
Mesio-Distal Measurement of Anterior Teeth in a Sample of Malagasy Population

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Abstract

The aim of this study was to determine the mesio-distal width of anterior teeth in a sample of Malagasy population.

It was carried out in a student population of the Institute of Tropical Odontostomatology of Madagascar in the University of Mahajanga. This is a descriptive cross-sectional study. The duration of the study was 9 months, and the study period was 4 months. All students with or without wisdom teeth were included in the study. Those with proximal caries or fillings, edentulousness greater than one tooth, tooth shape or number anomalies, and finally those who were reluctant to the study were excluded.

The study population consisted of 131 students, 67 of whom were females and 64 males. The mesio-distal measurement of the maxillary incisors is in ascending series from the lateral to the central. The central incisors have the largest size compared to the other anterior teeth. In the mandible, the measurements of the anterior teeth are in descending order from canine to central incisors. The male gender has a larger size of teeth compared to the female gender.

Our study confirms the importance of knowing the mesio-distal measurement of teeth in establishing the diagnosis in orthodontics because of the existence of ethnic variations in dental dimensions.

Keywords : *mesio-distal width of teeth, anterior teeth, orthodontics.*

1. INTRODUCTION

The precise knowledge of tooth dimensions is crucial in orthodontics, aiding in accurate diagnosis and the formulation of an effective treatment plan. Discrepancies in tooth size can lead to both aesthetic and functional consequences, impacting the achievement of a proper occlusion—the ultimate goal of orthodontic treatment [1, 2, 3].

Following the introduction of the six keys to optimal occlusion by Andrews in 1972, subsequent studies have emphasized the seventh key, focusing on tooth size [4, 5]. Over the years, numerous researchers have conducted studies on the mesio-distal measurement of anterior teeth in different countries, revealing variations influenced by racial groups [3]. However, to the best of our knowledge, no such study has been undertaken in Madagascar. Therefore, this study was designed to assess the specificities of the Malagasy population tooth size.

The objective of this study was to determine the mesio-distal measurement of anterior teeth in a student population in Madagascar.

2. METHODOLOGY

This study was conducted among a student population at the *Institut d'Odontostomatologie Tropicale de Madagascar* (IOSTM), in the University of Mahajanga. It was a cross-sectional descriptive study conducted over a period of 9 months from March 2018 to November 2018, with a study period of 4 months (March to June 2018).

The sampling method employed was exhaustive, including all IOSTM students with or without wisdom teeth. Students undergoing or having undergone orthodontic treatment were excluded.

Exclusion criteria encompassed students with proximal caries or fillings, edentulousness exceeding one tooth, tooth number anomalies i.e. agenesis and supernumerary teeth, shape anomalies such as rice-shaped incisors, and those who did not wish to participate in the study.

Prior to the study, approval for the investigation was obtained from the Director of IOSTM and the head of the Dental Care and Treatment Center. Informed consent for study participation was acquired after explaining the study's objectives and constraints to the students.

The dependent variable was the mesio-distal measurement of anterior teeth, while the independent variables were age and gender.

Data collection comprised three stages :

- the survey involved a questionnaire-interview by completing an inquiry form ;
 - photographs were taken using a camera and a mouth retractor ;
 - impressions were made to obtain 131 pairs of dental arch plaster models.
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Standard impression trays, alginate as impression material, and orthodontic plaster for model casting were used. Millimeter was the unit of measurement for model analysis. A caliper was used to determine the mesio-distal dimension of each anterior tooth from canine to canine. These measurements were then summed to yield the total measurement of the six anterior teeth. The caliper's jaws were adjusted to the proximal surface of each tooth, held either perpendicular or parallel, depending on the space, to ensure precision during measurement. The measurements were taken at the contact points where the maximum measurement of each tooth was found.

The data were entered and analyzed using SPSS version 20.0 software and Excel 2016 spreadsheet.

3. RESULTS

Table 1: Distribution of students by gender and age

Age	Gender					
	Male		Female		Total	
	n	%	n	%	n	%
Less than 20 years	17	26,6	19	28,4	36	27,5
[21 – 24]	31	48,4	40	59,7	71	54,2
More than 25 years	16	25,0	8	11,9	24	18,3
Total	64	100,0	67	100,0	131	100,0

Table 2: Average mesio-distal measurements of maxillary anterior teeth (mm)

Tooth number	Mean value	Standard deviation
13	7,55	0,67
12	6,66	0,67
11	8,32	0,61
21	8,32	0,61
22	6,66	0,66
23	7,54	0,67

Table 3: Average mesio-distal measurements of mandible anterior teeth (mm)

Tooth number	Mean value	Standard deviation
33	6,67	0,54
32	5,72	0,47
31	4,98	0,42
41	4,98	0,42
42	5,71	0,48
43	6,66	0,54

Table 4 : Average mesio-distal measurements of anterior teeth (mm)

Dental arch	Tooth number	Male		Female	
		Mean value	Standard deviation	Mean value	Standard deviation
Maxilla	13	7,79	0,63	7,31	0,62
	12	6,76	0,60	6,56	0,72
	11	8,45	0,54	8,20	0,65
	21	8,45	0,54	8,20	0,65
	22	6,78	0,59	6,55	0,70
	23	7,78	0,64	7,31	0,62
Mandible	33	6,88	0,49	6,49	0,52
	32	5,81	0,48	5,64	0,45
	31	5,08	0,45	4,88	0,37
	41	5,08	0,45	4,88	0,37
	42	5,79	0,50	5,62	0,45
	43	6,86	0,50	6,47	0,51

4. DISCUSSION

The study population consisted of 131 subjects, comprising 67 females and 64 males (Table 1). The students' ages ranged from 17 to 28 years, with an average age of 21 ± 2.72 years. This age range aligns closely with a similar study conducted in Yemen (19.11 ± 3.01) [6], and other comparable studies on younger populations in Nigeria and England [3].

Regarding the mesio-distal measurement of maxillary anterior teeth, the incisors exhibited an ascending order from lateral to central incisors (Table 2). Central incisors had the largest size compared to other anterior teeth, measuring $8.32 \pm$

0.61 mm, followed by canines at 7.55 ± 0.67 mm and lateral incisors at 6.66 ± 0.67 mm. The result of our study is similar to those of the British population according to Olayinka et al. [3].

In comparison, a study on the Nigerian population found higher averages ranging from 9.32 to 9.67 mm for central incisors, 7.49 to 7.72 mm for lateral incisors, and 7.92 to 8.26 mm for canines [7]. Jordanian studies showed a difference of approximately 1 mm, with central maxillary incisors measuring 9.57 ± 0.67 mm, lateral incisors at 7.35 ± 0.63 mm, and canines at 8.50 ± 0.65 mm [8]. In Yemen, Al-Gunaid (2012) demonstrated larger central maxillary incisors and smaller lateral incisors and canines compared to our study population [6].

In the mandible, the measurements of anterior teeth decreased from canines to central incisors. Average mesio-distal measurements were 6.57 ± 0.52 mm for canines, 5.72 ± 0.47 mm for lateral incisors, and 4.98 ± 0.42 mm for central incisors (Table 3). Uysal et al. similarly reported that mandibular anterior teeth follow the pattern of canines being larger, followed by lateral and central incisors [9]. Our population displayed smaller dimensions compared to the Nigerian population, as observed in Olayinka et al.'s study [3]. Comparison with the African American population showed that our study group had smaller mesio-distal dimensions for mandibular anterior teeth. Averages for the African American population were 5.48 mm for central incisors, 6.06 mm for lateral incisors, and 7.11 mm for canines [10].

In our study, the mesio-distal measurement of teeth on the left and right sides showed slight asymmetry of 0.02 mm for canines and lateral incisors. No significant difference was observed for central incisors in general (Tables 2, 3). This result aligns with a study conducted in Qatar in 2018 by Hashim et al. [11]. A study in Yemen also showed a slight difference between homologous teeth on the right and left sides, although it was not statistically significant [6]. However, Ballard (1944) reported that 90% of his sample exhibited size asymmetry on both sides, concluding that these asymmetries are rules rather than exceptions [12].

Our study demonstrated that males have a larger mesio-distal dimension of teeth compared to females. In the maxilla, canine size in men was 7.79 ± 0.63 mm versus 7.31 ± 0.62 mm in women; lateral incisor measured 6.76 ± 0.60 mm in men and 6.56 ± 0.72 mm in women, and that of central incisor was 8.45 ± 0.54 mm in men and 8.20 ± 0.65 mm in women (Table 4).

In the mandibular arch, for males, the canine was 6.88 ± 0.49 mm, lateral incisor was 5.81 ± 0.48 mm, and central incisor was 5.08 ± 0.45 mm. For females, the dimensions were 6.49 ± 0.52 mm for the canine, 5.64 ± 0.45 mm for the lateral incisor, and 4.88 ± 0.37 mm for the central incisor (Table 4). This gender difference in measurement has been confirmed by several studies in different countries (Jordan, Yemen, and the United States of America) [6, 8, 10].

CONCLUSION

Mesio-distal measurements of anterior teeth vary among populations. Our study found that, in the maxilla, teeth have a larger mesio-distal measurement than in the mandible; central incisors exhibit the widest mesio-distal measurement, followed by canines and lateral incisors. In the mandible, measurements decrease from canines to central incisors. Males have a larger mesio-distal measurement than females, with slight differences observed between homologous teeth on the right and left sides.

Tooth size analysis is an important part of orthodontic diagnosis. Identifying size discrepancies between teeth enables the selection of an appropriate treatment plan that meets both patient and practitioner expectations. To describe the characteristics of teeth in the Malagasy population and identify shape and size specificities, further extensive studies using the methodology employed in this work are necessary.

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