

## Evaluation of existence of gender dimorphism in Wits appraisal

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### ABSTRACT

**Background:** To evaluate whether any gender dimorphism exists for the value of wits appraisal in angle's class I malocclusion.

**Materials and methods:** Standardized lateral cephalograms were obtained from 60 subjects (30 males and 30 females) of 10-18 years age group with normal occlusion and pleasing facial profile who were referred to the department of orthodontics and dentofacial orthopaedics, Patna dental college and hospital, Patna. Lateral cephalogram was taken for each and every patient and wits analysis were performed. Data thus obtained was subjected to statistical analysis.

**Result:** Difference between the mean value of wits appraisal was found to be statistically significant between males and females which indicated requirement of gender based cephalometric norms for accurate diagnosis and treatment planning.

**Keywords:** Wits appraisal, antero- posterior jaw discrepancy, gender variation.

### INTRODUCTION

With the discovery of cephalometric in dentistry, a new era of various analyses began. Since then different analyses have been developed, such as Downs,<sup>1</sup> Steiner's,<sup>2</sup> Ricketts,<sup>3</sup> Tweed's,<sup>4</sup> and many more. These analyses mainly include skeletal, dental and soft tissue measurements.

Majority of patients in orthodontic department report with antero-posterior jaw discrepancies. For accurate measurement, cephalometric analyses such as Steiner and Wits appraisal are mainly used<sup>5</sup>. ANB measurement in the Steiner's analysis is used for the assessment of antero-posterior skeletal relationship. It indicates the magnitude of the skeletal jaw discrepancy and in a normal well proportionate face, ranges from 1 to 5 degrees.<sup>6</sup> However ANB angle has certain limitations. A false value can be obtained with altered antero-posterior and vertical position of nasion, increased or decreased vertical height of the face,<sup>7</sup> tipping of SN

plane and variation in ANB angle between patient's centric occlusion and centric relation.<sup>8</sup>

In 1976, Jacobson<sup>9</sup> introduced the "Wits appraisal" (abbreviation of the University of Witwatersrand, Johannesburg, South Africa) to overcome the limitations of ANB. This linear measurement measures the antero-posterior relationship of the skeletal bases eliminating reference points on the cranial base. According to Jacobson, a perpendicular line is drawn on the lateral cephalogram from points A and B on the maxilla and the mandible, respectively, to the occlusal plane. The occlusal plane is drawn as a line passing through the overlap of the mesiobuccal cusps of the first molars and the buccal cusps of the first premolars. The distance between the points of contact of the perpendicular lines on the occlusal plane (AO=A point to occlusal plane and BO=B point to occlusal plane) is measured to find out skeletal antero-posterior discrepancy in skeletal class I cases. In males, point BO remains approximately 1 mm ahead of point AO,

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with a range of -2 to 4 mm in skeletal class I cases. However in adult females, points AO and BO generally coincide, with a mean of -0.1 mm, range being -4.5 to 1.5 mm. Point BO remains behind point AO, in skeletal class II relationship, whereas in skeletal class III cases, point BO remains forward of point AO.

Several studies have shown that value of wits appraisal varies with races as well as with various ethnic groups<sup>10</sup>. Variations have also been reported among males and females of various ethnic groups and hence this study aimed to study any gender variation in the value of wits appraisal in angle's class I malocclusion.

## MATERIALS AND METHODS

Sample consisted of 60 subjects (30 males and 30 females), who were referred to the department of orthodontics and dentofacial orthopaedics, Patna dental college and hospital, Patna. Subjects included in this study were within the age group of 10-18 years, selected randomly based on: 1) Bilateral Angle's class I molar relation, 2) ANB ranging from 0° to 3°, 3) Normal overjet and overbite, 4) No history of previous Orthodontic treatment, 5) Harmonious profile, 6) No obvious craniofacial deformities.

Materials used for the study included Siemens X-ray machine with hi-speed intensifying screen, lateral cephalometric radiograph with Kodak X-ray cassette and KG4 screen (size 8" X 10"). Cellulose acetate tracing paper (0.003 mm), lead pencil - 0.5 mm, millimeter Scale and a radiograph illuminator. The lateral cephalogram was taken for all subjects selected under this study. Target film distance of 5 feet was used for all cephalograms obtained. The cassette-film assembly was positioned parallel with the midsagittal plane of the subject such that the x-ray beam is directed perpendicular to it. A voltage of 80kvp and a current of 20mA was used with an exposure time of 2.5 seconds to obtain the lateral head film.

The following points were marked and linear measurements were done on cephalogram:

- 1) Point A: A measuring point taken at the innermost curvature

from the maxillary anterior nasal spine to the crest of the maxillary alveolar process.

- 2) Point B: A measuring point on the anterior profile curvature from the pogonion to the crest of the alveolar process.
- 3) Occlusal Plane: A line passing through the overlapping cusps of Molars and Premolars.
- 4) Two perpendicular lines; one connecting A point to the occlusal plane (AO Point) and B point to the occlusal plane (BO Point)

## Statistical analysis:

Lateral cephalograms were traced upon a 0.003 mm matte acetate tracing paper the tracings were analysed using linear and angular measurements according to wit's analysis. Linear and angular measurements were done to an accuracy of 0.5 mm and 0.5 degrees respectively. All the measurements values of different parameters were collected, arranged properly and computed for statistical analysis. Statistical analysis was performed with help of Epi Info (TM) 3.5.3. EPI INFO is a trademark of the Centres for Disease Control and Prevention (CDC). Descriptive statistical analysis was performed to calculate the means with corresponding standard deviations (s.d.), median and ranges. 't'-test was used to test the difference between mean values.  $p < 0.05$  was taken to be statistically significant.

## RESULTS

Study sample consisted of equal number of males and females (Graph 1). Test of proportion showed that there was no significant difference in the proportion of male and female ( $p > 0.05$ ). The mean value of difference between AO-BO was found to be -0.69 mm in males with a standard deviation of 2.23mm whereas in females the value was 1.68 mm with standard deviation of 2.14 mm. The difference between the mean value of AO-BO between male and female was found to be statistically significant ( $p = 0.0001$ ).

Graph 1 : Gender distribution of sample.

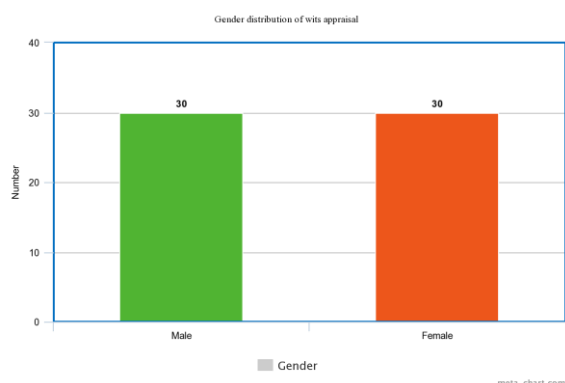


Table 1: Comparison of mean values of AO-BO between males and females.

| Gender | Mean  | Standard deviation | t-statistic | p value   |
|--------|-------|--------------------|-------------|-----------|
| Male   | -0.69 | 2.23               | 4.20        | P =0.0001 |
| Female | 1.68  | 2.14               |             |           |

## DISCUSSION

The name Wits is short for Witwatersrand, which is a University in South Africa. Jacobsen in 1975 published an article called "The Wits appraisal of jaw disharmony".<sup>11</sup> This analysis was created as a diagnostic aid to measure the antero-posterior skeletal disharmony. The antero-posterior skeletal discrepancy is also measured with the help of ANB angle. However This ANB angle can be affected by multitude of environmental factors such as:

1. Patient's age where ANB has tendency to reduced with age
2. Change in position of nasion as pubertal growth takes place
3. Rotational effect of jaws
4. Degree of facial prognathism

To remove the various drawbacks of ANB angle, wits appraisal was introduced. Since Wits values were shown not to be affected by age, it was critical to evaluate other variables such as gender, which may affect the normal skeletal, dental, and soft tissues characteristics of an individual<sup>9</sup>. According to Jacobson, the BO point approximately remains 1 mm ahead of point AO in males whereas in females, these two points generally coincides.

The present study showed that the difference of the mean value of AO-BO was statistically significant ( $p=0.0001$ ) between males and females. In contrast to the present study, no gender difference was reported by Al-Barakati SF, who in a study showed that the Wits mean values were 0.82 and 0.41 for males and females, respectively<sup>12</sup>. However, the result of this study was found to be similar as of Jacobson<sup>11</sup> with regard to the existence of gender dimorphism.

## CONCLUSION

The present study showed a variation in the measurement of AO-BO between sexes in skeletal class I cases. The result of the present study indicated that separate norms should be considered for males and females for wits analysis while diagnosing the patient for getting most accurate diagnosis and treatment planning. The present study was done with a limited number of samples. For standardization of result, further extensive study is necessary with greater number of samples and meticulous sample selection.

## CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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