm)	20 (19–21)	2019–21)	2.374	0.018
Outer canthal distance (mm)	63 (58–67)	63 (58–67)	0.405	0.686
Palpebral fissure length (mm)	21 (19–23)	21 (19.7–23)	0.013	0.989

*Data are presented as median (25th percentile–75th percentile).

Table 4. Comparison of the anthropometric measurements based on gestational age in female infants.*

	Gestational age (weeks)			Statistics	
	35–36 (n: 119)	37–38 (n: 212)	39–42 (n: 240)	χ^2	P
Chest circumference (cm)	30 (29–32)	33 (32–34)	33 (32–34)	117.915	<0.001†
Ear length (mm)	33 (31–34)	34 (32–35.2)	35 (33–36)	44.054	<0.001‡
Foot length (mm)	69 (67–74)	74 (71.7–77)	75 (73–78)	90.774	<0.001†
Palmar length (mm)	33 (31–35)	35 (33–36)	35 (33–37)	42.391	<0.001‡
Middle finger length (mm)	26 (24–27)	27 (26–29)	28 (26–29)	48.617	<0.001‡
Philtrum distance (mm)	8 (7–9)	8.5 (8–9)	9 (8–9)	26.559	<0.001‡
Inner canthal distance (mm)	19 (17.5–20)	20 (19–21)	20 (19–21)	37.475	<0.001‡
Outer canthal distance (mm)	60 (54–64)	64 (59–68)	64 (60–67)	27.769	<0.001‡
Palpebral fissure length (mm)	20 (18–22)	22 (20–24)	22 (20–23)	20.923	<0.001‡

*Data are presented as median (25th percentile–75th percentile). Bonferroni's post-hoc tests were performed. †P value was significant for pairwise comparisons of all 3 groups. ‡P value of pairwise comparisons was significant between the groups except for 37–38 and 39–42 weeks for each variable.

interval measurements, and intermamillary index, which is calculated using these measurements, allow recognition of some syndromes (6). A metaanalysis performed in Japan in 2011 showed that chest circumference is a good indicator of low birth weight (7). In our study, the chest circumference was measured as 30 cm in late preterm males and females, 33 cm in early term males and females, 33.5 cm in term males, and 33 cm in female infants. Telatar et al. found that the chest circumference was 3 mm less than in our study in term girls and boys (8). Our chest circumference values were also higher compared to the chest circumference curve that Merlop et al. identified for both sexes in 1984, which was accepted as a worldwide reference (9). This may be due to geographical and ethnic differences.

Ear defects are especially important in the diagnosis of newborn syndromes. Many syndromes are accompanied by small or large ears. Small ears may be related with

Table 5. Comparison of the anthropometric measurements based on gestational age in male infants.*

	Gestational age (weeks)			Statistics	
	35–36 (n: 118)	37–38 (n: 264)	39–42 (n: 244)	χ^2	P
Chest circumference (cm)	30 (29–31.7)	33 (32–34)	33.5 (33–35)	166.806	<0.001†
Ear length (mm)	33 (31–35)	35 (33–36)	36 (34–37)	55.576	<0.001†
Foot length (mm)	70 (67–74)	75 (73–78)	77 (75–80)	133.985	<0.001†
Palmar length (mm)	34 (32–36)	36 (34–37)	36 (34–38)	45.512	<0.001‡
Middle finger length (mm)	25 (24–27)	28 (26–29)	28 (27–30)	98.423	<0.001†
Philtrum distance (mm)	8 (7–9)	9 (8–10)	9 (8–10)	26.416	<0.001‡
Inner canthal distance (mm)	19 (18–20)	20 (19–21)	20 (20–21)	56.847	<0.001†
Outer canthal distance (mm)	57 (53–63)	63 (59–68)	64.5 (60–68.2)	79.361	<0.001‡
Palpebral fissure length (mm)	19 (17–22)	21 (20–23)	22 (20–24)	66.717	<0.001‡

*Data are presented as median (25th percentile–75th percentile). Bonferroni's post-hoc tests were performed.
†P value was significant for pairwise comparisons of all 3 groups.
‡P value of pairwise comparisons was significant between the groups except for 37–38 and 39–42 weeks for each variable.

Down syndrome, Treacher Collins syndrome, hemifacial microsomia, retinoic acid embryopathy, Meier–Gorlin syndrome, and Walker–Warburg syndrome (2). Large ear structure may be observed in Bordeaux–Forsman–Lehman syndrome, cerebro-oculo-facio-skeleton syndrome, Cohen syndrome, fragile X syndrome, Weaver syndrome, Marfan syndrome, and Sotos syndrome (2). In our study, ear length was longer in boys than in girls. In this country, 2 studies have been performed on ear length in newborns. In a study performed with 600 babies born between 28 and 42 gestational weeks in Malatya Province, ear lengths were not different between the sexes, and were longer compared to our study (10). In a study performed in Aydın among 152 term infants, ear length was higher in male infants, and results were lower than our results (11). The ear length of the babies born between 35 and 42 weeks in our study was found to be shorter when compared to those in the standardized study by Merlob et al. (9). Ear length measurements of newborns in this country are below the average measurements of the world (9–11).

A short foot is present in many syndromes such as Down syndrome, achondroplasia, apert syndrome, Bardet Biedl syndrome, and 18q deletion. A long foot is helpful in the diagnosis of Sotos syndrome (cerebral gigantism) (2). In our study, the mean foot length of male infants was significantly longer than that of females. In this country, among 60 babies (30 female, 30 male) born at 35–37 weeks and 60 babies (30 female, 30 male) born at 38–42 weeks in a study by Malas et al., no significant difference was detected in preterm infants due to sex, but the foot measurements were higher in term male infants (12). Compared to our study, preterm infants had shorter foot measurements, and term babies had longer foot measurements (12). In a retrospective study performed in Taiwan, compared to the study in which the foot length was measured with the footprint, our study found that the foot length was 1.7 cm longer in term infants (13). Our foot length results were also smaller when compared to the standardized study by Merlob et al. (9).

Hand and finger malformations may help to identify many syndromes. There was no hand length difference between the sexes among 200 children between the neonatal period and 5 years (15 female, 15 male) and hand length of newborns was 65.5 mm in a study by Malas et al. performed in Konya, Turkey (14). Malaysian newborns' hand length was determined to be 64.4 mm by Halder et al. (15). The hand length in our study was found to be longer than that of the standardized study by Merlob et al., but 2 mm smaller than the results reported by Malas et al. (9,14). In India, the mean middle finger length of term infants was determined as 30 mm, 2 mm longer than in our study (16). The mean middle finger length of both term and preterm infants in our study was longer than that of the standardized study by Merlob et al. (9).

Philtrum abnormality accompanies many syndromes. While short philtrum structure is observed in 4p deletion, Cohen syndrome, DiGeorge sequence, multiple synostosis syndrome, oral–facial–digital syndrome and Reiger syndrome, long philtrum is observed in 3p deletion, fetal valproate syndrome, Leroy I-cell syndrome, Robinow

Table 6. Chest circumference, ear length, foot length, palmar length, middle finger length, philtrum distance, inner and outer canthal distances, and palpebral fissure lengths Z scores of female infants based on gestational age.

Gestational age (weeks)	Z scores				
	–2 SD	–1 SD	Mean	1 SD	2 SD
Chest circumference (cm)					
35–36	25.64	28.01	30.38	32.75	35.12
37–38	29.25	30.93	32.61	34.29	35.97
39–42	28.26	30.00	33.04	34.78	36.52
Ear length (mm)					
35–36	26.80	29.63	32.46	35.29	38.12
37–38	27.97	30.95	33.93	36.91	39.89
39–42	28.73	31.61	34.49	37.37	40.25
Foot length (mm)					
35–36	59.89	64.88	69.87	74.86	79.85
37–38	66.18	70.07	73.96	77.85	81.74
39–42	66.76	71.01	75.26	79.51	83.76
Palmar length (mm)					
35–36	26.34	29.58	32.82	36.06	39.30
37–38	29.18	31.83	34.48	37.13	39.78
39–42	29.26	32.17	35.08	37.99	40.90
Middle finger length (mm)					
35–36	20.77	23.38	25.99	28.60	31.21
37–38	22.24	24.83	27.42	30.01	32.60
39–42	23.06	25.40	27.74	30.08	32.42
Philtrum distance (mm)					
35–36	5.75	6.88	8.01	9.14	10.27
37–38	5.89	7.20	8.51	9.82	11.13
39–42	6.08	7.41	8.74	10.07	11.4
Inner canthal distance (mm)					
35–36	15.32	17.12	18.92	20.72	22.52
37–38	16.39	18.19	19.99	21.79	23.59
39–42	17.07	18.56	20.05	21.54	23.03
Outer canthal distance (mm)					
35–36	46.16	52.84	59.52	66.20	72.88
37–38	51.18	57.20	63.22	69.24	75.26
39–42	52.13	57.60	63.07	68.54	74.01
Palpebral fissure length (mm)					
35–36	14.64	17.43	20.22	23.01	25.80
37–38	16.35	18.97	21.59	24.21	26.83
39–42	16.66	19.09	21.52	23.95	26.38

*SD: Standard deviation.

Table 7. Chest circumference, ear length, foot length, palmar length, middle finger length, philtrum distance, inner and outer canthal distances, and palpebral fissure lengths Z scores of male infants based on gestational age.

Gestational age (weeks)	Z scores				
	–2 SD	–1 SD	Mean	1 SD	2 SD
Chest circumference (cm)					
35–36	25.74	27.94	30.14	32.34	34.54
37–38	29.21	30.98	32.75	34.52	36.29
39–42	30.31	31.92	33.53	35.14	36.75
Ear length (mm)					
35–36	26.80	29.89	32.97	36.05	39.13
37–38	28.83	31.73	34.63	37.53	40.43
39–42	29.16	32.38	35.60	38.82	42.04
Foot length (mm)					
35–36	60.18	65.25	70.32	75.39	80.46
37–38	66.89	71.18	75.47	79.76	84.05
39–42	68.34	72.75	77.16	81.57	85.98
Palmar length (mm)					
35–36	27.93	30.91	33.89	36.87	39.85
37–38	29.59	32.56	35.53	38.50	41.47
39–42	27.95	32.16	36.37	40.58	44.79
Middle finger length (mm)					
35–36	20.62	23.02	25.42	27.82	30.22
37–38	22.68	25.19	27.70	30.21	32.72
39–42	23.17	25.70	28.23	30.76	33.29
Philtrum distance (mm)					
35–36	5.89	7.11	8.33	9.55	10.77
37–38	6.45	7.70	8.95	10.20	11.45
39–42	6.52	7.80	9.08	10.36	11.64
Inner canthal distance (mm)					
35–36	15.39	17.15	18.91	20.67	22.43
37–38	16.64	18.37	20.10	21.83	23.56
39–42	17.22	18.84	20.46	22.07	23.69
Outer canthal distance (mm)					
35–36	44.75	51.25	57.75	64.25	70.75
37–38	51.65	57.44	63.23	69.02	74.81
39–42	53.24	58.86	64.48	70.1	75.72
Palpebral fissure length (mm)					
35–36	14.15	16.81	19.47	22.13	24.79
37–38	16.54	19.02	21.50	23.98	26.46
39–42	17.14	19.59	22.04	24.49	26,94

*SD: Standard deviation.

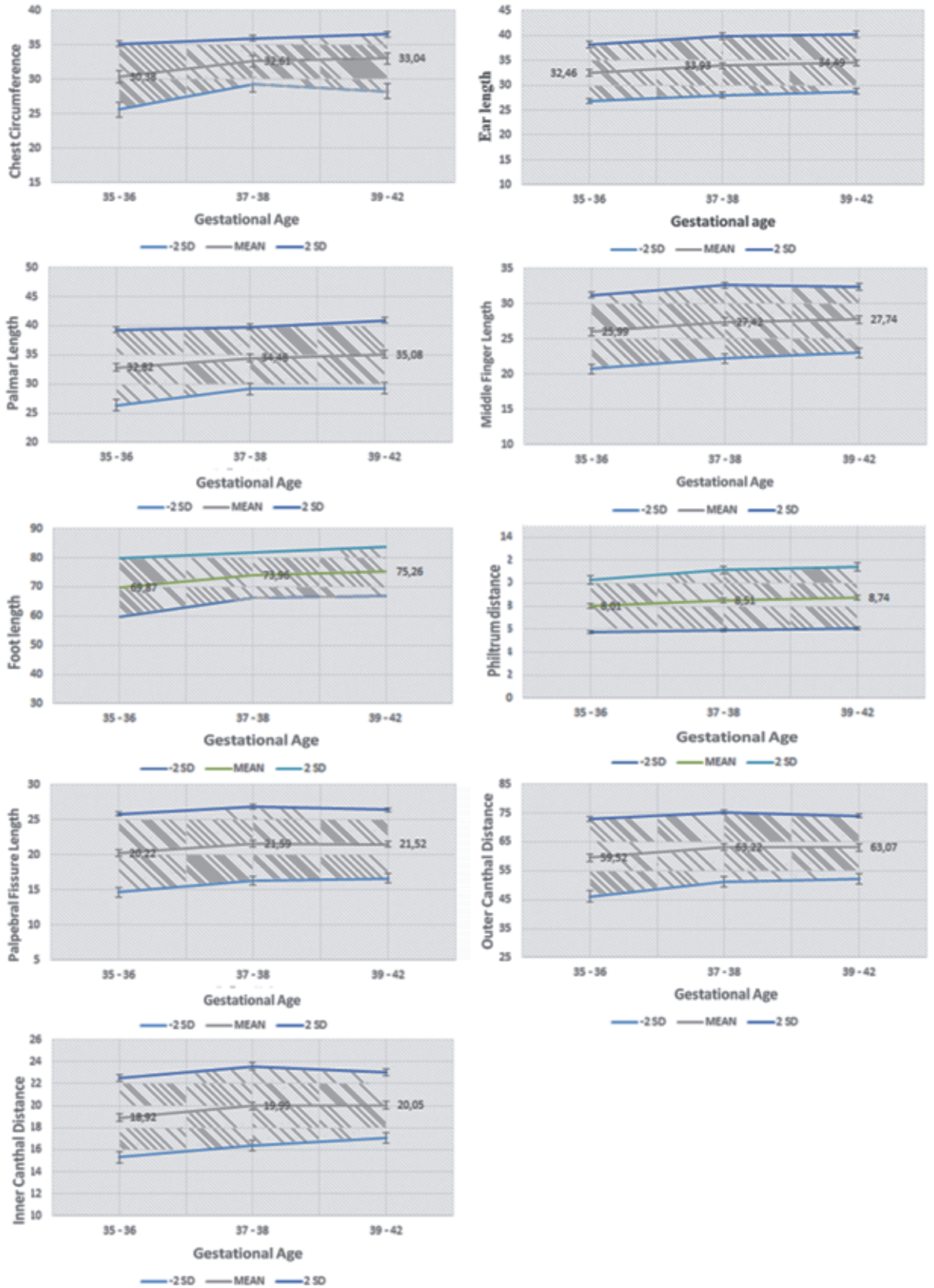

Figure 1. Chest circumference, ear, palmar, middle finger, foot length, philtrum, palpebral fissure, outer canthal, and inner canthal distance Z score values of female infants based on gestational age. The bars represent mean and ±2 standard deviation values.

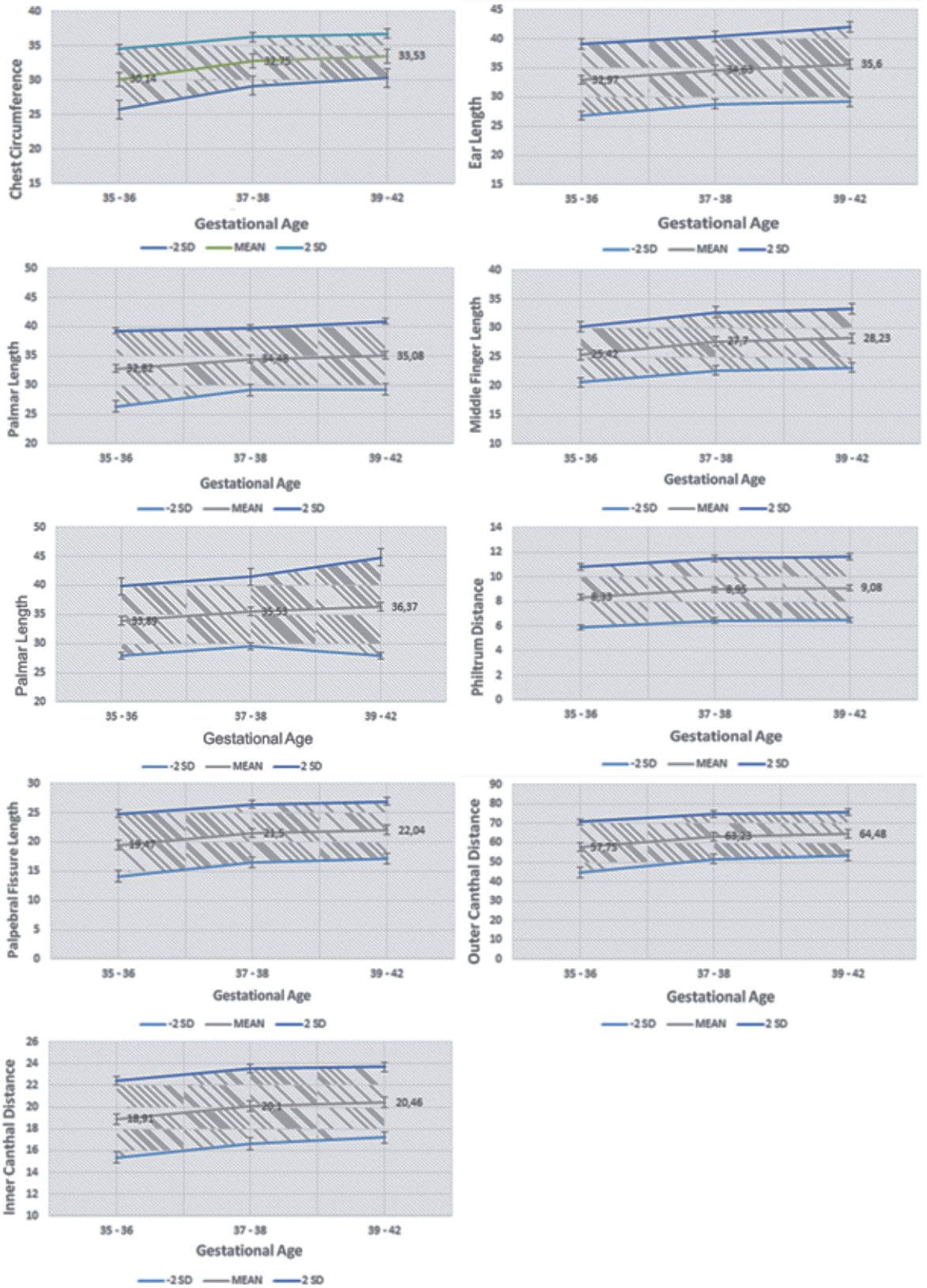

Figure 2. Chest circumference, ear, palmar, middle finger, foot length, philtrum, palpebral fissure, outer canthal, and inner canthal distance Z score values of male infants based on gestational age. The bars represent mean and ±2 standard deviation values.

syndrome, Weaver syndrome, and Williams syndrome (2). Philtrum length was longer in male infants than in females in our study. Karakaş et al. found shorter philtrum length values with no difference observed due to sex; however, the sample size was smaller than that of our study (11). The mean philtrum length in our study is similar to those of studies from Israel and India; also as in our study, the measurements were higher in the male group in the Indian study (17,18). The mean philtrum length in our study is shorter than that of the standardized study by Merlob et al. (9).

It appears that hypertelorism is present in the eyes in cases such as flat nasal root, narrow palpebral fissure, epicanthal fold, excessive width between eyebrows, and exotropia. In such cases, orbital measurements are normal when measured (19). In the evaluation of the eyes and periorbital structures, measurements of the inner canthal, outer canthal, outer orbital, interpupillary distance, palpebral fissure length, inner bulb index, and canthal index are helpful. Isolated hypertelorism is very rare and is usually sporadic. Syndromic hypertelorism may be observed due to many factors such as chromosomal anomalies, single gene disorders, and brain–skeleton developmental anomalies. Ocular hypertelorism is a characteristic finding of approximately 40 congenital syndromes, and may be observed with several syndromes (20). Hypotelorism is often accompanied by mental retardation (1).

In our study, no difference was found in other orbital measurements, except for the difference between the sexes in the inner canthal measurement. There are at present only 3 studies from our country where eye measurements were performed during the neonatal period. In a study by Suyugül et al., single value eye measurement for 0–3 months was performed among 1200 children between 0 and 14 years old (21). Inner and outer canthal measurements of 204 preterm and term infants were determined without sex distinction in a study by Akısü et al. (22). In a study by Karakas et al., only the inner canthal length of term infants was determined to be longer in male infants (11). The craniofacial measurements of 2371 Chinese infants, born between 33 and 42 weeks of gestational age, were performed by Fok et al., and all eye measurements were determined to be greater in male infants (23). The eye measurements are reported regardless of sex in Feingold and Bossert's study, which is considered as a standard for the white race, as well as in Merlop et al.'s study (1,9).

In our study, the outer canthal length was measured as 5.7 cm, 6.3 cm, and 6.4 cm in infants born at 35–36 weeks, 37–38 weeks, and 39–42 weeks of gestational age, respectively. In this country, the outer canthal length was measured as 5.58 cm by Suyugül et al., 6.21 cm by Akısü et al., and 6.56 cm by Karakas et al. (11,21,22). The smaller outer canthal measurements reported by Suyugül et al. may be related to preterm/term nondistinction (21). The outer canthal length was longer in blacks compared to whites in a comparative study from Wales and Nigeria among term infants (24). Outer canthal measurements of studies from Wales and United States were similar to our results (24). Two studies from India determined longer outer canthal length than in our study (16,25). In the study of Feingold and Bossert, which is accepted as standard in the measurement of the external canthal, the 50th percentile value of the outer canthal distance was determined as 6.32 cm in term infants, as in our study (1). The outer canthal distance is shorter in the study by Merlop et al. compared to our results (9).

In our study, the inner canthal interval is measured as 1.9 cm and 2 cm in infants born to 35–36 weeks and 37–42 weeks of gestational age, respectively. In this country, the inner canthal interval was measured as 2.09 cm by Suyugül et al., 2.14 cm by Akısü et al., and 1.80 cm by Karakaş et al. (11,21,22). No difference was observed in a comparative study from Wales and Nigeria among term infants (24). When we compare our results with studies from Wales, United States, and India, inner canthal measurements are similar (16,24,25). In addition, our inner canthal measurement results were similar to the results of Feingold and Bossert's study among term infants, which is accepted as the standard in the measurement of the inner canthal measurements, and also to the results of Merlop et al. among preterm and term infants (1,9).

In our study, the palpebral fissure length is 2 cm and 2.2 cm in infants born at 35–36 weeks and 37–42 weeks of gestational age, respectively. In this country, the palpebral fissure length was measured as 2.2 cm by Karakaş et al. (11). In a comparative study by Omontade et al., palpebral fissure length was longer in Nigerian babies than in Welsh babies (24). In our study, palpebral fissure length was shorter than that of Nigerian babies and was similar to that of Welsh infants. The palpebral fissure length of preterm and term infants in Merlop et al.'s study, which is accepted as a standard in palpebral fissure measurements, is shorter compared to our study (9).

One of the limitations in our study is that of being a single-center study, and the other is that only infants with more than 35 weeks of gestation were included. Furthermore, the region of this study reflected only the west side of our country. Thus, it may not reflect the geographical and ethnic differences across the nation. Multicentered studies may determine more precise anthropometric measures for Turkish infants.

In conclusion, these measurements for male and female infants born between 35 and 42 weeks may be useful for early detection of syndromes by defining anatomical abnormalities. New multicentered studies reflecting anthropometric measurements of preterm and term neonates are needed in this country.

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Table S1. Descriptive statistics and percentile values of chest circumference of all, female, and male infants due to gestational age.

	Gestational age (weeks)	n	Mean ± SD	Percentiles						
				5	10	25	50	75	90	95
				(CI)	(CI)	(CI)	(CI)	(CI)	(CI)	(CI)
All	35–36	237	30.36 ± 2.30	27	28	29	30	32	33	35
				26–28	27–28	28–29	30–31	31–32	33–34	34–36
	37–38	476	32.78 ± 1.75	30	31	32	33	34	35	36
				29–30	30–31	31–32	33–33	34–34	35–35	35–36
	39–42	484	33.36 ± 1.70	30	31	32	33	34.25	35	36
				30–31	31–32	32–33	33–34	34–35	35–36	36–36
Sex										
Female	35–36	119	30.48 ± 2.38	26.9	28	29	30	32	33	35
				25–28	26–28	25–29	30–31	31–32	32–35	34–37
	37–38	212	32.72 ± 1.71	30	31	32	33	34	35	35
				29–30	30–31	31–32	33–33	34–34	34–35	35–37
	39–42	240	33.12 ± 1.75	30	31	32	33	34	35	36
				30–30	30–31	32–32	33–33	34–34	35–36	35–36
Male	35–36	118	30.23 ± 2.22	27	28	29	30	31.75	33	34
				26–28	27–28	28–29	30–31	31–32	33–34	33–36
	37–38	264	32.84 ± 1.79	30	31	32	33	34	35	36
				29–30	30–31	31–32	33–33	34–34	35–36	35–36
	39–42	244	33.60 ± 1.62	31	31.3	33	34	35	35	36
				30–31	31–32	32–33	33–34	35–35	35–36	36–37

* Mean, SD, percentile, and the corresponding confidence intervals are measured.

Table S2. Descriptive statistics and percentile values of ear length of all, female, and male infants due to gestational age.

	Gestational age (weeks)	n	Mean ± SD	Percentiles						
				5	10	25	50	75	90	95
				(CI)	(CI)	(CI)	(CI)	(CI)	(CI)	(CI)
All	35–36	237	32.71 ± 2.96	28	29	31	33	35	36	37
				27–29	28–30	30–31	33–33	34–35	36–37	37–39
	37–38	476	34.31 ± 2.95	30	31	33	34	36	38	39
				29–30	30–31	32–33	34–35	36–36	37–39	39–40
	39–42	484	35.04 ± 3.10	30	31	33	35	37	39	40
				29–31	31–32	33–34	35–35	37–37	38–40	40–41
Sex										
Female	35–36	119	32.46 ± 2.83	28	29	31	33	34	36	36.1
				25–29	28–30	30–32	32–33	33–35	35–37	36–40
	37–38	212	33.92 ± 2.98	29	30.1	32	34	35.25	37	39
				27–30	30–31	32–33	34–34	35–36	37–39	38–40
	39–42	240	34.49 ± 2.88	30	31	33	35	36	38	39
				28–30	30–32	32–33	34–35	36–37	37–39	38–40
Male	35–36	118	32.97 ± 3.08	27.85	29	31	33	35	37	38
				25–29	27–30	30–32	33–34	34–36	36–38	37–40
	37–38	264	34.62 ± 2.90	30	31	33	35	36	38	40
				29–31	30–32	32–33	34–35	36–37	38–39	39–41
	39–42	244	35.59 ± 3.22	31	32	34	36	37	40	40.85
				28–31	31–32	33–34	35–36	37–38	39–40	40–42

* Mean, SD, percentile, and the corresponding confidence intervals are measured.

Table S3. Descriptive statistics and percentile values of foot length of all, female, and male infants due to gestational age.

	Gestational age (weeks)	n	Mean ± SD	Percentiles						
				5	10	25	50	75	90	95
				(CI)	(CI)	(CI)	(CI)	(CI)	(CI)	(CI)
All	35–36	237	70.09 ± 5.02	62	64	67	70	74	77	78
				61–64	63–65	65–68	69–71	73–75	75–78	77–80
	37–38	476	74.73 ± 4.53	68	70	72	75	78	80	81
				66–69	69–70	72–73	75–75	77–78	80–80	80–82
	39–42	484	76.13 ± 4.77	69	70	74	76	79	82	83
				67–70	70–71	73–74	76–77	79–80	81–82	82–84
Sex										
Female	35–36	119	69.86 ± 4.98	62.9	64	67	69	74	76	79
				62–64	62–65	65–67	68–71	72–75	75–79	77–81
	37–38	212	73.80 ± 4.67	68	70	71.75	74	77	78.9	80
				65–69	68–70	70–72	73–75	76–77	78–80	79–82
	39–42	240	75.09 ± 4.91	68	70	73	75	78	80.1	82
				65–70	69–70	72–74	75–76	77–79	80–82	81–83
Male	35–36	118	70.32 ± 5.07	61	64	67	70	74	77	78
				56–64	61–65	65–68	69–71	73–75	75–78	77–80
	37–38	264	75.47 ± 4.29	68	70	73	75	78	80	81.85
				65–70	69–71	72–74	75–76	78–79	80–81	81–83
	39–42	244	77.16 ± 4.41	70	72	75	77	80	82	84
				68–71	71–73	74–75	77–78	80–81	82–84	83–85

* Mean, SD, percentile, and the corresponding confidence intervals are measured.

Table S4. Descriptive statistics and percentile values of palmar length of all, female, and male infants due to gestational age.

	Gestational age (weeks)	n	Mean ± SD	Percentiles						
				5	10	25	50	75	90	95
				(CI)	(CI)	(CI)	(CI)	(CI)	(CI)	(CI)
All	35–36	237	33.35 ± 3.15	27.8	30	31	33	35	37	38
				26–29	28–30	31–32	33–34	35–36	37–38	37–39
	37–38	476	35.11 ± 3.05	30	32	33	35	37	38	39
				30–31	31–32	33–34	35–35	37–37	38–39	39–40
	39–42	484	35.70 ± 3.65	30.15	32	34	36	38	39	40
				30–31	31–32	33–34	35–36	37–38	39–40	40–41
Sex										
Female	35–36	119	32.81 ± 3.24	27	29	31	33	35	37	38
				25–28	27–30	30–32	32–34	34–36	36–38	37–39
	37–38	212	34.47 ± 2.65	30	31	33	35	36	37	38
				29–31	30–32	32–33	34–35	36–37	37–38	38–40
	39–42	240	35.08 ± 2.91	30	32	33	35	37	38	40
				28–31	30–32	33–34	35–36	37–37	38–39	39–40
Male	35–36	118	33.88 ± 2.98	29.85	30	32	34	36	37	38.15
				26–30	29–31	31–33	33–35	35–37	37–39	37–42
	37–38	264	35.62 ± 3.26	30	32	34	36	37	39	40
				28–32	31–33	34–35	35–36	37–38	39–39	39–41
	39–42	244	36.31 ± 4.17	31	32	34	36	38	39.7	40.8
				30–32	31–33	34–35	36–37	38–38	39–40	40–42

* Mean, SD, percentile, and the corresponding confidence intervals are measured.

Table S5. Descriptive statistics and percentile values of middle finger length of all, female, and male infants due to gestational age.

	Gestational age (weeks)	n	Mean ± SD	Percentiles						
				5	10	25	50	75	90	95
				(CI)	(CI)	(CI)	(CI)	(CI)	(CI)	(CI)
All	35–36	237	25.70 ± 2.52	22	23	24	26	27	29	30
				21–23	22–23	24–24	25–26	27–27	28–30	29–32
	37–38	476	27.58 ± 2.54	24	25	26	27	29	30	31
				22–24	24–25	26–27	27–28	29–30	30–31	31–32
	39–42	484	28.08 ± 3.34	24	25	27	28	30	31	31
				23–25	25–25	26–27	28–28	30–30	30–31	31–32
Sex										
Female	35–36	119	25.99 ± 2.61	22	23	25	26	27	29	31
				20–23	22–24	24–25	25–26	27–28	29–31	30–33
	37–38	212	27.42 ± 2.59	24	25	26	27	29	30	31
				21–24	24–25	25–26	27–28	29–29	30–31	30–33
	39–42	240	27.74 ± 2.34	24	25	26	28	29	30	31
				23–25	24–25	26–27	27–28	29–30	30–31	31–32
Male	35–36	118	25.42 ± 2.40	21.85	23	24	25	27	28.3	29
				21–22	21–23	24–24	25–26	27–27	27–29	29–32
	37–38	264	27.70 ± 2.51	24	25	26	28	29	30	31
				22–25	24–25	26–27	27–28	29–30	30–31	31–32
	39–42	244	28.42 ± 4.06	24	25	27	28	30	31	31.85
				22–25	24–25	26–27	28–29	30–30	30–31	31–33

* Mean, SD, percentile, and the corresponding confidence intervals are measured.

Table S6. Descriptive statistics and percentile values of philtrum distance of all, female, and male infants due to gestational age.

	Gestational age (weeks)	n	Mean ± SD	Percentiles						
				5	10	25	50	75	90	95
				(CI)	(CI)	(CI)	(CI)	(CI)	(CI)	(CI)
All	35–36	237	8.53 ± 4.11	7	7	7	8	9	10	11
				6–7	7–7	7–7	8–8	9–9	9–10	10–11
	37–38	476	8.90 ± 3.31	7	7	8	9	10	10	11
				6–7	7–7	8–8	9–9	9–10	10–11	11–11
	39–42	484	9.04 ± 2.23	7	7	8	9	10	11	11
				7–7	7–7	8–8	9–9	10–10	11–11	11–11
Sex										
Female	35–36	119	8.22 ± 2.30	7	7	7	8	9	9	10.1
				6–7	7–7	7–7	8–8	8–9	9–11	9–12
	37–38	212	8.82 ± 4.77	7	7	8	9	9	10	11
				6–7	7–7	7–8	8–9	9–10	10–11	11–11
	39–42	240	8.76 ± 1.32	7	7	8	9	9	10	11
				6–7	7–7	8–8	9–9	9–10	10–11	11–11
Male	35–36	118	8.83 ± 5.35	7	7	7	8	9	10	11
				7–7	7–7	7–8	8–9	9–9	10–11	10–11
	37–38	264	8.96 ± 1.25	7	7	8	9	10	11	11
				7–7	7–8	8–8	9–9	10–10	10–11	11–11
	39–42	244	9.32 ± 2.83	7	7	8	9	10	11	11
				7–7	7–8	8–8	9–9	10–10	11–11	11–12

* Mean, SD, percentile, and the corresponding confidence intervals are measured.

Table S7. Descriptive statistics and percentile values of inner canthal distance of all, female, and male infants due to gestational age.										
	Gestational age (weeks)	n	Mean ± SD	Percentiles						
				5	10	25	50	75	90	95
				(CI)	(CI)	(CI)	(CI)	(CI)	(CI)	(CI)
All	35–36	237	18.91 ± 1.77	16	17	18	19	20	21	22
				16–16	16–17	17–18	19–19	20–20	21–22	21–22
	37–38	476	20.05 ± 1.76	17	18	19	20	21	22	23
				17–17	17–18	19–19	20–20	21–21	22–23	23–24
	39–42	484	20.25 ± 1.57	18	18	19	20	21	22	23
				17–18	18–18	19–20	20–20	21–21	22–23	23–23
Sex										
Female	35–36	119	18.91 ± 1.80	16	17	17.5	19	20	21	22
				16–17	16–17	17–18	18–20	20–20	21–22	21–24
	37–38	212	19.99 ± 1.80	17	18	19	20	21	22	23
				16–18	17–18	19–19	20–20	21–21	21–23	23–24
	39–42	240	20.05 ± 1.49	18	18	19	20	21	22	22
				17–18	18–18	19–19	20–20	21–21	22–23	22–23
Male	35–36	118	18.90 ± 1.76	16	17	18	19	20	21	22
				15–16	16–17	17–18	18–19	20–21	21–22	21–23
	37–38	264	20.10 ± 1.73	17	18	19	20	21	22	23
				17–18	17–18	19–19	20–20	21–21	22–23	23–24
	39–42	244	20.46 ± 1.62	18	18	20	20	21	23	23
				17–18	18–19	19–20	20–21	21–22	22–23	23–24
* Mean, SD, percentile, and the corresponding confidence intervals are measured										

Table S8. Descriptive statistics and percentile values of outer canthal distance of all, female, and male infants due to gestational age.

	Gestational age (weeks)	n	Mean ± SD	Percentiles						
				5	10	25	50	75	90	95
				(CI)	(CI)	(CI)	(CI)	(CI)	(CI)	(CI)
All	35–36	237	58.63 ± 6.64	48.8	50	54	58	64	68	69
				47–49	49–51	52–54	57–59	62–65	67–69	68–72
	37–38	476	63.22 ± 5.88	53.75	56	59	63	68	70	72
				52–55	55–56	58–60	62–64	67–68	70–71	71–73
	39–42	484	63.78 ± 5.58	54.15	57	60	64	68	71	72
				53–55	55–57	59–60	63–65	67–68	70–72	72–73
Sex										
Female	35–36	119	59.52 ± 6.68	48.9	51	54	60	64	68	70.1
				47–51	48–51	52–56	58–61	62–66	67–71	68–73
	37–38	212	63.21 ± 6.01	53	55	59	64	68	70	72
				51–54	53–56	57–60	62–65	67–69	70–72	71–73
	39–42	240	63.07 ± 5.47	53	55	60	64	67	70	71.05
				52–54	54–57	58–60	63–64	66–68	69–71	70–71
Male	35–36	118	57.74 ± 6.50	48.85	50	53	57	63	67	69
				46–49	48–51	51–54	56–58	60–65	66–69	68–72
	37–38	264	63.22 ± 5.79	54	56	59	63	68	70	73
				53–56	55–57	58–60	62–64	66–69	70–72	71–74
	39–42	244	64.47 ± 5.62	56	57	60	64.5	68.25	72	73
				55–57	56–58	60–61	64–65	67–70	71–73	72–76

* Mean, SD, percentile, and the corresponding confidence intervals are measured.

Table S9. Descriptive statistics and percentile values of palpable fissure length of all, female, and male infants due to gestational age.

	Gestational age (weeks)	n	Mean ± SD	Percentiles						
				5	10	25	50	75	90	95
				(CI)	(CI)	(CI)	(CI)	(CI)	(CI)	(CI)
All	35–36	237	19.84 ± 2.75	16	16	17	20	22	24	24
				15–16	16–17	17–18	19–20	21–23	23–24	24–25
	37–38	476	21.53 ± 2.54	17	18	20	22	23	25	25
				17–18	18–18	19–20	21–22	23–24	25–25	25–26
	39–42	484	21.78 ± 2.45	18	19	20	22	24	25	25.85
				17–18	18–19	20–20	22–22	23–24	25–25	25–26
Sex										
Female	35–36	119	20.21 ± 2.78	16	17	18	20	22	24	25
				15–16	16–17	17–19	20–21	21–23	23–25	24–26
	37–38	212	21.58 ± 2.62	17	18	20	22	24	25	25
				16–17	17–19	19–20	21–22	23–24	25–25	25–26
	39–42	240	21.52 ± 2.43	17	18	20	22	23	24	25
				17–18	17–19	19–20	21–22	23–24	24–25	24–26
Male	35–36	118	19.44 ± 2.66	15.85	16	17	19	22	23	24
				15–16	15–17	17–18	19–20	21–23	23–24	23–25
	37–38	264	21.5 ± 2.48	17.15	18	20	21	23	25	25
				17–18	18–19	19–20	21–22	23–24	24–25	25–26
	39–42	244	22.03 ± 2.45	18	19	20	22	24	25	26
				17–19	19–19	20–20	22–22	23–24	25–26	25–27

* Mean, SD, percentile, and the corresponding confidence intervals are measured