

# **An Anthropometric Correlation Of Vertical Dimension Of Occlusion, Length Of Finger And Linear Ear Length Among Dentulous Patients-An Observational Study**

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***Abstract: Determination of accurate vertical dimension of occlusion is extremely important in achieving a successful prosthodontic therapy. It also aids in function, aesthetics and comfort to patients. Many techniques have been put forward for assessing the vertical dimension of occlusion but a universally accepted or a completely accurate method has never been established. The method has to be both satisfactory to the dentist and patient. Thus, a need exists for reliable methods as deviations in such dimensions can lead to joint disorders with severe physical discomfort in the jaw and neck region. This study highlights the anthropometric method to assess if any correlation exists between the dimensions of the ear and fingers with that of the vertical dimension of occlusion in both males and females.***

***Key Words: Anthropometry. Ear. Finger. VDO. Vertical Dimension of Occlusion.***

## **Introduction**

The prosthodontist has a significant role in the health care of geriatric population with dental disabilities. The need of the patients for prosthetic rehabilitation is growing continuously due to improved life expectancy across the globe.<sup>1</sup> The replacement of missing teeth in these elderly individuals through the fabrication of dentures helps to palliate the functional and psychological disabilities of the patient. Additionally, they also replace the associated structures of the oral cavity.

Establishment of correct occlusal vertical dimension during the fabrication is crucial for the successful clinical performance of complete dentures and implant-supported prosthesis.<sup>2</sup> According to the Glossary of Prosthodontic Terms, the occlusal vertical dimension (OVD) is defined as the distance between two selected anatomic or marked points (usually one on the tip of the nose and the other on the chin) when in maximal intercuspal position.<sup>3</sup> Inaccurate OVD leads to several adverse effects on functional efficiency, aesthetics, and masticatory muscles.<sup>4</sup> There are no reliable parameters for the determination of OVD and this poses a significant challenge to the clinicians.<sup>4</sup>

Researchers have recommended numerous post extraction methods like physiologic rest position, facial aesthetic appearance, deglutition, cephalometric radiographs, post- extraction phonetics, measurement of the former dentures, finger length and anthropometric measurements to determine occlusal vertical dimension (OVD).<sup>5,6,7</sup> The philosophy of anthropometric measurements to determine OVD was derived from Leonardo Da Vinci's drawings, later

explored further by researchers like Ivy, Good Friend and Willis.<sup>5</sup> Various correlations of facial measurements are mentioned in literature including eye, lip, nose and palm measurements. The knowledge of the correlation between anthropometric measurement and OVD in local population is required during full mouth rehabilitation with a complete denture, implant-supported prosthesis or fixed prosthesis.<sup>5</sup>

Since there is a paucity in literature, the present study was designed with an objective to examine the correlation between the occlusal vertical dimension, length of the ear and finger length among dentate patients attending the Prosthodontic department of our college.

### **Methodology:**

A cross-sectional study was conducted to assess the relationship between length of the right ear, occlusal vertical dimension and length of the right index and little finger. Sample size was calculated manually as  $N=82$  using the formula  $N= Z_{\alpha}2PQ/L2$ , based on results of a previous study conducted by Paranjay Prajapati et al., in 2015.<sup>8</sup> Anticipating 20% drop-out rate, sample size was increased to 100. Patients reporting to the dental hospital of Sri Ramachandra University were then selected using simple random sampling. Those between age group of 20-25 years and having a full complement of teeth up to the second molars in both arches with Class I occlusion in first molars and ready to give consent were included in the study. Patients who were partially edentulous, with history of orthodontic movement of teeth, fracture or surgery of either of the jaws, severe tooth wear, missing teeth, prosthesis for missing teeth, ear deformities, missing fingers or fingers with deformities were not included in the study. Prior to the start of the study ethical clearance was obtained from the Institutional Ethics Committee. Data collection was scheduled in the month of August and September 2019. The purpose of the study was explained to the study subjects and their consent was obtained for participating in the study.

Survey instrument comprised of 2 sections, the first section collected demographic information of the participants such as age in years, gender, and their residential location. The second part consisted of clinical examination and recording of the data.

The participants were seated on the dental chair with their head erect. All measurements were made with a digital Vernier calliper. (Figure-1) Participants were instructed to close his/her teeth in maximum intercuspation and hold till the measurement of VDO was recorded with the digital

Vernier calliper. The vertical dimension of occlusion was measured from the point marked at the tip of the nose to the point marked at the base of the chin at mid symphysis region with the teeth in maximum intercuspation. (Figure-2)

Second measurement (Length of the right ear) was recorded from upper border of ear to lower border of the pinna of the ear.<sup>9</sup> Each measurement was made by two investigators. (Figure-3)

The third measurement- Length of the index finger of right hand was measured on palmar aspect (in supination) from the tip of finger to the near most point on palmar digital crease with the digital calliper.(Figure-4) In the same way, length of little finger of right hand was measured from the tip of finger to the farther most point on palmar digital crease. The measurements were taken with the hand straight and flat. (Figure-5)

Examiners were calibrated through a series of clinical training prior to the study. Inter and Intra examiner reliability was calculated using kappa statistics, which was found to be 0.84 and 0.76 respectively. Mean of two measurements were taken as the final measurement. Data was entered in Microsoft excel spread sheet and analysed using SPSS software (version 2.0). Descriptive statistics such as mean and standard deviation were calculated. Correlation between vertical dimension of occlusion, length of index finger, length of little finger and length of ear was calculated using Pearson's Correlation test. For this study, p value of <0.05 was considered as statistically significant.

### **Results:**

The mean Vertical dimension of occlusion was 71.42±4.83, mean length of index finger 69.31±4.22, mean length of little finger 57.64±5.18 and mean length of ear 64.48±4.68 (Table 1). There was a positive correlation between Vertical dimension of occlusion and Length of the right ear (0.521); Vertical dimension of occlusion and Length of the index finger (0.473) and Vertical dimension of occlusion and Length of the little finger (0.482) (Table 2)

### **Discussion:**

Determining the correct occlusal vertical dimension is an important factor that determines the success of prosthodontic therapy. An ideal method for determining occlusal vertical dimension in terms of cost, time, and instrument requirements has been sought in prosthodontics by various investigators.<sup>10</sup> However, no such single method has been formulated.

There are several thoughts and evidences regarding restoration of the correct occlusal vertical dimension. These include the use of anterior teeth measurements, closest speaking space, swallowing method, patient's neuromuscular perception, cephalometric radiographs, intraoral and extra-oral anatomic landmarks.<sup>11</sup> All of these methods inherently possess some kinds of disadvantages. In the current anthropometric study, a relationship between length of the right ear, length of the little finger, occlusal vertical dimension and length of the index finger has been determined.

The current study was conducted among 100 patients belonging to age group between 20-25 years and having a full complement of teeth up to the second molars in both arches with Class I occlusion in first molars. The dimensions and length of ear, finger and vertical occlusion were measured using a single calibrated digital Vernier calliper. The two examiners recording the data were also trained and calibrated to avoid any bias. In this study, the mean occlusal vertical dimension was  $71.42 \pm 4.83$ , mean length of index finger was  $69.31 \pm 4.22$ , mean length of little finger was  $57.64 \pm 5.18$  and mean length of ear was  $64.48 \pm 4.68$ . There was a positive correlation between occlusal vertical dimension and length of the right ear (0.521). Similar results were obtained in the study done by Pranjay et al., 2015 ( $r=0.640$ ). There was also a positive correlation between occlusal vertical dimension and length of the index finger (0.473) and occlusal vertical dimension and length of the little finger (0.482) and it was similar to the results obtained in the study conducted by Alhajj et al., 2016 in which positive correlation was obtained between length of all the fingers and vertical dimension of occlusion.<sup>12</sup> In a study done by Ruchi et al., 2013 among males, correlation of VDO was strongest for length of index finger ( $r=0.406$ ) whereas in females, it was strongest for length of little finger ( $r=0.385$ ).<sup>13</sup> On the contrary, Ahmed M et al, found no significant correlation between the length of the index finger and VDO.<sup>14</sup> Aziz MF et al., in 2015 stated that measurement of little finger could be considered as a method of recording VDO and is a good parameter for both males and females.<sup>15</sup> Similarly Aruna JB et al., revealed that the little finger can be used for determination of VDO in males and females.<sup>16</sup> In a study by Munshi et al., results showed that the correlation was positive and strongest for the parameter little finger measurement in females.<sup>17</sup>

However, the results of present study could not be compared with earlier studies as there is a paucity in literature comparing the relationship between vertical dimension of occlusion among same population, length of the right ear and length of the index/little finger. Hence, findings of

the current study were compared with studies on different population and other parameters. Nevertheless, one should be cautious while extrapolating the results because of the small sample size and the chances of bias, which could be the possible limitation of the study. Future randomized studies should be done with a larger sample size including participants from different places and different ethnic groups.

### Conclusion:

The anthropometric study showed that there was a positive relationship between occlusal vertical dimension, length of the right ear and length of the index & little finger. The method is also simple, economic, and non-invasive; hence, it could be recommended for everyday practice to determine the vertical dimension of occlusion.<sup>17</sup>

Legends:

Figure 1: Digital Vernier Calliper

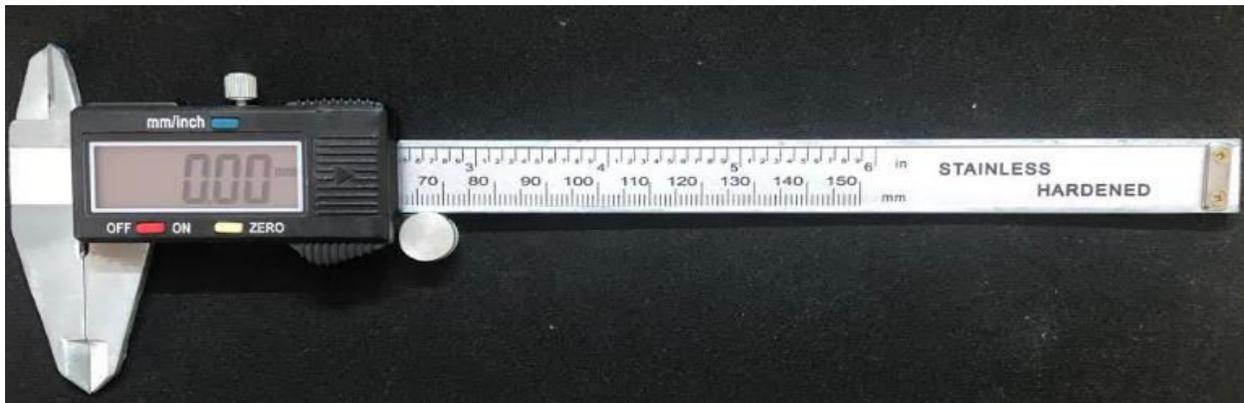


Figure 2: Vertical Dimension of Occlusion (VDO)



Figure 3: Length of Ear

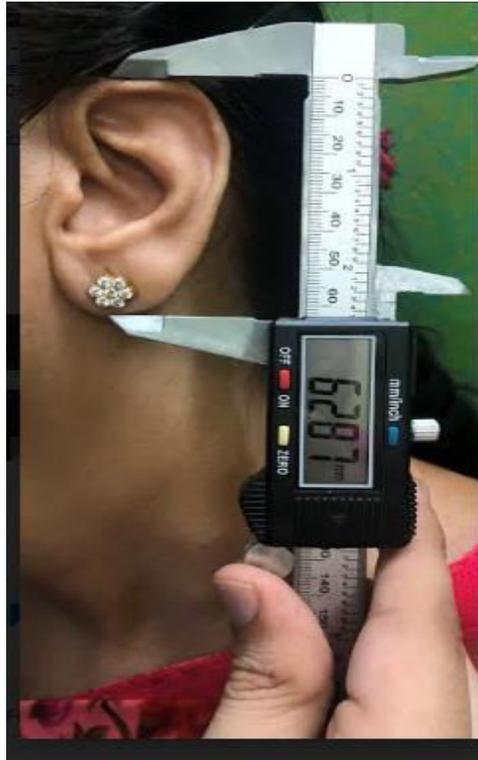


Figure 4: Length of Index Finger



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