

ROLE OF ANTHROPOMETRIC MEASUREMENTS IN DETERMINING OCCLUSAL VERTICAL DIMENSION

¹MUHAMMAD SAAD MATEEN MUNSHI, ²MUHAMMAD UMAR SHAH, ³MUHAMMAD ILYAS SHAIKH, ⁴SARA SHAHNAWAZ, ⁵FAIZA AWAIS, ⁶FAIQUA YASSER, ⁷KHEZRAN QAMAR

ABSTRACT

The objective of the present study was to evaluate the correlation of the occlusal vertical dimension with anthropometric measurement of fingers in Pakistani population. This correlation can be used to determine occlusal vertical dimension in edentulous patients. It was a cross sectional study and it was carried out in six months duration, from October 2018 to March 2019. A total of 200 dentate subjects fulfilling the inclusion criteria were selected from Lahore medical and dental college Lahore. Non-probability purposive sampling was used for the selection of the subjects. Informed consent was taken. Their occlusal vertical dimension was measured from base of nasal septum to the base of chin by using digital vernier caliper. Anthropometric measurement of the index finger, little finger and distance from the tip of thumb and the index finger were taken. SPSS version 20 was used to statistically analyzed the data. Pearson's correlation was used to find out the correlation between the occlusal vertical dimension and the length of fingers.

The results of the present study showed that the correlation was positive and strongest for the parameter little finger measurement in females. In males weak positive correlation of OVD was obtained with index finger ($p < 0.02$, $r = 0.23$) and similarly with the parameter little finger ($p < 0.06$, $r = 0.189$), however no correlation was found between OVD and distance between thumb and index finger.

From the results of the present study it was concluded that anthropometric measurements of fingers is a simple, non invasive and reproducible method for determining the OVD of edentulous patients.

Key Words: Maxillomandibular relations, Complete denture fabrication, Occlusal vertical dimension, Anthropometric measurements.

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INTRODUCTION

Recording of accurate occlusal vertical dimension is an important step in complete denture fabrication.¹ An

incorrect OVD can result in an unsuccessful denture.² An increase in the vertical dimension can result in muscle fatigue, fullness of mouth, difficulty in mastication and speech.³ It can also lead to muscle spasm and temporomandibular joint disorders.³ Similarly a decreased vertical can cause premature wrinkles, deepening of nasolabial groove, poor chewing and folds at the corner of the mouth that result in angular cheilitis due to collection of saliva.⁴

Several methods have been used for recording the occlusal vertical dimension but none is accurate and has its limitations.⁵ Presently vertical dimension is measured by physiological methods such as swallowing, rest vertical position, phonetics. Other methods include mechanical methods which are ridge parallelism, pre extraction records and cephalometric radiographs.⁶ Unfortunately, there is no universally accepted method for determining occlusal vertical dimension especially when pre extraction records are not available.⁷

Anthropometric measurements have been utilized to measure the body proportions since ancient times.

¹ Dr Muhammad Saad Mateen Munshi, BDS, FCPS, Associate Professor, Faryal Dental College E-mail: saad_munshi2003@yahoo.com

² Dr Muhammad Umar Shah, BDS, FCPS, FICD, PGD, Assistant Professor. King Faisal University Al Ahsa, Kingdom of Saudia Arabia E-mail: dr.umarshah@gmail.com

³ Dr Muhammad Ilyas Shaikh, BDS, FCPS, Associate Professor. Bibi Aseefa Dental College, Larkana, E-mail: ilyas@yahoo.com.

⁴ Dr Sara Shah Nawaz, BDS, Demonstrator Dept of Prosthodontics, Lahore Medical and Dental College, E-mail :sarashahnawaz92@gmail.com

⁵ Dr Faiza Awais, BDS, M PHIL, Assistant Professor, Rashid Latif Dental College. e mail: faiza.awais@gmail.com

⁶ Dr Faiqua Yasser, BDS, M.Phil, Associate Prof. Institute of Dentistry CMH LMC, Lahore. e mail. faiqayasser@gmail.com

⁷ Dr Khezran Qamar, BDS, FCPS, **Corresponding author**, Associate Professor, Lahore Medical and Dental College. Postal Address: 286 D,st#12,Askari 10, Lahore cantt. E-mail: drsajidnaem@hotmail.com Phone No.: 042-36500082, 0300-4577548

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Leonardo Di Vinci and Mc Gee correlated vertical dimension with various anthropometric measurements.⁸ Leonardo da Vinci gave the concept of the divine proportions.⁶ He proposed that the chin nose distance is equal to 1/3rd of the face and the thumb length is similar to the nose length.⁶ Similar is the case between the index figure and thumb's tip. Many studies have been carried out in the past where the anthropometric methods have been used to evaluate occlusal vertical dimension of various races.⁹⁻¹¹

This study was done to find out any possibility of correlation between occlusal vertical dimension and fingers length in Pakistani population. If a correlation was found that are static, then they could be useful for determining the vertical dimension in edentulous patients. Furthermore, it would be a simple, inexpensive and precise method for determining vertical dimension.

METHODOLOGY

A total of 200 dentate subjects were selected from the Lahore Medical and Dental College, Lahore. All the subjects were the students of the college. The study was carried out in 6 months duration from October 2018 till March 2019. Demographic information like age and sex was recorded. The age ranged from 19 to 30 years in both genders. The informed consent was taken from all the subjects for using their data in research. The individuals with definite centric stops and 28 permanent teeth with Angle's class I molar relation were included. All teeth were periodontally sound. The subjects with the history of orthodontic treatment, open bite, deep bite, teeth anomalies, attrition, TMJ disorders, trauma, prosthesis and restorations were excluded.

Anthropometric measurements of OVD, index finger length, little finger length and the distance of the thumb and index finger were recorded. Digital vernier caliper (accuracy .01mm) was used. For recording OVD, patients were asked close lightly in centric occlusion, head was kept well stabilized. The vernier caliper's was placed firmly on the chin, and the caliper's upper tip touched the base of the nasal septum. With vernier calliper the right hand's index finger's length was measured on the palmar aspect (insupination) from finger's tip to the near most point on the palmar digital crease. Similarly little finger's length of the right hand measured from the tip to the farthest most point of the palmar digital crease. The hand was kept straight during the measurements. Next the distance between thumb's tip to the index finger's tip was measured. Mean, SD, and range of all the measurements were calculated. The correlation between vertical dimension and all the parameters were found using Pearson's correlation. P value 0.05% was considered significant, for regression and preparation of prediction equation to estimate OVD. SPSS 20 was used to statistically analyzed the data.

RESULTS

A total of 200 males and females subjects were se-

lected for the study. The mean age of females subjects was 23.02 years, SD ± 2.68 and those of males subjects was 22.50 years, SD ± 3.21 , with the range from 19 to 30 years. Descriptive statistics is presented in Table I. In males the mean value of OVD was 65.3074 mm, SD ± 4.69 , ranged from (54.38 mm to 79.40 mm), whereas in females, the mean value was 60.332 mm, SD ± 3.96 , ranged from 52.12 mm to 76.42 mm. Thus the OVD was more in males as compared to the females. Table I

In males the length of index finger's mean was 70.5249 mm with the range from 57.03 mm to 84.12 mm, whereas in females, it was 69.2934 mm with the range from 52.31 mm to 82.33 mm ($t = -2.23, p < 0.05$), thus males had longer index finger as compared to females. In males the mean value of length of little finger was 63.9482 mm with range from 50.06 mm to 75.18 mm, whereas in females, the mean value was 59.6690 mm, ranged from 50.11 mm to 70.42 mm, (t value 6.76, $p < 0.05$), so females had shorter little finger than the males. Mean distance from the tip of thumb to the tip of index finger in males was 59.6597 mm with the range from 50.12 mm to 79.34 mm whereas in females, it was 58.1504 mm with the range from 43.27 mm to 75.94 mm, (t value 1.89, $p = 0.060$) thus the distance was more in males than females.

Pearson's method for correlation was used between the measured variables and OVD, Table II. In males weak positive correlation of OVD was obtained with index finger ($p = 0.02, r = 0.23$) and similarly with the parameter little finger ($p = 0.06, r = 0.189$), however no correlation ($r = 0.105, p = 0.29$) was found between OVD and distance between thumb and index finger. Table II. In females, correlation of OVD was strongest and positively correlated with the parameter length of the little finger ($r = 0.872, p$ value 0.001).

DISCUSSION

The present study endorsed sexual dimorphism, males with high values than females in OVD as well as in fingers length. The similar pattern was observed by many other researchers in their respective studies.¹²⁻¹⁵ The reason for these high values in males are due to post puberty level of androgen exposure.¹⁶ Right hand finger's lengths were measured and this was not biased as human body maintains symmetry physiologically.¹⁵ Due to the fact Danborn,¹⁷ and other investigators^{12,18} found both hands with similar finger lengths. The mean OVD found in males and females are 65.30mm ± 4.69 SD and 60.33mm ± 3.96 SD. This is in accordance with OVD values found by Adala¹ (61.4mm males and 60.33mm females), Kalra¹² (61.4 males and 56.7 mm females), G Harsh⁴ (65.68mm males 59.46mm females), Majeed⁶ (62.70mm), and Al Dhaher¹⁹ (65.93) in their respective studies. Similarly Miran²⁰ found OVD values in Kurdish population (68.63mm males and 61.99mm females). In contrast to our study Alhajj⁵ found OVD values 67.05 mm in Yemeni, Jhanvi²¹ (59.41mm males and 55.34 mm females) in India and Alhajj⁵ 56.70 mm

TABLE 1: DESCRIPTIVE STATISTICS OF OVD, LITTLE FINGER'S LENGTH, INDEX FINGER AND DISTANCE BETWEEN THUMB AND INDEX FINGER

Gender		N	Minimum	Maximum	Mean	±SD
Male	OVD	100	54.38	79.40	65.30	4.79
	Little finger	100	50.06	75.78	63.94	4.70
	Index finger	100	57.03	84.12	70.52	6.14
	Distance b/w thumb and index finger	100	50.12	79.34	59.65	5.74
	Age	100	19	30	22.50	3.21
Female	OVD	100	52.12	76.42	60.33	3.96
	Little finger	100	50.11	70.42	59.66	4.217
	Index finger	100	52.31	82.33	69.29	5.02
	Distance b/w thumb and index finger	100	43.27	75.94	58.15	5.40
	Age	100	19	30	23.02	2.68

TABLE II: PEARSON CORRELATIONS BETWEEN OVD, LITTLE FINGER'S LENGTH, INDEX FINGER'S LENGTH AND DISTANCE BETWEEN THUMB AND INDEX FINGER

Male		N	(R)	P-Value
	Index	100	0.234	0.02
	Little	100	0.189	0.06
	Distance b/w thumb and index finger	100	0.105	0.29
Female	Index	100	0.285	0.004
	Little	100	0.872	0.000
	Distance b/w thumb and index finger	100	0.296	0.003

Correlation is significant at the level 0.05

in Indian women.

In the current study mean index finger's length was 70.52 mm in males and 69.29 mm in females. Just like our study Danborn¹⁷ found the index finger mean 73.54 mm (males) and 69.95 mm (females). Kanchan et al¹³ found 64.9 mm mean (males) and 65.2 mm (females). Peters²² however reported males mean value 72.9 mm and females 66.9mm. Similarly Alhajj MN⁵ found them to be 65.93 mm. Al Dhaer¹⁹ reported mean lengths of index finger 65.27 mm in Iraqi women. In the present study it was found that the index finger's length was not reliable in determination of OVD in females (r 0.28) however in males a weak positive correlation existed. A weak relationship was reported between these two by Alhajj⁵ (r = 0.236 mm) P = 0.010 mm. However in contrast to the present study Ladd.et.al¹⁸ found positive and strong correlation of index finger in males. Nazir S⁴ and coworkers also reported positive correlation for males (0.804 mm) in Kashmiri population. Similarly Fernandez.et.al⁹ found positive and stronger correlation with index finger (r = 0.908 mm) in males. G Harsha²³ found it as a reliable parameter for predicting OVD in

females with (r = 0.406, p < 0.05) SE ±3.24.

In this study, little finger's length mean values found in males are 63.9482 mm and in females are 59.66 mm. Nag¹⁴ and G Harsha Vardhan.²³ Kalra¹² found 61.5 mm in males and 56.3 mm in females. Similarly Rega²¹ (58.927 mm males, 54.306 mm females), Bhandaria et.al²⁴ (60.57mm males, 56.224 mm females), Nazir⁴ (mean 60.267 of females little finger), Miran²⁰ (66.84 mm males and 61.07 females.) found similar values in their respective studies.

This study showed that little finger can be used for determining OVD in females, because positive and strong correlation exist between them i.e (r=0.872 mm) p (< 0.05) In accordance with our study Vardhan²³ also found positive and strong correlation with (r=0.385) and Standard Error of ±3.24 in females. Miran²⁰ also reported strong positive correlation for little finger's length (r=0.895) in Kashmiri population and so was by Fernandez⁹(r=0.827). Kalra¹² and coworkers however found (±3.81 males and ±2.74 females) the strong correlation of little finger with both genders. In contrast to the present study, Alhajj⁵ found weak correlation of

little finger measurement with the measurements of OVD in both males and females.

In this study mean value for the distance from index finger's tip to the thumb's tip was 59.6597 mm in males and 58.1504 mm in females. Similarly Vardhan et al²³ reported these values about 65.14 mm in males and 57.63 mm in females. Majeed et al⁶ found mean value 65.14 mm in 300 graduate students. They also found no close relationship of this parameter with OVD and thus proposed that this parameter cannot be used for evaluating OVD in Pakistani population.

This is a simple and inexpensive method as it requires no radiographs or any other sophisticated measuring devices. Moreover it provide reproducible values for future references. The OVD of edentulous patients can be determined by the regression equation formulated for males and females subjects.

The limitations of this study is that it was only for subjects with class I malocclusion only, other dental and skeletal malocclusions were not included. In a patient with round facial forms with thick soft tissue of the chin this method is difficult to use. Further studies must be carried out on large scale to authenticate these findings. Similar analysis for edentulous patients in different ethnic groups if carried out, can help in construction of appropriate regression equations that can be universally accepted.

CONCLUSION

From the results it was concluded that the fingers anthropometric measurement method is a simple, non invasive and reproducible method for determining occlusal vertical dimension of edentulous patients.

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CONTRIBUTIONS BY AUTHORS

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|---------------------------------|-----------------------------------|
| 1 Muhammad Saad Mateen: | Discussion writing. |
| 2 Muhammad Umer Shah: | Introduction writing. |
| 3 Muhammad Ilyas Shaikh: | Critical review. |
| 4 Sara Shahnawaz: | Data collection. |
| 5 Faiza Awais: | Statistical analysis and results. |
| 6 Faiqua Yasser: | Plagiarism analysis and write up. |
| 7 Khezran Qamar: | Data collection, correspondence. |