Original Article

Nasal changes in different age groups

ABSTRACT

Objective: The objective of this study was to evaluate nasal changes in different age groups and to detect gender difference in nasal dimensions.

Materials and Methods: Clinical measurement and profile photographic records of 279 randomly selected subjects were obtained for the evaluation of nasal changes. Thirty-nine subjects were excluded, and the final sample consisted of 240 subjects. The subjects were divided into four groups by age: Group 1 (16–20 years), Group 2 (21–30 years), Group 3 (31–40 years), and Group 4 (41–50 years). Each group was further subdivided on the basis of gender. Data were collected and analyzed by two-way multivariate analysis of variance with Duncan's multiple range *post hoc* test.

Results: In both males and females, nasal height and breadth increased with except nasal index and nasolabial angle. More nasal changes were seen in males as compared to females of the same age group.

Conclusions: Nonconsistent age-related changes were found for nasal index and nasolabial angle. The rest of the nasal parameters increased with age and differ between the genders. Larger nasal changes were seen in males as compared to females of the same age group.

Keywords: Different age groups, gender, nasal changes

INTRODUCTION

Expansion in the facial skeleton is a continuous process and it occurs throughout the life,[1-6] but there are certain facial measurements that progressively increase with age.[7,8] The shape of the nose is a distinctive feature of the human face, and it is believed that the dimensions of the nose change throughout the life even after the growth ceases. Previously there were lots of studies done, which showed that older persons have larger noses than younger one of the same gender and ethnic groups.[9-13] Nowadays, treatment of the patient is based on soft-tissue paradigm for the overall benefit of the patients of any age group.[14] In the modern orthodontic era, the esthetic outcome is critical for the patient, but the primary goal should remain the same to achieve the ideal occlusion of the patient of any age. With age, along with all physiological changes, there are many skeletal and soft-tissue cellular changes seen that affect the related soft tissues, related muscles, and their functions.[6,11,15,16] With age, the shape of the nose has been changed according to literature.[10-12] As in this era, adult patients in orthodontics are increased, so that knowledge of changes in nasal morphology with age is essential for diagnosis and treatment planning to achieve stable esthetically pleasing results. Knowledge of age-related changes in nasal dimensions in different genders is important as facial soft tissues played a social, functional, and esthetic role.[17-22] Reference data are necessary for the management of facial deformities and surgical reconstructions and to obtain harmonious facial features with sound functionality.[22-25] Overall, for the last several years,

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there are lots of quantitative data that are available on the age-related changes in nasal dimension during growth and development for the different ethnic groups.[21,26-29] Apart from several studies on this topic, there has been very limited literature available in the Indian population comparing age differences in nasal changes between the genders. Because of a lack of literature related to gender and age differences, a cross-sectional study was performed to evaluate the nasal changes in different age groups and different genders. Hence, according to nasal changes, an orthodontist can determine and decide the position of teeth in relation to age to provide the more natural appearance of the achieved results.

MATERIALS AND METHODS

The present study was conducted on randomly selected 279 subjects from the students, residents, staff, faculty, and parents/guardians of patients at our university, to evaluate nasal changes in different age groups and different genders. The study was approved from the institutional ethical committee (vide letter no -265/Ethics/R-cell-18/24-9-18). Clinical measurements with digital caliper and profile photographic records of these randomly selected 279 subjects were taken who willingly consented to participate in the study. Out of 279, 39 subjects were excluded from the study, so that the final sample consisted of 240 subjects with age range of 16 to 50 years. Exclusion criteria were age <16 years and more than 50 years, gross facial asymmetry, irregular lips, and no history of nasal prosthesis. Two hundred and forty subjects were divided into four age groups on the basis of age, namely Group 1 (16 – 20 years), Group 2 (21 – 30 years), Group 3 (31 – 40 years), and Group 4 (41 – 50 years), with each group consisting of thirty males and thirty females. All measurements were taken with a subject sitting on a chair in a relaxed mood and head in anatomical position. The nasal height (NH) was measured by using a digital caliper, from nasion to subnasale [Figure 1 and Table 1]. Nasal breadth (NB) was measured at right angle to the NH from right ala to left ala (which is the maximum breath of the nose) [Figure 2 and Table 1]. Nasal index was calculated as NB/NH×100.[29] The nasolabial angle[30] was calculated by angle between a line tangent to the base of the nose and a line tangent to the upper lip [Figure 3 and Table 1]. The measurement was done individually and cross-checked to prevent the intra- and inter-observer errors. All measured data were summarized into mean standard deviation, and all groups were compared by age and genders. By using analysis of variance (ANOVA), groups were compared by age and gender. As ANOVA showed statistical significance, the Duncan's multiple range *post hoc* test was done to ascertain the homogeneity of variance by Levene's test to determine which groups were significant from the others.

RESULTS

Tables 2 and 3 show the results, and NH increases significantly with age in both males and females and NB increases with age in both males and females except in Group 2 and Group 3 females. Nasal index increases with age except in Group 2 and Group 3 males and females, and nasolabial angle decreases with age in both males and females. Nasal index showed nonconsistent pattern between the groups [Table 2]. On comparison [Table 3], NH was found to be significantly higher in Group 1 and Group 2 males and females, and Group 1 and Group 4 males were also showed significant changes, whereas in females, the rest of the comparison is nonsignificant. NB parameter of Group 4 in both males and females was significantly higher as compared to Group 1 males and females. Group 3 and 4 males were significantly higher as compared to Group 2, whereas Group 4 females were significantly higher than Group 2 females. Nasal index ratio of Group 4 in both males and females is significantly higher as compared to Group 1 males and females. Group 3 and

Table 1: Measurements used in the study

Measurements	Description
NH	NH was measured from the nasion to the anterior nasal spine
NB	NB was measured as the maximum horizontal distance across the nasal aperture
Nasal index	Nasal index was calculated as NB/NH×100
Nasolabial angle	Angle between the tangent to upper lip and nasal tip: The nasolabial angle

NB: Nasal breadth, NH: Nasal height

Table 2: Descriptive statistics and significance of mean differences nasal measurements between males and females by Duncan's multiple range *post hoc* test

Measurements	Groups	Sex (mean±SD)		*P*
		Male	Female	
NH (mm)	Group 1	50.01±2.55	48.56±1.32	<0.001***
	Group 2	54.22±1.02	50.34±1.65	<0.001***
	Group 3	57.10±4.12	51.10±1.54	<0.001***
	Group 4	58.11±3.12	52.11±3.65	<0.008**
Nasal breadth (mm)	Group 1	31.02±3.22	31.65±1.87	0.832
	Group 2	32.84±1.21	29.22±1.54	0.738
	Group 3	33.34±2.34	30.10±5.32	0.247
	Group 4	34.86±2.55	33.11±4.19	0.354
Nasal index (percentage)	Group 1	60.02±1.88	61.65±1.32	0.743
	Group 2	58.13±2.43	56.33±2.14	0.453
	Group 3	57.56±4.01	57.42±1.43	0.278
	Group 4	62.65±5.11	61.11±1.54	0.479
Nasolabial angle (degree)	Group 1	96.06±3.15	95.46±2.44	0.116
	Group 2	94.53±1.98	94.23±2.37	0.204
	Group 3	92.43±5.31	93.58±1.95	0.674
	Group 4	90.15±3.22	90.11±2.53	0.453

**Moderately significant, ***$P<0.001$ Highly significant, NS: Nonsignificant, SD: Standard deviation

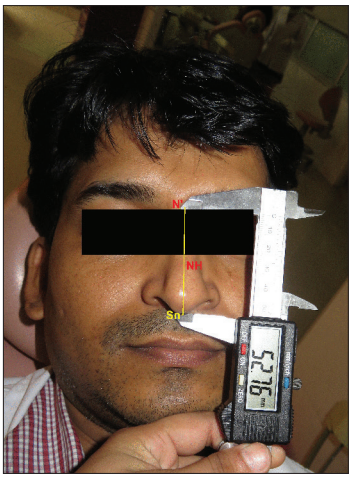


Figure 1: Landmarks: N', Soft-tissue nasion, Sn, Subnasale. The nasal height was measured using digital caliper, from soft-tissue nasion (N') to subnasale point

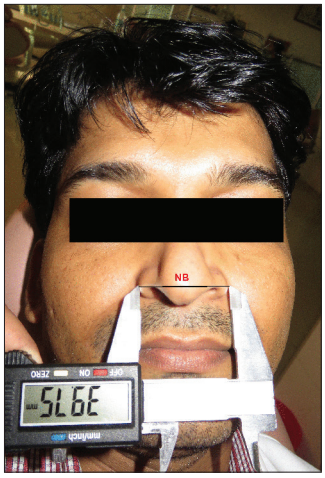
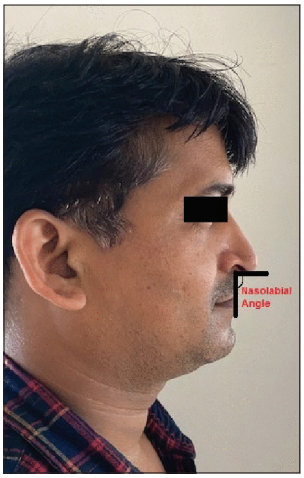


Figure 2: The nasal breadth measured by using digital caliper, it is the maximum breadth of nose was measured from right ala to left ala at right angle to the nasal height



Figures 3: The nasolabial angle was measured, the angle between a line tangent to the base of the nose and a line tangent to the upper lip

4 males were significantly higher as compared to Group 2, whereas Group 4 females were significantly higher than Group 2 females. Nasolabial angle of Group 2 and Group 3 in both males and females was significantly higher as compared to Group 1 males and females, and in Group 4, only males were significantly higher as compared to Group 2. Overall, in most occasions, male parameters of nasal changes were higher than those observed in females.

DISCUSSION

As the nasal growth changes with age and it plays a very important part in various fields like in orthodontics for diagnosis and treatment planning, forensic, plastic surgery, ENT, etc., Nowadays, adult patients are very concerned for their esthetics in both the genders as the current society is esthetically oriented. It is essential for an orthodontist, a plastic surgeon, and other specialists to have a good knowledge of the growth prediction of facial soft tissues to deliver better orthodontic and orthopedic interventions, age estimation, and facial reconstruction.[26] Therefore, a detailed knowledge of age-related changes in facial dimensions and relative positions of facial features in different ages and sexes is required. In this study, a digital caliper was used as it does not compress facial skin during measurements. The nose is one of the parts of body which shows very characteristic changes during the racial evolution.[30] According to Subtelny,[31] the nose experiences more growth in vertical dimensions than in anteroposterior dimensions in both males and females in their spurt years. There is a spurt in males' nasal growth from10 to 16 years with a peak around 13–14 years. According to previous studies, boys and males had larger noses than females and showed different age-related changes and sexual dimorphism in nasal dimensions with age.[2,4,25,26,32-34] In this study, we found that NH increased in both sexes from 16 to 50 years [Table 2], and an increase in NH could be attributed to the vertical dimension of the nose. Previous studies also showed that NH doubled from birth to adolescence, and it had the fastest growth with age. With age, lots of changes occur in the human body both internally and externally. Face is the structure, where age-related changes were noticed early because there are lots of modifications that occur at microscopic level in the cartilages, muscles, skin elasticity, etc.[21,35,36] Nasal tip showed very much age-related changes because of loss of muscle tone, and increased flaccidity, and redundancy.[37] On comparison of NH between the groups [Table 3], there was a significant difference between groups except Group 2 versus Group 3 and Group 3 versus Group 4 males and Group 1 versus Group 3, Group 1 versus Group 4, Group 2 versus Group 3, and Group 3 versus Group 4 females. NB was analyzed and increased in males and females insignificantly [Table 2], and on comparison between the groups, it was found a significant difference between Group 1 versus Group 4, Group 2 versus Group 4

Table 3: Comparisons of nasal measurements between the four age groups within males and within females (Duncan's multiple range *post hoc* test)

Comparison	NH (mm)		NB (mm)		Nasal index (percentage)		Nasolabial angle (degree)	
	Male	Female	Male	Female	Male	Female	Male	Female
Group 1 versus Group 2	0.004**	0.006**	0.232	0.432	0.439	0.856	0.353	0.242
Group 1 versus Group 3	0.003**	0.218	0.372	0.754	0.844	0.543	0.003**	0.002**
Group 1 versus Group 4	0.021*	0.131	0.004**	0.003**	0.003**	0.004**	0.002**	0.002**
Group 2 versus Group 3	0.423	0.322	0.031*	0.453	0.024*	0.034	0.453	0.546
Group 2 versus Group 4	0.44*	0.31*	0.035*	0.048*	0.022*	0.045*	0.36*	0.644
Group 3 versus Group 4	0.235	0.659	0.352	0.232	0.852	0.765	0.643	0.931

*Just significant, **Moderately significant, NS: Nonsignificant, NB: Nasal breath, Nasal height

in both males and females, and Group 2 versus Group 3 in males only. In males, growth spurt in NB was found between 11 and 13 years of age. Nonconsistent age-related pattern was found in nasal index from Group 1 to Group 4 [Table 2], and significant changes were seen in Group 1 versus Group 4 and Group 2 versus Group 4 in both males and females and Group 2 versus Group 3 [Table 3] in males only and this may be due to both males and females had different growth patterns, and overall in majority of times, males had greater increments than the females one.[38,39] From Group 1 to Group 4 [Table 2] nasolabial angle decreased non significantly. On comparison of Group 1 versus Group 3 and Group 1 versus Group 4 showed significant changes in both sexes but Group 2 versus Group 4 showed changes only in males [Table 3] and males showed more age related changes as compared to females. At different ages, different nasal dimensions appear to begin in different sexes. This is an important aspect to consider the evaluation of nasal changes with age in both genders because at birth the NH in boys was significantly larger as compared to girls of the same age group.[37] However, at birth, and in the first few months after the birth, NB was similar in both newborn boys and girls and it becomes larger in boys than in girls in postnatal growth only. There are lots of literature available that demonstrates that the different area of nose shows changes in different ways along with age. Anatomical structure of nose has its own as tip of nose is supported by cartilage and rest of nose is supported by bone. Age-related changes on the nose are not uniform, with age both bone and cartilage become weaker, but the difference is that bone does not move but cartilage moves with time. Hence, because of the movement of cartilage, the tip of the nose to droops leads to nasal tip ptosis. With age, the skin of the nose becomes thin and the sebaceous glands of the nose increase, and due to an increase in sebaceous activity, the skin of the nose becomes heavier, glandular, and vascular which further will cause the nasal tip to droop.[38] Cross-sectional anthropometric studies showed that nasal dimension changes continued after 20 years of age but with slow speed.[4] Some longitudinal studies showed that age changes on nasal dimensions in vertical and horizontal directions are in good relation to each other from late adolescence to late adulthood,[2,3] and as shown in the current study, aging differences were larger in men than in women [Table 3]. Soft-tissue facial characteristics are most commonly used for personal identification, and deep knowledge of age-related changes is essential to make data bank for forensic purposes and for treatment planning in adult cases so that an orthodontist can provide a more natural appearance of that particular age.[4,5,18,40] Orthodontically, we can construct the facial characteristics by software for diagnosis and treatment planning purpose and for forensic anthropologist can approximate the soft-tissue nasal morphology by better reconstruction of facial characteristics from skeletal remnants[25,28-30] and mostly affects the benefit from sex and racial specific developmental and aging patterns of the various nasal dimensions. The main drawback of the present study is that it is a cross-sectional study, and it is proposed that in the future, a longitudinal study with a larger sample size will allow for better results and new dimensions of the individual nasal changes that occur in the different ages and different genders.

CONCLUSIONS

- Changes in nasal dimensions increase with age, and it differs between the genders
- Males have more nasal changes as compared to females in all aspects
- NH and breadth increase with age, and it differs between the genders
- Nonconsistent age-related patterns were found for nasal index in all groups
- Nasolabial angle decreases with age as NH increases more than NB in both genders.

Declaration of patient consent

The authors declare that they have obtained consent from patients. Patients have given their consent for their images and other clinical information to be reported in the journal. Patients understand that their names will not be published and due efforts will be made to conceal their identity but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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