

Relationship of Dental Arch Dimensions with Cephalic and Facial Indices

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Abstract: The purpose of the present study is to investigate if maxillary and mandibular arch dimensions i.e, arch length, arch width and arch depth have any relation with facial index and cephalic index.

Material and method: In this randomized study 100 undergraduate students of age 18 -30yr are selected. Their head dimensions and facial dimensions are measured. Alginate impression of upper and lower arches are taken and plaster cast are fabricated. From the plaster cast intercanine width, interpremolar width, intermolar width and arch length are calculated. Cephalic index and facial index are calculated and compared with obtained arch ratios.

Result: The frequency of occurrence of Mesocephalic (MC) (36%) head form is more than Basocephalic (BC) (32%) and Dolichocephalic (DC) (32%). The BC group had higher mean maxillary inter premolar width (IPW) than the DC and MC group. The BC group had higher mean maxillary IPW than the DC and MC group. It was found that mandibular arch length had statistically significant difference among the groups. The MC group had relatively higher arch length than the DC and BC group. Pairwise comparison also showed significant differences between DC vs. BC and BC vs. MC groups.

Conclusion: It can be concluded that only cephalic index, maxillary inter-premolar width and mandibular arch length had statistically significant among the groups. Rest of the parameters [facial index, maxillary inter-canine width, maxillary inter-molar width, maxillary arch length, maxillary PPD, maxillary MPD, mandibular inter-canine width, mandibular inter-premolar width, maxillary inter-molar width did not show any significant difference among the groups.

Key words: cephalic index, facial index, arch length,

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I. Introduction

The orthodontic diagnosis, treatment planning and prognosis depends upon several factors. Certain malocclusions are associated with specific facial types¹. The size and shape of the arches also have a considerable implication in orthodontic diagnosis and treatment planning, dental aesthetics and stability of dentition^{2,3}.

The cephalic index (CI) classifies skull types as brachycephalic, (BC) mesocephalic (MC) and dolichocephalic (DC). It is determined by the ratio between maximum width and maximum length of the head. The facial index (FI) is a term used to express the facial proportions. Facial proportion can be determined by dividing the facial height (measured from Nasion to Gnathion) by the bizygomatic width (measured from the right to the left Zygion)⁴ or by calculating the ratio of the bizygomatic width to the anterior face height.

The head and face can be classified using the CI and FI, defined by Farkas and Munro⁵. Using the CI as a reference, the calvarias were classified into three categories: dolichocephalic (<76.0), mesocephalic (76.0-81.0), and brachycephalic (<81.0). Using the FI as a reference, the face was classified into three categories: leptoprosopic (LP≥90.0), mesoprosopic (MP-85.0<90.0), and euryprosopic (EP<85.0).

The effect of the shape of head and face on the arch shape and dimension has been of interest in orthodontic research. Many studies have attempted to relate the morphological features of craniofacial structures⁶, dental arch widths⁷ and dental arch forms⁸ yet the findings have been inconclusive.

II. Material And Methods

100 undergraduate students of JIS University Panihati, Kolkata, India were randomly selected for the study to meet the following criteria:

The inclusion criteria were-

1. Bengali lineage.
2. Age group between 18-30 years.
3. Class I molar relationship with full dentition with or without erupted third molars.

4. Well aligned arches with minimal crowding /spacing.
5. Overjet between 0-3mm
6. Overbite between 0-3mm.

The exclusion criteria were -

1. Any previous orthodontic treatment, orthognathic surgeries, facial injuries.
2. Edentulous spaces.
3. Significant cuspal wear.
4. Extensive restoration or prosthetics.
5. Anterior or posterior crossbite.

The head dimensions measured on the subjects with the help of spreading caliper (fig 1) were-

- (i) Maximum skull length (g-op), distance from opisthocranion (Op) to glabella (g) (fig 2).
- (ii) Maximum skull breadth or bieuzyonic (eu-eu) (fig3).

Facial measurements were taken

- (i) bizygomatic distance (Zy-Zy) between two zygomatic prominence (zygion).(fig-3)
- (ii) Facial length between Nasion (N) to Menton(Me).

From the measurements made following indices were calculated –

$$\text{Facialindex (FI)} = \frac{N-Me}{Zy-Zy} \times 100$$

$$\text{Cephalicindex (CI)} = \frac{eu-eu}{Op-g} \times 100$$

Each subject was classified into one of the three groups as given below according to the indices calculated –

Subjects group according to type of face	FI
Europrosopic	80.0-84.9
Mesoprosopic	85.0-89.9
Leptoprosopic	95.0≥95

Subjects group according to type of head	CI
Dolicocephalic	70.0-74.9
Mesocephalic	75.0-79.9
Brachycephalic	80.0-84.9

Alginate impressions of upper and lower arches were made of the subjects and plaster casts were fabricated. The following measurements were made on maxillary and mandibular casts with digital caliper accurate to 0.01mm (fig4) (fig5, 6)-

- (i) MAX ICW - maxillary intercanine width.
- (ii) MAX IPW- maxillary interpremolar width.
- (iii) MAX IMW- maxillary inter molar width.
- (iv) MAX AL- maxillary arch length
- (v) MAX PPD- maxillary palatal depth at premolar region.
- (vi) MAX MPD- maxillary palatal depth at molar region.
- (vii) MAND ICW- mandibular intercanine width
- (viii) MAND IPW- mandibular interpremolar width.
- (ix) MAND IMW- mandibular intermolar width.
- (x) MAND AL- mandibular arch length

All the measurements are made in millimeters (mm).

Statistical analysis

The data collected were subjected to descriptive and analytical statistics. The normality of data was analyzed by the Shapiro-Wilk test. The non-parametric Kruskal-Wallis test was used to check differences in mean scores between the groups. Post hoc analysis was done by Dunn's test. SPSS (Statistical Package for Social Sciences) Version 20.1 (Chicago, USA Inc.) Software was used.

From the calculated Cephalic index (CI) the total sample is divide into three groups Dolichocephalic (DC) Brachycephalic (BC) and Mesocephalic(MC). Comparison of cephalic index among the three groups – DC, BC and MC was done and also the pairwise comparison was done between the groups.

From the calculated Facial index (FI) the total sample is divide into three groups euryprosopic, (EP), mesoprosopic (MP) and leptoprosopic (LP) group. Comparison of facial index among the three groups – EP, MP, LP was done and also the pairwise comparison was done. From the measurements made on dental casts, the mean max ICW, IPW and IMW are compared between the groups. Same comparisons were done on mandibular cast measurement. Finally, relation between all the variables were tested.



Fig1 –spreading caliper

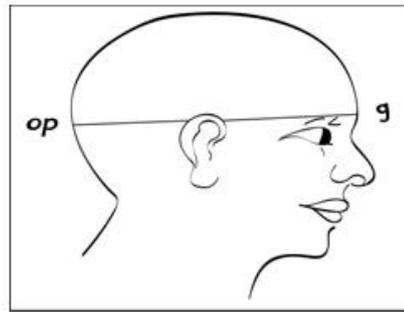


Fig2–measurement of headdimensions

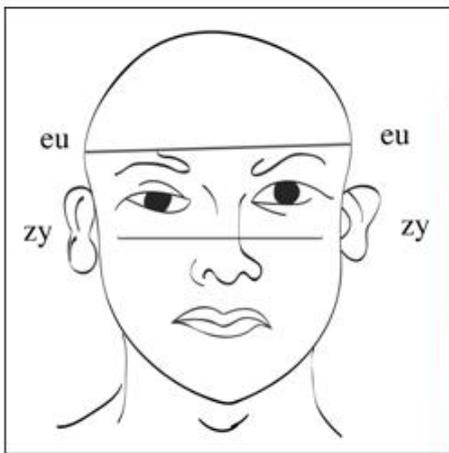


Fig3 -measurement of head dimensions



Fig 4 -sliding digital caliper

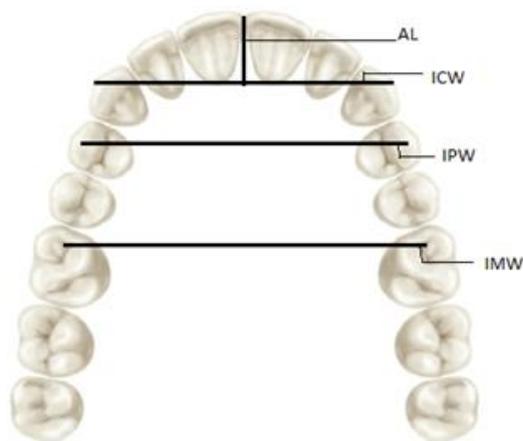


Fig5–measurement of maxillary arch

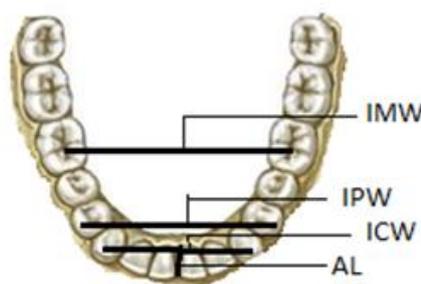


Fig6–measurement of mandibular arch dimensions

II. Results

Relationship with CI

The samples were drawn randomly from a group of untreated subjects of GNIDSR, for the comparison of distribution of study population in each group. There were 32 (32%) subjects each in DC and BC group and 36 (36%) in MC group. It was found that almost all the data did not follow normal distribution ($p < 0.05$). The non-parametric tests were then selected to analyze the data.

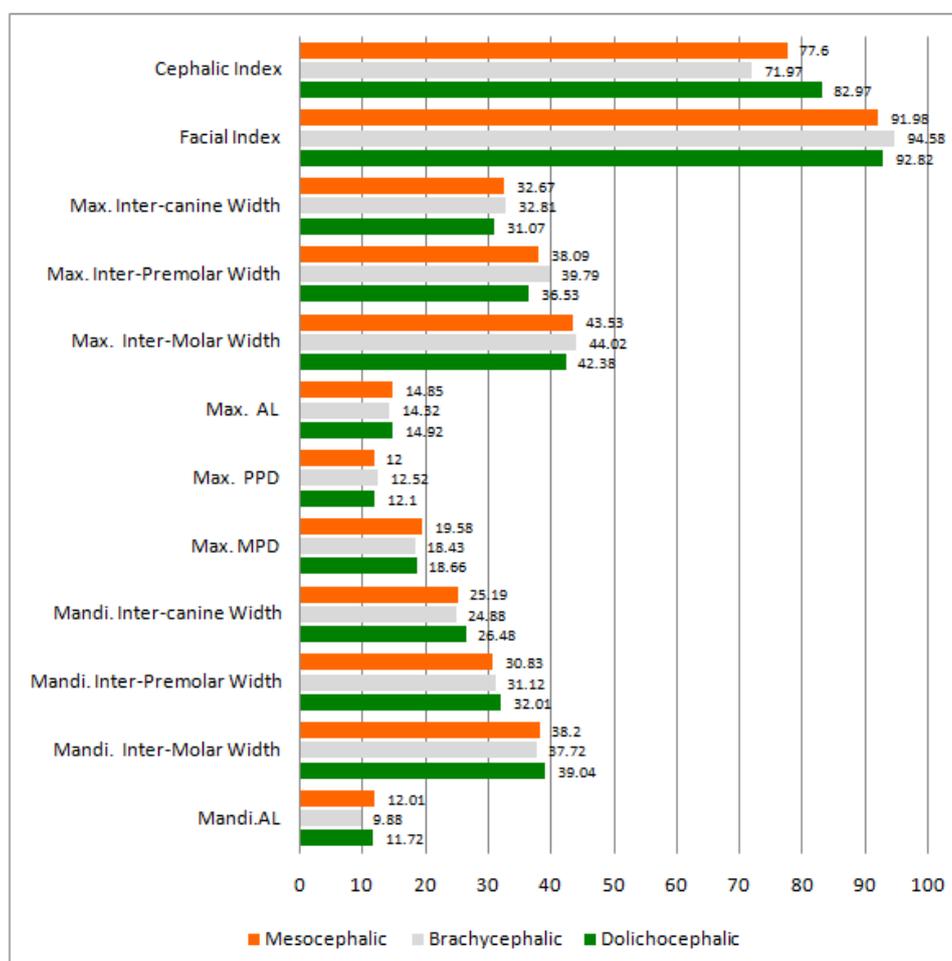
Cephalic index among the three groups were compared. It was found that statistically significant ($p < 0.001$) differences existed in the mean cephalic index values among the three groups. The DC group had higher mean cephalic index ($92.97\text{mm} \pm 4.75\text{mm}$) than the BC ($71.97\text{mm} \pm 3.83\text{mm}$) and MC group ($77.60\text{mm} \pm 1.26\text{mm}$). Pairwise comparison by Dunn's test also showed significant differences between the groups. Comparison results of facial index among the three groups shows no statistically significant ($p = 0.230$) differences in the mean facial index values among the three groups. The BC group had relatively higher mean ICW ($32.81\text{mm} \pm 3.64\text{mm}$) than the MC ($32.67\text{mm} \pm 4.13\text{mm}$) and DC group ($31.07\text{mm} \pm 4.22\text{mm}$) but the difference was not statistically significant. Comparison of maxillary IPW among the three groups. It was found that statistically significant ($p = 0.036$) differences existed in the maxillary IPW values among the three groups. The BC group had higher mean maxillary IPW ($39.97\text{mm} \pm 3.45\text{mm}$) than the DC ($36.53\text{mm} \pm 4.92\text{mm}$) and MC group ($38.09\text{mm} \pm 4.43\text{mm}$). Pairwise comparison showed significant differences between only one pair – DC and BC group ($p = 0.031$). Maxillary IMW among the three groups – DC, BC and MC is compared. The BC group had relatively higher mean IMW ($44.02\text{mm} \pm 3.88\text{mm}$) but the difference was not statistically significant. Comparison of maxillary arch length among the three groups – DC, MC and BC revealed that DC group had relatively higher mean maxillary arch length ($14.92\text{mm} \pm 2.14\text{mm}$) than the MC ($14.85\text{mm} \pm 2.43\text{mm}$) and BC group ($14.32\text{mm} \pm 2.72\text{mm}$) but the difference was not statistically significant. Comparison of maxillary premolar palatal depth (PPD) width among the three groups – DC, MC and BC is done. The BC group had relatively higher mean PPD ($12.52\text{mm} \pm 2.45\text{mm}$) but the difference was not statistically significant. Comparison of maxillary palatal depth at molar region among the three groups – DC, MC and BC is done. The MC group had relatively higher palatal depth ($19.58\text{mm} \pm 1.61\text{mm}$) but the difference was not statistically significant. Comparing the mandibular ICW among the three groups – DC, BC and MC. The DC group had relatively higher mean ICW ($26.48\text{mm} \pm 2.59\text{mm}$) but the difference was not statistically significant. Comparison of mandibular IPW among the three groups – DC, BC and MC is done. The DC group had relatively higher mean IPW ($32.01\text{mm} \pm 4.42\text{mm}$) than the BC ($31.12\text{mm} \pm 2.77\text{mm}$) and MC group ($30.83\text{mm} \pm 4.06\text{mm}$) but the difference was not statistically significant. Comparison of mandibular IMW among the three groups – DC, BC and MC is done. The DC group had relatively higher mean IMW ($39.04\text{mm} \pm 2.96\text{mm}$) than the MC ($38.20\text{mm} \pm 2.98\text{mm}$) and BC group ($37.72\text{mm} \pm 2.96\text{mm}$) but the difference was not statistically significant. Comparison of mandibular AL among the three groups – DC, BC and MC is done. It was found that mandibular AL had statistically significant difference ($p < 0.001$) among the groups. The MC group had relatively higher arch length ($12.01\text{mm} \pm 2.27\text{mm}$) than the DC ($11.72\text{mm} \pm 2.51\text{mm}$) and BC group ($9.88\text{mm} \pm 1.68\text{mm}$). Pairwise comparison also showed significant differences between DC vs. BC and BC vs. MC groups. Overall comparison between all the parameter is done in table 1 and bar diagram 1. It can be concluded that only cephalic index ($p < 0.001$), maxillary inter-premolar ($p = 0.036$) width and mandibular arch length ($p < 0.001$) had statistically significant among the groups. Rest of the parameters [facial index ($p = 0.230$), maxillary inter-canine width ($p = 0.104$), maxillary inter-molar width ($p = 0.098$), maxillary arch length ($p = 0.549$), maxillary PPD ($p = 0.544$), maxillary MPD ($p = 0.103$), mandibular inter-canine width ($p = 0.091$), mandibular inter-premolar width ($p = 0.418$), maxillary inter-molar width ($p = 0.418$)] did not show any significant difference among the groups.

The P value is derived from Kruskal-Wallis test.

Table 1: Comparison of all parameters among the three groups – dolichocephalic, brachycephalic and mesocephalic

Variables	Dolichocephalic	Brachycephalic	Mesocephalic	P-Value
	Mean ±S.D. (mm)	Mean ±S.D (mm).	Mean ±S.D. (mm)	
Cephalic Index	82.97 ±4.75	71.97 ±3.83	77.60 ±1.26	<0.001 [†]
Facial Index	92.82 ±7.66	94.58 ±6.51	91.98 ±6.78	0.230
Max. Inter-canine Width	31.07 ±4.22	32.81 ±3.64	32.67 ±4.13	0.104
Max. Inter-Premolar Width	36.53 ±4.92	39.79 ±3.45	38.09 ±4.43	0.036 [†]
Max. Inter-Molar Width	42.38 ±4.16	44.02 ±3.88	43.53 ±4.35	0.098
Max. AL	14.92 ±2.14	14.32 ±2.72	14.85 ±2.43	0.549
Max. PPD	12.10 ±1.81	12.52 ±2.45	12.00 ±1.86	0.544
Max. MPD	18.66 ±2.00	18.43 ±2.12	19.58 ±1.61	0.103
Mandi. Inter-canine Width	26.48 ±2.59	24.88 ±2.88	25.19 ±2.26	0.091
Mandi. Inter-Premolar Width	32.01 ±4.42	31.12 ±2.77	30.83 ±4.06	0.345
Mandi. Inter-Molar Width	39.04 ±2.96	37.72 ±3.07	38.20 ±2.98	0.418
Mandi.AL	11.72 ±2.51	9.88 ±1.68	12.01 ±2.27	<0.001 [†]

*P-value derived from Kruskal-Wallis test [†]significant at p < 0.05



Bar diagram 1: Comparison of all parameters among the three groups – dolichocephalic, brachycephalic and mesocephalic

Relationship with FI

There were 9 (9%) subjects in EP, 29 (29%) in MP and 62 (62%) in LP group, which suggest LP is commonest facial form among Bengali population. Comparing cephalic index among the three groups it was found that EP group had higher mean cephalic index (82.36mm±4.10mm) than the MP (76.92mm±4.45mm) and LP group (77.09mm±6.03mm). Pairwise comparison also showed significant differences between the groups EP and MP group (p=0.022) and between EP and LP (p=0.009). No significant differences were found in mean cephalic index between MP and LP group (p=1.000). There is statistically significant (p=0.034) differences in the mean max ICW values among the three groups. The MP group had higher mean ICW (33.68mm±3.25mm) than the EP (32.24mm±4.22mm) and LP group (31.5mm±4.23mm). Pairwise comparison also showed significant differences between the groups LP and MP group (p≤0.028). No significant differences were found between the groups EP vs. MP and LP vs. EP group. Comparison of maxillary inter-premolar width among the three groups shows statistically significant (p=0.016) differences existed in the mean max IPW values. The MP group had higher mean IPW (40.07mm±3.30mm) than the EP (38.87mm±3.74mm) and LP group (37.13mm±4.77mm). Pairwise comparison also showed significant differences between the groups LP and MP group (p≤0.015). No significant differences were found between the groups EP vs. MP (p≤1.000), and LP vs. EP (p≤0.716) group. Comparison of maxillary inter-molar width it was found that no statistically significant (p=0.057) differences existed in the maxillary inter-molar width values among the three groups. The Euryprosopic group had a mean maxillary inter-molar width of (43.76mm±2.95mm), Mesoprosopic group (44.79mm±3.29mm) and Leptoprosopic group (42.57mm ±4.51mm). Comparison of maxillary arch length among the three groups shows no statistically significant (p=0.160) differences existed. The EP group had a mean maxillary AL of (6.24mm ±1.76mm); MP group (14.mm ±2.88mm) and LP group (14.60mm ±2.23mm). P-value derived from Kruskal-Wallis test. Comparison of maxillary PPD among the three groups shows no statistically significant (p=0.162) differences existed. The EP group had a mean maxillary PPD of (13.08mm±1.67mm); MP group (12.68mm ±1.94mm) and LP group (11.84mm ±2.08mm).

Comparison of maxillary MPD among the three groups – Euryprosopic, Mesoprosopic and Leptoprosopic shows no statistically significant (p=0.905) differences. The EP group had a mean maxillary MPD of (18.96mm±1.67mm); MP group (18.95mm ±2.32mm) and LP group (18.90mm ±1.84mm). Comparison of mandibular inter-canine width among the three groups – Euryprosopic, Mesoprosopic and Leptoprosopic reveals no statistically significant (p=0.905) differences. The EP group had a mean maxillary MPD of (27.49mm±3.74mm); MP group (24.86mm ±2.96mm) and LP group (25.52mm ±2.16mm). Comparison of mandibular inter-premolar width among the three groups – Euryprosopic, Mesoprosopic and Leptoprosopic is done. There is no statistically significant (p=0.593) differences existed in the maxillary IPW among the three groups. The EP group had a mean maxillary MPD of (32.36mm ±3.99mm), MP group (31.21mm ±3.92mm) and LP group (31.19mm±3.19mm). Compares mandibular inter-molar width among the three groups – Euryprosopic, Mesoprosopic and Leptoprosopic. There is no statistically significant (p=0. 0.170) differences existed in the mandibular IMW among the three groups. The EP group had a mean mandibular IMW of (40.00mm ±3.23mm), MP group (37.34mm ±3.17mm) and LP group (38.53mm±2.81mm). We compare mandibular AL among the three groups and no statistically significant (p=0. 0.902) difference existed. The EP group had a mean mandibular AL of (11.68mm±2.59mm), MP group (11.06mm ±2.60mm) and LP group (11.25mm±2.24mm).

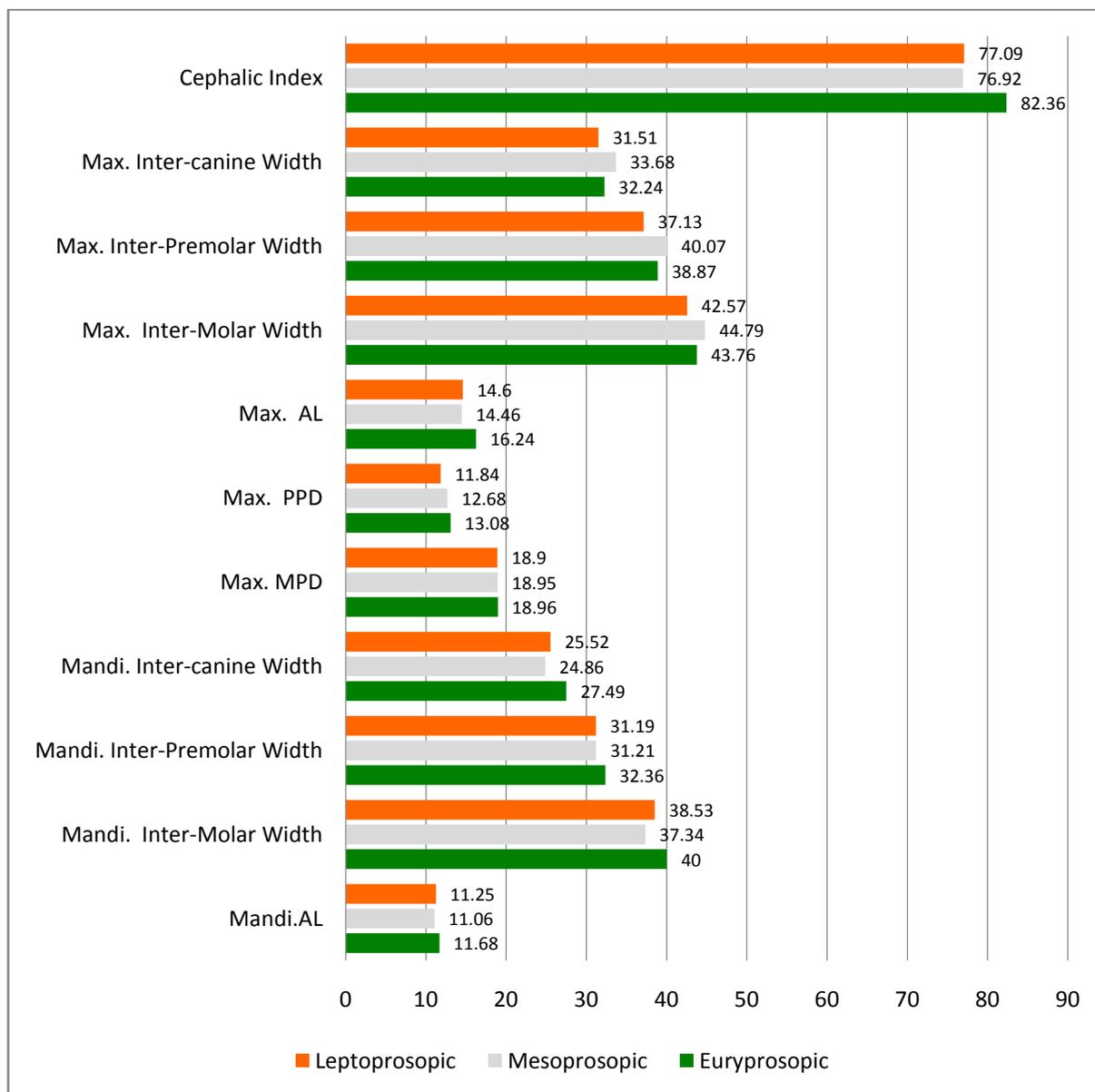
Table 2 bar diagram 2 gives a summary of the overall results as a whole. All parameters have been compared simultaneously and there results are depicted in one table. It can be concluded that only CI (p=0.011), maxillary ICW (0.034) and maxillary IPW (p=0.016) width had statistically significant differences among the groups. Rest of the parameters [maxillary IMW (p=0.057), maxillary AL (p=0.160), maxillary PPD (p=0.162), maxillary MPD (p=0.905), mandibular ICW (p=0.130), mandibular IPW (p=0.593), maxillary IMW (p=0.179) and mandibular AL (0.902)] did not show any significant difference among the groups.

Table 2: Comparison of all parameters among the three groups – Euryprosopic, Mesoprosopic and Leptoprosopic

Variables	Euryprosopic	Mesoprosopic	Leptoprosopic	P-Value
	Mean ±S.D. (mm)	Mean ±S.D. (mm).	Mean ±S.D. (mm)	
Facial Index	82.36 ±4.10	76.92 ±4.45	77.09 ±6.03	0.011
Max. Inter-canine Width	32.24 ±4.22	33.68 ±3.25	31.51 ±4.23	0.034
Max. Inter-Premolar Width	38.87±3.74	40.07 ±3.30	37.13 ±4.77	0.016
Max. Inter-Molar Width	43.76 ±2.95	44.79±3.29	42.57 ±4.51	0.057
Max. AL	16.24 ±1.76	14.46 ±2.88	14.60±2.23	0.160
Max. PPD	13.08 ±1.67	12.68 ±1.94	11.84±2.08	0.162
Max. MPD	18.96 ±1.67	18.95±2.32	18.90 ±1.84	0.905

Mandi. Inter-canine Width	27.49±3.74	24.86 ±2.96	25.52 ±2.16	0.130
Mandi. Inter-Premolar Width	32.36 ±3.99	31.21 ±3.92	31.19 ±3.79	0.593
Mandi. Inter-Molar Width	40.00 ±3.23	37.34 ±3.17	38.53±2.81	0.170
Mandi.AL	11.68±2.59	11.06 ±2.60	11.25 ±2.24	0.902

*P-value derived from Kruskal-Wallistest ; † significant at p < 0.05.



Bar diagram 2: Comparison of all parameters among the three groups – Euryprosopic, Mesoprosopic and Leptoprosopic.

III. Discussion

In the present study the pattern of arch form in the individual face & head form groups were studied to find possible associations of the arch forms with the craniofacial pattern. The result shows that the frequency of occurrence of MC (36%) head form is more than BC (32%) and DC (32%). These findings are in concurrence with the findings of Niraj Pandey et al⁹. (2015). However Z. Safikhani et al¹⁰ (2006) found that BC (38%) is the most common head form. Fernanda Catharino et al¹¹ in 2014, Himanshu Trivedi et al¹² (2017) and Praveen Kumar Doni¹³ (2013) had concluded that DC is the commonest head form.

In this study there is insignificant relation between ICW and CI. No studies comparing ICW to CI could be found in literature. Hamid Neshandar Asli¹⁴ (2017) conducted a cross-sectional study to determine the relationship between the upper intercanine width and the inner intercanthal distance. A significant relationship existed between intercanthal distance and intercanine width. It was found the biometric ratio of 1 to 1.13 could be used to estimate intercanine width. This biometric ratio may not be reliable in women.

In this study the BC group had higher mean maxillary IPW (39.97mm±3.45mm) followed by MC (38.09mm±4.43mm) and DC (36.53mm±4.92mm). Pairwise comparison showed significant differences between only one pair – DC and BC group (p=0.031). This suggests that broader the head form, broader is the arch at premolar region. When the mean maxillary IPW was compared between DC and MC (p=0.832) and BC and MC group (p=0.357), no significant differences were found.

The maxillary IMW among the three groups are different. The BC group had relatively higher mean IMW (44.02mm±3.88mm) than the MC (43.67mm±4.35mm) followed by DC group (42.38mm±4.16mm). Our findings suggest that broader head form may be associated with broader arches. However the difference was not statistically significant. No study was found till date to compare of the max IMW and ICW with CI.

The comparison of the max AL among DC, BC and MC shows DC group has longer arch length (14.92mm± 2.94mm) but that is not statistically significant. Max PPD width is greater in BC (12.2mm ± 2.4mm) but the difference is statistically insignificant.

The mandibular ICW, IMW and IPW is greater in DC group than BC and MC but the difference is not statistically significant. However trends shows that dental arch width dimensions are increased in narrower head shapes than in broader. This is opposite of the trend seen in maxilla.

There is highly significant relation between CI and mandibular AL. DC has significantly longer arch length (11.72mm± 2.51mm) than MC (12.01mm± 2.27mm) followed by BC (9.88mm±1.68mm). Pairwise comparison also shows significant difference between the groups DC and BC, and also BC and MC. Thus it can be suggested that longer the head, longer is the mandibular arch length.

Relation with FI

In the present study the most common face form is LP (62%). A similar study conducted by Ashwini C et al¹⁵ (2014) to compared the facial index among South Indians and North Indians. They had also concluded that LP form is the commonest type of facial form among South Indians and North Indians. Dr. Sapana Shah et al¹⁶ (2012) concluded that MP at 32.75% prevalence is the most common facial type followed by EP (25.49%), and LP (24.31%).

Adriana M Torres- Restrepo et al¹⁷ (2014) carried out a cross-sectional study among 8-15-yr-old children with the help of indirect method and found that the indirect visual classification method is not appropriate to calculate the cranial and facial indices. Hence this study uses direct methods to calculate the cranial and facial indices.

In this study it was found that statistically significant (p=0.011) differences existed in the mean cephalic index values among the three groups. The EP group had higher mean cephalic index (82.36mm±4.10mm) than the MP (76.92mm±4.45mm) and LP group (77.09mm±6.03mm). Pairwise comparison also showed significant differences between the groups EP vs. MP and EP vs. LP. However these findings should be further investigated with large sample size of EP group.

Comparison of maxillary inter-canine width among the three groups of FI reveals significant difference (P=0.034) among the groups. Pairwise comparison shows the difference lies between MP v/s LP group (P=0.028).

Maxillary inter-premolar width among the three groups of FI also have significant difference (P=0.016). Pairwise comparison shows the difference lies between MP v/s LP group (P=0.015). In other groups no significant differences was found.

Ahmed and Ali et al.¹⁸ (2012) concluded that the relation between facial type and upper dental arch form is a direct one, and as the facial type graduated from LP to MP to EP the maxillary dental arch form increases from narrow to mid to wide. However our studies failed to find any such relation.

No statistically significant differences existed in the maxillary AL, PPD and MPD values among the three groups.

Mandibular ICW, IPW, IMW did not show any significant difference among the groups.

Paranhos et al.¹⁹ (2014) and Nayar et al.²⁰ (2015) concluded that the facial type was not associated with mandibular dental arch forms in individuals with normal occlusion.

The shortcoming of this study were-

(i) It was assumed that when comparing a ratio (CI, FI) to absolute values, (dental arch dimensions such as ICW, IPW, IMW etc.) that head sizes are similar in all subjects. Variation in head and arch size has been assumed to not exist.

- (ii) Soft tissue thickness may effect measurements of the anthropometric values. Dry skull or CT scan study of the subjects will be more accurate.
- (iii) Measurements made on digital models, generated from intra oral scans, are suggested for better accuracy.
- (iv) Dental class I was chosen regardless of skeletal pattern. Further studies can be done on class I, II or III malocclusion and with various growth pattern.
- (v) Sample size was small in EP group after grouping.
- (vi) Separate grouping and comparison between male and female may be done.

Further studies can be done on class I, II, or III malocclusion and with various skeletal patterns with large sample size.

Clinical significance of the findings is that the arch form or shape should not be guided by the facial form. The shape of head may be suggestive of the arch form to be used in the maxillary arch, such as a broader arch form may be expected in a broader head.

IV. Conclusion

A lot of study had been done on FI and CI. But very few study have been done to find relation, if any exists between CI, FI and arch dimensions. Based on the assessment of the CI, FI and arch dimensions it can be concluded that in the study population the commonest head form is mesocephalic and the commonest face form is leptoprosopic. A very weak relation exists between the CI, FI and arch dimensions. Understanding the facial proportion can be the key to both diagnosis and treatment of an orthodontic patient. With the increased use of arch wires to correct transverse dimensions of dental arches the increased knowledge of a link between facial proportion and dental arch width can be of immense help to orthodontists.

References

- [1]. Kanashiro LK, Vigorito JW. A study of the form and dimensions of the superior and inferior dental arches, in Brazilians, with Class-II, Division-1 malocclusion, and different facial types. *Ortodontia* 2000; 33:8-18.
- [2]. Lee RT. Arch width and form: a review. *Am J Orthod Dentofacial Orthop* 1999; 115:305-13. Comment in: *Am J Orthod Dentofacial Orthop* 1999; 116:17A-8A.
- [3]. Ricketts RM. *Orthodontic diagnosis and planning: their roles in preventive and rehabilitative dentistry*. Philadelphia: W. B. Saunders; 1982
- [4]. K. Lakshmi Kumari, P. V. S. S. Vijaya Babu, P. Kusuma Kumari, M. Nagamani. A study of cephalic index and facial index in Visakhapatnam, Andhra Pradesh, India. *Int J Res Med Sci*. 2015 Mar;3(3):656-658.
- [5]. Farkas LG, Munro IR. *Anthropometric facial proportions in medicine*. Springfield,IL: Charles C. Thomas Publisher; 1986. p. 344.
- [6]. C. Matthew Forster, Elaine Sunga and Chun-Hsi Chung. Relationship between dental arch width and vertical facial morphology in untreated adults *European Journal of Orthodontics* 30 (2008) 288–294
- [7]. Raberin M, Laumon B, Martin JL, Brunner F. Dimensions and form of dental arches in subjects with normal occlusions. *Am J Orthod Dentofacial Orthop* 1993; 104:67-72.
- [8]. Burris BG, Harris EF. Maxillary arch size and shape in American blacks and whites. *Angle Orthod* 2000; 70:297-302.
- [9]. Bishara SE, Bayati P, Jakobsen JR. Longitudinal comparisons of dental arch changes in normal and untreated Class-II, Division-subjects and their clinical implications. *Am J Orthod Dentofacial Orthop* 1996; 110:483-9.
- [10]. Anwar, N., Fida, M. (2010). Variability of arch forms in various vertical facial patterns. *Journal of the College of Physicians and Surgeons Pakistan*, 20(9), 565-70.
- [11]. IMRAN TAJIK, NASIR MUSHTAQ, MUSLIM KHAN. Arch forms among different angle classifications a – study. *Pakistan oral & dental journal*; vol 31;no. 1,june 2011.
- [12]. Trivedi H ,Azam A ,Tandon R, Chandra P ,Kulshrestha R, Gupta A. Correlation between Morphological Facial Index and Canin Relationship in Adults - An Anthropometric Study *Kulshrestha R, et al. Dental Research and Mangt* 2017, 2:1
- [13]. DoniP. K., R, Janaki CS, Vijayaraghavan. V, Delhi raj UA study on measurement and correlation of cephalic and facial indices in males of south indian population *Int j med res health sci*. 2013;2(3):439-446.
- [14]. Tahamida Yesmin, San San Thwin, Shazia Afrin Urmi, MarMar Wai, Pu. Fazlin Zaini, and Khairil Azwan A Study of Facial Index among Malay Population *Journal of Anthropology Volume* 2014, Article ID 726974
- [15]. Torres-Restrepo. A. M.; Quintero-Monsalve AM, Giraldo-Mira JF, Rueda ZV Vélez-Trujillo N and Botero-Mariaca P. Agreement between cranial and facial classification through clinical observation and anthropometric measurement among envigado school children. *BMC; Oral Health*; 2014.
- [16]. Fernanda Catharino Menezes Franco et al Brachycephalic, dolichocephalic and mesocephalic: Is it appropriate to describe the face using skull patterns? *Dental Press J Orthod*. 2013 May-June;18(3):159-63.
- [17]. Paranhos L. R. .Is there any association between facial type and mandibular dental arch form in subjects with normal subjects; *Acta scieniarum v 36 33n1p129-134*.

DR. SNIGDHA MONDAL CHOWDHURY, et. al. "Relationship of Dental Arch Dimensions with Cephalic and Facial Indices." *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 20(09), 2021, pp. 01-09.