Descriptive Study of Tongue Patterns, Intermolar and IntercanineTongue widthamong Rivers State Students in Rivers State University

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ABSTRACT

The human tongue is a muscular, vital organ encased within the oral cavity that performs multiple actions. It is the least understood structures of the body and its complex anatomy is one of the reasons for the relative lack of research on it. Research on the tongue helps to enlighten individuals on the evaluation of tongue patterns (tongue shape and tongue size) but among Rivers State Students in Rivers State University. For this purpose, a camera was used for taking pictures of the tongue to identify the shape and a software (Adobe Photoshop Software) used for measurement of the tongue to know the size (inter-canine width and inter-molar width), questionnaires for participant's data and consent form which was also administered. Statistical analysis using independent t-test, chi-square, and descriptive statistics tool was carried out with the aid of SPSS version 28. Results showed that the predominant tongue shape among Rivers State Students in Rivers State University is the triangular tongue shape with a proportion of 24.5% while the irregular tongue shape (0.4%) is the least of all tongue shape. The mean inter-canine and inter-molar width were 142.35±1.97mm 151.99±2.04mm respectively. The result of the study showed that inter-canine tongue width showed a significant difference between college and non-college participants with non-college having a higher mean value (149.3±2.36mm) P = 0.001 at 95% Confidence Interval and the most prevalent tongue shape was triangular while the least tongue shape is irregular.

Keywords:*Tongue shape, inter-canine, inter-molar, tongue width, Rivers State Students, Rivers State University.*

INTRODUCTION

The tongue is located at the entrance of the digestive and respiratory system which enables it perform its functions and it also plays a vital role in everyday functions of the body including breathing, speech and swallowing. It is not a deformable structure and does not contain bones, joints, or air-filled chambers, yet it must move in the oral cavity. This makes the tongue unique to the body.[1]

The tongue is also a vital organ encased within the oral cavity which performs multiple actions such as articulation of speech, perception of taste, and formation of food bolus. It is the only external organ which can easily be protruded and displayed for inspection and palpation purposes. This means its shape and texture analyzed. This organ is also helpful due to its exposed portion which comprises information with clear differences between two individuals and maybe easily called and used as a "lingual impression". Hence this study describes the various tongue patterns and also emphasize on the uniqueness of the tongue[2]Although, human identification is one of the most challenging area in forensic field that man has been confronted with, identification of an individual plays an important role in any crime investigation mass disaster and deceased cases.[3]

This study also observed that the shape and surface features are characteristics of each individual which may serve as a tool for identification.[4]Only internal muscles, forming the body of the tongue were considered.[5]
Observation shows that the tongue (lingua) is a skeletal muscle dorsally and structurally fat surrounded by a cartilaginous sheath forming lyssa (canids only) ventrally. The tongue also occupies the ventral aspect of the oral cavity and oropharynx and it is involved in grooming, lapping, prehension, manipulating food in the oral cavity and has attached root and body with free apex. The frenulum (fold of mucosa) attaches the body of the tongue to the floor of the oral cavity and the root of the tongue is attached to the hyoid bone.[6]

The tongue is one of the organs most central to human speech and the shape, proportions, and positioning of the human tongue are crucial components of speech biomechanics, accounting for both articulatory and temporal properties of speech acoustics and production.[7]Also, the volume of the tongue gradually increases from the intrauterine life to the end of the second decade of life.[8]

Additionally, the tongue is a muscular organ used for communication, taste, and deglutition. Studies have shown variations in the morphology of the tongue as the study was carried out to assess the various morphological variations of the tongue such as shapes among the bachelor level students.[9]

Materials and Methods

Research design

A descriptive cross-sectional design was applied in this research study. The respondents of this study comprised of Rivers State Students in Rivers State University selected through convenience sampling technique.

Study area

The research work was done using Rivers State Students in Rivers State University.

Research population

Using Taro Yamane formula to determine the sample size:

$n = N(1+N(e^2)$

Where;

n = Sample size

N = Population size

e = Level of precision or margin error (expressed as proportion, typically ranging from 0.01-0.05)

Calculation for Sample size: using a population of 20302 obtained from the records of the Rivers State University's Registry.

Eligibility criteria

Participants are selected according to their willingness and availability to participate in the study.

Inclusive criteria

All undergraduate students of Rivers State Origin.

Exclusive criteria

Individuals with a deformity of the tongue and systemic or contagious diseases were excluded.

Sample size

The study used a sample of 233 participants from Rivers State University.

Sample Technique

Convenience sampling technique was adopted for this study.

Method of data collection and instrumentation

In this study, primary method of data collection was employed in obtaining tongue patterns. Prior to obtaining primary data from participants, a participant consent form was administered. The consent form was aimed at providing information on what the research entails, possible risk factors and future benefits that would allow participants take a rationale decision to volunteer themselves for this research.

Tongue shape

The subjects were made to protrude their tongue outward and a camera was used to capture the tongue to able to identify different tongue shape captured.

Tongue size (Inter-canine width and inter-molar width)

The tongue is measured using a software known as Adobe Photoshop Software. The canine of the teeth below is used to measure inter-canine width and the first molar of the teeth below is used to measure the inter-molar width. The measurement was carefully taken and in millimeters.

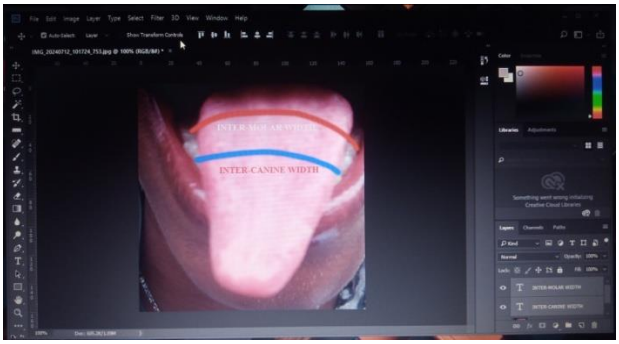

Figure1:*Adobe photoshop software used in measuring the intercanine and intermolar tongue width*

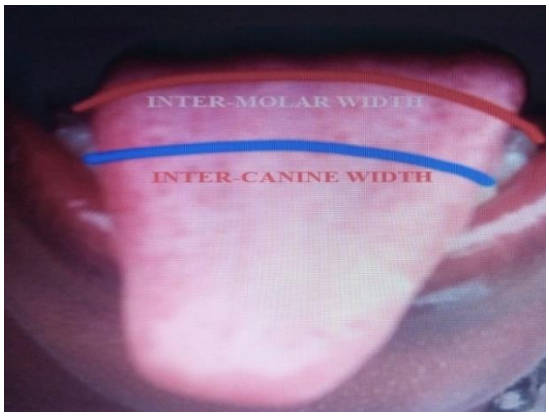

Figure 2:*The measurement of Inter-molar width (first molar) and Inter-canine width*

Figure 3:*Acute Triangular Tongue Shape*

Figure 4:*Obtuse tongue shape*

Figure 5:*Rectangular tongue shape*

Figure 6: *Square tongue shape*

Figure 7:*Circular Tongue Shape*

Figure 8:*Hammer Tongue Shape*

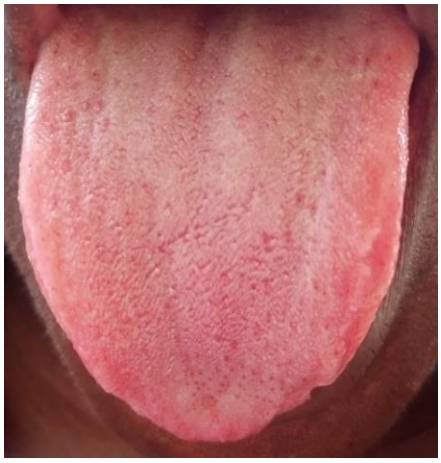

Figure 9:*Ellipsoidal Tongue Shape*

Figure 10:*Irregular Tongue Shape*

Method of data analysis

The statistical analysis was done using Statistical Product and Service Solutions (SPPS)VERSION 28. The descriptive statistics tool was used for descriptive statistics, while Chi-square and Independent t-tests were used to test for association between the variables. P-value set 0.05 with 95% confidence interval.

Ethical consideration

Ethical approval was obtained from the Research and Ethical Committee of Faculty of Basic Medical Sciences in Rivers State University before the commencement of the study.

RESULTS

The results from the data analyzed were presented in tables and graphs was necessary.

Table 1: Sociodemographic Characteristics

Sociodemographic characteristics	Frequency (n)	Percentage (%)
Gender		
Male	54	23.2
Female	179	76.8
Total	233	100.0
Marital status		
Single	228	97.9
Married	5	2.1
Total	233	100.0
Religion		
Christianity	231	99.1
Islam	2	0.9
Total	233	100.0

The results showed that the females (76.8%) were more prevalent than the males, the participants were more of singles (97.9%) than married, there were more Christians (99.1%) than Muslims.

Table 2: Descriptive Statistics of Variables

Variables	Frequency (n)	Percentage (%)
Faculty		
College	110	47.2
Non-college	123	52.8
Total	233	100.0
Tongue shape		
Circular	39	16.7
Ellipsoidal	47	20.2
Hammer-shaped	28	12.0
Rectangular	31	13.3
Square	30	12.9
Triangular	57	24.5
Irregular	1	0.4
Total	233	100.0
Inter-canine tongue width		
Mean±Standard error	142.35±1.97mm	
Inter-molar tongue width		
Mean±Standard error	151.99±2.04mm	

The non-college (52.8%) participants were more prevalent than the college participants; The triangular tongue shape was more prevalent (24.5%), while the irregular shape was least (0.4%) prevalent, the mean inter-canine width and inter-molar width were $142.35\pm1.97mm$ and 151.99±2.04mm respectively.

Table 3: Chi Square Analysis of the Relationship between tongue Shape, Gender, and Faculty

Variables	Males n (%)	Females n (%)	X^2	p-value	Inference
Tongue shape					
Circular	10(4.3)	29(12.4)	7.760	0.256	Not significant
Ellipsoidal	5(2.1)	42(18.0)			
Hammer-shaped	7(3.0)	21(9.0)			
Rectangular	11(4.7)	20(8.6)			
Square	6(2.6)	24(10.3)			
Triangular	15(6.4)	42(18.0)			
Irregular	0(0.0)	1(0.4)			
Total	54(23.2)	179(76.8)			
	Faculty of participants				
Tongue shape	**College**	**Non-college**	11.103	0.085	Not significant.
Circular	17(7.3)	22(9.4)			
Ellipsoidal	24(10.3)	23(9.9)			
Hammer-shaped	14(6.0)	14(6.0)			
Rectangular	19(8.2)	12(5.2)			
Square	7(3.0)	23(9.9)			
Triangular	29(12.4)	28(12.0)			
Irregular	0(0.0)	1(0.4)			
Total	110(47.2)	123(52.8)			

The result showed that there was no significant ($p>0.05$) relationship between the tongue shape, gender, and the faculty of the participants.

Table 4a: Descriptive statistics for Independent t-test of the association between tongue intercanine width and Faculty of participants

Variable	N	Mean(mm)	Std. Deviation (mm)	Std. Mean Error (mm)
Inter-canine tongue width				
College	110	134.5	32.314	3.081
Non-college	123	149.3	26.197	2.362

The mean of inter-canine tongue width for college participants ($\text{Mean}\pm S.E.$) was $134.5\pm3.081mm$, while non-college participants was 149.3±2.36mm.

Table 4b: Independent t-test of the association between tongue inter-canine width and Faculty of participants

Variable	F	Sig	T	df	p-value	Mean diff	95% Confidence interval	
							Lower	Upper
Inter-canine tongue width								
Equal variances assumed	0.767	0.382	-3.868	231	0.001	-14.844	-22.406	-7.283
Equal variances not assumed			-3.824	209	0.001	-14.844	-22.498	-7.191

The mean of inter-canine tongue width of college (n=110) and non-college (123) were 134.5±3.08mm and 149.3±2.36mm, respectively. Levene's test (p=0.382) indicated that variances between the groups were statistically equal. At equal variances assumed, independent samples t-test (p=0.0001) indicated that the mean inter-canine tongue width of college and non-college students were statistically not equal.

Table 5a: Descriptive statistics for Independent t-test of the association between tongue inter-molar width and Faculty of participants

Variable	N	Mean (mm) ± Std. Error (mm)
Inter-molar tongue width		
College	110	148.02±3.344
Non-college	123	155.54±2.421

The mean of inter-molar tongue width for college participants (Mean$\pm S.E.$) was 148.02$\pm$3.34mm, while non-college participants was 155.54$\pm$2.42mm.

Table 5b: Independent t-test of the association between tongue inter-molar width and Faculty of participants

Variable	**F**	**Sig**	**T**	**Df**	**p-value**	**Mean diff**	**95% Confidence interval**	
							Lower	**Upper**
Inter-molar tongue width								
Equal variances assumed	1.573	0.211	-1.849	231	0.066	-7.523	-15.541	0.494
Equal variances not assumed			-1.822	203.3	0.070	-7.523	-15.665	0.618

The mean of inter-molar tongue width of college (n=110) and non-college (123) were 148.02$\pm$3.34mm and 149.3$\pm$2.42mm, respectively. Levene's test (p=0.211) indicated thatvariances between the groups were statistically equal. At equal variances assumed, independent samples t test (p=0.066) indicated that the mean inter-molar tongue width of college and non-college students were statistically equal.

DISCUSSIONS

This study investigatedthe tongue patterns (shape and size) among Rivers State Students in Rivers State University. using anthropometric methods, the data collected on tongue shape and size (inter-canine width and inter-molar width) among 233 participants, examining how these patterns vary by gender, religion, marital status, and faculty. Results showed that the triangular shape (24.5%) was the most prevalent while the least prevalent shape was the irregular shape (0.4%). The inter-canine tongue width showed a significant association with non-college having a higher mean value than those in college while inter-molar tongue width did not show any significant association between the two categories.

The distribution of socio demographics (Table 1) showed that females, singles and Christians were the most prevalent sociodemographic characteristics. It could be because the data collection site was dominated by the female and the fact that the data collection was coordinated by a female, which may have made the female participants more comfortable to allow them take data. In addition, the study centre had more of students who were majorly single.

In a student population, particularly undergraduate students, there is a possibility that more of the students would be single than married. Furthermore, the prevalent religion in the study area tends to reflect in the demography of the participants. This study was done in Rivers State University where the more prevalent religion is Christianity.

This explains why Christians were more prevalent in the study. This finding agrees with the reports of previous studies who also maintained that the distribution of the sociodemographic characteristics is dependent on the study setting.[9-10]

The study revealed in table 2, that the most prevalent tongue shape was triangular shape with a prevalence of 24.5% while the least prevalent tongue shape was the irregular shape. The result of this present study negates the findings of the previous studies.[4,9,11]who reported that the most prevalent tongue shapes were U-shaped or rectangular tongue shapes.

The reason for the high prevalence of triangular tongue shape could be from the developmental stage of the tongue, the genes and moderators of the mechanism resulting in the development skewed towards the triangular tongue shape.[12]
The inter-canine tongue width has an average of 142.35±1.97mm. This average when compared with the average reported in the previous studies was higher than what was reported.[13-14] The difference in the mean value could be probably because the studies were done in populations that are far apart. The morphology of the people maybe different considering the geography, and nutrition of the people.

Similarly, the inter-molar tongue width showed an average of 151.99±2.04mm. Comparing with the previous studies it was higher than what was reported.[14] The reasons are similar to what was earlier highlighted.

The comparison between tongue shape, gender, and faculty of the participants, in table 3 showed that there was no significant association seen between the variables (P> 0.05).

The test of association between inter-canine width and faculty of the participants in table 4 showed that there was a significant association (P< 0.001). The non-college participants had a significantly higher mean value than those in college. While the inter-molar tongue width in table 5 did not show any significant association between the two categories (P>0.05).

This result showed that participants in college probably had a lesser body morphology which was shown in the development of the tongue. The body morphology has been seen to corroborate size.

Conclusions

The result of the study showed that the most prevalent tongue shape was triangular with a proportion of 24.5% while the least prevalent shape was the irregular with 0.4%.
The mean inter-canine and inter-molar width were 142.35±1.97mm and 151.99±2.04mm respectively.

The inter-canine tongue width showed a significant difference between college and non-college participants with non-college having a higher mean value (149.3±2.36mm) P = 0.001 at 95% Confidence Interval.

Recommendations

Thisstudy recommends conducting similar studies in different populations to establish baseline data for such populations.

Further investigation is recommended to explore the unique characteristics of each tongue shape and their comparative differences across populations.

It is also recommended to examine the relationship between tongue shape, individual performance, and speech characteristics.

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