The Normative Study Of Acoustic Parameters In Normal Egyptian Children Aged From 4 To 12 Years

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- Children vocal disorders are relatively frequent, affecting 6 to 23% of the children population

• Voice change during childhood may affect the child’s school, social and emotional performances.

• It may also reflect on the development of proper capacity to communicate in the adult life.

• The range of etiological factors associated with child dysphonia requires early and precise diagnosis, which is not always possible due to numerous factors:
  – Delay in consulting due to the little concern parents have in relation to their children’s vocal changes.
  – Little collaboration of the child during the ENT exam.

– Lack of proper instruments to examine the child’s larynx, and the difficulties of a detailed exam
  • smaller than that of adults,
  • epiglottis more posteriorly positioned
  • preventing a proper exposure of the vocal folds.
– The use of complementary methods is of the utmost importance, and it can be carried out through computerized auditory-perception and acoustic analysis.

• In order for these assessments to be reliable it is necessary to establish well-defined normality standards among the genders and different age ranges.
• The value of computerized acoustic vocal analysis has been constantly recognized, since, besides providing qualitative data, it allows for a quantitative analysis of vocal parameters.

• Voice analysis computer-based software have normative values for these parameters for the adult population considering both genders; however, not for the pediatric population.
• Many authors have studied childhood voice abnormality, but there have been fewer studies of the normal childhood voice.

Aim of the work
• To establish a prototype database of the normal acoustic parameters in normal Egyptian children.

Subjects and methods
• This study was carried on one hundred normal children aged from 4 to 12 years, from both genders, attending the out patient clinic in the Unit of Phoniatrics.
• Children with any language, speech or voice problems were excluded.

• Acoustic analysis:
  – All children were subjected to computerized acoustic analysis using Multidimensional voice program software. Model 5105
  – The vocal samples were obtained from the children by holding a microphone 10 cm in front of their mouth and producing sustained phonation.
  – The analyses of the vocal parameters was carried out with the sustained /a/ vowel, with elimination of the irregularities in the beginning and end of utterance.
• The studied acoustic parameters were:

  – The fundamental frequency
  – Shimmer in dB and %
  – Jitter absolute and %
  – The harmonic/noise ratio
Distribution of the sample according to age

<table>
<thead>
<tr>
<th>Number</th>
<th>minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>St. Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>4.3</td>
<td>12</td>
<td>8.7</td>
<td>2.5</td>
</tr>
</tbody>
</table>

Distribution of the sample according to gender

- Boys: 58
- Girls: 42
- Total: 100

- Males: 58
- Females: 42
### Table 1: Mean and Standard Deviation (St.Dev) for Boys and Girls

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>St.Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>FF</td>
<td>260.46</td>
<td>37.82</td>
</tr>
<tr>
<td>Jitter</td>
<td>70.76</td>
<td>31.7</td>
</tr>
<tr>
<td>Jitter %</td>
<td>1.7</td>
<td>0.69</td>
</tr>
<tr>
<td>Shimmer</td>
<td>0.31</td>
<td>0.14</td>
</tr>
<tr>
<td>Shimmer%</td>
<td>3.74</td>
<td>1.47</td>
</tr>
<tr>
<td>H/N ratio</td>
<td>0.13</td>
<td>0.03</td>
</tr>
</tbody>
</table>

### Table 2: Norms in boys n=42 versus girls n=58

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean boys</th>
<th>Mean girls</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>FF</td>
<td>249.8748 ± 38.18229</td>
<td>268.1328 ± 35.96749</td>
<td>0.0164 *</td>
</tr>
<tr>
<td>Jitter</td>
<td>81.825 ± 39.32665</td>
<td>62.7535 ± 21.85716</td>
<td>0.0026 **</td>
</tr>
<tr>
<td>Jitter %</td>
<td>1.8914 ± 0.77702</td>
<td>1.5724 ± 0.60437</td>
<td>0.0231 *</td>
</tr>
<tr>
<td>Shimmer</td>
<td>0.2764 ± 0.17099</td>
<td>0.3369 ± 0.11673</td>
<td>0.0380 *</td>
</tr>
<tr>
<td>Shimmer%</td>
<td>3.7471 ± 1.44787</td>
<td>3.7478 ± 1.49972</td>
<td>0.9981</td>
</tr>
<tr>
<td>H/N ratio</td>
<td>0.1343 ± 0.03394</td>
<td>0.1312 ± 0.03232</td>
<td>0.6440</td>
</tr>
</tbody>
</table>
Discussion

• In Vanzella’s study, the mean $f_0$ values recorded were around 237.15 Hz, and such values are almost similar to those seen in this study.

• The mean value of the jitter % was 1.21%, mildly lower than what was found in our study; while, the shimmer % was mildly higher.

• In the present study there was a significant difference between boys and girls regarding jitter and shimmer values whereas the results presented by Nicollas et al, showed no important variations in these values.


• The results of the study by Tavares et al was close to our study regarding the values of the jitter % while a little bit higher regarding the shimmer %

*Tavares et al, Normative study of vocal acoustic parameters from children from 4 to 12 years of age without vocal symptoms. A pilot study J Otorhinolaryngol. 2010;76(4):485-90
Conclusion and Recommendation

• The inclusion of computerized acoustic analyses makes the vocal assessment more accurate and less subjective, thus representing an important tool for vocal screening, for it is a simple, fast and reliable method.
• To construct a representative database of normal children, we recommend the recruitment of larger number of subjects, inclusion younger age group, and covering other acoustic parameters.

THANK YOU