ORIGINAL ARTICLE

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INFLUENCE OF DIFFERENT BODY POSITIONS ON PULMONARY FUNCTIONS: A PILOT STUDY

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ABSTRACT:

Background: Pulmonary function is one of the most common practice parameters to know airway and lung health. Any abnormality or imbalance can directly change the pulmonary function.Even different body positioning can change pulmonary function. So in different positioning different physiological parameters are having a direct or indirect effect. **Objective-** The objective of the study was to find out the pulmonary function in supine, sitting and recline positions and compare the pulmonary function of these positions. **Procedure-** subjects performed PFT 3 times in sitting, recline and supine positions. outcome measures used were FVC,FEV_1,FEV_1/FVC,FEF_{25-75}% and PEFR. The result showed that sitting position shows better results than supine and recline position. **Conclusion-** five subjects shows better result in sitting position than supine and recline position.

Keywords: Pulmonary Function Test, Normal individuals, Height, Age, Weight

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INTRODUCTION

Pulmonary function is one of the most common practice parameters to know airway and lung health. Pulmonary function is a broad term to know how the air goes in or out from the nose and mouth to alveoli, how gases exchange in the lung, and how gases carried in or out throughout the body. Any abnormality or imbalance can directly change the pulmonary function.

Even different body positioning can change pulmonary function. The best example is to facilitate removal of secretions, we provide airway clearance by postural drainage and some other techniques[1]. Several studies have reported that postural drainage, especially prone and 45 degrees rotative prone were effective for acute respiratory distress syndrome or acute respiratory distress syndrome or acute lung injury[2]

Takahashi et al.[3] assessed the relationship between posture and Bronchial inclination angle from an anatomical angle. However, they found a direct effect of posture on physiological respiratory function.

Vitaccaet al.[4]and Vilke et al.[5]are showed the effect on the respiratory function in different positions.

Expired flow is also important for the expectoration of sputum and intrabronchial secretions. Badret al.[6] reported that maximal expiratory pressure and flow were changed by body positions. However, whether or not 45 degrees rotative prone is a useful position for coughing has not previously been examined.

So in different positioning different physiological parameters are having a direct or indirect effect. Like upward pressure caused by the intra-abdominal organ to the diaphragm is more in supine than in sitting, and its more at dorsal than at ventral. In the supine, the dorsal side of the chest wall is limited its mobility by weight so VC and FVC were not lower in the supine position. This indicates that the effect of the pressure caused by the intra-abdominal organ to diaphragm or limitation of the dorsal chest wall might be small act inforced expiration. In the sitting position and 45 in young healthy subjects.

Jenkins et al.[7] reported that lung capacity is smaller on the side of lying than in supine and it causes from the limitation of the chest wall. Based on this result, we presumed that limitation of the chest wall would be greater in 45 degrees rotative prone than the other positions, and that VC and FVC would decrease in 45 degrees rotative prone.

To assess FEV_1 fast forced expiration is required. The expiratory muscles, mainly the abdominal rectus muscle, degree rotative prone, one or both hip joints are bent.

So it is very much clear that pulmonary function is one of the important components to determine pulmonary complications like obstruction. And because of the biomechanical structure of diaphragm and the lungs and the viscera different positions have a direct effect on pulmonary function. So this study is to mainly find out this effect.

SUBJECTS AND METHODS:- study shows the observational type of study and the setting of this study in the DVVPF college of physiotherapy / OPD, purposive sampling technique was used in this study. And the healthy five normal individuals were taken for this study between the age group of 20- 45 years. The patient diagnosed with any cardiorespiratory disease were excluded from this study.

PROCEDURE:- pulmonary function test is performed by taking the measure of height and weight of the patient and fill the demographic details. the patient should be in a relaxed position, explain the procedure of 1spirometer in one hand and asked the patient to do the normal tidal volume breathing three times. After that ask them to take deep inspiration through the nose, then the mouthpiece is put into the mouth and nose clip was attached to the nose, immediately after inspiration asked the patient to expire for 6 seconds. Then the patient has to do deep inspiration through the spirometer mouth. Then the graph will be plotted on the paper and intrept the best of 3 trials and that is the final result.

Fig 1: A

Fig 3: subject performing PFT in supine lying position.

RESULT:-

The present study was conducted on five normal healthy adults who were in the age group of 25 to 45 years who were found in DVVPF'S college of physiotherapy/opd.

1	FVC
Sitting	102.8
recline	97.4
supine	93.8

2	FEV1
Sitting	114.4
recline	108.4
supine	109.4

5	FEF 25-75 %
Sitting	102.8
recline	91.8
supine	110.4

3	FEV1/ FVC
Sitting	110.6
recline	110.4
supine	116.4

4	PEFR
Sitting	99.4
recline	93.6
supine	94.4

Table: 1,2,3,4 & 5 are showing the Comparative chart of FVC,FEV1,FEF25-75%,FEV1/FVC,PEFR of all the subjects.

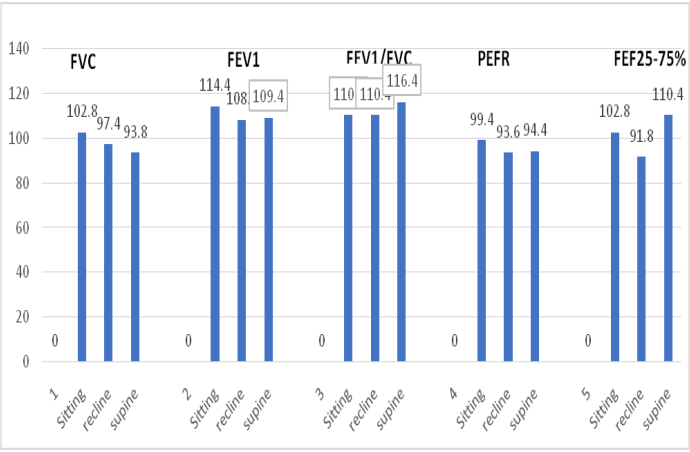

Fig 4: **Comparative graph of FVC,FEV1,FEV1/ FVC,PEFR,FEF25-75% of all subjects.**

DISCUSSION

Pulmonary function is one of the most common practice parameters to know airway and lung health. Pulmonary function is a broad term to know how the air goes in or out from the nose and mouth to alveoli, how gases exchange in the lung, and how gases carried in or out throughout the body. Any abnormality or imbalance can directly change the pulmonary function.

Even different body positioning can change pulmonary function. Vitaccaet al.[4] compared the respiratory function between sitting position, recline position, and supine position in middle aged subjects. they established that forced expiratory volume in one second($FEV_{1.0}$) forced vital capacity(FVC), and peak expiratory flow rate(PEFR), were significantly lower in supine than in sitting.

The upright sitting position with the legs dependent is the standard reference position. when upright the diameter of the main airway increases slightly. if the airways are obstructed, even small degrees of airway narrowing induced by recumbency can result in a significant increase in airway resistance. The vertical gravitational gradient is maximum when upright. The AP dimensions of the chest wall are greatest and compression of the heart and lungs is minimal. Though the diaphragm, the main inspiratory muscle, its fibres are in a shortened position, it is countered by an increase in neural drive to breath in an upright position.

In our result, it was observed that all the five parameters were higher in sitting position compared to the rest of the positions. **FVC** was significantly reduced in all recumbent positions when compared to sitting, while **FEV1** was also higher in sitting and a significant reduction was seen in a recumbent position.

PEFR was also significantly higher in sitting compared to the rest of the positions which can be very well explained by the decreased airway resistance in upright position compared to recumbent and also slightly increase the diameter.

Reclined sitting position was also effective than all recumbent positions and all parameters were higher in reclined position compared to recumbent but all values were lower than that upright sitting position. The recline position was the intermediate position between the upright and

recumbent positions.

The capacities and flow rates were much better than recumbent positions but slightly lower than upright sitting. This is the position,which is used in all ICU's that actually help to prevent all those deleterious effects of recumbency.

The supine position:

It is said to be a non-physiological position for humans unless sleeping and is physiologically the least justifiable position for ill patients regardless of whether they exhibit cardiopulmonary dysfunction[6,7,8,9].

In our study, it was clearly seen that all pulmonary function parameters dropped significantly in the supine position compared to an upright sitting

This position alters the chest wall configuration, the anteroposterior position of hemi diaphragm, the intrathoracic pressure and the intra-abdominal pressure secondary to shifting of abdominal viscera in this position [15,14,13,12,11,16].

The anteroposterior configuration becomes more transverse. The hemi diaphragm is displaced cephalad.

People with obstructive sleep apnoea also exhibit breathing difficulties in the supine position.

In the supine position, the position of the diaphragm is also greatly influenced by anaesthesia and neuromuscular blockade, which ascends approximately 2cms in the chest and when paralysis induced, the loss diaphragmatic tone results in greater excursion of the nondependent rather than dependent part of diaphragm[16]. While in spontaneously breathing subjects, the excursion of the diaphragm is greater posterior because the dependent viscera beneath the posterior portion of the diaphragm push it in a more mechanically advantageous position and more excursions are possible.

So this study shows that sitting position in compared to recline and supine position is a more desirable position to get the maximum and effective value of lung function, and in recline and supine position visceral organ which is major restrict the diaphragm movement, and the diaphragm is the main muscle for inspiration as well as for forced expiration. A sitting position with back support gives a better advantage because in this position viscera are on lowered position and diaphragm get enough space to move freely.

CONCLUSION:-

This study shows that among all five subjects shows better results in sitting position than supine and recline sitting position. But with more sample numbers we can get a more accurate interpretation.

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