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PREVALENCE OF SKELETAL COMPONENTS OF MALOCCLUSION USING COMPOSITE CEPHALOMETRIC ANALYSIS

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ABSTRACT

The purpose of this study was to find out the prevalence of skeletal components of malocclusion using composite cephalometric analysis. Cephalograms of a total of 100 patients were assessed. Patients who were selected had the following characteristics. Adult patients, all teeth present except 3'd molars, no supernumerary or retained tooth and no transverse skeletal discrepancy.

The mean age of the sample was 18.28 years. 61% females and 39% were male patients.

The results were as follows;

Skeletal Class II was the most common antero-posterior malocclusion (47%).

Among vertical malocclusions the most common was the skeletal open bite (38%)

Bimaxillary proclination was the most common dental cephalometric finding (48%)

Patients with orthognathic profile & competent lips were most common (34%)

Components of various skeletal malocclusions were also assessed. Vertical growth pattern, dental inclinations, lip competency and profile of the patients were assessed in relation with sagital relationship.

Identification of prevalence of malocclusion using cephalometrics seems to be an important method as it includes skeletal component of malocclusion.

Key words: *Prevalence, Components of malocclusion, Cephalometrics*

INTRODUCTION

Researchers have employed different methods to differentiate between the various components of malocclusion. Most of the researchers have used Angle's Classification1while others have used different indices[2,3,4,5] to get information about prevalence[6,7,8] and to quantify the severity of various features of malocclusion. Although these methods are important and valuable but do not include skeletal components of malocclusion. Cephalometric Analysis[9] has also been used in few researches but the work is limited to individual malocclusions[10], e.g., Class II or Class III malocclusions (Guyer EC et al: Components of Class III malocclusions in juveniles and adolescents). In Pakistan little work is available on establishing prevalence of malocclusion and identifying the components of malocclusion especially using cephalometrics.

Purpose of this study was

- To find out the Prevalence of malocclusion in patients reporting at de`Montmorency College of Dentistry using Composite Cephalometric Analysis
- To find out the components of various malocclusions, i.e., of
  - > Skeletal Class I
  - > Skeletal Class II
  - > Skeletal Class III

MATERIALS AND METHODS

The study was conducted on 100 patients (61 females, 39 males) who reported at de`Montmorency College ofDentistry /Punjab Dental Hospital, Lahore.

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Lateral Cephalogram was taken, traced and analyzed for each patient. Composite Cephalometric Analysis was performed. Seven parameters (4 angular and 3 linear measurements) were used to evaluate sagittal relationship[1112], ten parameters (8 angular and 2 ratios) were used to evaluate the vertical growth pattern[13] of the patient, nine parameters (6 angular and 3 linear measurements) were used to assess the dental pattern of malocclusion and five parameters (4 linear and 1 angular measurement) were used to assess the profile and lip status. (Table I)

STATISTICAL METHOD

SPSS 8.0 is used for statistical evaluation. Table (II)

Dahlberg's method was used for the calculation of the operator's random error.

25 cephalograms were selected at random from the total of 100 available and twice the same investigator measured these

The formula being

$$Sm = \sqrt{\frac{\sum d^2}{2n}}$$

Sm = The Dahlberg's method error

d = The difference between the two measurements n = number of patients

$$Sm\ \frac{(x.0.975)}{n} < Qm < Sm\ 1\ \frac{(x.0.225)}{n}$$

Q = the actual method error

X = n degrees of freedom

RESULTS

The chronological age range of sample was 13-26 years, with a mean age of 18.28 years. The sex distribution was 39 males (39%) and 61 females (61%).The mean age of male patients was 18.25 years and mean age of female patients was 18.33 years.

Sample population showed that 31% of the patients had Skeletal Class I pattern. 47% of the patients had Skeletal Class II pattern, 21% had Skeletal Class III pattern while only 1% had Bimaxillary Retrognatism. (Graph I, Graph II)

Prevalence of horizontal components of Skeletal Class II and Skeletal class III malocclusion was also identified (Table III, Table IV). Among Class II cases, short mandible was dominant while among the Class III cases, short maxilla was prevalent. (Graph III, Graph IV).

By vertical malocclusions we mean whether the patient is a normal grower (mandible grows downward and forward), has a vertical growth pattern (mandible grows downward and backwards) or has a horizontal growth pattern (mandible grows upward and forward). Sample showed that 38% patients had high angle, 38% had normal angle while 24% had skeletal deep bite. (Graph V)

48% cases showed bimaxillary proclination, which was the most common of all the patterns. The second

TABLE 1. COMPOSITE CEPHALOMETRIC ANALYSIS (FIG. 5)

SAGITTAL ANYLYSIS (Fig. 1)	
< SNA	(80° — 84°)
< SNB	(78° — 82°)
< ANB [15]	(0° — 4°)
AO—BO Distance[14]	(F = 0 mm , M=1mm)
Anterior cranial base length	(X) mm
Mandibular corpus length	(X +7) mm
Facial angle	(81°±4°)

DENTAL ANALYSIS (Fig. 3)	
< U.I. SN	(102°±5°)
< U.I. Palatal	(108°±5°)
IMPA	(90°t5°)
I.I.A.	(135°±5°)
UI- NA distance	(4mm)
UI — Na Angle	(22°)
LI — NB distance	(4mm)
LI NB Angle	(25°)

VERTICAL ANALYSIS (Fig.2)	
< SN Mand. Plane	(32° ± 4°)
< SN Palatal Plane	(6° ± 4°)
< SN Occlusal Plane	(l7°±17°)
MMA	(25°±4°)
< Upper Occlusal	(11° ± 4°)
< Lower Occlusal	(14° ± 4°)
Y. axis (with SN)	(66°±4°)
Sum of posterior (inner) angles	(396°±4°)
Jaraback's Ratio	(65%±4%)
Ratio of Lower Anterior Facial height To Total Anterior Facial Height	(54%±2%)

SOFT TISSUE ANALYSIS (Fig. 4)	
Upper lip to E Line	(.3mm±2mm)
Lower lip to E line	(.2mm ± mm)
Upper lip to S Line	(0±2mm)
Lower lip to S Line	(0±2mm)
Effective H Angle	(7+5°)

TABLE II. COMPOSITE CEPHALOMETRIC ANALYSIS

n= 100					
	Mean	**S.D +**		**Mean**	**S.D +**
Sagittal Analysis			**Dental Analysis**		
SNA	80.3	1.74	< UI-SN	105.3	1.77
SNB	78.1	1.9	< UI-Pal. Plane	110.1	1.23
ANB	2.1	1.25	IMPA	91.3	1.65
Facial Angle	79.6	2.1	IIA	124.2	1.92
Witt's Value mm	0.9	1.08	< UI-NA	22.9	2.14
ACB (X) mm	67.3	1.83	UI-NA Distance	5.2	1.34
MCL (X+7) mm	73.2	2.2	< LI-NB	24.6	2.21
			LI-NB Distance	4.9	1.91
Vertical Analysis			**Soft Tissue Analysis**		
<SN-Mand.Plane	33.4	2.13			
<SN-Pal.Plane	6.6	1.61	U-Lip to E-Line	-4.2	1.31
<SN-Occlusal Plane	15.2	1.84	L-Lip to E-Line	-2.7	1.21
MMA	26.7	2.11	U-Lip to S-Line	-2.3	1.29
<Upper Occlusal	12.1	1.13	L-Lip to S-Line	-3.1	1.32
<Lower Occlusal	15.2	1.69	Effective H Angle	7.3	3.28
Sum of Posterior Inner Angles	397.9	4.88			
JaraBack's Ratio (S-Go/N-Me) %	66.1	2.24			
Facial Ratio (ANS-Me/N-Me) %	55.2	1.75			

TABLE III

Skeletal Class II is Categorized as	**Skeletal class III is Categorized as**
Skeletal Class II with large maxilla	Skeletal Class III with short maxilla
Skeletal Class II with short mandible	Skeletal Class III with large mandible
Composite Class II	Composite Class III

TABLE IV

Prevalence of each Class II pattern among the class II population is as:		**Prevalence of each Class III Pattern among the class III population is as:**	
Skeletal Class II with large maxilla	35%	Skeletal Class III with short maxilla	65%
Skeletal Class II with short mandible	62%	Skeletal Class III with large mandible	14%
Composite class II	3%	Composite Class **III**	21%

TABLE V

SKELETAL CLASS II SHOW THE FOLLOWING %AGES IN THEIR RELATION TO THE DENTAL PATTERNS

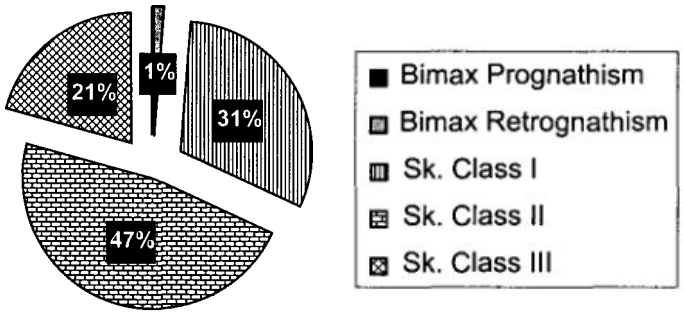
Cephalometric Dental Patterns	**%ages**
Bimaxillary proclination (Excessive o/j,lower incisors proclined as compensatory to increased o/j)	43%
Proclined Upper Incisors (Excessive o/j)	12%
Bimaxillary retroclination (98% show incisor div II)	12%
Upper & lower incisors normally inclined (Incisal angle of 135 degrees is evident in quiet considerable class II cases)	12%
Upper incisors Retroclined & lower proclined	6%
Upper normally inclined & lower proclined	6%
Upper incisors proclined & lower retroclined	6%
Upper normally inclined & lower retrocliend	3%

TABLE VI

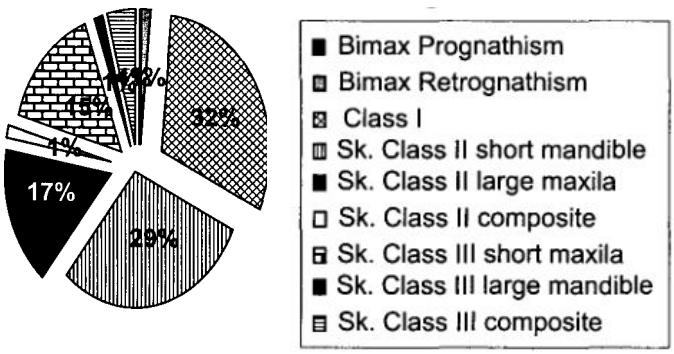
SKELETAL CLASS III SHOWS THE FOLLOWING %AGES IN THEIR RELATION TO THE DENTAL PATTERNS

Cephalometric Dental Patterns	**%ages**
Dental compensation (Severe Class III)	47%
Negative Overjet cases	20%
Upper/Lower Incisors normally inclined	20%
Upper incisors normally inclined while lower proclined	13%

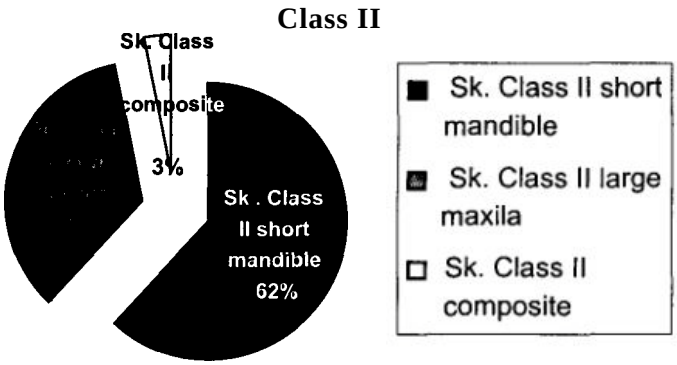
Graph I
Sigital Relations and their Categories



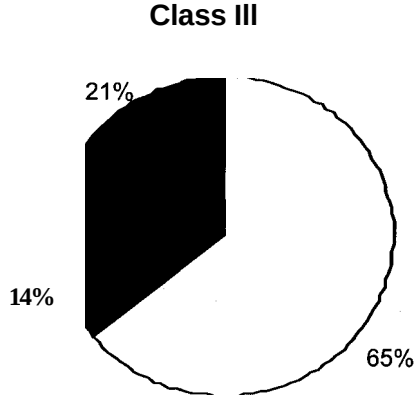
Graph II
Graph showing different skeletal patterns and the categories



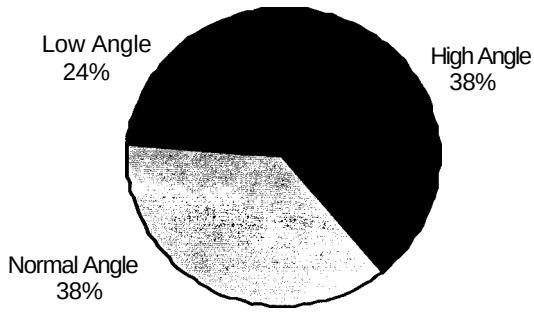
Graph III
Prevalence of Skeletal II Pattern



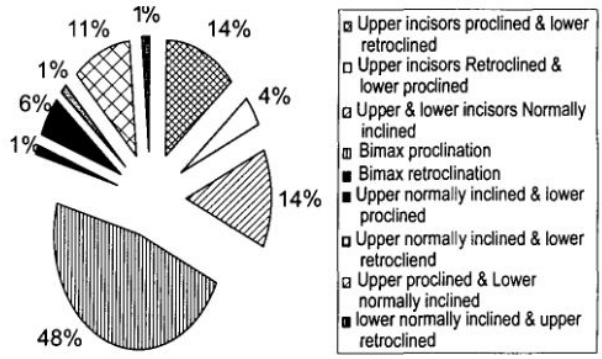
Graph IV
Prevalence of Skeletal III Pattern



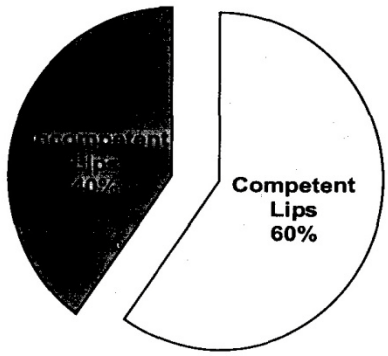
Graph V
Graphic Representation of Vertical Malocclusion



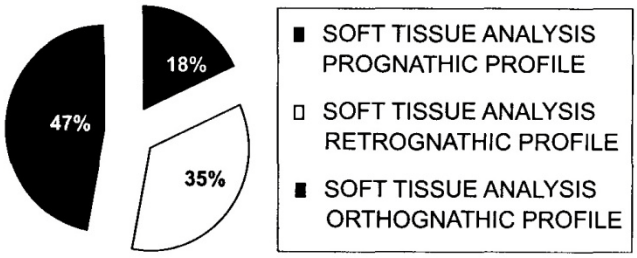
Graph VI
Graphic showing Dental Component of Malocclusion



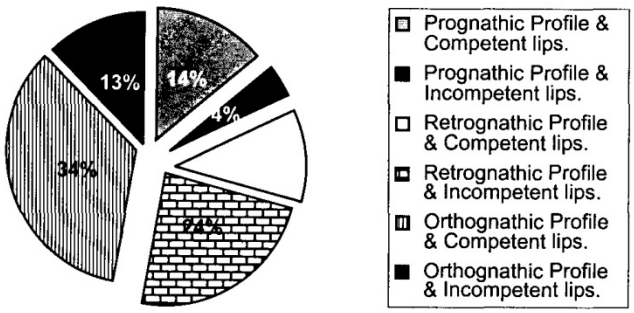
Graph VII
Graphic Representation of Lip Profile



Graph VIII
Facial Profile Analysis

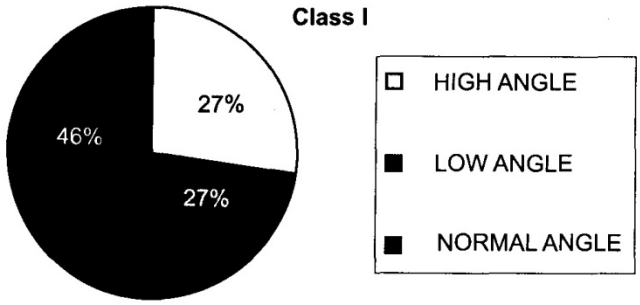


Graph IX
Comparison of Facial and Profiles

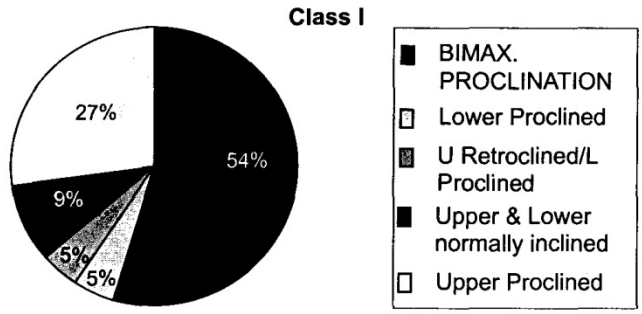


Components of Skeletal Class I

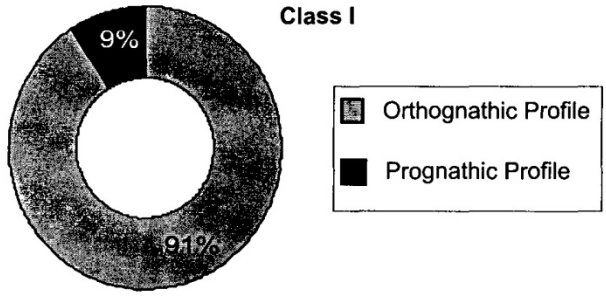
Graph X
Graphic representation of Correlation between Class I and different vertical Patterns



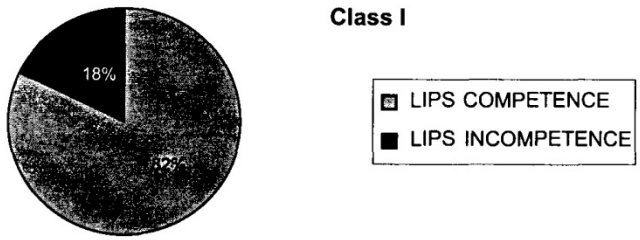
Graph XI
Graphic Representation of Correlation between Class I and different Dental Patterns



Graph XII
Graphic Representation of Correlation between Class I and different Facial Profiles

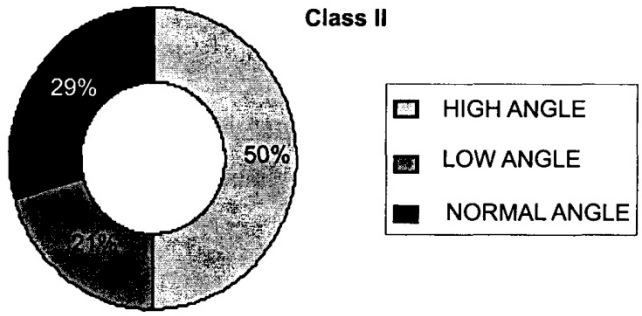


Graph XIII
Graphic Representation of Correlation between Class I and different Lip Profiles

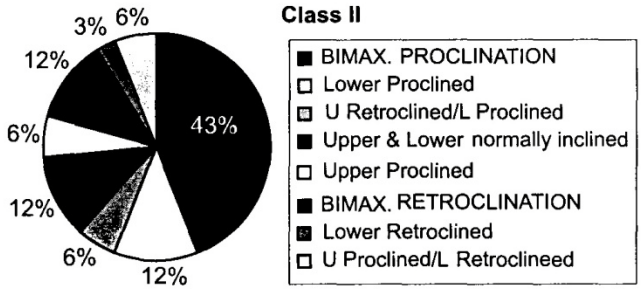


Components of Skeletal Class II

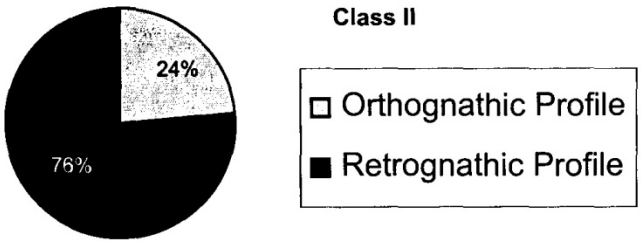
Graph XIV
Graphic Representation of Correlation between Class II and different Vertical Patterns



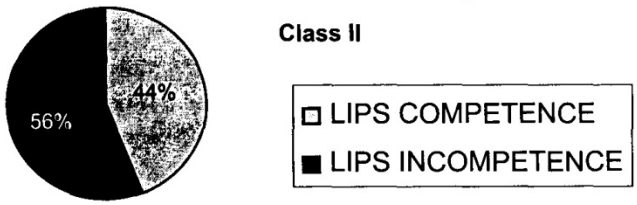
Graph XV
Graphic Representation of Correlation between Class II and different Dental Patterns



Graph XVI
Graphic Representation of Correlations between Class II and different Facial Profile

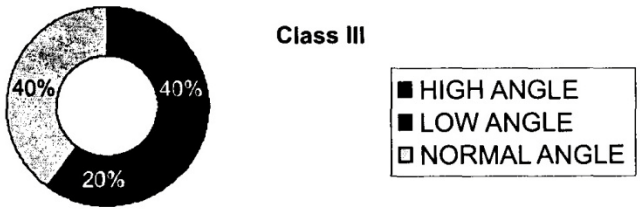


Graph XVII
Graphic Representation of Correlation between Class II and different Lip Profiles

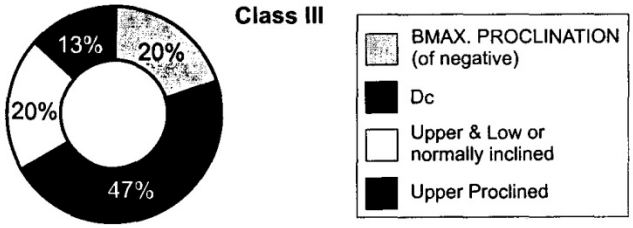


Components of Skeletal Class III

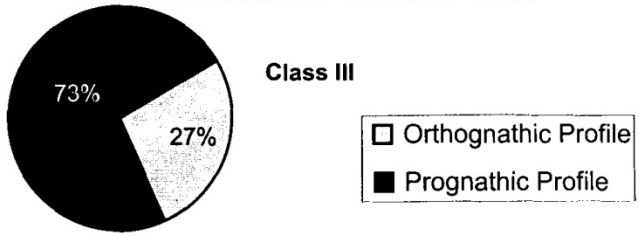
Graph XVIII
Graphic Representation of Correlation between Class III and different Vertical Patterns



Graph XIX
Graphic Representation of Correlation between Class III and different Dental Patterns



Graph XX
Graphic Representation of Correlation between Class I and different Facial Profiles



Graph XXI
Graphical Representation of Correlation between Class III and different Lip Profiles

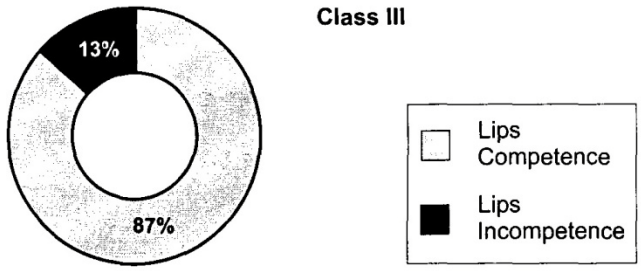
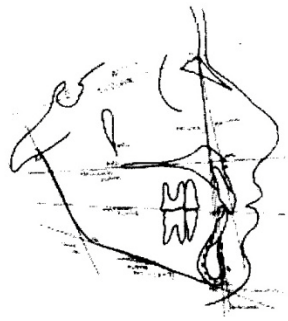
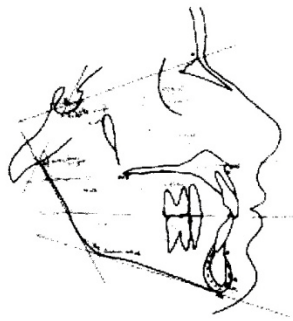


Fig 1



Sagital Analysis

Fig 2

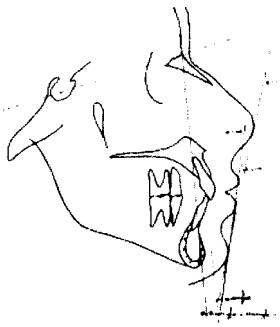


Vertical Analysis

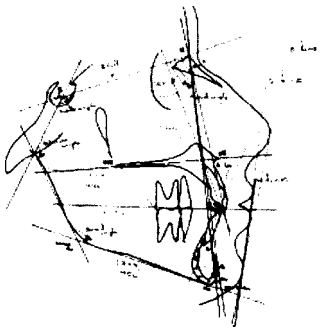
Fig 3

Dental Analysis

Fig 4



Soft Tissue Analysis



Composite Analysis

most common pattern was the proclined upper incisors with normally inclined lower incisors. (Graph VI)

Patients with straight profile were the most common while those with concave profile were least cornmon. 47% showed orthognathic (straight) profile, 35% showed retrognathic (convex) profile while 18% showed prognathic (concave) profile. Many patients with straight profile showed class II or Class III malocclusion indicating that one sagittal pattern can have different profiles. (Graph VII)

60% of the patients were with competent lips while 40% were with incompetent lips. (Graph VIII)

Patients with orthognathic profile & competent lips were most common, i.e., 34%, 24% showed retrognathic profile with incompetent lips, 14% showed prognathic profile with competent lips, 13% showed orthognathic profile with incompetent lips, 11% showed retrognathic profile with competent lips while remaining 4% showed prognathic profile with incompetent lips. (Graph IX)

DISCUSSION

In Pakistan, till now no work had been done to differentiate between the various components of malocclusion though researchers have used IOTN[4], PAR Index and ICON[5]to establish similar kind of results but that does not consider the skeletal components of malocclusion. The present study was aimed to differentiate between Horizontal, Vertical, Dental and Soft Tissue malocclusions by using Composite Cephalometric Analysis.

The number of female patients (61%) compared to (31%) male patients in this study clearly indicates that females are more concerned about orthodontic treatment in our socio-economic status.

The results of this study showed that most prevalent horizontal malocclusion is Skeletal Class II pattern (47%). Among 47% Skeletal Class II cases, Skeletal class II with short mandible is the most common (62%). Most common vertical malocclusion is Skeletal open bite (38%).Most common dental malocclusion is bimaxillary proclination (48%),It is interesting to note that cases of excessive overj et with upper/lower proclination are more common than true bimax. cases. Patients with orthognathic profile & competent lips are most common (34%) among soft tissue malocclusion component.

Another aim of this study was to identify the various components of Class I, II and III malocclusion and to establish their prevalence.

- **Components of Skeletal Class I Malocclusion (31%)**

46% Skeletal Class I cases showed normal overbite, 27% of them showed association with skeletal open bite while the remaining 27% showed association with Skeletal deep bite[19]. (Graph X).

54% of Skeletal Class I cases showed Bimaxillary Proclination, 27% had proclined upper incisors with normal inclination of lower incisors, 9% of the patients had normally inclined teeth, 5% had proclined lower incisors with normal inclination of upper incisors, while another 5% showed retroclined lower incisors with proclined upper incisors. (Graph XI)

91% of Skeletal Class I cases showed straight profile (orthognathic profile) while 9% showed prognathic profile. 82% showed competent lips while 18% showed incompetent lips (Graph XII, XIII)

- **CompoMalocclusion1718tal Class II Malocclusion[17 18] (47%)**

Among Skeletal Class II cases, patients with large maxilla were 35%, 62% were with short mandible while only 3% reported with composite Class II. (Graph III).

50% of Class II cases showed skeletal open bite, 29% were with skeletal deep bite while remaining 21% were normal angle cases[18]. (Graph XIV)

43% of Class II cases showed bimaxillary proclination (excessive o/j, lower incisors proclined as compensation to increased o/j). 12% reported with proclined upper incisors, 12% showed bimaxillary retroclination (98% showed Incisor div II). Least common were the retroclined lower incisors with normally inclined upper incisors. (Table V) (Graph XV)

76% of Skeletal Class II cases showed convex profile while 24% showed straight profile. 56% of Class II cases were with incompetent lips and 44% with competent lips. (Graph XVI, XVII)

- **Components of Skeletal Class III Malocclusion (18%)**

Among Skeletal Class III caseslo [16], patients with short maxilla were 65%, 14% were with large mandible while 21% reported with composite Class III. (Graph IV).

40% of Class III cases showed Skeletal open bite, 20% were with Skeletal deep bite while remaining 40% were normal angle cases[18]. (Graph XVIII)

47% showed dental compensation for Class III, which was the most common of all the dental patterns seen with class III. (Table VI) (Graph XVIX)

73% of Skeletal Class III showed prognathic profile while remaining 27% showed straight profile. (Graph XX)

87% of Class III cases were with competent lips and 13% with incompetent lips. Class III high angle cases were associated with incompetent lips . (Graph XXI)

Discussion above shows that "Cephalometric classification of malocclusion" is quiet an important method to evaluate prevalence of malocclusion

CONCLUSION

Composite Cehalometric Analysis is used to distinguish between various horizontal, vertical, dental and soft tissue malocclusions.

- Skeletal Class II is the most common antero-posterior malocclusion (47%).
- Among vertical malocclusions the most common is the skeletal open bite (38%).
- Bimaxillary proclination is the most common dental cephalometric finding (48%). It is also found that though patients have bimaxillary proclination but that is associated with excessive overjet.
- Patients with orthognathic profile & competent lips are most common (34%).

Identification of various components of malocclusion is important as knowing of it is critical for the treatment and management of malocclusions.

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