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Comparison of different sagittal skeletal pattern using soft tissue, dental, and skeletal parameters along with sagittal dysplasia indicators in Chhattisgarh population.

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Abstract

Cephalometrichasbeenadaptedasanimportantclinicaltoolf orassessment ɗ jaw relationship in all three planes– anteroposterior, transverse and vertical being an integral part of orthodontic treatment planning after its discovery. Many analyses have been introduced in the past that have both advantages and disadvantagesassociatedwiththeirusewhichneedstobeund erstood.Theanteroposteriordiscrepancy is usually of utmost concern to patients and parents and hence has received maximum attention in orthodontics. The purpose of this study is to assess Class I, Class II and Class III malocclusion using soft tissue, dental and skeletal long with some sagittal dysplasia indicators in Chhattisgarh population. SN-MP,FMA,SNA,Wits,U1-exposure,L1-NB,overjet,overbite,subnasale to H-line, H angle, Taylors AB linear distance(mm), Freeman AXB angle were found to be significantly higher in class 2 and lower in class 3.SNB, facial height ratio, U1-NA, U1-NA,basic upper lip thickness, upper lip thickness, chin thickness(H),chin thickness(V),Rickets E-line to upper lip , Rickets E-line- lower lip, soft tissue contour, AXD angle, JYD angle, beta angle, FH to AB plane angle, assessment of anteroposterior dysplasia by Wendell 1 Wyllie were found to be having significantly greater values in class 3 and lesser values in class 2.

Keywords: Sagittal dysplasia, cephalometric analysis

Introduction

Cephalometrichasbeenadaptedasanimportantclinicaltoolf orassessmentof jaw relationship in all three planes–

anteroposterior, transverse and vertical beingan integral part of orthodontic treatment planning after its discovery. The Sagittal relationship is usually of utmost concern to the patient and needs a critical evaluation. Many analyses have been introduced in the past that have both advantages and disadvantages associated with their use which needs to be understood. The anteroposterior discrepancy is usually of utmost concern to patients and parents and hence has received maximum attention in orthodontics. It is absolutely essential that a clinician be aware of a range of analyses to be used indifferent situations.[1] After extensive exploration of available literature there is scarcity of adequate information available in Chhattisgarh subjects. Therefore, the purpose of this study is to assess Class I, Class II and Class III malocclusion using soft tissue, dental and skeletal along with21 sagittal dysplasia indicators in Chhattisgarh population.

Aim

To compare Class I, Class II and Class III skeletal patterns using soft tissue, dental and skeletal parameters along with sagittal dysplasia indicators in 180 subjects in Chhattisgarh population.

Materials and methods

A Cross sectional study will be conducted to evaluate Class I, Class II andClass III malocclusionby using soft tissue, dental and skeletal parameters along with sagittal dysplasia indicators and compare with each other.180 lateral cephalo grams of patient reporting to Outpatient Department at the Department of Orthodontics and Dentofacial Orthopaedics, Government Dental College, Raipur are distributed according to skeletal pattern 60 Class I, 60 Class II and 60 Class III radiographs.

Classification of skeletal type into class I, Class II and Class III was based on ANB angle.

1. Angle 0-4˚ – Class I
2. Angle >4˚ – Class II
3. Angle <0˚ – Class III

Inclusion criteria

1. No History of previous Orthodontic treatment.
2. Patients having Class I, Class II and Class III Skeletal Patterns.
3. Patients who are willing to participate in the study after giving written informed consent.

Exclusion criteria

1. Patient underwent previous orthodontic treatment.
2. Patient underwent previous orthognathic surgery.
3. Patients with major illness or medical conditions.
4. History of head and neck trauma, vertebral column and craniofacial anomaly or syndrome.

Armamentarium

For clinical evaluation

- Mouth mirror
- Explorer or probe
- For radiographic evaluation
- Radiographic machine
- Digital lateral cephalogram (Planmeca, Proline XC Dimax 3 Ceph)
- Trimaxprinter.

For tracing

- DigitalLateral cephalogram.
- Acetate tracing paper of 0.003-inch matte finish.
- 0.3mm HB lead pencil.
- Geometry box –(scale, protractor, eraser , sharpener.)
- Illuminator, cello tape.
- Graph Sheet.
- Calculator.

Cephalometric analysis

A pre-structured proforma was used to collect the relevant information and record cephalometric measurement of each subject. Each subject was examining clinically and revaluated to check inclusion

criteria. then patient were sent to the department of Oral Medicine and Radiology, Government Dental college and hospital and digital lateral cephalogram were taken.

The cephalogram of the patients were obtained by positioning the patients head in cephalostat with teeth in maximum interception with relaxed lip in order to maintain standardization of radiograph with the Frankfort horizontal plane parallel to the floor and ensured that (NHP) natural head position this obtained by positioning the ear rods and forehead positioning the knobs. Distance from the tube to patients was standardized at 5 feet.

- 180 subjects comprising of 60 Class I, 60 Class II and 60 Class III malocclusions.
- Classification of skeletal type into class I, Class II and Class III was based on ANB angle. Skeletal class was categorized as follows:

Angle 0-4˚ – Class I

Angle >4˚ – Class II

Angle <0˚ – Class III

The following land marks were used for cephalometric analysis

Skeletal measurements (angular and linear measurements)

- SNto MP(°)(sella-nasion to Mandibular plane angle)
- FMA(Frank for t Mandibular plane angle)
- SNA(°) (sella-nasion-point Aangle)
- SNB(°)(sella-nasion -pointB angle)
- ANB(°) (pointA-nasion-pointB)
- Faciallength (mm)(sella tognathion)
- Facialdepth (mm)(nasion togonion)
- Facialheightratio(%) (sella-gonion/ nasion –men ton)
- Wits(mm)(AO-BO)

Dental measurements (angular and linear measurements)

- U1toSN(°)(upperincisor tosella nasionangle)
- U1toNA(°)(upperincisorto nasion –pointAangle)
- U1toNA(mm)(upperincisor to nasion– point Adistance)
- U1exposure (upperincisorexposure)
- L1toNB(°)lowerincisor tonasionpointB)
- IMPA(°)(incisormandibularplaneangle)
- Overjet(mm)
- Overbite(mm)
- U1exposure(mm)(atrest)
- Interincisalangle(°)

Softtissueanalysis (angularand linearmeasurements)

- Basicupperlipthickness(mm)
- Upperlipthickness(mm)
- Upperlipstrain(mm)
- Lowerlipthickness(mm)
- Basiclowerlipthickness(mm)
- Chinthickness-H(mm)
- Chinthickness-V(mm)
- SubnasaletoH-line(mm)
- LowerliptoH-line(mm)
- Ricketts'E-line-upper(mm)
- Ricketts'E-line-lower(mm)
- Upperliplength(mm)
- Lowerliplength(mm)
- Softtissuecontour (mm)
- Hardtissuecontour (mm)
- Contourratio(%)
- Nasolabialangle(°)
- H-angle

Sagittaldysplasiaindicators

- Theassessmentof anteroposteriordysplasiabyWendellLWylie

- Down'sABplaneangle andangleofconvexity
- AngleANB
- Jenkin's'a'plane
- Taylor'sABlineardistance
- AXDangle andA-D'distance
- Witsappraisalofjawdisharmony
- Freeman'sAXBangle(1981)
- JYDangle (1982)
- Mcnamara'smaxillomandibulardifferential(1984)
- AF-BFdistance(1987)
- APP-BPPdistance
- FHtoABplane angle(FABA)
- Betaangle(2004)
- OverjetaspredictorofSagittal dysplasia(2008)
- Yenangle(2009)
- Wangle (2011)
- Pianalysis(2012)

Self-derived(ANS–Gonion –Gnathionangle)

Statistical analysis

Data were analyzed using the statistical package for social sciences version 18.0 for windows (SPSS Inc., Chicago, Illinois, USA). Analysis of variance test was performed to study the relationship between different skeletal patterns and different skeletal, dental, soft tissue and sagittal dysplasia indicators. Multiple comparison test was used to further distinguish which skeletal pattern showed the most significant difference.

Analysis of variance test was performed to study the relationship between different skeletal patterns and different parameters.

Table 1 shows the frequency of the parameters used in the study in terms of mean ± SD in class 1, class 2 and class 3 malocclusion which includes total of 54 parameters.

		N	Mean	Std. Deviation
SN-MP	Class I	60	29.6333	6.51977
	Class II	60	32.0167	6.72837
	Class III	60	27.2333	6.46337
	Total	180	29.6278	6.82178
FMA	Class I	60	23.8733	6.27991
	Class II	60	24.5333	5.58286
	Class III	60	20.9500	5.60395
	Total	180	23.1189	6.00513
SNA	Class I	60	84.8250	3.71304
	Class II	60	84.6500	3.31701
	Class III	60	83.0750	4.78152
	Total	180	84.1833	4.04096
SNB	Class I	60	82.1000	3.65666
	Class II	60	78.3417	3.42039
	Class III	60	85.2500	4.77502
	Total	180	81.8972	4.87832

WITS	Class I	60	.9167	.88857
	Class II	60	5.3000	2.06094
	Class III	60	-2.1333	2.36117
	Total	180	1.3611	3.58576
FACIAL LENGTH	Class I	60	1.1762E2	7.39925
	Class II	60	1.1360E2	5.40621
	Class III	60	1.2173E2	6.72679
	Total	180	1.1765E2	7.32675
FACIAL DEPTH	Class I	60	1.1147E2	7.23332
	Class II	60	1.1280E2	6.38536
	Class III	60	1.1118E2	6.40045
	Total	180	1.1182E2	6.68482
FACIAL HEIGHT	Class I	60	67.7667	4.89333
	Class II	60	66.1333	4.51914
	Class III	60	70.9210	4.95577
	Total	180	68.2737	5.16622
U1-SN	Class I	60	1.1747E2	7.76447
	Class II	60	1.1327E2	7.51691
	Class III	60	1.1902E2	8.76529
	Total	180	1.1658E2	8.35181
U1-NA(*)	Class I	60	36.3167	8.64064
	Class II	60	32.1167	5.94064
	Class III	60	38.8000	5.85648
	Total	180	35.7444	7.42946
U1-NA	Class I	60	6.7333	2.47610
	Class II	60	6.2833	1.92302
	Class III	60	7.8500	1.72543
	Total	180	6.9556	2.15806
U1 EXP	Class I	60	2.3667	2.49723
	Class II	60	2.6667	2.34099
	Class III	60	1.6167	2.21774
	Total	180	2.2167	2.38308
L1-NB	Class I	60	32.1333	7.41384
	Class II	60	34.0333	5.95454

	Class III	60	28.5333	6.12156
	Total	180	31.5667	6.88379
IMPA	Class I	60	99.0333	8.46922
	Class II	60	1.0405E2	7.57208
	Class III	60	96.7167	6.07605
	Total	180	99.9333	8.00810
INTERINCISAL ANGLE	Class I	60	1.1152E2	12.53131
	Class II	60	1.0895E2	14.57351
	Class III	60	1.1460E2	10.47548
	Total	180	1.1169E2	12.77886
OVERJET	Class I	60	3.7667	1.74051
	Class II	60	6.4000	2.85942
	Class III	60	3.7000	2.28703
	Total	180	4.6222	2.64714
OVERBITE	Class I	60	2.8667	1.35880
	Class II	60	4.7333	2.19295
	Class III	60	2.4333	1.45400
	Total	180	3.3444	1.97278
Basic upper lip thickness(mm)	Class I	60	13.9500	2.02045
	Class II	60	13.4667	2.48703
	Class III	60	15.2667	2.71135
	Total	180	14.2278	2.52768
Upper lip thickness(mm)	Class I	60	10.7333	2.23126
	Class II	60	10.6833	2.23600
	Class III	60	12.1333	2.50062
	Total	180	11.1833	2.40919
Upper lip strain(mm)	Class I	60	3.5500	1.62005
	Class II	60	4.1000	1.76309
	Class III	60	3.4333	1.96034
	Total	180	3.6944	1.80036
Basic lower lip thickness(mm)	Class I	60	12.6667	2.17588
	Class II	60	13.0833	2.10964
	Class III	60	12.9000	2.46810
	Total	180	12.8833	2.25045

Chin thickness – (H) (mm)	Class I	60	12.1000	1.76309
	Class II	60	11.6167	2.17919
	Class III	60	12.6500	2.22334
	Total	180	12.1222	2.09723
Chin thickness – (V) (mm	Class I	60	8.4500	2.84292
	Class II	60	8.6833	2.72149
	Class III	60	9.6333	2.65513
	Total	180	8.9222	2.77349
Subnasale to H line(mm)	Class I	60	10.2333	5.44111
	Class II	60	13.6000	5.99774
	Class III	60	8.4833	3.10544
	Total	180	10.7722	5.41551
Lower lip to H – line(mm)	Class I	60	2.2833	1.86939
	Class II	60	2.8833	1.83277
	Class III	60	2.5667	1.80739
	Total	180	2.5778	1.84287
Rickets E line – upper lip(mm)	Class I	60	2.0667	1.42456
	Class II	60	1.3500	2.76678
	Class III	60	3.0667	2.00733
	Total	180	2.1611	2.24022
Rickets E line – lower lip(mm)	Class I	60	1.8167	2.48720
	Class II	60	.6333	3.20469
	Class III	60	2.3333	1.65106
	Total	180	1.5944	2.61377
Upper lip length(mm)	Class I	60	17.0667	2.85744
	Class II	60	16.9833	3.73028
	Class III	60	16.7333	2.60941
	Total	180	16.9278	3.08905
Lower lip length(mm)	Class I	60	14.2000	2.27589
	Class II	60	13.7500	2.08810
	Class III	60	15.3667	2.20144
	Total	180	14.4389	2.28222
Soft tissue contour(mm)	Class I	60	80.6167	16.16241
	Class II	60	74.8167	10.78526

	Class III	60	91.4667	14.37213
	Total	180	82.3000	15.50523
Hard tissue contour(mm)	Class I	60	71.0833	10.34702
	Class II	60	69.7500	9.62804
	Class III	60	73.3333	12.01082
	Total	180	71.3889	10.75132
Contour ratio	Class I	60	1.1317	.14974
	Class II	60	1.0952	.12714
	Class III	60	2.8257	13.02084
	Total	180	1.6842	7.52002
Nasolabial angle (°)	Class I	60	1.0072E2	8.28740
	Class II	60	1.0203E2	8.17181
	Class III	60	97.7000	11.29767
	Total	180	1.0015E2	9.48829
H angle (°)	Class I	60	10.7333	2.26144
	Class II	60	19.4833	2.71525
	Class III	60	7.2167	1.92302
	Total	180	12.4778	5.66421
Downs AB plane angle and angle of convexity (°)	Class I	60	-4.4250	2.47528
	Class II	60	-6.6000	3.23225
	Class III	60	2.4333	.98060
	Total	180	-2.8639	4.54770
Taylors AB linear distance(mm)	Class I	60	3.4250	5.84296
	Class II	60	5.5333	.98233
	Class III	60	-3.4167	1.06232
	Total	180	1.8472	5.15942
AXD angle and A-D’ distance(mm)	Class I	60	9.3333	1.01809
	Class II	60	5.9833	1.52373
	Class III	60	12.0167	1.33393
	Total	180	9.1111	2.79624
Freemans AXB angle (°)	Class I	60	4.2633	1.05621
	Class II	60	6.1000	1.93715
	Class III	60	5.9000	1.03662
	Total	180	5.4211	1.62464

JYD angle (°)	Class I	60	5.3933	1.34087
	Class II	60	3.7317	.60548
	Class III	60	8.1333	.96492
	Total	180	5.7528	2.08145
McNamara ‘s maxillomandibular differential (mm)	Class I	60	26.0833	4.17130
	Class II	60	26.1167	3.04259
	Class III	60	25.0820	3.39729
	Total	180	25.7607	3.58083
AF – BF	Class I	60	3.5500	1.16073
	Class II	60	6.3833	1.12131
	Class III	60	2.3917	.67404
	Total	180	4.1083	1.95842
APP – BPP	Class I	60	4.9667	1.98269
	Class II	60	7.5333	1.09648
	Class III	60	2.8667	.50310
	Total	180	5.1222	2.33184
FH to AB plane angle (°)	Class I	60	79.9000	2.28258
	Class II	60	77.9333	.73338
	Class III	60	87.2000	1.08612
	Total	180	81.6778	4.27368
Beta angle	Class I	60	30.7833	3.05371
	Class II	60	23.0667	1.20545
	Class III	60	36.8667	1.52345
	Total	180	30.2389	6.03191
Yen angle	Class I	60	1.2018E2	2.38989
	Class II	60	1.1373E2	1.79327
	Class III	60	1.2672E2	2.40826
	Total	180	1.2021E2	5.75378
W Angle	Class I	60	52.6833	1.96142
	Class II	60	47.3500	1.95565
	Class III	60	59.9167	2.78794
	Total	180	53.3167	5.63556
Pi analysis	Class I	60	4.0950	1.35439
	Class II	60	6.7533	.83878

	Class III	60	23.6583	.80723
	Total	180	11.5022	8.74837
Jenkins a plane	Class I	60	3.7000	1.15421
	Class II	60	4.1667	.76284
	Class III	60	2.6167	.69115
	Total	180	3.4944	1.10103
assessment of anteroposterior dysplasia by Wendell l Wyllie	Class I	60	81.3050	.35674
	Class II	60	78.9167	1.15409
	Class III	60	84.7333	1.71599
	Total	180	81.6517	2.68000
Self-derived	Class I	60	46.4167	3.95865
	Class II	60	48.7000	3.88522
	Class III	60	45.2500	3.44263
	Total	180	46.7889	4.01393

Table 2shows comparison of variables in different malocclusion using ANOVA test.

		Sum of Squares	df	Mean Square	F	Sig.
SN-MP	Between Groups	686.411	2	343.206	7.947	.001*
	Within Groups	7643.650	177	43.184		
	Total	8330.061	179			
FMA	Between Groups	436.435	2	218.218	6.418	.002*
	Within Groups	6018.581	177	34.003		
	Total	6455.016	179			
SNA	Between Groups	111.475	2	55.738	3.509	.032*
	Within Groups	2811.475	177	15.884		
	Total	2922.950	179			
SNB	Between Groups	1435.453	2	717.726	44.979	.001*
	Within Groups	2824.396	177	15.957		
	Total	4259.849	179			
WITS	Between Groups	1675.411	2	837.706	236.815	.001*
	Within Groups	626.117	177	3.537		
	Total	2301.528	179			
FACIAL LENGTH	Between Groups	1984.633	2	992.317	23.037	.001*
	Within Groups	7624.317	177	43.075		
	Total	9608.950	179			

FACIAL DEPTH	Between Groups	89.433	2	44.717	1.001	.370
	Within Groups	7909.517	177	44.687		
	Total	7998.950	179			
FACIAL HEIGHT	Between Groups	710.787	2	355.393	15.468	.001*
	Within Groups	4066.688	177	22.976		
	Total	4777.475	179			
U1-SN	Between Groups	1062.100	2	531.050	8.228	.001*
	Within Groups	11423.650	177	64.540		
	Total	12485.750	179			
U1-NA(*)	Between Groups	1369.478	2	684.739	14.241	.001*
	Within Groups	8510.767	177	48.083		
	Total	9880.244	179			
U1-NA	Between Groups	78.078	2	39.039	9.145	.001*
	Within Groups	755.567	177	4.269		
	Total	833.644	179			
U1 EXP	Between Groups	35.100	2	17.550	3.165	.045*
	Within Groups	981.450	177	5.545		
	Total	1016.550	179			
L1-NB	Between Groups	936.400	2	468.200	10.982	.001*
	Within Groups	7545.800	177	42.632		
	Total	8482.200	179			
IMPA	Between Groups	1686.233	2	843.117	15.239	.001*
	Within Groups	9792.967	177	55.327		
	Total	11479.200	179			
INTERINCISAL ANGLE	Between Groups	960.344	2	480.172	3.006	.052
	Within Groups	28270.233	177	159.719		
	Total	29230.578	179			
OVERJET	Between Groups	284.578	2	142.289	25.971	.001*
	Within Groups	969.733	177	5.479		
	Total	1254.311	179			
OVERBITE	Between Groups	179.244	2	89.622	30.659	.001*
	Within Groups	517.400	177	2.923		
	Total	696.644	179			
Basic upper lip thickness(mm)	Between Groups	104.144	2	52.072	8.866	.001*

	Within Groups	1039.517	177	5.873		
	Total	1143.661	179			
Upper lip thickness(mm)	Between Groups	81.300	2	40.650	7.513	.001*
	Within Groups	957.650	177	5.410		
	Total	1038.950	179			
Upper lip strain(mm)	Between Groups	15.211	2	7.606	2.383	.095
	Within Groups	564.983	177	3.192		
	Total	580.194	179			
Basic lower lip thickness(mm)	Between Groups	5.233	2	2.617	.514	.599
	Within Groups	901.317	177	5.092		
	Total	906.550	179			
Chin thickness – (H) (mm)	Between Groups	32.078	2	16.039	3.759	.025*
	Within Groups	755.233	177	4.267		
	Total	787.311	179			
Chin thickness – (V) (mm	Between Groups	47.144	2	23.572	3.138	.046*
	Within Groups	1329.767	177	7.513		
	Total	1376.911	179			
Subnasale to H line(mm)	Between Groups	811.544	2	405.772	16.183	.001*
	Within Groups	4438.117	177	25.074		
	Total	5249.661	179			
Lower lip to H – line(mm)	Between Groups	10.811	2	5.406	1.602	.204
	Within Groups	597.100	177	3.373		
	Total	607.911	179			
Rickets E line – upper lip(mm)	Between Groups	89.211	2	44.606	9.758	.001*
	Within Groups	809.117	177	4.571		
	Total	898.328	179			
Rickets E line – lower lip(mm)	Between Groups	91.144	2	45.572	7.127	.001*
	Within Groups	1131.750	177	6.394		
	Total	1222.894	179			
Upper lip length(mm)	Between Groups	3.611	2	1.806	.187	.829
	Within Groups	1704.450	177	9.630		
	Total	1708.061	179			
Lower lip length(mm)	Between Groups	83.544	2	41.772	8.711	.001*
	Within Groups	848.783	177	4.795		

	Total	932.328	179			
Soft tissue contour(mm)	Between Groups	8571.700	2	4285.850	22.012	.001*
	Within Groups	34462.100	177	194.701		
	Total	43033.800	179			
Hard tissue contour(mm)	Between Groups	393.611	2	196.806	1.716	.183
	Within Groups	20297.167	177	114.673		
	Total	20690.778	179			
Contour ratio	Between Groups	117.312	2	58.656	1.038	.356
	Within Groups	10005.271	177	56.527		
	Total	10122.583	179			
Nasolabial angle (°)	Between Groups	592.233	2	296.117	3.377	.036*
	Within Groups	15522.717	177	87.699		
	Total	16114.950	179			
H angle (°)	Between Groups	4788.011	2	2394.006	443.752	.001*
	Within Groups	954.900	177	5.395		
	Total	5742.911	179			
Downs AB plane angle and angle of convexity (°)	Between Groups	2667.369	2	1333.685	228.162	.001*
	Within Groups	1034.626	177	5.845		
	Total	3701.995	179			
Taylors AB linear distance(mm)	Between Groups	2627.119	2	1313.560	108.757	.001*
	Within Groups	2137.789	177	12.078		
	Total	4764.909	179			
AXD angle and A-D' distance(mm)	Between Groups	1096.478	2	548.239	320.132	.001*
	Within Groups	303.120	177	1.713		
	Total	1399.598	179			
Freemans AXB angle (°)	Between Groups	121.840	2	60.920	30.754	.001*
	Within Groups	350.619	177	1.981		
	Total	472.460	179			
JYD angle (°)	Between Groups	592.868	2	296.434	287.279	.001*
	Within Groups	182.640	177	1.032		
	Total	775.509	179			
McNamara 's maxillomandibular differential (mm)	Between Groups	41.486	2	20.743	1.629	.199
	Within Groups	2253.719	177	12.733		
	Total	2295.205	179			

AF – BF	Between Groups	506.058	2	253.029	248.151	.001*
	Within Groups	180.479	177	1.020		
	Total	686.537	179			
APP – BPP	Between Groups	655.511	2	327.756	182.545	.001*
	Within Groups	317.800	177	1.795		
	Total	973.311	179			
FH to AB plane angle (°)	Between Groups	2860.578	2	1430.289	619.380	.001*
	Within Groups	408.733	177	2.309		
	Total	3269.311	179			
Beta angle	Between Groups	5739.878	2	2869.939	657.280	.001*
	Within Groups	772.850	177	4.366		
	Total	6512.728	179			
Yen angle	Between Groups	5057.078	2	2528.539	515.078	.001*
	Within Groups	868.900	177	4.909		
	Total	5925.978	179			
W Angle	Between Groups	4773.733	2	2386.867	463.639	.001*
	Within Groups	911.217	177	5.148		
	Total	5684.950	179			
Pi analysis	Between Groups	13511.395	2	6755.698	6.354E3	.001*
	Within Groups	188.184	177	1.063		
	Total	13699.579	179			
Jenkins a plane	Between Groups	75.878	2	37.939	47.586	.001*
	Within Groups	141.117	177	.797		
	Total	216.994	179			
assessment of anteroposterior dysplasia by Wendell l Wyllie	Between Groups	1025.824	2	512.912	349.410	.001*
	Within Groups	259.825	177	1.468		
	Total	1285.649	179			
Self-derived	Between Groups	369.544	2	184.772	13.007	.001*
	Within Groups	2514.433	177	14.206		
	Total	2883.978	179			

Results

Table 1 shows the frequency of the parameters used in the study in terms of mean ± SD in class 1, class 2 and class 3 malocclusion which includes total of 54 parameters.

- SN-MP, FMA, SNA, Wits, U1-exposure, L1-NB, overjet,overbite,subnasale to H-line, H angle, Taylors AB linear distance(mm), Freeman AXB angle were found to be significantly higher in class 2 and lower in class 3.
- SNB, facial height ratio, U1-NA, U1-NA, basic upper lip thickness, upper lip thickness, chin thickness(H), chin thickness(V), Rickets E-line to upper lip, Rickets E-line-lower lip, soft tissue contour, AXD angle, JYD angle, beta angle, FH to AB plane angle, assessment of anteroposterior dysplasia by Wendell 1 wyllie were found to be having significantly greater values in class 3 and lesser values in class 2.
- Pi analysis showed significantly higher values in class 3 than in class 1 and class2.

Table 2shows comparison of variables in different malocclusion using ANOVA test.

- In this we can appreciate statistically significant difference between SN-MP, SNB, WITS, facial length, facial, height, UI-SN, UI-NA(angular), UI-NA(linear), LI-NB, IMPA, overjet, overbite, basic upper lip thickness(mm), upper lip thickness, Subnasale to H line, rickets E line-upper lip, rickets E line lower lip, lower lip length, soft tissue contour H angle, downs AB plane and angle of convexity, Taylor sab linear distance, AXD angle and A-D distance, freemans AXB angle, JYD angle, AF-BF, APP-BPP, FH to AB plane angle, beta angle, yen angle, w angle, pi analysis, Jenkins a plane, assessment of anteroposterior dysplasia by Wendell 1 wyllie self-derived among CLASS 1, CLASS 2 and CLASS 3 malocclusions.(p-value = 0.001)
- We also found statistically significant difference between FMA, SNA, U1-exp, chin- thickness (H), chin-thickness (V), nasolabial angle among CLASS 1, CLASS 2 and CLASS 3 malocclusion.
- (p-value= 0.002; 0.032; 0.045; 0.025; 0.046; 0.036 respectively).

Discussion

Cephalometric has been adapted as an important clinical tool for assessment of jaw relationship in all three planes–anteroposterior, transverse and vertical being an integral part of orthodontic treatment planning after its discovery. The sagittal relationship is usually of utmost concern to the patient and needs a critical evaluation. Previously established parameters such as the Wits analysis, APDI (anteroposterior dysplasia indicator) , Beta angle, ANB (point A- Nasion – point B) angle, Yen angle, W angle and the recently introduced Pi analysis have been defined and used effectively for the evaluation of anteroposterior discrepancies affecting the apical bases of the jaws. These analyses have both advantages and disadvantages associated with their use which needs to be understood. The anteroposterior discrepancy is usually of utmost concern to patients and parents and hence has received maximum attention in orthodontics.

A number of analyses have been proposed over the years with varying degrees of reliability and success in assessing sagittal jaw relationships. It is absolutely essential that a clinician be aware of a range of analyses to be used in different situations. It provides an insight into the various cephalometric methods used for evaluation of the anteroposterior jaw relationship in chronologic order and their clinical implications in contemporary orthodontics. There is no doubt that improving the balance and harmony of the face is a main purpose of orthodontic treatment, satisfying objective treatment goals and subjective patient desires

simultaneously. Therefore, it is necessary to consider facial appearance determined by soft tissue analysis as well as the underlying skeletal pattern in orthodontic treatment planning.[1]

In the present study, various sagittal dysplasia indicators were taken and results were statistically determined. Among them Taylors AB linear distance(mm), Freeman AXB angle were found to be significantly higher in class 2 and lower in class 3. Previous studies done by Freeman's AXB angle (1981) and Taylor' AB linear distance (1969) also showed same results. In 1981, Freeman described a method eliminating point N, so that the degree of divergence of the face does not affect the readings. A perpendicular is constructed from point A to Frankfort Horizontal, establishing point X. A line from points X to B forms angle A-X-B . The mean for the A-X-B measurement in normal occlusion cases was approximately 4 degrees. A variation of this is to draw perpendicular from point A to SN plane (X-point), giving an angle of 6.5 degrees. Taylor (1969) introduced new parameter, the linear distance between Point A and B'. B' is the perpendicular from point B to the Sella-nasion plane (Fig. 2B). Its mean value was 13.2 mm. This study concluded that there was 1 mm of change from point A to the perpendicular B' for each degree of change in ANB.[12]

AXD angle, JYD angle, beta angle, FH to AB plane angle, assessment of anteroposterior dysplasia by Wendell 1 Wyllie were found to be having significantly higher values in class 3 and lower values in class 2. AXD angle by Beatty (1975), JYD angle by Seppo Jarvinen (1982), beta angle by Baik and Ververidou (2004), FH to AB plane angle by sang and Suhr (1995), assessment of anteroposterior dysplasia by Wendell 1 Wyllie (1947) also showed similar outcomes. To counter the disadvantages of angle ANB, Beatty (1975) introduced the AXD angle—the interior angle formed by the intersection of the lines extending from points A and D at point X (X is point of intersection of perpendicular from point A to SN plane). Instead of point B, point D is taken as it is Center of bony symphysis and not affected by changes in incisor position or chin prominence. Seppo Jarvinen proposed JYD angle to measure sagittal apical base relationship, formed by the intersection of the lines extending from points J and D to point Y. Point J is the Center of the cross-section of the anterior body of the maxilla, and point Y is the point of intersection of the SN plane and the perpendicular to the SN plane from point J. Mean value for this angle is 5.25 ± 1.97°. An advantage of this method is that it eliminates use of point A. But, disadvantage is that it is affected by jaw rotation and vertical facial growth. Sang and Suhr (1995) proposed FH to AB angle to measure sagittal dysplasia. This study was conducted on 110 Korean children with normal occlusion. Mean value for this was 80.91 ± 2.5 ° with range of 10.5°. There was no statistically significant difference between males and females. However, from a clinical standpoint, when FABA was compared with Freeman's AXB angle14 and AF-BF, it shows more sensitivity to the vertical relationship between points A and B.

Wylie (1947) was the first to evaluate Antero posterior apical base relationship cephalometric ally. He proposed an analysis where perpendiculars from glenoid fossa, Sella turcica, pterygomaxillary fissure, buccal groove of maxillary first molar and anterior nasal spine are projected to the FH plane and horizontal distances measured and entered on a form where the standard values are printed. Any increase or decrease in patient values are designated as orthognathic and prognathic respectively. Mandibular length is assessed by projecting perpendiculars from pogonion and posterior surface of

condyle to a tangent drawn to lower border of mandible. Maxillary values below the norm and mandibular values above the norm are considered Class III, prognathic (positive sign). Vice versa to this situation are considered Class II, orthognathic (negative sign). A disadvantage here is that linear measurements are more prone to errors than angular.[9]

Cephalometrics is not an exact science. Cephalometric analyses based on angular and linear measurements have obvious limitations and hence dependency on any one parameter for skeletal assessment is discouraged. Since present study has been performed retrospectively on lateral cephalogram which is 2D image of 3D structures, future studies can be planned on recent CBCT and MRI modalities to make study more relevant in long term. Further study can be performed on larger scale in longitudinal pattern to provide more clinical data.

Conclusion

In this study we have taken dental parameters, skeletal parameters, soft tissue parameters and sagittal dysplasia indicators for cephalometric evaluation of different malocclusion in Chhattisgarh population. Following conclusions are made from the study.

- SN-MP, FMA, SNA, Wits, U1-exposure, L1-NB, overjet,overbite,subnasale to H-line, H angle, Taylors AB linear distance(mm), Freeman AXB angle were found to be significantly greater in class 2 and lower in class 3.
- SNB, facial height ratio, U1-NA, U1-NA, basic upper lip thickness, upper lip thickness, chin thickness(H), chin thickness(V), Rickets E-line to upper lip, Rickets E-line-lower lip, soft tissue contour, AXD angle, JYD angle, beta angle, FH to AB plane angle, assessment of anteroposterior dysplasia by Wendell 1 Wyllie were found to be having significantly higher values in class 3 and lower values in class 2.
- Pi analysis showed significantly higher values in class 3 than in class 1 and class2.

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