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Original Article

Anatomy Section

To Check the Validity of Neoclassical Canon in Western Maharashtra- An Anthropometric Study

LAXMI PRASHANT NIVALE[1], ACHELSHWAR R GANDOTRA[2], ROHINI RAJESH KARAMBALEKAR[3]

ABSTRACT

Introduction: In ancient days, it was believed that attractive and harmonious faces were having certain fixed proportions known as neoclassical canons. These canons were used extensively by Leonardo Da Vinci, Durer in their art during renaissance. They served as guidelines for artists as well as for aesthetic surgeons for centuries and proved to be helpful till now. From ancient days to modern era, the exact formula of beauty is not yet calculated. The norms of beauty changes from country to country and race to race. A face is beautiful and shows harmonious features if the individual components are proportional, this is what is referred as facial balance. In ancient Greece, they calculated the formula for creation of art and these formulae are called as neoclassical canons. The classical Greek canons of facial balance are still foundation of modern reconstructive and aesthetic surgery.

Aim: To check the validity of neoclassical canon in Western Maharashtrian population.

Materials and Methods: This was an observational type of study carried out from March 2018 to January 2020. The validity of Naso-oral canon was checked in Western Maharashtrian population. According to this canon ideal mouth width (ch-ch) (mouth width (distance between right and left corners of mouth called chelion)) is 1.5 times of Nose width/alar width (al-al) (alar width (distance between right and left ala of nose)). Mouth width=1.5 times of Nose width. However, the mouth width can be less than 1.5 times of nose width or mouth width can be greater than 1.5 times of nose width. This study was carried out in the five cities Sangli, Kolhapur, Islampur, Karad and Satara of Western Maharashtra, India. Total 1500 male and female students, 300 from each city, between the age group of 18-20 years were selected. Measurements were taken with the help of digital Vernier caliper. The methodology adopted for the measurements was taken from the guidelines given by Farkas LG in his book- "Anthropometric facial proportions in Medicine".

Results: In present study, total 68.33% subjects including males and females were having mouth width (ch-ch) lesser than one and half times of nose width/alar width (al-al) i.e., ch-ch <1.5 (al-al). Remaining 31.67% subjects were having mouth width greater than one and half times of nose width/alar width i.e., ch-ch >1.5 (al-al).

Conclusion: Naso-oral neoclassical canon was not found valid in Western Maharashtrian young adults. In 78.32% male and 62.80% female population of Western Maharashtra, mouth width was found lesser than one and half times of nose width.

Keywords: Anthropometry, Facial aesthetics, Facial balance, Facial proportion

INTRODUCTION

Polycleitus (c.450-c.420BC) was a Greek sculptor who seemed to have been the first to define canons. The principles for the canons of the human body may have been defined by Egyptian artists who influenced the Greeks and Romans [1].

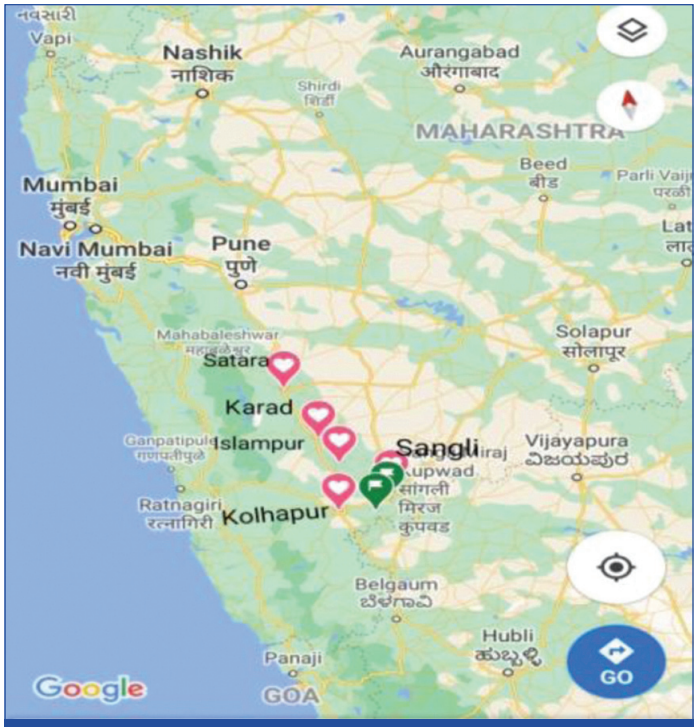
Leonardo Da Vinci worked extensively on the proportions of human body and face and he applied these canons in his art [2]. Ricketts RM popularised the concept of "golden proportion". The golden proportion was first recorded in the third century BC by Pythagoreans and later by Greek geometrician Euclid [2]. The golden proportion is defined as the ratio that is most attractive to the human eye and mind [2]. Farkas LG worked extensively on facial soft tissue anthropometry. By measuring and comparing more than 100 dimensions and proportions in hundreds of people, he defined standards for almost every soft tissue measurement in the head and face. Also, he published on the aesthetics of woman's faces and revised the classic canons for facial proportions in art to correlate these to current norms [2]. These neoclassical canons can be regarded as precursors to the current anthropometric facial indices which are used by anatomists, medical artists, aesthetic surgeons, orthodontists [3]. In the 1980s, Farkas LG, the Father of modern facial anthropometry revised the classic canons for facial proportions as he measured and compared the neoclassical canons in different ethnicities [4-6]. Evaluation of facial aesthetics is essential during treatment of planning of prosthodontic, orthodontic, plastic reconstructive surgery. For such surgeries one promising baseline data should be available. So far, no data have been published on the validity of neoclassical canons in Western Maharashtrian population. Therefore, this study aimed to check the validity of neoclassical canon for young adults in Western Maharashtra as well as to generate baseline data for facial reconstructive surgeries and to compare the results with other ethnicities/ groups in the World.

MATERIALS AND METHODS

This was an observational type of study which was carried out from March 2018 to January 2020. After getting due approval from both the Institutes: Prakash Institute of Medical Sciences and Research, Urun-Islampur (Ref No.-PSM/PIMSR/24013/2018) and Sumandeep Vidyapeeth University, Vadodara, Gujarat, India (SVIEC/IN/MEDI/PHD/18004) the study was conducted. Total 1500 subjects including 535 males and 965 females from Kolhapur, Sangli, Karad, Satara and Islampur cities, 300 from each city were studied [Table/Fig-1]. The age group of participants was ranging between 18-20 years. After taking written consent from all the participants and No Objection Certificate (NOC) letter from Dean/Principal of respective College, the procedure and purpose of the study was explained to the participants.

Inclusion criteria: Individuals with normal craniofacial configuration were selected. It was confirmed that all the participants were residing in the respective city from their forefathers after taking personal and family history in brief.

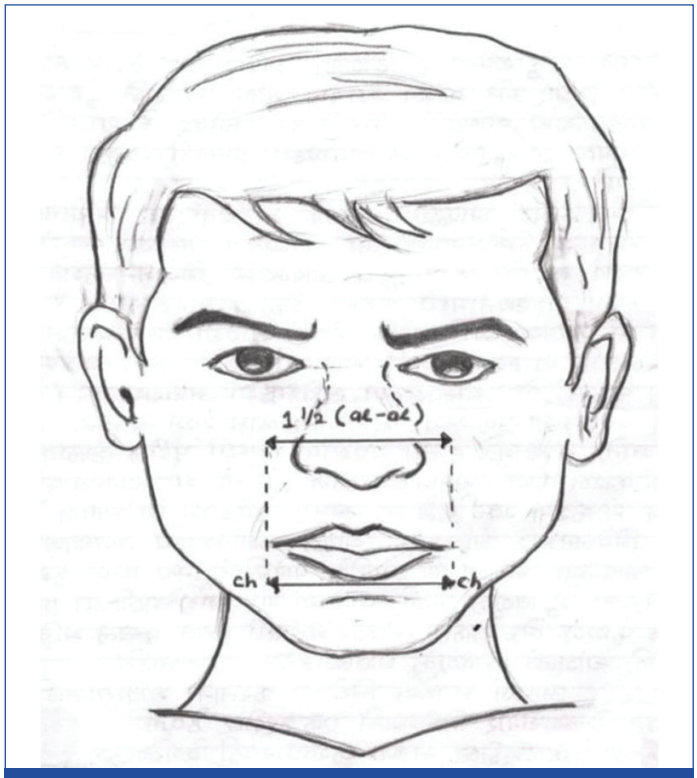
Exclusion criteria: Students who were not resident of Western Maharashtra were excluded from the study and those who were



[Table/Fig-1]: Showing places of study in western Maharashtra.

having history genetically transmitted disorders like cleft lip, cleft palate were also excluded from the study.

Calibrated Standard digital Vernier caliper 30 centimeter length with accuracy of (0.01 mm) was used to take facial measurements. All the facial soft tissue landmarks were first marked with the help of skin marking pencil and then the measurements were taken by the author by standing in front of the participants. Keeping both the arms of the caliper on either side of alar of nose similarly on both corners of the mouth (chelion), nose width/alar width (al-al) and mouth width (ch-ch) was measured respectively [Table/Fig-2]. Participants were asked to remain quiet with erect neck with gently closed lips and avoid talking or laughing while taking measurements. All the facial measurements were taken in millimeters. The methodology adopted for the measurements was taken from the guidelines given by Farkas LG in his book-"Anthropometric facial proportions in Medicine" [7].



[Table/Fig-2]: Showing facial landmarks and naso-oral canon.

Facial Measurements was checked by the validity of one horizontal neoclassical canon, the naso-oral canon in which ideal mouth width (ch-ch) should be equal to one and half times of nose width/alar width (al-al) i.e., (ch-ch)=1.5 (al-al).

Mouth width can be lesser than 1.5 times nose width i.e., (ch-ch) <1.5 (al-al) or mouth width can be greater than 1.5 times nose width i.e., (ch-ch) >1.5 (al-al).

For this the following facial measurements were taken:

1a) Width of Mouth (ch-ch)-distance between right and left chelion;
1b) Width of nose/alar width (al-al)-distance between right and left alar of nose.

STATISTICAL ANALYSIS

All the collected data were subjected to appropriate statistical analysis (mean, standard deviation), p-value. It was analysed by using three way ANNOVA test with type III sum of squares. Software used was R statistical software with 3.5 version.

RESULTS

Nose width/Alar width (al-al)

Mean nose width/alar width in Western Maharashtrian males was found to be significant (p-value <0.001) at 5% level of significance. In general males were having significantly higher alar width as compared to females [Table/Fig-3]. [Table/Fig-4] shows place-wise mean alar width.

Variable	Male	Female	p-value
Mean Alar width with std. deviation (mm)	38.28±2.72	35.26±2.47	<0.001

[Table/Fig-3]: Gender-wise mean alar width with standard deviation.

Place	n	Alar width (mean) (mm)	SD	SE
Islampur	300	37.241	2.793	0.242
Karad	300	37.015	2.291	0.2
Kolhapur	300	36.612	2.581	0.215
Sangli	300	36.524	2.493	0.212
Satara	300	36.461	2.846	0.236

[Table/Fig-4]: Place-wise mean alar width with standard deviation and standard error.
n: No. of subjects; SD: Standard deviation; SE: Standard error

Mouth Width (ch-ch)-

Mean mouth width in Western Maharashtrian males was found to be significant. Mean width of mouth was higher for male than females [Table/Fig-5]. [Table/Fig-6] shows place-wise mean mouth width.

Variable	Male	Female	p-value
Mean mouth width std deviation (mm)	53.92±3.79	51.53±3.50	0.001

[Table/Fig-5]: Gender-wise mean mouth width with standard deviation.

Place	n	Mouth width (mean) (mm)	SD	SE
Islampur	300	53.780	3.742	0.216
Karad	300	52.283	3.593	0.207
Kolhapur	300	52.268	3.468	0.200
Sangli	300	51.453	3.990	0.230
Satara	300	52.139	3.778	0.218

[Table/Fig-6]: Place-wise mean mouth width with standard deviation and standard error.
n: No. of subjects; SD: Standard deviation; SE: Standard error

According to naso-oral canon, width of mouth (ch-ch) should be one and half times of nose width (al-al). Width of mouth could be lesser or greater than 1.5 times of nose width. In present study, total 68.33% subjects including males and females were having ch-ch <1.5 al-al. Remaining 31.67% subjects were

having ch-ch >1.5 al-al. 78.32% males and 62.80% females were with ch-ch <1.5 al-al. Not any subject was found with mouth width equal to 1.5 times of alar width. More details are shown in [Table/Fig-7,8].

Naso-oral canon	Count	Percentage
ch-ch <1.5 al-al	1025	68.33
ch-ch >1.5 al-al	475	31.67
Total	1500	100

[Table/Fig-7]: Showing prevalence of naso-oral canon with percentage.

	Female		Male	
Naso-oral canon	Count	Percentage	Count	Percentage
ch-ch <1.5 al-al	606	62.80	419	78.32
ch-ch >1.5 al-al	359	37.20	116	21.68
Total	965	100	535	100

[Table/Fig-8]: Showing distribution of naso-oral canon in males and females.

DISCUSSION

Naso-oral canon represents relationship between mouth width and nose width/alar width. According to this canon ideal mouth width (ch-ch) should be equal to 1.5 times of nose width (al-al). Mouth width can be greater or lesser than nose width.

In the present study, ch-ch=1.5 (al-al) was not found among Western Maharashtrian population similar to the results of another study done on Indian and Malaysian women by Kusuagal P et al., [8]. Other studies showed validity of this canon up to some extent by comparing of nose width and mouth width between different ethnicities/population is shown in [Table/Fig-9] [9,10]. Farkas LG et al found 21.7% validation in North American Caucasian [11]. Also it was found valid in 17% each of Turkish males and females by Karaca Sayagili O et al., in 5.9% males and 11.5% females of Southern China by Jayaratne YSN et al., 12.50% males and 12.26% females of Bulgaria by Sivkov S et al., in 0.9% African-American males by Jennifer PP et al., in 6% males and 3% females of Kenya by Virdi S et al. [12-16].

Mouth width less than 1.5 times of alar width was seen in 78.32% of males and 62.80% of females in the present study. Similar results were found in a study done on Singapore, Chinese, Vietnamese, Thais, but mouth width studied in Indian Women by Farkas LG and Christopher R, was significantly less than in present study [9]. Similar distribution was seen in Kenyan individuals, in Indian and Malaysian women, in Turkishand in Southern Chinese and in Bulgarians [Table/Fig-10] [8,12,13,14,16].

Mouth width greater than 1.5 times of nose width was seen in 21.68% of males and 37.20% in females of the present study.

Limitation(s)

As this study was focused only on five cities of Western Maharashtra, results of it cannot be generalised for Maharashtra as well as for India.

Author	Population/Ethnicity	al-al (mm)		ch-ch (mm)	
		Male	Female	Male	Female
Farkas LG and Christopher R, [9]	North American White	34.7	31.4	53.3	49.8
	Bulgarian	36	33	49.8	46.2
	Greek	35.7	32.4	51.8	50.3
	Russian	35.8	33.2	52.5	48.1
	Iranian	35.3	32.1	50.3	45
	Turkish	36.8	32.9	53	47.6
	Egyptian	32.4	29.3	48.3	46.7
	Indian	37.9	33.8	51	46.5
	Japanese	38.2	37.1	48.4	46.5
	Afro- American	44.1	40.1	54.6	53.6
Othman SA et al., [10]	Malay	39.59	36.67	50.83	48
Present study	Indian (Western Maharashtra)	38.28	35.26	53.92	51.53

[Table/Fig-9]: Showing nose width and mouth width in different ethnicities/population [9,10].

Author	Population	Ch-Ch=1.5 (al-al)			Ch-Ch <1.5 (al-al)			Ch-Ch >1.5 (al-al)		
		Male	Female	Total	Male	Female	Total	Male	Female	Total
Present study	Indian	0	0	0	78.32	62.80	-	21.68	37.20	-
Farkas LG et al., [11]	Singapore	-	-	1.70	-	-	96.70	-	-	1.70
	Chinese									
	Vietnamese	-	-	0	-	-	100	-	-	0
	Thais	-	-	1.70	-	-	98.30	-	-	0
	North Americian	-	-	21.70	-	-	18.30	-	-	60
	Caucasian									
Sayagili K et al., [12]	Turkish	17.17	17.17	-	43	52	-	40	31	-
Jayaratne YSN et al., [13]	Chinese	5.90	11.50	-	92.20	82.70	-	2	5.80	-
Sivkov S et al., [14]	Bulgarian	12.50	12.26	-	74.11	47.17	-	13.39	40.57	-
Kusugal P et al., [8]	Indian	-	0	-	-	56.67	-	-	43.33	-
	Malaysian	-	0	-	-	73.33	-	-	26.67	-
Jennifer P, [15]	African American	0.90	-	-	96.30	-	-	2.80	-	-
Sourabh Virdi et al., [16]	Kenyan	6	3	-	89	86	-	6	11	-

[Table/Fig-10]: Comparison of Naso-oral canon with other studies worldwide by different authors [8,11-16]. (All the values are in percentage).

CONCLUSION(S)

Very few studies are available which have checked the validity of neoclassical canons worldwide, amongst that only few showed conformity about some classical canons. Neoclassical canons can be used in facial aesthetic surgeries in the absence of anthropometric data but cannot be used as ideal proportions as they did not found valid in most of the ethnicities worldwide. Naso-oral neoclassical canon could not found valid in Western Maharashtrian young adults. In 78.32% male and 62.80% female population of Western Maharashtra, mouth width was found lesser than one and half times of nose width.

To generalise it, more extensive researches are required in this field in Maharashtra as well as in India in various ethnic groups. There is a need to study other neoclassical canons, both horizontal and vertical in Maharashtra as well as India.

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PARTICULARS OF CONTRIBUTORS:
1. PhD Scholar, Department of Anatomy, Sumandeep Vidyapeeth, Vadodara, Gujarat, India.
2. Professor and Head, Department of Anatomy, S.B.K.S. Medical College, Vadodara, Gujarat, India.
3. Professor and Head, Department of Anatomy, Prakash Institute of Medical Sciences and Research, Islampur, Maharashtra, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Dr. Achelshwar R Gandotra,
Professor and Head, Department of Anatomy, S.B.K.S. Medical College, Piparia, Vadodara, Gujarat, India.
E-mail: dragandotra@gmail.com

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