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RESEARCH ARTICLE

AN EVALUATION OF FACIAL AND SMILE ESTHETICS IN GARHWALI POPULATION: A CEPHALOMETRIC AND PHOTOGRAMETRIC STUDY

[1]Tarun Sharma, [2]P Narayana Prasad, [3]Tarun kumar, [4]Gaurav Chaudhary, [5]Prashant Saini and [6]Navid Wani

[1]Associate Professor, Department of Orthodontics and Dentofacial Orthopaedics, Seema Dental College and Hospital, Rishikesh, Uttarakhand, India
[2]Professor and Head, Department of Orthodontics and Dentofacial Orthopaedics, Seema Dental College and Hospital, Rishikesh, Uttarakhand, India
[3,4]Assistant Professor, Department of orthodontics and Dentofacial Orthopaedics, Seema Dental College and Hospital, Rishikesh, Uttarakhand, India
[5,6]Postgraduate Student, Department of Orthodontics and Dentofacial Orthopaedics, Seema Dental College and Hospital, Rishikesh, Uttarakhand, India

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ABSTRACT

Introduction: In this study we want to evaluate facial and smile esthetics in Garhwali population with cephalometric and photogrammetric study and a novel esthetic evaluation technique has also been assessed that explains the relationship of the maxilla and mandible to the cranial base in the form of a triangle, called the T-analysis.

Materials and Methods: 120 subjects were taken, out of which 60 class I subjects comprising of 30 males and 30 females having the esthetically pleasing profile and smile were selected for extraoral photograph and cephlometric analysis.. Angles namely facial convexity angle, total facial convexity angle, nasofrontal angle, nasofacial angle, nasal tip angle, nasolabial angle, nasomental angle, cervicomental angle, maxillary lip contour angle and mandibular lip contour angle were recorded for the subjects. The buccal corridors were measured for smile analysis. 30 class I, 30 class II, 30 class III subjects were taken for T-analysis. T- analysis include stable point sella(s), ptA, and ptB then angles SAB, ABS, BSA, were measured to assess the relation of the maxilla and mandible with cranial base.

Results: Garhwali population has a straighter profile as compared to white European population and other north Indian population. There is sexual dimorphism seen with males having more convex profile, a prominent nose and sharper nasal tip in comparison to females. Males have more acute cervicomental angles than females. While Females have prominent maxillary lip contour than males. There is no statistically significant difference found between the observation of lateral profile and cephalometric values in both males and females. The mean values of buccal corridor in males and females suggestive of broad buccal corridor. In assessing the relation of the maxilla and mandible with cranial base angles SAB, ABS, BSA in Class I, Class II, Class III subjects, we have found that there is highly significant difference exist between them.

Conclusion: The parameters for facial and smile of this study can be considered during orthodontic treatment planning and t analysis can be use as the diagnostic tool to differentiate between class I, class II, class III to strengthen our diagnosis.

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INTRODUCTION

A major reason for orthodontic treatment is to overcome psychosocial difficulties relating to facial and dental appearance therefore the goal of orthodontics can be summed up as the maintenance of optimum relations in physiologic and esthetic harmony among facial and cranial structures Soft tissue has been an area of concern since the end of the 19th century and the beginning of the 20th century for pioneers of orthodontics like Angle and Case. Angle followed the sculpture of Apollo Belverde and considered the ideal profile to be straight. Case however looked for the best facial appearance of each person, according to his or her own morphological features and integrated occlusal and facial objectives into the treatment plan. After the standardization of

Corresponding author: **Tarun Sharma,**
Department Of orthodontics and Dentofacial Orthopaedics, Seema Dental College and Hospital, Rishikesh, Uttarakhand, India.

the radiographic technique in 1931 by Broadbent and Hofrath (Jacobson, 1995), importance of soft tissue analysis was downplayed and dentoskeletal relationships became the deciding factor in diagnosis and treatment planning. Authors like Graber (Jacobson, 1995) stated that the photograph assumes even greater importance when cephalograms cannot be taken and have classified photographs as an essential diagnostic tool. Downs (Jacobson, 1995) in 1956 began interpreting measurements of soft tissue facial profile into their cephalometric analysis and tried to obtain information about the relationship between soft tissue facial profile and underlying dentoskeletal profile.

During the l950's to l960's different authors like Subtenly (1959), Steiners (1960), Rickets (1968) and Burstone (1958, 1967) elaborated various analysis for the soft tissue profile assessment. Their work was followed by Holdaways (1983), Farkas (1985), Bass(1991), Epkers (1992), Arnett and Bergman (1993) and Canut (1996).During the 1980s to the late 90s a variance in soft tissue attributes does not always indicate disproportions and factors that influence the normality criteria like age, sex, and origin should be taken into consideration. The esthetics of a smile is influenced by such features as the amount of gingival display, the presence of a smile arc, and the shade of the teeth.

Another potentially important smile feature is the presence or absence of buccal corridors. In 1958, Frush and Fisher (1958) defined buccal corridors they stated that the size and shape of the buccal corridors were not important, as long as the buccal corridors were noticed. A large number of studies have been carried out so far on facial and smile esthetics but few illustrate angular measurements on the soft tissue profile. Keeping this in mind, the following Study was designed to determine the angular measurements that define the average soft tissue profile of a young adult Garhwali Indian population using a standardized angular photogrammetric and cephalometric analysis. A novel esthetic evaluation technique has also been assessed that explains the relationship of the maxilla and mandible to the cranial base in the form of a triangle, called the T-analysis.

Aims and Objectives

The aim of the study is to evaluate the facial and smile esthetics in Garhwali population, cephalometrically and photogrammetrically.

- Assessment of smile esthetics in Garhwali population.
- Assessment of nasal, labial and genial aspects of the face in balanced profiles.
- Evaluation of sexual dimorphism.
- Incorporation of a novel approach named T-analysis to assess the relation of the maxilla and mandible with cranial base.

MATERIALS AND METHODS

Photographs and lateral cephalogram of sixty subjects (30 Males, 30 Females) having good facial balance and pleasant smile. Digital soft copies of photographs and lateral cephalogram in standard JPEG format of the selected samples

Materials used for evaluation

- Digimizer Image Analysis (version 3.7.0.0) by MedCalc Software bvba, Acacialaan 22 8400 Ostend, Belgium software.
- Grading Forms.
- Microsoft Excel.
- SPSS (Statistical package for social sciences) version 16.0 and Epi-info version 3.0 - For Statistical Analysis

This present study was conducted at Seema dental college and Hospital, Rishikesh. All the subjects of the Uttarakhand ethnicity with pleasing profile and esthetic smile were selected by screening the patient who had visited the OPD (Out Patient Department) at Seema Dental College and Hospital Rishikesh and from the free camps conducted at various colleges and local areas in Uttrakhand.120 subjects were taken, out of which 60 class I subjects comprising of 30 males and 30 females having the esthetically pleasing profile and smile were selected for extraoral photograph and cephlometric analysis and 30 class I, 30 class II, 30 class III subjects were taken for T- analysis.

The photographs of these selected subjects were assessed by the panel of judges comprising of an Oral Surgeon, a Prosthodontist, an Orthodontist, a layperson and a professional photographer. A digital camera (Canon 70 D) duly fitted with a canon F2.8 macro lens, focused at 1:1 ratio and mounted on a tripod were used. Photographs were taken from a fixed distance of 110cm.The records were taken in natural head position. Each subject was shown where to stand/seat and asked to relax, and look into his or her own eyes in the mirror. The lips were also relaxed, adapting to their normal position. Spectacles were removed, and the patient's forehead, neck, and ears were clearly visible during the recording and then the photographic records were taken.For evaluation of smile, same set of 60 class I subjects i.e 30 male and 30 female were selected. The records were taken at same camera distance, and natural head position.

The patient was asked to relax and provide a natural social smile. Smile together with components of the nose and also the chin were kept in one frame .The frame with patient's natural unstrained social smile was selected and was cropped to eliminate most of the nose, cheeks and chin to attenuate the influence of background facial attractiveness. Buccal corridor was calculated as the difference between the visible maxillary dentition width and the inner commissure width divided by the inner commissure width and the ratios were reported as percentages.

For T analysis, the stable points on the lateral cephalogram i.e sella (S), point A (pt.A), point B (pt.B) were used to construct a triangle and measured the following angles sella- pt.A-pt.B(SAB), pt.A- pt.B- sella(ABS), pt.B- sella- pt.A(BSA) in ClassI, ClassII, ClassIII patient with pleasant profile and esthetic smile to evaluate the relationship of the maxilla and mandible to the cranial base.Digimizer Image Analysis (version 3.7.0.0) by MedCalc Software bvba, Acacialaan 22 8400 Ostend, Belgium software was used to analyze the smile. Using the tool named "unit line" and the metallic scale in the photograph, the actual life size measurements was calibrated by the computer.

The markers used in this study were

Soft Tissue Landmarks in photographs and Lateral Cephalogram: (Figure 1 and 2)

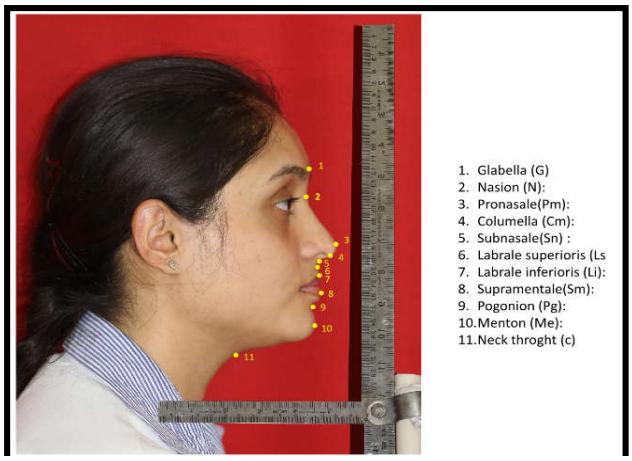

Figure 1. Soft Tissue Landmarks

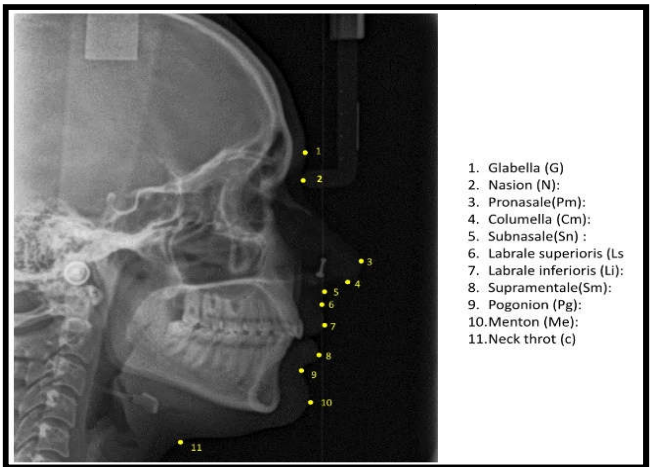

Figure 2. Soft Tissue Landmarks in Lateral Cephalogram

- Glabella (G) : the most anterior point on the mid-line of the forehead
- Nasion (N): the point in the midline located at the nasal root
- Pronasale(Pm): the most prominent point of the tip of the nose
- Columella (Cm): the most inferior and anterior point of the nose
- Subnasale(Sn) : the point where the upper lip joins the columella
- Labralesuperioris (Ls): the point that indicates the muco-cutaneous limit of the upper lip
- Supramentale(Sm): the deepest point of the inferior sub labial concavity
- Stomionsuperioris (Sts): the most superior point on the upper lip
- Stomioninferioris (Sti): the most inferior point of the lower lip.
- Labraleinferioris (Li): the point that indicates the muco-cutaneous limit of the lower lip.
- Pogonion (Pg): the most anterior point on the chin
- Menton (Me): the most inferior point on the inferior edge of the chin.

Angular measurements in photographs and Lateral Cephalogram: (Figure 3 and 4)

Fig 3a

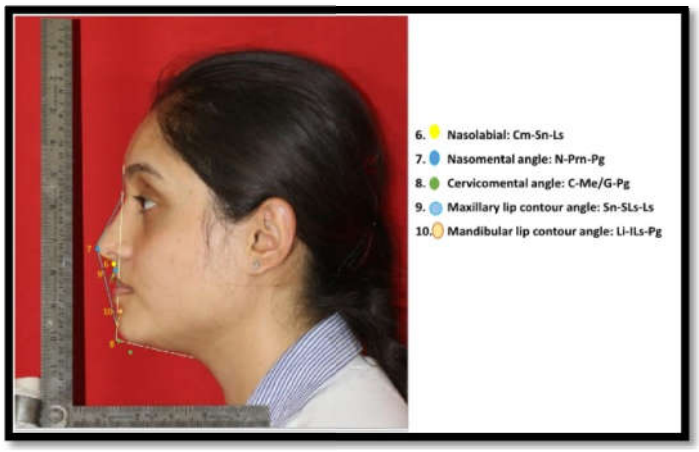

Fig 3b

Figure 3. Angular measurements in photographs

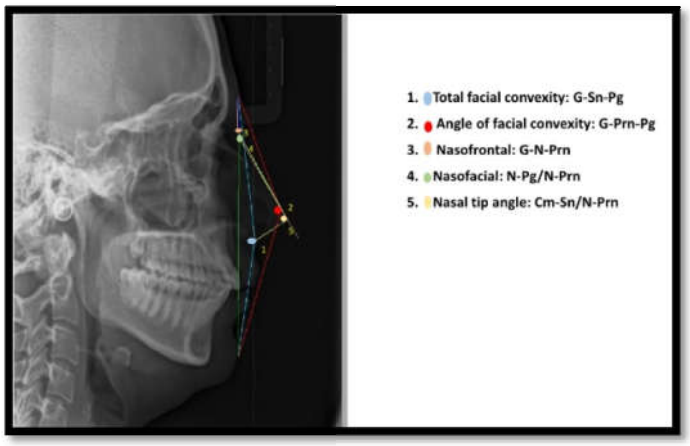

Fig 4a

Total facial convexity: G-Sn-Pg
Angle of facial convexity: G-Prn-Pg
Nasofrontal: G-N-Prn
Nasofacial: N-Pg/N-Prn
Nasal tip angle: Cm-Sn/N-Prn
Nasolabial: Cm-Sn-Ls

Nasomental angle: N-Prn-Pg
Cervicomental angle: C-Me/G-Pg
Maxillary lip contour angle: Sn-SLs-Ls
Mandibular lip contour angle: Li-ILs-Pg
Linear measurements for smile: (Figure 5 and 6)

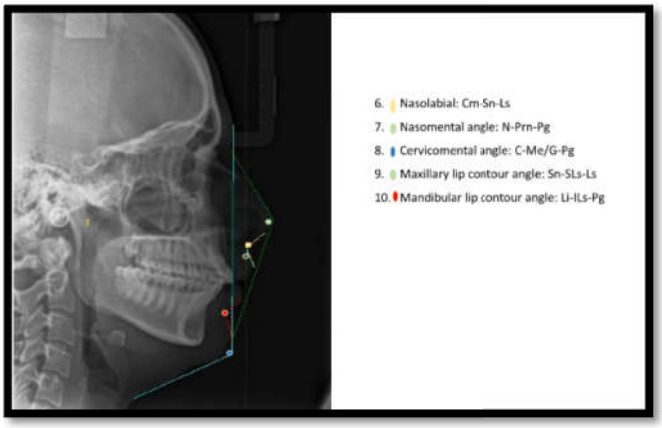

Fig 4b

Figure 4. Angular measurements in Lateral Cephalogram

Figure 5. Frontal smiling photograph

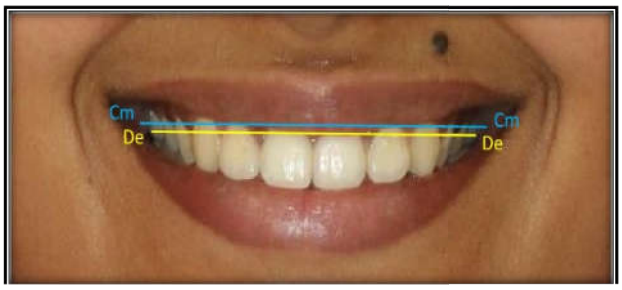

Figure 6. Linear measurements for smile

Cm-Cm: Distance between right and left outer commissure.
De-De: Distance between most prominent buccal contours last tooth visible

T-analysis points and angles:(Figure 7)

Points

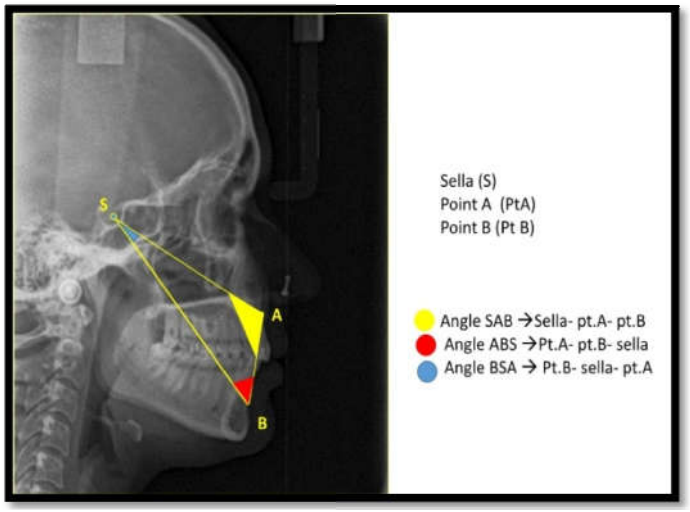

Figure 7. T-analysis points and angles

Sella(S): The geometric center of the skull.
Point A (Pt A): the point at the deepest midline concavity on the maxilla between the anterior nasal spine and prosthion.

Point B (Pt B): the point at the deepest midline concavity on the mandibular symphysis between infradentale and pogonion.

Angles

SAB →Sella- Pt. A- Pt. B
ABS →Pt. A- Pt. B- sella
BSA →Pt. B- Sella- Pt. A

The statistical formulae used were

After completion of the procedure all the data was collected and student t-test and chi square test was done for evaluation of difference between the measurements in male and females and Post Hoc Turkey test was done to compare class I, class II and class III values for T- analysis.

RESULTS

In this study we have analyzed the angular measurements in relation to the nose, chin, labial and facial parameters and evaluated smile esthetic norms within the Garhwali population with skeletal class I occlusion, we have also assessed sexual dimorphisms. Angles namely facial convexity angle, total facial convexity angle, nasofrontal angle, nasofacial angle, nasal tip angle, nasolabial angle, nasomental angle, cervicomental angle, maxillary lip contour angle and mandibular lip contour angle were recorded for the subjects. The buccal corridors were measured for smile analysis .T-analysis was done to assess the relation of the maxilla and mandible with cranial base. The results of the study were as follows: The angles denoted in the table 1 and 2 are significant in p-value gender attributes. The values that were statistically highly significant both on the lateral profile photograph and on the lateral cephalogram were Nasofrontal (G-N-Prn) on the lateral profile photographs (p=0.004) radiographically (p=0.000), cervicomental:

(C-Me/G-Pg). Lateral profile photographs and cephalogram both shows (p=0.003). Other significant values obtained by photographic assessment were maxillary lip contour Sn-SLs-Ls (p=0.042) Nasal tip: Cm-Sn/N-Prn (p=0.038) A wider Nasofacial: N-Pg/N-Prn (Male 29.05 ± 2.63 Female 27.89 ± 3.06) Cervicomental angle: C-Me/G-Pg (Male 104.96 ± 7.80 Female 99.59 ± 5.23). Maxillary lip contour angle: Sn-SLs-Ls Male (154.07± 13.07 Female 147.71± 10.39) were found more significant in males rest of the angles that presented sexual dimorphism were wider in females. The same findings are also represented in graph 1 and Graph 2.

DISCUSSION

In this study we have analyzed the angular measurements in relation to the nose, chin, labial and facial parameters and smile esthetic norms within the Garhwali population with skeletal class I occlusion we have also assessed sexual dimorphisms in various parameters. The inclusion criteria and overall study was specifically devised to observe normative values for the Garhwali population, which may well be accustomed to improve treatment plan in assessing facial patterns in keeping with accepted norms and natural look. The various angles assessed were the facial convexity angle, total facial convexity angle, nasofrontal angle, nasofacial angle, nasal tip angle, nasolabial angle, nasomental angle, cervicomental angle, maxillary lip contour angle and mandibular lip contour angle. The buccal corridor for smile analysis and the T- analysis to assess the relation of the maxilla and mandible with cranial base was done. The data obtained was put to statistical analysis using Microsoft Excel 2013 version. The descriptive statistics include the mean values, obtained with their standard deviation, range and standard error of mean.

When comparing this results with alternative studies, the characteristics of the strategy and also the sample used ought to be borne in mind.In this investigation, standardized photogrammetric records taken in NHP were analyzed using angular measurements. The records were obtained from a sample of 60 (30 males, 30 females) Garhwali population.Many authors like Yuen and Hiranaka[22], Arnett and Bergman (Amett, 1993) conjointly used NHP in their studies. In regard to the photogrammetric technique, the lens used was a 100 mm macro to avoid facial distortion and provide 1:1 magnification. The height of the camera was custom-made to the subject's body height by raising or lowering the peak of the stand. The selected samples were between 18 and 25 years of age, and they were of Garhwali population.The facial convexity angle (G-Sn-Pg) that was assessed in the Garhwali population is (169.67±5.25 in males and 170.59 ± 4.70 in females) which is similar in accordance to the values given by Anic-Miloševic (Anic´-Miloševic, 2008) in Caucasian population (168.78° ± 4.97° in males and 169.05° ± 4.69° in females). These values are slightly more in comparision to values given by Fernández-Riveiro (Riveiro et al., 2003) in white European population (168.2° ±4.96° in males and 167.0° ± 5.36° in females) and the value of R. Munish et al. (2011) for the north Indian population (168.54° ± 3.23° in males and 166.64° ± 4.09°in females). The male values are similar while females exhibited greater values as compared to the values given by Malkoç (Malkoç et al., 2009) in Turkish population (170.60° ± 6.15° in males and 168.78° ± 5.44° in females). It is observed that Garhwali females have more straight profile. There are no significant (p value >0.001) changes between Garhwali male and female, facial convexity angle. The mean value of total facial convexity angle (G-Prn-Pg) in the Garhwali population is (143.74° ± 5.42° in males and 145.22° ± 4.89° in females) same results are observed on comparison with Malkoç (Malkoç et al., 2009) in Turkish population for males but female vales are more, in present study. The values are as follows for Turkish population (142.35° ± 6.15° in males and 142.57° ±5.29° in females). The values are more than the values given by Fernández-Riveiro (Riveiro et al., 2009) in white European population (139.9° ± 5.38° in males and 139.2° ± 4.48° in females), the value of R. Munish et al. (2011) in the north Indian population is (138.62° ± 2.76° in males and 138.62° ± 2.82° in females) This indicates that Garhwali population have a straight profile as compared to white European population . A statistical significant difference ($p < 0.271$) is observed in male and female.The mean value of nasofrontal angle (G-N-Prn) in the Garhwali population is (139.76° ± 6.25° in males and 144.08° ± 4.93 in females) similar to those of Fernández-Riveiro (Reddy et al., 2011) (138.57° ±6.81° in males and 141.98° ± 6.06° in females).These values were same in males and more for females compared to the study by Anic-Miloševic (Anic´-Miloševic et al., 2008) (136.38° ± 6.71° in males and 139.11° ± 6.35° in females) whereas, it is less for both the sexes in comparison with values given by Malkoç (Malkoç et al., 2009) (146.03° ± 8.19° in males and148.61° ± 6.66° in females). The mean value of nasofrontal angle (G-N-Prn) are slightly more for male and similar for females in accordance with the R. Munish et al. (Reddy et al., 2011) in the north Indian population is (136.71° ± 3.64° in males and 144.33° ± 1.75° in females) The values are in accordance to smaller total facial convexity angle along with a prominent nose in Garhwali population compared to Caucasian. A pronounced difference ($p < 0.001$) is observed in male and female values.The mean value of nasofacial angle (N-Pg/N-Prn) in the Garhwali population is (29.05° ± 2.63° in males and 27.89° ± 3.06° in females) which is similar for male and less for females as compared to the values given by Anic-Miloševic (Anic´-Miloševic et al., 2008) (29.53° ± 2.51° in males and 30.36° ± 2.38° in females). The mean value of nasofacial angle are less in comparison to R. Munish et al. (2011) in the north Indian adult population (34.38° ± 1.77° in males and 33.69° ± 1.37° in females) .This can be attributed to the fact that the Garhwali population has a less prominent nose leading to a more straight total facial profile in comparison to the white European population and other north Indian population. No significant sexual dimorphism is observed between males and females.

Nasal tip angle (Cm-Sn/N-Prn), as evaluated in the Garhwali population, does not show much difference between males and females, (74.33° ± 8.92° in males and 78.53° ± 6.15°in females) which is less for males and similar for females in comparison to the values given by Malkoç (2009) (76.21°± 6.72° in males and 78.41° ± 9.17° in females) and more in comparison to the values of Fernández-Riveiro (2003) (72.6° ±9.04° in males and 76.28° ± 5.8° in females), whereas both the values are less than that of Anic-Miloševic (2008) (79.85° ± 6.36°)in males and 84.12° ± 5.20° in females). This angular values are similar for male and more for females as evaluated by R. Munish et al[80]in the north Indian adult population (75.09° ± 3.17° in males and 75.35° ± 3.08° in females) this shows sharper nasal tip in Garhwali population is due to decreased nasolabial angle. No pronounced difference is observed in male and female values.The mean value of nasolabial angle (Cm-Sn-Ls) 99.88±13.56 for males and

101.93±7.22 for females in Garhwali population which much similar to Malkoç (2009) in Turkish population (101±10.19 in males and 102.94±10.43 in females) but, less in comparison to the values given by both Jay Fitzgerald in Caucasian population (113° ± 9.44° in males and 116° ± 9.38º in females) and Fernández-Riveiro[19]in white European population (105.2° ± 13.28° in males and 107.57° ± 8.5° in females). Same results are observed on comparison with values given by Anic-Miloševic, (2008) in Caucasian population (105.42° ± 9.52° in males and 109.39° ± 7.84° in females). The mean value of nasolabial angle (Cm-Sn-Ls) are similar for females and less for males in the north Indian population is (102.32° ± 4.69° in males and 101.50° ± 4.39° in females) as suggested by R. Munish et al. (2011).This can be attributed to the fact that the Garhwali population has a much straight profile in comparison to the Caucasian. Any significant sexual dimorphism is not observed between males and females.

The average value of nasomental angle (N-Prn-Pg) in the Garhwali population is (132.78° ± 4.86° in males and 135.14°± 6.58° in females) which is similar for females slightly less for males to the values of Hiranka (1992) 135±4 in male and 135±3 in females. These angular measurements are also more in comparison to the values given by Anic-Miloševic, (2008) in Caucasian population (130.47°± 3.73° in males and 130.19° ± 3.47° in females)and the average value of R. Munish et al. (2011) in the north Indian population (127.71° ± 1.97° in males and 127.11° ± 1.81° in females). No significant sexual dimorphism is observed.The average value of cervicomental angle (C-Me/G-Pg) in the Garhwali population 104.96° ± 7.86° in males and 99.59° ± 5.23° in females was found to be similar to the values given by Malkoç, (2009) (104.86° ± 9.86° in males and 95.64° ± 7.74° in females) and more in comparison to the values given by Fernández-Riveiro, (2003) (79.85°± 7.19° in males and 84.18° ± 6.65° in females) and The average value of R. Munish et al[80]in the north Indian adult population (100.93° ± 1.77° in malesand 94.11° ± 1.37° in females). Pronounced difference is observed in male and female values in Garhwali adult population which suggests that females have more prominent chin compared to males.

The maxillary lip contour angle (Sn-SLs-Ls) mean values in the Garhwali population is (154.07° ± 13.07° in males and 147.71° ± 10.39° in females) which is higher than the range suggested by Burstone(1967) for white American population (136.9° ± 10.0° in males and 136.9° ± 10.0° in females). In comparing R. Munish et al. (2011) values of the north Indian adult population is (155.60° ± 4.34° in males and 154.26° ± 2.67° in females) the male measurements are similar while females values are less This can be because of the Garhwali population is has a much straighter profile. No significant sexual dimorphism is noticed.The mean value of mandibular lip contour angle (Li-ILs-Pg) in the Garhwali population is 125.45° ± 16.17° in males and 129.07° ± 10.91° in females which is less in comparison to the values given by Fernández-Riveiro (Malkoç et al., 2001) in white European population (130.75° ± 9.64° in males and 131.45° ± 11.01° in females), Anic-Miloševic[82]in Caucasian population (129.26°± 9.55° in males and 134.50° ± 9.08° in females) and Malkoç, (2001) in Turkish population (130.19° ± 8.50° in males and 137.19° ±10.93° in females). The mean value of mandibular lip contour angle values for males are similar and for females lesser in comparison to the R. Munish et al. (2011) values in the north Indian adult population is (124.24° ± 4.56° in males and 132.03° ± 4.75° in females) Females have a much prominent chin compared to males and subsequently a deeper mentolabial sulcus. The values show highly significant sexual dimorphism. As presence or absence of buccal corridors is potentially important smile feature along with amount of gingival display, the presence of a smile arc, and the shade of the teeth.in the present study the relationship between (buccal corridor) and smile attractiveness was shown. It was found that the broader the smile (the smaller the buccal corridor) is more attractive. Theodore (2005) was explained the smile in 5 different range 10 subjects to produce a range of 5 smile fullness's: narrow (28% buccal corridor), medium narrow (22% buccal corridor), medium (15% buccal corridor), medium-broad (10% buccal corridor), and broad (2% buccal corridor).In the study we found that the mean values male is 3.08% and which suggestive of broader smile and for female 4.08 % suggestive of broader buccal corridor. The average width of buccal corridor was 2.29 ± 3.72 mm in female and in male it is found to be 2.18 ±1.44 mm which statistically significant p=0.03 the male buccal corridor are significantly higher than the female buccal corridor.To assess the relation of the maxilla and mandible with cranial base T analysis was developed, considering the stable points on the lateral cephalogram i.e. Sella (S), point A (pt.A), point B (pt.B) were used to construct a triangle and measured the following angles sella- pt.A- pt.B (SAB), pt.A- pt.B- Sella (ABS), pt.B- Sella- pt. A (BSA) in Class I, Class II, Class III patient with pleasant profile and esthetic smile to evaluate the relationship of the maxilla and mandible to the cranial base.The descriptive statistical analysis shows that the mean value of angle SAB for class I is 121.51 ± 2.18; for class II 108 ± 3.28 and for class III 130 ± 5.14. Similarly angle ABS is having mean values for class I is 41.33 ± 2.32; for class II 51.18 ± 3.60; for class III 32.97 ± 3.02. Angle BSA is having mean values for class I is 17.16± 1.39; for class II 20.78 ± 2.50; for class III 16.99 ± 3.11.The descriptive statistical analysis also suggest the range of SAB for class I is 118.02 -126.10; for class II 103.40 -114.38 and for class III 123.46 - 141.42. Similarly angle ABS is having mean values for class I is 35.91 - 44.89; for class II 43.01 - 58.02; for class III 25.48 -37.23. Angle BSA is having mean values for class I is 14.43 - 19.54; for class II 16.18 - 25.39; for class III 11.34 - 23.27.When compare the dependable variability of all the angels with each other with Post Hoc Turkey Test, statistically significant values were found. The comparison for angle SAB between class I and class II was found to be 13.47and Class I and class III was -8.53. This difference were found to be statically highly significant with p=0.000. This shows that SAB angle for class I is significantly more than class II and less then class III. For angel SAB the difference between class II and class III was -22.01which is highly significant with p=0.000. Shows that SAB angle for class II is significantly less then class III.For ABS angle the mean difference between class I class II was found to be -9.85 shows that this difference is statistically highly significant with p value 0.000 while.The mean difference of angle ABS between class II and class III was found to be 18.21 and this value is statistically highly significant with p=0.000. When compare the values of class I and class III the value is 8.36 which is highly significant with p=0.000. Shows that SAB angle for class I is significantly less than class II and more than class III.For BSA angle the mean difference between class I class II was found to be -3.62 shows that this difference is statistically highly significant with p value 0.000 while.The mean difference of angle BSA between class II and class III was found to be 3.79 and this value is also statistically highly significant with p=0.000.

When compare the values of class I and class III the value is 0.17 which is not significant p=0.96. The overall result shows that SAB angle for class I is significantly less than class II, but more than class III though it is not significant.

Conclusion

Soft-tissue facial analyses may be created on photographs and lateral cephalograms, by measuring (measurements directly on the face), or with 3-dimensional imaging techniques. Many techniques, norms, ideal ratios, angles and guidelines are proposed in the literature, and chiefly advocated the use of 2-dimensional records for measurements.

After a detailed study both photographically and cephalomertically. It was concluded that:-

- Garhwali population has a straighter profile as compared to white European population and other north Indian population.
- There is sexual dimorphism seen and males have more convex profile than female.
- Males have a prominent nose and sharper nasal tip in comparison to females.
- Females have more acute cervicomental angles than males.
- Females have prominent maxillary lip contour than males.
- There is no statistically significant difference found between the observation of lateral profile and cephalometric values in both males and females.

In the study we found that the mean values of buccal corridor in males was 3.80 %, which is suggestive of a broad smile and for females 4.08 % suggestive of broad buccal corridor. Compared to the study done by M. Theodore et al[14]The average width of buccal corridor was 2.29 ± 3.72 mm in females and in males it is found to be 2.18 ± 1.44 mm which is statistically significant p=0.03.the male buccal corridors were significantly wider than the female buccal corridors. To assess the relation of the maxilla and mandible with cranial base, T analysis was developed, considering the stable points on the lateral cephalogram i.e. Sella (S), point A (pt.A), point B (pt.B). We constructed a triangle and measured the following angles SAB (sella- pt.A- pt.B), ABS (pt.A- pt.B- Sella), BSA (pt.B- Sella- pt. A) In Class I, Class II, Class III subjects .we have found that there is highly significant difference exist between them. The normal values ranges for the angles that were calculated and illustrated are as follows of angle SAB for class I is 121.51 ± 2.18; for class II 108 ± 3.28 and for class III 130 ± 5.14. Similarly angle ABS is having mean values for class I is 41.33 ± 2.32; for class II 51.18 ± 3.60; for class III 32.97 ± 3.02. Angle BSA is having mean values for class I is 17.16± 1.39; for class II 20.78 ± 2.50; for class III 16.99 ± 3.11.BSA angle for class I and class III is not significant though it is higher in class I subjects then class III subjects.This approach can be used as one of the diagnostic tool to differentiate between class I, class II, class III to strengthen our diagnosis.

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