The Changeability of Some Cephalofacial Variables and Stature During a Timeline of Over 80 Years

La Capacidad de Cambio de Algunas Variables Cefalofaciales y Estatura Durante un Periodo de más de 80 Años

Agron M. Rexhepi & Behlul Brestovci

SUMMARY: Cephalofacial variables and the body height have priority importance in anthropological researches for a chronological study of the anthropological status of peoples. The main aim of this study was to evaluate the changeability of the cephalofacial variables and stature under the influence of exogenous factors during the over 80 years period-time. . The realisation of the goal was done by comparing of some anthropometrical data (stature, 5 cephalofacial measurements and 2 cephalofacial indexes) done on the Albanian male population in three different time-line studies (Coon, 1950; Dhima, 1974-84; Rexhepi et al. 2018; cephalofacial measurements, 1997-2008, and stature, 2007-2017). Regarding the cephalofacial variables, some minor systematic differences were found between three different timeline studies, but without contradictions regarding the group's classification according to the corresponding scale. The major and meaningful differences between the three studies are noted in body height (Coon = 169.71 cm, Dhima=171.61cm; Rexhepi et al.=178.23 cm). The results of this study suggested that the timeline difference over 80 years, with all exogenous factor changes (environment, socioeconomic conditions, health, etc.) has a meaningful impact on body height, while not on the substantial changes on cephalofacial variables.

KEY WORDS: Anthropological; Head; Facial; Body height; Timeline measurements.

INTRODUCTION

The human body height and cephalofacial measurements are the most measured and studied variables in Biological Anthropology. These anthropometrical variables are over 80 % determined by internal (genetic) and less than 20 % by external factors (socio-economic conditions, mental status, culture, climate and seasonal, physical activities, certain diseases, environment factors, nutritional factors, head position during childhood sleep, avitaminosis, keeping the narrow hats, carrying heavyweights on the head, eating solid foods causes changes to the mandible and the lateral walls of the head, etc (McEvoy & Vischer, 2009; Fagaras *et al*., 2015; Rexhepi *et al*., 2018).

The data obtained from the head measurements and stature have priority importance in anthropological researches since they are the most reliable data for a chronological study of the anthropological status of populations, and enable comparison of morphological characteristics between the people of our time and the ancients (Rexhepi & Meka, 2008; Dhima, 2017). Head measurements can be carried out in live subjects (cephalometry), but also in the skeleton of the head (craniometry). Paul Broca was a French physician, anatomist and anthropologist who by developing a few new types of craniometers (measuring instruments) and cranial indices, has vigorously influenced in advancing of the science of craniometry (Memoir of Paul Broca, 1881). Both anthropometrical methods: cephalometry and craniometry complement each other and enable the anthropological (morphological) study of a population in the chronological sense.

In general, the head (skull) has an oval shape with a predominantly longitudinal dimension (head length, g-op), divided into the cranial part (skull, brain) and in facial part. To classify populations based on the head form, the cranium (skull) part of the head has more importance than the facial part. Of all the creatures created by our Lord, man is the only creature that has the cranial/skull (brain) part of the head more massive than the facial part. Increasing and changing the shape of the head occurs from birth to the age

Institute of Human Anthropology, Rr. Sali Butka Nr. 31, 10000 Prishtina, Kosovo.

of 25. Throughout this period, the intensity of growth and change of head shape is not the same. In the final shape and size of the head, many endogenous and exogenous factors influence (head position during childhood sleep, avitaminosis, keeping the narrow hats, carrying heavyweights on the head, eating solid foods causes changes to the mandible and the lateral walls of the head, etc.). It is also thought that the endocrine factor has an impact on the shape and size of the head (endemic struma areas are mainly inhabited by people with the brachycephalic type of the head) (Ylli, 1975).

Numerous scholars and historical data support that the Albanians have ancient origins and are the descendants of Illyrians (Coon, 1950; Stipcˇevicˊ, 1989; Hammond, 1992; Mallory & Adams, 1997; Fortson, 2004; Cole, 2011). The primary sources that confirm the Illyrian origin of the Albanians date from the 2nd century BCE, when the Greek historian Polybius mentioned a place/city in Illyria named as Arbona (Histories, 1962). The same Illyric toponymy "Arbona" and the name Arbonios/Arbonites for the inhabitants of Arbona, was mentioned eight centuries later by Stephanus of Byzantium (6th century CE) in his geographical dictionary entitled Ethnica (Stephanus Byzantinus, 1849).

The early anthropological researches on Albanians were done by Weissbach (1868) and Glück (1897), while the first more detailed anthropological research was conducted by American anthropologiest Carlton S. Coon (1929-30). Also, comprehensive anthropological research on Albanians of Albania has been done by Albanian anthropologist Dhima (1974-84), while in Albanians from Kosovo the extensive anthropological studies have been done in the frame of the Institute of Sports Anthropology (Rexhepi *et al*.: cephalofacial measurements 1997-2008; anthropometric measurements 2007-2017).

Certainly, age is one of the factors with the most significant changeable impact on almost all anthropological dimensions (Suzanne, 1974). Undoubtedly cephalofacial measurements compared with stature, are the variables that over time under the influence of the exogenous factors changes the least.

In this context, the present study aims to evaluate the influence of exogenous factors in the changeable of the cephalofacial variables and stature, during a period of time.

It was hypothesized that there are minimal systematic differences in measured cephalofacial variables and stature, between measurements done in different period-time. This hypothesis will be tested through descriptive analysis.

MATERIAL AND METHOD

Research design: This study as a part of the project "Morphological characteristics of the Kosovo Albanian population" was carried out within the framework of the Institute of Human Anthropology, department for Sports Anthropology in Prishtina, Kosovo.

By its nature, this research is an observational and cross-sectional descriptive study.

Site of study and sampling: Cephalofacial measurements were measured in 425 Kosovo Albanian male subjects aged 18-35 years old, during the period time 1997-2008; while stature was measured in 32404 Kosovo Albanian male entities, during the period time 2007-2017. The sample of the measured entities was chosen randomly, respecting the rule that their psycho-physical condition was in the normal range (without any morphometrical abnormality, deformity, or extracted tooth).

Since the purpose of this paper was to evaluate cephalofacial changes at different timelines (approx. 25 and 80 years), the results of this paper were compared with the results of two other anthropologists: Dhima and Coon. It is worth noting that the sample of subjects measured in all three measurements are males over 18 years old and belong to the northern part of the Albanian territories.

Albanian anthropologist Aleksander Dhima, in his comprehensive anthropological study of the Albanian population during the period 1974-84, he made anthropometric measurements on 346 Albanian males from northern Albania (Malësi & Madhe 106, Malësi & Vogël 100, and Dukagjin 140). The measured entities were 19-60 years of age, while the selected areas are typical mountainous areas that have preserved all the province's customs and first residential territory. Anthropological investigations have shown that these territories have been inhabited by this population since at least the first millennium BCE (Dhima, 2017).

American anthropologist Carleton S. Coon - 1929-30, made anthropometric measurements on 1063 Albanian males from the north of Albanian-inhabited territories, aged 18-65 years (mean 39.4 yo).

Dhima's research was conducted approximately 23-43 years ahead of our research, while the Coon's research 77-88 years ahead.

Measuring tools and data collection: Following the rules of the International Biological Program (IBP), the

following 5 cephalofacial variables and stature were measured:

- Maximum head length (g-op) - was measured by spreading caliper. The anterior caliper tip was resting on glabella, whereas the posterior tip slid inferiorly along medial line of occipital until maximum length was reached;
- Maximum head breadth (eu-eu) - was measured by spreading caliper, sliding both tips of caliper down lateral sides of parietal bones, forward and back until maximum width was reached.
- Head height (v-po) - was measured on the right and left sides of the head using a double sliding caliper and a level;
- Morphological height of the face (n-gn) - was meausured by sliding caliper. The fixed tip of caliper was placed at the subject's gnathion and the moveable end on nasion;
-Maximum facial breadth (zy-zy) - was measured by spreading caliper. First by palpation were located the most lateral point of the zygomatic arch, with the tips of index fingers were placed the caliper tips on the arches with enough pressure to feel the bone, than were moved the caliper back and forth, up and down until scale shown maximum reading;
- Stature (v-pl) - indicates the distance from the standing surface to the vertex of the head, with subject's body position in a standard erect posture, without shoes, and with head position in Frankfort horizontal plane. Stature was measured with a classical anthropometer and was expressed in cm.

From the above measured cephalofacial variables were derived three cephalofacial indexes:

-Horizontal Cephalic Index indicates the ratio of the maximum breadth of the head to the length of the head. This index was calculated according to the equation: HCI = (eu-eu / g-op) x 100.
-Superior Facial Index indicates the ratio of the morphological height of the face to the maximum face breadth.

This index was calculated according to the equation:

SFI = (n-gn / zy-zy) x 100

The human head presents the upper part of the human body and is consisted of two main parts: the cranial part that consists of 8 bones, and the facial part consisting of 14 bones. Since the head, respectively the cephalofacial dimension is of a complex three-dimensional nature consisting of several other one-dimensional variables, we have for the first time presented it through the total sum of the mean value of the cephalofacial variables measured in all three studies. Also, in order to obtain a more representative result, the mean value of the total sum obtained of the cephalofacial dimension was calculated.. The same procedure has been applied for cephalofacial indexes.

Data analysis: The statistical analyses were performed with the IBM SPSS Statistics software package, version 20. The obtained data were analysed through the descriptive analysis, respectively the mean value of the measured cephalofacial parameters.

Ethical considerations. This project was approved by the Ethics Committee of the Institute of Sports Anthropology. The authors declare no conflict of interest and no financial or commercial benefits for the performing of this study.

RESULTS AND DISCUSSION

Mean values and standard deviation, as well as the total sum and the mean value of the total sum of the measured cephalofacial variables and cephalofacial indices, measured in three different timelines occasions, are summarized in Table I respectively Table II.

The comparison of the gained results in three different timeline measurements, except some minimal systematic differences (which might be as a result of different used cephalometrical instruments), in general, shows a high similarity between three measurements.

Table I. Cephalofacial measurements in three different timeline studies.

Variables:	Coon (1929-30) Malsia e Ghegnisë		Dhima (1974-84) Malësi e madhe, Malësi e vogël, Dukagjin		Rexhepi (1997-2008) Kosovo	
	Mean	SD	Mean	SD	Mean	SD
Maximum head length (g-op)	186.18	7.08	187.75	6.22	188.76	6.28
Maximum head breadth (eu-eu)	157.78	6.00	160.23	5.72	157.75	6.14
Head height (v-po)	128.34	5.03	129.59	6.73	122.41	6.99
Morphological height of the face (n-gn)	123.90	5.50	124.68	6.04	122.98	6.48
Maximum facial breadth (zy-zy)	142.35	5.85	144.14	4.95	139.51	4.95
The total sum of the cephalofacial dimension	738.55		746.39		731.41	
Mean of the cephalofacial dimension	147.71	5.89	149.28	5.93	146.30	6.17

Table II. Cephalofacial indexes in three different timeline studies.

	Coon (1929-30) Malsia e Ghegnisë		Dhima (1974-84) Malësi & madhe; Malësi & vogël, Dukagjin		Rexhepi (1997-2008) Kosovo	
Variables	Mean	SD	Mean	SD	Mean	SD
Horizontal Cephalic Index	84.84	4.29	85.43	3.62	83.33	3.78
Superior Facial Index	87.06	5.04	86.56	4.45	89.96	6.31
The total sum of the cephalofacial indexes	171.90		171.99		173.29	
Mean of the cephalofacial indexes	85.95	4.67	86.00	4.04	86.64	5.05

In addition to comparing measurements based on the mean values of cephalofacial variables from the three measurements, one more comparison of the data was made based on their classification by respective scales (Table I).

Regarding the maximum head length (g-op), according to the Lebzelter-Saller scale, the examined entities of three studies done in different timelines are characterized with a long head (186-193 mm). Results of our study show the distribution of the results of the head-length as follows: 25.2 % of the measured entities are characterised with the moderately long head (178-185 mm); 51.5 % with the long head (186-193 mm), respectively 19.3 % with the very long head (>194 mm).

Concerning head breadth (eu-eu), the results of all three studies show similar results. According to the Lebzeller-Saller scale, the heads of the entities measured in all three studies are classified into the broad-head type (156-163 mm). In our study the head breadth results are distributed as follows: with the moderately broad-head (148-155 mm) are 33.4 % of the measured entities, the broad-head (156-163 mm) 48.7 %, and very broad-head 15.2 % of the measured entities.

Concerning the head height (v-po), the results of Coon and Dhima are very similar (difference 1.25 mm), compared to our findings (difference 5.93 mm, respectively 7.18 mm). According to both studies, measured entities are characterised with the heigh head-height (Routil Scale 126-133 mm). In our study, 24.5 % of the measured entities are described with the high head-height, while 44.9 % with the moderately head-height, respectively 24.2 % with the low head-height.

The similar dispersion of the results has been found in the classification of the measured entities regarding the morphological height of the face (n-gn).

The data of the morphological height of the face, obtained from the measured entities, presented by the Coon's

and Dhima's study are described to have a high morphological facial height (Lebselter-Saller scale; 124–129 mm) with a difference of 0.69 mm. Results obtained from our study, indicate that the dispersion of the measured entities regarding this facial dimension has a bipolar dispersive character: with moderately face-height are 32.7 % of the measured entities, respectively 31.5 % with the high face-height; while with very low face-height 20.0 % of the measured entities, respectively 14.8 % with a very high face-height.

Concerning the maximum facial breadth (zy-zy), the classification of the measured entities of the Coon's and our study is similar. Both studies describe their entities to have a moderately narrow face (Lebselter-Saller scale; 136-143) with a difference of 2.84 mm. While in Dhima's study, the measured entities are characterised with a narrow face (144.14mm). The dispersion of the results of the maximum facial breadth in our study was as follows: 78 % of the measured entities are with a moderately narrow-face, while 22 % are broad-faced.

The mean value of the cephalofacial dimension indicates more compatibility and similarity between three measurements, compared with the total sum of this dimension.

The horizontal cephalic index in all three measurements shows approximate values (Coon - 84.84; Dhima - 85.43; Rexhepi - 83.33) that, according to the Martin-Seller scale are classified in the brachycephalic head group (81.0-85.9). Similar results of HCI of Albanians have been presented by other authors such as Pittard, Haberlandt, Lebzelter, Glueck, Weninger, Drontchilov, Nekrasov, etc.

In our research, the population distribution according to HCI was as follows: 22.6 % with mesocephalic head (76-80.9), 50.4 % brachiocephalic (81-85.9) and 23.3 % hyperbrachiocephalic (86-90.9).

Regarding the Superior Facial Index, the entities from all three measurements showed a similar categorisation of

the face: Leptoprosop face (> 85). In our study, the distribution of results was as follows: 13.4 % of entities were found with mesoprosope face (83-84.9), and 77.9 % of entities with the leptoprosope face (> 85). The total sum and the mean value of the cephalofacial indices indicate high similarity between the three measurements.

The data of Table III shows the mean values and variations (min, max) of stature presented in three different studies.

The Body Height (v-pl) differentiation between three studies done in the different timeline, presented in Table III, shows slight increases from Coon's research to Dhima's research (1.9 cm). The considerable differences are encountered between Dhima's research and our research (6.62 cm); while the greater differences are encountered between Coon's research and our research (8.52cm).

The results of this study have shown that the time difference of over 80 years, with all exogenous factor changes did not affect the substantial changes of cephalofacial dimensions measured in the three different timeline measurements, but significantly affect the body height increasing it for 8.52 cm. This important increase in body height between Coon's research and our research, carried out in a different timeline of over 80 years, can be explained by the rapid improvement of socioeconomic and health conditions.

After analysing the above tables, based on the results of the three measurements in different timelines, it can be concluded that the Albanian male subject of the northern part of the Albanian settlements, in general, has a stable and unchanging head morphology over 80 years. The head is characterised by a pronounced cephalic dimension (long, broad, and moderately high head), with a medium to high facial-height, and moderately narrow to broad facial width. Based on the value of cephalofacial indices, it is characterised by brachycephalic head and leptoprosope face. Differently of cephalofacial variables, over the 80 years, the stature of the Albanian male entity has increased from average body height (Coon: 169.71 cm) to average high body height (Dhima: 171.61 cm; Rexhepi *et al.*: 178.23cm).

Our hypothesis that there may be small systematic differences between measurements but without affecting the overall classification of the head dimensions accordingly with the corresponding scale has been confirmed. While regarding the body height we can conclude that it was rejected.

Practical Application. The gained results may be used and applied in anthropological contexts.

Table III. Body Height (Stature, cm) in three different timeline studies.

	Nr	Mean	Min	Max
Coon (1929-30), Malsia e Ghegnisë	1085	169.71	143.00	193.00
Dhima (1974-84), Malësi e madhe, Malësi e vogël, Dukagjin	346	171.61	155.00	186.70
Rexhepi et al. (2007-2017), Kosovo	32404	178.23	161.30	215.00

REXHEPI, A. M. & BRESTOVCI, B. La capacidad de cambio de algunas variables cefalofaciales y estatura durante un periodo de más de 80 años. *Int. J. Morphol., 38(3)*:659-664, 2020.

RESUMEN: Las variables cefalofaciales y la altura del cuerpo tienen una importancia mayor en las investigaciones antropológicas para un estudio cronológico del estado antropológico de la población. El objetivo principal de esta investigación fue evaluar la capacidad de cambio de las variables cefalofaciales y la estatura de acuerdo a la influencia de factores exógenos durante un período de más de 80 años. El objetivo se llevó a cabo mediante la comparación de algunos datos antropométricos (estatura, 5 mediciones cefalofaciales y 2 índices cefalofaciales) realizados en la población masculina albanesa en tres estudios de línea de tiempo diferentes (Coon, 1929-30; Dhima, 1974-84; Mediciones cefalofaciales de Rexhepi *et al.*, 1997-2008, y estatura, 2007-2017). Con respecto a las variables cefalofaciales, se encontraron algunas diferencias sistemáticas menores entre tres estudios de línea de tiempo diferentes, pero sin contradicciones con respecto a la clasificación del grupo, según la escala correspondiente. Las diferencias principales y significativas entre los tres estudios se observaron en la altura del cuerpo (Coon = 169,71 cm, Dhima = 171,61 cm; Rexhepi *et al.* = 178,23 cm). Los resultados de esta investigación sugieren que la diferencia en la línea de tiempo en un periodo de 80 años, junto a todos los cambios de factores exógenos (ambiente, condiciones socioeconómicas, salud, etc.) tienen un impacto significativo en la altura corporal, mientras que esto no ocurre en los cambios de las variables cefalofaciales.

PALABRAS CLAVE: Antropológica; Cabeza; Facial; Altura corporal; Medidas de línea de tiempo.

REFERENCES

Cole, J. E. *Ethnic Groups of Europe: An Enciclopedia*. Santa Barbara, ABC-CLIO, 2011. pp.9.

Coon, C. S. *The Mountains of Giants. A Racial and Cultural Study of the North Albanian Mountain Ghegs*. Cambridge, The Museum, 1950. pp.105.

Dhima, A. *Antropologjia Etnike e Shqiptareve*. Tirana, UET Press, 2017. pp.9-14.

Fagaras, P. S.; Radu, L. E. & Rus, M. C. Relation between body shape and body mass index. *Procedia Soc. Behav. Sci., 197*:1458-63, 2015.

Fortson, B. W. *Indo-European Language and Culture: An Introduction*. 2nd ed. Chichester, Wiley-Blackwell, 2010.

Glück, L. Zur physischen anthropologie der Albanesen. *Wissenschaften und Mitteilungen aus Bosnien und der Hercegovina, 5*:365:402, 1897.

Hammond, N. *The Relations of Illyrian Albania with the Greeks and the Romans*. In: Winnifrith, T. (Ed.). Perspectives on Albania. Warwick Studies in the European Humanities. London, Palgrave Macmillan, 1992.

Histories. *Polybius. Evelyn S. Shuckburgh. translator*. London, New York. Macmillan, 1889. Reprint Bloomington, 1962.

Mallory, J. P. & Adams, D. Q. *Encyclopedia of Indo-European Culture*. London, Fitzroy Dearborn, 1997.

McEvoy, B. P. & Vischer, P. M. Genetics of human height. *Econ. Hum. Biol., 7(3)*:294-306, 2009.

Memoir of Paul Broca. *J. Anthropol. Inst. G. B. Irel., 10*:242-61, 1881.

Rexhepi, A. & Meka, V. Cephalofacial morphological characteristics of Albanian Kosova population. *Int. J. Morphol., 26(4)*:935-40, 2008.

Rexhepi, A. M.; Brestovci, B. & Isufi, I. Normative values of some morphometric variables for kosovo Albanian population aged 06 - >70 years old. *Int. J. Morphol., 36(2)*:592-7, 2018.

Stephanus of Byzantium. "αρβων". *Ethnika kat' epitomen (in Greek)*. P111, 1849.

Stipcevic, A. *Iliri.* 2nd ed. Zagreb, 1989.

Suzanne, C. Les changements morphologiques lies à l'age. *L'anthropologie (Paris), 78*:693-718, 1974.

Ylli, A. *Disat dhna kraniometrike*. Tirana. 1975. pp.64-97.

Corresponding author:
Agron M. Rexhepi
Rr. Sali Butka
10000 Prishtina
KOSOVO

Email: agronmrexhepi@gmail.com