Janaki Medical College Journal of Medical Sciences (2021); Vol.9 (2):5-12

JMCJMS

Original Article

Correlation of Different Facial Measurements among Undergraduate Medical and Nursing students in Nepal

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ABSTRACT

Background and Objectives: The human being is found different by its overall morphology and body dimensions. Thus, the study was focussed to access the correlation of different facial measurements among undergraduate medical and nursing students in Nepal.

Material and Methods: An institutional based cross-sectional study was carried out in the Department of Clinical Anatomy, Maharajgunj Medical Campus, Institute of Medicine, Kathmandu, Nepal. The variables selected for the present study was 140 subjects, among them 44 were female and 96 were male. Physical measurements were made by Spreading Caliper**,** Measuring tape**,** Weight machine**,** Height Scale. All the procedures were of non-invasive type. The personal height and weight, head length, head breadth, head circumference, Facial height, bigonial breadth, bizygomatic facial breadth was measured using International standard protocol. Statistical analysis was done using SPSS 20. 't' tests was applied. P <0.05 was considered to be statistically significant.

Results: Out of total, 68.6% were male and 31.4% were female. The mean age of the study participants were 20.36±1.29 ranges from 18 years to 26 years. The mean facial height and bizygomatic facial width of male were 10.96 cm and 13.64 cm with SD of 0.59 cm and 0.48 cm whereas for female the mean were 10.13 cm and 12.75 cm with SD of 0.67 cm and 0.49 cm respectively. The anthropometry and different facial measurements among males were significantly higher (p<0.0001) than the females. A positive correlation was observed for head breadth, head circumference, bigonial breadth, facial height, bizygomatic facial width whereas an inverse correlated was observed inversely correlated for head length with age.

Conclusions: The anthropometry (height, weight, head length, head breadth, head circumference) and different facial measurements (Bigonial breadth, Bizygomatic facial width, and Facial height) among MBBS students were found to be significantly higher than the nursing students. A positive correlation was observed for head breadth, head circumference, bigonial breadth, facial height, bizygomatic facial width whereas an inverse correlated was observed inversely correlated for head length with age.

Keywords: Bigonial breadth, Bizygomatic facial width, Facial height, MBBS, Nursing

INTRODUCTION

The human being is found different by its overall morphology and body dimensions. This variation occurs in many respects including age, sex, race, ethnic origin, geographical location, nutritional status, food habit and even religion [1-3]. Stature is one of the most important parameters in the

identification of an individual, living or dead [4]. Stature is the height of a person in the upright posture and has a definite and proportional biological relationship with each and every part of the human body, i.e., head, face, trunk, and extremities [5]. It has been proposed that each race requires its own finding for stature estimation because of ethnic, dietary, and climatic variations. Results of studies done in one population cannot be applicable to other populations' entirely [6]. Estimation of height using anthropometry of facial dimension has been employed for over a century now. However, no in-depth and detailed studies are available on the determination of stature from head and facial dimensions [7]. In certain medico-legal cases, where only head and face are available for examination [8-11], it becomes difficult for a forensic specialist to identify the deceased.

There have been a number of anthropometric researches based on the measurement of long bones and other body dimensions such as arm length to assess their relationship with stature [12]. A few studies have been conducted in the past which focus on the determination of stature from cephalo-facial and craniofacial material. A great role of craniofacial anthropometry could not be ignorant in many aspects of our life. The forensic and criminal investigators, reconstructive and hairstyle designers and many other professions essentially feel a correct database of it in the implication of their practice. Also, there is paucity of scientific literatures on the works of measurement of body dimensions or anthropological measurements among Nepalese population. Therefore, the study was focused to access the correlation of different facial measurements among undergraduate medical and nursing students in Nepal.

MATERIALS AND METHODS

An institutional based cross-sectional study was carried out in the Department of Clinical Anatomy, Maharajgunj Medical Campus, Institute of Medicine, Kathmandu, Nepal. A total of one hundred and forty medical students studying at Maharajgunj Medical Campus and Nursing Campus, aged between 18 and 26 years were selected as the subjects. Ethical approval was granted by Institutional Review Board of Institute of Medicine (IOM), Nepal. The variables selected for the present study were measured by physical method, among the 140 subjects, 44 were female and 96 were male. The information supporting the inclusion criteria were done directly from the subjects by enquiry and physical observation as far as possible. With history of occulofacial trauma, craniofacial congenital or post traumatic deformities, abnormal neurological findings (for physical & photographic groups) affecting the craniofacial dimensions (like facial palsy, ptosis, squint), Dwarfism and gigantism were excludued from the study. The information regarding the exclusion criteria were collected by the eye observation. The informed consent was taken prior to study. Physical measurements were made by Spreading Caliper**,** Measuring tape**,** Weight machine**,** Height Scale. All the procedures were of non-invasive type. The method of measurement using International Standard protocol for personal height and weight, head length, head breadth, head circumference, Facial height, bigonial breadth, bizygomatic facial breadth were followed from Brown et al., [13], Jadav and Shah [2], Krishan K [5], Evereklioglu et al.,[1], Standrings et al., [14], Martin and Saller [15], Kumar and Lilinchandra[16], Standring et al., [14],

Gabarre-Mir et al., [17] respectively. After collection of data, the group wise results were prepared calculating means, standard deviations (SD) etc. as applicable. Statistical analysis was done using SPSS 20. 't' tests was used. P <0.05 was considered to be statistically significant.

RESULTS

Study participants consists of 140 students in a medical school. Out of total, 96 (68.6%) were male and 44 (31.4%) were female. The mean age of the study participants were 20.36±1.29 ranges from 18 years to 26 years. The study participants were involved in two educational streams; 121(86.4%) in MBBS and 19 (13.6%) in BSc nursing.

Anthropometry and different facial measurements among participants by gender status are presented in Table 1. It reveals the mean age of the male were 20.53 years with S.D of 1.39 years whereas the mean age of female were 20.00 years with S.D of 0.98 years with statistically significant difference of age between male and female (p=0.011). The mean (height and weight) of male were 166.66 cm and 58.59 kg with SD of 6.22 cm and 7.01 kg respectively. But, the mean (height and weight) of female were 154.05 cm and 47.79 kg with SD of 5.81 cm and 6.77 kg respectively. The mean head (length, breadth and circumference) of male were 18.58 cm, 15.06 cm and 54.06 cm with SD of 0.76 cm, 0.59 cm and 1.42 cm respectively whereas for female the mean were 17.76 cm, 14.42 cm and 52.09 cm with SD of 0.67 cm, 0.47 cm and 1.32 cm respectively. Likewise, the mean bigonial breadth of male and female were 10.35 cm and 9.70 cm with SD of 0.55 cm and 0.58 cm respectively. The mean facial height and bizygomatic facial width of male were 10.96 cm and 13.64 cm with SD of 0.59 cm and 0.48 cm whereas for female the mean were 10.13 cm and 12.75 cm with SD of 0.67 cm and 0.49 cm respectively. The result shows anthropometry (height, weight, head length, head breadth, head circumference) and different facial measurements (Bigonial breadth, Bizygomatic facial width, and Facial height) among males were significantly higher (p<0.0001) than the females.

Table-1: Anthropometry and different facial measurements among participants by gender status (n=140)

Parameters	Male	Female	p-value
Age (yrs)	20.53±1.38	20.00±0.98	0.011
Height (cm)	166.66±6.22	154.05±5.81	<0.0001
Weight (kg)	58.59±7.01	47.79±6.77	<0.0001
Head length (cm)	18.58±0.76	17.76±0.67	<0.0001
Head breadth (cm)	15.06±0.59	14.42±0.47	<0.0001
Head circumference (cm)	54.22±1.42	52.09±1.32	<0.0001
Bigonial breadth (cm)	10.35±0.55	9.70±0.58	<0.0001
Facial height (cm)	10.96±0.59	10.13±0.67	<0.0001
Bizygomatic facial width (cm)	13.64±0.48	12.75±0.49	<0.0001
*p-value <0.01 for independent t-test			

Table-2: Anthropometry and different facial measurements among participants by educational stream (n=140)

Parameters	MBBS	BSc Nursing	p-value
Age (yrs)	20.47±1.33	19.63±0.59	0.007
Height (cm)	164.55±7.44	150.92±3.54	<0.0001
Weight (kg)	56.70±8.07	45.63±4.31	<0.0001
Head length (cm)	18.42±0.81	17.68±0.64	<0.0001
Head breadth (cm)	14.94±0.61	14.34±0.48	<0.0001
Head circumference (cm)	53.81±1.62	51.89±1.24	<0.0001
Bigonial breadth (cm)	10.25±0.59	9.50±0.58	<0.0001
Facial height (cm)	10.80±0.69	10.06±0.65	<0.0001
Bizygomatic facial width (cm)	13.48±0.57	12.56±0.40	<0.0001
*p-value for independent t-test			

Table 2 demonstrates the anthropometry and different facial measurements among participants by educational stream (MBBS

and BSc nursing) with mean value and SD. The age between MBBS and BSc nursing participants was found to be statistically significant (p=0.007). Moreover, all the anthropometry (height, weight, head length, head breadth, head circumference) and different facial measurements (Bigonial breadth, Bizygomatic facial width, and Facial height) among MBBS students were found to be significantly higher (p<0.0001) than the nursing students.

Table-3: Correlation between age, anthropometry and different facial measurements among participants (n=140)

Parameters		Age (yrs)	Height (Cm)	Weight (kg)	Head length (cm)	Head breadth (cm)	Head circ. (cm)	Bigonial breadth (cm)	Facial height (cm)	Bizygomatic facial width (cm)
Age (yrs)	R	1								
	p-value									
Height (Cm)	R	0.232**	1							
	p-value	0.006								
Weight (kg)	R	0.321**	0.660**	1						
	p-value	0.000	0.000							
Head length (cm)	R	-0.047	0.440**	0.416**	1					
	p-value	0.580	0.000	0.000						
Head breadth (cm)	r	0.083	0.471**	0.466**	0.253**	1				
	P-value	0.331	0.000	0.000	0.003					
Head circumference (cm)	r	0.119	0.585**	0.571**	0.680**	0.521**	1			
	P-value	0.161	0.000	0.000	0.000	0.000				
Bigonial breadth (cm)	R	0.025	0.469**	0.538**	0.361**	0.339**	0.440**	1		
	p-value	0.772	0.000	0.000	0.000	0.000	0.000			
Facial height (cm)	r	0.123	0.613**	0.451**	0.446**	0.395**	0.601**	0.487**		
	p-value	0.147	0.000	0.000	0.000	0.000	0.000	0.000		
Bizygomatic facial width (cm)	r	0.166*	0.643**	0.656**	0.374**	0.668**	0.570**	0.572**	0.570**	1
	p-value	0.049	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

r= Pearson's Correlation Coefficients

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Correlation between age, anthropometry and different facial measurements are shown in Table 3. A significant positive correlation was found between all possible pair for age, anthropometry and facial measurements (p<0.05). Furthermore, a positive correlation was observed for head breadth, head circumference, bigonial breadth, facial height, bizygomatic facial width whereas an inverse correlated was observed inversely correlated for head length with age. However, the observed correlation was insignificant (p>0.05).

DISCUSSION

The craniofacial features may serve as diagnostic markers to discriminate male and female genders and can also be used interchangeably [18]. Evidences of research suggest that the various cephalometric variables could be used in the prediction of the height of an individual as shown in the linear regression analysis. But, it is a well-known fact that the anthropometric dimensions are different by age, sex, size of the body, race, ethnic origin, geographical location, dietary variation and even religion [1-3].

Out of total study participants, 68.6% were male and 31.4% were female in this study. In similar study conducted at Gujarat the sample size was 727 medical students [2] while the sample size was 225 with 93 males and 132 females at Ramaiah Medical College,

Bangalore [19]. All participants were related to medical science due to easy availability of participants in medical college.

The mean age of the study participants were 20.36±1.29 ranges from 18 years to 26 years. The study participants were involved in two educational streams; 86.4% in MBBS and 13.6% in B.sc nursing. This study reveals the mean age of the male were 20.53 years with S.D of 1.39 years whereas the mean age of female were 20.00 years with S.D of 0.98 years with statistically significant difference of age between male and female (p=0.011). Similar studies show the age was in the range of 17 to 22 years in Gujarat [2] and between 18 and 25 years of age in Bangalore [19]. This possibility might be the seats alloted for MBBS is more than the BSC nursing in Medical colleges and the average age group of bachelor level students in 18-26 years in Nepal.

The mean (height and weight) of male were 166.66 cm and 58.59 kg with SD of 6.22 cm and 7.01 kg respectively. But, the mean (height and weight) of female were 154.05 cm and 47.79 kg with SD of 5.81 cm and 6.77 kg respectively. The height and weight more in males might be accounted with body composition, amount of fat and muscle, genetical factors and ethnicity as well. The mean head (length, breadth and circumference) of male were 18.58 cm, 15.06 cm and 54.06 cm with SD of 0.76 cm, 0.59 cm and 1.42 cm respectively whereas for female the mean were 17.76 cm, 14.42 cm and 52.09 cm with SD of 0.67 cm, 0.47 cm and 1.32 cm respectively. The mean head length for male is greater than that of females speculated to be due to the fact that head length is related to posterior growth of the brain and development of super structures [20].

Although, the exact mechanism driving this process of differences in head dimension is still a subject of debate. It was presumed that cultural factors related to food may have played an important role, and physical environmental factors such as climatic change may have influenced diet and changes occured [21, 22]. It is reasonable to assume that causes of secular changes are different or that reactions to common factors between male and female are different. It was speculated that earlier attainment of adult size reduces the time used for later posterior growth of the head and this leads to shorter cranial length [23]. This is most especially seen in females because females attain adult size earlier than males of the same age, and that could reduce the time used for later posterior growth of the head. It could also be assume that the Lamboid suture in females appears to close earlier than that in males. Also environmental influence on prenatal and post-natal exposure may be different in males and females leading to higher head length in males. It may also be attributed to differences in the dominant direction of growth vectors [23]. Also, expanding neural mass by neural fibers may preferentially be in the vertical direction in males. It may well be explained that this mainstream of thought could have been responsible for the very little difference in head length in males and females [22].

Likewise, the mean bigonial breadth of male and female were 10.35 cm and 9.70 cm with SD of 0.55 cm and 0.58 cm respectively. However, on 250 adult dry, complete, undamaged human mandibles collected from various medical colleges in and around Bangalore and Puducherry, (India) the mean value of the bigonial breadth of mandible was found to be 9.45 cm in males and 8.74 cm in females. The standard deviation for bigonial breadth in male was 0.53 and in female was

0.54 cm. The values in the female mandible was lesser compared to that obtained in males [24]. Similar results on human mandibles were also reported by Jayakaran et al. [25], Franklin et al. [26], Vallabhajosyula et al. [27], Ongkana and Sudwan [28].

The study reveals mean facial height and bizygomatic facial width of male were 10.96 cm and 13.64 cm with SD of 0.59 cm and 0.48 cm whereas for female the mean were 10.13 cm and 12.75 cm with SD of 0.67 cm and 0.49 cm respectively. In a study conducted at Lucknow, India researchers observed significantly increased (P < 0.001) facial height with a mean±standard deviation (SD) of 112.10 ± 5.66 mm in males and 102.15 ± 5.40 mm in females. Also, similar findings were reported with a higher facial height with a mean ± SD of 12.25 ± 2.11 cm in males and 11.19 ± 1.92 cm in females of Igbo ethnic origin [20]. The results are in accordance with our study. Weston et al. argued that these sex differences in skull shape might result from intersexual selection pressure, so that a region of the face has evolved which highlights the distinction between men and women. Consistent with this hypothesis, a frequent claim is that faces width, as well as certain kinds of aggressive behaviours, are influenced by testosterone [29]. The implication of these views is that increased WHR may correlate with levels of other masculine characteristics, even though some of these characteristics, such as aggression, might not be in themselves sexually attractive [30].

The result shows anthropometry (height, weight, head length, head breadth, head circumference) and different facial measurements (Bigonial breadth, Bizygomatic facial width, and Facial height) among males were significantly higher ($p<0.0001$) than the females. This might be due to the natural increase in the cartilaginous tissue of the face causing an increase in certain facial parameters. According to Joy *et al*., the facial height used to determine sexual dimorphism was significantly higher in males (12.25 cm) compared to females (11.19 cm) of Igbo ethnic group among Nigerians with $P< 0.05$. According to their study, the sexual difference is better projected as one attains adulthood [31]. Similar findings were reported by Anibor et al. in the age group between 18 and 30 years. They observed that the mean facial height was 11.58 cm in Ijaw males and 10.86 cm in Ijaw females [32]. The results are in proximity to the result of the present study.

The age between MBBS and BSC nursing participants was found to be statistically significant ($p=0.007$). Moreover, all the anthropometry (height, weight, head length, head breadth, head circumference) and different facial measurements (Bigonial breadth, Bizygomatic facial width, and Facial height) among MBBS students were found to be significantly higher ($p<0.0001$) than the Nursing students.

A significant positive correlation was found between all possible pair for age, anthropometry and facial measurements ($p<0.05$). Furthermore, a positive correlation was observed for head breadth, head circumference, bigonial breadth, facial height, bizygomatic facial width whereas an inverse correlated was observed inversely correlated for head length with age. However, the observed correlation was insignificant ($p>0.05$). But, in a cross- sectional study conducted among 100 individuals (50 males and 50 females) in Lucknow when comparing the mean craniofacial features between two genders, t- test revealed significantly higher

facial height, pronasale- to- menton distance, and interzygomatic width in males as compared to females, but the mean intercanthal width was found to be the same. Pearson's correlation analysis revealed a positive correlation between facial height and pronasale- to- menton distance, facial height and interzygomatic width, pronasale- to- menton distance and interzygomatic width, and interzygomatic width and intercanthal width [18].

CONCLUSION

The anthropometry (height, weight, head length, head breadth, head circumference) and different facial measurements (Bigonial breadth, Bizygomatic facial width, and Facial height) among males were significantly higher than the females. All the anthropometry and different facial measurements among MBBS students were found to be significantly higher than the nursing students. A positive correlation was observed for head breadth, head circumference, bigonial breadth, facial height, bizygomatic facial width whereas an inverse correlated was observed inversely correlated for head length with age. The findings may be important for anatomists, forensic scientists, plastic surgeons, physical anthropologists. Further, more research with large sample size on different facial measurements are recommended.

ACKNOWLEDGEMENTS

Author is highly thankful to all the participants for their cordial support during the completion of this research study.

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