

In health --vital capacity is maximum in supine position

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ABSTRACT

Vital capacity, frequently measured clinically as an index of pulmonary function, gives useful information about the strength of respiratory muscles and other aspects of lung functions. It is generally noted in sitting position. As in the supine position, respiratory excursions of diaphragm is highest in normal breathing, this study was planned to note whether there occurred any alteration in vital capacity in supine position in comparison to that noted in sitting position. Young sedentary non smoker healthy medical students (n = 100, age 19-22 years) of Nepal Medical College participated as volunteers in this study. Body mass index (BMI) of each of them was calculated. Vital capacity was noted in sitting position and in supine position with the help of a spirometer, following the standard procedure. Result exhibited greater vital capacity in supine posture than in sitting position in the same individual. Diaphragm is the major muscle of inspiration, responsible for some two-thirds of the vital capacity. Naturally, in supine posture the scope of diaphragmatic movements increased and as a result, vital capacity exhibited greater value in comparison to that recorded in sitting posture.

Keywords: Vital capacity, supine posture, sedentary healthy individual.

INTRODUCTION

Breathing is a complex and highly orchestrated neuromuscular activity, about which there is still much to be learned. It is a highly coordinated abdominal and thoracic process in which diaphragm is the major muscle of inspiration, responsible for some two-thirds of the vital capacity. Vital capacity is one of the most important parameter of pulmonary function tests.¹ Vital capacity, the highest amount of air that can be expired after a maximum inspiratory effort, is frequently measured clinically as an index of pulmonary function. It gives useful information about the strength of respiratory muscles and other aspects of pulmonary function.²

It was reported that in healthy volunteers the vital capacity decreased after moving from the upright to the supine position.³⁻⁸

As in the supine position, in normal healthy individuals respiratory excursions of diaphragm is highest; this study was planned to note whether there occurred any alteration in vital capacity in supine position in comparison to that noted in sitting position.

SUBJECTS AND METHODS

Young sedentary non smoker normal medical students (n =100, male 57, female 43, age 19-22years) of Nepal Medical College participated as volunteers in this study. All the tests were performed in the laboratory maintained at 27-28 °C, in between 10: 30 to 11:30 AM. All of them took breakfast at 7:30 AM. They had no history of any

major disease and were not under physical training program and/or any medicine. All were informed about the purpose, requirements and experimental protocol of the investigation. All experimental procedures were demonstrated to allay their apprehension. Height and weight of the volunteers were measured with the help of height measuring stand and weighing machine (Krupps company manufactured by Dr Beli Ram and sons, 17 Asraf Ali Road, New Delhi) respectively. Body mass was measured to an accuracy of ± 0.25 Kg and height to an accuracy of ± 0.5 cm. Body mass index (BMI) of each of them was calculated to assess whether they are obese, underweight or normal. Vital capacity was noted in sitting posture and in supine position with the help of a spirometer, following the standard procedure. Data were analyzed by z test.⁹

RESULTS

The mean height and weight in males were noted 170.47cm, and 65.26 kg respectively. The same in female volunteers were noted 157.02 cm and 53.95 kg respectively. BMI were within normal range in both the sexes. Vital capacity in supine posture in females increased significantly and in males also it increased, but the increment was insignificant (Table-1).

DISCUSSION

Buffalo health study concluded that pulmonary function is the long term predictor for over all survival rate in both the genders and could be used as a tool in general

Table-1: Vital capacity in sitting and supine posture

Sex	Weight(kg) (Mean±SD)	Height(cm) (Mean ±SD)	BMI(kg/m ²) (Mean± SD)	Vital capacity(ml) (Sitting posture) (Mean ± SD)	Vital capacity(ml) (Supine posture) (Mean ± SD)
Male(n=57)	65.26±9.67	170.47±6.43	22.29±2.76	3829.82±517.53	3984.21±461.18
Female (n=43)	53.95±7.47	157.02±5.50	22.35±3.01	2830.23±380.81	3012.79±423.99*

* = p d^o0.05

health assessment.^{10,11} Pulmonary function test (PFT) is one of the indicators of the health status of the individuals.¹² Vital capacity is one of the most important parameter of pulmonary function tests. Previous studies conducted among the young Indians showed the vital capacity values about 3.9 l in males and about 3.0 l in female subjects in sitting posture.^{13,14} which were very near to our findings. Our previous studies noted the values of vital capacity in sitting posture, in Nepalese, a little less than that of present values (3.46 l in males and 2.40 l in females; and 3.52 l in another study) which were also noted in sitting posture.^{15,16} It might be due to less muscular strength of those group of volunteers. Previous studies reported that in healthy volunteers lung volume and vital capacity decreased after changing from the upright posture to the supine position. This phenomenon was thought to be due to shifting of blood to the pulmonary vasculature, changes in position of the diaphragm and the weight of the abdominal viscera pressing against the diaphragm.³⁻⁸ Lumb and Nunn (1991) also reported significant increase in vital capacity when sitting compared with supine position.¹⁷ It is evident from the present study that vital capacity is significantly greater in supine posture than in sitting position in the same individual. Our volunteers were young, mostly sedentary and having BMI of normal range. Diaphragm is the major muscle of inspiration, responsible for some two-thirds of the vital capacity. Radiographic study showed that the height of the diaphragm within the thorax also varies considerably with posture. It is highest when the body is supine, and in this position it performs the largest respiratory excursions with normal breathing. In sitting posture, the diaphragm is lower and the respiratory excursions become smaller under this condition.² Naturally, in supine posture the scope of diaphragmatic movements increases. As a result, vital capacity showed greater value in supine posture, in comparison to that recorded in sitting posture, which is in contradistinction to findings of previous reports.

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