

**Gender divergence in dimensions of tongue: A morphometric study**

<sup>1</sup>Prachi Anand, <sup>2</sup>M.S.Raju, <sup>3</sup>Sunira Chandra, <sup>4</sup>Dewanshu Kumar

<sup>1</sup>BDS,MDS,Department Of Oral Medicine and Radiology, Senior Lecturer, Maharana Pratap Dental College and Hospital, Chhatrapati Shahuji Maharaj University, Kanpur, India,

<sup>2</sup>BDS,MDS Department Of Oral Medicine and Radiology, Professor and Head of the Department, Dr.B.R.Ambedkar Institute Of Dental Sciences& Hospital, Patna, Magadh University, Gaya.

<sup>3</sup> BDS,MDS Department Of Oral Medicine and Radiology, Professor and Head of the Department, Saraswati Dental College, Ram Manohar Lohia Awadh University,Lucknow, India.

<sup>4</sup>BDS,MDS Department of Prosthodontics Crown and Bridge, Senior Lecturer, Maharana Pratap Dental College and Hospital, Chhatrapati Shahuji Maharaj University, Kanpur, India.

**Corresponding Author:** Prachi Anand, Department Of Oral Medicine and Radiology, Senior Lecturer, Maharana Pratap Dental College and Hospital, Chhatrapati Shahuji Maharaj University, Kanpur, India

**Type of Publication:** Original Research Paper

**Conflicts of Interest:** Nil

**Abstract**

The claimed testimony is a requisite part of forensic investigations. Anthropometry, the systematic collection and correlation of measurements of the human body is now one of the principal techniques of physical anthropology. Gender determination is the first factor which is analyzed while identifying a set of human remains. Various studies in forensics have been done on various structures of head and neck region, but literature review shows the negligence of an important human organ “the tongue”. Though the tongue is of major interest to phoeneticians, linguists, speech therapists, but has been neglected by comparative anatomists. This demands the need for current research and study to confirm its normal size variations.

**Aim:** To evaluate the gender variations on the normal dimensions of the tongue.

**Methodology:** Individual methods were used to measure the different parameters i.e.Length, Breadth,

Circumference and Thickness with the help of a dental floss on maximum protrusion of tongue.

**Results and Conclusions:** The range values of the various parameters in males were as follows: length- 6-10cm, breadth- 5-11 cm, thickness-1-3cm, and circumference- 6-15cm. The range values of the various parameters in females were as follows: length- 6-10cm, breadth – 2-10cm, thickness- 1-3cm, circumference – 4-12 cm. Significant gender divergence in dimensions of tongue in male and female was observed with the help of a technique, which has an ease of availability and approachability.

**Keywords:** circumference, breadth, gender, length, morphology, thickness, tongue.

**Introduction**

A claimed testimony is a requisite for forensic investigations. Forensic anthropology combines the theories and methods of anthropology, osteology and archaeology with legal investigations. At times they are

the first to be called on discovery of suspected human remains. The role of the forensic anthropologist is varied :excavation , collection and analysis of human remains. *Gender determination is the first factor in identifying a set of human remains*[1]. Various studies in forensics have been done on various structures of head and neck region. *But literature review shows the negligence of an important human organ “The Tongue”*. Though the tongue is of major interest to phoeneticians, linguists, speech therapists, but has been neglected by comparative anatomists[2]. This demands the need for current research and study to confirm its normal size variations.

### Materials and Methods

The study was conducted in SARASWATI DENTAL COLLEGE AND HOSPITAL , LUCKNOW. Random 500 subjects with 287 males and 213 females participated in the study. Subjects with the age range 18 yrs to 60 yrs having dentulous arches with complete eruption of permanent mandibular second molars were included in the study. Physically disabled/handicapped subjects were excluded from the study. Subjects with Syndromes /systemic and local pathologies affecting the size of the tongue and taking medications that causes an enlarged tongue were also excluded from the study.

The subjects tongue was measured using Non –flexible thread(dental floss), Mouth Mirror, Metallic Scale, Divider, Gauze Piece using universal precautions. The methodology was designed for the following Parameters Length , Breadth , Thickness , and Circumference.

#### Length

Measurement was done from the tip of tongue to the point on the lateral surface of the tongue adjacent to distal marginal ridge of the distolingual cusp of the permanent lower second molar

#### Breadth

Horizontal measurement was done on the dorso- lateral surface of the tongue adjacent to canine- premolar region on both sides

#### Thickness

Vertical measurement was done on the dorso-lateral edge on both sides at the canine premolar region

#### Circumference

The tongue was entwined with a non–flexible thread over the canine-premolar region

The results were subjected for statistical analysis using Pearson Chi Square and One Sample t test. The comparisons were done using Anova test.



Fig .1: Measurement Of Length

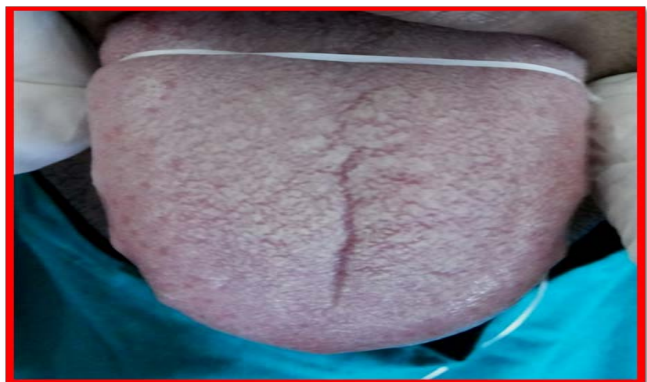


Fig . 2: Measurement Of Breadth



Fig .3: Measurement Of Thickness

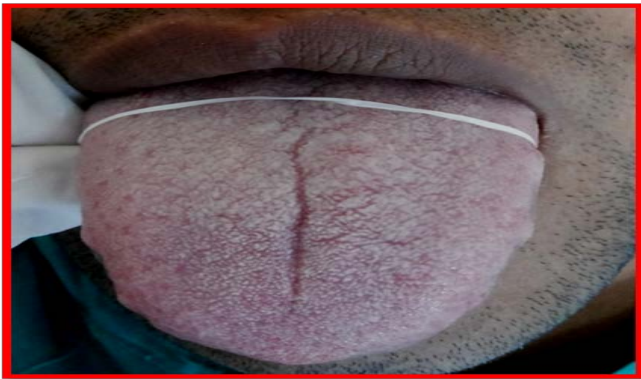


Fig .4: Measurement Of Circumference

### Result and Discussion

The tongue is a muscular hydrostat organ . There have been studies done to measure the tongue size in various conditions. But the anatomical definition and how much of it is measured is not standardized [3]. There are different methods in previous literature to record the normal size variations of the tongue which includes Impression Technique, Fluid Displacement, Cephalometrics , Computed Tomography , Magnetic Resonance Imaging [4]. These methods are expensive and less approachable. So an approach was taken into measuring the normal size of tongue with a technique which was feasible and inexpensive .In the present study the number of subjects included was 500 (287 males, 213 females). Similar other studies have been done by Oliver et.al. on 35 subjects (23 male , 12 female), Hopkin et.al. on 32 subjects neonatal tongue (16 male , 16 female) and 30 adult tongue (14 male, 16 female). In our study the

parameters taken were length, breadth, thickness and circumference. Similar other parameters were taken in the studies done by Oliver et.al. and Hopkin et.al. with parameters (length, breadth and thickness).When standardizing a method each parameter bestowed difficulty in few aspects. To determine the maximum length visibility of the posterior ends , avoidance of gag reflex, easy reproducibility and a standard location in the oral cavity.Length - Measurement was done from the tip of tongue to the point on the lateral surface of the tongue adjacent to distal marginal ridge of the distolingual cusp of the permanent lower second molar (Fig.5.1) . Oliver et.al. in their study measured length as protrusion beyond the lower incisors . Hopkin et.al. measured length from tip of the epiglottis to the apex of the tongue.Breadth - Horizontal measurement was done on the dorso- lateral surface of the tongue adjacent to canine- premolar region on both sides(Fig.5.2) . Oliver et.al. in their study measured breadth at the oral commissure . Hopkin et.al. measured breadth at the widest part of the tongue.Thickness- Vertical measurement was done on the dorso-lateral edge on both sides at the canine premolar region(Fig.5.3) . Oliver et.al. in their study measured thickness above the incisor edges . Hopkin et.al. measured thickness of the free edge of the tongue at its widest partCircumference - The tongue was entwined with A non-flexible thread over the canine-premolar region(Fig.5.4) . No studies have recorded the parameter. Our study showed a statistical significant differenceHopkin et al study showed the following results Length -7.9cm, Breadth -5.19cm, And Thickness-1.61cm while our result is illustrated in Table .1

Table .1 Results of the parameters

	Male		Female	
Length	7.99 ± 0.781	6-10	7.53 ± 0.787	6-10
Breadth	6.00 ± 0.673	5-11	5.53 ± 0.780	2-10
Thickness	10.86 ± 1.11	1-3	1.79 ± 0.409	1-3
Circumference	1.93 ± 0.321	6-15	10.15 ± 1.073	4-12

### Conclusion

The study present methods to evaluate the normal size parameters of the tongue. A feasible, approachable and inexpensiveness of the methodology is taken into consideration . The divergence of mean value, range of these parameters (length, breadth, thickness and circumference) in the among the gender has been concluded. Among all the parameters Circumference parameter shows a significant difference .

### References

1. Oliver RG, Evans SP. Tongue Size, Oral Cavity Size and Speech. Angle Orthod 1986;56(3):234-42.
2. Hopkin GB. Neonatal and Adult Tongue Dimensions. Angle Orthod 1967;37:132-3.
3. Wolford Larry M and Cottrell David A. Diagnosis of Macroglossia and Indications for Reduction Glossectomy. Am J Orthod And Dentofac Orthop 1996;110:170-7.
4. Kazuhiko Tamari, Teruo Murakami and Yasuhide Takahama. The Dimensions of the Tongue in relation to its Motility. American Journal of Ortho Dent Facial Orthopaedics 1991;99:140-6.
5. Lauder Robert, Muhl F Zane. Estimation of Tongue Volume from Magnetic Resonance Imaging. Angle Orthod 1991;61(3):175-83.
6. Kazuhiko Tamari, Teruo Murakami and Yasuhide Takahama. The Dimensions of the Tongue in relation to its Motility. American Journal of Ortho Dent Facial Orthopaedics 1991;99:140-6.
7. Lauder Robert, Muhl F Zane. Estimation of Tongue Volume from Magnetic Resonance Imaging. Angle Orthod 1991;61(3):175-83.
8. Ardran G.M, Kemp F.H A Functional Assessment of Relative Tongue Size. American Journal of Roentgenology 1972;114(2):282-8.
9. Chisato Lida Kondo, Norio Yoshino, Tohru Kurabayashi, Shirou Mataka, Makoto Hasegawa and Norimasa Kurosaki. Comparison of Tongue Volume/Oral Cavity Volume ratio between Obstructive Sleep Apnea Syndrome Patients and Normal Adults using Magnetic Resonance Imaging. J Medical and Dental Sciences 2006;53:119-126.
10. Vig. P.S, Cohen .A.M. A Serial Growth Study of the Tongue and the Intermaxillary Space. Angle Orthod 1976;46(4):332-7.