

## ORIGINAL ARTICLE

# Dental Aesthetic Index (Dai) Score Among Patients with Antero-Posterior Basal Bone Discrepancy

ANNAM IMTIAZ<sup>1</sup>, CH. REHAN QAMAR<sup>2</sup>, USMAN YOUSAF<sup>3</sup>, MOHAMMAD UMAR SHAH<sup>4</sup>, AAQIL MALIK<sup>5</sup>, MUHAMMAD AFZAL<sup>6</sup>

<sup>1</sup>Senior Registrar Orthodontic Dept. University College of Dentistry, The University of Lahore.

<sup>2</sup>Professor of Orthodontics. University College of Dentistry, The University of Lahore.

<sup>3</sup>Assistant Professor Orthodontics. University College of Dentistry, The University of Lahore.

<sup>4</sup>Consultant Prosthodontist/Assistant Professor, Department Of Prosthodontics, Qassim Regional Dental Center, Kingdom Of Saudi Arabia

<sup>5</sup>Associate Professor, Department of Prosthodontics and Implantology. University College of dentistry, The University of Lahore.

<sup>6</sup>Associate Professor, Department of Prosthodontics, Institute of Dentistry, CMH Lahore Medical College, NUMS

Correspondence to: Annam Imtiaz

## ABSTRACT

**Aim:** To determine the mean Dental Aesthetic Index (DAI) malocclusion score among patients with Antero-posterior basal bone discrepancy (APBBD) and to assess the treatment need of the patients with horizontal jaw deformities as calculated by DAI guidelines.

**Methodology:** The descriptive cross sectional study was conducted in the Orthodontic department, University College of Dentistry, The University of Lahore. Lateral cephalograms of the patients were analyzed for anteroposterior basal bone discrepancy by measuring angle ANB. Two hundred and thirty one subjects were included in the study having ANB  $>4^\circ$  or  $<1^\circ$  through non probability consecutive sampling technique. Study casts were obtained and malocclusion parameters for Dental Aesthetic Index (DAI) were calculated.

**Results:** The mean Dental Aesthetic Index (DAI) score in APBBD was  $37.10 \pm 7.62$ , in skeletal class II ( $37.14 \pm 7.90$ ) and in skeletal class III ( $36.98 \pm 6.68$ ), (p-value 0.75). Moderate positive correlation existed between DAI score and ANB in skeletal class II subjects (R 0.49,  $p < 0.001$ ).

**Conclusion:** The mean DAI score in APBBD showed mandatory treatment need in patients with Antero-posterior basal bone discrepancy. Moderately positive correlation existed between ANB and DAI score in skeletal class II patients.

**Keywords:** Malocclusion, Dental Aesthetic Index, Jaw disharmony

## INTRODUCTION

Orthodontic indices has been developed for categorization of malocclusion and estimation of treatment needs of the patients.<sup>1</sup> Dental aesthetic index was developed by cons et al.<sup>2</sup> The index has been accepted by World Health Organization (WHO) as cross cultural index because of its non-invasive nature, aesthetic considerations and integration of opinions from both layman and orthodontists for the final weightage of malocclusion scores.<sup>3</sup> Dental aesthetic index comprises often parameters of malocclusion.<sup>4</sup> These parameters can be measured from the study casts or by the intra-oral clinical examination.<sup>5</sup> The resulting score is categorized against the standardized values for the estimation of severity of malocclusion and treatment need requirements.<sup>6</sup> Malocclusion is defined as deviation from the normal characteristic of occlusion and dentofacial patterns, thus could affect the skeletal, dental or both the components.<sup>7, 8</sup>

Jaw disharmonies are usually diagnosed with the help of radiographic analysis and can be managed in less invasive manner by growth modification or camouflage or invasively by Combined Orthodontic-Orthognathic surgical procedures, depending upon the severity and growth potential of the individual.<sup>9</sup>

The current study aimed to calculate the mean Dental Aesthetic index (DAI) score among patients with anteroposterior basal bone discrepancy (APBBD). Although mean DAI score has been reported in local orthodontic patients; however, no distinction was made on the basis of maxillo-mandibular basal bone discrepancy which may act as an effect modifier of the results.<sup>10</sup> As Anteroposterior

basal bone discrepancy can be treated less invasively if diagnosed at an early and timely stage of growth,<sup>11</sup> thus the rationale of the study was to have the knowledge of mean DAI score in patients with anteroposterior basal bone discrepancy, which may lead to not only prioritization of patients according to the severity of treatment need, rather also explores the possibility of its utilization as non-invasive screening tool in such patients.

The findings of the study will also be able to fill the knowledge gaps existed by reporting the mean DAI score in skeletal class II and Skeletal class III patients with any significant difference if exists between them.

## MATERIAL AND METHOD

This descriptive cross sectional study was conducted on the patients seeking orthodontic treatment from the department of Orthodontics, University College of Dentistry, The University of Lahore. Sample size of 231 patients was calculated by taking reported mean DAI in skeletal malocclusion as  $41.0 \pm 15.5$ <sup>12</sup>, Alpha at 0.05, power of the sample 80%, confidence interval of 95% and 2 point score as the absolute precision from the mean.

Age range of the patients was 12-25 years. The inclusion criteria were the presence of permanent set of dentition and skeletal class II or skeletal class III malocclusion. Subjects with prior orthodontic treatment history, immuno-compromised health status and those with syndromic presentation were excluded from the study. Standard cephalograms of the patients were traced manually to calculate the angle ANB.<sup>13</sup>

Dental casts of the selected patients with ANB  $>4^\circ$  or  $<1^\circ$  were obtained. Dental Aesthetic Index score was calculated by visual observation and pointed Vernier caliper with 0.05mm accuracy, and categorized into groups as per the method proposed by cons et al.<sup>2</sup> SPSS version 25.0 was used for statistical analysis. Measurement errors were calculated through intra-class correlation coefficient on 10% of the sample. Descriptive analysis was used to estimate means and standard deviations. Mann Whitney U test was used to compare the mean DAI score in skeletal class II and skeletal class III malocclusion. Spearman correlation test was used to determine the correlation between DAI score and angle ANB.

## RESULTS

The mean age of the sample was 16 years  $\pm$  3.47. The sample comprised subjects of Skeletal class II (n= 178,

Mean ANB  $7.04 \pm 1.73$ ) and Skeletal class III malocclusions (n= 53, Mean ANB  $-2.75 \pm 1.65$ ). The gender distribution of the sample was males (n=96) and females (135). Intra-class correlation coefficient showed excellent reliability of the measured parameters  $r > 0.9$ .

The Mean Dental Aesthetic Index (DAI) score was  $37.10 \pm 7.62$  in patients with APBBBD. There was no significant difference observed between the DAI score of skeletal class II and skeletal class III subjects. Treatment need assessment of the sample revealed 54.5% of the subjects with skeletal malocclusion needed mandatory treatment.

The spearman's analysis revealed moderately positive correlation between ANB and DAI score in skeletal class II patients, however the analysis did not reveal any significant correlation for skeletal class III subjects.

Table 1: Mean Values of the Variables

	Mean	Std. Deviation	Minimum	Maximum	Sig.
Dental Aesthetic index (DAI) Score					
APBBBD (N=231)	37.10	7.62	24	65	-
Skeletal class II (N= 178)	37.14	7.90	24	65	0.75*
Skeletal class III (N=53)	36.98	6.68	24	50	
DAI score Group					
APBBBD (N=231)	3.29	0.885	1	4	-
Skeletal class II (N= 178)	3.28	0.894	1	4	0.61*
Skeletal class III (N=53)	3.36	0.857	1	4	

Mann-Whitney U test, \* P-value  $> 0.05$

Table 2: Frequency distribution of treatment need assessment in APBBBD as per DAI score groups

DAI score group	APBBBD (n=231)		Skeletal class II malocclusion (n=178)		Skeletal class III malocclusion (n= 53)	
	Frequency	%age	Frequency	%age	Frequency	%age
(Group 1) No treatment indicated	8	3.5	5	2.8	3	5.7
(Group 2) Elective treatment	42	18.2	38	21.3	4	7.5
(Group 3) Treatment highly desirable	55	23.8	38	21.3	17	32.1
(Group 4) Treatment Mandatory	126	54.5	97	54.5	29	54.7

Table 3: correlation between angle ANB and APBBBD

Spearman's correlation	Dental Aesthetic Index (DAI) Score		Dental Aesthetic Index (DAI) Score Groups	
	R	Sig.	R	Sig.
ANB				
APBBBD (N=231)	0.311	0.000	0.312	0.000
Skeletal class II malocclusion (N=178)	0.490	0.000	0.496	0.000
Skeletal class III malocclusion (N=53)	0.015	0.916	0.069	0.622

## DISCUSSION

The accurate orthodontic treatment need assessment is essential to utilize the funded resources for severe malocclusions.<sup>14</sup> Dental Aesthetic index (DAI) has been accepted by WHO for this purpose.<sup>15</sup> Skeletal malocclusion needs prioritized treatment as per the growth status of the patient.<sup>16</sup> Thus it was imperative to know that how well the assessment of treatment need by DAI score categorized and correlate with ANB for the patients with APBBBD.

The findings of the current study with mean DAI score  $37.10 \pm 7.62$  in APBBBD in Pakistani population differs significantly than the study reported mean DAI score  $27.13 \pm 9.52$  in the same population without separate categorization of subjects with skeletal malocclusion.<sup>10</sup> The difference in the score demonstrated that the treatment need assessment by DAI in epidemiological surveys should be carefully considered for patients with APBBBD. Our

findings were found comparable with those reported by Huang, et al<sup>12</sup> with mean DAI score in APBBBD ( $41.0 \pm 15.5$ ).

Our results demonstrated that DAI score in APBBBD suggested mandatory orthodontic treatment need in 54.5% of the sample. The findings were similar to the retrospective study done in Indian population, where 55% of the subjects reporting to Orthodontics department needed mandatory orthodontic treatment.<sup>16</sup> In contrast to our findings, Firdaus<sup>17</sup>, reported 32.7% of the subjects visiting orthodontic clinics needed mandatory Orthodontic treatment, showed that skeletal discrepancy may act as effect modifier in treatment need assessments of Orthodontic patient.

The current study determined mean DAI score  $37.14 \pm 7.90$  and  $36.98 \pm 6.68$  in skeletal class II and skeletal class III respectively, On the contrary a study conducted on Japanese population reported mean DAI score of

48.9±10.2 and 48.0±13.3 in skeletal class II and skeletal class III respectively.<sup>18</sup> However, both the studies categorized the patients in mandatory treatment need.

The analysis of the present study revealed moderately positive correlation of DAI score and angle ANB for skeletal class II. No significant correlation was present for skeletal class III. Moderate positive correlation ( $r= 0.45$ ,  $p$ - value  $<0.001$ ) was found between DAI and American board of Orthodontics-Discrepancy Index (ABO-DI) score which measures ANB as integral component. The research conducted on Korean population revealed weak positive correlation ( $r= 0.23$ ,  $p$ - value  $<0.001$ ) between sagittal craniofacial components and the sagittal parameters of DAI.<sup>19</sup>

Although the mean DAI score varies in different ethnicities, our results complement the literature reported mandatory treatment need in APBBD when assessed through DAI score. Future studies with larger sample size will further validate the results.

## CONCLUSION

Mean Dental Aesthetic index (DAI) score in APBBD was 37.10 ±7.62 showed mandatory treatment need in patients with Antero-posterior basal bone discrepancy. There was statistically non-significant difference between the mean DAI score of skeletal class II and skeletal class III patients. Moderate positive correlation and statistically non-significant correlation existed between ANB and DAI score of skeletal class II and skeletal class III respectively.

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