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Cephalometric analyses of the craniofacial pattern using the Jarabak analysis

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***Abstract*---**Background: For an accurate orthodontic diagnosis and management, knowledge of face development and progression is required. Objective: To evaluate the linear cranial base (LCB) and angular cranial base (ACB) measurements in various Anterior and Posterior (AP) skeletal correlations, research study used Bjork-Jarabak evaluation. Material and Methods: A total of 220 young participants presenting (120 females and 100 males; average ages of 19.34 ± 2.51 and 24.84 ± 2.81 years, correspondingly) at the Multan

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Medical and Dental College, Multan from March 2022 to September 2022, Pakistan, served as the basis for this retrospective cross-sectional study. Results: In comparison to Jarabak's standards, male dimensions revealed significant differences in the articular angle, AP cranial bases, ramus height, jaw length, anterior face height while women displayed low significant differences, with the exception of mandibular body length, which is longer in Pakistani women. Conclusion: Skeletal differences between Pakistani man and women were considerable, and a contrast to the study of Bjork Jarabak's standardized linear and angular values was also noteworthy.

***Keywords*---**Bjork-Jarabak method, cranial, facial bones, cephalograms.

Introduction

For an accurate orthodontic diagnosis and management, knowledge of face development and progression is required. Whether indirectly or directly, the development of the cranial base (CB) is related to the total development of the facial bones, particularly the maxilla and mandible [1,2]. The mandible is indirectly related towards the posterior portion of the CB via temporomandibular joint, whereas the maxilla is connected directly to the anterior section of the base by development sutures. Consequently, any alteration in the rate and/or angle of CB growth may have either positive or negative consequences lying on the growing mandible as well as maxilla [3].

Past research discovered that the skeletal anterior and posterior (AP) connections I, II and III, correspondingly, tended to demonstrate a steady decline in CB angulation and linear measures [4-6]. According to Proff *et al.*, (2008), participants with Class III sagittal connections had shorter CB lengths and smaller CB angles than those with various skeletal associations [7]. Additionally, Chin *et al.*, (2014) hypothesized that the SNB angle reduced as the CB angle rose [8]. Several research, nevertheless, failed to find such a connection among CB measures and sagittal skeletal connections [9-11].

It was previously believed that the CB angle was crucial in the formation of malocclusion [12]. Straightening this angle may cause the glenoid fossa to be positioned more posterior, which may increase the tendency for the jaw to be positioned further rearward [13]. On the other hand, a decrease in the CB angle may lead to a propensity toward a Class III skeletal connection and a further advanced location of the glenoid fossa [14].

Establishing the connection between the development of the maxilla and mandible and the development of the CB may be done with the use of the Bjork-Jarabak assessment [15]. It was hypothesized that the mandible preferred to exhibit a reverse grow spin but the average of the Bjork polygon angles was greater than 400^{o}, although the mandible inclined to comprise a lateral grow spin if the mean was below 392^{o} [3]. The role of linear measures and CB angulation inside the formation of AP jaw connections is still up for dispute. In order to evaluate the LCB and ACB dimensions in various AP skeletal correlations, research study used Bjork-Jarabak evaluation.

Material and Methods

The study was carried out at Multan Medical and Dental College, Multan from March 2022 to September 2022. A total of 220 adult individuals presenting (120 females and 100 males; average ages of 19.34 ± 2.51 and 24.84 ± 2.81 years, correspondingly) served as the basis for this retrospective cross-sectional study. Patients who had previously undergone orthodontic or orthognathic therapy, had craniofacial deformities, had sustained face injuries, or had asymmetries that were discovered were rejected.

The same standardized procedure was used to manually trace lateral cephalograms in a dim environment. The radiopaque ruler was used to change the radiographs' magnifying power (calibration marker). A 4H pencil was used to mark lines and points. To minimise variations between examiners, relatively similar investigation conducted all measures. The data from the Bjork-Jarabak assessment comprised linear and angular measurements of a Bjork polygon (figure 1). After a one-month break, 30 lateral cephalograms were chosen at random and reexamined. The intraclass consistency of the examiners was assessed using the intraclass correlation coefficient (ICC).

The data was analyzed using the Statistical Package for the Social Sciences (version 20.0). Q-Q regular plot and Shapiro-Wilk assays both supported the existence of a standard deviation. For each of the variables that had been measured, descriptive statistics i.e. means and standard deviations (SD) were computed. Several correlation coefficients were evaluated utilizing Bonferroni correction. To identify sex differences, the t-test was performed. P value less than 0.05 was used to indicate statistical significance

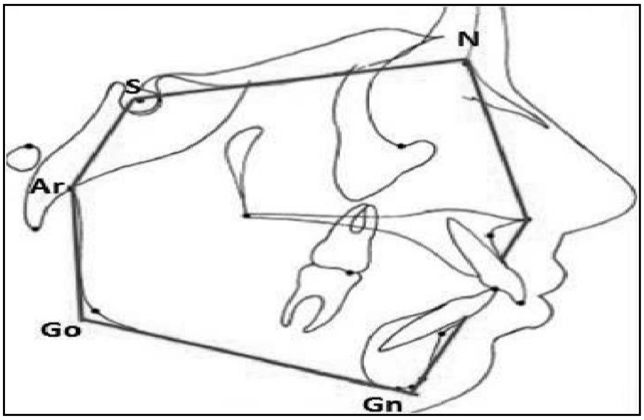

Figure 1: Linear and angular measurements for the Bjork polygon

Results

The consequences of the test to gauge the degree of accuracy revealed that there were few overall inaccuracies for any one parameter (linear measurements <

0.23mm and for angular measurements, 0.34nm) and within appropriate limits. Figure 2 displays descriptive data for the craniofacial morphology of Pakistani individuals. The AP cranial base lengths of Pakistani men and women differ significantly, whereas men have greater AP face height, ramus height, and mandibular length (figure 3).

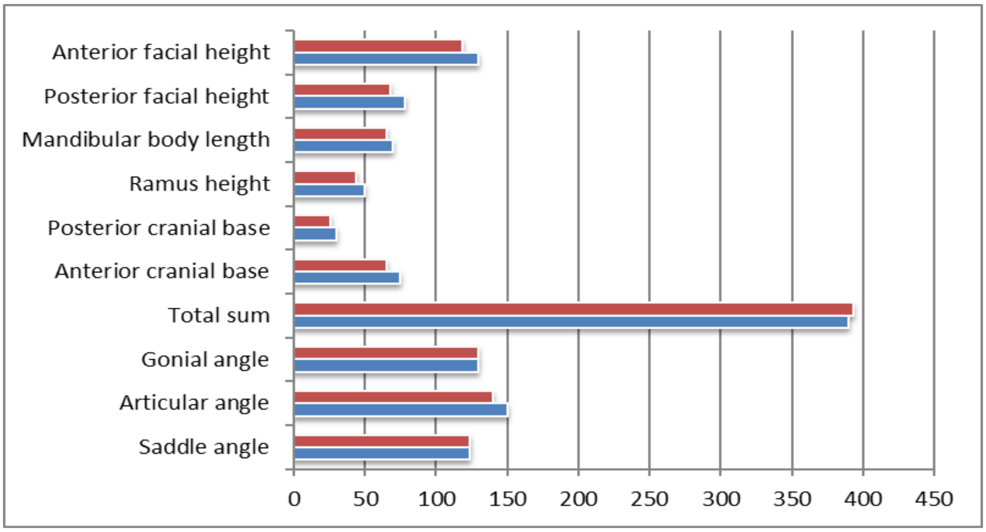

Figure 2: Displaying the average of the gender gap in Jarabak norms for adults

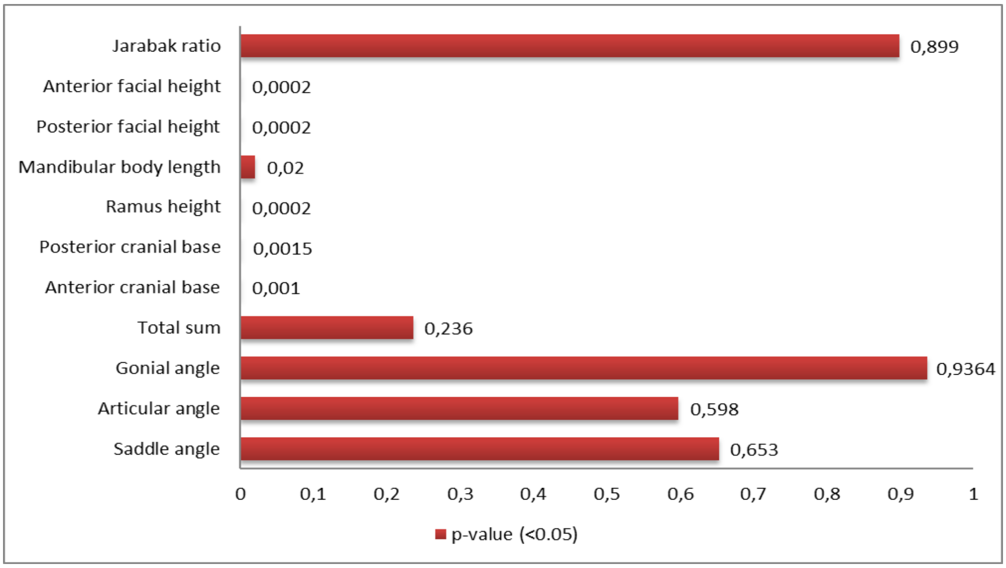

Figure 3: demonstrating the statistical importance of the various Jarabak Analysis components

In comparison to Jarabak's standards, Table 1 shows the averages and SD of LCB and ACB measurement for men and women in Pakistan. Male cephalometric measures found significant deviations from Jarabak's norms in the articular angle, AP cranial bases, and height of ramus, mandibles and anterior facial, and

Jarabak's percentage, with higher standards in Pakistani men. When their findings were associated to Jarabak's models, females revealed startling alterations in the articular angle, ACB, posterior facial height, and mandibular body length. When compared to Jarabak's standards, all values were lower in Pakistani women, with the exception of mandibular body length, which was higher.

Table 1: Jarabak's standards and the Pakistani Male and Female Mean vary statistically

Variable	Pakistani Males			Pakistani Females		
	Jarabak norms Mean ±SD	Pakistani males Mean ± SD	P value	Jarabak norms Mean ±SD	Pakistani females Mean ± SD	P value
Saddle Angle	122.0 ± 5	124.649±4.15	0.852	122.2 ± 5	124.840 ± 5.671	0.723
Articular Angle	142.0 ± 4	138.805±5.31	0.006	141.1 ± 4	138.326 ± 6.926	0.005
Gonial Angle	129.0 ± 5	129.411±5.40	0.513	129.3 ± 5	129.180 ± 5.143	0.970
Total Sum	395.0 ± 4	394.934±5.62	0.982	395.4 ± 6	394.929 ± 5.524	0.164
Anterior Cranial Base	70nm ± 2	73.17±4.595	0.019	70nm ± 4	73.16 ± 5.3.221	0.238
Posterior Cranial Base	31nm ± 2	33.643±5.486	0.002	31nm ± 2	33.642 ± 4.4851	0.002
Ramus Height	43nm ± 4	48.339±5.796	0.003	42nm ± 6	48.338 ± 4.3.587	0.843
Mandibular Body Length	70nm ± 4	77.326±5.63	0.002	70nm ± 4	77.325 ± 5.145	0.007
Posterior Facial Height	76.4 ± 6.4	77.447±6.08	0.312	76.6 ± 6.4	77.446 ± 5.182	0.002
Anterior Facial Height	111.4 ± 6.4	119.607±5.05	0.002	111.7 ± 6.1	119.606 ± 7.089	0.740
Jarabak Ratio	62.50 ± 1.4	64.03±2	0.019	62.41 ± 1.3	64.03 ± 3	0.284

Discussion

The findings of this study showed that majority of the factors had significant differences. Facial differences are influenced by a variety of factors, such as sex, age, ethnic origin, and face type. These qualities are layered with each person's unique uniqueness. Since these fundamental differences vary depending on the population, values created for any group should only be used as a guideline rather than as comprehensive criteria that all members of that community need adhere to in order to be classified as "normal" [16].

This findings suggest that while angular measurements did not demonstrate any variation between the two gender identities, linear measurements only showed a substantial increase in males relative to females, which is represented by a research project in the Saudi population by Nabeel and Barakati (2009), WeiSHY (1986), and Foo (1968), which discovered that in the Chinese and Malaysian populations, including both [17-19]. The majority of linear measures were considerably larger in men than in women, although there were more significant differences in angular measurements between the genders in the Bangladeshi population.

According to Bjork, the anterior facial height (AFH) should increase by around 2.3 mm every year, whereas the posterior facial height (PFH) should increase by about 2.9 mm per year. The glenoid fossa outpace anterior vertically development, forcing the symphysis forward, which results in the typical anticlockwise growth of the TMJ. This asymmetry is more pronounced in persons with brachy face features, and dolichofacial patients typically exhibit clockwise development [20].

Prior to the design of orthodontic and/or orthognathic treatments, assessment of highly divergent profiles and judgement of anterior face height are essential. Similar findings were reported by Al-Barakati and Talic in 2007, who informed the Saudi people about the prototype of the jaw rotating backward and downward and of its propensity to resemble a class II prototype [21]. The outcomes of this research indicated that anterior facial height of Pakistani men is much higher than Jarabak's values. Comparable results were obtained by Al-Barakati and Talic (2007), who alerted the Saudi public to the prototype of backward and downward revolution of the mandible and predisposition adjacent to a class II prototype [22]. The majority of the linear measures found by Hussein and Hussiny (2015) in the Iraqi population are higher in Iraqi men than Iraqi women and Caucasians, which is also verified by our research [23].

Conclusion

The skeletal variability in Pakistani males and females, including the AP and CB lengths, anterior and posterior face heights, ramus height, and mandibular dimension, were considerable. It was additionally noticeable to compare these variance to the standardised LCB and ACB values of Bjork Jarabak's assessment.

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