

Validity of Pont's analysis in a sample of Bangladeshi orthodontics patients.

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Abstract: To assess the applicability of Pont's index for arch width prediction among the Bangladeshi population. **Materials and Methods:** Models of 37 male and 63 female subjects ranging in age between 16 to 25 years were randomly selected out of all patients attending the Orthodontic clinic of Bangabandhu Sheikh Mujib Medical University (BSMMU). Teeth size and arch size were measured to determine the Pont's value. **Results:** The reported value of Pont's ratio is 0.87 ± 0.08 (premolar) and 0.67 ± 0.05 (molar). The mean value of Pont's ratio in the present study is 0.88 ± 0.07 and 0.67 ± 0.05 for females, and 0.89 ± 0.09 and 0.66 ± 0.05 for males. The reported mean index value of Pont is 0.80 and 0.64 with the differences 0.03 and 0.01 whereas, in this study, index value were 0.87 and 0.67, and the differences are 0.07 and 0.03 respectively which are statistically significant compared to the reported values. **Conclusion:** Based on the results of the current study, Pont's index is not applicable in the Bangladeshi population.

Keywords: Pont's analysis; validity; index; arch width.

INTRODUCTION.

Tooth and arch sizes are of utmost importance to orthodontists for ideal occlusion. Thus diagnostic and analytical indices are needed to forecast dental arch development and for proper treatment planning in clinical orthodontics.¹⁻³ Orthodontic subjects with various types of malocclusion and crowding may be treated satisfactorily with an extraction or non-extraction approach.²

Pont determined a constant ratio between the width of the four maxillary incisors, and the width of the maxillary arch as measured from distal pit of premolar and mesial pit of molar either side.⁴ 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, the respective index values called "Pont's index".⁴

Pont also devised a prediction table from which ideal premolar and inter molar arch width could be read directly after finding the mesiodistal diameters of the maxillary incisor teeth. All his measurements and predictions were related to the maxillary dental arch and did not include an assessment of the mandibular arch.⁵

The usefulness of Pont's Index is controversial as there has been a recent resurgence of interest in its clinical use for establishing dental arch development objectives. Therefore we consider it worthwhile to reassess the Pont's index. We hypothesized Pont's index is not applicable for the Bangladeshi population. Based on this hypothesis, our aim is to assess the applicability of Pont's index for arch width prediction among a Bangladeshi population.

MATERIALS AND METHODS.

After ethical approval (Research protocol approval number: No. CPS-712\2016\DSN-2016-07-0006), the data for this study was obtained randomly from the dental casts of all patients attending the Orthodontics outpatient department of Bangabandhu Sheikh Mujib Medical University (BSMMU) based on the following - inclusion criteria:

A full complement of maxillary and mandibular teeth which were free from any problems. A normal molar, canine and incisor relationship (Class I relationship) and no prior orthodontic treatment.

The sample comprised of 37 males and 63 females with an age range from 16 to 25 years. A digital slide calipers (Mitutoyo, Japan) with sharpened beaks was used to measure the mesiodistal crown diameters of the maxillary permanent incisors and arch widths on the dental casts, to an accuracy of 0.1mm.^{3,5}

The mesiodistal crown diameter of the tooth was measured from anatomical contact point of one tooth to another on the occlusal side perpendicular to the long axis of the teeth. In those instances where there was slight attrition, the measuring point for arch width was determined as the middle of the facet on the tooth. The predicted arch widths in the first premolar (MP) and molar (MM) regions were estimated with the formula proposed by Pont.⁴

The data were verified and analysed statistically using IBM SPSS Statistics Version 22.0 (Armonk, NY: IBM Corp). 20% of dental casts were randomly selected for intra observer

errors. Two weeks after, the method error was analyzed by the Dalhberg's formula.

RESULTS.

The method error of intra observer measurements was found to be negligible.

Table I shows the distribution of subjects by their demographic variables and clinical characteristics.

Nearly two-thirds (65%) of the patients were below 20 years old, 32% were 20 to 25 years and 3% were above 25 years old. The mean age of the patients was 19.7 years. About two-thirds (63%) of the patients were female resulting in a female to male ratio of roughly 2:1.

More than three-quarters (78%) of the patients complained of crowding of their teeth. Attrition and occlusal prematurity were rarely seen (1% of all patients). The findings revealed that measured premolar value (0.80 ± 0.03) and measured molar value (0.64 ± 0.02) are significantly higher in this Bangladeshi population than those in the French population ($p < 0.001$).

Table II shows the measured premolar value (MPV) and measured molar value (MMV) were significantly higher in males than in females ($p = 0.032$ and $p = 0.005$ respectively). However, no gender disparities were observed for sum of incisors (SI) and ratio of SI to MPV and MMV.

The mean Pont's ratio in the current study (0.88 ± 0.07 and 0.67 ± 0.05 for females, and 0.89 ± 0.09 and 0.66 ± 0.05 for males) were significantly higher compared to the reported value of the Pont's ratio (0.87 ± 0.08 and 0.67 ± 0.05).

Table 1. Distribution of patients by their demographic variables and clinical characteristics.

Demographic variables		Frequency	Percentage	
Gender	Male	37	37%	
	Female	63	63%	
Religion	Muslim	92	92%	
	Hindu	8	8%	
Education	Secondary	36	36%	
	Graduate	64	64%	
Clinical characteristics		Frequency	Percentage	Mean±SD
Chief complaints	Crowding	78	78%	-
	Spacing	22	22%	-
Overjet (mm)		--	--	2.3±0.9
Overbite (mm)		--	--	2.1±0.8
Attrition		1	1%	--
Occlusal prematurity		1	1%	--

Table 2. Gender disparities for orthodontic parameters between genders.

Orthodontic parameters	Group		p-value
	Male (M±SD)	Female (M±SD)	
SI (mm)	30.9±2.1	30.4±2.2	0.317
MPV (mm)	36.0±3.3	34.8±2.5	0.032
MMV (mm)	47.2±3.6	45.3±2.8	0.005
SI/MPV	0.89±0.09	0.88±0.07	0.376
SI/MMV	0.66±0.05	0.67±0.05	0.126

SI: Sum of incisors. MPV: , measured premolar value. MMV: measured molar value. SI/MPV: sum of incisors/measured premolar value ratio. SI/MMV: sum of incisors/measured molar value ratio. M: mean value. SD: standard deviation. mm: millimeter.

DISCUSSION.

A sound knowledge of tooth size and dental arch dimensions of a population is important for several dental treatment procedures.^{2,4,6} Variation in dental arch can be inherited and these differences are useful for the practice of aesthetic dentistry and for effective orthodontic treatment.⁷

As orthodontic problems commonly result from disharmony between tooth size and dental arch size, dental indices have often been related to either one or both of these variables.^{2,6} Pont's Index is a much talked about issue in orthodontics with regard to its clinical value. Pont did his experiments on a French population. He did not mention the sample size. In his study he made a note that further investigation is needed to check the validity of his formula.⁴ These formulas were applied to populations of different ethnic origins by different investigators to determine whether the index could be applied to different populations in order to determine the need for dental arch expansion in a given individual.^{5,6}

Rathi and Fida critically analyzed the validity of Pont's index and found the under estimation of Pons value for Pakistani population.⁸ On the basis of findings of the present

study, it could be observed that no person displayed the ideal arch dimensions predicted by Pont's index. In the present study dental arch width is over-estimated by this index. These findings are in agreement with those of Nimkarn *et al.*,⁹ who found an over-estimation of arch widths estimated by Pont's index relative to actual arch width measured on dental casts.³ On the other hand, Alam *et al.*,⁶ found an under-estimation of the dental arch width. Pont index should not be extrapolated to individuals of different ethnic origins as it does not give accurate estimates of ideal arch widths for a given individual in the majority of cases.¹⁰

The reasons that may explain the lack of applicability of the index in the studied population may be due to the dental size or the amplitude of the arch. Future research should be focused on the comparison of cross-sectional dimensions of different populations.

CONCLUSION.

Our experimental hypothesis was accepted. Applicability of Pont's index is therefore not a reliable tool to predetermine the ideal arch width for the Bangladeshi population.

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