Journal of Medical Sciences

ISSN 1682-4474

science alert

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Research Paper

J. Med. Sci., 6 (3): 400-404
May-June, 2006

Morphological Evaluation of Head and Face in 18-25 Years Old Women in Southeast of Iran

[1]Zahra Heidari, [1]Hamid-Reza Mahmoudzadeh Sagheb and
[2]Mohammad-Hosein Noori Mugahi

Measurement of human head or cephalometry is used in identification, forensic medicine, plastic surgery, orthodontics, archeology and examine the differences between races. This investigation was undertaken on 800 young women (18-25 years old) to determine the head and face phenotypes among them in two aborigines of Sistani (Fars) and Baluchi who were resident in southeast of Iran. In this study cephalic and prosopic indices were determined by classical cephalometric method. Means and standard deviation of cephalic indices were 78.4±4.15 and 81.94±4.99 and prosopic indices were 83.22±4.02 and 84.86±5.15 in Sistani and Baluchi subjects, respectively. Based on the cephalic index, the dominant and rare head types in Sistani group was mesocephalic (41.3%) and hyperbrachycephalic (6%) and in Baluchi group was brachicephalic (42%) and dolichochephalic (5.5%), respectively. Furthermore, according to the prosopic index, the dominant and rare face type among sistanis were euryprosopic type (50.8%) and hyperleptoprosopic (0.5%) and in Baluchi group were euryprosopic (37%) and hyperleptoprosopic (2.5%), respectively. This research showed that differences in terms of head and face type indices between these two groups were statistically significant. Based on this cross-sectional study, it seems that there is differences between the aforementioned groups.

Key words: Anthropometry, cephalometry, cephalic index, prosopic index

JMS (ISSN 1682-4474) is an International, peer-reviewed scientific journal that publishes original article in experimental & clinical medicine and related disciplines such as molecular biology, biochemistry, genetics, biophysics, bio-and medical technology. JMS is issued six times per year on paper and in electronic format.

For further information about this article or if you need reprints, please contact:

Dr. Zahra Heidari
Department of Anatomical Sciences, School of Medicine,
P.O. Box 98165-488,
Zahedan, Iran

Tel: 985413220424
Fax: 985412418 960

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[1]Department of Anatomical Sciences, School of Medicine,
Zahedan University of Medical Sciences, Zahedan, Iran
[2]Department of Histology, Khoramshahr University of Marine Sciences and Technology, Khoramshahr, Iran

INTRODUCTION

Physical anthropometry probably began because of the interest in the racial classification, which deals with the measurement of human body dimensions (Meibodi and Mastari, 1996; Heidari *et al*., 2004; Galalipour *et al*., 2003; Williams *et al*., 1995). Various ecologic, geographic, and ethnical factors as well as age and gender determine the dimensions of human body (Golalipour *et al*., 2003; 2001a,b). Therefore, anthropometric studies must be performed on specific age groups of only a single sex among individual ethnicities in a geographical region (Meibodi and Mastari, 1996; Heidari *et al*., 2004; Golalipour *et al*., 2003, 2001a,b). An important branch of anthropometry is cephalometry (Heidari *et al*., 2004; Will *et al*., 1995). Cephalometry is helpful in identification, forensics, head and face reconstruction, plastic surgery, oral and maxillofacial surgery, orthodontics and clinical diagnosis and treatment planning (Meibodi and Mastari, 1996; Heidari *et al*., 2004; Williams *et al*., 1995; Will *et al*., 1995; Sakakibara *et al*., 1999). Conducting anthropometrical studies with the aim of obtaining the characteristics of ethnical groups inhabiting a particular geographical region, not only assist in understanding the frequency distribution of human morphologies but also in providing the basis for a comparison among different races (Heidari *et al*., 2004; Golalipour *et al*., 2003; 2001a, b; Zaidi, 1989; Everekliogl*u et al*., 2002).

This study aimed at applying well-known international cephalometric methods to assess and compare craniofacial morphological characteristics of young women (18-25 years old) in two aborigines of Sistani (Fars) and Baluchi who were resident in southeast of Iran. Similar studies have been carried out in this region and in other parts of Iran on newborns (Meibodi and Mastari, 1996; Heidari *et al*., 2004. Golalipour *et al*., 2003; 2001a,b; Heravi and Zieaee, 2002), but the geographical features of the Southeastern region, changes of anthropometric indices with age and sex and most importantly a lack of studies on this particular subject were the incentives for the current study. In this study, two important anthropometrical indices, the cephalic and prosopic indices were measured to assess different craniofacial types among Sistani (Fars) and Baluch young women.

MATERIALS AND METHODS

The current cross-sectional descriptive analytical study was performed on normal young women (18-25 years old) in two aborigines of Sistani (Fars) and Baluchi who were resident in southeast of Iran, during the winter of 2003. Eight hundred volunteer women were consecutively included 400 Sistani (Fars) and 400 Baluch were selected by cluster sampling. The Sistani or Baluch attributed to ones that were born from whom that inhabitant in Sistan and Baluchistan province during 3 generations and had have intra-group marriages. Using the classical cephalometry (Williams *et al*., 1995) the morphological dimensions of head and face (maximum length and breadth) were respectively measured with a scaled cephalometer and a sliding caliper at precision levels of 0.5 mm. The measurements included maximum head length (glabella to inion), maximum head breadth (between right and left euryons), maximum face length (nasion to gnathion) and maximum face breadth (bizygomatic). All data were recorded in data sheets along with the cephalic and prosopic indices that were calculated using the following equations (Heidari *et al*., 2004; Golalipour *et al*., 2003; Williams *et al*., 1995).

Table 1: Craniotyping based on the cephalic index

Cephalic phenotype	Cephalic index
Dolichocephalic	≤70-74.9
Mesocephalic	75-79.9
Brachicephalic	80-84.9
Hyperbrachicephalic	≥85-89.9

Table 2: Facial typing based on the prosopic index

Facial phenotype	Prosopic index
Hypereuryprosopic	≤75-79.9
Euryprosopic	80-84.9
Mesoprosopic	85-89.9
Leptoprosopic	90-94.9
Hyperleptoprosopic	≥95

$$\text{Cephalic index} = \frac{\text{Maximum head breadth}}{\text{Maximum head length}} \times 100$$

$$\text{Prosopic index} = \frac{\text{Maximum face length}}{\text{Maximum face breadth}} \times 100$$

Then, the craniofacial typing was done through comparing these indices with the craniofacial phenotypic classification and the results were (Table 1 and 2) recorded.

The data were analyzed with SPSS 9.0 and results expressed as mean±SD. The Chi-square and t-test were used to compare the results. P-value of less than 0.05 was considered significant.

RESULTS

The indices: The mean cephalic indices were 78.4±4.15 and 81.94±4.99 for Sistani and Baluch women, respectively. Statistical analysis showed that there was significant difference between two groups ($p<0.0001$) (Table 3).

Table 3: Means, standard deviations, maximum and minimum values for the anthropometric indices

	Sistani				Baluch				t-test analysis
Variable	Mean	SD	Max.	Min.	Mean	SD	Max.	Min	results
Cephalic index	78.4	4.15	92.75	69.45	81.94	4.99	96.88	69.7	t = 0.5 df=798 p<0.0001
Prosopic index	83.22	4.02	97.67	74.48	84.86	5.15	97.66	72.41	t = 0.5 df=798 p<0.0001

Table 4: The frequency and % of head phenotypes among the women plotted to ethnicity X^2 =90.76, df = 3, p<0.0001

	Sistani		Baluch	
Phenotype	Frequency	%	Frequency	%
Dolichocephalic	85	21.3	22	5.5
Mesocephalic	165	41.3	118	29.5
Brachicephalic	126	31.5	168	42.0
Hyperbrachicephalic	24	6	92	23.0
Total	400	100	400	100.0

Table 5: The frequency and % of facial phenotypes among the women plotted to ethnicity X^2 =39.37, df=4, p<0.0001

	Sistani		Baluch	
Phenotype	Frequency	%	Frequency	%
Hypereuryprosopic	78	19.5	74	18.5
Euryprosopic	202	50.8	148	37.0
Mesoprosopic	98	24.5	103	25.8
Leptoprosopic	19	4.8	65	16.2
Hyperleptoprosopic	2	0.5	10	2.5
Total	400	100	400	100.0

The mean prosopic index in Sistani and Baluch groups were 83.22±4.02 and 84.86±5.15, respectively. There was significant difference between two groups (p<0.0001) (Table 3).

The morphological classification of the head: The classification was done according to the cephalic index. Among Sistani women the dominant type was mesocephalic with a frequency of 41.3% and the rare type was the hyperbrachicephalic (6%), other morphological types in this group was brachicephalic (31.5%) and dolichochephalic (21.3%). In Baluch women dominant and rare types were brachicephalic 42% and dolichochephalic (5.5%), respectively. Frequency of mesocephalic and hyperbrachicephalic types were 29.5 and 23%, respectively. There was also statistical difference between two groups (p<0.0001) (Table 4).

The morphological classification of the face: By means of the prosopic index, it was determined that the euryprosopic type was the dominant phenotype in both Sistani (Fars) and Baluch women with frequencies of 50.8 and 37%, respectively. The rare facial type was hyperleptoprosopic with frequencies of 0.5 and 2.5% in Sistani (Fars) and Baluch groups, respectively. Frequency of hypereuryprosopic type was 19.5 and 18.5% and leptoprosopic type was 4.8 and 16.3% in Sistani (Fars) and Baluch groups. The difference between the two racial groups was statistically significant regarding the facial types (p<0.0001) (Table 5).

DISCUSSION

The cephalic index is a very important parameter in craniotyping. In the present study, the mean cephalic index was statistically different between Sistani (Fars) and Baluch groups, implying their different ethnical origin. The cephalic index of Sistani women in the current study was lower than cephalic index of Sitsani (Fars) male newborns but this index in Balouch women was almost similar to balouch newborns in another study performed in this region (Heidari *et al*., 2004). This showed that in Sistani (Fars) newborns with the aging anatomical indices of skull has changed but in Balouchs with growth of skull, this index has been constant. The cephalic index of Sistani women was similar to cephalic indices of boy infants of Gorgani (Fars) and Turkamans who lived in northeast Iran (Golalipour *et al*., 2003), but this index for Balouch women was higher. Another study on female infants of Fars and Turkaman origin revealed respective mean cephalic indices, which was similar to those of Sistani women and well lower than Baluch women (Golalipour *et al*., 2001).

In the present study, the cephalic index of Balouch women were higher than the cephalic index reported by Meibodi and Mastari (1996), but this was similar to a cephalic index of whom that studied different groups in Pakistan (Zaidi, 1989) and that of studied on 12-year-old boys in Mashad, Northeast Iran (Heravi and Zieaee, 2002) Another study reported a similar cephalic index of in South Africa (Jordan, 1976). These may indicate similarity between Balouchs and those races but there are obvious differences between Sistanis and those races. There is a research performed in Japan that showed cephalic index of 87% (Nakashima, 1986), which is higher than these indices in both Balouch and Sistanis. This difference indicates the heterogeneity of the cephalic morphologies in the two native inhabitants of the regions.

Present results showed that the dominant head forms of Sistani and Balouch women were mesocephalic (41.3%) and brachicephalic (42%), respectively. In male newborns of these two native dominant head form were hyperbrachicephalic and brachicephalic (both 37% in Sistani subjects vs. 37.3 and 35.3% in Baluchs) (Heidari *et al*., 2004), in Balouch women dominant form is different from other studies (Meibodi and Mastari, 1996; Heidari *et al*., 2004; Golalipour *et al*., 2003; 2001a,b) which showed that mesocephaly was the dominant form in Turkamans, Fars-Gorgani and Qazvini boy and girl infants but is almost similar to Balouch newborns. Dominant form of head in Sistani was similar to above-

mentioned studies but was different with Sistani newborns (Heidari *et al*., 2004). Furthermore, the rare type in the current study was dolichocephaly, unlike other parts of Iran where hyperbrachicephaly has been shown to be rare type (Golalipour *et al*., 2003; 2001a,b). Dolichocephaly is common in the black race (Okanlwon *et al*., 1990).

The current research in Balouh women reproduced the results of a multiracial study in Pakistan with the dominance of brachicephalic and hyperbrachicephalic forms (Zaidi, 1989) and another similar study on Indo-Aryan inhabitants of the temperate parts of India who were shown to be mostly brachicephalic (Bharati *et al*., 2001) and the dominance of hyperbrachicephaly in Nakashima's study (Nakashima, 1986). As well, it is in accordance with the dominance of the brachicephalic type in South Africa (Jordan, 1976), America and Europe (Panero, 1979).

Overall, in the first glance it seems that inheritance determines the varieties of the cranium among different races. Environment is undoubtedly an effective determinant as well, but through a closer look, it can be concluded that it is actually the genotype of the population which dictates its response to the environmental stimuli (Heidari *et al*., 2004; Golalipour *et al*., 2003; 2001a,b; Jordan, 1976; Bharati *et al*., 2001). Interestingly, it was noticed that the first generation of Japanese immigrants in Hawaii had an increased head breadth, a decreased head length and a higher cephalic index than their parents (Heravi and Zieaee, 2002). Therefore, in addition to inheritance, geographical factors play a certain role (Heidari *et al*., 2004; Golalipour *et al*., 2003; 2001a,b; Jordan, 1976; Bharati *et al*., 2001; Jagr *et al*., 1998).

The influential role of time must also be considered as a probability. For instance, in a study it was observed that over a period of 30 years, the residents of an area in Japan developed some changes in the form of their cranium toward an increase in the head breadth in the subsequent generations (Nakashima, 1986). Time can also induce the gradual expression of genetic characteristics in individuals. A group of black Africans tends to become more dolichocephalic than their white peers within the first 2 years of life (Okanlwon *et al*., 1990). In addition, in Czech Republic, it was observed a natural decrease in the cephalic index within the first 3 years of life (Krasnicanova, 1990).

Multiracial anthropological studies have shown that the dolichocephalic phenotype is mostly spread in Africa, India, Australia and parts of Europe and North America. In America, the residents of the Pacific Coast are commonly brachicephalic while in the Middle East, Russia, Central Europe and the coastal areas of the Atlantic Ocean mesocephaly is more common (Jagr *et al*., 1998). Archeological evidence shows that before the Mesolithic period, the early humans were dolichochephalic and it was in the Mesolithic period that the dolichocephalic phenotype appeared for the first time in Europe. In today's Eastern Europe such as in Poland, this phenotype can still be found. The Caspian people are dolichocephalic and much less commonly mesocephalic (Heidari *et al*., 2004; Golalipour *et al*., 2003).

In our study the prosopic index was significantly different in Sistani (Fars) and Baluch women ($p<0.0001$), thus in fact the similarity of these two ethnicities was not observed. In male newborns of these ethnicities, this index was 86.79±5.87 vs. 86.03±6.76 (Heidari *et al*., 2004). In two other studies in Northeast Iran, the prosopic index for Fars-Gorgani and Turkaman baby boys were 71.19±10.89 and 78.15±10.78 4, respectively (Golalipour *et al*., 2003) and for their peer baby girls it was 74.32±11.32 and 81.6±9.8 (Will *et al*., 1995) which were lower than our results. A study on 12-year-old boys in Mashad, Northeast Iran, reported a prosopic index of 100% (Heravi and Zieaee, 2002) that is quite higher than our results.

The dominant facial type in Sistani (Fars) and Baluch women were euryprosopic with a statistically significant difference between them. In Sistani and Balouch newborns, the dominant facial type was reported euryprosopic with no statistically significant differences (Heidari *et al*., 2004). The rare types were hypereuryprosopic and hyperleptoprosopic in Sistanis and hyperleptoprosopic in Baluchs. It must be noted that the distribution of different facial types were different in these two groups. In male newborns in this region, the rare types were hypereuryprosopic (6.5%) and hyperleptoprosopic (6.5%) in Sistanis and hyperleptoprosopic (7.8%) in Baluchs (Heidari *et al*., 2004). However, this pattern was quite different from the dominant facial morphologies observed among other ethnicities, namely hypereuryprosopic which was found in Fars-Gorgani male infants (81.9%), Turkaman male infants (48%) (Golalipour *et al*., 2003) and Fars-Gorgani female infants (71.22%) (Golalipour *et al*., 2001) and the mesoprosopic form in Turkaman female infants (36%) (Golalipour *et al*., 2003). The difference between Turkaman girl and boy infants regarding their facial types may be attributed to the role of gender in prosopic index. Also in another study the dominant type was hypereuryprosopic in Qazvin (60%) (Meibodi and Mastari, 1996). In America and Europe the dominant face form was reported hypereuryprosopic (Panero, 1979; Snyder, 1974).

Normally, various facial types are encountered in every population so that a certain number of people have thin, broad or small faces. It must be noted that the prosopic index changes over time, in children, the prosopic index is lower than the adults and through

growing up they gain a longer and narrower face (Heidari *et al*., 2004; Golalipour *et al*., 2003).

In conclusion the comparisons between the two ethnical groups of Sistani (Fars) and Baluch it can be stated that although their newborns are perfectly alike in their craniofacial morphology, in young women there is significant differences in head and face morphology. This may be due to their different origins, because they have similar geographical and climatic situations. In addition, we conclude that the balouch women have craniofacial morphologies different from the residents of the North, Northeast and Central regions of the Iranian Plateau and are more resemble their Pakistani neighbors along the Eastern borders and to some extent to whom lived in India. Considering the historical migration rout of the Aryan tribesmen, this observation can be explained by assuming common origins for the immigrant Aryans of India and balouchs in Southeast of the Iranian plateau.

ACKNOWLEDGEMENTS

The authors wish to especially thank Dr. Mohammad Jafar Golalipour for his invaluable guidance and Miss F. Heidari for her forbearance in reading the manuscript and providing her comments.

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