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**ORIGINALA RTICLE**

# Determination of Mandibular Symphysis Width in Skeletal Class I Patients with Different Vertical Patterns

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## ABSTRACT

Symphysis is an anatomical part of mandible that includes lower incisors and anterior chin. Mandibular symphysis is a contributing factor of facial harmony for esthetics and is a determinant for lower incisor position in orthodontic treatment planning for border line cases. This cross-sectional study was carried out in Orthodontics department, Fatima Memorial Hospital College of Medicine and Dentistry Lahore on a sample size of 90 cases using 95% confidence level. Non probability consecutive sampling technique was used. Symphyseal dimensions were measured on lateral cephalogram. Data collected was entered and analyzed in computer program SPSS version 20. Quantitative outcomes like symphysis dimensions, symphysis width, vertical pattern, and ANB were subjected to ANOVA of significance. Independent T-test was used to make the comparison between males and females on the basis of variables. Results of this study suggested thatC-C' varies significantly between males and females, whereas the differences in symphysis width LA, and LP between males & females are statistically insignificant (P>0.05). Bone anterior to lower incisor apex varies significantly among various facial profiles with hypo divergent males exhibiting wider chin than normo divergent and hyper divergent subjects. Sexual dimorphism in symphysis width was seen among genders.

**Keywords:** Facial harmony, lower incisor position.

## INTRODUCTION

The stability and facial esthetics depend upon the position of lower incisors contained within the mandibular symphysis with defines the outline of face, hence defining the facial profile[1-3]. Mandibular symphysis is an area located in lower jaw where the two halves of mandible meet. Symphysis is a term normally used for union or fusion, hence forming a midline[4]. The area of symphysis is of prime concern for an orthodontist because it defines the facial esthetics and incisor stability in the lower third of face[5].

Symphysis is an anatomical part of mandible that includes lower incisors and anterior chin. Morphologically it is divided into dentoalveolar symphysis that includes alveolar processes with lower incisors and the basal symphysis. Mandibular symphysis is a contributing factor of facial harmony for esthetics and is a determinant for lower incisor position in orthodontic treatment planning for border line cases as their position can compromise the stability of orthodontic results. Sexual dimorphism exists in symphyseal morphology especially symphysis height that was 10% more in males as compared to females[5-9].

According to some authors symphysis morphology can be a good indicator of mandibular rotation and defines esthetics in the lower one-third of face. As the mandibular incisors are primary determinants in planning occlusal and dental relationships for orthodontic treatment planning, therefore the structure of alveolar bone in that area is critical for differential diagnosis and should be considered to prevent potential iatrogenic squeal like fenestrations, dehiscence, gingival recession and mobility. The possible boundaries of tooth movements must be considered in camouflage cases with or without extraction during planning since inclinations of lower incisor may affect post treatment stability in orthodontics[10].

Traditional cephalometrics is used for evaluating various facial profiles in orthodontics using different linear and angular measurements on intra osseous landmarks to quantify anteroposterior (AP) jaw and incisal positions. Normal occlusion can be attained in variable facial patterns by dental compensations. Therefore incisal positioning both in maxilla and mandible is important for case planning, analysis, stability and post treatment results[11].

A recent study conducted on a sample of 150 Pakistani population found prevalence of 56% skeletal class I, 32% of skeletal class II, and 12% of skeletal class III malocclusion[12]. Symphyseal depth, symphyseal area and total symphyseal area ratio showed significant differences between males and females indicating sexual dimorphism is present in mandibular symphyseal morphology[13].

In orthodontics it's not only the position of teeth that is primary area of concern, but related skeletal and soft tissue condition of the patient is equally important to formulate a comprehensive treatment plan.[14] Therefore mandibular symphysis helps in considering treatment planning of both surgical and non-surgical camouflage case because it is an important guide in planning lower incisor movements.[15] Due to scarcity of any local data available and the currently known importance of mandibular symphysis, the aim of study was to evaluate the mandibular symphysis

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dimensions in skeletal class I malocclusions to determine the anatomic limitations to lower incisor movements in orthodontic treatment for stability in future outcomes.

## METHODOLOGY

This cross-sectional study was carried out in Orthodontics department, Fatima Memorial Hospital College of Medicine and Dentistry Lahore after permission from Ethical Committee. The duration of study was six months and sample size was estimated as 90 cases using 95% confidence level. After taking approval from institutional ethical committee (IRB) of Fatima Memorial Hospital, informed consent was taken from every patient. Demographic profile of all patients was recorded. History of past dental condition was explored and a thorough dental checkup was carried out. Lateral cephalograms of all subjects were taken in natural head position and traced manually. Non probability consecutive sampling technique was used. Inclusion criteria was Age 12-30 years, Skeletal class I patients of Pakistani descent coming to OPD for orthodontic treatment (ANB 0-4°), Symmetric face (on clinical examination).Skeletal class I subjects were further subdivided into three groups each on the basis of vertical pattern obtained from cephalometric analysis and their symphyseal dimensions were measured on lateral cephalogram. Data collected was entered and analyzed in computer program SPSS version 20. Quantitative variables like age were presented in the form of mean and standard deviation. Qualitative data like gender was presented in the form of frequency and proportions.

Multiple descriptive statistics and tests were applied where needed. Any difference observed in symphyseal dimensions within the groups were subjected to the test of significance. Qualitative outcome like gender were subjected to chi-square test of significance. Quantitative outcomes like symphysis dimensions, symphysis width, vertical pattern, and ANB were subjected to ANOVA of significance. Independent T-test was used to make the comparison between males and females on the basis of variables. P-value of 0.05 or less was considered as statistically significant.

## RESULTS

A total of 90 Skeletal Class I cases were enrolled in this study. The mean age of the patients was noted as 18.34±3.45 years with minimum and maximum ages of 13 & 26 years respectively. Out of a sample of 90, 49 (54.44%) were females and 41 (45.56%) were males. The study results of the study are showed in Table 1-4. LA in males and females between groups showed statistically significant results (P<0.05). This result showed that at least two of the groups varies significantly among each other. The linear measurements of LP within groups showed statistically insignificant results in males with a P-value>0.05, whereas LP within groups in Females showed a statistically significant result with a P-value<0.05. Therefore, in females LP varies significantly among various facial profiles. Distance at vestibular and lingual bone crests (C-C') within groups in males showed statistically insignificant results (P>0.05). Females also showed statistically insignificant results (P>0.05).

Table 1: Descriptive statistics of baseline evaluation of cases

| | N | Min. | Max. | Mean | SD |
|---|---|---|---|---|---|
| Sella Nasion Point A Angle (SNA) | 90 | 71 | 88 | 80.16 | 3.585 |
| Sella Nasion Point B Angle (SNB) | 90 | 70 | 85 | 77.37 | 3.558 |
| Difference Between Point A and Point B (ANB) | 90 | 0 | 4 | 2.79 | 1.185 |
| Valid N (listwise) | 90 | | | | |

Table 2: Descriptive analysis of symphysis values

| | N | Min. | Max. | Mean | SD |
|---|---|---|---|---|---|
| Anterior to apex (LA) | 90 | 2.00 | 8.50 | 4.6056 | 1.35641 |
| Posterior to Apex (LP) | 90 | .50 | 9.50 | 4.4556 | 1.26900 |
| Distance at Vestibular and Lingual bone Crests (C-C') | 90 | 3.50 | 11.00 | 6.7633 | 1.29584 |
| Valid N (listwise) | 90 | | | | |

Table 3: Analysis of variance among groups (ANOVA)

| | | Sum of Squares | P-value |
|---|---|---|---|
| Anterior to apex (LA) | Between Groups | 23.217 | .001* |
| | Within Groups | 140.530 | |
| | Total | 163.747 | |
| Posterior to Apex (LP) | Between Groups | 7.449 | .098 |
| | Within Groups | 135.873 | |
| | Total | 143.322 | |
| Distance at Vestibular and Lingual bone Crests (C-C') | Between Groups | 9.263 | .062 |
| | Within Groups | 140.186 | |
| | Total | 149.449 | |

Table 4: Independent t-test for variables

| Variables | T | P |
|---|---|---|
| Anterior to apex (LA) | 1.764 | .081 |
| Posterior to Apex (LP) | .803 | .424 |
| Distance at Vestibular and Lingual bone Crests (C-C') | 2.063 | .042* |

## DISCUSSION

Previously different orthodontists around the globe evaluated and developed the mean values of mandibular symphysis for different ethnicities including Gama in Brazilian population, Arruda in Caucasian population, Chung in South Korean population, Olayemi in Nigerian population, Datta in South Indian population[2,6,9,17,18]. These available norms can't be applied to other races unless they are modified according to our ethnic background. This study was conducted to develop these cephalometric mean values for a particular sample presenting in a tertiary care hospital, which can serve as norms for this specific population.

In the present study skeletal class I subjects with different vertical patterns were accessed and horizontal symphysis measurements were taken. In our study males showed wider symphysis than females. Our results were coincident with Mangla who reported that symphysis width varies significantly among males and females.[19] There has been a contraindication in literature regarding symphysis dimensions. Moshfeghi reported that females have greater symphysis ratio as compared to males[20]. Nanda also in his

study reported that no significant difference in size exists between male and female chin[21].

The result coincides with the findings of study carried out by Gama on Brazilian population who concluded that the bone anterior to incisor apex in mandibular symphysis varies significantly among facial types, with brachyfacial patterns showing maximum thickness till the outer cortex labially.[1] Previous studies on same population showed that thickness of alveolar symphysis at the apical region in narrower in long faced individuals by 20% as compared to short faced individuals. Molina in a study on symphysis dimensions also mentioned that facial patterns affects the bone thickness lying anterior to lower incisor apex[22]. Contradictory to above mentioned findings, Gracco in his study mentioned that no statistically significant difference occur between the cancellous bone in the mandibular symphysis among the three facial types[23]. Yamada in his study on Japanese population concluded that the bone thickness at the lower incisor apex depends upon the inclination of incisor and independent of facial types[24].

According to our study males showed statistically significant differences in LA between hypo divergent and hyper divergent profiles, whereas LP, and C-C' showed no statistically significant differences among Hypo divergent, normo divergent and hyper divergent facial profiles. It showed that symphysis of males in different facial types doesn't vary significantly.

A recent study agreed that individuals with long facial height have a narrower symphysis by 20% on average in apical region as compared to those with short facial heights[6]. Esenlik et al also reported that divergence of facial pattern affects the symphysis width, with symphysis width greater in individuals with hypo divergent faces.[11] A study conducted by Kim also reinforced the above results. In that study bucco-lingual thickness at incisor apex was more in low angle cases as compared to normal and high angle[25].

Females on the other hand showed statistically significant differences in LA, and LP between hypo divergent and hyper divergent groups, whereas C-C' showed no statistically significant difference among hypo divergent, normo divergent and hyper divergent groups. Therefore female symphysis varies among different facial types.

Molina et al in their study stated a short and broad symphysis in short faced individuals[7]. Whereas in normal and long face individuals, bone thickness anterior and posterior to incisor apex is less, resulting in narrow symphysis. Results obtained by Tang coincides with our findings in female subjects, showing difference in symphyseal dimensions among various facial profiles. Hyper divergent showed narrow while hypo divergent showed thin and broad symphysis[26].

A study by Khan et al concluded that symphysis is narrow in hyper divergent and wide and short in hypo divergent subjects with mean vertical heights in normo divergent, hyper divergent and hypo divergent groups. The mean values for symphysis width in these groups were 12.07±0.96, 11.80±1.82, 13.07±1.79 respectively that is very close to our findings[27]. Contradictory to the above mentioned findings Alarcon in his study concluded that although sexual dimorphism occurs between all facial patterns and classes, vertical facial patterns behaves differently and needs individualization for every subject[28].

Orthodontists should monitor the symphysis dimensions while planning orthodontic camouflage or surgery in order to prevent potential iatrogenic sequel like fenestrations, dehiscence that can occur due to limited housing of lower incisors in mandibular symphysis.

## CONCLUSION

Within the limitations of this study following conclusions can be made:

1. Bone anterior to lower incisor apex varies significantly among different facial profiles.
2. Sexual dimorphism occurs in mandibular symphysis with males showing wider chin.
3. Males with hypo divergent profiles show a wider chin than hyper divergent and normo divergent profiles.
4. Females with hypo divergent profiles showed a broad and short symphysis than normo divergent and hyper divergent subjects.

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