



## Sexual Dimorphism of Adult Human Palate by its Dimensions in South Indian Dry Skulls

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### ABSTRACT

The adult human palate varies for every individual. A study using bones of various individuals can be done to identify the differences between male and female palate. It is difficult to identify a mutilated body when constructing a biological profile. Sex determination is the most important and the initial step in individual identification by using skeletal elements. This research will be useful in forensic dentistry as well when the sex of an individual is found many other features can be more easily determined. The main objective of this study is to identify the sex of a person using the dimensions of the palate.

**Keywords:** Hard palate, Sex determination, Palatal Index, measurement.

### INTRODUCTION

The palate is the roof of the mouth and the floor of the oral cavity. It separates the oral and nasal cavities as well as the nasopharynx. The palate has an extravagant arterial supply from branches of the maxillary artery and it has a rich nerve supply by many sensory nerves. The palate consists of an anterior two-thirds of hard palate and a posterior third called as soft palate. The hard palate consists of the bony palate formed by the palatine processes of the maxillae and the horizontal plates of the palatine bones. The soft palate is a mobile, fibromuscular fold suspended from the hard palate posteriorly and ending in the uvula<sup>2</sup>. The main objective of this research is to identify the sex of the person using the hard palate. It is the most common & critical problem faced by anatomist, forensic science experts & anthropologist. Hence it plays an important role in identification. Individual bones have been used for identifying sex of the individual as bones of the body are last to perish after death, next to enamel of teeth. Almost all bones of the human skeleton show some degree of sexual dimorphism<sup>5,6,7</sup>. As South India is composed of a heterogeneous population rich in ethnic and cultural diversity, and craniofacial growth is influenced by racial, ethnic, sexual and dietary differences<sup>8</sup>, standard data of the local population is fundamental in the evaluation and diagnosis of craniofacial abnormalities<sup>9,10</sup>. In this study a total number of 42 adult human skulls of South Indian population were used to measure the maximum width and the maximum length of the hard palate. 24 male skulls and 18 female skulls were used for this study. The palate was measured using a vernier calliper.

### MATERIALS AND METHODS

This study is conducted using 42 South Indian adult dry skulls from the Department of Anatomy collection at Saveetha Dental College. The skulls were selected only

after confirming the hard palate was still intact. The skulls taken for study were of adult to old age group. The dry skulls taken for this study were first examined for sex determination with the help of various traits. If the majority of the traits pointed towards male, it was taken as male and the same criteria applies for female skulls.

The hard palate was measured using a vernier calliper. Each reading was repeated twice to rule out any errors. Each calculation was repeated twice as well to rule out any error. The maximum width and the maximum length of the hard palate were taken. The parameters used for measuring the hard palate are as follows:

- 1) The maximum width of the hard palate is taken at the gingival margin of the first molar tooth of one side to the opposite.(Photo No.2)
- 2) The maximum length of the hard palate is taken from the anterior margin of the incisive fossa to the posterior nasal spine.(Photo No.1)
- 3) Palatal index = maximum width/maximum length x 100



Photo No.1

The maximum length of the hard palate is taken from the anterior margin of the incisive fossa to the posterior nasal spine.





Photo No.2

The maximum width of the hard palate is taken at the gingival margin of the first molar tooth of one side to the opposite.

**RESULTS AND DISCUSSION**

There have been many studies conducted on the palate. The present study was done using 42 skulls out of which 24 are male and 18 are female skulls.

From the present study it was found that the average length of the hard palate in male is 50.62mm and in females it is 46.65mm. The average width of the hard palate in male is 23.86mm and in females it is 23.52mm. The average palatal index of the hard palate in males is 47.43mm and in females it is 48.19mm. This is the overall results of the study.

**Table 1: Mean Maximum Palatal Width**

Sex	N	Mean	Min	Max
Male	24	23.86	20.3	27.2
Female	18	23.52	20.1	28.1
Total	42	19.55	20.1	28.1

The above table (Table No-1) shows the mean as well as the minimum and maximum values of the width of the measured palates. The mean for males was 23.86mm and for females it was 23.52mm. The range for male cases was 20.3mm to 27.2mm and for females it was 20.1mm to 28.1mm. The average for males was slightly higher than females.

**Table 2: Mean Maximum Palatal Length**

Sex	N	Mean	Min	Max
Male	24	50.62	43.6	60.6
Female	18	46.65	39.4	59.1
Total	42	50.07	39.4	60.6

The above table (Table No-2) shows the mean as well as the minimum and maximum values of the length of the measured palates. The mean for males was 50.62mm and for females it was 46.65mm. The range for males was

43.6mm to 60.6mm and for females it was 39.4mm to 59.1mm. The average for males was significantly higher compared to females.

**Table 3: Mean Palatal Index**

Sex	N	Mean	Min	Max
Male	24	47.43	35.6	57.07
Female	18	48.19	37.6	68.2
Total	42	47.76	35.6	68.2

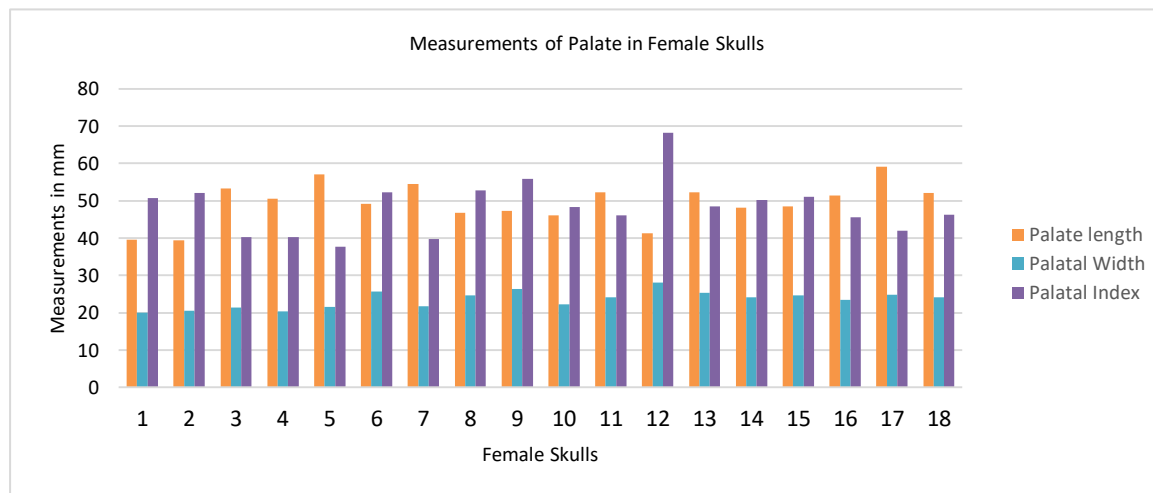
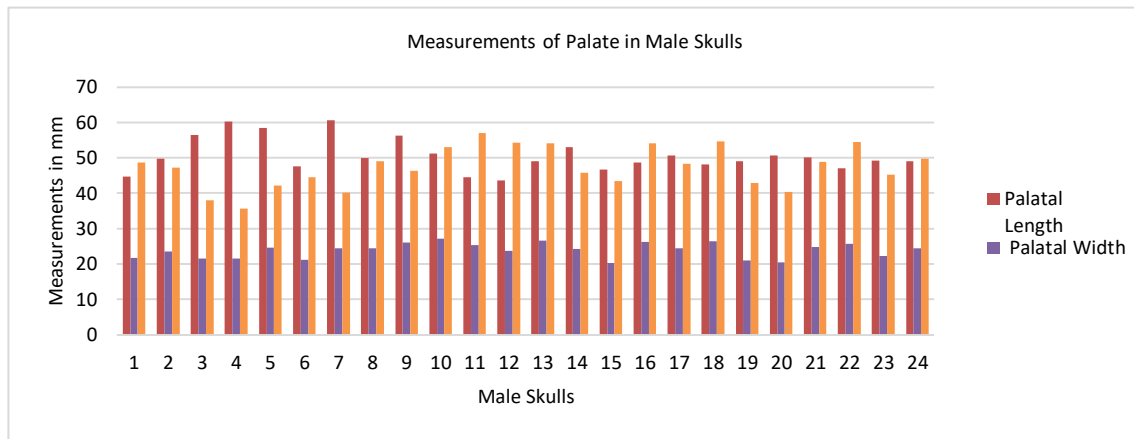
The above table (Table No-3) shows the mean as well as the maximum and minimum values of the Palatal index of the measured palates. The mean for males was 47.43mm and for females it was 48.19mm. The range for males was 35.6mm to 57.07mm and for females it was 37.6mm to 68.2mm. The average for females was found to be significantly higher compared to males. The individual value of each measurement of the palate taken in the skulls is given below. The data is represented in the form of bar graphs (Graph 1 & Graph 2). The male and female measurements are represented separately to show the variation in the measurements for each individual.

322 dry skulls for his research<sup>2</sup>. Another study conducted by Shabana Bowsiya looked at only the breadth and the length of the hard palate and not the palatal index<sup>1</sup>. The present study looks at the palatal length, width and the palatal index of dry skulls of South Indian origin.

The study conducted by Shabana Bowsiya found the length and the breadth of the hard palate. The study was done using 50 skulls and the hard palate was measured using a digital vernier calliper<sup>1</sup>. The measurement for the length of the palate is almost similar but there are major differences in the measurement of the breadth of the palate.

The present study was conducted on dry skulls of South Indian origin. There have been many studies conducted on the hard palate. Dr. Manmohan conducted a study on the hard palate of skulls of central Indian origin. He used

**Graph 1:** Measurements of the Hard Palate in Male Skulls for the Palatal Length, Palatal Width and Palatal Index



**Graph 2:** Measurements of the Hard Palate in Female Skulls for the Palatal Length, Palatal Width and Palatal Index

The study by Dr. Manmohan Patel it was found that the results published by his study on the hard palate in dry skulls of Central Indian origin were similar to the results found in the present study.

In a study conducted on the determination of sex from the hard palate by discriminant function analysis which was done using 60 skulls<sup>11</sup> showed results within the same range as that of the present study.

**CONCLUSION**

In the present study, it was found that the palatal width and the palatal length of the skulls of males was higher when compared to the female skulls. It was significantly higher in the palatal length average of the skulls whereas it was only slightly higher in the palatal width average of the skulls. The palatal index was found to be significantly higher in females compared to males of South Indian population. The findings of this study could be of clinical importance, interest to forensic anthropologists and genetic studies.

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