Effect of Ethnicity on the Females' Brain Weight in Northern Iran

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ABSTRACT

Introduction: Brain weight and cranial capacity are important parameters in the study of racial/ethnic differences. This study was done to determine the effect of ethnicity on the female's brain weight in Northern Iran.

Methods: Brain weight was estimated using linear (Lee–Pearson's) formula in 410 normal 17–20 year old (207 native Fars and 203 Turkman) females in northern Iran. Dimensions of the head measured with spreading caliper and auricular head spanner.

Results: The mean±SD of brain weight in native Fars and Turkmen females were 1258.33±130 and 1270.17±124 grams and 1215, respectively.

Conclusion: This study showed that Brain weight in Turkmen's was higher than native Fars females.

1. Introduction

The dimensions of the head and face are one of the most important items in human anthropology which can determined by Brain weight and Cranial capacity [1, 2] and are affected by geographical, racial, ethnic, gender and age factors [3-6]. There are some studies on measurements of brain weight and cranial capacity in various parts of the world. Brain weight and cranial capacity can be measured by different methods including MRI, endocranial volume measured from empty skulls, wet brain weight at autopsy, and external head size measurements–all produce the same results [7-13].

Considering the lack of documented study and having realized the importance of acquiring information on brain weight in living subjects, and having obtained the baseline data, this study was carried out in living subjects by a classic cephalometry method for determining the effect of ethnic factor on the brain weight in normal females aged 17-20 years-old in northern Iran.

2. Materials & Methods

In this study, 410 healthy females of Turkmen group aged 17-20 years old (207 native Fars, 203 Turkmens) living in Gorgan, North of Iran were measured for the head dimensions and their cranial capacities and brain weights were calculated.

Turkmen's population, who have immigrated from central Asia, are living in this area for more than two centuries. Turkmen people have within-group marriages be-

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cause of their religious and ethnic beliefs. Thus, they are nearly pure ethnic groups.

The native Fars groups are the main and original inhabitants of the Gorgan region who have been selected from among last three generations who have lived in this zone.

Body weight and height were determined in each case. Body weights were measured by spring weighing-machine (Soehnle, Germany) while the individuals were wearing light clothes weighting accurately 1 kg. Measurements were performed with an accuracy of 1 cm. At the same time the following linear dimensions of the head were measured in each individual:

1. Maximum head length (L) (Glabella inion length).

2. Maximum head breath (B) (measured between parietal eminences).

L and B were measured by a spreading caliper.

3. Auricular height (HT) (external acoustic meatus to the highest point of the vertex) was measured using an auricular head spanner.

Each measurement was taken to the nearest millimeter at least three times and the average was considered for computation.

The cranial capacity was calculated using the following formula given by Williams et al. (1995) [3] and Manjunath [14].

Females: 0.000400 (L-11) (B-11) (HT-11) +206.60 cm^3

Brain weight in grams and cerebral index (CI) were determined by the following formulas: Brain weight=cranial capacity×1.035

Where 1.035 is the mass density of the brain [15-17].

The data for each person was recorded in a special form and then analyzed by Epi6. For comparison of the means of anthropometric measurements T student Test (P=0.05) was used.

3. Results

Mean±SD of Head Length, head width, and auricular height in Native Fars and Turkmen groups are depicted in Table 1. Head Length and auricular height in Turkmens were more than Native Fars females but head width in Turkmens was less than Native Fars.

The Mean±SD of Brain weight was 1258.33±130 grams and 1270.17±124 grams in Native Fars and Turkman females, respectively.

The Mean±SD of cranial capacity was 1227.22±120.71 and 1215.78±125.68 cm^3 respectively without any significant differences.

4. Discussion

In this study, brain weight of Turkmen populations (1270.17 gram) was higher than native Fars females (1258.33 g). According to Nooranipoor and Masteri farahani study in Tehran, Capital of Iran, the brain weight of 18-22 years old males was 1203.73 gram [13]. Also, in a study carried out by Bayat and Khosrobeigi in central Arak, the brain weight of 18-26 years old females were determined using cephalometry method (1209.61 gram) [18], while using brain autopsy method Hartman et al. (1994) reported that brain weight was 1198 gram in adult females [19].

Broca (1873) reported that Whites averaged the heavier brains than Blacks with more complex convolutions and larger frontal lobes by using the method of weighting brains at autopsy [20]. The subsequent studies have found an average Black–White difference of about 100 g [21-4].

Some studies have reported that the more White admixture (judged independently from skin color), the greater

Table 1: Head length and width and auricular height in 17-20 year old Native Fars and Turkmen Females in Northern Iran.

	Native Fars	Turkmen
	Mean±SD	Mean±SD
Head length (mm)	177.01±7.33	179.31±7.62
Head width (mm)	150.39±7.20	148.42±6.70
Auricular height (mm)	119.72±8.10	121.16±0.58

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the average brain weight in Blacks [21-23]. Also, Ho et al. (1980) determined in an autopsy study of 1261 American adults, that 811 White Americans averaged 1323 g and 450 Black Americans averaged 1223 g—a difference of 100 g [25]. Since the Blacks and Whites in the study were similar in body size, differences in body size cannot explain apart from the differences in brain weight. The overall size of the human brain (determined by weight) differs by almost 30% among normal subjects [26, 7].

Some studies have demonstrated that the sex difference in brain size remains after correction for body size in a sample of similarly aged men and women [7, 27-29].

Furthermore, Skullerud (1985) reported 110–115 g smaller brain weight in women compared to men even after correction of body size using a body mass index [30].

Also, in this study, the measured cranial capacity of the Turkman was higher than native Fars groups. Other researchers such as Manjunath [31] and Hwang et al. [32] indicated the measurement of cranial capacity in Indian (1117 cm^3), Korean (1317 cm^3) female populations. Also, Harvey et al. (1994) showed that 41 Africans and West Indians had a smaller average cranial volume than did 67 Caucasians [33].

In other study, Morton (1849) used the method of measuring endocranial volume on 1000 skulls with packing material and found that Blacks averaged about 5 in^3 less cranial capacity than Whites [34]. More recently, Beals et al. (1984) carried out the large study in endocranial volume, with measurements of up to 20,000 skulls from all around the world [35]. He reported that East Asians, Europeans, and Africans averaged cranial volumes of 1415, 1362, and 1268 cm^3 respectively. The skulls from East Asia were 3 in^3 larger than those from Europe, which in turn were 5 in^3 larger than those from Africa. Broca (1873) corroborated the Black–White difference using endocranial volume and found that East Asians averaged larger cranial capacities than did Whites [20].

Genetic and racial/ethnic characteristics and environmental factors can affect brain weight and cranial capacity. Regarding the genetic and racial/ethnic factor, anthropometric parameters such as brain weight and cranial capacity have been shown to depend on gene expression [5] since several decades ago; Hooton (1926) reported that racial characteristics are best defined in the skull. Indeed, cranial capacity and subsequently brain weight constitutes one of the most important parameters for determining racial differences [36]. Similarly, Okupe (1984) reported higher fetal biparietal diameter in Nigerian than Europeans [5].

Furthermore, environmental factors and various ecological conditions may cause changes in head dimensions. Nakashima (1984) showed that head and cranium dimensions of Japanese immigrant children changed over a period of 30 years [37]. The fact that environmental pressures produce noticeable differences between people with respect to the cranial capacity is an important factor in enabling man to adapt to life in diverse environmental conditions [6].

In conclusion, this study showed that Brain weight in Turkmen females was higher than native Fars, so it can be concluded that ethnicity can effect on them.

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