APPLICABILITY OF PONT’S INDEX IN ORTHODONTICS PATIENTS
IN A SAMPLE OF PESHAWAR

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ABSTRACT

The aim of study was to determine the applicability of Pont’s Index in a sample of Peshawar population.

Seventy five casts were measured for combined incisors width, interpremolar width and intermolar width using digital vernier caliper in millimeter. The predicted arch widths in the first premolar and molar regions were estimated with the formula proposed by Pont.

\[
\text{Premolar width} = \frac{\text{Sum of Incisor widths}}{80} \times 100
\]

\[
\text{Molar width} = \frac{\text{Sum of Incisor widths}}{64} \times 100
\]

Incisor diameters and arch widths were recorded for all subjects and described in terms of mean values, standard deviations, and range. Correlation coefficients (Pearson) were calculated between observed arch widths and those predicted according to Pont’s index.

A total of 75 out of which 40 females and 35 males casts were included in this study. The female to male ratio was 1.14:1. The mean age of the sample was 16.8 ± 1.8. The mean mesiodistal width for incisors, Interpremolar width, and intermolar were 31.2, 36.6 and 43.8 mm respectively. A significant but weak coefficient of correlation and coefficient of determination were found between the observed values and those predicted according to Pont’s index.

Low correlations were found between observed and Pont’s predicted arch widths. Pont’s index is not reliable for in this sample of Peshawar population.

Key Words: Pont’s index, Arch width, Incisor width.

INTRODUCTION

The morphology of teeth is influenced by cultural, environmental and racial factors and their measurements have been used for various genetic, anthropological, odontologic and forensic investigations. Tooth size and form discrepancies are a common occurrence which may prevent attainment of an ideal occlusion.\(^1\) Intransverse or vertical arch mal-relationships such as crowding and local irregularities are common causes of Class I malocclusions and are handled usually by extraction or non-extraction treatment in the permanent dentition.\(^2\)

Malocclusion commonly results from discrepancy between tooth size and dental arch size. In moderate crowding situation it is sometimes difficult to decide whether to expand the upper arch or go for extraction. Expansion in cases having inadequate bases is prone to relapse.\(^2\)

Therefore, a variety of diagnostic indices have been proposed by orthodontists to predict dental arch development and assist with treatment planning. Bolton analyzed the ratio between maxillary and mandibular tooth size for achieving optimal occlusion in orthodontic treatment.\(^3\) Peck and Peck\(^4\) described an index for assessing deviation in tooth shape. Pont established...
constant ratios between tooth sizes and arch widths in French population which came to be known as premolar and molar indices. In the ideal dental arch, he concluded that the ratio of combined incisor width to transverse arch width was 0.80 in the premolar area and 0.64 in the molar area. Pont suggested that by using this method, an ideal dental arch necessary to accommodate the dentition and alleviate crowding can be determined. According to Pont, this index can be used as a guide in expanding the dental arch and as a determinant of arch development. The new paradigm is that soft tissue has prime importance in treatment planning. It helps in achieving esthetic and stability goals. Early expansion is more stable.

Gupta DS et al using one hundred dental models of normal occlusion evaluated the reliability of Pont’s Index on a North Indian population. They reported significant correlations between the combined maxillary incisor widths and the maxillary intermolar and inter-premolar arch widths. Alam MK et al using Cone-beam computed tomography for evaluation of Pont’s index predictability for Malay population in orthodontics. They reported that Pont’s index is not practical for use with the Malaysian population since the index overestimated inter-premolar and intermolar widths. In Karachi population a weak correlation have been reported for Pont’s index. The objective of this study was to determine the applicability of Pont’s Index for Peshawar population.

METHODOLOGY

A total of 75 casts from the records of patients in Orthodontics Department, Khyber College of Dentistry were included in this descriptive cross-sectional study. Inclusion criteria adopted were presence of permanent dentition, caries free teeth, normal overjet and overbite, minimal crowding or spacing (< 3 mm) and normal molar and canine relationships. Patients with presence of cross bites or skeletal and dental deformity was excluded from the study.

Sample size calculation was done using a previous study conducted in Karachi. Using correlation calculator, the correlation coefficient of 0.3648, power of test is 90% and probability of type 1 error is 5%, the calculated sample size was 75.

Digital caliper with sharp beaks (to an accuracy of 0.01 mm) were used for measurement of maxillary casts. The premolar arch width was taken from the first premolar of the left side to the right side at the distal end of its occlusal groove. The molar arch width was measured from the maxillary left permanent molar to the same of the right at its mesial pit on the occlusal surface. The combined width of the maxillary incisors was taken at the distal contact points with the canines on either side. The predicted arch widths in the first premolar and molar regions were estimated with the formula proposed by Pont.

\[
\text{Premolar width} = \frac{\text{Sum of Incisor widths}}{80}
\]

\[
\text{Molar width} = \frac{\text{Sum of Incisor widths}}{64}
\]

Incisor diameters and arch widths were recorded for all subjects and described in terms of mean values and standard deviations. Correlation coefficients were calculated between observed arch widths and those predicted according to Pont’s indices. The same observer (a postgraduate trainee) made all measurements. The coefficient of correlation was calculated to determine the impact of the combined maxillary incisor widths on the maxillary intermolar and inter-premolar arch widths. P< 0.05 was considered significant.

RESULTS

A total of 75 out of which 40 females and 35 males casts were included. The female to male ratio was 1.14:1. The mean age of the sample was 16.8 ± 1.8 years. The mean mesiodistal width for incisors, Interpremolar width, and intermolar were 31.2, 36.6 and 43.8 mm respectively. The details are given in Table 1.

A significant but weak coefficient of correlation and coefficient of determination were found between the observed values and those predicted according to Pont’s index. The details are given in Table 2.

| TABLE 1: DESCRIPTIVE STATISTICS FOR INCISOR WIDTHS, INTERPREMOLAR WIDTH, INTERMOLAR WIDTH |
|---|---|---|---|
| **Mean (mm)** | **SD** | **Minimum** | **Maximum** |
| Combined incisor width | 31.2 | 5.2 | 27 | 35 |
| Interpremolar width | 36.6 | 3.1 | 30 | 39 |
| Intermolar width | 43.8 | 2.9 | 41 | 49 |

| TABLE 2: CORRELATION COEFFICIENTS DETERMINED BETWEEN THE OBSERVED VALUES AND THOSE PREDICTED ACCORDING TO PONT’S INDEX |
|---|---|---|
| **Correlation coefficient (r)** | **P-value** | **Coefficient of determination (r^2)** |
| Interpremolar width | 0.381 | 0.000 | 0.145 |
| Intermolar width | 0.317 | 0.001 | 0.100 |
DISCUSSION

The importance of tooth size discrepancies in orthodontic diagnosis has been widely reported in the literature and accepted by the orthodontic community because the relationship between the upper and lower anterior and posterior dentitions is related to orthodontic finishing excellence. Because of this, many indices and methods have been suggested to guide clinicians in predicting the ideal arch width. One of these was described by Pont\textsuperscript{11} who obtained his data from an ill-defined French population and did not indicate how many subjects were included in his study sample. However, he apparently was aware of possible differences between ethnic groups and suggested that the reliability of his index should be tested in other populations.

This study was conducted to evaluate the validity of Pont's index estimating the dental arch width depending on the sum of mesiodistal dimensions of maxillary incisors. It was found that Pont's index not properly estimate the interpmolar and intermolar widths in most of Peshawar population.

The results of this study denotes weak correlations between observed and Pont's predicted arch widths. This is consistent with a study by Dalidjan in which low correlations have been found between observed and predicted arch widths according to Pont's index in three study populations (Australian Aborigines, Indonesians and white subjects).\textsuperscript{12} In study by Celebi et al\textsuperscript{13} with a sample of 142, they found weak correlations (r-values 0.07 to 0.36) between the measured arch width values and those calculated according to Pont's index. Similarly in Nepalese population also showed a weak correlation.\textsuperscript{14}

In contrary to the current study, studies conducted on Indian population a high correlation and applicability of Pont's index. Agnihotri\textsuperscript{15} reported significant correlations (p < 0.001) between the combined maxillary incisor widths and the maxillary intermolar and interpmolar arch widths. In his study on 100 Lucknow subjects, he generated a corrected index of 81.66 in the premolar and 65.44 in the molar region. While the corrected index in this study was 84.9 in the premolar region and 65.7 in the molar region.

Sridharan K et al\textsuperscript{16} reported that was no statistically significant difference between the Pont's index proposed by Pont and the mean values of this study. They conclude that Pont's index can be applied in Tumkur population.

From a clinical point of view, Pont's index cannot provide reliable predictions for individual orthodontic treating planning. Treatment plans should not be based on simplistic mathematical concepts but formulated with regard to sound biological rationale.

CONCLUSION

Low correlations were found between observed and Pont's predicted arch widths. Pont's index is not reliable for Peshawar population.

REFERENCES


CONTRIBUTIONS BY AUTHORS

2. Ghulam Rasool: Supervision and proof reading.
5. Umar Hussain: Data analysis.