Original Article

CORRELATION OF OCCLUSO-VERTICAL DIMENSION WITH FINGER AND THUMB LENGTH IN DENTATE INDIVIDUALS

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ABSTRACT

Objectives: *Correlation of occluso-vertical dimension with finger and thumb length in dentate individuals.*

Materials and Methods: *This Cross-sectional study was conducted at the Saidu Dental College Saidu Sharif Swat. 85 dentate individuals were selected by nonprobability consecutive sampling, having age 18–40 years, without any craniofacial anomalies or dental prostheses. OVD, middle finger and thumb lengths were recorded between two standardized anatomical landmarks by using a digital vernier caliper. Data collected were analyzed using SPSS version 22.0. Descriptive statistics were computed, followed by Pearson's correlation and regression analysis. p-value <0.05 was considered statistically significant.*

Results: *A 47.1% of the 85 participants were males and 52.9% were females. Mean age was 25.5 ± 4.6 years. Mean value for OVD, middle finger and thumb length was 66.1 ± 4.8 mm, 79.2 ± 5.4 mm, and 61.4 ± 4.3 mm respectively. Males had significantly greater measurements for these variables than females (p < 0.001). OVD showed moderate positive correlation with middle finger length (r= 0.326, p= 0.003) and thumb length (r= 0.289, p= 0.007). Regression analysis showed significant associations for middle finger and thumb length having value of β = 1.053 and β = 1.608 respectively.*

Conclusion: *The study concluded that middle finger and thumb lengths have moderately significant correlation with OVD, suggesting these two as reliable anthropometric indicators in Prosthodontic rehabilitation of patients, especially in resource-limited settings.*

Key words: *Correlation, dentate individuals, finger length, Occluso-vertical dimension, thumb length, vertical dimension estimation*

INTRODUCTION

In the rehabilitation of edentulous patients, establishment of the proper occluso-vertical dimension

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(OVD) is a very important step[1]. OVD is the lower facial height which is measured between two chosen points on patient`s face when the maxillary and mandibular teeth are in maximum intercuspation[2]. Inaccurate OVD can cause temporomandibular joint disorders, compromised esthetic, headache, eating and speech difficulties[3]. OVD for edentulous patients can be assessed through rest position of the mandible, patient`s perceived comfort, phonetics and esthetics[4]. Other methods which can be used for OVD assess-

ment are pre-extraction records, photographs and measurements between certain structures. Electromyographs and anthropological measurements are also used for OVD estimation[5,6]. Anthropological measurements are considered as reliable in Prosthodontics. Principles of classical anthropometry suggests that by using proportional relationship of the body parts, some of the external body measurements can be used as a guide for intraoral measurements[7,8]. Many studies have investigated the use of finger and thumb length to estimate OVD[9-11]. Basnet et al found that thumb length and OVD often exhibit strong and positive correlation within individuals (r=0.87)[9]. Similarly, Hussain et al found significant correlations between index finger length and OVD (r=0.74 for males and r=0.82 for females) offering potential for clinical application[11]. Bacali et al found statistical correlation between middle finger and OVD[12]. OVD recording is a tedious step in complete dentures (CD) fabrication. Conventional approaches for recording OVD depend on inconsistent and unreliable facial landmarks which change rapidly with old age. So there is a need to develop reliable and more consistent alternate method for measuring proper OVD[13,14]. Patients demanding for CDs are mostly without any pre-extraction records. OVD for these patients can only be estimated using post-extraction records and anthropometric measurements can be relied upon for this purpose. As the length of the finger does not change after adolescence, it can be a less time-consuming and easy alternate for OVD recording for patient demanding CDs[15].

Estimation of proper OVD in CD patients is very challenging especially when pre -extraction records are unavailable and conventional techniques are inconclusive. Anthropometric record like finger and thumb length can serve as simple, potentially reliable and non-invasive guides for OVD recording in CD patients. By exploring the correlation of finger and thumb length with OVD in dentate individuals, this study may offer as an accessible tool for Prosthodontic diagnosis and treatment planning, especially in the teaching dental setting.

The objective of the study was to assess the correlation of occluso-vertical dimension (OVD) with middle finger and thumb length in dentate individuals.

MATERIALS AND METHODS

This Cross-sectional study was conducted at the Saidu Dental College Saidu Sharif Swat, after ethical approval NO. 735/Ethical/Certificate. Sample size was calculated using the most conservative value (r = 0.74 by Hussain et al.), taking alpha as 0.05, and using power of 0.80. The calculated minimum sample size was 12 subjects. However, to improve statistical power, allow for subgroup analysis (e.g., by gender), reduce measurement variability, and enhance generalizability, the final sample size was increased to 85 dentate individuals. Non probability consecutive sampling technique was used. Dentate individuals aged 18–40 years having Class I facial profile, with no history of Orthodontic or Prosthodontic treatment were included in the study. Individuals with missing teeth except 3rd molar, with hand or facial deformities, having any systemic diseases affecting bone or muscle tone or having temporomandibular joint disorders (TMDs), were excluded from the study. Participants who fulfil the inclusion criteria were recruited and informed verbal consent was taken. For the purpose of this study occluso-Vertical Dimension (OVD) is the lower face height measured between two points i.e one point on the base of the nose (subnasale) and the other point on the base of the chin (menton) when the teeth were in maximal intercuspation using a digital vernier caliper. Participants were seated upright in the chair with no support from the back of the chair for OVD measurement. The length of middle finger was measured from the tip to the metacarpophalangeal crease of the middle finger. Thumb length was measured from the tip to the base of the thumb at the metacarpophalangeal crease. Left hand was used for measuring middle finger and thumb lengths. All measurements were recorded thrice and was averaged for accuracy. All information was entered in a pre-structured proforma. The collected data were analyzed using SPSS version 22. Mean and standard deviations were calculated for continuous variables such as age, OVD, middle finger and thumb length and for categorical variables such as gender and age groups frequencies and percentages were calculated. Participants were grouped into two age categories for stratification. Group A: 18–29 years Group B: 30–40 years. Mean values for OVD, finger length, and thumb length were compared between these age groups and gender using Independent Samples

t-test. The Pearson correlation coefficient (r) was used to determine the strength and direction of the relationship between: 1. OVD and middle finger length, 2. OVD and thumb length. Pearson correlation coefficient was computed separately for males and females to assess gender-specific relationships between OVD and measurements of middle finger and thumb. A p-value of < 0.05 was considered statistically significant and the Power of the study was set at 80%.

RESULT

T85 dentate individuals were invited in the study of which 40 were males (47.1%) and 45 were females (52.9%). The mean age of participants was 25.5 ± 4.6 years. Mean values for OVD, middle finger and thumb lengths were 66.1 mm, 79.2 mm and 61.4 mm, respectively (Table 1).

No statistically significant differences were found between younger (18–29) and older (30–40) age groups for OVD or finger measurements. Significantly higher values for OVD, middle finger length, and thumb length were found for males as compared to females (p < 0.001), which indicates a consistent gender base dimorphism in the measured variables (Table 2). Both middle finger and thumb lengths showed moderate positive correlations with OVD (Table 3). The correlation was stronger in males, particularly for middle finger length (r = 0.412). While

the thumb-OVD correlation in females (r = 0.262) did not reach statistical significance (p= 0.072), all other relationships were significant (p < 0.05) (table 4). Linear regression analysis was conducted to explore the predictive effect of finger dimensions. Using thumb length, the regression model explained more variance (β = 1.608) in OVD (table 5) than the model using middle finger length (β = 1.053) (table 6). Thumb length showed a stronger predictive effect per unit increase, although both models were statistically significant.

DISCUSSION

The aim of the present study was to evaluate the correlation of occluso-vertical dimension (OVD) with two anthropometric markers like middle finger length and thumb length in dentate individuals. The findings demonstrated a moderate positive statistically significant correlation of middle finger and thumb lengths with OVD. The results are consistent with many previous studies and highlight the potential utility of finger dimensions in the estimation of OVD during rehabilitation of patients. In this study, the Pearson correlation coefficient (r) for middle finger length and OVD was 0.326 (p = 0.003), and for thumb length and OVD was 0.289 (p = 0.007). These findings are in agreement with the findings of Basnet et al. who reported a positive correlation of r = 0.87 between thumb length and OVD, suggesting that thumb length can be used as reliable anthropometric indicator for OVD estimation[9]. Studies by Majeed et al. and Tripathi et al. advocated the use of finger

Table 1: Descriptive statistics of age, OVD, middle finger and thumb length

Variable	Mean ±SD
Age	25.5±4.6
OVD	66.1±4.8
Middle finger length	79.2±5.4
Thumb length	61.4±4.3

Table 3: Pearson's correlation between OVD and anthropometric measurements

Correlation Pair	Pearson's r	P-value
OVD vs Middle Finger Length	0.326	0.003
OVD vs Thumb Length	0.289	0.007

Table 2: Age and gender stratification of variables

Variable	Male (Mean ± SD)	Female (Mean ± SD)	p-value	Group A (18–29) Mean ± SD	Group B (30–40) Mean ± SD	p-value
OVD (mm)	68.2 ± 4.3	64.2 ± 4.4	0.001	65.8± 4.6	67.1 ± 5.1	0.247
Middle Finger Length	82.5 ± 4.7	76.2 ± 4.5	0.001	78.7 ± 5.1	80.4 ± 5.	0.182
Thumb Length	63.7 ± 3.5	59.3± 3.8	0.001	61.2 ± 4.2	62.0 ± 4.2	0.378

Table 4: Pearson's correlation between OVD and anthropometric measurements for gender

Correlation Pair	Male (r)	p	Female (r)	p
OVD vs Middle Finger Length	0.412	0.009	0.295	0.048
OVD vs Thumb Length	0.388	0.014	0.262	0.07

measurements in determining OVD because statistically significant associations was found between finger lengths and OVD in their studies[13,14]. These correlations advocate the anatomical relationships of different skeletal structures and show relationship of craniofacial proportions of hand and digits measurements, which can be used reliably for OVD estimation. Study by Hussain and Yazdanie found gender based dimorphism in the correlations between index finger length and occluso vertical dimension (r = 0.82 for females, r = 0.74 for males) which is also evident in our study[11]. Similarly in gender-wise analysis of our study, males showed stronger correlations of OVD with finger and thumb length as compared to females, which is consistent with study by Alhajj et al. who reported variation in the anthropometric correlation of digits with OVD, in both genders of Sudanese populations[10]. The pattern of sex-based differences of both the mean values and strength of correlations found in our study are also consistent with Bacali et al. and Klales who emphasized gender dimorphism in anthropometric measurements[12,19]. The results of this study for regression coefficient for thumb length (β = 1.608) compared to middle finger length (β = 1.053) also match the regression findings of Prakash et al., who found a strong predictive relationship of both thumb and finger lengths with vertical dimension. suggesting reliability of finger length measurements in OVD estimation[6]. Furthermore in a multinational population-based study by Sajjan et al. advocated thumb length as a useful landmark for occluso vertical dimension estimation[7]. Our study results are also consistent with the results of Saxena et al. who assessed anthropometric measurements of finger in a North Indian population and found statistically significant correlations with occluso vertical dimension[17]. Similarly Ladda et al. found that using finger lengths in OVD determination

is high reliable[18]. Basutkar et al. in a Saudi cohort and Castro-Rodríguez and Sihuay-Torres reported a significant relationship between OVD and finger length and can be considered as reliable indicators for establishing vertical dimension[16,20].

LIMITATIONS

Despite its strengths, our study had some limitations. Being cross-sectional, it does not assess changes over time or across edentulous transitions. Additionally, ethnic homogeneity could limit generalizability; future studies should aim to include broader demographic and ethnic variations.

CONCLUSION

The practicality of finger-based measurement is very appealing especially in our resource-limited environments or when no reliable or consistent record is available. In conclusion, this study consider middle finger and thumb length as clinically useful, non-invasive means for estimating occluso-vertical dimension in edentulous individuals as it is supported by multiple previous studies and present as practical application in Prosthodontic.

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Table 5: Regression– OVD vs. thumb length

Variable	Unstandardized B	Standardized Beta	Std. Error	t-value	Sig. (p)	Lower CI 95%	UpperCI 95%
Intercept	43.87	—	6.11	7.18	0.001	31.72	56.02
Thumb Length	0.354	1.608	0.099	3.58	0.001	0.157	0.549

Table 6: Regression – OVD vs. middle finger length

Variable	Unstandardized B	Standardized Beta	Std. Error	t-value	Sig. (p)	Lower CI 95%	Upper CI 95%
Intercept	50.03	—	6.98	7.17	0.001	36.15	63.91
Middle Finger Length	0.198	1.053	0.088	2.25	0.027	0.023	0.372

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AUTHORS' CONTRIBUTION

The following authors have made substantial contributions to the manuscript as under:

Conception or Design: SS, BA, SN, GW, AF, NI

Acquisition, Analysis or Interpretation of Data: SS, BA, SN, GW, AF, NI

Manuscript Writing & Approval: SS, BA, SN, GW, AF, NI

All the authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.