Research Article

JRAD Journal of Research and Advancement in Dentistry

J Res Adv Dent 2020;10:2s:275-282.

Cephalometric Evaluation of Size and Form of Sella Turcica in Skeletal Class I and Class II Dysplasia Among Bhopal Population: A Cross-Sectional Study

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ABSTRACT

Background: The purpose of the current study is to analyse the size (linear dimensions) of Sella turcica and also describe its morphology on standardized lateral cephalogram of skeletal class I and class II patients in Bhopal population.

Material and methods: 100 lateral cephalometric radiographs were taken, which are grouped as 50 skeletal class I and skeletal class II subjects of age group 12 to 35 years in which linear measurement (length, width, diameter) and morphology were analysed. Student's t-test was used to calculate the mean difference in the linear dimension of sella turcica and chi-square (χ^2) test was used for the measurement of the frequency distribution of different shapes between skeletal class I and skeletal class II subjects.

Results: Comparing the linear dimensions there was statistically insignificant difference were noted in length, width and diameter in between skeletal class I and skeletal class II subjects. In 60% of the subject's normal morphology of sella turcica was noticed.

Conclusion: The result of the present study can be used as a reference standard for Bhopal population in determining the shape and size of sella turcica.

Keywords: Lateral Cephalogram, Sella turcica, Morphology, Skeletal Class I and skeletal Class II.

INTRODUCTION

Sella turcica is considered as a significant landmark of the craniofacial complex in the radiographic analysis. Sella turcica is derived from the Turkish language because of Turkish saddle-shaped concavity in the body of sphenoid present in middle cranial fossa which varies in size and shape [1].The information about its normal radiological anatomy and morphology of this area is helpful to study growth in an individual, diagnose any pathological situation, facial skeletal type and evaluate treatment results [2]. Estimation of normal standards and wide variation in normal morphology of sella turcica between individuals will aid in eliminating any morphological abnormality. The purpose of this study is to analyse the size of sella turcica and illustrate its morphology on standardized lateral cephalogram of skeletal Class I and Class II patients in Bhopal population.

Received: Feb. 15, 2020**: Accepted**: Mar. 22, 2020
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pISSN 2278-0076
eISSN 2321-9270

MATERIAL AND METHOD

This cephalometric study was a prospective study of subjects undergoing orthodontic treatment consisting of the following inclusion criteria-

1. Patients should be between the age group of 12 to 35 years. 2. Patients with all permanent teeth up to second molars. 3. Skeletal Class I and Class II patients based on ANB angle. 4.No past history of orthodontic treatment, orthognathic or plastic surgery. 5. No history of trauma and surgery in the head and neck region. Exclusion criteria were as follows- 1. Individual with a major illness or medical conditions. 2. Class III pattern. 3. Patients with missing teeth. 4. Patients with a history of orthodontic treatment. 5.Patient with a history of trauma and surgery in the head and neck area. 6.Patient with mixed dentition.

In this study, records of 337 orthodontic patients were examined, and out of these 263 lateral cephalograms were selected, which was further narrowed to 100 lateral cephalograms free of any error. These were then divided according to ANB angle in two groups of 50 skeletal class I and 50 skeletal class II. All lateral cephalograms were taken in natural head position. The subject with feet at a comfortable distance apart and slightly diverging were asked to stand below the raised cephalostat. The subject was asked to see the reflection of their own eyes in the mirror, located on the wall facing the cephalostat at a distance of 5 feet. The cephalostat was locked and then brought down into position. Both ear rods ensure the stability in the transverse plane by lightly placing them into the external auditory meatus of the subjects and nasion holder stabilized the head in the vertical plane. Film cassette was checked for both vertical plane and horizontal alignment. The subject was then asked to swallow and bite into centric occlusion with lip relaxed position. The cephalograms were traced by single operator 0.003 inches acetate matte sheet (lacquered polyester paper) using 0.03 lead pencil. Random selection of 20 lateral cephalograms was done, which was then traced by the same operator so as to assess any inter/intraexaminer visibility and accuracy in the tracing.

Cephalometric tracing of sella turcica-

All lateral cephalograms were taken by the same operator in the same cephalostat. Subjects were classified as skeletal class I and skeletal class II according to ANB angle. Sella turcica outline on each lateral cephalogram was traced using an acetate matte paper and lead pencil (0.03) under optical illumination. Linear measurement of sella turcica(length,breadth, anteroposterior diameter) was measured by tracing based on the methodology described by Silverman & Kisling[3]. For measuring sella size reference lines and points used are as follows (figure1)

TS-Tuberculum sella DS- Dorsum sella BPF-Base of the pituitary fossa

Blackline – Length of sella
Dashed line – Diameter of sella
Dotted line – Depth of sella

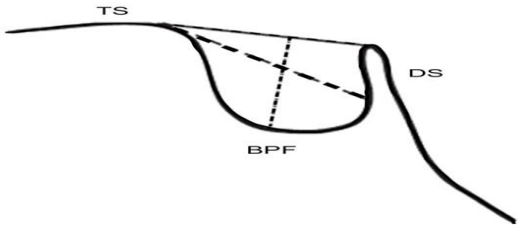


Fig 1: Size of sella turcica.

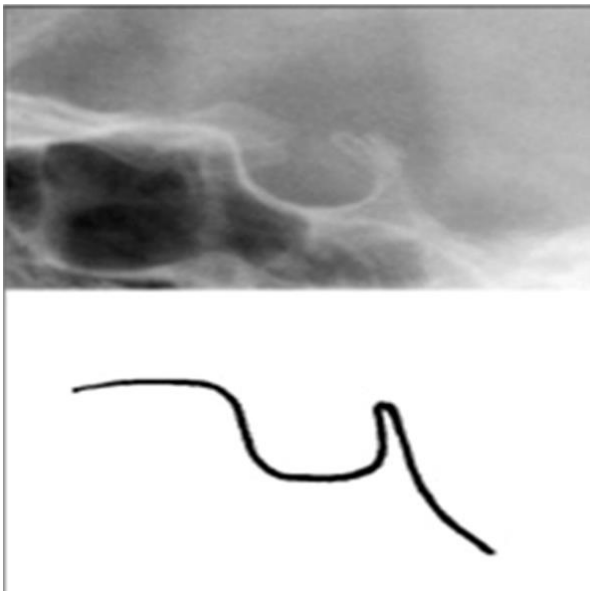


Fig 2: Normal Sella Turcica.

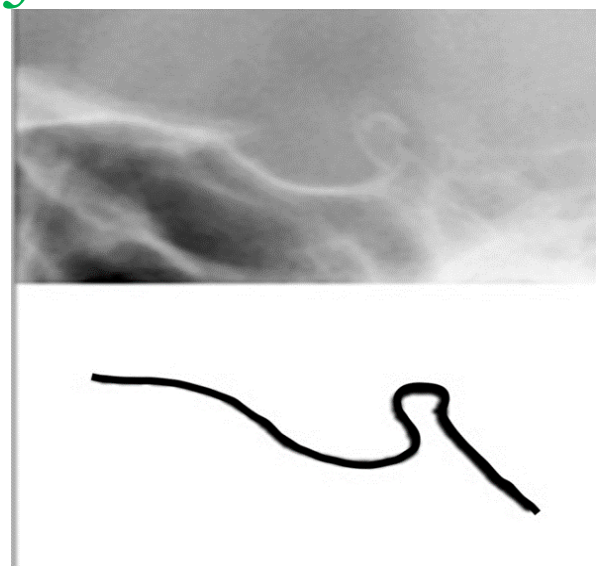


Fig 3: Oblique Anterior Wall.

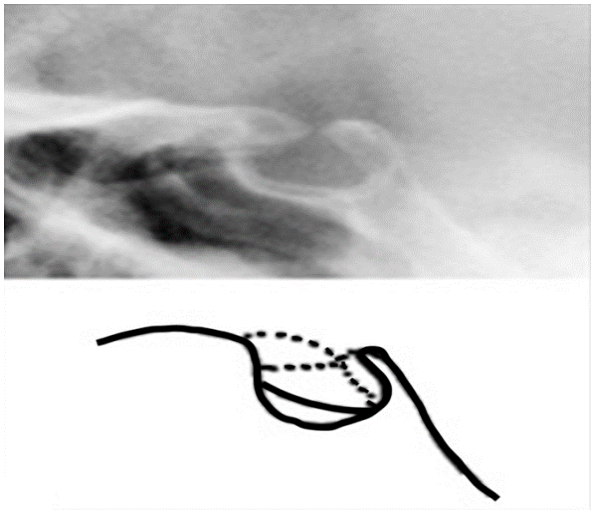


Fig 4: Double Contour of The Floor.

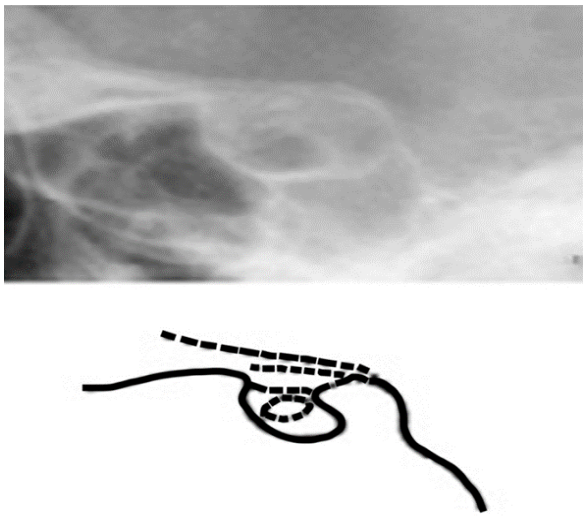


Fig 5: Sella Turcica Bridge.

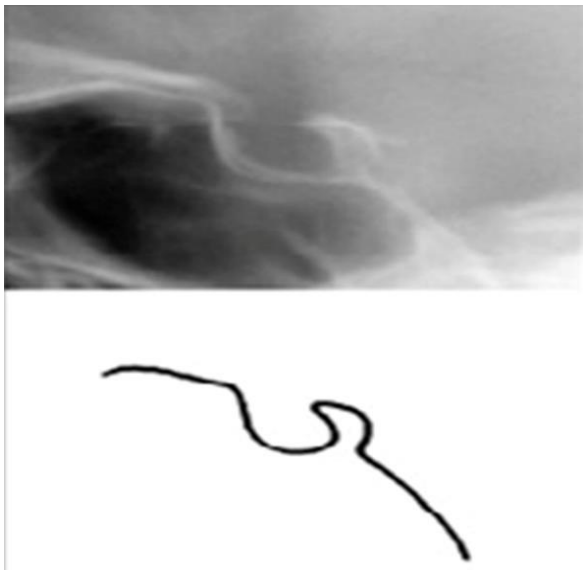


Fig 6: Irregularity (Notching) In Posterior Part Of Sella Turcica.

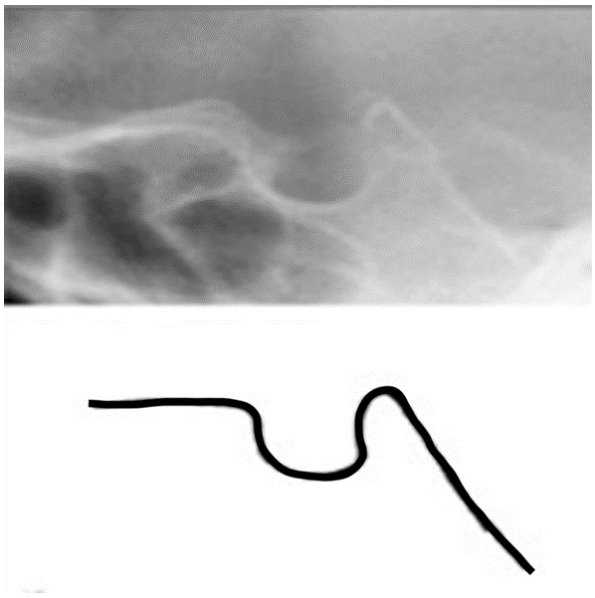


Fig 7: Pyramidal Shape of Dorsum Sellae.

ETHICAL CLEARANCE AND INFORM CONSENT - Ethical clearance certificate had taken from the institute, and written consent was taken from all the participants.

STATISTICAL ANALYSIS

Statistical analysis was done using Statistical Package of Social Science (SPSS Version 20; Chicago Inc., USA). Data comparison was done by applying specific statistical tests to find out the statistical significance of the comparisons. Chi-Square (χ^2) Test used for measurement of the frequency

distribution of different shape of Sella Turcica in skeletal Class I & II. Student's t-test used to calculate the mean difference in the linear dimension of Sella Turcica between skeletal Class I & II patients.

RESULTS

Size of sella turcica- There is statistically insignificant difference were found in a linear dimension that is length, breadth, diameter between skeletal class I and class II patients (TABLE-1,2,3/ GRAPH -1,2,3) Morphology of sella turcica (TABLE 4/ GRAPH 4) - Majority of patients (60%) morphology of sella turcica was noted to be healthy. Only in 39% of patient's morphological variation were found. It was noticed that oblique anterior wall was seen in 0.8%, double contour floor was noted in 0.7%, sella turcica bridging was found in 0.8%, irregularity in the posterior wall was seen in 0.6%, the pyramidal shape was seen in 1.1%. On assessing the morphology, it was found that in skeletal class I normal morphology was found in 52% and morphological variation in 48% of subjects, whereas in skeletal class II normal morphology was found in 68% and variation in 32% subjects.

Table 1: Comparative evaluation of linear dimension (LENGTH) of Sella Turcica between skeletal Class I & II patients.

Groups		LENGTH OF SELLA TURCICA (mm)		
	NUMBER	MEAN	SD	RANGE
Skeletal Class I	50	6.16	1.69	3-11
Skeletal Class II	50	5.86	1.53	3-9
Unpaired Student 't' Test Value	0.927			
Significance 'p' Value	0.356(NS)			

Graph 1: Comparative evaluation of linear dimension (LENGTH) of Sella Turcica between skeletal Class I & II patients.

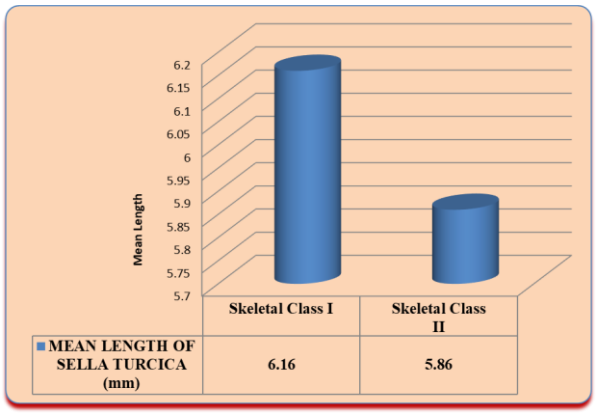


Table 2: Comparative evaluation of linear dimension (DIAMETER) of Sella Turcica between skeletal Class I & II patients.

Groups		DIAMETER OF SELLA TURCICA (mm)		
	NUMBER	MEAN	SD	RANGE
Skeletal Class I	50	9.50	1.09	7-12
Skeletal Class II	50	9.52	1.26	6-12
Unpaired Student 't' Test Value	0.085			
Significance 'p' Value	0.933(NS)			

Graph 2: Comparative evaluation of linear dimension (DIAMETER) of Sella Turcica between skeletal Class I & II patients.

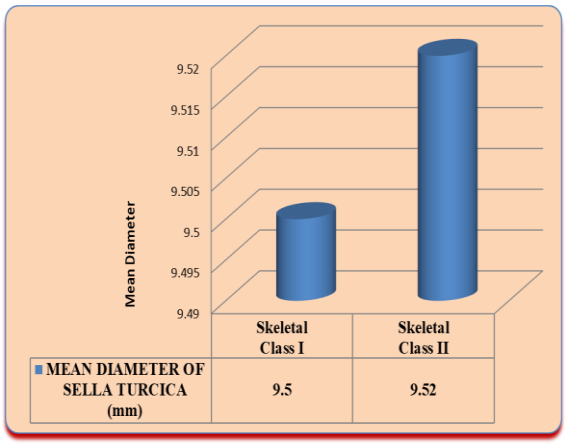


Table 3: Comparative evaluation of linear dimension (DEPTH) of Sella Turcica between skeletal Class I & II patients.

Groups		DEPTH OF SELLA TURCICA

		(mm)		
	NUMBER	MEAN	SD	RANGE
Skeletal Class I	50	7.56	1.28	5-10
Skeletal Class II	50	7.80	1.29	5-11
Unpaired Student 't' Test Value	0.932			
Significance 'p' Value	0.353(NS)			

Graph 3: Comparative evaluation of linear dimension (DEPTH) of Sella Turcica between skeletal Class I & II patients.

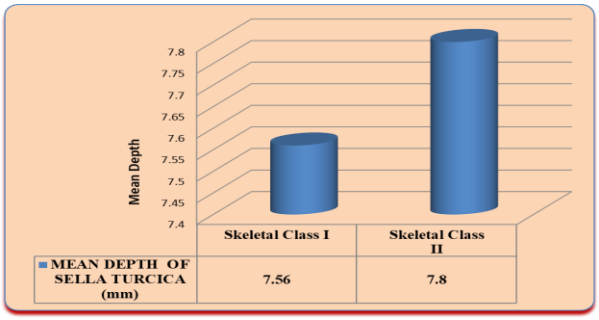
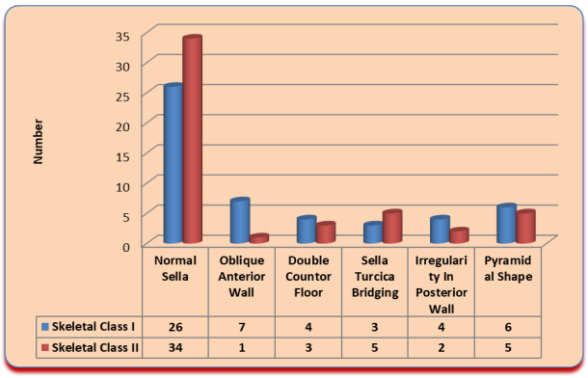


Table 4: Frequency distribution of different shape of Sella Turcica in skeletal Class I & II.

Shapes of Sella Turcica	Skeletal Class I	Skeletal Class II	Chi-Square Value	Significance 'p' Value
Normal Sella	26	34		
Oblique Anterior Wall	7	1		
Double Countor Floor	4	3		
Sella Turcica Bridging	3	5	6.97	0.223(NS)
Irregularity In Posterior Wall	4	2		
Pyramidal Shape	6	5		
Total	50	50		

Graph 4: Frequency distribution of different shape of Sella Turcica in skeletal Class I & II.



DISCUSSION

This prospective study was designed to establish norms for linear dimension and different morphological variation of sella turcica in subjects with different skeletal pattern in Bhopal population.

DISCUSSION OF VALIDITY AND RELIABILITY OF THE STUDY-

Ahsan Mahmood Shah in 2011[4] described the shape and size of sella turcica found a correlation between males and females and also in different skeletal pattern. He had taken 180 patients lateral cephalograms of 15 years above age and then he divided them into class I, class II,class III (60 in each group) and equal in both genders (90 in each gender). Majority of the subjects presented with normal morphology of Sella turcica (66.7 %). He concluded that there is no significant difference were found in linear dimension between males and females and also in skeletal types.

Tejavathi Nagaraj in 2015[5] evaluated 200 digital lateral cephalometric radiographs of males and females (100 each ,in between 8 to 30 years of age and grouped into 1. less than 10 years, 2.10-15 years, 3. 15-20 years, 4. 20-25 years, 5. 25-30 years. The difference was found in linear measurements in each age group(depth and anteroposterior diameter) with statistically significant difference ($P<0.05$). Statistically, the insignificant difference was found in a different age group. Normal morphology of sella turcica was noted in 46.5% population.

DISCUSSION OF RESULTS

SIZE OF SELLA TURCICA

In the current study, comparative evaluation of linear dimension (Length, TABLE-1,Graph-1)

showed no significant changes among skeletal pattern (class I and class II).Sella turcica mean length is 6.16±1.69 mm in skeletal Class I patients and 5.86±1.53 in skeletal class II patients. Even though the size is slightly more between class I patients as compared to class II patients, it is statistically insignificant (p=0.356).The results were similar to the study conducted by Preston (1979)[6], Yassir (2010)[7], Ahsan (2011)[4]and Nagraj (2015)[5]who concluded that statistically no significant difference in the linear dimension (length) of different age groups. However statistically significant differences in size were noted in the studies conducted by Sathyanarayan et al. (2012)[8](p-value of 0.004) and Valizadeh(2015)[9]who found that length was significantly greater in class III in comparison with skeletal class I and class II subjects (P<0.0001). Boddeti (2016)[10]alsoshowed in his study that significant difference in linear dimension (length and diameter) of sella turcica. Akhare (2018)[11]noted statistically significant difference in length among class III when compared to class II subjects (p<0.004).

In this study, comparative evaluation of linear dimension (Diameter, TABLE-2, Graph -2) of sella turcica in skeletal class I and class II subjects, showed a statistically insignificant difference (p=0.933). Sella turcica means diameter was found to be 9.50±1.09 mm in skeletal class I patients and 9.52±1.26 in skeletal class II patients. Results of the present study were supported by the studies of Yassir (2010)[7], Ahsan (2011)[4], Nagraj (2015)[5]who suggested that no significant difference was noted in the diameter when different skeletal types were compared. In contrast, the study by Rabia (2015)[12]found a significant difference in the diameter of females subjects in class I and class II subjects (p=0.017) and larger diameter was noted in skeletal class I subjects

The comparative evaluation of linear dimension (Depth, TABLE-3,and Graph-3) of sella turcica between skeletal class I and skeletal class II patients showed a mean depth of sella turcica 7.56±1.28 mm in skeletal class I subjects and 7.80±1.29 in skeletal class II patients. It was slightly more among class II patients as compared to class I, but it was statistically insignificant (p=0.353). Our results were in accordance to the findings in the study by Yassir (2010)[7]who noted that sella turcica linear measurements were within normal standard and also neither gender nor skeletal patterns showed any significant difference and this was also supported by Ahsan (2011)[4], Nagraj (2015)[5]. A study by Prathna B(2015)[13]showed a significant difference in depth (p<0.05) and found depth measurement to be smaller in skeletal class II subjects.

MORPHOLOGY OF SELLA TURCICA

In the current study, the frequency of distribution of 6 different shapes of sella turcica (TABLE-4, Graph-4) between 100 patients of skeletal Class I and II was noted. Typical morphology of sella turcica was found in most of the cases of both skeletal class I (26) and skeletal class II (36). The oblique anterior wall was found in 7 skeletal class I and skeletal class II. The double Counter floor is found in 4 skeletal class I and 3 skeletal class II cases. Sella turcica bridging is found in 3 class I and 5 class II cases. Irregularity in the posterior wall was found in 4 skeletal class I and 2 skeletal class II subjects. Pyramidal shape is found in 6 skeletal class I and 5 skeletal class II cases. There is statistically no significant difference was found in the frequency distribution of different shapes of sella turcica in skeletal Class I and Class II (p=0.223) and normal morphology was 52% in skeletal class I and 68% in skeletal class II subjects. This was in accordance with the study by Yassir (2010)[7]who suggested normal shape in 71.15% subjects, Ahsan (2011)[4]also showed normal sella turcica morphology in 66.7% subjects, Nagraj (2015)[5] who concluded that in 46.5% of study population normal morphology was seen. In contrast, the study by Chauhan (2014)[14]found normal morphology (typical) of sella in 28% of cases and atypical sella in most cases like an oblique anterior wall (23%), followed by irregular sella (18%) and pyramidal shape was seen in none of the subjects. Fitriasary (2017)[15]noted that irregular (notching) posterior wall was more frequently found in Class II malocclusion (26.9%) when compared to in Class I malocclusion (7.7%). Dixit (2017)[16]noted in class I malocclusion bridging, double contour floor and pyramidal shape of dorsum sella of sella turcica were most common and whereas in Class II malocclusion showed the highest prevalence of notching in dorsum sella.

CONCLUSION

The result presented in this study have shown that –

1. 52% normal morphology of sella turcica is found in skeletal class I and 68% in skeletal class II.

2. Among skeletal class, I and skeletal class II subject's statistically insignificant difference in size (linear measurement) of sella turcica have been found.

3. This study can be used as a reference standard for Bhopal subjects when analyzing sella turcica morphology.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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