Original Article

Evaluation of Skeletal Jaw Relation by Different Cephalometric Angles for Sample of Kurdish Young Adults in Sulaimani City-A Cephalometric Study

Shiler A. Mohammed[1], Trefa M. Ali[2], Zhwan J. Rashid[2]

Abstract

Objective: An accurate evaluation of the skeletal sagittal jaw relationship is important in orthodontic diagnosis and treatment planning. This study was done to establish cephalometric norms of all types of malocclusions using ANB angle, Wit's appraisal, and Beta angle and evaluate the significance of W angle compared to these parameters.

Methods: Ninety pre-treatment lateral cephalograms of male and female patients aged 18-28 years from Sulaimani city that met the sample criteria were traced digitally by the Easy Dent 4 software program. The sample was divided into three groups of skeletal malocclusions, class I, II, and III, by the two-finger method of Foster initially. It was later confirmed cephalometrically by ANB angle, Beta angle, and Wit's appraisal; each group consisted of 30 patients. Also, for each subject, the W angle was measured.

Results: Significant differences were found in the ANB angle, Beta angle, Wit's appraisal, and W-angle in all 90 patients. The coefficient of variability showed that Wit's appraisal was the most variable parameter and W angle was the least variable parameter.

Conclusions: ANB angle, Beta angle, Wit's appraisal, and W-angle are significant parameters to assess the sagittal jaw relationship. The use of W angle and other parameters can provide a more accurate assessment of the sagittal skeletal jaw relationship as it has the least coefficient of variance; it should therefore enable better diagnosis and treatment planning for patients.

Keywords: *Skeletal sagittal jaw relationship, W Angle, ANB angle, Beta angle, Wit's appraisal*.

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Introduction

In orthodontics, discrepancies in the jaws can be described in three planes, namely transverse, sagittal and vertical[1]. Of these, the sagittal discrepancies are of most concern to the patient. Hence, in orthodontic diagnosis and treatment planning, an accurate measurement of sagittal discrepancy is critical[2]. However, evaluating the sagittal relationship between the maxilla and mandible has posed a major problem. The causes of this problem are the change in the sagittal relationship due to rotations of the jaws during growth and a lack of validity of the various methods proposed for their evaluation[3].

The importance of the sagittal jaw relationship for patients and orthodontists has led to the invention of many linear and angular cephalometric parameters for its measurement, including ANB angle, Wit's appraisal, and Beta angle[4]. But they are affected by at least one of the following factors: jaw rotations, poor reproducibility of landmarks, patient's age changes during orthodontic treatment, and growth changes in reference planes[5].

In 2013, Bhad et al. introduced the W-angle to overcome these problems. This is the angle between the perpendicular line from point M to the S–G line and the M–G line. The use of this has many advantages. Firstly, it is not dependent on unstable landmarks or dental occlusion. Therefore, it is a valuable tool for assessing true sagittal changes because of growth and orthodontic treatment[6]. Secondly, in skeletal patterns with clockwise or counterclockwise rotation of the jaws and during transitional periods when vertical facial growth is taking place, the W angle is a useful sagittal parameter[7]. Finally, it can be used for treatment planning during orthopedic or orthognathic procedures. This angle is independent of the cranial base length (position of point N) that sometimes camouflages the true skeletal class I, II, and III patterns[8].

Moreover, cephalometric analysis is practiced by comparing the patient's radiographic measurements with norms or standard values, most obtained from samples of European or American populations. Therefore, applying these norms to other populations may cause errors because of possible ethnic and racial variations[7].

This study aims to establish cephalometric norms of all types of sagittal skeletal malocclusion using ANB, Wit's appraisal, W angle, and Beta angle for a sample of Kurdish young adults in Sulaimani city and to evaluate the significance of W angle in comparison to these parameters.

Patients and methods

The present study was conducted on patients seeking orthodontic treatment in the Orthodontic department of Shorsh teaching dental center from the beginning of July 2016 to the end of January 2017 in Sulaimani city. The study was approved by the college research committee, Dentistry college, Sulaimani University (Appendix I). The sample consisted of 124 cephalograms of 311 patients examined clinically (male and female) with class I, class II, or class III malocclusion. The sample size has been determined based on the Sharma et al. (2011) study. However, in this study, the sample size was increased to increase the statistical power and reduce type II error (the non-rejection of a false null hypothesis)[9].

Ninety patients fit the study's criteria, while 34 cases were excluded due to the poor quality of cephalometric radiograph or failure to communicate with the patients. Among the selected cases, 40% were male (36 cases), and 60 % were female (54 cases). These 90 cases were randomly divided into three groups, based on class I, II, and III classifications, with 30 cases in each group.

Criteria for selecting the cases

1. Patients must possess Kurdish nationality (all three grandparents of both parents for patients were Kurdish) and live in Sulaimani.
2. Patients aged between 18 and 28 years old.
3. Patients with complete permanent dentition except for third molars.
4. No history of orthodontic treatment or orthognathic surgery.
5. No history of craniofacial trauma.
6. No cranial or facial malformation.
7. No TMJ disorder or pain.

The researcher filled the data recording sheet for each case (Appendix II). After that, the patients were referred for a lateral cephalometric radiograph (ceph). All the cephs were taken by one radiologist. These cephs were obtained using the cephalogram [pax-i3D system (Pano-Cephalo-CT), 2014]. The machine was set at 84 kilovoltage peak, 10.0 milliampere, and exposure time of 1.2 seconds. Cephs were taken with teeth in centric occlusion, lips relaxed posture, and the head in the natural position with the Frankfort plane parallel to the floor[10].

Cephalometric landmarks and planes used in this study for analyses[3,6] (Figures 1 and 2)

S: The midpoint of the pituitary fossa (sella turcica).

Point A: The deepest midline point on the premaxilla between the anterior nasal spine and prosthion, near the apex of the central incisor root.

Point B: The deepest midline point of the bony curvature of the mandible.

Nasion (N): In the frontonasal suture at the most anterior point.

ANB angle: Is an angle formed between A, N, and B points (Figure 1 A).

Functional occlusal plane: A line drawn through the region of the overlapping cusps of the first premolars and first molars.

Wit's appraisal: horizontal distance between two lines, AO and BO, is formed by drawing two lines perpendicularly from points A and B to the functional occlusal plane (Figure 1 B).

C: Condylion, the midpoint of the condyle.

Beta angle: The center of the condyle and point B is joined by the C-B line. A perpendicular line is drawn from point A to the C-B line angle. Also, a connecting line between point A and point B is drawn. The Beta angle is between the perpendicular line and the A-B line (Figure 1 C).

M: The midpoint of the premaxilla, identified as the mid-point of the largest circle that could be drawn in the premaxilla tangent to the anterior and superior walls.

G: Center of the largest circle tangent to the anterior, posterior, and internal inferior surfaces of the mandibular symphysis.

S-G Line: This is a line connecting S and G points.

W angle: Sella is connected to the M point, and G and M-G points are connected. Then a perpendicular line is drawn from point M to the S-G line. Finally, the W angle is formed between the perpendicular and the M-G lines (Figure 2).

Foster's two-finger method [9] was used for the initial skeletal classification of the malocclusion, and later the following variables: ANB, Beta angle, and Wit's appraisal, separately for each patient was measured as shown in Figures 1 A, B, C. Next, the patients were classified into class I, II, or III skeletal pattern groups if two of the three parameters meet the same criteria and be within the same class[6]. Table 1 shows the distribution of the patients who fulfilled the criteria across the class I, II, and III study groups.

All landmark identification and measurements were made using the software program (Easy Dent 4, software version: 4,14,1 (2012)). This software program had options for adjusting the radiograph by adjusting the contrast and brightness to facilitate the identification of the landmarks and zoom option and magnification for better viewing and differentiation of the landmarks.

After sample classification, the W angle was constructed and measured, as shown in Figure 2. According to Bhad et al., a W angle between 51 - 56 ° is considered a class I skeletal pattern. An angle less than 51 ° is considered a skeletal class II relationship, and an angle greater than 56 ° is considered a skeletal class III[6].

To assess the intra-examiner and inter-examiner reliability of the cephalometric analysis, five parameters/variables from 10 randomly selected cephalograms were traced twice at a two-week interval by the same observer and by 2nd observer. Later, the intra-examiner was tested by the paired t-test, and for the inter-examiner reliability, a one-way analysis of variance (ANOVA) was used. The analysis showed no significant difference.

Statistical analysis

The Statistical Package for Social Sciences (SPSS, version 22) was used for analyzing data. The Shapiro Wilk test was done to test the normality of the data. According to the *p* - values, the data were normally distributed. Hence, ANOVA was used to compare the means of the three study groups. The post-doc test was used to compare every two groups, Pearson correlation coefficient (r) was used to assess the strength of correlation between two numerical variables, and the coefficient of variability was used to measure the extent of variability of the variable in relation to the population. The significance alpha level was set at a *p-value* of ≤ 0.05.

Results

Determination of Kurdish norms for sagittal analyses in class I, II, and III groups for the variables of Beta angle, ANB angle, Wit's appraisal, and W angle for all three

classes of malocclusion included in the study along with the coefficient of variability were summarized in Table 2.

The differences in the means of Beta angle, ANB, Wit's appraisal, and W angle readings between and within the three classes are shown in Table 3.

Table 1: The criteria included in the classes I, II, or III skeletal patterns for grouping of study.

Skeletal class	ANB angle (11)	Wit's appraisal (12)	Beta angle (13)
Class I	2° to 4°	Coincidence of AO and BO in females or BO 1 mm ahead of AO in males	Between 27° to 35° and clinically a pleasant (almost straight) profile
Class II	> 4°	AO ahead of BO in females or AO coinciding with or ahead of BO in males	< 27
Class III	< 2°	BO ahead of AO in females or BO ahead of AO by more than 1 mm in males	> 35°

Table 2: Determination of Kurdish norms for sagittal analysis in class I, II and III group along with coefficient of variability.

	Class	No.	Mean	SD	CV
Beta angle	Class I	30	32.387	2.96	0.09
	Class II	30	25.233	3.10	0.12
	Class III	30	42.957	6.39	0.15
ANB angle	Class I	30	2.740	0.73	0.27
	Class II	30	5.850	1.27	0.22
	Class III	30	-3.290	1.36	-0.41
Wit's appraisal	Class I	30	-.010	0.75	-74.90
	Class II	30	4.320	2.37	0.55
	Class III	30	-6.060	3.88	-0.64
W angle	Class I	30	54.1	3.31	0.06
	Class II	30	48.34	2.16	0.04
	Class III	30	60.07	3.74	0.06

Table 3: ANOVA and post-hoc (LSD) test results of Table 2.

		p (ANOVA)	LSD groups	p (LSD)
Beta angle	Class I	< 0.001	Class I X Class II	< 0.001
	Class II		Class I X Class III	< 0.001
	Class III		Class II X Class III	< 0.001
ANB angle	Class I	< 0.001	Class I X Class II	< 0.001
	Class II		Class I X Class III	< 0.001
	Class III		Class II X Class III	< 0.001
Wit's appraisal	Class I	< 0.001	Class I X Class II	< 0.001
	Class II		Class I X Class III	< 0.001
	Class III		Class II X Class III	< 0.001
W angle	Class I	< 0.001	Class I X Class II	< 0.001
	Class II		Class I X Class III	< 0.001
	Class III		Class II X Class III	< 0.001

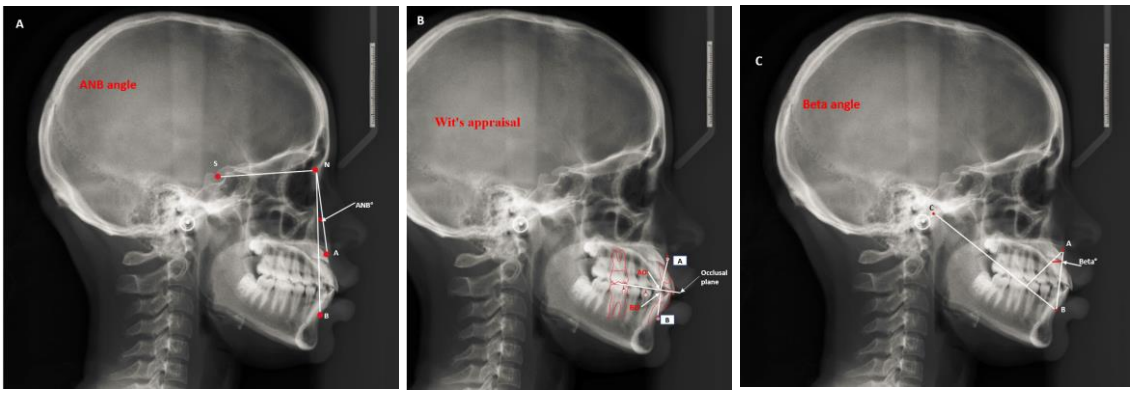

Figure 1: Cephalometric tracing: **A)** ANB angle, **B)** Wit's appraisal, and **C)** Beta angle identification.

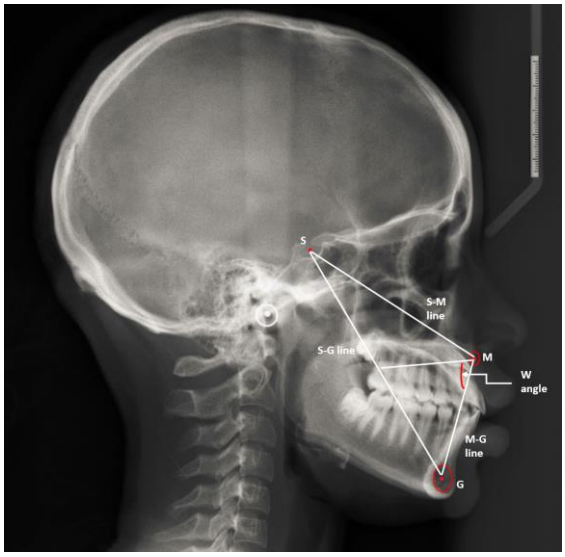

Figure 2: Cephalometric tracing showing W angle.

Correlation between the study parameters

In class, I patients, all of the correlations between the studied parameters were weak and not significant ($r < 0.4$, and $P > 0.05$), except for the correlation between W angle and Wit's appraisal, which was a significant positive correlation ($r = 0.382$, $p = 0.037$). It means in class I, patients, when the value of W angle increases, the value of Wit's appraisal also increases and vice versa. In class II patients, all the correlations were weak and not significant, except for a negative, moderate strength significant correlation between W angle and ANB angle ($r = -0.563$, $p = 0.001$). It means in class II patients, when the value of W angle increases, the value of ANB angle decreases and vice versa (Table 3).

The picture was different regarding class III patients. First, a strong inverse significant correlation was detected between the Beta and ANB angles ($r = -0.725$, $p < 0.001$). The same was found for the correlation between Beta angle and Wit's appraisal ($r = -0.820$, $p < 0.001$). Second, a nearly strong positive significant correlation was detected between the Beta and W angle readings ($r = 0.686$, $p < 0.001$). Third, a strong significant positive correlation was detected between the ANB angle and Wit's appraisal ($r = 0.719$, $p < 0.001$). Fourth, there was a strong negative correlation between ANB angle readings and W angle readings ($r = -0.723$, $p < 0.001$). Finally, an inverse, nearly strong, significant correlation was observed between Wit's appraisal and W angle ($r = -0.678$, $p < 0.001$) (Table 3).

Discussion

Angular and linear variables are utilized cephalometrically to analyze the skeletal sagittal jaw relationship. A literature search indicated that various parameters are available to assess the sagittal relationship, but none can be applied with maximum reliability[11].

Riedel developed the ANB angle in 1952[12]. It is considered the most popular and widely used angle for assessing the sagittal jaw relationship. However, it is affected by jaw rotation due to orthodontic treatment or growth. In addition, any displacement in point N influences ANB values[12]. Therefore, when using the ANB angle, many factors, including the length of the anterior cranial base, growth rotation of the jaws, vertical growth, and patient age, should be considered, which assesses this angle much more complicated[13]. In the present study, the mean values of this angle were near to those of Riedel's standards, and the results of our study showed that the ANB angle values are not affected by ethnic group differences. However, it is affected by various factors, which can often lead to errors such as positions of point A or B and position of Nasion.

To overcome the controversies surrounding the ANB angle, Wit's appraisal was introduced by Jacobson in 1975[14]. Although landmarks identification or jaw rotations do not affect it, its accuracy is affected by the need to correctly identify the functional occlusal plane, which can sometimes be impossible, especially in patients with open bites, mixed dentition, multiple impactions, missing teeth, severe cant of the occlusal plane, and skeletal asymmetries, or steep curve of Spee[15]. Additionally, the functional occlusal plane may be changed by orthodontic treatment, which can influence Wit's measurement. Therefore, in these cases, Wit's appraisal will not reflect pure sagittal changes of the jaws[3]. The mean values of the present study were near Jacobson's finding. Again, the result indicated that

we could use Wit's appraisal for our population confidently as an ethnic group has not affected the finding. However, the functional occlusal plane's location was difficult, as confirmed by Ishikawa et al. and Moore et al.[5,17].

The present study showed that the Beta angle values were statistically significant among all groups, as supported by Biak and Ververidou. They stated that the Beta angle remains relatively stable even when the jaws are rotated, and it does not depend on the functional occlusal plane or cranial landmarks[13]. When there is a clockwise or counterclockwise rotation of the jaws, the Beta angle can more accurately assess the sagittal jaw relationship. Nonetheless, it still uses points A and B, which are affected by alveolar bone remodeling associated with growth or orthodontic movement of the incisor teeth[18].

- above limitations of other parameters, a measurement was developed named the W angle. In the present study, the mean values of W angle were near those found in the Bhad et al. and Al Mashhadany studies[6,18], while it disagrees with Mittal et al. study[4]. This difference might be due to sample size or ethnic group. However, the present study shows that the groups' W angle values were statistically significant. This agrees with Bhad et al.'s study, which proposed that this angle indicates sagittal skeletal dysplasia[6]. The W angle uses three stable landmarks: point S, point M, and point G; the W angle remains relatively stable even when the jaws are rotated or growing vertically. This is because of the S-G line's rotation and jaw rotation, which carries the perpendicular from point M with it[6].

Another advantage of the W angle is that it can be a valuable tool for planning orthopedic or orthognathic procedures as this angle is independent of cranial base length, which will be affected by the position of point N and can sometimes camouflage true skeletal class I, II, and III patterns[3]. The present study results showed that the coefficient of variability was highest for Wit's appraisal and lowest for W angle in all three classes, agreeing with Mittal et al. and Sharma et al. studies [4, 7]. This indicates that Wit's appraisal is a highly variable parameter and W angle is the least variable and most homogeneously distributed parameter in intra-group comparisons.

Correlation of the study parameters in class I patients

The present study showed that in the class I group, all correlations between the studied parameters were weak and not significant, except for the correlation between W angle and Wit's appraisal, where there was a significant positive correlation. This may be related to the that the ANB angle is affected by the growth of Nasion while the W angle is most stable and reliable[19].

The findings agree with Mittal et al. study[4] but disagree with Sharma et al.[7] study, which found that in class I subjects, ANB angle correlated positively with Wit's appraisal. Additionally, our study disagrees with Pervez and Ahmed's [8] and Al-Mashhadany's [18] studies, which reported a strong negative correlation between W angle and ANB angle in CL I malocclusion.

Correlation of the study parameters in class II patients

The present study showed that in the class II group, all the correlations between the studied parameters were weak and not significant except for a negative, moderate strength significant correlation between W angle and ANB angle, which agrees with Sharma et al.[7] and Pervez and Ahmed[8] studies but disagrees with the study by Mittal et al.[4] which found a moderate negative correlation between W angle and Wit's appraisal. Therefore, assuming that Beta angle may not be a reliable tool for assessing sagittal jaw discrepancy in patients exhibiting vertical growth patterns with skeletal Class I and Class II malocclusions. However, the Beta angle is a reliable indicator of sagittal dysplasia in normal and horizontal growth patterns[20]. Furthermore, the geometry of the W angle gives it the advantage of remaining relatively stable even when the jaws are rotated or growing vertically as it uses three stable landmarks: point S, point M, and point G, and the angle is measured between a perpendicular line from point M to the SG line and M-G line. Thus the W angle remains relatively stable even when the jaws rotate or grow vertically. This is because of the S-G line's rotation and jaw rotation, which carries the perpendicular line from point M with it[6].

Correlation of the study parameters in class III patients

The findings of this study showed a strong negative significant correlation between ANB angle and Beta angle, also a strong significant positive correlation between ANB angle and Wit's appraisal. Interestingly, skeletal class III malocclusions showed 100% adherence to Beta angle values irrespective of the growth pattern. To overcome some of the limitations of the previously discussed parameters, the W angle was developed[20]. These results agree with Mittal et al.'s[4] study. In the CL

III group, the W angle showed a strong positive significant correlation with the Beta angle and a significant correlation with Wit's appraisal.

Moreover, there was a strong negative correlation between the ANB angle readings and the W angle readings. These results agree with Pervez, Ahmed, and AL Mashhadany[8,18]. However, they disagree with the Mittal et al.[4] results which showed only a negative correlation between W and ANB angles and no significant correlation between other parameters.

The Beta angle is similar to the W angle in being unable to determine which jaw is prognathic or retrognathic in class II and class III skeletal cases. To clarify this, clinicians should be aware of the importance of other cephalometric measurements[8]. The relatively new W angle is the most stable and reliable angle for measuring sagittal skeletal discrepancies[21].

Conclusions

The ANB angle, Beta angle, Wit's appraisal, and W-angle are significant parameters for assessing the sagittal jaw relationship between maxilla and mandible; however, to overcome the limitations of each, at least 2- to to three parameters should be used. The use of W angle and other parameters can provide a more accurate assessment of the sagittal skeletal jaw relationship as it has the least coefficient of variance; it should therefore enable better diagnosis and treatment planning for patients.

References

1. Singh A, Jain A, Hamsa P, Ansari A, Misra V, Savana K, Yadav A. Assessment of sagittal discrepancies of jaws: A review. Int J Adv Health Sci. 2015;1(9):29-4.
2. Jain S, Raghunath N, Muralidhar N. A comparison of W angle, Pi Angle and YEN angle as an indicator for assessing anteroposterior skeletal dysplasia in various malocclusion among the regional population: a cephalometric study. IJDRD. 2018;8(3):29-40.
3. Gor J, Kubavat A, Desai M, Mahida K, Modh A, Vaghela A. W angle: sagittal jaw dysplasia indicator for orthodontic diagnosis outcome. JMSCR. 2019;8(5):61-5.
4. Mittal D, Venkatesh S, Shivamurthy P, Mathew S. A" new vista" in the assessment of antero-posterior jaw relationship. APOS Trends Orthod. 2015;5(4):151-55.
5. Ishikawa H, Nakamura S, Iwasaki H, Kitazawa S. Seven parameters describing anteroposterior jaw relationships: postpubertal prediction accuracy and interchangeability. Am J Orthod Dentofacial Orthop. 2000;117(6):714-20.
6. Bhad W, Nayak S, Doshi U. A new approach of assessing sagittal dysplasia: the W angle. Eur J Orthod. 2013;35(1):66-70.
7. Sharma R, Sharma K, Mathur A, Preethi N, Agarwal V, Singh S and Satija N. Comparison of W angle with different angular and linear measurements in assessment of sagittal skeletal relationship in Class I and Class II patients in Jaipur population-A cephalometric study. OHDM. 2015;14(3):155-60.
8. Pervez H and Ahmed I. A new cephalometric tool W angle in the evaluation of anteroposterior skeletal discrepancy in orthodontic patient. Int. JDH S. 2014;1(3):299-304.
9. Foster TD. A textbook of orthodontics 2nd ed. St Louis: Blackwell Scientific Publications, Mosby Book Distributors. 1982. P25-41.
10. Major P, Johnson D, Hesse K, Glover K. Effect of head orientation on posterior anterior cephalometric landmark identification. Angle Orthod. 1996;66(1):51-60.
11. Doshi J, Trivedi K, Shyagali T. Predictability of YEN angle & appraisal of various cephalometric parameters in the assessment of sagittal relationship between maxilla and mandible in Angle's class II malocclusion. Peoples J Sci Res. 2012;5(1):1-8.
12. Riedel R. The relation of maxillary structures to cranium in malocclusion in normal occlusion. Angle Orthod. 1952;22(3):140-45.
13. Baik C, Ververidou M. A new approach of assessing sagittal discrepancies: the Beta angle. Am J Orthod Dentofacial Orthop. 2004;126(1):100-5.
14. Jacobson A. The Wit's appraisal of jaw disharmony. Am J Orthod1975; 67 (2):125-38.
15. Jacobson A. Application of the" Wit's" appraisal. Am J Orthod.1976;70(2):179-89.
16. Sherman S, Woods M and Nanda R. The longitudinal effects of growth on the Wit's appraisal. Am J Orthod. 1988;93(5):429-36.
17. Moore R, DuBois L, Boice P, Igel K. The accuracy of measuring condylion location. Am J Orthod Dentofacial Orthop. 1989;95(4):344-7.
18. Al-Mashhadany S. The relation between W angle and other methods used to assess the sagittal jaw relationship. J Bagh Coll Dentistry. 2012;24(2):144-9.
19. Anjora D. Comparative Evaluation of Yen Angle and W Angle with ANB Angle and Wits Appraisal

for Predicting Sagittal Jaw Dysplasia. EJMCM. 2021;8(2):2021.

20. Asudaria B, Chandulal Jadav D, Srinivasulu D, Swamy S, Mothe G. Reliability of W-angle to assess sagittal skeletal dysplacia in class I, class II, class III, patients: A Cephalometric study. Int J Appl Dent Sci. 2021;7(1):414-17.
21. Gupta A, Kumar A, Ashraf K, Hussain K, Kumar A, Kulshrestha R. Establishment of cephalometric norms of Yen, W and Beta angle with assessment of sagittal jaw relationship in Eastern Indian population. Indian J Orthod Dentofacial Res. 2019;5(2):63-6.

AppendixI Data recording form

I- General Information

Origin: Date: / / 2016 serial No. …….

II-Personal Information

Name:…….. Gender: M / F Birth Date: / /

Type of malocclusion: Class I ☐ Class II ☐ Class III ☐

History of jaw or facial fracture: Yes ☐ No ☐

Previous orthodontic treatment: Yes ☐ No ☐

Previous orthognathic surgery: Yes ☐ No ☐

cranial or facial malformation: Yes ☐ No ☐

TMJ disorder and pain: Yes ☐ No ☐

Dentition:

17	16	15	14	13	12	11	21	22	23	24	25	26	27
47	46	45	44	43	42	41	31	32	33	34	35	36	37

III- Cephalometric measurement

1-ANB angle: ……....

2-Wits appraisal: …….

3-Beta angle: ……..

4-W angle: ……..