Annals of R.S.C.B., ISSN:1583-6258, Vol. 24, Issue 2, 2020, Pages. 962-970
Received 24 October 2020; Accepted 15 December 2020

Relation of Dental Crowding to Arch Dimensions in Andhra Pradesh Population

Dr. Divya Kumar Jain[1], Dr.P.Revathi[2], Dr. Asiya Fatima[3], Dr. Gargilaxmi Elkunchwar[4], Dr. Nikhita Pekhale[5], Dr. Ruchiketan S. Gute[6]

[1]Assistant Professor, Department of Dentistry, Jhalawar Medical College , Jhalawar, Rajasthan
[2]Professor and Head, Department of Orthodontics and Dentofacial Orthopaedics, SIBAR Institute of dental sciences, Guntur, A.P
[3]Lecturer, Department of Orthodontics and Dentofacial Orthopaedics, Maharishi Markandeshwar Deemed to be University, Mullana, Ambala, Punjab
[4]Sr. Lecturer, Department of Orthodontics, SMBT Institute of Dental Sciences and Research, Dhamangaon Ghoti, Nashik, Maharashtra
[5]Sr. Lecturer, Department of Orthodontics, SMBT Institute of Dental Sciences and Research, Dhamangaon Ghoti, Nashik, Maharashtra
[6]Professor, Department of Orthodontics, SMBT Institute of Dental Sciences and Research, Dhamangaon Ghoti, Nashik, Maharashtra
[1]divya.j.inn@gmail.com, [2]revathipeddu@gmail.com, [3]drasiyafatima@ymail.com ,
[4]gargilaxmi6891@gmail.com, [5]nikhitapekhale@gmail.com, [6]ruchiketan10ortho@gmail.com
Corresponding authors name: Dr. Divya Kumar Jain
divya.j.inn@gmail.com

Abstract:
Introduction: Dental crowding is the difference between the space needed in the dental arch and the space available in that arch. The conditions which may predispose the dental arches to crowding are excessively large teeth, excessively small bony bases of the jaws, and a combination of large teeth and small jaws. Jaw dimensions have a strong genetic control, and the transverse dimensions affect the amount of space available to accommodate teeth. The objectives of the present study were to evaluate the relationship of the dental crowding to arch dimensions and to correlate the sex differences, if any, to dental crowding in Andhra Pradesh population.
Materials and Methods: Present study was conducted to evaluate the relationship of the dental crowding to arch dimensions in Andhra Pradesh population. The Maxillary and Mandibular casts of 100 subjects belonging to 13 to 21 years of age were collected following specific inclusion criteria. Data was entered in MS Excel and unpaired T test was used in data analysis.
Results and Conclusion: Lingual arch width in canine region of maxillary arch was found more in crowded group than non crowded group. Non crowded group has more lingual and buccal arch width in molar region of maxillary arch and buccal arch width in canine region of mandibular arch than crowded group. Males of non crowded group has more lingual arch width in canine region of maxilla, buccal arch width in molar region of maxilla, buccal arch width in canine region of mandible, lingual arch width in molar region of mandible and buccal arch width in molar region of mandible than females of non crowded group. Males of crowded group has more maxillary arch perimeter than females of crowded group.

Key words: *dental overcrowding, arch dimension, maxillary and mandibular arches*

I. INTRODUCTION

Dental crowding, as described by Nance, as quoted by D. Radnzic[1], is the difference between the space needed in the dental arch and the space available in that arch. Three conditions which may result in crowding are excessively large teeth, excessively small bony bases of the jaws, and a combination of large teeth and small jaws. Age, sex and race also play a role in dental crowding as described by studies by Raymond P. Howe[2]. Dental crowding is more disturbing to the patients when located in the anterior segment of the dental arch because it often affects the quality of patient's smile and speech causing social embarrassment to patient. Crowding sometimes obstructs the access for maintenance of oral hygiene leading to periodontal complications. Jaw dimensions do seem to have a strong genetic control, and the transverse

Annals of R.S.C.B., ISSN:1583-6258, Vol. 24, Issue 2, 2020, Pages. 962-970
Received 24 October 2020; Accepted 15 December 2020

dimensions directly affect the amount of space available for the teeth.

Environmental factors may have played some role in the recent increase in crowding of the dental arches. Perhaps the relatively recent alterations in diet which is not as coarser, without question have reduced the functional demands on the jaws, have accelerated the already occurring trend toward reduction in jaw size. It has been found by Sangeeta A. Gowalkar et al[3], that arch width and crowding are strongly correlated and that a narrow arch in man predisposes to crowding of the teeth. Also suggested by D. Radnzic[1] (1988), a complex interrelationship is present amongst cumulative mesiodistal crown widths, the various arch dimensions, and primary dental crowding. Raymond P. Howe[2] (1983) stated that significant differences are present between the dental arch dimensions of crowded and non crowded arches and consideration should be given to those treatment techniques which increase dental arch length rather than reducing the tooth mass. Edward F. Harris[4] (1982) stated that the crowded group had smaller dental arch dimensions than the non-crowded group. Ashley E. Howes[5] (1947) studied relationship of tooth material to the supporting bone and concluded that normal occlusion is supported by a normal apical base and malocclusions have either a deficient or deformed apical bases. Mary Lynn Merz et al[6] undertook study in which he found that the dental arches of the black patients were significantly wider and deeper and did not show significantly more crowding. O. Mockers et al[7](2004) conducted a study with the aim of investigating dental crowding form the Copper Age and results of their study concluded that crowding may be of genetic origin. In one such study, Francesco Pachi et al[8] (2009) found that a clear pattern of association existed between extended head posture and lower arch dental crowding.

To evaluate the differences between tooth material and arch dimensions, Arch perimeter model analysis is carried out prior to starting orthodontic treatment. This study was taken up to evaluate the relationship of the dental crowding to arch dimensions in Andhra Pradesh population.

1. 1 Aims and objectives:

The objectives of the present study were:-

1. To evaluate the relationship of the dental crowding to arch dimensions in Andhra Pradesh population.
2. To correlate the sex differences, if any, to dental crowding.

II. MATERIALS AND METHODS

This study was undertaken in the Department of Orthodontics and Dent facial Orthopedics, SIBAR Institute of Dental Sciences, Guntur, Andhra Pradesh, India, to evaluate the relationship of the dental crowding to arch dimensions in Andhra Pradesh population.

The Maxillary and mandibular casts of 100 subjects belonging to Andhra Pradesh between 13 to 21 years of age were collected following specific inclusion criteria. These subjects were divided into 2 groups. Group I (non crowded group) exhibited no crowding and Group II (crowded group) exhibited gross crowding. In the Group I (non crowded group), maxillary and mandibular casts of 50 subjects (25 boys and 25 girls) were selected from students of different schools and colleges in Guntur District.

The criteria implied for the selection of the subjects of this group were:-

(i) Well aligned dental arches
(ii) Angle's class I molar relation
(iii) Angle's class I canine relation
(iv) Maximum overbite of 2-3 mm
(v) Maximum overjet of 2-3 mm
(vi) Slight rotations and mild midline deviations were accepted.

This group was further subdivided into two groups for evaluating sex predilection.

GROUP I. A: 25 male subjects following this criterion

GROUP I. B: 25 female subjects following this criterion

In the Group II (crowded group), maxillary and mandibular casts of 50 subjects (25 boys and 25 girls) were selected on the basis of gross crowding, who were in the age group of 13 to 21 years with crowding more than 2 mm.

This group also was further subdivided into two groups for sex predilection. They are:-

Annals of R.S.C.B., ISSN:1583-6258, Vol. 24, Issue 2, 2020, Pages. 962-970
Received 24 October 2020; Accepted 15 December 2020

GROUP II. A: 25 male subjects with crowding
GROUP II. B: 25 female subjects with crowding
The measurements were taken on dental casts of these groups were:-

- Lingual arch width for first molar was measured at the cervical region from midpoint of the lingual surface of the molar to corresponding point on its antimere.
- Lingual arch width for canine was measured at the cervical region from midpoint of the lingual surface of the canine to corresponding point on its antimere.
- Buccal arch width for first molar was taken from a point, 5 mm apical to the mesiodistal centre of the molar towards gingival margin, to its corresponding point across the dental arch.
- Buccal arch width for canine was measured from a point, 5 mm apical to the mesiodistal centre of the canine towards gingival margin, to its corresponding point across the dental arch.
- Arch perimeter was measured from distal surface of 1st permanent molar to the distal surface of opposing molar at the buccal aspect according to Proffit method. The dental arch is divided into segments which can be measured into straight lines approxing the arch.

The segments of straight lines were:-

1. Segment A - distal surface of permanent 1st molar on right side to mesial surface of canine on right side.
2. Segment B - mesial of canine on right side to dental midline.
3. Segment C - dental midline to mesial surface of canine on left side.
4. Segment D - mesial of canine to distal of permanent 1st molar of left side.

All these measurements were done using digital vernier caliper (AEROSPACE, China make) which is accurate to 0.01 mm. To quantify the intraobserver error, a second set of readings were made after an interval of one week and both the sets were statistically compared and analyzed for errors, and the average of both the readings was taken.

After the measurements were made and tabulated, the following comparisons were done:

a. Between canine arch width (lingual and buccal)
b. Between molar arch width (lingual and buccal)
c. Between arch perimeters

Statistical Analysis: all the data is entered in MS Excel and analyzed through SPSS Software 10.0 (Trail version) and unpaired T test is used in data analysis

Result:

Table 1: Arch perimeter of upper and lower arches (comparison between two sets of readings)

APU & L(1) VS APU & L(2)					
		N	Mean	Std. Deviation	P VALUE
Segment A (U)	APU&L(1)	100	32.45	1.90	0.704 NS
	APU&L(2)	100	32.34	2.16	
Segment B (U)	APU&L(1)	100	15.59	1.26	0.853 NS
	APU&L(2)	100	15.64	2.11	
Segment C (U)	APU&L(1)	100	15.72	1.33	0.823 NS
	APU&L(2)	100	15.68	1.28	
Segment D (U)	APU&L(1)	100	32.26	2.65	0.571 NS
	APU&L(2)	100	32.45	1.89	
AP (U)	APU&L(1)	100	96.02	4.92	0.908 NS
	APU&L(2)	100	96.10	4.80	
Segment A (L)	APU&L(1)	100	32.39	2.34	0.871 NS
	APU&L(2)	100	32.44	2.04	
Segment B (L)	APU&L(1)	100	10.24	1.52	0.996 NS
	APU&L(2)	100	10.24	1.55	
Segment C (L)	APU&L(1)	100	10.51	1.41	0.757 NS
	APU&L(2)	100	10.45	1.31	

Annals of R.S.C.B., ISSN:1583-6258, Vol. 24, Issue 2, 2020, Pages. 962-970
Received 24 October 2020; Accepted 15 December 2020

Segment D (L)	APU&L(1)	100	32.34	1.80	0.894 NS
	APU&L(2)	100	32.30	1.77	
AP (L)	APU&L(1)	100	85.48	4.76	0.604 NS
	APU&L(2)	100	85.11	5.49	

(U) = Upper
(L) = Lower
AP = Arch Perimeter

Table 2: Buccal and lingual arch widths in canine and molar region of upper and lower arches (comparison between two sets of readings)

AW(1) VS AW(2)					
		N	Mean	Std. Deviation	P VALUE
ULAW (C)	AW(1)	100	25.48	2.59	0.5320 NS
	AW(2)	100	25.25	2.51	
UBAW (C)	AW(1)	100	36.80	3.49	0.7603 NS
	AW(2)	100	36.65	3.54	
ULAW (M)	AW(1)	100	35.17	2.75	0.8629 NS
	AW(2)	100	35.11	2.78	
UBAW (M)	AW(1)	100	56.39	3.37	0.4192 NS
	AW(2)	100	55.97	4.06	
LLAW (C)	AW(1)	100	19.22	2.33	0.9858 NS
	AW(2)	100	19.22	2.42	
LBAW (C)	AW(1)	100	27.65	2.47	0.6892 NS
	AW(2)	100	27.46	3.80	
LLAW (M)	AW(1)	100	32.25	3.36	0.9266 NS
	AW(2)	100	32.21	3.45	
LBAW (M)	AW(1)	100	52.21	3.61	0.9875 NS
	AW(2)	100	52.20	3.71	

ULAW = Upper Lingual Arch Width
LLAW = Lower Lingual Arch Width
UBAW = Upper Buccal Arch Width
LBAW = Lower Buccal Arch Width
(C) = Canine Region
(M)= Molar Region

Table 3: Non Crowded VS Crowded

NC VS C					
GROUP		N	Mean	Std. Deviation	P-VALUE
AP(U)	NC	50	94.87	4.50	0.18 NS
	C	50	97.1748	5.10	
AP(L)	NC	50	86.2034	4.62	0.1305 NS
	C	50	84.7612	4.84	
ULAW(C)	NC	50	24.921	1.79	0.0317 S
	C	50	26.032	3.12	
UBAW(C)	NC	50	36.7716	2.75	0.9285 NS
	C	50	36.8346	4.12	
ULAW(M)	NC	50	35.9692	2.46	0.0033

Annals of R.S.C.B., ISSN:1583-6258, Vol. 24, Issue 2, 2020, Pages. 962-970
Received 24 October 2020; Accepted 15 December 2020

	C	50	34.3778	2.82	S
UBAW(M)	NC	50	57.0678	2.68	0.0455 S
	C	50	55.7212	3.85	
LLAW(C)	NC	50	19.0374	2.08	0.4249 NS
	C	50	19.412	2.57	
LBAW(C)	NC	50	28.324	1.90	0.0056 S
	C	50	26.969	2.79	
LLAW(M)	NC	50	32.6182	2.43	0.2758 NS
	C	50	31.8816	4.08	
LBAW(M)	NC	50	52.834	2.43	0.0839 NS
	C	50	51.584	4.42	

(U) = Upper
(L) = Lower
AP = Arch Perimeter
ULAW = Upper Lingual Arch Width
LLAW = Lower Lingual Arch Width
UBAW = Upper Buccal Arch Width
LBAW = Lower Buccal Arch Width
(C) = Canine Region
(M) = Molar Region

Table 4: Non Crowded Females VS Crowded Females

NC(FEMALE) VS C (FEMALE)						
GROUP			N	Mean	Std. Deviation	P-VALUE
AP(U)	NC	FEMALE	25	94.75	3.55	0.49554 NS
	C	FEMALE	25	95.56	4.77	
AP(L)	NC	FEMALE	25	86.31	5.46	0.08421 NS
	C	FEMALE	25	83.99	3.65	
ULAW(C)	NC	FEMALE	25	24.42	1.94	0.06 NS
	C	FEMALE	25	25.80	2.98	
UBAW(C)	NC	FEMALE	25	36.45	2.55	0.47146 NS
	C	FEMALE	25	35.98	2.03	
ULAW(M)	NC	FEMALE	25	35.51	2.01	0.045 S
	C	FEMALE	25	34.26	2.28	
UBAW(M)	NC	FEMALE	25	56.00	2.11	0.36737 NS
	C	FEMALE	25	55.39	2.62	
LLAW(C)	NC	FEMALE	25	18.99	1.33	0.8805 NS
	C	FEMALE	25	18.92	1.63	
LBAW(C)	NC	FEMALE	25	27.75	1.56	0.04309 NS
	C	FEMALE	25	26.72	1.92	
LLAW(M)	NC	FEMALE	25	31.79	2.15	0.27099 NS
	C	FEMALE	25	31.06	2.50	
LBAW(M)	NC	FEMALE	25	51.91	2.01	0.3466 S
	C	FEMALE	25	51.11	3.66	

Annals of R.S.C.B., ISSN:1583-6258, Vol. 24, Issue 2, 2020, Pages. 962-970
Received 24 October 2020; Accepted 15 December 2020

(U) = Upper
(L) = Lower
AP = Arch Perimeter
ULAW = Upper Lingual Arch Width
LLAW = Lower Lingual Arch Width
UBAW = Upper Buccal Arch Width
LBAW = Lower Buccal Arch Width
(C) = Canine Region
(M)= Molar Region

Table 5: Non Crowded Males VS Crowded Males

NC(MALE) VS C (MALE)						
GROUP			N	Mean	Std. Deviation	P-VALUE
AP(U)	NC	MALE	25	94.99	5.36	0.1268
	C	MALE	25	98.79	4.99	NS
AP(L)	NC	MALE	25	86.09	3.7	0.6844
	C	MALE	25	85.53	5.76	NS
ULAW(C)	NC	MALE	25	25.42	1.5	0.2494
	C	MALE	25	26.27	3.3	NS
UBAW(C)	NC	MALE	25	37.09	2.97	0.629
	C	MALE	25	37.69	5.38	NS
ULAW(M)	NC	MALE	25	36.43	2.81	0.0314
	C	MALE	25	34.49	3.33	S
UBAW(M)	NC	MALE	25	58.14	2.8	0.0694
	C	MALE	25	56.06	4.82	NS
LLAW(C)	NC	MALE	25	19.09	2.66	0.3345
	C	MALE	25	19.9	3.21	NS
LBAW(C)	NC	MALE	25	28.9	2.07	0.0443
	C	MALE	25	27.22	3.47	S
LLAW(M)	NC	MALE	25	33.44	2.46	0.5202
	C	MALE	25	32.71	5.12	NS
LBAW(M)	NC	MALE	25	53.76	2.5	0.143
	C	MALE	25	52.05	5.11	NS

(U) = Upper
(L) = Lower
AP = Arch Perimeter
ULAW = Upper Lingual Arch Width
LLAW = Lower Lingual Arch Width
UBAW = Upper Buccal Arch Width
LBAW = Lower Buccal Arch Width
(C) = Canine Region
(M)= Molar Region

Two sets of readings were taken for all parameters to determine any significant intra-observer difference. The readings were subjected to statistical analysis.

The statistical results showed that there is no significant difference between the two sets of readings of arch dimensions including - arch perimeter, lingual arch width in canine region, buccal arch width in canine region, lingual arch width in molar region, buccal arch width in molar region **(Table 1 and Table 2) -** in both maxillary and mandibular arches.

Comparisons were made between non crowded (sample size - 50) and crowded groups (sample size - 50) as shown in **Table 3:** There is significant difference in Lingual arch width in canine region of maxillary arch

Annals of R.S.C.B., ISSN:1583-6258, Vol. 24, Issue 2, 2020, Pages. 962-970
Received 24 October 2020; Accepted 15 December 2020

of non crowded (24.921) and crowded group (26.032) ($p<0.05$). There is also Significant difference between in non crowded (35.9692) and crowded group(34.3778) in Lingual arch width in molar region of maxillary arch ($p<0.05$). Also shown significant difference between non crowded (57.0678) and crowded group(55.7212) in Buccal arch width in molar region of maxillary arch ($p<0.05$).And have significant difference between non crowded (28.324) and crowded group (26.969) in Buccal arch width in canine region of mandibular arch ($p<0.05$). But No significant difference between non crowded and crowded group in Arch perimeter of maxillary arch, Arch perimeter of mandibular arch, Buccal arch width in canine region of maxillary arch, Lingual arch width in canine region of mandibular arch, Lingual arch width in molar region of mandibular arch and Buccal arch width in molar region of mandibular arch ($p>0.05$).

Table 4 suggests**:** There significant differences were found between non crowded (35.21) and crowded group (34.26) of females in Lingual arch width in maxillary molar region ($p<0.05$). There is also significant differences were found between non crowded (51.91) and crowded group (51.11) of females in Buccal arch width in mandibular molar region. But no significant differences were found between non crowded and crowded group of females in Arch perimeter of maxillary arch, Arch perimeter of mandibular arch, Lingual arch width in canine region of maxillary arch, Buccal arch width in canine region of maxillary arch, Buccal arch width in molar region of maxillary arch, Lingual arch width in canine region of mandibular arch, Buccal arch width in canine region of mandibular arch and Lingual arch width in molar region of mandibular arch ($p>0.05$).

Table 5 concludes**:** There was significant differences were found between non crowded (36.43) and crowded group (34.49) of males in Lingual arch width in molar region of maxillary arch ($p<0.05$). And also significant differences were found between non crowded (28.9) and crowded group (27.22) of males in Buccal arch width in canine region of mandibular arch ($p<0.05$). But no significant differences were found between non crowded and crowded group of males in Arch perimeter of maxillary arch, Arch perimeter of mandibular arch, Lingual arch width in canine region of maxillary arch, Buccal arch width in canine region of maxillary arch, Buccal arch width in molar region of maxillary arch, Lingual arch width in canine region of mandibular arch, Lingual arch width in molar region of mandibular arch and Buccal arch width in molar region of mandibular arch ($p>0.05$).

III. SUMMARY OF RESULT

The results showed that:-

1. Lingual arch width in canine region of maxillary arch were found more in crowded group that non crowded group
2. Non crowded group has more lingual and buccal arch width in molar region of maxillary arch and buccal arch width in canine region of mandibular arch than crowded group
3. Males of non crowded group has more lingual arch width in canine region of maxilla, buccal arch width in molar region of maxilla, buccal arch width in canine region of mandible, lingual arch width in molar region of mandible and buccal arch width in molar region of mandible than females of non crowded group
4. Males of crowded group has more maxillary arch perimeter than females of crowded group.
5. Lingual arch width in molar region of maxillary arch and buccal arch width in molar region of mandibular arch was more in females of non crowded group than in females of crowded group
6. Lingual arch width in molar region of maxilla and buccal arch width in canine region of mandible was more in non crowded males than in crowded males.

IV. DISCUSSION

The importance of discrepancy causing crowding in treatment planning has been the subject of various discussions. It is thus important to know the underlying cause for the malocclusion so as to plan the corrective treatment accordingly.

In primates and ancient people, a small but significant proportion exists amongst malocclusions caused by inherited anomalies, developmental disturbances, and other known causes. Teratogens, growth disturbances, developmental anomalies, genetic influences, genetic admixture of people from different parts of the world, and habits such as thumb sucking and tongue thrusting, attribute to malocclusion. However, causative factors for most modern malocclusions are disparity between jaw size and total tooth-arch length.

Annals of R.S.C.B., ISSN:1583-6258, Vol. 24, Issue 2, 2020, Pages. 962-970
Received 24 October 2020; Accepted 15 December 2020

Dental crowding may also be the resultant of dental factors like early loss of primary teeth, supernumerary teeth eg. Mesiodens, supplemental etc., hyperdontia, retained primary teeth, midline diastema, dilacerations, ectopic maxillary canines or impacted canines.
This study was taken up to evaluate the causes of dental crowding in Andhra Pradesh population.
In this study 100 subjects in the age group beween 13 to 21 years were selected, with 50 subjects exhibiting well aligned arches, while the other 50 subjects exhibiting gross crowding following specific inclusion criterion and were further devided into 25 males and 25 females in the non crowded and 25 males and 25 females in the crowded group for evaluating sex predilection.
These two groups were taken up to compare arch perimeter and canine and molar arch widths (both buccal and lingual) and the measurements of Lingual arch width, Buccal arch width and Arch perimeter (Proffit method) were made on the casts of both the groups:-

After the measurements were done, the comparisons were made

a. Between canine arch width (lingual and buccal)
b. Between molar arch width (lingual and buccal)
c. Between arch perimeters

The results were then tabulated and subjected to statistical analysis by using independent sample t-test and inference was drawn.
The results obtained by the study showed :-

1. Crowded group had more lingual arch width in canine region of maxillary arch than non crowded group.
2. Non crowded group had more lingual arch width in molar region of maxillary arch than crowded group
3. Non crowded group had more buccal arch width in molar region of maxillary arch than crowded group
4. Non crowded group had more buccal arch width in canine region of mandibular arch than crowded group
5. Lingual arch width in molar region of maxillary arch was more in females of non crowded group than in females of crowded group
6. Buccal arch width in molar region of mandibular arch was more in females of non crowded group than in females of crowded group
7. Lingual arch width in molar region of maxilla was more in non crowded males than in crowded males
8. Buccal arch width in canine region of mandible was more in non crowded males than in crowded males

These findings show that the arch dimensions are differing in the crowded and non crowded groups but only at few instances. It is also found that in certain comparisons the arch width was more in crowded group which can be a result of natural compensations made to accommodate the excess tooth material to the arch.
There were certain studies which were having the results same as present study that it is not the dental arch size which results in crowding like the one of Norderval and colleagues[1] who have reported it was the mesiodistal widths of teeth responsible for crowding and not the arch size. Also, Doris and co-workers[9] in their study found the crowded group having uniformly larger teeth. Tancan Uysal et al[10] also states that it is the cumulative mesiodistal width of the tooth, which contribute more towards crowding while the other factors like arch perimeter and lingual and buccal arch widths contributes much less to crowding.
Some other studies had findings which were in contrast with the findings of the present study. Loren F. Mills[11] (1964) indicated that significant correlation is present between malalignment of teeth and arch widths.
Thus, this study is states that factors like arch perimeter and lingual and buccal arch widths contributes much less to crowding in patients of Andhra Pradesh population.

V. CONCLUSION

The study revealed that arch perimeter did not show any variation in crowded and non crowded groups but it was found more in maxillary arch of males of crowded group than females of crowded group. Even arch widths were differing in between crowded and non crowded groups but most of them were statistically

insignificant. Even at an instance, i.e when crowded and non crowded groups; and males and females were compared, lingual arch width of maxillary arch was found more in crowded group than non crowded group which might be a natural compensation for accommodating the more amount of tooth material.

References

1. Radnzic D. Dental crowding and its relationship to mesiodistal crown diameters and arch dimensions. Am J Orthod Dentofacial Orthop 1988;94:50-8
2. Raymond P. Howe, McNamara JA Jr., O'Connor KA. An examination of dental crowding and its relationship to tooth size and arch dimension. Am J Orthod 1983;83:363-73
3. Sangeeta A. Gowalkar and Keki M. Mistry. An evaluation of dental crowding in relation to the mesiodistal crown widths and arch dimensions. J Ind Orthod Soc 2009;43:22-30
4. Edward F. Harris and Richard J. Smith. Occlusion and arch size in families. Angle Orthod 1982;52:135-43
5. Ashley E. Howes. Case analysis and treatment planning based upon relationship of the tooth material to its supporting bone. Am J Orthod Oral Surg 1947;33:499-533
6. Merz M.L., Isaacson R.J., Germane N., Rubenstein L.K. Tooth diameters and arch perimeters in a black and a white population. Am J Orthod Dentofacial Orthop 1991;100;53-58
7. Mockers O., Aubry M., Mafart B. Dental crowding in a prehistoric population. E J Orthod 2004;26:151-56
8. Francesco Pachi, Ruggero Turla, Alessandro Proietti Checchi. Head posture and lower arch dental crowding. Angle Orthod 2009;79:873–79
9. John M. Doris, Bernard B. W., Kuftinec M. M. A biometric study of tooth size and dental crowding. Am J Orthod 1981;79:326-336
10. Tancan Uysal, Zafer Sari, Faruk Ayhan Basciftci, Badel Memili. Intermaxillary tooth size discrepancy and malocclusion: Is there a relation?. Angle Orthod 2005;75:208–13
11. Loren F. Mills. Arch width arch length and tooth size in young adult males. Angle Orthod 1964;34:124-9