

Effect Of Pelvic Tilt On Lung Function Test In Copd Patients

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ABSTRACT

BACKGROUND: Pelvic tilt is a position- dependent parameter defined as the angle created by a line running from the sacral endplate midpoint to the center of the bifemoral heads and the vertical axis. COPD is characterized by generalized airflow of obstruction, the major site of obstruction being the small airways. Pulmonary function tests(PFT) are useful in measuring the functional status of the lung both in physiological and pathological conditions. **PURPOSE:** The purpose of this study was to investigate the effect of pelvic tilt position on lung function in COPD patients achieving pelvic tilts on a chair. **METHODOLOGY:** The study was conducted among 20 COPD patients (age=30 to 72) from SRM Medical College Hospital and Research Center by using Computerized Spirometer (Easyone pro). While they were performing pelvic tilt on a chair, FVC, FEV₁, FEV₁/FVC, PEFR were measured at anterior, neutral and posterior pelvic tilts. **RESULTS:** This study showed that the mean values of FVC, FEV₁, FEV₁/FVC, and PEFR gained from anterior, neutral and posterior pelvic tilt positions of COPD patients were almost similar and there was no statistical significance (p>0.05). **CONCLUSION:** This study concludes that there is no effect of pelvic tilt positions on PFT in COPD patients.

KEYWORDS: Pelvic tilt, Sacral end plate, Bifemoral head, FVC, FEV₁, FEV₁/FVC, PEFR, Spirometer, COPD, PFT

INTRODUCTION:

COPD is characterized by generalized airflow of obstruction, the major site of obstruction being the small airways. This includes Chronic bronchitis and Emphysema¹. The worldwide incidence of COPD in men aged 30 years and more was 14.3% and 7.6% in women². In India, the incidence is being between 2 to 22% in men and 1.2 to 19% in women³. Due to the higher prevalence of COPD in India, the assessment of pulmonary function test is necessary to rule out the status of lung function.

The respiratory muscles are divided into inspiratory muscles and expiratory muscles, among these the expiratory muscle (rectus and transverse abdominis, external and internal oblique⁴) are playing a major role in trunk motion, posture, vomiting, pelvic position⁵.

Pelvis tilt is a position dependent parameter defined as the angle created by a line running from the sacral endplate midpoint to the center of bifemoral heads and the vertical axis. Anterior pelvic tilt is when the pelvis moves forward and inferiorly in a sagittal plane around the vertical axis with the help

of hip flexors and back extensors (iliopsoas, rectus femoris, erector spinae). Posterior pelvic tilt is when pelvis moves backward in a sagittal plane around the vertical axis with help of hip extensors and trunk flexors (gluteus maximus, hamstring, rectus abdominis, external oblique muscles)⁶.

Forced vital capacity(FVC) is the volume of air that can be expelled out forcefully and as soon as possible after deep inspiration. Forced expiratory volume in one second (FEV_1) is the volume of air, that is expelled out forcefully in one second after deep inspiration. Peak expiratory flow rate (PEFR) is the highest rate on which the air will be expelled out thereafter deep inspiration.⁷

While differentiating the healthy older adults, COPD patients seem to be having greater angle of dorsal kyphosis⁷. COPD patients with increased dorsal kyphosis may have the following consequences in their life those are, reduction of pulmonary function, increasing dyspnea, reduction in fundamental activities, the quality of life seems to be reduced and therefore there is a greater risk of mortality for the subjacent vertebral osteoporosis^{8,9,10,11,12}.

COPD Patients have abnormal lung function when compared to the normal healthy individual. In COPD patients FVC, FEV_1 , FEV_1/FVC , PEFR are usually reduced. These simple measurement values of FVC, FEV_1 , FEV_1/FVC , are essential in determining level of COPD by GOLD stage¹.

Pelvic tilt position plays a major role in maintaining intra-abdominal pressure that results in improved dome shape of the diaphragm. So, the contractibility of the diaphragm may alter. In certain pelvic tilt position, the lung volume and capacities are improved for normal healthy individuals. Hence this study is taken to find the effect of pelvic tilt position on pulmonary function in COPD patients.

METHODS:

An observational study was conducted among 20 COPD patients (mild to moderate according to GOLD classification) aged 30 to 72 years both men and women from SRM Medical College Hospital and Research Center. Exclusion criteria were: severe dyspnea, ICU patients, complains of wheezing.

The participants were selected based on the inclusion and exclusion criteria and explained about the procedure and informed consent was obtained. Before taking a measurement, participants were instructed how to use the spirometry. In this study computerized spirometer (Easyone pro) was used. They were permitted to look display to gain more confidence and motivation.

The patients took a deep breath in as maximum as possible and blew out as fast and as hard as possible and kept going until there is no air left, to measure FVC, FEV_1 , and PEFR.

The patients were instructed to perform posterior pelvic tilt by tuck-in lower abdomen and followed by flattening the lumbar lordosis. For anterior pelvic tilt, the patients were instructed to rotate the anterior superior iliac spine forward and downwards. In order to prevent respiratory muscle fatigue, 1-minute rest was given for each trial and measurement was taken 3 times in one position the highest value is taken as a record and 5 minutes rest is given between each position. The outcome measures are FVC(L), FEV_1 (L), FEV_1/FVC , PEFR(L/S).

Data Analysis:

The data obtained was tabulated and statistically analyzed using the statistical package for social science (SPSS) version 20. The statistical tool used in this study was one-way ANOVA to compare the pulmonary function test in various pelvic tilt positions in COPD Patients.

TABLE-1 DEMOGRAPHIC DATA

CHARACTERISTICS	N
Male	13
Female	7
	Mean + SD
Age	53.15±9.05
Body Mass Index	26.37±5.23

TABLE 2

COMPARISON OF PFT VALUES IN DIFFERENT PELVIC TILT POSITION AMONG COPD PATIENTS(N=20)

S.NO	COMPONENTS	TILT POSITION	MEAN	SD	F VALUE	P VALUE
1	FVC(L)	ANT	1.96	0.54	0.994	0.376
		NEUT	2.01	0.44		
		POST	1.79	0.58		
2	FEV ₁ (L)	ANT	1.30	0.37	1.40	0.253
		NEUT	1.31	0.35		
		POST	1.14	0.35		
3	FEV ₁ /FVC	ANT	0.68	0.14	0.234	0.792
		NEUT	0.65	0.13		
		POST	0.66	0.15		
4	PEFR(L/S)	ANT	2.47	1.02	1.97	0.149
		NEUT	2.75	0.95		
		POST	2.15	0.86		

RESULTS:

A total of 20 COPD patients(men-12, women-8) were included in this study with the mean age of 53.15±9.05 years with mean BMI 26.37±5.23(Table 1). Table 2 shows mean, standard deviation of different pelvic tilt positions and it shows that there is no significant difference between pelvic tilt positions and pulmonary function in COPD patients (p>0.05). The mean values of FEV₁,FVC, PEFR are more in neutral pelvic tilt when compared to the anterior and posterior pelvic tilts. Whereas the mean value of FEV₁/FVC is more in anterior pelvic tilt when compared to neutral and posterior pelvic tilts.

DISCUSSION:

The main purpose of the study was to find out the effect of pelvic tilt position on lung function in COPD patients. In normal individuals, the thoracic kyphosis and lumbar lordosis have an effect on pulmonary function. In COPD patients they have increased dorsal kyphotic angle which in turn results in reduced pulmonary function. According to this study the FVC, FEV₁, FEV₁/FVC, PEFr are reduced in posterior pelvic tilt. When COPD patients perform posterior pelvic tilt on a chair this may worsen the pulmonary function by creating more dorsal kyphosis and reducing intra-abdominal pressure.

This study shows that Mean, SD value of FVC, FEV₁, FEV₁/FVC, PEFr gained from neutral, anterior, and posterior pelvic tilt positions were almost similar and there was no statistically significant difference ($p > 0.05$). FVC, FEV₁, PEFr showed higher mean value in neutral pelvic tilt position when compared to anterior followed by posterior pelvic tilt position, but not statistically significant ($p > 0.05$). But on contrary Hiromichi Takeda et al concluded that improvement of posterior pelvic tilt angle will improve the thoracic mobility and lung function.¹⁷

Young-In Hwang et al. concluded that there are significant differences between pelvic tilt angles and FVC ($p < 0.05$).⁵ Supine body posture helps the primary inspiratory muscle to stimulate the abdominal muscles on the thoracic ribcage¹³. Fang et al. suggested that body posture has a role to determine lung capacity and expiratory flow.

Márcia Aparecida Gonçalves et al stated that patients with COPD have more anterior pelvic tilt when compared to healthy individual¹⁴. Gonçalves Lisboa, et al concluded that COPD patients with dorsal hyperkyphosis have lower diaphragmatic mobility than others^{15,16}. This study suggests that relaxation breathing exercises are taught in a neutral position to increase the FVC, FEV₁, and PEFr for COPD patients.

This study has the following limitations: age group of 30-72 years only was included, pelvic tilt angles were not measured, sitting height was not measured. Further research can be done on larger sample size, respiratory conditions other than COPD, compare the pulmonary function test and pelvic tilt position in subjects with forward head posture, breathing retraining can be done in various pelvic tilt positions and analyzed.

CONCLUSION:

The PFT values are more in a neutral pelvic position when compared to pelvic tilt of anterior and posterior. However, the values are not statistically significant therefore this study concludes that there is no effect of pelvic tilt position on pulmonary function test in COPD Patients.

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