A Cephalometric appraisal of Steiner’s analysis normal occlusion in Chennai suburban and rural area of population in the age group of 14 – 21 years.

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Abstract:
Aim: The purpose of the study is to formulate Cephalometric norms of the Chennai suburban and rural areas of population.
Design: A cross sectional study sample selected on the basis of Class 1 occlusion.
Materials and methods: The samples for the present study comprised of pre-treatment lateral cephalogram taken in natural head position of 64 participants (males 32 and females 32). All these cephalometric radiograph were manually traced, analysed, interpreted using the landmark values given by Steiner analysis. The student t test, standard deviation and mean value were calculated to compare the standard norms.
Result and Conclusion: The result of this study showed that maxilla and mandible were more protruded. Sn occlusal plane angle and mandibular plane angle were smaller than mean value. Both maxilla and mandible incisors were proclined.
Key words: lateral cephalogram, Steiner analysis, Chennai suburban and rural population, parameters (skeletal and dental).

Introduction:
Cephalometric radiograph is one of the most commonly used diagnostic tools in both clinical and research based orthodontics. The introduction of the Broadbent – Bolton Cephalometric in 1931 opened a new field of investigation and understanding pertaining to the head, face and dentition. Studies have been made to calculate facial dimension and growth and establish the boundaries of normal range of variations.

Variations within normal range are harmonious but variations outside the normal range are incongruous and ugly. Clinical cephalometric tells more than just anatomic pattern displayed by a child. Numerous cephalometric analysis has been suggested in the literature by several authors and researches. The limitation and benefit of one analysis and others have been analysed and researched. Some analysis is more useful for research purpose while others are clinical application in day to day practice.

Orthodontist should be able to differentiate between normality and abnormality. The extent to which deviation occur cannot be assessed unless the norms on a quantitative basis are established since it gives no definite idea of deviation. Quantitative assessment helps in diagnosis, classifying dento facial deformities and assist in demarcating anatomic deviation from normal.

Norms is the standard of forms and functions of a majority of individual on a group or race. It is not a single value but a range of values denoting the existing variability and reducing the funding to twice of the average as a goal in treatment planning.

Establishments of norms are usually carried out using anthrometric and cephalometric data. It is important to record the age, racial background and gender since the facial features are different at different ages in both gender and in different ethnic groups.

Norms established from the Caucasians samples are still being widely used on the population groups all over the world resulting unsatisfactory result. Norms used only as guide and not as a reference for every patient with this concept they emphasized there was a huge variety of skeletal and dental variations within the different racial groups.

It is evident from the studies of numerous investigations that the cephalometric norms vary among different age, gender and race.
Several studies have been carried out for various racial sub groups and information concerning cephalometric findings in the Japanese, Chinese, Caucasian, African Americans and Nigerians and in other part of the world.

In India many papers have been published establishing the norms for the local population. The first cephalometric study on the Indian population was done by Kotak (1961) on Gujarati girls and then Seshadri (1964) Mathur (1964) on Maharashtrians, Shetty (1962) on Parsis and Maharashtrians by Sidhu (1969).

Other Indian studies include those of Kharbanda and Kotak on North Indian, Patel on Gujarathis, Kannappan on South India, John and Valithan on Keralites have established these norms based on Steiner analysis.

Till date no study has been conducted on the population of Chennai suburban and rural area. Therefore the purpose of this study was to formulate cephalometric norms for the Chennai suburban and rural population and compare these data with the norms established by Steiner analysis between the age groups of 14 years – 21 years.

**Materials and methods:**

The present study included randomly collected sample of 64 subjects including 32 males and 32 females of the age varying between 14 – 21 years in Chennai suburban and rural population. Materials used:

1. 64 number of lateral cephalogram.
2. Acetate matt paper.
4. 3 H pencil

The samples were selected according to the following criteria.

1. An individual with no history of orthodontic treatment.
2. All permanent teeth present.
3. Angle class 1 molar relationship with proper inter cuspation, acceptable overjet and overbite.
4. Age 14 to 21 years old.
5. No symptoms related to TMJ disorder.
6. History of systemic disorders were excluded from the study.
7. Consent from the parents of each subject was taken after explaining the nature and purpose of radiograph.

**Methodology:**

Ethical approval for this study was obtained from research ethical committee. A cephalometric radiograph was taken for each of the participants in a standard position with the teeth in centric position and with lips relaxed. Lateral cephalogram of each individual using Planmecca PM with voltage 68 KV and current of 5 MA are used to obtain the lateral head film. Exposure time is 18.7 sec. The position will be stabilised with the help of ear rods. Care was taken about the clarity and quality of the cephalogram selected so that the necessary points and landmarks can be accurately plotted without any error. The following points and planes were drawn on each cephalogram.

The cephalograms were all traced on acetated matt paper (8x10 inches) using 3H pencil. All the required hard tissue landmarks will be marked and various angular and linear measurements will be analysed in accordance to the Steiner analysis which is also explained in flowchart.

### Statistical analysis:

Descriptive statistics of angular and linear measurements (SNA, SNB) will be analysed expressed in terms of mean and standard deviation. Normal t test for single mean comparison will be used for angular and linear measurements of Chennai sub urban rural population compared to standard norms and values of Steiner.

**Results:**

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Steiner norms</th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNA</td>
<td>82</td>
<td>63.6</td>
<td>63.74</td>
</tr>
<tr>
<td>SNB</td>
<td>80</td>
<td>80.8</td>
<td>79.08</td>
</tr>
<tr>
<td>ANB</td>
<td>7</td>
<td>4.3</td>
<td>5.8</td>
</tr>
<tr>
<td>SMD</td>
<td>76</td>
<td>77</td>
<td>75</td>
</tr>
<tr>
<td>SN-SOGN</td>
<td>31</td>
<td>32</td>
<td>31.67</td>
</tr>
<tr>
<td>SN-CC</td>
<td>13°</td>
<td>14°</td>
<td>13.5°</td>
</tr>
<tr>
<td>Maxillary incisor (angular)</td>
<td>22°</td>
<td>22.50°</td>
<td>22.0°</td>
</tr>
<tr>
<td>Maxillary incisor (mm)</td>
<td>8.6mm</td>
<td>8.57mm</td>
<td>8.67mm</td>
</tr>
<tr>
<td>Mandibular incisor (angular)</td>
<td>25°</td>
<td>24.8°</td>
<td>23.1</td>
</tr>
<tr>
<td>Mandibular incisor (mm)</td>
<td>8.4</td>
<td>8.3</td>
<td>8.3</td>
</tr>
<tr>
<td>Interincisal</td>
<td>131</td>
<td>110</td>
<td>106</td>
</tr>
</tbody>
</table>

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Table 2: Mean, Median and Standard deviation of the present study population.

<table>
<thead>
<tr>
<th></th>
<th>MEAN</th>
<th>MEDIAN</th>
<th>S.D</th>
<th>S.E of mean</th>
<th>p-VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNA</td>
<td>83.68</td>
<td>84</td>
<td>3.757</td>
<td>.767</td>
<td>.383</td>
</tr>
<tr>
<td>SNB</td>
<td>75.54</td>
<td>70</td>
<td>3.978</td>
<td>.832</td>
<td>.172</td>
</tr>
<tr>
<td>ANB</td>
<td>10.04</td>
<td>10.50</td>
<td>1.794</td>
<td>3.575</td>
<td>.490</td>
</tr>
<tr>
<td>SND</td>
<td>74.61</td>
<td>76</td>
<td>3.533</td>
<td>.717</td>
<td>.580</td>
</tr>
<tr>
<td>SN-GOGN</td>
<td>39.67</td>
<td>32</td>
<td>5.808</td>
<td>1.424</td>
<td>.410</td>
</tr>
<tr>
<td>SN-OCN</td>
<td>14.42</td>
<td>14</td>
<td>6.071</td>
<td>1.239</td>
<td>1.000</td>
</tr>
<tr>
<td>SN-PP</td>
<td>6.61</td>
<td>6</td>
<td>2.722</td>
<td>.558</td>
<td>.092</td>
</tr>
<tr>
<td>Maxillary incisor (angle)</td>
<td>32.80</td>
<td>32.70</td>
<td>4.842</td>
<td>1.927</td>
<td>.750</td>
</tr>
<tr>
<td>Maxillary incisor (mm)</td>
<td>9.75</td>
<td>9.50</td>
<td>3.991</td>
<td>.692</td>
<td>.399</td>
</tr>
<tr>
<td>Mandibular incisor (angle)</td>
<td>23.42</td>
<td>23</td>
<td>5.999</td>
<td>1.225</td>
<td>.487</td>
</tr>
<tr>
<td>Mandibular incisor (mm)</td>
<td>3.70</td>
<td>3.20</td>
<td>3.620</td>
<td>.654</td>
<td>.191</td>
</tr>
<tr>
<td>Interincisal</td>
<td>100.04</td>
<td>106.50</td>
<td>12.495</td>
<td>2.501</td>
<td>.370</td>
</tr>
<tr>
<td>S line to upper lip (mm)</td>
<td>1.79</td>
<td>2</td>
<td>8.333</td>
<td>.170</td>
<td>.134</td>
</tr>
<tr>
<td>S line to lower lip (mm)</td>
<td>3.46</td>
<td>2.50</td>
<td>2.895</td>
<td>.489</td>
<td>.197</td>
</tr>
</tbody>
</table>

Discussion:
The study is intended to establish and discuss norms for children of the Chennai suburban and rural area of population utilising Steiner analysis.

Steiner analysis provide maximum clinical information with minimum number of measurement. He proposed the appraisal of various parts of the skull separately:

1. Skeletal analysis
2. Dental analysis
3. Soft tissue analysis

Skeletal analysis:

- SNA (82°) is more than the mean value. It indicates that Maxilla lies more anteriorly in relation to the cranial base.
- SNB (80°) is more than the mean value, then it indicates that Mandible lies more anteriorly to the cranial base.
- ANB (2°) is an anterio posterior relationship between Maxilla and Mandibular apical base relation to the cranial base. ANB represent the difference SNA and SNB. ANB angle in the present study were slightly more than normal value.
- The mean value of the SNA, SNB and ANB angles in the present study were slightly more than those presented by Steiner norm, indicating Maxillary and Mandibular proclination. These findings were in agreement with Shalhoub et al. Who did this study among adult Saudi Males and Females and another study is in agreement with al Barakati in the Saudi population. No significant difference was found to mandibular plane angle.
- SND angle was higher than that of the mean value. This indicates that the mandible is set slightly more forward when compared to the mean value of Steiner norms and this agreed with the study of Leo (1994) who did a comprehensive study on Singaporean Malay on comparison between Male and Female there was no significant difference between them.
- Mp-Sn: The mandibular plane to the anterior cranial base revealed that the angle was smaller than the mean value. From this study mp-sn angle exhibited a more horizontal growth pattern than the Steiner norms. There was no significant difference between males and females.

Occlusal Plane Angle: Inclination of occlusal plane to anterior cranial base in the present study showed that the angle was smaller than the mean value.

Dental:

- Upper incisor to NA (22°) indicates the relative angular relationship of the upper incisor teeth to N A line. The present study shows the mean value is higher than the Steiner norms. It indicates more labial inclination of the maxillary teeth.
- Upper incisor to NA (4mm) provides information on the relative forward or backward positioning of the incisor teeth to NA line, the mean value. The present study shows higher than the Steiner norms. It indicates more forward positioning of the Maxillary teeth.
- Lower incisor to NB (25°) long axis of lower central incisor and NB line. It represents the degree of inclination of lower incisor relation to the mandibular base.
- Lower incisor to NB (4mm) the linear perpendicular distance from the incisal tip of the most protruded lower central incisor and the NB line. It represents the degree of the protrusion of the lower incisor relative to the anterior limit of the mandibular base.
- This finding is in agreement with the study done by Valliathan et al. (1975, 1976) on Madras population where both angular and linear measurements were more compared to that given by Steiner norms. Interincisal angle: it is a measure of relative position of upper incisor to lower incisor. The mean value of inter incisal angle in present study shows lower than those given by Steiner indicating proclined Maxillary and Mandibular teeth. This finding is in agreement with the study done by Kannappan JG et al. (1976) on Madras population where it was found that the incisor teeth of people from India was more labially placed. This finding is also in agreement with the study done by Nanda R et al on North Indian in which they had reported suggesting more vertical incisor in North India. Elbe P etal (2000) in which it was found that interincisal angle was less for North Indian as compared to Steiner norms and was concluded that North Indian have more proclined lower incisor as compared to normal value. No significant difference was found for occ to SN.

Summary and Conclusion:

- The findings of the present study have revealed that there is some fundamental variation in the craniofacial structures of Chennai suburban and rural population when compared to Steiner norms.
- The maxillary and mandibular apical bases in relation to the anterior cranial base were located more anteriorly.
- Interincisal angles shows a lesser value indicating proclination of maxillo mandibular incisors.
- Mandibular plane angle in relation to the cranial base was smaller which was suggestive of horizontal growth pattern.
- No significant difference was found in most skeletal, dental parametric between males and females.

Most cephalometric parameters in this study was significantly different from Steiner norms.

The result of the present study supports the idea that a single standard of facial aesthetics should not be applied to all racial and ethnic groups.
References: