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A Descriptive Study of Cephalic and Prosopic Anthropometric Indices in One-day-old Infants in Imam Ali and Kamali Hospital, Karaj

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Abstract

Objective: There is no published literature about the types of head and face shapes in the Alborz newborns. Therefore, we designed this study to report these important regional data.

Methods: Head length, head width, face length, face width, prosopic and cephalic indices were made on 150 newborns (75 males and 75 females) with a view to establish the criterion of cephalometry for this age group in Iran. A special emphasis was given to delivery mode in this study.

Results: There was no significant difference in cephalic and prosopic indices between two groups (female: $P = 0.46$; male: $P = 0.43$). Brachycephalic type was dominant and dolicocephalic type was rare in male and female neonates. There was no significant difference in head shape between two groups. Hypereuriprosopic and hyperleptoprosopic were dominant and rare types, respectively, in newborns without significant difference between two groups.

Conclusion: The head and face indices in the newborn infants born by cesarean section were not significantly different from vaginal delivery group. However, the role of nutrition and climate could not be ruled out.

Keywords: Anthropometry, cephalic index, prosopic index, craniofacial, newborn

Introduction

Anthropometry, defined as the science of measurement and the art of application of physical properties of the human, is one of the most important studies in medicine.[1,2] Cephalometry or craniometry means measurement of dimension of skull without soft tissue. Cephalic and craniofacial indexes, especially in the first days after birth, are important for the assessment of neonatal health status and their findings are used in different branches of medicine.[3] In recent years, craniofacial anthropometry has become an important tool used by clinical geneticists, forensic experts and reconstructive surgeons.[3] In this regard, researchers in various countries and societies have sought to collect craniofacial anthropometric indexes so that they define and present proportional facial indices of specific communities and ethic groups.[4,5] Since the evaluation of such indicators reflects the development of the brain growth and facial shapes, it has received much attention from researchers and health physicians.[1] The brain and skull grows at different rates and most changes occur from the first month of birth until the sixth years of age.[3] Based on complex process bone growth in different directions, cephalometry can be explained. Head length and width are the most important dimensions of the skull. Cephalometry is carried out utilizing several methods, including photogrammetry, ultrasound, CT scan, MRI, and the use of standard lateral skull radiographs or cephalograms.[6,7]

Determination of anthropometric measurements and reference ranges of each ethnic group is therefore essential for indicating the degree of deviations from normal. Moreover, background newborn anthropometric data, which could assess deviations from normal, are generally lacking in developing countries. So, the physical measurements of newborn are compared with the standards of other countries. However, relying on these standards brings some limitations related to differences in genetic, nutritional and environmental factors.[8,9] At present, very limited data are available regarding the reference ranges of head and facial proportions and anthropometric measurements of the Persian population in Iran. This study aimed to provide data from Karaj to help establish the reference range of craniofacial anthropometric measurements in the newborns Karaj population.

Materials and Methods

This cross sectional study was undertaken from June, 2019 to November, 2019 as a joint effort by the department of Anatomy and Pediatrics, Alborz University of Medical Sciences, karaj, Iran. The project was approved by the Research Committee in Health Sciences at the Alborz University of Medical Sciences by ethic code; IR.ABZUMS.RES.1398.097. The ethics committee approved all the ethical considerations of the study. Gestational age estimation was based on the first day of the last menstrual period. After taking written permission from the parents of newborns,the head and face of 150 living newborn [male (C/S or NVD) and female (C/S or NVD)], which 47 of them had born by cesarean section (C/S) and 103 of them had born by normal vaginal delivery (NVD), were considered. All the newborns were healthy with no known genetic diseases or specific deformity. Infants were weighed in a time interval between 5 to 10 hours following birth, wearing no clothes and diapers, using a scale with accuracy of 100 g. Their height was also measured using a tape meter with a precision of 0.5 mm while the infants were being placed in the supine position and their knees straightened from heel to head. Then, head dimensions of the infants underwent anthropometric measurement using a standard millimetric caliber (Martin Saler) with the accuracy ± 0.5 mm based on the international reference

points.[3] Head, face and nose indices were determined. All measurements were taken under observation of a pediatrician and during daytime.
Measurement parameters included are:

Head length = summit of glabella to farthest occipital point
Head width = greatest breadth, at right angles to median plane
Face length = nasion–gnathion height
Face width = bizygomatic breadth
Cephalic Index = (Head width/Head length) × 100
Prosopic Index = (Face width/Face length) × 100

The above indices were determined on the basis of international anatomical descriptions (Williams P, 1995). Based on these indices the types of head and face shapes were classified following Banister 1995 and Panero 197 (Table 1 , Table 2). All races and populations are divided into four head shape groups:

Dolichocephalic (long head): The ratio of head length to head width is higher than normal (<74.9).
Mesocephalic (round head): The average ratio of head length to head width is between 75 to 79.9.
Brachycephalic (wide head): The ratio of head length to head width is lower than normal (80–84.9).
Hyperbrachycephalic (super wide head): having a very broad head with a cephalic index of over 85.

In term of face shape there are 5 models:

Hypereuriprosopic (super wide face): having a very wide face with a prosopic index of lower than 79.9.
Euriprosopic (wide face): having a wide face with a prosopic index between 80 to 84.9.
Mesoprosopic (round face): The average ratio of head length to head width is between 85 to 89.9.
Leptoprosopic (long face): having a long face with a prosopic index between 90 to 94.5.
Hyperleptoprosopic (super long head): having a very long face with a prosopic index of over 95.

Table 1. **Various head shape [Range of Cephalic Index (CI) (%)]**

Head shape	Range of cephalic index (CI) (%)
Dolicocephalic	<74.9
Mesocephalic	75–79.9
Brachycephalic	80–84.9
Hyperbrachycephalic	85–89.9

Table 2. **Various face shape [Range of Prosopic Index (PI) (%)]**

Face shape	Range of prosopic index (PI) (%)
Hypereuriprosopic	<79.9
Euriprosopic	80–84.9
Mesoprosopic	85–89.9
Leptoprosopic	90–94.9
Hyperleptoprosopic	>95

The study groups were divided according to the gender (male or female). After gathering and saving the data, they were analyzed with SPSS 20 software using statistical analysis, T-test, K-2 and Pearson index. $P < 0.05$ were considered statistically significant.

RESULTS

Respecting delivery type, 47 (31.3%) were cesarean deliveries, and 103 (68.6%) were vaginal deliveries. The average maternal age was 27.02 ± 5.25 and mean of parity was 1.66 ± 0.64. The mean of gestational age was 38.21 ± 0.92.

The research results showed that the average weight and height of the girl infants (n = 75) were 3365.3 g and 492.1 mm while the average weight and height of the boy infants (n = 75) were 3385.5 g and 513.1 mm. The overall mean cephalic indices were 82.71 ± 4.72 and 83.12 ± 4.31 in male and female newborns respectively. When the mean cephalic indices were analyzed according to the type of delivery, it was 81.12 ± 1.54 cm and 81.81 ± 1.65 cm in children born by vaginal and cesarean delivery, respectively, and this difference was not significant ($P > 0.001$). Means and SD of length and width of head and face in addition to Cephalic and Prosopic indices are depicted in Table 3.

Brachycephalic type was dominant whilst dolicocephalic type was rare in male and femal neonates. There was no significant difference in head shape between two groups (Table 4).

Hypereuriprosopic and hyperleptoprosopic were respectively the most dominant and rare types in newborns without significant difference between two groups (C/S, n = 47; NVD, n = 103) (Table 5).

Table 3. **Parameters of head and face [There was no significant difference in cephalic and prosopic indices between two groups ($P = 0.46$, $P = 0.43$ respectively)]**

	Male ($n = 75$)		Female ($n = 75$)		
Variables	**Mean**	**SD**	**Mean**	**SD**	***P*-value**
Head length	117	3.91	115.8	4.01	0.52
Head width	96.71	4.21	96.21	3.91	0.42
Face length	55.72	4.21	55.23	3.70	0.32
Face width	81.46	3.20	80.04	3.13	0.33
Cephalic index	82.71	4.72	83.12	4.31	0.46
Prosopic index	68.57	6.41	68.41	5.80	0.43

Table 4. **Distribution of head shapes [Brachycephalic type was dominant whilst dolicocephalic type was rare in male and femal neonates. There was no significant difference in head shape between two groups male and female]**

	Male ($n = 75$)		Female ($n = 75$)		C/S ($n = 47$)		NVD ($n = 103$)	
Variables	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Dolicocephal	5	6.7	1	1.3	2	4.3	4	3.9
Mesocephal	14	18.7	19	25.3	10	21.3	23	22.3
Brachycephal	29	38.7	32	42.7	20	32.8	41	39.8
Hyperbrachycephal	27	36	23	30	15	30	35	34

Table 5. **Distribution of face shapes [Hypereuriprosopic and hyperleptoprosopic were respectively the most dominant and rare types in newborns without significant difference between two groups male and female]**

	Male ($n = 75$)		Female ($n = 75$)		C/S ($n = 47$)		NVD ($n = 103$)	
Variables	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Hypereuriprosopic	67	89.3	66	88.2	41	87.2	92	89.3
Euriprosopic	2	2.6	4	5.3	5	10.6	1	0.9
Mesoprosopic	4	5.3	3	4	0	0	7	6.7
Leptoprosopic	2	2.6	2	2.6	1	2.1	3	2.9
Hyperleptoprosopic	0	0	0	0	0	0	0	0

Table 6. **Comparison of the present study and other similar studies [Statistical differences between the present project and other similar studies in other provinces of the country in terms of cephalic dimensions]**

Province	Gender	Cephalic index	Prosopic index	Head shape	Face shape
Alborz (present project)	Male Female	82.71 83.12	68.57 68.41	Brachycephic	Hypereuriprosopic
Kermanshah[13]	Male	81	–	Brachycephic	–
Gorgan[17]	Female Male		84 88.22		Euryprosopic Mesoprosopic
Gorgan[10]	Male	78.63	74.3	Mesocephalic	Hypereuriprosopic
Arak[16]	Female	81.5	94.9	Mesocephic	Hypereuriprosopic
Zahedan[14]	Male	83.6	86.3	Brachycephic	Euriprosopic

Discussion

In the current survey female and male newborn infants were assessed for cephalometric measurement based on the type of delivery. In this study, brachycephalic type was predominant and dolichocephalic type was rare in terms of head shape in both male and female infants. Hyperperiposopia and hyperleptosporosis were the most prevalent and rarest types of facial indexes in infants, respectively.

The cephalic indices of this study were higher than Golalipour's study in Golestan, Iran[10] and resembled to Jordaan's study in South Africa[11] and Imami's study in Qazvin, Iran.[12] The observed cephalic indices showed that the brachycephalic type was dominant and dolicocephalic type was rare in male and female neonates. Brachycephalic type was dominant in both NVD and CS groups. These results agree with the findings of Iviza[13] and Heidari.[14] In respect to the variation of head shape in various races and geographical zones, it seems that hereditary factors primarily affect the shape of head. However, the additional effect of environment cannot be underestimated.[9] The anthropological studies concerning the role of racial elements determined that people's head shape in pacific ocean were commonly brachycephalic type while in middle East, Russia and central parts of Europe were mostly mesocephlic type and finally, most of the people in Atlantic Ocean boundary were mesocephalic type.[14]

Findings of cephalometric studies in Karaj showed that brachycephaly and mesocephly have been dominant head types in Iranian newborn's (Table 6).

The obtained prosopic indices showed that the hypereuryprosopic type of face shape was dominant in male and female newborns among both NVD and CS groups. In parallel with our results, Bayat[15] and Golalipour[16] reported that the dominant type of face shapes in Iran was hypereuryprosopic. On the contrary, Heidari et al. in 2004 reported that the dominant type of face shapes in Zahedan was Euriprosopic type.[14] Therefore, It seems that racial differences, nutritional factors and ecological conditions such as climate may influence craniofacial parameters. According to this theory, Jahanshahi et al. in 2008 reported that hypereuriprosopic was dominant type in Turkman's male newborns.[17] In another study, it has been shown that ethnic differences can even affect brain weight and cranial capacity. They found that brain weight and skull capacity were significantly higher in the Persian people compared to the Turkmen people.[16]

Conclusion

All of all, brachycephalic type was predominant and dolichocephalic type was rare in terms of head shape in both male and female infants. Hyperperiposopia and hyperleptosporosis were the most prevalent and rarest types of facial indexes in infants, respectively.

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Conflicts of Interest

None.

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