ORIGINAL ARTICLE

Pont's index applicability in Pakistani dental class I and class II orthodontic patients

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ABSTRACT

Aim: To evaluate Pont's index applicability on Pakistani population as well as to evaluate the difference of two dental classes, i-e, class I and class II.

Methods: A total of 100 casts from the records of patients in Orthodontics Department, University of Lahore were included in this descriptive cross-sectional study. Combined maxillary incisal width and arch widths were measured from study models using a digital caliper. The predicted arch widths were estimated with the formula proposed by Pont. Paired sample t test, was used to calculate the difference of predicted value and the actual measured value of inter-premolar and inter molar widths on dental casts.

Results: The results revealed that there was no significant difference between the incisal width in dental class I and dental class II but highly significant difference between the predicted distance and measured distance between premolars in dental class I (M=5.69, Std. deviation= 2.18, p<.001) as well as in dental class II (M=5.35, Std. deviation= 3.46, p<.001).Significant difference was found between the predicted and measured distance between molars in dental class I (M=4.84, Std. deviation= 2.99, p<.001) as well as in dental class II (M=5.99, Std. deviation= 3.21, p<.001).

Conclusion: It was concluded that overestimated values of premolar and molar arch widths were found using Pont's index calculations as in Pakistani population narrow arch was observed in both dental classes I and II as compared to the Pont's predicted values.

Keywords: Pont's index, Incisor width, Arch width

INTRODUCTION

Orthodontists primarily focus on arch shape and size during clinical practice. Transverse discrepancy between the dental arches is one of the most frequent malocclusions in orthodontics. The prevalence of this transverse discrepancy among children and adults was reported as 23% and 30% respectively.1 It could be prevail in people due to the digit sucking habits, teeth crowding, premature loss of deciduous teeth, genetics and sleep apnea.2 Diagnosis of transverse discrepancy can be diagnosed by taking history of the patient, clinical and radiographic examination and cast analysis. Dental casts provide a handsome amount of useful information which works as supportive information during diagnosis as well as implementation of treatment plan and its assessment.3 the ideal width of the premolar and molar of an ideal dental arch of combined maxillary incisor to transverse arch width was .80 and .64 (Pont, 1909). Pont concluded that this proposed index should be verified according to diverse ethnic groups.4 In treatment planning and implementation, Pont's index delivers very vital information as its application is very simple. On the other hand, the Pont's Index usage for the predicted ideal shape of dental arch in orthodontics has been debatable.5 several research supported the Pont's index as a useful guide which helps in dental arch expansion,6-7 as well as a factor of development of dental arch.8-11 Contrary to these findings, many other research supported that the results of Pont's index as unreliable procedure for diagnosis as observed values were slightly associated with the predicted values in different ethnic groups[12,13]. According to the study conducted on Malaysian Population, the mean value of interincisal measurement was 30.31±2.49 mm, mean value of inter-premolar width was 36.67± .50 mm and mean value of inter-molar width was 45.21±2.90 mm. No significant variations were noticed at racial level. Among males, low but significant interincisal measurement was found as compared to females however, inter-molar width among males was significantly higher as compared to females. The values of average predicted inter-premolar width was 37.89±3.11 mm and inter-molar widths was 47.36±3.89 mm which were greater as compared to the actual measured means values. These results revealed that overestimation of inter-premolar and inter-molar widths on Pont's index in Malaysian population[14]. Pont's index neglected the craniofacial framework of the patient which he felt to be explored[11]. Therefore, validation of Pont's index usefulness is required alongside the craniofacial pattern of patients. The facial form, arch width and tooth size differs with respect to the geographical regions as well as on gender basis.15-19 The current study was led to evaluate Pont's index applicability on Pakistani population as well as to evaluate the difference of two dental classes, i.e., class I and class II.

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MATERIALS AND METHODS

A total of 100 casts (out of which 65 females and 35 males) from the records of patients in Orthodontics Department, University of Lahore were included in this descriptive cross-

sectional study. Non-probability consecutive sampling was used to enroll the patients for study.

Inclusion Criteria:

- Healthy gingivae and periodontium
- Full complement of teeth from second molar to second molar in both arches.
- Angle's class I, class II occlusal relationship
- Well aligned arch
- Minimal attrition

Exclusion Criteria:

- Fractured or carious teeth
- Supernumerary teeth
- Malformed teeth like peg laterals
- Presence of cleft palate
- Previous history of orthodontic or prosthodontic treatment

Measurements of all study models were done using a digital caliper (accuracy of 0.01mm). Data was collected by measuring the inter-premolar and inter-molar widths of dental casts.

Measurements from Cast Models:

1. Sum of incisal width –Combined measured width of 4 maxillary incisors
2. Premolar arch width - Distance between the distal end of the occlusal groove of the maxillary left and right 1st premolars.
3. Molar arch width - Distance between the mesial pits on the occlusal surfaces of the maxillary left and right permanent molars

Calculations from cast model's measurements:

The predicted arch widths were estimated with the formula proposed by Pont.

Predicted premolar arch width=Sum of Incisor widths/80 x 100

Predicted molar arch width= Sum of Incisor widths/64 x 100

Data was entered manually and analyzed in SPSS version 25.0. Independent sample t test was used to explore the incisal width difference in dental class I and dental class II. Paired sample t test, was used calculate the difference of predicted value and the actual measured value of inter-premolar and inter molar widths on dental casts.

RESULTS

The results of independent sample t test revealed that there was no significant difference between the incisal width in dental class I and dental class II. The mean value of incisal width of dental class I was slight higher than incisal width of dental class II, M=32.52±1.030 and M=33.17±1.613 respectively.

The mean value of predicted interpremolar width was calculated according to Pont's index formula as 41.31mm which was greater than the measured interpremolar width, i-e. 35.61mm in dental class I. Moreover, in dental class II, the mean predicted value was 41.35mm which was also greater than the measured interpremolar mean value which was 36mm. This showed that there was a difference found between the predicted and measured value in dental class I and class II.

The mean value of predicted intermolar width was calculated according to Pont's index formula as 51.50mm which was greater than the measured intermolar width, i-e. 46.66mm in dental class I. Furthermore, in dental class II, the mean value of predicted intermolar was 51.55mm which was also greater than the measured value which was 45.56mm. This showed that there was a difference found between the predicted and measured value of intermolar in dental class I and class II.

The results of paired sample t test revealed that there is a highly significant difference between the predicted distance and measured distance between premolars in dental class I (M=5.69, Std. deviation= 2.18, p<.001) as well as in dental class II (M=5.35, Std. deviation= 3.46, p<.001). These results showed that the predicted distance between the premolars in both dental classes (class I and class II) is greater than the measured distance between the premolars.

Significant difference was found between the predicted distance and measured distance between molars in dental class I (M=4.84, Std. deviation= 2.99, p<.001) as well as in dental class II (M=5.99, Std. deviation= 3.21, p<.001). These results showed that the predicted distance between the molars in both dental classes (class I and class II) is greater than the measured distance between the molars.

Table1: Incisal width among dental class I and class II

Dental class	Mean	Std. Deviation	T	Sig.
Incisor width in class I	32.523	1.030	-1.575	.123
Incisor width in class II	33.173	1.613		

Table 2: Pair wise difference between Predicted and Measured inter-premolar value

Dental Class		Paired Differences				t	Sig.
		Mean	Std. Deviation	95% Confidence Interval of the Difference			
				Lower	Upper		
class I	Predicted interpremolar value - Measured interpremolar value	5.69619	2.18776	4.70033	6.69205	11.931	.000
class II	Predicted interpremolar value - Measured interpremolar value	5.35783	3.46660	3.85876	6.85689	7.412	.000

Table 3: Pair wise difference between Predicted and Measured inter-molar value

Dental class		Paired Differences				t	Sig.
		Mean	Std. Deviation	95% Confidence Interval of the Difference			
				Lower	Upper		
class I	Predicted intermolar value – Measured intermolar value	4.84048	2.99725	3.47615	6.20481	7.401	.000
class II	Predicted inter-molar value – Measured intermolar value	5.99000	3.21464	4.59988	7.38012	8.936	.000

Fig 1: Comparison of Predicted and Measured inter-premolar mean values in dental class I and class II

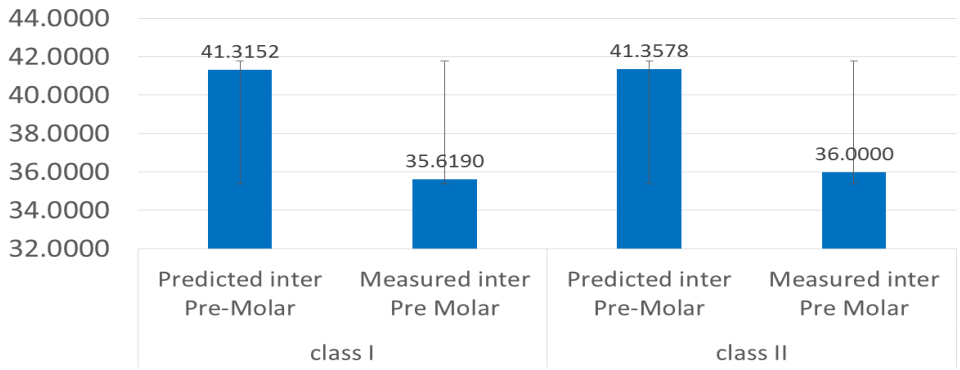
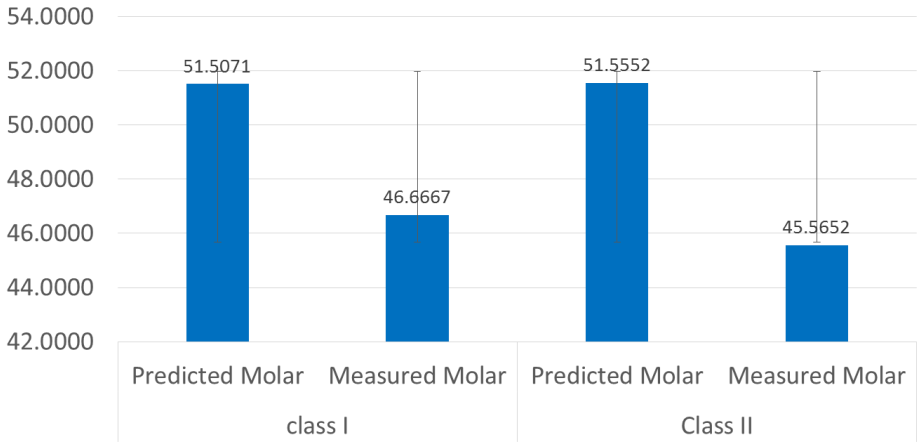


Fig 2: Comparison of Predicted and Measured inter-molar mean values in dental class I and class II



DISCUSSION

Racial, cultural as well as environmental aspects have shown huge effect on tooth morphology and facial forms.15-18 Therefore, the Pont's index's applicability and clinical value has been evaluated in numerous studies using various selection standards. The current study directed to evaluate the validity of Pont's Index in dental class 1 and class 2 in Pakistani population.

For dental class I, the combined maxillary incisal width was smaller than for dental class II which was not statistically significant which means that no difference was present in the combined maxillary incisal width in both dental classes.

There is a highly significant difference between the predicted distance and measured distance between premolars in dental class I as well as in dental class II. These results showed that the predicted distance between the premolars in both dental classes (class I and class II) is greater than the measured distance between the premolars. This explained that the predicted values of distance between pre-molars depict wider faces which were not observed in the real time in Pakistani population. Significant difference was found between the predicted distance and measured distance between molars in dental class I as well as in dental class II. These results showed that the predicted distance between the molars in both dental classes (class I and class II) is greater than the measured distance between the molars. This explained that the predicted values of distance between pre-molars as well as molars depict wider faces which were not observed in the real time in Pakistani population as measured values were less than that of predicted values of inter-premolar and inter-molar distances. These findings are in accordance with the two previously conducted studies 2,13.

On the other hand, the outcomes of the current study are different to the outcomes of Gupta et al.7 who declared a substantial and positive association between the combined maxillary incisal width and premolar as well as molar arch widths.

Beside the racial and ethnic differences, this change between the research studies could be because of the differences in the selection criteria. For instance, one type of occlusion could be in inclusion criteria of one study which could be exclusion in the other study. Moreover, most of the studies have done on one dental occlusion with gender difference. So according to the results of this study, Pont's index was proved as an unreliable tool to predict values for orthodontic treatment in Pakistani population from a clinical point of view.

Sound biological justification should be used to devise treatment plans rather than simplistic mathematical concepts. Soft tissues and facial profile assessment, Angle'

classification determination, status of future growth, association of upper jaw with lower jaws, and the midline etc. are likely to be the other factors which should be taken under consideration.

CONCLUSION,

From clinical point of view, combined maxillary incisal tooth width is an unreliable source for premolar and molar widths estimator provider in Pakistani population. Overestimated values of premolar and molar arch widths were found using Pont's index calculations as in Pakistani population narrow arch was observed in both dental classes I and II as compared to the Pont's predicted values.

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