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Estimation of Cranial Capacity in 17-20 Years Old in South East of Caspian Sea Border (North of Iran)

Estimación de la Capacidad Craniana en Individuos entre 17-20 Años de Edad del Sureste del Borde Costero del Mar Caspio (Norte de Irán)

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GOLALIPOUR, M. J.; JAHANSHAEI, M. & HAIDARI, K. Estimation of cranial capacity in 17-20 years old in South East of Caspian Sea border (North of Iran). ***Int. J. Morphol., 23(4)***:301-304, 2005.

SUMMARY: It is natural that there is close relationship between cranial capacity, and the size of brain, several studies have estimated the cranial capacity which indirectly reflects the brain volume in different countries. In the present study cranial capacity has been estimated in Turkmans and native Fars17-20 years old groups in North of Iran.

This study was carried out on 808 normal 17-20 years old (male 398, female 410) in Turkman and native Fars groups in South-East of Caspian Sea border (North of IRAN). By using linear dimensions of the head.

The mean and SD of cranial capacity in Turkmans males and females were 1420.6±85 ml and 1227.2±120 ml, respectively. The mean and SD of cranial capacity in native Fars male and females were 1369±142ml, 1215.8±125ml, respectively, this difference was significant ($P<0.05$).

This investigation was shown that the cranial capacity is higher in male than female, also racial factor can affect on cranial capacity.

KEY WORD: Anthropometry; Craniometry; Cranial capacity; Sex.

INTRODUCTION

Cranial capacity, which is in close correlation with brain volume, reflects racial characteristics and thus has been though to be one of the commonest items in physical anthropological studies (Hwang *et al*., 1995). Several investigators have estimated the cranial capacity in the past which indirectly reflects the brain volume. Most of these studies have been made on the dry skulls using linear dimension, packing methods or occasionally radiological methods. A few studies have been made on living subjects (Manjunath 2002a).

Knowledge of the volume of the cranial cavity of either a dry skull or of a living being may be important to the study and comparison of the crania of populations with various fundamental difference like racial, geographic, ethnic, dietary, etc. (Manjunath 2002b). This information is useful in correlating cranial capacity with other cranial measurements and in studies of primate phylogeny. Medically, an analysis of cranial capacity exposes another aspect of growth and development and permits critical evaluation of unusually large, small or misshapen (Haack & Meihoff, 1971). Although a few studies on the estimation of cranial volume do exists in the literature (Jorgensen *et al.*, 1959; Chaturvedi *et al.*, 1962; Hwang; Verdun & Bourdiol, 1962; Shukla, 1966; Vankatesan & Cooper, 1975; Dekaban, 1977; Thomas *et al.*, 1980; Harper *et al.,* 1984; Ricklan & Tobias, 1986 and Manjunath 2002a, but up to now, any study of cranial capacity based on the examination of living subjects or cadavers exists in the Iranian literature.

Hence an attempt has been made in the present study to estimate the cranial capacity of living subjects using the linear dimensions of the heads in this region.

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MATERIAL AND METHOD

This study was done on 401 healthy years old of Turkman group (198 males, 203 females) and 407 healthy 17-20 years old of native Fars group (200 males, 207 females) in Gorgan South-East Caspian Sea border (North of Iran), during 2002.

Turkman's population are living for more than two centuries in this area, who immigrated from central Asia. Turkman people are only marring in intra-group because of religious and ethnic beliefs. Thus, they are nearly pure race. Native Fars group is population of native Fars that have been selected from amongst last three generations who lived in this zone. In each case the following linear dimensions of the head were measured:

1. Occipito-frontal circumference (OFC/head circumference) using a steel tap.
2. Maximum head length (L) (Glabella inion length).
3. Maximum head breath (B) (measured between pariental eminences): 2and 3 measured with a spreading caliper.
4. Auricular height (HT) (external acoustic meatus to the highest point of the vertex) 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) and Manjunath, 2002b.

Males : 0.000337(L-11) (B-11) (HT-11) +406.01
Females: 0.000400(L-11) (B-11) (HT-11) +206.60

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 (α=0.05) was used.

RESULTS

Means and SD of head length, head width and Auricular height in both sex in Turkman group are depicted in Table I. Means and SD of cranial capacity were in males: 1420.6171 ± 85.03cc (Range: 1334.5771-1505.6371cc), and in females: 1227.2269 ± 120.712cc (Range:1106.5149-1347.9389cc). That this difference was significant($p<0.05$).

Means and SD of head length, head width and auricular height in both sex in native Fars group are depicted in Table II.

Means and SD of cranial capacity were in males: 1369.4±142cc (Range: 1227.4-1511.4), and in females: 1215.8 ±125cc (Range:1090.8-1340.8). That this difference was significant ($p<0.05$).

DISCUSSION

In this study, the measured cranial capacity of the Turkman was 1420.60 ± 85cc in male and 1227.2 ±120cc in females, and in native Fars group in male and female were 1369.4±142cc and 1215.8 ±125cc, respectively. The finding of this research is higher than Indian skulls (Manjunath, 2002a) and lower than Korean (Hwang *et al.*).

According Hwang report's (Hwang *et al.*), the cranial volum was 1470±107cc in males and 1317±117cc in female skull.

Manjunath (2002a) reported the cranial volume was 1152.813±279.16cc in male and 1117.82±99.09cc in females.

Another research in Korea by Shima (1934) have showed that cranial volume in males1475.5± 8.7and 1330.5± 15.8cc in female.

Table I. Showing various parameters of head in 17-20 years old of Turkman's group in North of Iran.

	Female		Male	
Different parameters	Mean	SD	Mean	SD
Head length (mm)	179.31	7.62	186.95	7.12
Head width (mm)	148.42	6.70	150.31	7.10
Auricular height (mm)	121.16	9.58	133.79	5.69

Table II. Showing various parameters of head in 17-20 years old of native Fars group in North of Iran.

	Female		Male	
Different parameters	Mean	SD	Mean	SD
Head length (mm)	177.0	7.3	176.0	14.8
Head width (mm)	150.4	7.2	149.3	10.0
Auricular height (mm)	119.7	8.1	135.0	5.5

Also, Dekaban reported cranial volume, 1548cc in males and 1425cc in females. In this study, the cranial capacity in both sex of Turkmans group was more than native Fars. Our finding indicated that there is a difference between cranial capacity of males and females, that is similar others study (Manjunath 2002a; Dekaban; Hwang *et al.* and Shima).

The comparison of result of this study with other studies (Manjunath, 2002a and Hwang *et al*.) indicates that cranial capacity is differented among different racial groups.

According to Hooton(1926), the racial characters are best defined in the skull, cranial capacity constitute one of the most important characters for determining the racial difference.

Also, cranial capacity is an indirect approach to evaluate the size of the brain. Which it has been affected by gender race, ethnic, geographical, biological and ecological factors (Hooton; Ricklan & Tobias and Tuli *et al.,* 1995).

By noticing to our result and other studies about cranial capacity which indicate diversity of cranial volume.

According different racial group and different area in the world, we can conclude that racial and geographical factor can affect cranial capacity and brain size. Of course other researches indicated the above mentioned factors could affect in head dimensions (Tuli *et al.* and Golalipour *et al.,* 2003).

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GOLALIPOUR, M. J.; JAHANSHAEI, M. & HAIDARI, K. Estimación de la capacidad craniana en individuos entre 17-20 años de edad en el Sureste del borde costero del Mar Caspio (Norte de Irán). ***Int. J. Morphol., 23(4)***:301-304, 2005.

RESUMEN: Es natural que exista una relación entre la capacidad craneana y el tamaño del cerebro. Numerosos estudios realizados en diferentes países, han estimado la capacidad craneana con lo cual han determinado indirectamente el volumen del cerebro. En este estudio ha sido estimada la capacidad craneana, en individuos pertenecientes a grupos del Norte de Irán, Turcomanos y Fars nativos.

El estudio fue realizado en 808 individuos (398 hombres y 410 mujeres), normales, entre 17-20 de edad pertenecientes a grupos del Norte de Irán, Turcomanos y Fars nativos del Sureste del borde costero del Mar Caspio (Norte de Irán). Para la estimación de la capacidad craniana se utilizaron las dimensiones lineares de la cabeza.

La media y SD de la capacidad craneana en Turcomanos hombres y mujeres, fue de 1420.6±85 ml y 1227.2±120 ml, respectivamente. La media y SD de la capacidad craneana en nativos Fars, hombres y mujeres, fue de 1369±142ml, 1215.8±125ml, respectivamente. Las diferencias fueron estadísticamente significativas ($p<0.05$).

La investigación demostró que la capacidad craneana es mayor en los hombres que en las mujeres pudiendo además, influir en la capacidad craneana factores raciales.

PALABRAS CLAVE: Antropometría; Craneometría; Capacidad craneana; Sexo.

REFERENCES

Chaturvedi, R. P. & Harenja, N. K. Cranial capacity .gnathic index , and facial angle in adult human skulls. *J. Anat. Soc. India, 11*:18-23, 1962.

Dekaban, A. Tables of cranial and orbital measurements, cranial volume and derived indices in males and females from 7 days to 20 yrs of age. *Annals of Neurology. 2(6)*:485-91, 1977.

Golalipour, M. J.; Haisarik, Jahanshahi, M. & Farahani, R. M. The shapes of head and face in normal male newborns in South-East of Caspian sea (Iran -Gorgan) *J. Anat. Soc. India., 52(1)*:28-31, 2003.

Haack, D. C. & Meihoff. A method for estimation of cranial capacity from cephalometric Roentgnograms. *Am. J. Phys. Anthropol., 34*:447-52, 1971.

Harper, C.; Krill, J.; Raven, D. & Jones, N. Intracarnial cavity volumes: a new method and its potential applications. *Neuropathology Applied Neurobiology, 10(1)*:25-32, 1984.

Hooton, E. A. A method of racial analysis. *Science, 44*:256, 1926.

Hwang, Y.; Lee, K. H.; Choi B.; Lee, K. S.; Lee, H.Y.; Sir, W. S. *et al*. Study on the Korean adult cranical capacity. *J. Korean Sci., 10(4)*:239-42, 1995.

Jorgensen, J. B.; Parison, E. & Quade, F. The external cranial volume of normal children. *Acta paediatrica, 48*:371-8, 1959.

Manjunath, K.Y. Estimation of cranial volume in dissecting room cadavers. *J. Anat. Soc. India, 51(2):*168-72, 2002a.

Manjunath, K.Y. Estimation of cranial volume an overview of Methologies. *J. Anat. Soc. India, 51(1)*:85-91, 2002b.

Ricklan, D. E. & Tobias, P. V. Unusually low sexual dimorphism of endocranial capacity in a Zulu cranial series. *Am. J. Phys. Anthropol, 71*:285-93, 1986.

Shima, G. Further notes on the anthropological studies of the modem Korean. The skull (In Japanese). *J. Anthropol. Soc, Tokyo, 49*:245-67,1934.

Shukla, A. P. A study of cranial capacity and cranial index of Indian skull . *J. Anat. Soc. India., 15:*31-5, 1966.

Thomas, I. M.; Janaliram, S.; Rajangam, S. & Amar, D. S. Cranial capacity of crania from Kamatalka. *J. Anat. Soc. India, 29(3)*:135-7, 1980.

Tuli, A.; Choudhry, R.; Agarwal, S.; Anand, C. & Gary. H. Correlation between craniofacial dimensions and foetal age. *J. Anat. Soc. India, 44(1):*1-12, 1995.

Vankatesan, B. & Cooper, M. M. Calavarial displacement volume as a guide to cranial. *J. Anat. Soc. India, 24(1)*:40, 1975.

Verdun, M. & Bourdiol, R. Les disproportions du volume cranien (Dispropostions of cranial volume. Anthropometric criteria. Mental and Psychosocial correlations Etiological research based on the study of 281 male male subjects from 9 yrs to the adult age). *Bulletin de I'Academia Nationale de Medicine (Paris), 146*:392-407, 1962.

Williams, P. L.; Bannister, L. H; Berry, M. M.; Collins, P; Dyson, M.; Dussek, J. E. & Ferguson, M.W. J. *Gray's Anatomy*. Soames, R. W. Edn. 38 th. Churchill Livingstone, London, 1995. p612.

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