

The application and correlation of Pont's Index to the facial framework of three main ethnic groups in Malaysia

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Objective: To assess the applicability of Pont's Index in a Malaysian population by obtaining baseline measurements of dental arch shape based on premolar arch width, molar arch width and the combined width of the maxillary incisors. A secondary aim was to determine whether a correlation exists between arch widths, Pont's Index and the facial framework.

Methods: Ninety subjects of mixed racial backgrounds had maxillary dental casts made, measured and selected craniofacial anthropometric measurements taken. Arch widths were compared between the measured and the predicted values derived from Pont's formula. A comparative analysis was performed between interpremolar and intermolar widths and the craniofacial anthropometric measurements. Comparative statistics were applied.

Results: The average interincisal measurement, interpremolar and intermolar widths were 30.31 ± 2.49 mm, 36.67 ± 2.50 mm and 45.21 ± 2.90 mm respectively. No significant differences were detected between the races. The interincisal measurement in males was significantly lower than for females but male intermolar width was significantly higher than for females. The average predicted interpremolar width (37.89 ± 3.11 mm) and intermolar widths (47.36 ± 3.89 mm) were higher than the actual measured means, suggesting that Pont's Index overestimated interpremolar and intermolar widths in the majority of Malaysians. The premolar index (83.34) and molar index (67.71) of the Malaysians were higher than the original Pont's Indices. Significant correlations were noted for intermolar width with facial width, mandibular width, mandibular depth and mouth width.

Conclusion: The findings suggest that Pont's Index should not be applied to the Malaysian population.

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Introduction

Pont's Index was established in 1909 to predict maxillary dental arch width from the sum of the mesiodistal diameters of the four maxillary incisors (interincisal width).¹ The use of Pont's Index in predicting ideal arch shape in orthodontics has been controversial and dependent on practice philosophy. Nevertheless, there has been a recent resurgence of interest in its clinical use for establishing dental arch development objectives, particularly by non-specialists.² One of the objections against the Pont's

Index is that it ignores the patient's craniofacial framework.³ Hence, there is a need to validate the usefulness of Pont's Index against the patient's craniofacial pattern.

Craniofacial anthropometry is a component of physical anthropology comprising precise and systematic measurement of the facial framework. The historical development of craniofacial anthropometry started when anthropologists first measured human skulls as a way to categorise race. Physical anthropologists used a holistic method in which multiple observable physical

characteristics to determine race, were examined. As anthropologists gained access to methods of skull measurement, a racial classification based on skull shape evolved.

To date, there has been one report on the application of Pont's Index in a selected Malaysian population.⁴ However, the findings suggested that Pont's Index was inaccurate because of a poor correlation between interincisal width and dental arch width and the facial framework (facial width or bizygomatic width). The present study was conducted over a larger Malaysian population, comprising subjects who were of Malay, Chinese and Indian backgrounds. The aim was to establish Pont's Index for the Malaysian population and ascertain whether the index could be used to predict arch widths. A secondary aim was to determine whether a correlation existed between Pont's Index and other landmarks of the facial framework.

Material and methods

Sample size

Ninety (N = 90) subjects fulfilled selection criteria and were included in this study. There were 34 Malays, 30 Chinese and 26 Indians, with an equal gender distribution. Overall, there were 44 males, and 46 females, all of whom had an average age of 22.3 ± 1.7 years. The average weight and height of all subjects was 57.7 ± 14.4 kg and 165.3 ± 9.3 cm, respectively.

Selection criteria

The subjects consisted of convenient samples of students attending the University of Malaya and an adjacent learning institution. The subjects were healthy and exhibited no observable craniofacial abnormalities and were recruited on a voluntary basis. Subjects of mixed parentage were excluded from the study. Ninety-four students volunteered for the project, but 4 were excluded because of prior orthodontic treatment.

The applied inclusion criteria were:

- Healthy gingivae and periodontium,
- A full complement of maxillary and mandibular teeth which were caries free,
- No supernumerary teeth,
- A normal molar and canine relationship (Angle Class I relationship),
- A normal overjet (< 3 mm) and overbite (< 4 mm),
- No crossbite,
- No or mild spacing between the anterior teeth (< 3 mm),
- Minimal total arch crowding (< 3 mm),
- Minimal rotations,
- Minimal attrition,
- No prior orthodontic treatment.

The exclusion criteria were:

- Obvious diastemata,
- Reverse curve of Spee,
- Abnormal buccal or lingual tipping of teeth,
- Crossbite relationship,
- Peg-shaped lateral incisors or other anomalies.

Collection of data

Approval for the study was obtained from the Ethics Committee, Faculty of Dentistry of the University of Malaya. Written consent was obtained from all subjects who underwent examination and impression taking. Two sets of measurements were taken on each subject:

1. The combined width of the maxillary incisors (interincisal width), premolar arch width (interpremolar width) and molar arch width (intermolar width) were measured from the dental casts.
2. Measurements of the facial framework were undertaken directly on the participants from specified craniofacial landmarks.

All measurements were performed by a single examiner.

Measurement of arch sizes

The premolar arch width, molar arch width and the combined width of the maxillary central incisors were obtained from study casts made from each subject. A Vernier Calliper (Least Count -0.01 mm) was used for measuring the mesiodistal widths of the maxillary permanent incisors, as well as the interpremolar and intermolar arch widths. The combined width of maxillary incisors was generated by the sum of the

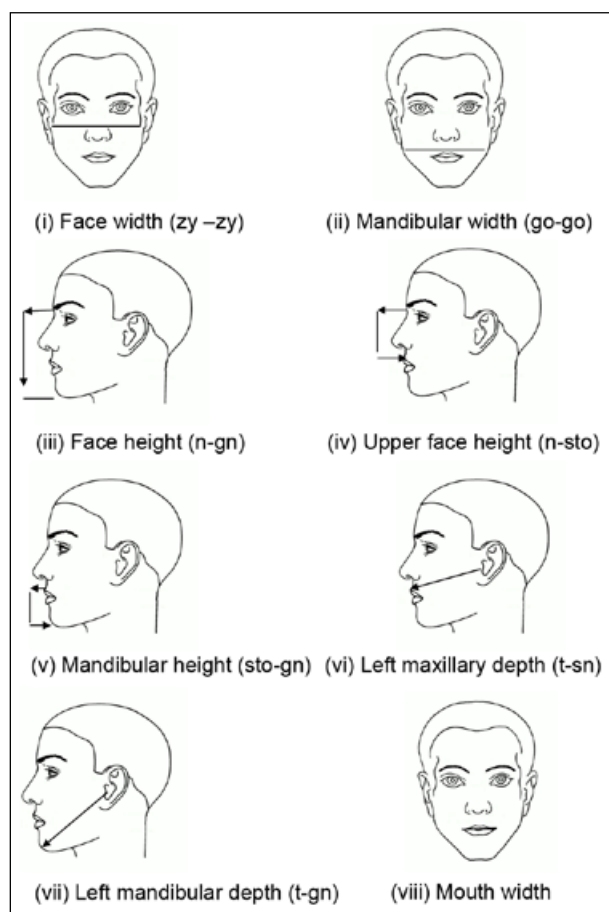


Figure 1. Eight measurements of the craniofacial region.

mesiodistal diameters of the 4 maxillary permanent incisors, measured from the anatomic mesial contact point to the anatomic distal contact point of each tooth, parallel to the occlusal plane.

The premolar width was derived from a measurement between the distal end of the occlusal groove of the maxillary left and right first premolar. The molar width was obtained by a measurement between the mesial pits on the occlusal surfaces of the maxillary left and right permanent molars. The premolar and molar indices were then calculated using the following formulae:

- a) Pont's premolar index was obtained by dividing the sum of the incisal widths times 100 by the premolar arch width.

$$\text{Premolar Index} = \frac{\text{Sum of incisal widths} \times 100}{\text{Premolar arch width}}$$

- b) Pont's molar index was obtained by dividing the sum of the incisal widths times 100 by the molar arch width.

$$\text{Molar Index} = \frac{\text{Sum of incisal widths} \times 100}{\text{Molar arch width}}$$

Measurement of the facial framework (Craniofacial anthropometric measurements)

The measurements of the face and the mouth were carried out according to standard methods of physical anthropology developed by Farkas.⁵ Eight measurements were taken from the craniofacial region (Figure 1) and included:

- i. Face width (zy-zy)
- ii. Mandibular width (go-go)
- iii. Face height (n-gn)
- iv. Upper face height (n-sto)
- v. Mandibular height (sto-gn)
- vi. Left maxillary depth (t-sn) (Left)
- vii. Left mandibular depth (t-gn) (Left)
- viii. Mouth width (ch-ch).

The relationships between the measurements were determined using 7 proportion indices adapted from Hajnis et al.⁶ These indices were:

- i. Facial index ($n\text{-gn} \times 100 / zy\text{-}zy$)
- ii. Mandibular index ($sto\text{-}gn \times 100 / go\text{-}go$)
- iii. Upper face – face height index ($n\text{-}sto \times 100 / n\text{-}gn$)
- iv. Mandible – upper face height index ($sto\text{-}gn \times 100 / n\text{-}gn$)
- v. Mandible – face width index ($go\text{-}go \times 100 / zy\text{-}zy$)
- vi. Middle – lower third face depth ($t\text{-}sn \times 100 / t\text{-}gn$)
- vii. Mouth- face width index ($ch\text{-}ch \times 100 / zy\text{-}zy$).

Error of method

A test-retest exercise was undertaken to ensure that the data collected were consistent and accurate. Twenty random subjects and dental casts were reassessed 2 weeks following the first measurement.

The reproducibility of measurements was analysed using an intraclass coefficient correlation (Version 16.0; SPSS Inc, Chicago, IL, USA) and the Bland and Altman plot for mean percentage of difference (MedCal, Belgium). These findings indicated that the errors were minimal and unlikely to bias the results.

Statistical analysis

Data collected were entered into the Statistical Package for Social Science statistical software (Version 16.0; SPSS Inc, Chicago, IL, USA). Incisor and arch widths and craniofacial anthropometric measurements were recorded for each subject to the nearest 0.01 and 0.1 mm respectively, and described by average values and standard deviations. Arch widths were calculated for each subject according to Pont's formulae:¹ Premolar width = sum of mesiodistal dimension of upper four incisors multiplied by 100/80. Molar width = sum of mesiodistal dimension of upper four incisors multiplied by 100/64. Comparisons were made between the measured and the calculated arch width values. The skewness and kurtosis statistics showed that all distributions were normal. A *t*-test for independent samples was used to determine whether there was a significant difference in tooth and/or arch width values for males and females. Analyses of variance (ANOVA) were used to compare the differences between the three races. Post-hoc tests with a Bonferroni adjustment were applied to assess the races involved. Correlation analysis was made between the interpremolar and intermolar widths and the various craniofacial anthropometric measurements. The significance value was set at 95% ($p < 0.05$).

Results

Reproducibility

Tables I and II show the results of test-retest reliability of various dental cast and craniofacial anthropometric measurements. The agreement between the first and repeat measurement was acceptable in all the parameters analysed, as shown by their Cronbach's alpha (Table I) and mean percentage difference (Table II). The Cronbach's alpha provided the average measure of intraclass coefficient correlation (ICC). A figure higher than 0.8 was considered highly reliable. The Pearson correlation (Table II) between both measurements was also significantly high (0.710 - 0.953).

Measurements

The average overall interincisal measurement and interpremolar and intermolar widths were 30.31 ± 2.49 mm, 36.67 ± 2.50 mm and 45.21 ± 2.90 mm respectively. No significant difference between males and females for interpremolar width was found (independent *t*-test, $p = 0.39$), but a significant difference between genders for the incisal measurement (independent *t*-test, $p = 0.04$) and intermolar width was evident (independent *t*-test, $p = 0.03$). The interincisal measurement of males was significantly lower than for females, but male intermolar width was significantly higher than for females.

A comparison of arch widths between the various races is shown in Table III. Overall, the results showed that there was no significant difference in arch dimensions between the three races.

Table I. Cronbach's alpha (ICC) of various repeated measurements.

Measurement	Cronbach's (ICC)	F test	Significance
Interincisal measurement	0.92	12.26	0.00
Interpremolar width	0.91	11.29	0.00
Intermolar width	0.98	39.49	0.00
Facial width	0.98	41.47	0.00
Facial height	0.81	5.18	0.00
Mandibular width	0.94	16.55	0.00
Mandibular height	0.86	6.85	0.00
Maxillary depth	0.97	28.47	0.00
Mandibular depth	0.94	17.28	0.00
Upper face height	0.96	27.27	0.00
Mouth width	0.96	43.12	0.00

Table II. Mean percentage difference (according to Bland-Altman method) and Pearson correlation between repeated measurements.

Measurement	Mean percentage difference	Pearson correlation (<i>r</i>)	Significance (<i>p</i>)
Interincisal measurement	2.17	0.86	0.00
Interpremolar width	2.03	0.84	0.00
Intermolar width	1.22	0.95	0.00
Facial width	1.80	0.95	0.00
Facial height	3.75	0.71	0.00
Mandibular width	2.96	0.89	0.00
Mandibular height	4.83	0.76	0.00
Maxillary depth	2.01	0.94	0.00
Mandibular depth	2.38	0.89	0.00
Upper facial height	3.15	0.93	0.00
Mouth width	1.91	0.96	0.00

Table III. Dental arch widths of the Malay, Chinese and Indian.

Arch width	Gender	Mean (SD)		
		Malay	Chinese	Indian
Incisal width (mm)	Male [§]	29.47 (2.99)	29.83 (2.85)	29.84 (2.22)
	Female [§]	30.07 (3.32)	30.87 (1.67)	31.80 (1.16)
	Combined	29.78 (3.13)	30.35 (2.35)	30.82 (2.00)
Interpremolar width (mm)	Male	35.94*(2.14)	38.20*(2.46)	36.18*(2.52)
	Female	36.85 (2.03)	36.82 (3.56)	36.00 (2.27)
	Combined	36.32 (2.01)	37.10 (2.67)	35.96 (2.39)
Intermolar width (mm)	Male [§]	45.69 (2.96)	46.73 (3.15)	45.50 (3.34)
	Female [§]	44.90 (2.86)	45.12 (2.67)	43.31 (2.39)
	Combined	45.38 (2.92)	45.87 (2.93)	44.33 (2.89)

[§] Difference between gender noted (*t*-test; *p* < 0.05)

* ANOVA; Post-Hoc Bonferroni test *p* < 0.05

There was no significant gender difference between the Malay, Chinese and Indian males for interincisal and intermolar width. However, a significant difference was observed between the males of the three races in the interpremolar width (*p* = 0.018). A Post-Hoc test with Bonferroni adjustment showed that the interpremolar width of the Chinese male was significantly larger than that of the Malay (*p* = 0.036) and the Indian (*p* = 0.048). Females exhibited no significant difference in dental arch dimensions between the races.

The average predicted interpremolar width and intermolar width based on Pont's Index were 37.89

± 3.11 mm and 47.36 ± 3.89 mm. These were higher than the actual measured means (36.67 ± 2.55 and 45.21 ± 2.91), suggesting that Pont's Index overestimated interpremolar and intermolar widths of Malaysians. The differences between predicted and actual individual measurements are shown in Figure 2, which indicates that Pont's Index overestimated 67.8% of interpremolar widths and intermolar widths.

Table IV shows the predicted arch widths according to gender and race. Independent *t*-tests reported no significant differences between gender for the predicted interpremolar (*p* = 0.05) and intermolar widths (*p* = 0.05). This finding is in contrast with the

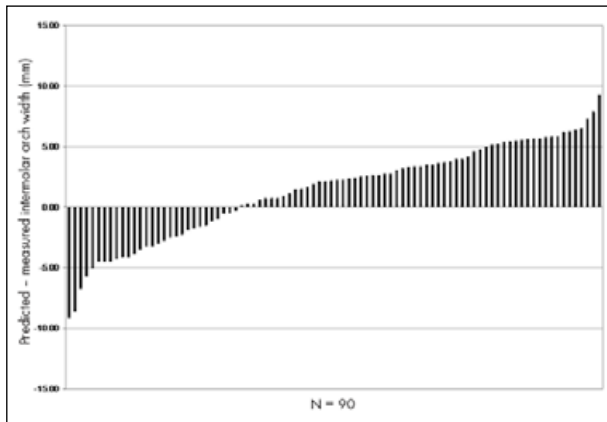


Figure 2a. Differences in interpremolar arch widths (Predicted – Measured arch width).

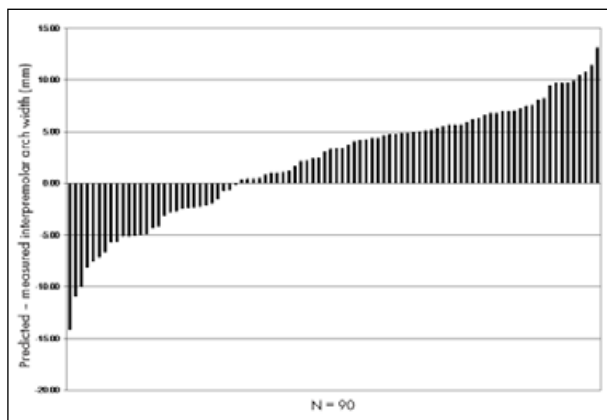


Figure 2b. Differences in intermolar arch widths (Predicted – Measured arch width).

measured widths, in which a significant difference between genders was observed in intermolar width. There was also no significant gender difference between the predictions when analysed according to race, in contrast with the finding of a significantly larger actual interpremolar width in Chinese males.

Table V shows the Pont's Index values of the Malaysian subjects. The figures were higher than those proposed by Pont which recorded 80 for the interpremolar index and 65 for the intermolar index. The overall premolar index and molar index for Malaysians was estimated to be 83.34 and 67.71 respectively, with no gender or racial differences. However, detailed analyses according to gender and race showed that the premolar indices of the Chinese and Indian females were significantly larger than for their male counterparts (both with $p = 0.02$; independent t -test). The molar index was significantly higher in Indian females compared with Malay females (ANOVA;

Post-Hoc Bonferroni, $p = 0.018$). In addition, Indian females also showed a larger molar index compared with their male counterparts (independent t -test; $p = 0.00$).

The average craniofacial anthropometric norms of the 90 subjects are shown in Table VI. The overall mean craniofacial anthropometric measurements are as follows:

Face width = 130.9 ± 9.8 mm

Face height = 98.1 ± 11.5 mm

Upper face height = 56.5 ± 9.8 mm

Mandibular width = 105.6 ± 8.2 mm

Mandibular height = 42.2 ± 5.7 mm

Mandibular depth = 130.6 ± 12.3 mm

Maxillary depth = 106.0 ± 13.5 mm

Mouth width = 48.2 ± 4.0 mm.

The differences between genders were statistically significant for all facial measurements, apart from face width. However, when analysed according to race, only the face width was significantly larger in the Chinese than in the Malays and Indians. The Chinese also had significantly larger mandibular depth compared with the Indians.

When the gender and racial factors were taken into consideration, there were no significant differences between the males, but significant differences were noted between Chinese and Indian females in mandibular width (ANOVA; Post-Hoc Bonferroni $p = 0.04$) and Malay and Indian females in mandibular height (ANOVA; Post Hoc Bonferroni $p = 0.01$).

Pearson correlation analysis showed no significant correlation between interpremolar width and craniofacial anthropometric measurements. However, significant correlations were noted for intermolar width relative to:

Facial width ($r = 0.24$, $p = 0.02$)

Mandibular width ($r = 0.32$, $p = 0.00$)

Mandibular depth ($r = 0.34$, $p = 0.01$)

Mouth width ($r = 0.22$, $p = 0.04$).

These significant correlations were nullified when second parameters were added to the linear measurements to make up various anthropometric indices.

Table IV. Predicted arch widths according to gender and race.

Pont's prediction	Gender	Mean (SD) [mm]		
		Malay	Chinese	Indian
Premolar width	Male	36.83 (3.73)	37.30 (3.56)	37.30 (2.77)
	Female	37.58 (4.15)	38.58 (2.09)	39.75 (1.45)
	Combined	37.23 (3.92)	37.94 (2.94)	38.52 (2.50)
Molar width	Male	46.04 (4.67)	46.62 (4.45)	46.63 (3.47)
	Female	46.98 (5.19)	48.22 (2.61)	49.68 (1.82)
	Combined	46.54 (4.90)	47.42 (3.67)	48.16 (3.13)

Table V. Pont's Index of Malaysian subjects.

Pont's Index	Gender	Malay	Chinese	Indian
Premolar index	Male	82.37	78.42 [§]	83.27 [§]
	Female	82.24	86.04 [§]	88.53 [§]
	Combined	82.30	82.23	85.90
Molar index	Male	64.99	65.53	66.18 [§]
	Female	67.06*	68.82	74.69 ^{*§}
	Combined	66.09	67.17	70.44

[§] Difference between gender noted (t-test; $p < 0.05$)

* ANOVA; Post-Hoc Bonferroni test $p < 0.05$

Table VI. Craniofacial anthropometric norms of 90 subjects.

		Mean (SD) [mm]							
		zy-zy	go-go [†]	n-gn [†]	n-sto [†]	sto-gn [†]	t-sn [†]	t-gn [†]	ch-ch [†]
Malay	Male	129.9 ± 9.3	106.7 ± 7.8	104.1 ± 8.7	58.9 ± 5.4	44.9 ± 4.0	114.2 ± 8.9	136.8 ± 10.4	51.6 ± 2.4*
	Female	128.4 ± 10.1	103.9 ± 5.4*	92.3 ± 12.4	55.9 ± 11.4	41.6 ± 3.9*	100.6 ± 7.6	124.6 ± 10.0	47.4 ± 2.8*
	All	129.1 ± 9.6 [§]	105.2 ± 6.7	97.8 ± 12.2	57.3 ± 9.1	43.1 ± 4.2	107.0 ± 10.7	130.4 ± 11.8	49.4 ± 3.3
Chinese	Male	137.2 ± 6.7*	108.2 ± 7.5	104.2 ± 7.4	60.1 ± 5.0	44.9 ± 5.4	109.8 ± 18.8	139.2 ± 11.2*	48.4 ± 5.0
	Female	132.7 ± 7.3*	105.3 ± 6.5*	97.1 ± 8.9	52.5 ± 6.2	41.5 ± 3.3	105.3 ± 6.4	129.7 ± 6.2*	46.3 ± 3.4
	All	134.9 ± 7.2 [§]	106.7 ± 7.1	100.6 ± 8.8	56.3 ± 6.7	43.2 ± 4.7	107.5 ± 14.0	134.5 ± 10.2 [§]	47.3 ± 4.3
Indian	Male	131.8 ± 14.2	111.1 ± 10.0	102.8 ± 12.6	59.4 ± 17.8	44.3 ± 7.0*	104.9 ± 22.4	127.8 ± 19.8*	49.2 ± 4.5
	Female	125.6 ± 6.6	98.7 ± 8.4	88.2 ± 9.0	51.9 ± 5.0	35.2 ± 5.2**	100.7 ± 5.5	125.2 ± 5.6*	46.4 ± 3.8
	All	128.7 ± 11.3 [§]	104.9 ± 11.0	94.5 ± 13.1	55.6 ± 13.4	39.8 ± 7.6	102.8 ± 16.1	126.5 ± 14.3 [§]	47.4 ± 4.3

[†] t-test; $p < 0.05$ between genders, as an overall

* t-test; $p < 0.05$ within a race group

[§] ANOVA; $p < 0.05$ between races, as an overall

ANOVA; $p < 0.05$ between races, according to gender

Discussion

Tooth morphology is known to be influenced by cultural, environmental and racial factors.⁷ As a result, tooth size reportedly differs between the Caucasoids, Negroids and Mongoloids.⁸ Thu et al.,⁴ in a study that involved estimating maxillary arch measurements and

assessing the validity of Pont's and Korkhaus' Indices, estimated a standard deviation (SD) of 2.3 mm from bootstrap (measures of accuracy) statistics based on 1000 simulated means of the sum of the four maxillary incisors. A sample of 85 subjects was calculated to be required based on this SD with a precision of

± 0.5 mm at a 95% confidence interval. Based on the estimation of Thu et al., the present study aimed to recruit 95 subjects.

The applicability of Pont's Index to predict the correct arch width based on tooth size is questionable, based on the French sample. Hotz⁹ also indicated that due consideration must also be given to the shape of the skull in the assessment of arch width and form. However, it is worthy to note that the interincisal distance between the subjects in the present study was not different between races, but was influenced by gender. The interincisal measurement of the Malay, Chinese and Indian females was consistently larger than their male counterparts.

The average interincisal distance of Malaysians (30.31 ± 2.49 mm) was lower than the 32.00 ± 2.3 mm reported by Thu et al.⁴ for the Malay, but was close to the 29.33 mm reported by Ling and Wong for Southern (Hong Kong) Chinese¹⁰ and the 29.85 mm reported by Gupta et al. for Northern Indian people.¹¹

This distance approximates that reported by Dalidjan et al.² on Indonesians who are closely related to the Malays. The reason for the difference is unknown, but may be related to differences in the subgroups examined. Al-Khatib et al.¹² reported that differences in the size and shape of the face and dental arch may occur in two subgroups of the same ethnicity (Malay). However, there was no mention of an intra-group gender difference. Similarly, Ling and Wong observed extensive variations when comparing their data with other reports related to Southern Chinese.¹⁰

The applicability and clinical value of Pont's Index has been assessed in research on populations of different ethnic origins to determine whether the index could be applied. An earlier study aimed to assess the applicability of Pont's Index on a Malaysian population, but the present study goes further by recruiting two additional Southern (Malaysian) Chinese and Malaysian Indian races. This was believed to better reflect the applicability of Pont's Index to Malaysian patients.

As Pont's Index did not correlate with facial width, a secondary aim of the present study was to determine whether a relationship existed between Pont's Index and other landmarks of the facial framework. Various alternative craniofacial landmarks and indices were chosen, based on their relationship and close proximity to the maxilla and upper dental arch. In addition, a

correlation between intermolar width and mandibular width had been previously reported.¹³

Nimkarn et al.¹⁴ identified that Pont's Index systematically overestimated interpremolar and intermolar widths. The interpremolar and intermolar indices detailed in the present study (mean premolar index = 83.34; mean molar index = 67.71) agreed with the finding of Thu et al.,⁴ who also reported a Pont's overestimation on their Malay samples. In contrast, Dalidjan et al.,² in describing Indonesians and Lew, in describing Southern (Singaporean) Chinese,³ attributed the overestimation to differences in the genetic inheritance in different racial types.³

The present study found no significant difference between genders for interpremolar width but a significant difference between genders for the interincisal and intermolar width measurements. The intermolar width of males was significantly larger than for females, which agrees with Alvaran et al.¹⁵ but differs compared with other reports.¹⁶⁻¹⁹ This suggests that the maxillary arch in males widens significantly across the posterior segment, compared with the maxillary arch in females. This specific gender difference was reported by Ngeow and Al-Junid in Malaysians^{20,21} and may be related to the expansion of the male face in agreement with the current craniofacial anthropometric data, which indicates that males had a significantly larger facial framework than females.

The present study confirmed that there was no significant correlation between Malay facial width and interpremolar width as reported by Thu et al.⁴ However, the finding of a significant correlation between the intermolar width and the facial width confirmed suggestions that a correlation existed between the maxillary arch and facial (zygomatic) width.^{15,22,23} This significant correlation was only observed in the posterior arch width (intermolar width), and not anterior arch width (interpremolar width). This may be explained by the facial framework of the Malaysian who has longer lateral and smaller anteroposterior dimensions (brachycephalic feature/broad short head).^{4,24}

The present study found several significant correlations between the intermolar width and mandibular width, mandibular depth and mouth width. Apart from mouth width, the referenced landmarks formed part of the lower jaw.¹⁵ Mandibular width and depth might influence intermolar width because the mandible is a

major insertion site for the masticatory musculature, which, together with the buccinator muscle, influences dentoalveolar morphology.

The present study found no correlation between the interpremolar and intermolar widths and the facial index (derived from the formula $n-gn \times 100/zy-zy$), an adjusted factor used by Schwarz in his prediction of arch widths, which factored in the facial index. This finding questions the applicability of Schwarz's analysis in a Malaysian population. A multiple regression analysis needs to be undertaken to verify this result and further study is needed to confirm the presented preliminary findings.

Conclusion

Pont's Index overestimated interpremolar and intermolar widths in the majority of Malaysians. The facial indices did not correlate with arch width as measured or predicted by Pont's Index.

The findings suggest that Pont's Index should not be applied to the Malaysian population.

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