



Size of Maxillary Anterior Teeth in Relation to Selected Facial Anatomic Landmarks among a Group of Subjects in Port Harcourt

A. O. Arigbede^{1*} and P. Igwedibia²

¹Department of Restorative Dentistry, Faculty of Dentistry, College of Health Sciences, University of Port Harcourt, Port Harcourt, Rivers State, Nigeria.

²Department of Restorative Dentistry, University of Port Harcourt Teaching Hospital, Port Harcourt, Rivers State, Nigeria.

Authors' contributions

This work was carried out in collaboration between both authors. Author AOA developed the concept, conducted literature search, analyzed the data and wrote up the article. Author PI collected the data. Both authors read and approved the final manuscript.

Article Information

DOI: 10.9734/BJMMR/2016/24846

Editor(s):

(1) Ibrahim El-Sayed M. El-Hakim, Ain Shams University, Egypt and Riyadh College of Dentistry and Pharmacy, Riyadh, Saudi Arabia.

Reviewers:

- (1) Kritika Jangid, Saveetha Dental College, India.
(2) Takahiro Kanno, Shimane University, Japan.
(3) Luciana de Barros Correia Fontes, Universidade Federal de Pernambuco, Brazil.
(4) Parveen Akhter Lone, Indira Gandhi Government Dental College, Jammu, India.
Complete Peer review History: <http://sciencedomain.org/review-history/13843>

Original Research Article

Received 4th February 2016
Accepted 15th March 2016
Published 24th March 2016

ABSTRACT

Aims: The study aims to correlate the intercanthal distance (ICD), interalar width (IAW), and intercommissural width (ICoW) to the intercanine width [ICW] and the width of the philtrum to the size of central incisors.

Study Design: It was a cross-sectional study conducted at the Department of Restorative Dentistry, University of Port Harcourt Teaching Hospital in the month of October, 2015.

Methodology: The study was conducted among dental students, dental surgery assistant trainees and patients attending the restorative clinic of our institution. A sample of 115 participants was employed. Measurements of ICD - distance between the inner angles of the palpebral fissure; IAW - distance between the ala of the nose at the widest point; PW- width of the philtrum; and ICoW- the position of the corners of the mouth, at rest were done with the aid of a manual vernier caliper.

*Corresponding author: E-mail: arisabbey@gmail.com;

For accuracy, each parameter was measured three times following which the average was taken. ICW-intercanine width and width of central incisors were determined indirectly using dental floss stretching from the lateral surface of one tooth to the other along the greatest curvature of the arch. Descriptive statistics was performed and Pearson's correlation coefficient was employed to determine the level of correlation between two parameters. Significance was set at $P=0.05$.

Results: The mean age of the participants was 28.52 years ± 9.037 . The intercommisural width has the greatest mean, 53.3 ± 0.451 . The mean of the philtrum was about the size of 1 central incisor. The mean for ICW was 47.4 mm (0.951), ICD was 31.7 mm ± 0.376 and that of IAW was 38.1 mm ± 0.421 . The Pearson correlation coefficient varied from poor to weak.

Conclusion: The width of the philtrum was about the size of one central incisor. It appears the width of the philtrum could be used to estimate the size of central incisor No anatomic facial landmark provided significant predictive value for ICW. Level of correlation varied from poor to weak among the different anatomic facial landmarks investigated.

Keywords: Anterior teeth selection; complete denture; teeth size; tooth loss.

1. INTRODUCTION

Facial appearance following prosthetic rehabilitation with denture is a very important subject not only to prosthetic dentists, but also to their numerous patients. Poor aesthetics is one of the common reasons why dental patients request for tooth replacement services and it is also a well recognized reason for failure of prosthetic rehabilitation [1-3]. Selection of maxillary anterior teeth of appropriate size is one of the difficult clinical steps in the process of developing optimal complete denture esthetics [4]. It is often prone to error [5], because it is not absolutely objective [6]. Good denture aesthetics is achieved by selecting teeth of appropriate size and by its proper placement [6]. In most instances, artificial teeth that are similar in size to patient's natural teeth are desirable. Patient appearance is better when artificial teeth that are similar in proportion to the lost natural teeth are selected for prosthetic rehabilitation purposes [4]. Apart from size consideration, anterior teeth selection also includes consideration of appropriate form and color and this must be in harmony with the supporting facial structures [4].

There are many methods for estimating the size of maxillary anterior teeth even when pre-extractions records are not available. One of these involves the use of anthropological measurements [1,4,5,7]. Some of the anthropological measurements that have been advocated for estimating the combined width of the maxillary anterior teeth include: intercanine width [ICW], bizygomatic width (BZW), interpupillary distance (IPD), interalar width (IAW), intercanthal distance (ICD), intercommisural width, and multiple anatomical structures [4,7]. When objective records are not

available, facial measurements could serve as useful guides [4]. However, existing data in this field were said to have been developed using Caucasian population [7] and the published standards for this people may not be relevant for subjects in our environment. Inconsistent reports relating to individual variations and differences rooted primarily in ethnic and morphological characteristics of different population had previously been observed [4,7].

The present study aims to correlate the intercanthal distance (ICD), interalar width (IAW), and intercommisural width (ICoW) to the intercanine width [ICW] and the width of the philtrum to the size of central incisors.

2. METHODOLOGY

This was a cross-sectional study conducted using dental students, dental surgery assistant trainees and patients attending the restorative clinic of our institution as research participants. A sample of 115 participants was employed. The objectives of the study were presented to all invitees and they were assured that participation is voluntary and that no unfair treatment will be meted out to those who declined participation. Those who agreed to participate were examined intra orally and extra orally. Participants who had full complement of upper and lower teeth and who did not have caries, restoration, tooth fracture, diastema, congenital anomaly, facial surgery, malocclusion and who have not undergone orthodontic treatment were recruited into the study.

All extra oral facial measurements were done with the aid of a manual vernier caliper by bringing the recording parts of the caliper just in

contact with the reference points without applying pressure. Each parameter was measured three times by the same individual; the average was taken afterwards to ensure accuracy. The ICW was measured indirectly in the patient mouth with the aid of dental floss, extending from the distal surface of one canine along the greatest curvature of the maxillary arch to the distal surface of the contralateral canine. The method described by Quamar et al. [3] was adapted for the study. The reference points were marked on the floss before it is removed from the mouth. The floss is removed, straightened and its length is measured with the aid of vernier caliper. The other intra oral measurement that was done was "CIsW". This represents the width of the two central incisors. The extra oral facial measurements that were done included:

ICD - distance between the inner angles of the palpebral fissure;

IAW - distance between the ala of the nose at the widest point;

PW- width of the philtrum; and

ICoW- the position of the corners of the mouth, at rest.

Personal protective equipment (PPE) was employed in all cases for infection control. Ethical clearance certificate for the study was obtained from Research Ethics Committee of University of Port Harcourt Teaching Hospital, Port Harcourt, Rivers State, Nigeria (UPTH/ADM/90/S.II/VOL.X/838).

2.1 Statistical Analysis

The data was analyzed using SPSS for Windows version 20.0, (SPSS Inc. Chicago Illinois, USA). Descriptive statistics was performed and Pearson's correlation coefficient was employed to determine the level of correlation between two parameters. Significance was set at $P=0.05$.

3. RESULTS

Sixty eight of these (59.1%) were females and the remaining 47 (40.9%) were males. The age range was 17-60 years and the mean age was 28.52 years ± 9.037 . The distribution of the orofacial dimensions in relation to gender is shown in Table 1. The intercanine width has the widest range (28-67 mm) but the intercommisural width has the greatest mean, 53.3 ± 0.451 . The width of

the philtrum was about half the width of the 2 central incisors. Out of the remaining extra-oral facial dimensions, ICoW has the closest mean (53.3 mm) to the ICD (47.4). When gender variation was considered, the females generally had narrower anatomic facial dimensions (Table 1).

The Pearson's correlation coefficient between ICW & IAW was low and negative (Table 2). A similar pattern was found between ICD and IAW. Pearson's correlation showed significant statistical difference between ICW & IAW and between ICD & ICoW. The Pearson's correlation coefficient between PW & CIsW was low, positive and showed significant statistical difference.

4. DISCUSSION

The total number of participants employed for the study was similar to that employed by EL-Sheikh et al. [8] and was within the range of the sample size employed by Ellakwa et al. [7]. The age range of the participants was also close to those reported in previous publications [4,9]. Our results revealed a mean ICD of 31.7 mm ± 0.376 . This result corroborates the 31.2 mm reported by Freihofer [9] and 31.92 mm published by Al Wazzan [10]. It was more than a mean ICD of 26.22 mm reported by Deogade et al. [4] and less than 33.24mm ± 3.8 reported by Ellakwa et al [8]. Our result showed that the mean ICD for males was slightly more than that of females as previously reported by Deogarde et al. [4]. Freihofer [9], however, reported no gender difference.

The mean IAW found in our study closely approximate 38.27 ± 3.8 reported by Ellakwa et al. [7] and 38.28 mm reported by Deogarde. et al [4]. The distance between the distal surfaces of the maxillary canines measured along the circumference is one of the methods advocated for selecting the maxillary anterior denture teeth; **it is believed** to approximate intercommisural width [11]. The mean ICW recorded in our study was 47.4 ± 0.951 . This result was comparable to 46.01 mm reported by Qamar et al. [3] and 45.8 mm reported by Shillingburg et al. [12] It was much more higher than 36.1 mm previously published by Esan et al. [13] for subjects in our environment. Our finding, however, revealed a much narrower ICW compared to 53.22 mm published by Scandrett et al. [14] and 52.22 mm reported by al-el-Sheikh and al-Athel [15]. The reason for the wide variation in reported values

Table 1. Distribution of Oro-facial dimensions and gender

Variable	Range (mm)	Mean dimension for male & female (±)	Gender	
			Male mean (±)	Female mean (±)
ICW	28-67	47.4 (0.951)	47.9 (1.00)	46.4 (0.908)
ICD	20-43	31.7 (0.376)	32.4 (0.356)	31.4 (0.398)
IAW	27-49	38.1 (0.421)	39.7 (0.459)	37.1 (0.351)
ICoW	41-65	53.3 (0.451)	55.5 (0.446)	51.7 (0.372)
PW	4-20	10.2 (0.322)	11.4 (0.310)	9.25 (0.283)
CIsW	11-28	18.5 (0.297)	18.8 (0.347)	18.3 (0.252)

for ICW is not farfetched. Some investigators measured from the tip of one canine to the other [9,16] while others measured from the distal surface of one canine to the other [3,4,17]. In addition, some investigators measured the intercanine dimension in a straight line while [9,16] others measured along the circumference of the arch [3,4,17].

Table 2. Distribution of Pearson’s correlation coefficient

Variables	Pearson’s correlation coefficient	P value
ICW & ICD	0.136	0.15
ICW & IAW	-0.204	0.03
ICW & ICoW	0.105	0.26
ICD & IAW	-0.061	0.51
ICD & ICoW	0.247	0.01
PW & CIsW	0.3	0.001

A mean intercommissural distance of 53.3 mm ± 0.54150.61 reported in our study was higher than 50.61 mm reported by Ellakwa et al. [8], but less than 74.6 mm ±0.67 reported by Esan et al. [13] among subjects in Western part of Nigeria. Silverman [18] found that the distal surface of maxillary canines was ±4 mm from the commissures. Our finding does not appear to support this hypothesis. Vuttiparum et al. [19] stated that “Size of central incisors is a significant factor in selection of anterior teeth for all types of dentures.” Our study showed a mean dimension of 18.5 mm for the 2 central incisors. This was slightly higher than 17.026 mm presented for male and 16.573 mm for female subjects by Vuttiparum et al. [19]. However, the philtrum width dimensions of 14.105 mm presented by Vuttiparum et al. [19] for male and 12.271 mm for female was much higher than 10.2 mm reported in our study. Our study showed that the width of

the philtrum was about the size of one central incisor. The Pearson’s correlation coefficient was 0.3 and the P value was statically significant (0.001). This suggests that the philtrum as an anatomical landmark could provide limited guide in the selection of central incisor. The dimensions for male participants in our study, as previously reported by Deogarde et al. [4] and Esan et al. [13] were generally higher than those for female subjects.

Our results did not reveal any significant predictor of ICW. The Pearson’s correlation coefficient between ICD and IAW was weak and negative (-0.061) and the P value was statistically insignificant (0.514). This was contrary to the finding by Deogarde et al. [4] where it was found to be positive and strong ($r=0.696$) with a high statistical significance ($P < 0.001$). The Pearson’s correlation coefficient between IAW and ICW was negative and weak (-0.204) and the statistical difference was significant (0.03). This finding corroborates the report of Deogarde et al. [4] in this regard. The Pearson’s correlation coefficient between PW and CIsW showed a positive and weak correlation (0.3), and the P value (0.001) was statistically significant. Abdullah et al. [20] reported that the ICD may be used as a tentative predictor for the estimation of the combined width of the maxillary six anterior teeth. Al Wazzan [21] on the other hand reported a weak correlation between ICD and width of maxillary incisors only. Conflicting views had also been expressed regarding the relevance of IAW and indeed other facial anatomical dimensions as predictors of ICW [4].

5. CONCLUSION

The width of the philtrum was about the size of one central incisor. It appears the width of the philtrum could be used to estimate the size of

central incisor. No anatomic facial landmark provided significant predictive value for ICW. Level of correlation varied from poor to weak among the different anatomic facial landmarks investigated.

CONSENT

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Waliszewski M. Restoring dentate appearance: A literature review for modern complete denture esthetics. *J Prosthet Dent.* 2005;93(4):386-394.
2. Osagbemiro BB, Akadiri OA, Arigbede AO. Prosthetic replacement at the UPTH Dental Centre, Port Harcourt. *Nig J Med.* 2011;20(1):52-56.
3. Qamar K, Hussain MW, Naeem S. The role of the interalar width in the anterior teeth selection. *Pak Oral Dental J.* 2012; 32(3):569-573.
4. Deogade SC, Mantri SS, Sumathi K, Rajoriya S. The relationship between innercanthal dimension and interalar width to the intercanine width of maxillary anterior teeth in central Indian population. *J Indian Prosthodont Soc.* 2015;15(2): 91-97.
5. Lucas BL, Bernardino-Júnior R, Lopes-Júnior I, Gonçalves LC, Gomes VL. Comparison of three anthropometric techniques for tooth selection. *Eur J Prosthodont Restor Dent.* 2012;20(2): 67-70.
6. Landa LS. Anterior tooth selection and guidelines for complete denture esthetics. In *Essentials of Complete Denture Prosthodontics*, Sheldon Winkler, ed. 2nd ed, A.I.B.S. Publishers, Delhi; 202-216.
7. Ellakwa A, McNamara K, Sandhu J, James K, Arora A, Klineberg I, El-Sheikh A, Martin FE. Quantifying the selection of maxillary anterior teeth using intraoral and extraoral anatomic landmarks. *J Contemp Prac.* 2011;12(6):414-421.
8. EL-Sheikh NMA, Mendilawi LRB, Khalifa N. Intercanthal distance of a Sudanese population sample as a reference for selection of maxillary anterior teeth size. *Sudan J M S.* 2010;5(2):117-121.
9. Freihofer HP. Inner intercanthal and interorbital distances. *J Maxillofac Surg.* 1980;8(4):324-326.
10. Al Wazzan KA. The relationship between intercanthal dimension and the widths of maxillary anterior teeth. *J Prosthet Dent.* 2001;86(6):608-612.
11. Varjão FM, Nogueira SS. Intercommissural width in 4 racial groups as a guide for the selection of maxillary anterior teeth in complete dentures. *Int J Prosthodont.* 2005;18(6):513-515.
12. Shillingburg HT Jr, Kaplan MJ, Grace SC. Tooth dimensions - A comparative study. *J South Calif Dent Assoc.* 1972;40(9): 830-839.
13. Esan TA, Oziegbe OE, Onapokya HO. Facial approximation: Evaluation of dental and facial proportions with height. *Afr Health Sci.* 2012;12(1):63-68.
14. Scandrett FR, Kerber PE, Umrigar ZR. A clinical evaluation of techniques to determine the combined width of the maxillary anterior teeth and the maxillary central incisor. *J Prosthet Dent.* 1982; 48(1):15-22.
15. Al-el-Sheikh HM, Al-Athel MS. The relationship of interalar width, interpupillary width and maxillary anterior teeth width in Saudi population. *Odontostomatol Trop.* 1998;21(84):7-10.
16. Al-Kaisy N, Garib BT. Selecting maxillary anterior tooth width by measuring certain facial dimensions in the Kurdish population. *Vojnosanit Pregl.* 2013;70(7): 653-659.
17. Sinavarat P, Anunmana C, Hossain S. The relationship of maxillary canines to the facial anatomical landmarks in a group of Thai people. *J Adv Prosthodont.* 2013; 5(4):369-373.
18. Silverman SI. Physiologic factors in complete denture esthetics. *Dent Clin North Am.* 1967;115-122.
19. Vuttiparum N, Benjakul C. Relationship between the width of maxillary central incisors and philtrum. *J Dent Assoc Thai.* 1989;39(6):233-239.
20. Abdullah MA, Stipho HD, Talic YF, Khan N. The significance of inner canthal

- distance in prosthodontics. Saudi Dent J. 1997;9(1):36-39.
21. Al Wazzan KA. The relationship between intercanthal dimension and the widths of maxillary anterior teeth. J Prosthet Dent. 2001;86(6):608-612.

© 2016 Arigbede and Igwedibia; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:
The peer review history for this paper can be accessed here:
<http://sciencedomain.org/review-history/13843>