



## RESEARCH ARTICLE

# ANTERIOR OPENBITE – A CEPHALOMETRIC EVALUATION OF DENTAL PATTERN IN BENGALI POPULATION

Dr. Sourav Koley<sup>1,\*</sup>, Dr. Santosh Shukla<sup>2</sup>, Dr. Subhasis Sheet<sup>1</sup>, Dr. Chandra Bhanu Pratap<sup>1</sup>,  
Dr. Anukul Chandra Biswas<sup>3</sup> and Dr. Anirban Choudhury<sup>4</sup>

<sup>1</sup>MDS, Assistant Professor, Dept. of Orthodontics and Dentofacial Orthopaedics, Dr. R. Ahmed Dental College & Hospital, Kolkata, India; <sup>2</sup>MDS, Dept. of Dentistry, Midnapur Medical College & Hospital, Midnapur, India.

<sup>3</sup>MDS, Burdwan Dental College & Hospital, Burdwan, India; <sup>4</sup>MDS, Orthodontist, Dept. of Dentistry, Contai Subdivisional Hospital, Contai, India

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### \*Corresponding Author:

Dr. Sourav Koley

## ABSTRACT

**Background:** There are large racial variations in the characteristic features of anterior open bite among different population groups throughout the world. The purpose of this comparative study was to find out significant dento-alveolar differences between Bengali anterior openbite and normal subjects to identify any peculiarity in dental factors that may help to categorize the dental pattern of anterior open bite in this particular population group. **Methods:** Lateral cephalometric films of 30 Bengali subjects having anterior open bite were compared with lateral cephalometric films of 30 normal Bengali subjects by dental parameters. **Results:** Statistically significant differences were found in two dental parameters. **Conclusion:** More acute interincisal angle and increased proclination of maxillary anterior teeth were found in anterior open bite subjects.

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## INTRODUCTION

Human face matures through growth and development, depending upon the interaction between genetic and epigenetic factors to its adult form. Facial balance, harmony and proportions related some degree at least to skeletal and dental patterns of an individual. Some malocclusions disfiguring the facial proportion along with the overlying soft tissue curtain can be easily noticed by the common people, especially those almost exclusively limited to anterior part of mouth, like anterior open bite. According to T. M. Graber, (Graber T. M 2005) "Open bite is descriptive of a condition where a space exists between the occlusal or incisal surfaces of maxillary and mandibular teeth in the buccal or anterior segments, when the mandible is brought into habitual or centric occlusion." Depending on the location, open bite is of two types, anterior open bite and posterior open bite. Anterior open bite (AOB) (Houston 1996) is present when there is no incisor contact and no vertical overlap of the lower incisors by the uppers. Anterior open bite has been grouped (Nahoum HI 1975) into two broad categories, dental open bite and skeletal open bite.

Prevalence (William R 2007) of AOB varies greatly between racial/ethnic groups. In U.S. population anterior open bite (negative overbite > - 2 mm) occurs in less than 1 % and is five times more prevalent in blacks than whites or Hispanics. Etiology of anterior openbite is multifactorial (Watson WG 19981), broadly divided into, genetic factors and environmental factors. Environmental factors that may contribute to this malocclusion may be tongue size (Wolford LM 1996) or posture (Watson WG 1981) (Kydd WL 1963), digit sucking habits (William R 2007), mouth breathing (Nahoum HI 1975), neuromuscular disturbance (English JD 2002), pathological conditions (Wolford LM 1999), iatrogenic. The Bengali people (Wikipedia, Encyclopedia) are an ethnic community native to the historic region of Bengal, mostly concentrated in Bangladesh and the states of West Bengal and Tripura in India. They speak Bengali, which is an Indo-Aryan language. The purpose of this study was to evaluate and characterize dental features of anterior open bite and compare them with normal subjects by lateral cephalometric radiograph with the hope that those findings will be useful for diagnosis, treatment planning, prognosis and post-treatment stability for Bengali population in near future.

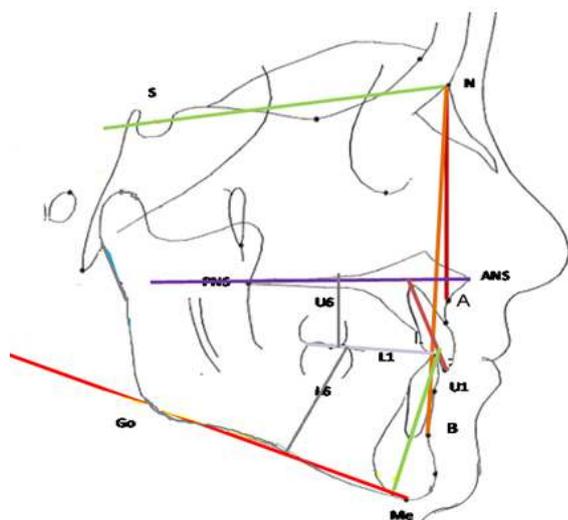
## MATERIALS AND METHODS

Lateral cephalometric radiographs for this study were collected from the Department of Orthodontics, Dr. R. Ahmed Dental College & Hospital, 114, A. J. C. Bose Road, Kolkata-700014. Clearance from institutional ethics committee was obtained. 30 subjects selected with anterior open bite (clinically having at least 1 mm of open bite) were included and 30 subjects were selected as control group with Angle's class-I molar relationship with normal overbite (2-4 mm), randomly. All the subjects having complete permanent dentition in upper & lower arches except third molars and without any individual tooth malformation, pathology, with no history of previous or ongoing orthodontic intervention. No attempt was made to distinguish differences by gender. Age and sex distribution of both the groups was quite similar. Standardized lateral cephalometric radiographs of all the subjects were selected with same magnification (as all the radiographs were taken with same machine & by same operator). Tracings were done on 0.003-inch acetate matte tracing paper with hard 3H lead pencil. This was a cross-sectional study and duration of the study was about one year.

### Specific dental parameters used for the study

- **In antero-posterior plane**
- **U1-PP angle:** Angle formed by the intersection between the long axis of maxillary central incisor and palatal plane.
- **L1-MP angle:** Angle formed by the intersection between the long axis of mandibular central incisor and mandibular plane (Go-Me).
- **U1-L1:** Interincisal angle.
- **Vertical plane:**
- **U1-PP:** Liner perpendicular distance from the tip of maxillary central incisor to palatal plane.
- **U6-PP:** Liner perpendicular distance from the tip of mesio-buccal cusp of maxillary first molar to palatal plane.
- **L1-MP:** Liner perpendicular distance from the tip of mandibular central incisor to mandibular plane (Go-Me).
- **L6-MP:** Distance from the tip of mesio-buccal cusp to mandibular first molar to mandibular plane (Go-Me).

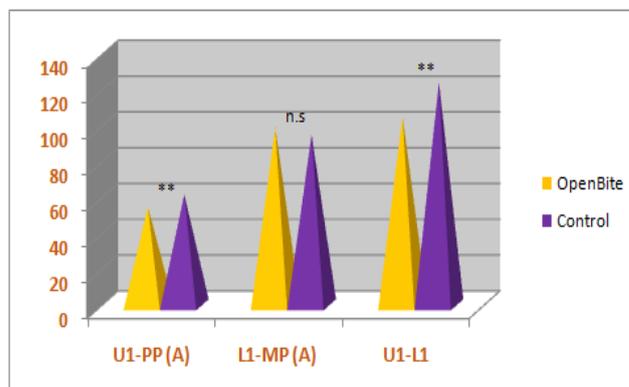
Data were collected for Cephalometric evaluation and statistical analysis.



## RESULTS AND ANALYSIS

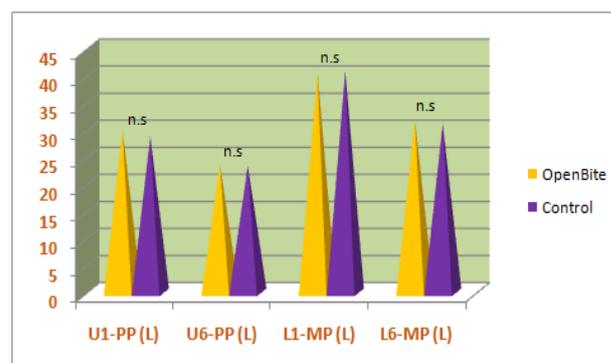
Microsoft office Excel and Minitab (Key maker Core Inc.) were the data analysis tools used for this study. Calculation included the descriptive statistical analysis of comparison between open bite and normal subjects by performing the student t-tests (Unpaired t-tests). The results are reported for antero-posterior and vertical dental parameters. In Table 1 and 2 the means, standard deviations, standard

errors, t values, p values are given for both the groups after statistical analysis of data through "Unpaired t test". Table 1 shows the comparisons between the open bite and control groups when examining the antero-posterior position and angulations of the upper and lower dentitions. The upper incisors were significantly more proclined, on average, to the palatal plane (U1-PP) in the open bite sample (P: 0.000). The large difference in mean values (p: 0.000) for the two groups is observed in the relative angulation of the upper to lower incisors, with more acute interincisal angle in AOB subjects than control subjects.



n.s = non-significant, \*\* significant at 1% level (p<0.01).

**Figure 1. Comparison of Dental Antero-posterior Cephalometric Measurements**



n.s = non-significant

**Figure 2. Comparison of Dental Vertical (Linear) Cephalometric Measurements**

The vertical height of the dentoalveolar segments in the open bite subjects and the normal overbite group are given in Table 2. None of the dental vertical values were statistically significantly different between the open-bite and non-open bite groups.

## DISCUSSION

This study compares the data obtained from lateral cephalometric radiograph between the anterior open bite subjects and subjects with normal occlusion of Bengali population in an attempt to locate and differentiate the changes in dental patterns. In this study, there is a more proclined maxillary incisors with more acute inter incisal angle ( $104.9^{\circ}$ ) is seen in AOB group than control group. Mandibular incisors position remains relatively unchanged between both the groups. F.M. Hapak (Hapak FM 1964) noticed reduced inter incisal angle ( $120.67^{\circ}$ ) in Caucasian AOB subjects than control subjects. Osmond.G.Jones (Jones OG 1989) after investigation on North American black patients, found maxillary protrusion & greater upper incisal procumbency. Gloria Lopaz-Gavito et al (Lopez-Gavito G et al 1985) & C. T .Kao & T.H. Huang (Kao CT et al 1997) found more proclined maxillary and mandibular incisors in open bite subjects than normal subjects.

**Table 1. Comparison of Dental Antero-posterior Cephalometric Measurements**

Variables	OPEN BITE			CONTROL			t value	P value
	Mean	SD	SE	Mean	SD	SE		
U1-PP angle	54.83	5.66	1	61.73	7.48	1.4	-4.03	0.00 **
L1-MP angle	99.1	10.5	1.9	95	6.38	1.2	1.84	0.07
U1-L1 angle	104.93	9.4	1.7	124.3	11.7	2.1	-7.09	0.00 **

Ns = non-significant ; \* significant at 5% level (p< 0.05); \*\* significant at 1% level (p<0.01).

**Table 2. Comparison of Dental Vertical (Linear) Cephalometric Measurements**

Variables	OPEN BITE			CONTROL			t value	P value
	Mean	SD	SE	Mean	SD	SE		
U1-PP	30	10.5	1.9	28.83	9.43	1.7	0.46	0.64 n.s
U6-PP	23.6	2.77	0.51	23.45	2.95	0.54	0.2	0.84 n.s
L1-MP	40.75	4.78	0.87	40.95	3.57	0.65	-0.18	0.85 n.s
L6-MP	31.9	3.64	0.66	31.2	3.17	0.58	0.79	0.43 n.s

n.s = non-significant; \* significant at 5% level (p< 0.05); \*\* significant at 1% level (p<0.01).

Subtelny & Sakuda (Subtelny JD 1964) observed more proclined maxillary incisors and reduced interincisal angle in AOB subjects than control. Richard.A Beane et al (Richard A 2003) observed more proclined maxillary & mandibular incisors with decreased inter incisal angle in open bite samples than that of control subjects. Adrina. S. Stuani et al (Stuani AS 2006) found statistically significant difference between inter incisal angle (129.5<sup>o</sup> in AOB & 122<sup>o</sup> in NOB), maxillary incisor-NA angle (21.5<sup>o</sup> in AOB & 28.5<sup>o</sup> in NOB), and mandibular incisor-NB angle (25<sup>o</sup> in AOB & 30<sup>o</sup> in NOB).

In present study no differences are found in vertical dentoalveolar compartment. Nahoum did not observe any supra eruption of maxillary molars in AOB subjects. David. E. Frost et al (Frost DE 1980) PP-AU6 (apex of maxillary permanent first molar) was 6.3 mm in AOB & 4 mm in control group. Gloria Lopez-Gavito et al observed that maxillary dental height was increased in both the posterior and in the anterior regions. The mandibular incisor and molar linear, angular, and vertical positions were very similar in both groups. W. M. Tsang et al (Tsang WM 1998) found upper posterior dental height (U6PP) was significantly greater in AOB subjects, suggesting excessive growth of the dento-alveolus mainly in the posterior maxilla. Subtelny & Sakuda (Subtelny JD, Sakuda M 1964) observed over eruption of maxillary posterior teeth occurs in anterior open bite. He did not find any difference in vertical height of mandibular incisors and molars between open bite & control group. Enlow's (Enlow DH 1982) counterpart analysis, proposed that a combination of craniofacial components work together to produce a vertical dysplasia. In the case of the open bite, increased dental proclination have consistently been identified as contributors to this problem. The findings in this study may have some important clinical implications. The presence of a bimaxillary protrusion or proclination of maxillary incisors in anterior open-bite patient presents an opportunity to improve or correct the open bite by reducing the angulation of the anterior teeth. As such, extraction therapy may well be considered in the treatment in many of these patients.

## CONCLUSION

This study confirms the findings of past studies that some dental pattern plays a significant role in producing anterior open bite malocclusion. Reduced interincisal angle and proclined maxillary anterior teeth are seen in anterior open bite subjects in bengali population.

**Conflict of interests:** None

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