

**PREDICTED VITAL CAPACITY V/S RECORDED VITAL CAPACITY
IN STUDENTS OF DESH BHAGAT DENTAL COLLEGE, SRI
MUKTSAR SAHIB PUNJAB**

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ABSTRACT

Background: This study was aimed to observe the difference between predicted and recorded Vital Capacity in young Punjabi adults. Till date no effort has been made to evaluate vital capacity of young adults in Punjab. **Methods:** Total 100 students were enrolled for the study. Out of these 100, 77 were female and 23 were male in the age group of 18-20 years. Height of the enrolled subjects varied from 146–183 cm. All the subjects with any history of smoking or respiratory ailment were not enrolled for the study. Vital Capacity was recorded Spiro meter of 9 L capacity. Predicted Vital Capacity was calculated by using the formula based on age and height. **Results:** A statistically significant ($p < 0.001$) difference between predicted and recorded Vital

Capacity for both female and male dental students was observed. In females, recorded Vital Capacity value was 25% less than predicted value, and in male it was 18% less than the predicted value. **Conclusion:** Vital Capacity is dependent on other factors besides age and height. Therefore recorded values 75–82% of predicted should be considered normal. The incorporation of weight in prediction equation would result in better estimation of Vital Capacity in Punjab India for different age groups.

Keywords: Predicted vital capacity, Spiro meter, recorded vital capacity.

INTRODUCTION

Vital capacity (VC) is maximal volume of air forcefully expelled from the lungs after a maximal inspiration. Vital Capacity is a critical component of good health. Measurement of VC is useful diagnostically and is an important pulmonary function test^[1]. Predicted Vital Capacity formulas given by researchers for Caucasian population always overestimated the values for black races^[2,3]. Lung function tests provide a clearer understanding of pulmonary function in subjects of different races, age, sex, occupation and profession. If there are functional abnormalities in the respiratory system, the deviation from normal can form a basis for diagnosis and assessment of progress in the management of chronic ventilator diseases^[4]. Tests of lung function, of which spirometry is the most common, find application in diagnosis, assessment and management of patients with different lung diseases and also as outcome tools in research studies^[5]. Interpretation of an observed value involves comparison with a reference value, defined as 'normal' derived from a representative sample of healthy subjects. Unlike most other measurements in medicine where universally applicable normal ranges are available, lung function shows wide variations even in normal. Reference equations are used to determine a normal range of spirometry results. The sources of variation in lung function have been summarized by the American Thoracic Society (ATS)^[1]. Besides technical factors related to equipment and procedures, biological and environmental factors are other sources of variation. These include racial and ethnic, sex and anthropometric factors as well as several other factors including environmental influences, nutrition and childhood infections, and other undefined factors. Significant differences are known to exist among the major ethnic groups in the United States. Several prediction equations have been described for northern, eastern, western and southern regions in India. These equations have limitations^[6,7]. Vital capacity is a measure of the maximum amount of air the lungs can breathe in or out. At rest, values vary from about 3–6 litres, according to age, sex, and height. Measurements of vital capacity are used as part of a fitness assessment. A person, whose vital capacity is less than 75% of the expected value, is generally advised to consult a doctor for further testing before exercising. A normal adult has a vital capacity between 3 to 5 litres. After the age of 20 years the vital capacity decreases approximately 250 ml per 10 year^[8,9]. Spirometry is pivotal in screening, diagnosing and monitoring respiratory disease and is increasingly advocated for use in primary care practice^[10]. Most pulmonary function laboratories in the USA and Europe use reference values based on populations with predominantly European backgrounds^[11]. The objective of the present study was to observe

the differences in predicted and recorded vital capacity in dental students in age range of 18–20 years.

MATERIAL AND METHODS

Student's Wet Spirometer having capacity of 9 liters are used to record the vital capacity in dental students. The subject sat comfortably facing the spirometer and was asked to inspire as deeply and as fully as possible to fill the lungs. While keeping the nostrils closed with a nose clip and the mouthpiece held firmly between the lips, the subject was instructed to expel all the air with maximum effort into the spirometer.

Hundred (77 female, 23 male = 100) dental students of 1st year BDS from Desh Bhagat Dental College, belonging to age group 18–20 years and height ranging from 146–183 Cm having no history of smoking or respiratory ailment consented to participate in the study. Written consent from all subjects was taken after explaining the experimental procedure. Age in completed years, and standing height in Cm was recorded. Predicted vital capacity was calculated using the following equations^[12,13].

Males: $VC = (0.052 \times \text{height in cm}) - (0.022 \times \text{Age in years}) - 3.6$

Females: $VC = (0.041 \times \text{Height in Cm}) - (0.018 \times \text{Age in years}) - 2.69$

Vital capacity was recorded by Students' Wet Spirometer having capacity of 9 litres. The subject sat comfortably facing the spirometer and was asked to inspire as deeply and as fully as possible to fill the lungs. While keeping the nostrils closed with a nose clip and the mouthpiece held firmly between the lips, the subject was instructed to expel all the air with maximum effort into the spirometer (Fig 1). Three acceptable spiograms (Fig 2) were taken at intervals of 5 min and the highest among the three was taken as final^[14]. The spiogram was obtained on a kymograph with drum speed 2.5 mm/Sec. The calculated vital capacities were compared as percentage of predicted values. SPSS-17 was used for data analysis. The comparison of mean values between predicted and recorded vital capacities were performed by one sample *t*-test. Correlation between variables was established using one-tailed Pearson correlation.

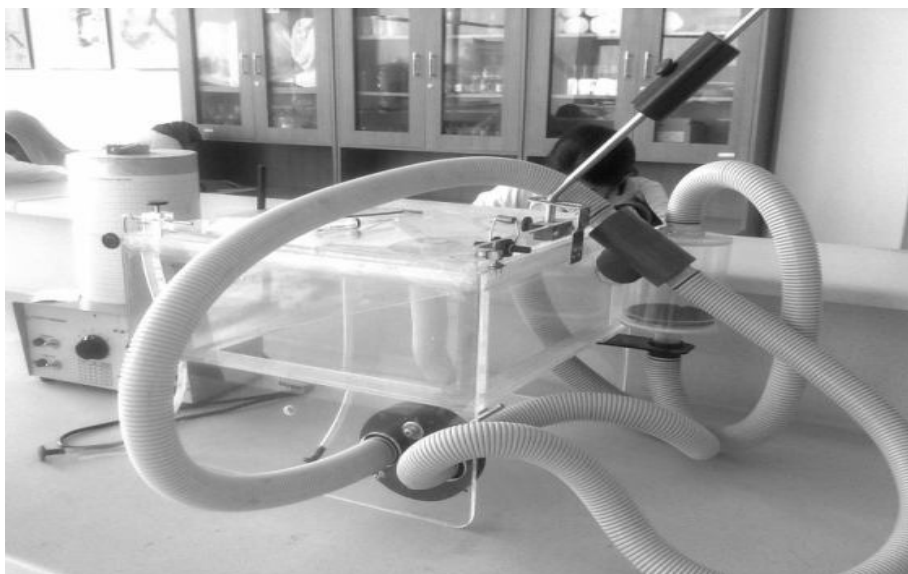


Fig 1: Water-sealed Wedge type Spirometer

A typical spirogram shown in fig 2., indicates inspiratory reserve volume, expiratory reserve volume and standard vital capacity.

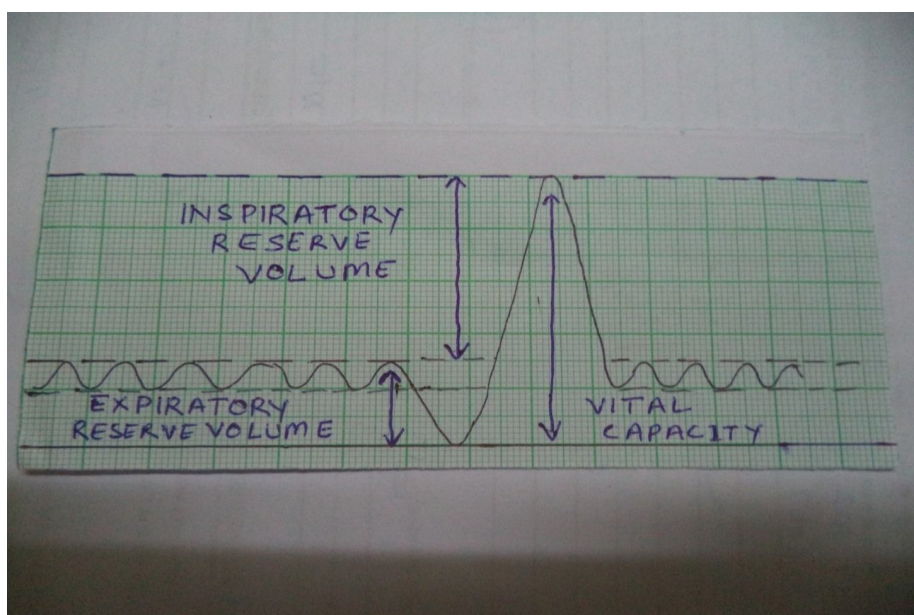


Fig 2: Typical Spirogram

RESULTS

The results are shown in Tables: 1–4 and Fig 3 & 4. There was a statistically extremely significant difference ($p < 0.0001$) between predicted and recorded vital capacity in female dental students as shown in Table-1. The recorded vital capacity is 75% of the predicted value.

Table 1: Comparison of predicted and recorded vital capacity in female dental students.

Predicted VC	Recorded VC	VC % Predicted	P Value
3.52± 0.27	2.66±0.53	75%	<0.0001*

Mean ±SD, VC=vital capacity, *significant

Table-2 shows a statistical significant difference between recorded and predicted vital capacity in dental students and the percentage of recorded predicted vital capacity is 82%.

Table-2: Comparison of predicted and recorded vital capacity in male dental students.

Predicted VC	Recorded VC	VC % Predicted	P Value
4.96±0.29	4.11±0.49	82%	<0.0001*

On comparison of age and height with predicted vital capacity both in male and female dental students a statistically significant relation is shown in Table-3 and Table-4 respectively. Highly significant correlation ($r=0.99$, $p<0.0001$) existed between the height of the male and female subjects and predicted vital capacity. Linear, regression analysis shows that height is the best predictor for vital capacity.

Table-3: Comparison of age with predicted vital capacity in female and male dental students.

Gender	Age (Yr)	Predicted VC	P Value
Male	18.89±0.68	4.96±0.29	<0.0001*
Female	18.89±0.52	3.52± 0.27	<0.0001*

Table IV: Comparison of height with predicted vital capacity in female and male dental students.

Gender	Height (cm.)	Predicted VC	P Value
Male	172.77±5.65	4.96±0.29	<0.0001*
Female	159.77±6.58	3.52± 0.27	<0.0001*

Correlation between predicted vital capacity and height in male and female dental students shown in fig-3 and fig-4 respectively. Graphs showing that according to the height, predicted vital capacity are increase.

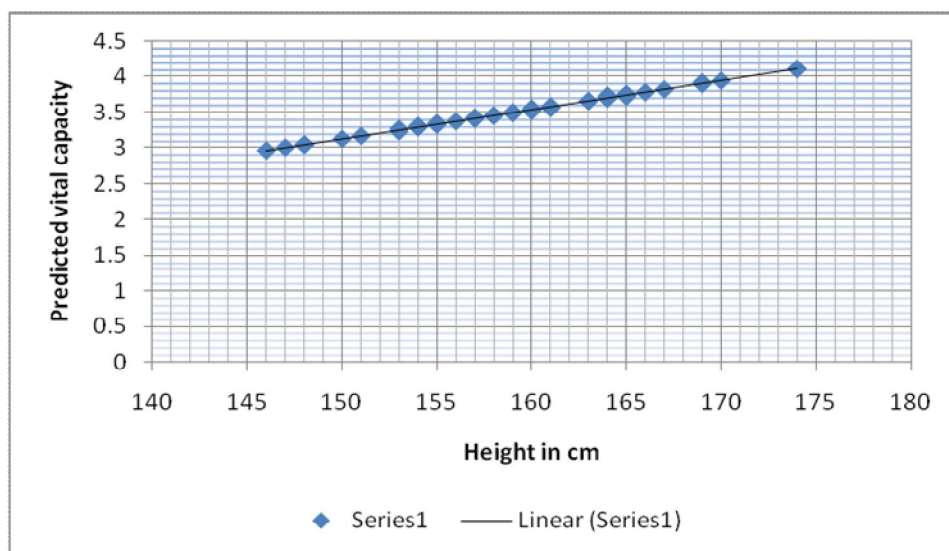


Fig 3: Correlation between predicted vital capacity and height in female dental students.

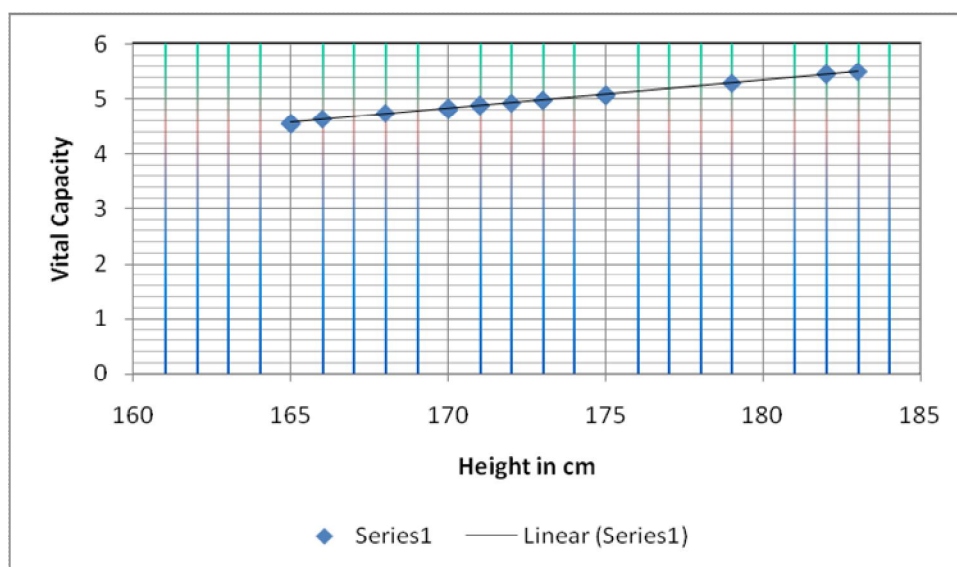


Fig 4: Correlation between predicted vital capacity and height in Male dental students.

DISCUSSION

Over the past 30 years, pulmonary function testing has been put to widespread clinical use and is presently considered an essential prerequisite to diagnose various obstructive and restrictive disorders. Spirometry is the most widely used screening test for lung function or pulmonary function studies. It is usually the first test to be performed and interpreted. Spirometry can be carried out in the ambulatory setting, physician's office, emergency department or inpatient setting^[15]. Our study highlights the importance of obtaining normative values for lung function in dental students and comparing them with the predicted values.

Lower results of recorded vital capacity than predicted in male students could be due to lack of correct history of smoking which the students may not have informed due to social stigma. In one study it was observed that smoking in all likelihood modified vital capacity over time but not in recent smokers^[16]. The values we observed are different from those recorded in Caucasians of the same age group. Vital Capacity is dependent on other factors besides age and height. Therefore, the recorded values can be considered normal^[17].

CONCLUSION

The present study shows a statistically significant relationship between heights, predicted and recorded vital capacity in both male and female dental students. The incorporation of weight in prediction equation would result in better estimation of Vital Capacity in India for different age groups.

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