

Evaluation of the Distance between the Alveolar Crest to the Cementoenamel Junction in Rajasthan and North-east Indian Population: A Comparative Analysis

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Abstract

Introduction: Evaluation of bony changes in periodontal tissue is based primarily on the appearance of the interdental bone. Demographic variations in the distance between cementoenamel junction and the alveolar crest may be perceived as an important factor in the diagnosis of periodontal disease progression. **Aim:** The aim of the study was to measure and compare the distance between the alveolar crest and the cementoenamel junction between first and second permanent mandibular molars in North-east and Rajasthan population who were clinically healthy and belonged to the age group of 17–21 years. **Materials and Methods:** Fifty participants were included in each group. The distance between alveolar crest and the cementoenamel junction was analyzed using an orthopantomograph. A calibrating tool was used to eliminate the bias/error between the radiographic measurements and the actual clinical measurements done with the help of vernier calipers. T test was used to compare the values between two groups. **Results:** There was a statistically significant difference in the distance between the alveolar crest and cementoenamel junction between the two groups and it was found to be higher in the North-east group as compared to the Rajasthan group. When a comparison was done between males and females, the value was higher in males than in females in the North-east group. **Conclusion:** The following study proposes to recognize the importance of the distance between the cementoenamel junction and the alveolar crest in the diagnosis of periodontal disease progression based on demographic patterns.

Keywords: Alveolar crest, cementoenamel junction, comparative analysis

INTRODUCTION

Alveolar processes are tooth dependent bony structures which develop and undergo remodeling with the tooth formation and eruption. The size, shape, location, and function of the teeth determine the morphology of alveolar bone. The harmony of the periodontal tissues thus rely on the adaptability of the alveolar bone.^[1] The previous clinical and laboratory studies have shown that occlusal forces and bone morphology can cause changes in the alveolar bone in the presence as well as absence of periodontitis. Hence, it may be stated that even in healthy individuals, changes in the alveolar bone can take place which can affect the disease progression.^[2]

Destruction of alveolar bone is one of the main features of periodontitis, along with other parameters.^[3] The porous and non-uniform nature of the alveolar bone and its close

proximity to dentition make it difficult to quantify. In general, bony changes are evaluated clinically as well as radiographically. Radiographic evaluation of bony changes represents a non-invasive and painless alternative to direct bone measurements.^[2] Numerous studies have confirmed a wide variation in the alveolar crest height in different areas within the same individual, between individuals and among different races. Furthermore, a reduction in alveolar crest height with age in healthy subjects has been observed.^[3]

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Demographic variation in the distance between cementoenamel junction and the alveolar crest may be perceived as an important factor in the diagnosis of progression of periodontal disease, its determination and clinical evaluation may act as an important perspective in the treatment results. However, till date, no study has been carried out in an Indian population to determine the distance of alveolar crest from cementoenamel junction. The previous studies have stated that increase in the distance from CEJ to contact point to the bone crest and the distance from CEJ to bone crest had a strong correlation with the amount of recession.^[4]

In this study, radiographs were used to measure the distance from alveolar crest to cementoenamel junction. Orthopantomographs provided a complete picture of the dentition and the magnification errors were nullified by standardizing the calibrating tool that could eliminate or minimize the bias regarding the validity of results.^[5]

Aim of the study

The aim of the present study was to measure and compare the distance between the alveolar crest to the cementoenamel junction between first and second permanent mandibular molars in North-east and Rajasthan population.

Inclusion criteria

The following criteria were included in the study:

- Clinically healthy individuals with OHI-S score ranging in “Good” category
- Age group of 17–21 years
- Fifty participants each from North-east and Rajasthan with equal number of males and females.

Exclusion criteria

- The following criteria were excluded from the study: Patients with systemic diseases
- Pregnant and lactating females
- Smokers.

MATERIALS AND METHODS

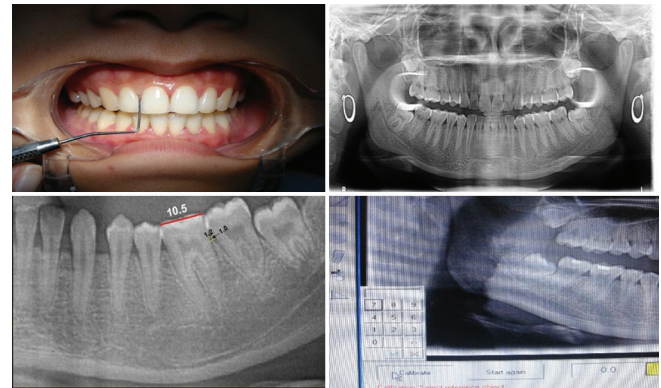
This was a cross-sectional study consisting of 100 participants of which 50 participants were from North-east India and 50 from Rajasthan. Participants were selected from the out-patient department of Periodontics NIMS Dental College, Jaipur. The participants selected were clinically healthy under the age group of 17–21 years with equal number of males and females. The patient who fulfilled consent was taken before beginning the study.

The OHI-S was recorded for all the participants and then mesiodistal dimension was measured for mandibular first molars in third and fourth quadrants with the help of vernier calipers to get the exact dimension of the tooth.

All participants underwent an orthopantomographic examination and the distance between cementoenamel junction and alveolar crest was assessed. The magnification error was corrected or eliminated with the help of a calibrating tool. After

adjusting for the error, two parallel lines were drawn, one along the cementoenamel junctions of the adjacent teeth and other along the alveolar crest. Then, a perpendicular was dropped and the distance between the two was measured. Similar procedure was performed on the other quadrant.

All the data were drawn on a master chart and subjected to statistical analysis. Descriptive statistical analysis was carried out in the present study. Student *t*-test was used to compare the values between two groups. Significance was assessed at 5% level of significance. The statistical significance was considered at $P < 0.05$.



RESULTS

Mean age in North-east group was 19.96 years and 19.92 years in Rajasthan group.

The mean distance between cementoenamel junction and alveolar crest in North-east group in the third quadrant was observed to be $0.93 \text{ mm} \pm 0.17$ and in the Rajasthan group was $0.83 \text{ mm} \pm 0.13$, showing a statistically significant difference with *p* value of 0.03. Similarly, for the fourth quadrant, the mean distance in the North-east group was found to be $0.94 \text{ mm} \pm 0.15$ and for Rajasthan group, it was $0.83 \text{ mm} \pm 0.17$, which was statistically significant with $P = 0.02$. The present study suggested that the distance between cementoenamel junction and alveolar crest was significantly higher for the North-east group (Table 1 and Figure 1).

Using the *t*-test, the distance from alveolar crest to cementoenamel junction was assessed between males and females within the group, the distance was significantly higher for males as compared to females in North-east group in both the quadrants whereas in Rajasthan group, the distance was significantly higher for males as compared to females only in the third quadrant (Table 2, Figure 2a and b).

When the comparison of the mean distance between CEJ and alveolar crest was done based on gender in each category separately using *t*-test, no statistically significant difference was found among females of North-east and Rajasthan groups in both the quadrants. However, among males, North-east group showed higher values in both quadrants which were statistically significant (Table 3, Figure 3a and b).

DISCUSSION

Destruction of alveolar bone is one of the main features of periodontitis along with various other parameters. Determination of realistic prognosis and treatment plan

for periodontally involved dentitions requires an accurate assessment of each tooth.^[3] Radiographs are considered as an important adjuncts in diagnosing and treating periodontal disease in every day clinical practice as well as in dental research.^[6] Recognizing the cemento-enamel junction with a

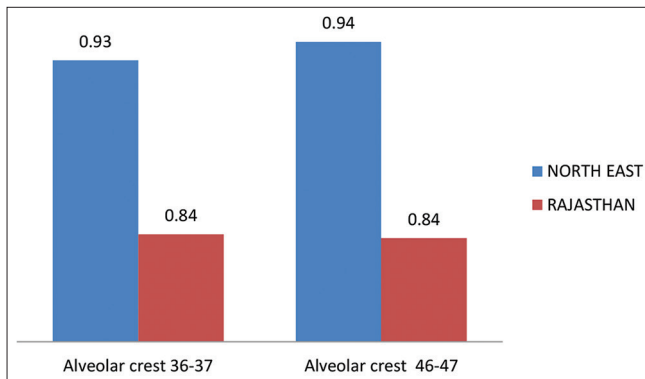


Figure 1: Bar graph showing the mean distance between CEJ and alveolar crest in the third and fourth quadrant of North-east and Rajasthan groups

Table 1: T-test comparing the values of the distance from CEJ to alveolar crest between the two groups

Parameters	Group	N	Mean	Std. Deviation	T	Df	P-value
Age (years)	North-east	50	19.96	0.832	0.214	98	0.831
	Rajasthan	50	19.92	1.027			
Alveolar crest 36-37	North-east	50	0.932	0.16714	3.077	98	0.003
	Rajasthan	50	0.838	0.13686			
Alveolar crest 46-47	North-east	50	0.942	0.15265	3.231	98	0.002
	Rajasthan	50	0.836	0.17468			

Table 2: Comparing the mean distance from CEJ to alveolar crest between males and females of both groups

Parameters	Sex	n	Mean distance	Std. Deviation	T	Df	P-value
North-east							
Age (years)	M	24	20.17	0.816	1.721	48	0.092
	F	26	19.77	0.815			
Alveolar crest 36-37	M	24	1.0375	0.13453	5.37	48	<0.001
	F	26	0.8346	0.13249			
Alveolar crest 46-47	M	24	1	0.16681	2.748	48	0.008
	F	26	0.8885	0.11774			
Rajasthan							
Age (years)	M	23	19.87	1.014	-0.318	48	0.752
	F	27	19.96	1.055			
Alveolar crest 36-37	M	23	0.887	0.10998	2.451	48	0.018
	F	27	0.7963	0.14539			
Alveolar crest 46-47	M	23	0.8609	0.18025	0.928	48	0.358
	F	27	0.8148	0.1703			

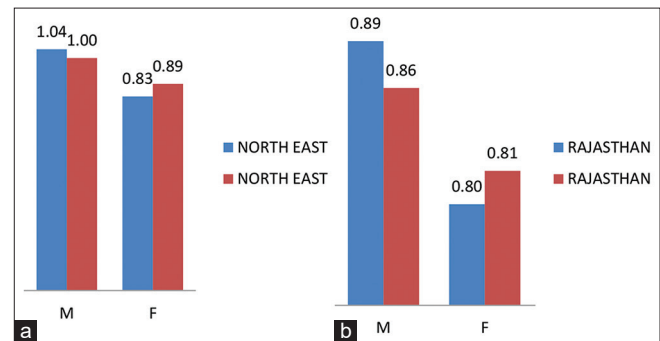


Figure 2: Bar graphs showing the mean distance from CEJ to alveolar crest between males and females of North-east group (a) and Rajasthan group (b)

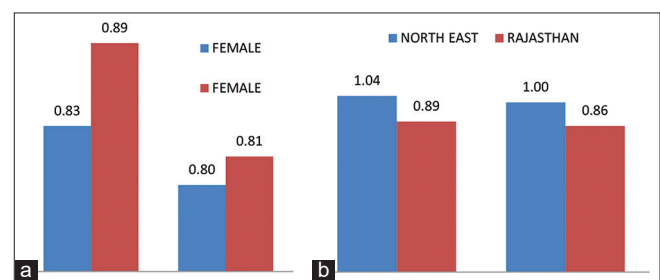


Figure 3: Bar graphs showing the mean distance from CEJ to alveolar crest among females (a) and males (b) of North-east and Rajasthan groups

Table 3: Comparing the distance from CEJ to alveolar crest among females and males of North-east and Rajasthan groups

Parameters	Group	N	Mean	Std. Deviation	T	Df	P-value
F							
Age (years)	North-east	26	19.77	0.815	-0.746	51	0.459
	Rajasthan	27	19.96	1.055			
Alveolar crest 36-37	North-east	26	0.8346	0.13249	1.002	51	0.321
	Rajasthan	27	0.7963	0.14539			
Alveolar crest 46-47	North-east	26	0.8885	0.11774	1.825	51	0.074
	Rajasthan	27	0.8148	0.1703			
M							
Age (years)	North-east	24	20.17	0.816	1.109	45	0.273
	Rajasthan	23	19.87	1.014			
Alveolar crest 36-37	North-east	24	1.0375	0.13453	4.19	45	<0.001
	Rajasthan	23	0.887	0.10998			
Alveolar crest 46-47	North-east	24	1	0.16681	2.748	45	0.009
	Rajasthan	23	0.8609	0.18025			

periodontal probe is a difficult task (Jamison-1963), and the accuracy is limited by the penetration of the probe into the junctional epithelium (Listgarten *et al.*, 1976; Vander Valden, 1979; Armitage *et al.*, 1977). On the other hand, radiographic measurements may not only allow evaluation of the distance between cemento-enamel junction and alveolar bone crest but a more accurate assessment of periodontal disease affecting the alveolar bone (Stoner, 1972; Holl *et al.*, 1975, and Selicokowitz, 1981). The previous findings describe the normal distance between cemento-enamel junction and alveolar bone crest to be about 2 mm in permanent dentition (Lennon and Davis 1974; Jorkjend, 1976; and Gjermo *et al.*, 1984).^[7] The orthopantomograms were taken in which the magnification error was rectified with the help of “calibrating tool.”

At present, there are no means to identify patients/teeth at risk of developing periodontal destruction. Lavstedt *et al.*, 1986 and Bolin *et al.*, in 1986 conducted a 10 year study to assess the magnitude of marginal alveolar bone loss and the influence of predictors on the marginal bone loss and found the annual mean marginal bone loss to be about 0.09 mm. Among the potential predictors of bone loss, the marginal bone loss/levels at baseline, Russel’s periodontal index, age, and number of lost teeth were found to be significantly important.^[8] Therefore, it becomes imperative to know the normal architecture of periodontal structures to diagnose periodontal disease and to identify the oral health disparities among various ethnic and racial subpopulations which may help in efficient resource allocation to bridge these disparities. In the present study, attempt has been made to compare the distance from CEJ to the alveolar crest between two subpopulations.^[9]

In the present study, the distance from alveolar crest to cemento-enamel junction was measured in North-east and Rajasthan population in healthy individuals and a statistically significant results of “p” value of 0.003 and 0.002 was obtained when it was measured in relation to 36–37 and 46–47, respectively, thus indicating that the distance was more in North-east population. On the basis of gender when the evaluation was done in each group, $P < 0.001$ and 0.009 was obtained, these statistically significant values stated that the distance was more in North-east males as compared to Rajasthan males. When the comparison was between males and females within the groups, the distance was higher in

North-east males for both quadrants whereas Rajasthan males showed higher values only in the third quadrant.

However, till date, no such study is carried out in the Indian population of this kind. Further studies are recommended considering a larger sample size with measurements taken from all teeth of maxilla and mandible using reproducible techniques and among various other subpopulations of India as well as across the world.

CONCLUSION

In the present study, the distance from alveolar crest to cemento-enamel junction was measured in North-east and Rajasthan population in healthy individuals and a statistically significant results of “p” value of 0.003 and 0.002 was obtained when it was measured in relation to 36–37 and 46–47, respectively, thus indicating that the distance was more in North-east population. On the basis of gender when the evaluation was done in each group, $P < 0.001$ and 0.009.

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