INTRODUCTION
Vertical anterior tooth display is one of the most important aspects of dental and facial esthetics. It helps in determining the outcome of fixed or removable prosthetic care, implant dentistry, operative dentistry, anterior esthetic procedures and orthognathic surgery.

The dentofacial composition encompasses both the frontal and sagittal planes in two muscular positions, static and dynamic. The static position is determined when the lips are slightly parted and the teeth are out of occlusion with the perioral muscles relatively relaxed. Age influence the degree of tooth visibility. The amount of maxillary teeth visible at rest significantly decreased with increasing age and increased for the mandibular teeth. As the upper lip length increased, the mean visible labial length of maxillary anterior teeth significantly decreased.

METHODOLOGY
It was a cross-sectional study conducted from October 2012 to March 2013 at the Department of Prosthodontics, Dr. Ishrat-ul-Ebad Khan Institute of Oral Health Sciences, Karachi.

ABSTRACT
Objective: To determine the mean visible labial length of maxillary and mandibular anterior teeth at rest.
Study Design: Cross-sectional study.
Place and Duration of Study: Department of Prosthodontics, Dr. Ishrat-ul-Ebad Khan Institute of Oral Health Sciences, Karachi, from October 2012 to March 2013.
Methodology: A total of 200 subjects were included. Measurements were carried out using digital caliper from the border of the lip to the incisal edges of incisor and to the cusp tip for the canines. The length of the upper lip was measured from subnasale to stomion. Statistical analyses were performed by Mann Whitney-U test and Kruskal Walli's test.

Results: The age of the participant ranged between 20 and 65 years. At rest, females significantly displayed more of the maxillary central incisor (2.93 ± 1.57 mm; p=0.003), lateral incisor (1.87 ± 1.12 mm; p=0.005) and canine (0.59 ± 0.62 mm; p=0.031). With increasing age, the amount of maxillary anterior teeth visible at rest significantly decreased (p < 0.001), and increased for the mandibular teeth (p < 0.001). Subjects with shorter upper lips significantly displayed more maxillary anterior incisor structure than subjects with longer upper lip (p < 0.001).

Conclusion: Females displayed significantly more labial length of the maxillary anterior teeth. The mean visible labial length of maxillary anterior teeth significantly decreased with increasing age and increased for the mandibular teeth. As the upper lip length increased, the mean visible labial length of maxillary anterior teeth significantly decreased.

All the subjects with maxillary and mandibular anterior teeth present without caries, restorations, tooth surface loss, interdental spacing, crowding, gingival and periodontal disease were inducted. Subjects with a history of congenital anomalies, lip trauma, oral and maxillofacial surgery, orthodontic trauma were excluded.

After taking consent, measurements were performed with the subjects seated in a dental chair with head and back in an upright position. It was carried out using an electronic digital caliper to the nearest tenth of a millimeter for specified measured dimensions in each patient. The caliper had two edges, external and internal; the internal edges were used in the measurements to avoid lip distortion.

For measurements of patients at a rest position, the visible portions of anterior teeth were measured vertically from the lower border of the upper lip to the incisal edges of the incisors (cusp tip for the canines) at the midpoint of the tooth at the rest position (when the lips and the lower jaws were in the rest position) for the maxillary teeth.

For the mandibular teeth, measurements were made from the upper border of the lower lip to the incisal edge of the incisors (the cusp tip for the canines) at the midpoint of the tooth rest position.

The measurement was considered to be zero if the tooth could not be seen regardless of how short it was. Three measurements per tooth were made and the mean was calculated. The length of the upper lip was measured from the subnasale to the stomion at the midline of the face.13,14

Statistical Package for Social Sciences (SPSS) version 17 software was used for the analyses. All recorded data were analyzed by Mann Whitney-U test and Kruskal Walli’s test. The significance level was set at 5%.

**RESULTS**

Two hundred adult subjects, male (80) and female (120) were randomly selected. The age of the patients ranged from 20 - 65 years.

The most significant differences in the visible amounts of teeth with lips at rest were between the sexes (Table I). The females significantly displayed more of the maxillary central incisor (2.93 ± 1.57 mm; p=0.003), lateral incisor (1.87 ± 1.12 mm; p=0.005) and canine (0.59 ± 0.62 mm; p=0.031). Table II shows the difference in the visible amount of teeth between the age groups. With increasing age, the amount of maxillary anterior teeth that was visible at rest significantly decreased (p < 0.001); however, the amount of mandibular anterior teeth that was visible at rest was significantly increased with increasing age (p < 0.001).

Subjects with shorter upper lips significantly displayed more maxillary anterior incisor structure than subjects with longer upper lip. The amount of maxillary central incisor, lateral incisor and canine were affected significantly by the increasing length of the upper lip (p < 0.001; Table III). As the upper lip length increased, the visible length of mandibular anterior teeth also increased, but the differences were not significant.

**Table I: Amounts of visible tooth surface by gender (mm).**

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Male</th>
<th>Female</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean ± SD</td>
<td>Mean ± SD</td>
<td></td>
</tr>
<tr>
<td>Maxillary central incisor</td>
<td>2.14 ± 1.64</td>
<td>2.93 ± 1.57</td>
<td>0.003*</td>
</tr>
<tr>
<td>Maxillary lateral incisor</td>
<td>1.32 ± 1.04</td>
<td>1.87 ± 1.12</td>
<td>0.005*</td>
</tr>
<tr>
<td>Maxillary canine</td>
<td>0.41 ± 0.62</td>
<td>0.59 ± 0.62</td>
<td>0.031*</td>
</tr>
<tr>
<td>Mandibular central incisor</td>
<td>1.62 ± 1.16</td>
<td>1.44 ± 0.61</td>
<td>0.834</td>
</tr>
<tr>
<td>Mandibular lateral incisor</td>
<td>1.87 ± 1.19</td>
<td>1.55 ± 0.66</td>
<td>0.121</td>
</tr>
<tr>
<td>Mandibular canine</td>
<td>1.34 ± 1.01</td>
<td>1.13 ± 0.53</td>
<td>0.661</td>
</tr>
</tbody>
</table>

Mann Whitney-U test was applied. *Significant (p ≤ 0.05)

**Table II: Amounts of visible tooth surface by age (mm).**

<table>
<thead>
<tr>
<th>Parameters</th>
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<th>&gt; 51</th>
<th>p-value</th>
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<td>Mean ± SD</td>
<td>Mean ± SD</td>
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<tr>
<td>Maxillary central incisor</td>
<td>3.10 ± 1.50</td>
<td>2.11 ± 1.58</td>
<td>0.86 ± 1.11</td>
<td>&lt; 0.001*</td>
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<td>Maxillary lateral incisor</td>
<td>1.94 ± 1.06</td>
<td>1.36 ± 1.07</td>
<td>0.55 ± 0.74</td>
<td>&lt; 0.001*</td>
</tr>
<tr>
<td>Maxillary canine</td>
<td>0.63 ± 0.64</td>
<td>0.44 ± 0.60</td>
<td>0.11 ± 0.10</td>
<td>&lt; 0.001*</td>
</tr>
<tr>
<td>Mandibular central incisor</td>
<td>1.37 ± 0.66</td>
<td>1.37 ± 0.73</td>
<td>3.02 ± 1.25</td>
<td>&lt; 0.001*</td>
</tr>
<tr>
<td>Mandibular lateral incisor</td>
<td>1.54 ± 0.70</td>
<td>1.52 ± 0.79</td>
<td>3.28 ± 1.26</td>
<td>&lt; 0.001*</td>
</tr>
<tr>
<td>Mandibular canine</td>
<td>1.05 ± 0.51</td>
<td>1.14 ± 0.68</td>
<td>2.65 ± 1.07</td>
<td>&lt; 0.001*</td>
</tr>
</tbody>
</table>

Kruskal Walli’s test was applied. *Significant (p ≤ 0.05)

**Table III: Amounts of visible tooth surface by upper lip length (mm).**

<table>
<thead>
<tr>
<th>Parameters</th>
<th>14.5 - 18.5</th>
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<th>22.5 - 26.5</th>
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<td>Mean ± SD</td>
<td>Mean ± SD</td>
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<td>Maxillary central incisor</td>
<td>3.42 ± 1.60</td>
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<td>0.97 ± 1.32</td>
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<td>Maxillary lateral incisor</td>
<td>2.15 ± 1.15</td>
<td>1.39 ± 0.89</td>
<td>0.58 ± 0.94</td>
<td>&lt; 0.001*</td>
</tr>
<tr>
<td>Maxillary canine</td>
<td>0.75 ± 0.64</td>
<td>0.37 ± 0.56</td>
<td>0.18 ± 0.53</td>
<td>&lt; 0.001*</td>
</tr>
<tr>
<td>Mandibular central incisor</td>
<td>1.44 ± 0.65</td>
<td>1.57 ± 0.95</td>
<td>1.56 ± 1.33</td>
<td>0.683</td>
</tr>
<tr>
<td>Mandibular lateral incisor</td>
<td>1.58 ± 0.70</td>
<td>1.73 ± 1.02</td>
<td>1.87 ± 1.30</td>
<td>0.662</td>
</tr>
<tr>
<td>Mandibular canine</td>
<td>1.11 ± 0.52</td>
<td>1.28 ± 0.84</td>
<td>1.37 ± 1.21</td>
<td>0.428</td>
</tr>
</tbody>
</table>

Kruskal Walli’s test was applied. *Significant (p ≤ 0.05)
The mean visible labial length of maxillary and mandibular anterior teeth at rest

**DISCUSSION**

The present study was conducted to investigate the effect of gender, age and lip length on the visibility of anterior teeth at rest.

Variations in tooth display have been reported between subjects of different age and gender. The amount of the display of anterior teeth has been generally overlooked by restorative dentists as an element of esthetic assessment. The amount of tooth exposure at rest is predominantly a muscle determined position that varies from one person to another, and this study revealed the variability of this factor.

The present study showed significant gender differences in the display of the maxillary central incisor at rest; which is in agreement with the previous studies. However, Al-Wazzan and Al-Habahbeh et al. found no significant gender difference in the display of maxillary central incisor at rest. In addition, it has been reported in a survey conducted in adolescents that females displayed more maxillary incisor clinical crown length compared with males, with lips at rest. These findings were in agreement with the present study, although some variations may need to be explained by differences in measuring techniques and difference between the populations studied. In this study, females displayed significantly more of the maxillary lateral incisor (p=0.005) and canine (p=0.031) at rest compared to males; contrary to previous studies. In the present study, males displayed more of the mandibular anterior teeth at rest as compared to females; a similar result was found by Vig and Brundo. The dentogenic concepts described by Frush and Fisher used the patient's gender, personality and age in selecting and arranging anterior teeth. They have described the typical male and female dental characteristics. The present study indicated, showing more of the maxillary central incisor, lateral incisor and canine, when the lips are at rest is associated with females, and it can be considered as feminine feature, while greater mandibular anterior teeth display at rest is associated with males, and it can be considered as masculine feature.

In the present study, it was found that the amount of maxillary anterior teeth exposed is significantly decreased with increasing age (p < 0.001), and the amount of mandibular anterior teeth exposed is significantly increased with increasing age (p < 0.001). A similar finding was reported by Vig and Brundo. It is clear from the study that as time and gravity wins out, the tissues surrounding the mouth sag. The visible length of maxillary anterior teeth diminishes and the amount of mandibular anterior teeth that is visible increases. A similar finding was reported in previous study, however, the results were not significant. Facial muscle exercises might help in preventing muscle sagging.

Esthetic considerations could become major concern for patients seeking prosthodontic services in the future. Traditionally, prosthodontists have been taught to evaluate facial esthetics to restore overall harmony to the face. Anterior tooth selection and arrangement for removable dentures usually depends on the clinician's experience. The arrangement of the anterior teeth should be individualized to the patient's esthetic needs while considering patient's age, gender, race and lip length.

People with short upper lips display more maxillary tooth structure than people with long upper lips. This seems axiomatic, but surprisingly some dentists still set the anterior teeth to display 1 to 2 mm of the maxillary incisors regardless of lip length, since this is an accepted rule. This study showed people with short upper lips significantly displayed the maximum maxillary anterior teeth surface, while people with long upper lips displayed more mandibular anterior teeth. This is in agreement with previous studies.

For complete denture patients, a guideline was suggested to adjust the vertical length of the maxillary occlusion rim in the anterior region by extending it approximately 2 mm below the relaxed lip to establish the lip length-incisal edge relationship and accordingly the visible amount of the anterior teeth. However, female young subjects may reasonably be expected to show 4 to 5 mm of tooth beneath the resting lip, especially if the patient had a class-II division-I profile or short upper lip. The visible amount of anterior teeth can be one of the helpful guidelines for determining the appropriate vertical dimension of occlusion. Another point of view of treating all patients using the same therapeutic values regardless of age differences is not acceptable since it contributes greatly to the obvious denture look. This general guideline will be more accurate if the patient's age, gender, race and upper lip length are considered as variables that may affect the visible amount of tooth at rest.

**CONCLUSION**

Females displayed significantly more labial length of the maxillary central incisors, maxillary lateral incisors and maxillary canine as compared to male participants. The mean visible labial length of maxillary anterior teeth significantly decreased with increasing age; however, the mean visible labial length of mandibular anterior teeth significantly increased with increasing age. As the upper lip length increased, the mean visible labial length of maxillary anterior teeth significantly decreased.

**REFERENCES**


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