Anthropometric study of nasal indices in four Indian states

ClinicalPractice

Abstract

Data on nasal index of 808 adult males and females distributed in four major states India were taken for present investigation, to study the morphometric variation. Nasal Index was computed and compared among male and female and among different states. Comparison of coefficient of variations shows that there exists variation in nasal breadth and nasal height, hence in nasal index. The study explained 3 types of nose in the population; Leptorhine, Mesorhine, and Platyrhine. The study found leptorhine or mesorhine type of nose is commonly found whereas platyrrhine is a rare finding in Indian population. Males of Uttar Pradesh have higher nasal index as compared to females of the same state. The study also found that leptorhine nose is commoner in Kerala and Jammu and Kashmir. The nasal index of overall males and females was 73.09 ± 0.46 and 72.85 ± 0.36 respectively. The nasal index for females from UP, Bihar, Jammu and Kerala were 76.94 ± 0.32, 80.38 ± 1.27, 62.96 ± 0.40 and 72.50 ± 0.30 respectively. On the other hand, in males from these states were 77.47 ± 0.32, 78.76 ± 0.24, 62.31 ± 0.42 and 72.53 ± 0.33 respectively.

Keywords: morphometry, anthropometry, India, nasal index, divergence, size and shape distances, nose, Indian states

Introduction

The term Anthropometry is derived from the Greek word "Anthropos: A man" and "Metron: Measure" that collectively synonymized as measurement of the man [1]. It is defined as a branch of morphometry that deals with the study of the different features of the human body parts [2]. The branch of anthropometry dealing with shape and size of the human nose across different populations is termed as Nasal Anthropometry [3]. Various studies have reported the varieties of nose and nasal indices across the world [4-6]. Nasal Index depicts the nasal width as the percentage of the nasal height. It is the most common parameter used in the nasal anthropometric classification [7,8]. Three different types of the nose have been identified on the basis of nasal index ratio, leptorrhiine (69.9 and below), mesorhine (70-89.4), and Platyrrhine (85 and above) [9]. Long term environmental factors determine the shape of the nose and it differs among various ethnicities and races [10,11]. The nasal anthropometric data is helpful in the Identification of racial differences, forensic investigations, esthetic and reconstructive surgeries [12]. The Indian population reflects an enormous diversity in the terms of culture, language, ethnic and genetic background [13]. The century old anthropological studies broadly classified Indo-Aryan predominance in Kashmir, Aryo-Dravidian type in Bihar and United Provinces with Dravidian dominance in Southern Provinces of India [14]. Each of the sub-types can be differentiated based on anthropometric parameters such as nasal index, orbital index, and stature [14]. The Indian population is a blend of Negrito Mongoloid, Caucasoid, and Australoid races although a clear demarcation exists between North and South Indian populations in genetic and physical components [13]. Multiple studies have been conducted to identify the genetic and anthropometric parameters among different regions and ethnic sub groups of Indian population [12,14,15]. However, limited studies have used nasal anthropometric data to compare the populations of northern (Kashmir and UP), eastern (Bihar) and southern (Kerala) provinces of India. This study is carried out to identify and compare the nasal indices of the population from four different geographical provinces i.e., Kashmir, Uttar Pradesh, Bihar and Kerala. The results of this study will provide a data for forensic research, anthropological studies and cosmetic surgeons. The results of the study will further facilitate anthropological researcher to draw the anthropometric distinctions between the Indian populations from North, East and Southern Provinces of India.

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Aims and Objectives

The study was aimed to compare and calculate nasal indices of 4 major states of India. Also to classify them in 3 different types of nose, as a tool of identification and comparison within the states.

The objectives were as follows:

- To identify different types of nose in 4 major states of India

- To compare male and female nasal indices of different states

- To compare nasal indices of different states

Materials and Methods

It is a cross sectional study with 808 subjects (Males=398) and (Females=410). The subjects were asymptomatic healthy adults of an age group ranging from 21-35 years. A total 202 (M=105, F=97) subjects were from Bihar, 202 (M=100, F=102) from Kerala, 202 (M=94, F=108) from Uttar Pradesh, and 202 from Jammu and Kashmir (M=102, F=100). Subjects who had trauma of the nose or cleft lips were excluded from the study. The Nasal Height (NH) was measured with a sliding caliper, from nasion to nasospinale. The Nasal Breadth (NB) which is the maximum breadth of nose was measured at right angle to the nasal height from right ala to left ala. All measurement was taken with subject sitting on a chair in a relaxed mood and head in anatomical position. One observer to prevent inter-observer error did the measurement. Nasal index was calculated as NB/NH × 100. T data was subjected to statistical analysis. The sample size was calculated by using level of precision formula. The participation of the subjects was voluntary after explaining the methods of the measurement. The data collected from August 13, 2015-Januray 17, 2017. Any previous history of the nasal surgery, cleft lip, cleft palate, trauma, and facial disfigurement is exclusion criteria for the subjects. The subjects with any history of the migration up to the level grandparents from any other region India to the given states were excluded from the study. The data was obtained by using sliding Vernier caliper in centimeters at the precision level of 0.1 mm. The nasal height was measured from nasion to nasospinale. The inter-alar distance was calculated as the nasal width. The measurements were taken in Frankfurt plane with subject sitting comfortably on the chair. After obtaining the nasal width and nasal height, the nasal index was calculated by the given formula: Nasal Index: Nasal Width (cm)/Nasal Height (cm) × 100 **TABLES 1-8**.

TABLE 1. Shows descriptive statistics of various measurements.								
STATE	Descriptive Statistics							
	Gender	N	Minimum	Maximum	Mean		Std. Deviation
		Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic
UP	Female	108	64.71	84.78	76.9433	0.32378	3.36482
	Male	94	69.39	82.98	77.4732	0.32953	3.19487
Bihar	Female	97	73.47	200	80.3868	1.27112	12.51905
	Male	105	73.47	86.67	78.7611	0.24424	2.50275
J&K	Female	105	54.69	73.21	62.9631	0.40886	4.18959
	Male	97	54.84	73.68	62.3113	0.42138	4.15008
Kerala	Female	100	65.52	80.36	72.5037	0.30396	3.03955
	Male	102	65.52	78.95	72.5342	0.33106	3.34352
UP (Nasal Height)	Female	108	4.5	5.1	4.7824	0.00891	0.09255
	Male	94	4.5	5	4.7872	0.00971	0.09417
UP (Nasal Breadth)	Female	108	3.3	4	3.6787	0.01477	0.1535
	Male	94	3.4	3.9	3.7074	0.01405	0.13618
Bihar (Nasal Height)	Female	97	1.9	4.9	4.7216	0.03106	0.30592
	Male	105	4.5	4.9	4.7629	0.00969	0.09928
Bihar (Nasal Breadth)	Female	97	3.6	3.9	3.7588	0.00864	0.08509
	Male	105	3.6	3.9	3.7495	0.00813	0.08335
J&K (Nasal Height)	Female	105	5.4	6.5	6.0476	0.01895	0.19419
	Male	97	5.6	6.5	6.0814	0.01918	0.18893
J&K (Nasal Breadth)	Female	105	3.4	4.3	3.8029	0.01977	0.20261
	Male	97	3.4	4.3	3.7845	0.02032	0.20018
Kerala (Nasal Height)	Female	100	5.5	5.9	5.74	0.00995	0.09949
	Male	102	5.4	6	5.7186	0.0113	0.11409
Kerala (Nasal Breadth)	Female	100	3.8	4.6	4.161	0.01711	0.17109
	Male	102	3.8	4.6	4.1471	0.01878	0.18969
	Valid N (list wise)	94					

TABLE 2. Shows comparison of different nasal type and their significance.

		Mean	N	Std. Deviation	Std. Error Mean
		Paired Samples Statistics			
Pair 1	UP	77.1898	202	3.2899	0.23148
	Bihar	79.542	202	8.87449	0.62441
Pair 2	UP	77.1898	202	3.2899	0.23148
	JK	62.65	202	4.1739	0.29367
Pair 3	UP	77.1898	202	3.2899	0.23148
	Kerala	72.5194	202	3.18899	0.22438
Pair 4	Bihar	79.542	202	8.87449	0.62441
	JK	62.65	202	4.1739	0.29367
Pair 5	Bihar	79.542	202	8.87449	0.62441
	Kerala	72.5194	202	3.18899	0.22438
Pair 6	JK	62.65	202	4.1739	0.29367
	Kerala	72.5194	202	3.18899	0.22438

TABLE 3. Shows comparison of nasal indices with standard error of mean among genders of different states.

			Mean	N	Std. Deviation	Std. Error Mean
			Paired Samples Statistics			
Pair 1		female	76.978	94	3.54264	0.3654
	UP	male	77.4732	94	3.19487	0.32953
Pair 2		female	80.3868	97	12.51905	1.27112
	Bihar	male	78.7061	97	2.57206	0.26115
Pair 3		female	63.3649	97	4.07177	0.41343
	J&K	male	62.3113	97	4.15008	0.42138
Pair 4		female	72.5037	100	3.03955	0.30396
	Kerala	male	72.663	100	3.24713	0.32471

TABLE 4. Shows correlation coefficient with significance among genders of different states.

			Paired Samples Correlations		
Group	State	Gender	N	Correlation	Sig.
Pair 1	UP	Female & male	94	0.237	0.021
Pair 2	Bihar	Female & male	97	-0.074	0.474
Pair 3	J&K	Female & male	97	0.528	0
Pair 4	Kerala	Female & male	100	0.528	0

TABLE 5. Shows level of significance among genders of different states.

			Paired Differences					t	df	Sig. (2-tailed)
						95% Confidence Interval of the Difference				
Group	State	Gender	Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	
Pair 1	UP	female-male	-0.49521	4.1695	0.43005	-1.34921	0.35878	-1.152	93	0.252
Pair 2	Bihar	female- male	1.68072	12.96467	1.31636	-0.93224	4.29368	1.277	96	0.205
Pair 3	J&K	female - male	1.05361	3.99676	0.40581	0.24808	1.85913	2.596	96	0.011
Pair 4	Kerala	female - male	-0.1593	3.06	0.306	-0.76647	0.44787	-0.521	99	0.604

Results

In the present study, the nasal index of overall males and females was 73.09 ± 0.46 and 72.85 ± 0.36 respectively. The nasal index for females from UP, Bihar, Jammu and Kerala were 76.94 ± 0.32, 80.38 ± 1.27, 62.96 ± 0.40 and 72.50 ± 0.30 respectively. On the other hand, in males from these states were 77.47 ± 0.32, 78.76 ± 0.24, 62.31 ± 0.42 and 72.53 ± 0.33 respectively.

Whereas mean nasal height and width from different states of males and females are mentioned in table.

TABLE 6. Shows level of significance among genders of different states with interstate comparisons.

			Paired Samples Test							
			Paired Differences							
Group	**State**	**Gender**	**Mean**	**Std. Deviation**	**Std. Error Mean**	**95% Confidence Interval of the Difference**		**t**	**df**	**Sig. (2-tailed)**
						Lower	**Upper**			
Pair 1	UP (Nasal Height)	Female-male	0	0.1336	0.01378	-0.02736	0.02736	0	93	1
Pair 2	UP (Nasal Breadth)	female-male	-0.0234	0.19144	0.01975	-0.06262	0.01581	-1.185	93	0.239
Pair 3	Bihar (Nasal Height)	female-male	-0.03814	0.32546	0.03305	-0.10374	0.02745	-1.154	96	0.251
Pair 4	Bihar (Nasal Breadth)	female-male	0.01443	0.11179	0.01135	-0.0081	0.03696	1.272	96	0.207
Pair 5	J&K (Nasal Height)	female-male	-0.05155	0.21895	0.02223	-0.09568	-0.00742	-2.319	96	0.023
Pair 6	J&K (Nasal Breadth)	female-male	0.03196	0.20132	0.02044	-0.00862	0.07253	1.563	96	0.121
Pair 7	Kerala (Nasal Height)	female-male	0.022	0.14255	0.01425	-0.00628	0.05028	1.543	99	0.126
Pair 8	Kerala (Nasal Breadth)	female-male	0.007	0.16652	0.01665	-0.02604	0.04004	0.42	99	0.675

TABLE 7. Shows mean, std deviation and overall level of significance among different states with interstate comparisons.

		Paired Samples Test							
		Paired Differences							
Group	**States**	**Mean**	**Std. Deviation**	**Std. Error Mean**	**95% Confidence Interval of the Difference**		**t**	**df**	**Sig. (2-tailed)**
					Lower	**Upper**			
Pair 1	UP-Bihar	-2.35226	9.36348	0.65881	-3.65133	-1.05319	-3.57	201	0
Pair 2	UP-JK	14.53978	5.9033	0.41536	13.72077	15.35879	35.006	201	0
Pair 3	UP-Kerala	4.67042	4.93934	0.34753	3.98515	5.3557	13.439	201	0
Pair 4	Bihar-JK	16.89204	9.85561	0.69344	15.5247	18.25939	24.36	201	0
Pair 5	Bihar-Kerala	7.02268	9.47517	0.66667	5.70812	8.33725	10.534	201	0
Pair 6	JK-Kerala	-9.86936	3.98383	0.2803	-10.4221	-9.31665	-35.21	201	0

TABLE 8: Shows comparison of nasal indices among state.

	Paired Samples Statistics				
Group	**State**	**Mean**	**N**	**Std. Deviation**	**Std. Error Mean**
Pair 1	UP	77.1898	202	3.2899	0.23148
	Bihar	79.542	202	8.87449	0.62441
Pair 2	UP	77.1898	202	3.2899	0.23148
	JK	62.65	202	4.1739	0.29367
Pair 3	UP	77.1898	202	3.2899	0.23148
	Kerala	72.5194	202	3.18899	0.22438
Pair 4	Bihar	79.542	202	8.87449	0.62441
	JK	62.65	202	4.1739	0.29367
Pair 5	Bihar	79.542	202	8.87449	0.62441
	Kerala	72.5194	202	3.18899	0.22438
Pair 6	JK	62.65	202	4.1739	0.29367
	Kerala	72.5194	202	3.18899	0.22438

Discussion

Nose is a very prominent and important part of the facial skeleton. Nose is made up of bones and cartilages. Nasal anthropometry is an important tool in identifying sexual dimorphism and plurality among different tribes and races. Nasal architecture is the best hint to identify the tribe [16] Nasal index is one of the indices, which is affected by climate, usually hot and moist climate is associated with a broad nose whereas

cool and dry climate has narrow nose [17]. There are few researchers who states that in hot, humid conditions a low, broad nose serves to dissipate heat which affects the shape of nose. It has been seen that if a child of African descent is born in very chilly climate and on the other hand if a child of Caucasian descent is born in a very hot and humid environment. In both cases, they retain their size and shape of the nose irrespective of the environmental influence. It means that an environmental factor plays a smaller role in determining the nasal index of an individual [18]. Nasal analysis is very useful for a surgeon prior to rhinoplasty, therefore analysis of the ethnic group and their facial features are of utmost importance to have better cosmetic results [19-21]

The nasal index is nasal height/nasal width × 100. The nose can be classified into 3 main types according to their nasal indices. Leptorrhine or fine nose (69.9 or less), Mesorrhine or medium nose (70.0-84.9) and platyrrhine or broad nose (>85.0) 30, which has earlier been defined, is a facial structure consisting of bones and cartilages 2 has also been classified into three groups based on nasal anthropometric parameters as Leptorrhine or fine nose (69.9 or less), Mesorrhine or medium nose (70.0-84.9) and platyrrhine or broad nose (85.0) [22].

The results of the present study state that not all four states have platy rhine rather they have either leptorhine or mesorhhine type of nose. Males of Uttar Pradesh has significantly higher nasal index than females as found in Jingpo race of China with mesorrhine morphology [23] and western UP people in Moradabad with mesorhhine type of nose [12]. The study also states that platyrrhine type of nose is 13.33% in western Uttar Pradesh, in contrast to our study where no case of platyrrhine nose was found in any of the four states. Platyrrhine type of nose is prevalent in African states [24].

This study also found that leptorrhine nose was prevalent in Kerala and Jammu & Kashmir states. A similar result was found in Iran southeastern region [10].

The results of the present study confirm few previous studies regarding leptorhine and mesorhhine nose in different Indian states, but it also refutes platyrrhine nose which is found 13% in of Uttar Pradesh population is some previous studies, we found no case of the platyrrhine nose in our study.

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