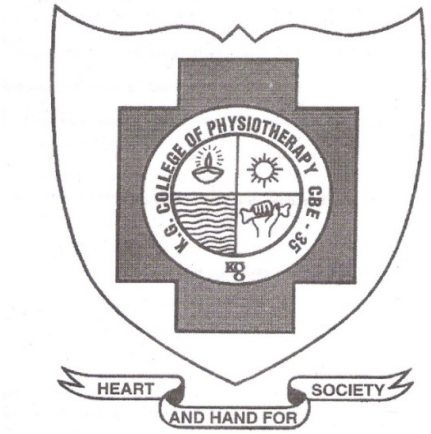
"A STUDY TO ANALYSE THE EFFECT OF VARIOUS POSITIONS ALONG WITH COUGHING AND HUFFING TECHNIQUES ON RESPIRATORY PARAMETERS IN SMOKERS"



A DISSERTATION SUBMITTED TO THE TAMILNADU Dr. M.G.R MEDICAL UNIVERSITY, CHENNAI, AS PARTIAL FULFILLMENT OF THE MASTER OF PHYSIOTHERAPY DEGREE

APRIL 2012.

CERTIFICATE

Certified that this is the bonafide work of **Miss. JEENA PRINCY. D** of K.G. College of Physiotherapy, Coimbatore, Submitted in partial fulfillment of the requirements for the Master of Physiotherapy Degree course from the Tamil Nadu Dr.M.G.R. Medical University under the **Registration No 27102214** for the April 2012 Examination.

Place :Coimbatore Principal

Date :

“A STUDY TO ANALYSE THE EFFECT OF VARIOUS POSITIONS ALONG WITH COUGHING AND HUFFING TECHNIQUES ON RESPIRATORY PARAMETERS IN SMOKERS”

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Has been submitted in partial fulfillment for the requirement of the Master of Physiotherapy degree

April 2012

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Internal Examiner **External Examiner**

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I.INTRODUCTION

Smoking is the inhalation of the smoke of the burning tobacco. If smoking is directly related to a decrease in pulmonary function, then people who smoke more than one pack a week or heavy smokers will show a dramatic difference in pulmonary measurements such as vital capacity, forced expired volume , Forced Vital Capacity and the ratio of Forced Expired Volume in one second to Forced Vital Capacity compared to mild smokers or nonsmokers .

Nicotine the active ingredient in tobacco , is inhaled into the lungs, where most of it stays. The rest passes into the blood stream , reaching the brain in about 10seconds and dispersing throughout the body in about 20 seconds.

Tobacco smoking is common in developing countries especially in India with Beedi and cigarette smoking. Chronic respiratory morbidity and cigarette smokers was measured in terms of prevalence of chronic respiratory symptoms (chronic cough, phlegm, breathlessness and wheezing) by lung function results. Beedi was the commonest form of smoking in rural areas. The mean number of cigarettes/ beedi smoked/day was 14 and the mean age of starting smoking was 20.5 ± 20.0 years. Nearly 14% of ever smokers had some respiratory symptoms (Agarwall et al 2006) the prevalence of symptomatic one or more chronic chest symptoms was significantly higher in Beedi smokers than cigarette smokers in

those smoking greater than 2.5 pack/ years.FEV1/FVC and FEV1% predicted showed significantly greater airway obstruction in Beedi smokers as compared to cigarette smokers.

India National Family Health Survey (NFHS-2) 1988-1999 smoking prevalence (South East Asia Region) mean among the adult males was about 29.4 and among the females 2.5 and among the youth males was about 8 and youth females was 5.3. In the survey the mean smoking among the male medical students males was 42 in the year 1998.

Studies conducted by WHO 1997 showed that smoking among the men was found to be 35% and among the women was about 3%. It was also found that 65% of men and 33% of women consumed tobacco in some other forms apart from smoking. WHO predicted that tobacco death in India may exceed 1.5 million annually by 2020.

According to studies conducted in South India by Kutty et al., (1990) the overall smoking prevalence was 21.9% in Kerala.

A study conducted by Venkatnarayanan et al ., (1996) in North India showed that 45% of men and 7% of women were found to be smokers in Delhi.

Anyone with a smoking habit has an increased chance of lung cancer , respiratory disease (emphysema, asthma ,and chronic bronchitis) and cardiovascular disease. A nagging morning cough may be one sign of a

tobacco habit. Other symptoms include shortness of breath, wheezing, dizziness, coughing, and excess phlegm, in the lungs, and frequent occurrence of respiratory illness, such as bronchitis. Smoking for even a short time can produce a chronic smokers cough.

The plateau in the FEV1, in the third decade of life is also shortened considerably by smoking. A previous study indicated that " abnormal spirometry i.e. , limitation of expiratory airflow, airways obstruction or a low FEV1, FVC ratio the degree of airways obstruction correlates closely to the pathological changes in the lungs of smokers and patients with COPD (Fergueson et al 2000).

Body positioning exerts a strong effect on pulmonary function. To facilitate removal of secretion, we provide airway clearance by postural drainage. Several studies reported that postural drainage in a 45° rotative prone positions is effective to cough out secretions.

Cigarette smoking is known to stop muco ciliary clearance. It has been noted that for every cigarette a person smoke, the cilia are paralyzed for approximately 20 minutes. Many individuals are chain smokers and consequently must cough and huff to provide an airway clearance. They will often have significant amounts of phlegm raised first thing in the morning secondary to ciliary clearance while they slept. Many researchers show that the airway clearance techniques such as coughing and huffing will be effective when done along with a favorable position to clear the tracheo bronchial

secretions in smokers. Thus this study was conducted to find out the effective position and the effect of sputum clearance techniques in various positions.

NEED FOR THE STUDY

Many researchers have assessed the relationship between posture and bronchial inclination angle from an anatomical angle. Some studies have also compared the respiratory function between the sitting poSsition and supine positions in elderly subjects. Body positioning exerts a strong effect on pulmonary function. To facilitate removal of secretion, we provide airway clearance by postural drainage. All these studies have focused the normal individuals. In addition to this it is proved that the airway clearance techniques such as coughing and huffing will be effective when done along with a favorable position to clear the tracheo bronchial secretions in smokers. Thus this study was conducted to find out the effective position and the effect of sputum clearance techniques in various positions.

STATEMENT OF THE PROBLEM

A study to analyse the effect of various positions along with coughing and huffing techniques on respiratory parameters in smokers

KEY WORDS

- Sitting
- Supine
- 45 □ rotative prone
- FEV1
- FEV1 / FVC
- FEV1/FEV6

OBJECTIVE OF THE STUDY

- To find out the effect of sitting position along with the interventions of coughing and huffing on FEV1, FEV1/FVC and FEV1/FEV6in smokers.
- To find out the effect of supine position along with the interventions of coughing and huffing on FEV1, FEV1/FVC and FEV1/FEV6 in smokers.
- To find out the effect of 45° prone position along with the interventions of coughing and huffing on FEV1, FEV1/FVC and FEV1/FEV6 in smokers.

HYPOTHESES

NULL HYPOTHESIS

Ho1

There is no significant increase on FEV1,FEV1/FVC and FEV1/FEV6 in 45º rotative prone position .

Ho2

There is no significant improvement on FEV1, FEV1/FVC and FEV1/FEV6 following the interventions of coughing and huffing techniques in smokers.

ALTERNATIVE HYPOTHESIS

Hα1

There is a significant increase on FEV1,FEV1/FVC and FEV1/FEV6 in 45º rotative prone position .

Hα2

There is a significant improvement on FEV1, FEV1/FVC and FEV1/FEV6 following the interventions of coughing and huffing techniques in smokers.

II.REVIEW OF LITERATURE

Sandelowsky et al., (2011)

They studied on the prevalence of undiagnosed COPD in a primary care population with respiratory tract infection. In this study, 138 subjects were included and their age was 40-75 years and attending urgent primary care centre with acute respiratory tract infection, positive smoking history and no previously known pulmonary diseases underwent pre and post broncho dilator spirometry test were performed after 4 – 5 weeks. The results showed that 45 % were in stage I and 53% in stage II, 3% in stage III and 0% in stage IV. They concluded that any type of common respiratory tract infection, positive smoking history and no previously known pulmonary diseases have an increased risk of having COPD.

Balamurugan et al., (2011)

They conducted a comparative study on pulmonary expiratory flow rates in females with rheumatoid arthritis (RA) hundred females with RA in age group twenty to sixty years, who fulfill the American rheumatism Association criteria (1988) were selected in this study. Their forced expiratory flow rates were measured by "spirolab II". The result showed that there was a negative correlation between the forced expiratory flow rates and the duration of diseases. By this study they concluded that female patients with RA and it must be pertinent to do pulmonary function test to detect and monitor changes in lung function.

Proenca et al., (2010)

They Studied the effects of immediate and short term effects on smoking on nasal mucociliary clearance in smokers. Thirty eight subjects were included in this study. 19 were smokers and their smoking history was collected using a questionnaire and they were assessed using spirometry and the STT test. This STT test was checked immediately after smoking and eight hours after smoking. This STT test was also performed to19 non smokers who served as a control group. On the basis of the study findings they concluded the STT remained the same after smoking and it reduced further after 8 hours after smoking.

Tahera et al., (2010)

They conducted a study about pulmonary function test in healthy school children of 8 to 14 years age in south Gujarat region. 655 normal healthy school children of Surat city aged 8 to 14 years were included in this study. And they were obtained FEV, FVC, FEV1 and PEFR among children by using spirometer "spirolab II" results showed that FVC and FEV1, highest correlation was found with age in girls and height in boys. By this study they concluded that FVC, FEV and PEFR showed good positive correlation with height age and body surface area in both sexes.

Tsubaki et al., (2009)

They conducted a study on the influence of posture on respiratory function and respiratory muscle strength in normal subjects. 15 non smoking healthy women participated in the study they measured the respiratory muscle strength and respiratory function in three postures {sitting, supine, 45ºrotative prone}results showed that the FEV1 was significantly lower in supine combined with sitting. They finally concluded that 45 º prone positions are effective for coping up secretion and endo-tracheal aspirate as well as the sitting position.

Delamora et al., (2009)

They were conducted a study on long term spirometry changes in smokers versus non-smokers undergoing hyperbaric oxygen therapy .the aim of this study is to examine physiological changes in lung function of smokers non smokers undergoing HBOT. Spirometry was performed at the end of 12 months on former smokers and non smokers undergoing minimum of 20 HBOT. The value among smokers (pretest/posttest) VC 3.31/3.72; FEV1 2.82/2.7; FEV1/FVC 0.75/0.69;FEV 25-75% 2.4/1.8;FEV6 3.65/3.54. The value among non smokers were VC 3.26/3.25; FEV1 2.82/2.63; FEV1/FVC 0.77/0.74;FEF 25-75% 2.56/ 2.09; FEV6 3.55/3.38. Thus this study concluded that there is a significant statistical decline in FEV1/FVC and FEV 25-75% in former smokers versus nonsmokers undergoing HBOT.

Vahid et al., (2008)

They conducted a pulmonary function parameters changes at different altitudes in healthy athletes. Fifty six male volunteers from a university student subjects were included in this study. Pulmonary function was measured with a ”spirolab II” in all participants result showed that significant decreased with increase in altitude from baseline level, at the sea level it was significantly less than baseline level. By this study they concluded that changes in pulmonary ventilator parameters were proportional to the magnitude of change in altitude during a high altitude trek.

Baron et al., (2007)

They conducted a study on the effects of prone position can improve oxygenation and right ventricular function in ARDS patients. 42 ARDS patients with severe impairment of oxygenation (PaO2/ fraction of inspired oxygen ratio of <100mm Hg) were included in this study and their respiratory parameters were observed in prone position and they find out significant improvement in oxygenation and significant decrease in PaCo2 using Bedside transesophageal echocardiography was performed before and after 8 hours of prone position ventilation. From this study they concluded that prone lying position improved. Oxygenation in severely hypoxemic ARDS patients, and also in controlling the right ventricular pressure over load in patients with severe ARDS.

Ghobain et al., (2006)

They studied the effect of prevalence of chronic obstructive pulmonary disease among smokers attending primary healthcare clinics in Saudi Arabia. They were included the number of subjects was 1380 who are ex-smokers and aged 40 years or above. The FEV1 / FVC was measured by spirometry airflow obstruction was classified according to the 2003 update of the World Health Organization and Global Initiative for COPD. 501 subjects were eligible for data analysis, 71 had an FEV1/FVC ratio <0.70, comprising 14.2%of the study population, of which 95.8%were males, current smokers comprised 57 subjects. They found 40 were in stage two and 31 were in stage three of the disease. So they concluded that spirometry placed important role in early detection and proper diagnosis of COPD, in patient with 40 years of age and with smoking history.

Dennis et al., (2006)

They conducted a study on non pharmacological airway clearance therapies. They were used "chest physiotherapy," "forced expiratory technique," "positive expiratory pressure," "high frequency chest compression," "insufflation," and "exsufflation.". It is limited by methodological constraints, and most were conducted only in patients with cystic fibrosis . Chest physiotherapy techniques are postural drainage, chest wall percussion and vibration, and a forced expiration technique (called *huffing*), increase airway clearance as assessed by sputum characteristics. By this study they concluded

that Some nonpharmacologic therapies are effective in increasing sputum production, but their long-term efficacy in improving outcomes compared with unassisted cough alone is unknown.

Cool et al., (2006)

They conducted a study about a global physiology and pathophysiology of cough. Objective of this study is to describe the anatomic components of the respiratory system work in concert to produce an effective cough. The result shows that inhaling to high lung volumes and glottis closure prior to the expiratory phase of cough facilitate the generation of high intrathoracic pressures. These high intrathoracic pressures provide the driving force for airstream flow during cough and dynamically compress the central airways, which further enhances the cough airstream velocity. By this study they concluded that cough may be effective in individuals with mild-to-moderate degrees of respiratory muscle weakness, as only modest increases in intrathoracic pressure are needed to dynamically compress the large intrathoracic airways and increase cough flow velocity.

Jindal et al., (2006)

They conducted a study on tobacco smoking in India: prevalence, quit-rates and respiratory morbidity. Adults over 15 years of age are selected for this study. The results showed that 11,496 ever smokers in the study sample of

73,605 subjects. Among 37,682 males, 10,756 were ever smokers and among 35,926 females 740 were ever smokers. By this study they concluded that India has current or past smoking habit with higher prevalence among males than females, and there is a significant respiratory morbidity associated with smoking.

Abraham et al., (2005)

They studied the effect of detecting airflow obstruction in smoking cessation trails. The study was conducted in a University of Research laboratory.598 smokers were included and attended two cessation classes. spirometry was performed after 1 year of follow-up .the values were normal in 493 subjects in this 105 had airway obstruction ,75 subjects had mild obstruction, 22 subjects had moderate obstruction and severe obstruction in 8 subjects, 75 were unavailable for follow –up. Spirometry placed a main role in prevalence of airflow obstruction in participants in smoking cessation trails

Halbert et al., (2003)

They were studied the effect of interpreting COPD prevalence estimates COPD is the fourth most common cause of death worldwide it is caused by cigarette smoking . They were selected 8215 adults with age of 35 who were participated in the health survey. Spirometry was detected 13.3 % participants

had COPD and remaining 80% had no history of respiratory diagnosis.34.4% subject with spirometry detect COPD were smokers compared with 22.4% of those without and smoking prevalence increased with disease severity. In smokers it is associated with higher degree of cigarette dependence.

Willemse et al., (2003)

They studied the impact of smoking cessation on respiratory symptoms, lung function, airway hyper responsiveness and inflammatory changes in patients with COPD. 45 patients were included and they were divided into 3 groups with 15 each. Group A- included smokers without chronic symptoms, Group B- included non obstructive chronic bronchitis and in Group C – smokers with COPD. They concluded that smoking cessation is the only effective treatment for avoiding or reducing the progression of the disease in patients with COPD.

Bhat et al., (2003)

They studied the effects of posture on oxygenation, lung volume and respiratory mechanics in premature infants before discharge. 20 infants with median gestational age 30 weeks were included in this study. They were measured compliance, resistance of the respiratory system and FRC was continuously monitored in 3 hours period and the results showed that median oxygen saturation and FRC were significantly reduced and there is no

significant improvement in compliance and resistance of the respiratory system affected by posture.

Rani et al., (2003)

They conducted a study about tobacco use in India: Prevalence and predictors of smoking and chewing in a national cross sectional household survey. The outcome measures are prevalence of current smoking and current chewing of tobacco were used. The results showed that 30% of the population 15 years are older (47% men and 14% women) either smoked are chewed tobacco. By this study they concluded that, improve health outcomes among the poor in India must include effective interventions to control tobacco use.

Badr et al., (2002)

They studied the effect of body position on maximal expiratory pressure and flow. 25 adults with normal respiratory function and 11 adults with chronic airflow limitation. They were measured maximum expiratory pressure and PEFR performed across 7 randomized position (standing, chair sitting, sitting in bed with back rest vertical, sitting in bed with back rest at 45 º, supine , side lying, and side lying with head down tilt 20º).The study result showed that a significant effect on MEP and PEFR in normal respiratory function, and chronic airway limitation, the values are lowest in head down position, so the cough and huff is encouraged to adopt a more upright position.

Pontifex et al., (2002)

The effects of huffing and directed coughing on energy expenditure in young asymptomatic subjects. 24 subjects were included in this study without any form of disease and their energy expenditure was measured over 10 minutes period. Randomly ordered sessions of huffing, directed coughing and rest. The forced expiratory technique consists of single huff / double barrel cough (both starting at total lung capacity) at the end of every 2 minutes. Each session was separated by a 5 wash out period. The results showed that there was no significant difference in energy expenditure was found between the huffing and directed coughing periods.

Johnson et al., (2001)

They studied the effects of smoking on human health .62 individuals were included in this study and divided into 3 groups, the groups were heavy smokers, mild smokers and non – smokers. Spiro meter was used to measure the parameters (VC, FRC, FEV1, FEV1 /FVC). Based on this study they concluded that heavy smokers have a higher ratio, and then mild smokers, non-smokers have a greatest ratio.

Ogiwara et al., (2001)

They studied the effect of posture on ventilator muscle strength. 20 participants were included in this study. They were positioned into sitting, half lying, slumped half lying, supine lying, right side lying and left side lying, and they were measured negative inspiratory pressure and maximum positive expiratory pressure. By this study they concluded that a significant change in negative inspiratory pressure and positive expiratory pressure would occur with alteration of the body position in healthy persons.

Sivasothy et al., (2001)

They conducted a study on the effects of manually assisted cough and mechanical insufflations on cough flow on normal subjects, patients with COPD and with respiratory muscle weakness. They included 20 subjects 9-normal subjects, 8- COPD, 4-respiratory muscle weakness with scoliosis and 8-subjects with respiratory muscle weakness without scoliosis. They concluded that manually assisted cough and mechanical insufflations should be considered to assisted expectoration of secretion in patients with respiratory muscle weakness without scoliosis.

Vilke et al., (2000)

They studied the effect of spirometry in normal subjects in sitting, prone, and supine positions.20 healthy men; ages 18 to 50 years were included and measured the FVC, FEV1, and maximum voluntary ventilation in sitting, supine and prone positions. The result showed that comparing sitting to supine and prone positions, there was a significant reduction in the spirometry values. So they concluded that the supine, sitting, and prone positions were altered the respiratory pattern.

Fiona et al., (1999)

They studied the effect of side lying on lung function in older individuals. 19 non smoking subjects were included with no history of cardiac or pulmonary disease was tested over 2 sessions. They were measured FVC, FEV1, single breath pulmonary diffusing capacity and the slope of the phase three of the single breath nitrogen washout list to determine inhomogenity of ventilation in sitting and left side lying in one section and sitting in right side lying in other section. By this study concluded that side lying positions resulted in reduced FVC and FEV1 where as in supine position this parameters are well documented.

Pryor et al., (1999)

They studied the effect of physiotherapy for airway clearance in adults. The techniques which have been developed in more recent years are effective comfortable and it can also be used independent of an assistant in the majority of adolescents and adults. Among various airway clearance techniques the forced expiratory maneuver "huff" technique increased the effectiveness of airway clearance.

David et al., (1997)

They studied the age effect on interrelationship between lung volume and heart rate during standing. They were measured 5 minute of lung volume and R-R interval data from 7 young and 10 old healthy humans in the position of supine and standing .The results showed that both age groups exhibited decreased rate of respiration and increased TV with standing. By this study they concluded that the respiratory and respiration, heart rate inter relationship are altered by aging.

Vitacca et al., (1996)

They conducted a study on does the supine position worsen respiratory function in elderly subjects. 17 subjects were included; they were measured breathing pattern and mechanics by spirometry in sitting and supine positions. The results showed that significant decreases in FEV1, FVC, PEF and breathing pattern data showed a significant reduction in tidal volume and dynamic lung compliance and an increase in respiratory rate and vital capacity ratio. By this study they confirm the results of previous reports about compliance reduction in supine posture in young normal people, where as in old people significant decreases in FEV and VC in supine position.

Hassani et al., (1994)

They conducted a study on the regional mucous transport following unproductive cough and the forced expiratory technique in patients with airway obstruction. 14 patients were included age group <68 years with airway obstruction. FEV1: (54 ± 5); daily wet sputum: (9.1±2.0 g). Each patient underwent the three treatment maneuvers. Controlled cough (30 coughs over a 10 minutes period), forced expiration (30 forced expirations over a 10 minutes period) an objective aerosol technique was used to monitor regional mucous movement within the lungs of the patients. The results showed that cough and forced expiratory technique resulted in significant clearance compared with

control for all regions with the expectoration of the forced expiration in the outer region.

Brown et al., (1993)

They studied the effect of Prevalence of chronic cough and phlegm among male cigar and pipe smokers: results of the Scottish Heart Health Study. So many studies investigating the effect of cigar or pipe smoking on the occurrence of chronic cough and chronic phlegm have reported prevalence among cigar and pipe smokers lying between those of non-smokers and current cigarette smokers. This study they told about the uses of previous cigarette consumption, current cigar or pipe consumption, and biochemical markers of smoking to provide a detailed analysis of chronic cough and chronic phlegm among cigar and pipe smokers. A total of 10,359 men and women aged 40-59 years of subjects were included in this study. The result showed that among the ex-cigarette smokers, cigar or pipe smokers had 1.63-1.71 times the prevalence of both chronic cough and chronic phlegm than those who had never smoked. – by this study concluded that Cigar and pipe smokers have a higher prevalence of chronic cough and phlegm than those who have never smoked

Michels et al., (1991)

They conducted a study on influence of posture on lung volumes and impedance of respiratory system in healthy smokers and non smokers.105 adults were included, They were investigated the influence of the body positions, Sitting with respective supine ,on lung volumes and on the input resistance and reactants of , the respiratory system. They were measured VC and ERV and the result showed that the VC, ERV were decreased in supine position this reduction is associated with age and is less for ERV in male smokers than in non smokers. The study concluded that the changes in resistance due to posture are larger in young smokers than in young non smokers.

Jenkins et al., (1988)

They conducted a study on the effects of posture on lung volumes in normal subjects and in patients who had undergone pre and post coronary artery surgery. 20 normal subjects were included in this study. They were measured FRC, ERV, VC in different postures (sitting, slumped sitting, side lying position) they observed FRC was significantly highest in the sitting position ,when compared to that of slumped position and side lying position. Similar

changes occur in the ERV, VC, total lung capacity and reserve volume were much less influenced by alterations in body positions.

Tager et al., (1988)

They conducted a study about the natural history of forced expiratory volumes, effect of cigarette smoking and respiratory systems. The study focused on both the growth and decline of lung function measurements. subjects completed a standardized respiratory illness and smoking questionnaire and provided forced expiratory volume-time curves from which forced vital capacity (FVC) and forced expiratory volume in one second (FEV_1) were derived. They were used a nonparametric curve smoothing method to provide an overall summary of growth and decline of each measure of function.The result showed that in these smokers, decline in FEV_1 began in the early part of the third decade at a rate only slightly greater than that observed for non-smokers (−25 to −30 ml/yr). Similar decline were observed for females. These study suggest that a major effect of cigarette smoking on lung function decline involves the premature onset of a “normal” rate of decline in function and to a lesser extent, more rapid rates of decline later in life and that the pattern and magnitude of decline is similar in males and females.

Minette et al., (1976)

They conducted a study on lung function changes in smokers with normal conventional spirometry .To detect early abnormalities in smokers by using lung function test. 65 healthy male smokers were taken and provided standards for FEV1, VC, End Tidal spirometry, forced mid and end expiratory flow, single breath diffusing capacity, static lung volume and single breath nitrogen closing volume measurements. The single breath N2closing volume test detected the greatest number of abnormal results using normal conventional spirometry.

III. METHODOLOGY

3.1. STUDY DESIGN

One group pretest and post test experimental study design

3.2. STUDY SETTING

Study was conducted at physiotherapy outpatient department, K.G College of Physiotherapy, Saravanampatti, Coimbatore-35.

3.3. STUDY DURATION

Study was conducted for a period of 6 month.

3.4. STUDY SUBJECTS

Based on selection criteria, 20 subjects were selected for the study

3.5. CRITERIA FOR SELECTION:

3.5.1. INCLUSION CRITERIA:

- Age group between 30 and 40 years
- Male subjects
- Smokers
- Subjects with BMI from 20-29.9 kg/m^2
- Subjects who are willing to participate

3.5.2. EXCLUSION CRITERIA:

- Subjects with cardio vascular disease
- Subjects with neuro muscular disease
- Subjects with acute respiratory disease within the previous 6 weeks
- Uncooperative subjects
- Subjects unwilling to participate

3.6. OPERATIONAL TOOLS:

- Spiro lab II spirometer
- Inch Tape
- Weighing Scale

3.7. VARIABLES:

3.7.1 INDEPENDENT VARIABLES:

- Sitting position
- Supine position
- 45º rotative prone position
- Coughing and huffing techniques

3.7.2 DEPENDENT VARIABLES:

- FEV1
- FEV1/FVC
- FEV1/FEV6

3.8. ORIENTATION OF SUBJECTS:

Before treatment, all the subjects were explained about the study and procedure to be applied, and were asked to inform if they feel any discomfort during the course of the treatment. All the patients who were interested to participate in the study were asked to sign the consent form before the treatment.

3.9. PROCEDURE

Based on selection criteria, total of 20 smokers were selected for the study and consent form were obtained from them before pre-test evaluation. Pre test assessment was done using Spiro lab II spirometry in three different positions i.e. in sitting, supine and 45º rotative prone position. After completion of pre test assessment, each subject was given coughing and huffing interventions in all the three positions ie sitting, supine and 45º rotative prone for a period of 12 -15 minutes. After giving intervention, the subjects were involved for post test assessment again through Spiro lab II spirometry. In the spirometer measurement FEV1, FEV1/FVC, FEV1/FEV6 parameters were considered. Each subject was given 4 weeks of treatment as three sessions/day and 12–15minutes/session.

3.10. STATISTICAL TOOLS:

- One way ANOVA was used to analyze the variance between three different positions on respiratory parameters before and after interventions
- Dependent ‘t’ test was used to analyze the significant difference within the study group

STATISTICAL TOOLS

- **1.Analysis of variance(ANOVA):**

Analysis of variance is a statistical technique specially designed to test whether the means of more than two quantitative populations are equal. The basic principle of ANOVA is to test for differences among the means of the populations by examining the amount of variations within each of these samples, relative to the amount of variation between the samples.

Formula:

$$F = \frac{S_1^2}{S_2^2}$$

Where, S_1^2 is $S_1^2 = \frac{\Sigma(x_1 - \bar{x}_1)^2}{n_1 - 1}$

S_2^2 is $S_2^2 = \frac{\Sigma(x_2 - \bar{x}_2)^2}{n_2 - 1}$

Formula: Dependent‘t’ test

$$S = \sqrt{\frac{\sum d^2 - \frac{(\sum d)^2}{n}}{n-1}}$$

$$t = \frac{\overline{d}\sqrt{n}}{s}$$

Where,

d = difference between the pre test versus post test

$\overline{d}$ = mean difference

n = total number of subjects

S = standard deviation

IV.DATA ANALYSIS AND INTERPRETATION

TABLE-I

ANALYSIS OF PRETEST VALUES OF FEV1 IN THREE POSITIONS

Source of variation	Sum of square	DF	Mean square	F- value	P-Value	F critical value
Between groups	11.37	2	5.688	15.088	5.5072	3.158
Within groups	21.48	57	0.377			
Total	32.86	59				

USING ONE WAY ANOVA

While comparing pre-test values of FEV1 for three positions supine , sitting and 45° rotative prone , the one – way ANOVA results showed that the calculated F- value (15.088) is greater than F-critical value (3.158) and also the p value (5.5072) is greater than 0.05.Thus there is a significant difference between these three positions.

TABLE-II

ANALYSIS OF POSTTEST VALUES OF FEV1 IN THREE POSITIONS USING ONE WAY ANOVA

Source of variation	Sum of square	DF	Mean square	F- value	P-Value	F critical value
Between groups	8.5040	2	4.2520	16.8142	1.8213	3.1588
Within groups	14.4142	57	0.2528			
Total	22.9182	59				

While comparing post-test values of FEV1 for three positions supine , sitting and 45° rotative prone , the one – way ANOVA results showed that the calculated F- value (16.814) is greater than F-critical value (3.158) and also the p value (1.8213) is greater than 0.05.Thus there is a significant difference between these three positions.

TABLE-III

ANALYSIS OF PRETEST VALUES OF FEV1/FVC IN THREE

Source of variation	Sum of square	DF	Mean square	F- value	P-Value	F critical value
Between groups	127.92	2	63.9611	38.4060	2.7373	3.1588
Within groups	94.9275	57	1.66339			
Total	222.849	59				

POSITIONS USING ONE WAY ANOVA

While comparing pre-test values of FEV1/FVC for three positions supine , sitting and 45° rotative prone , the one – way ANOVA results showed that the calculated F- value (38.406) is greater than F-critical value (3.158) and also the p value (2.7373) is greater than 0.05.Thus there is a significant difference between these three positions.

TABLE-IV

ANALYSIS OF POSTTEST VALUES OF FEV1/FVC IN THREE

Source of variation	Sum of square	DF	Mean square	F- value	P-Value	F critical value
Between groups	120.7503	2	60.3751	36.066	7.5502	3.15884
Within groups	95.4190	57	1.67401			
Total	216.169	59				

POSITIONS USING ONE WAY ANOVA

While comparing post-test values of FEV1/FVC for three positions supine , sitting and 45° rotative prone , the one – way ANOVA results showed that the calculated F- value (36.066) is greater than F-critical value (3.158) and also the p value (7.5502) is greater than 0.05.Thus there is a significant difference between these three positions.

TABLE-V

ANALYSIS OF PRETEST VALUES OF FEV1/FEV6 IN THREE

Source of variation	Sum of square	DF	Mean square	F- value	P-Value	F critical value
Between groups	50.3963	2	25.1981	27.822	3.6911	3.1588
Within groups	51.611	57	0.9054			
Total	102.007	59				

POSITIONS USING ONE WAY ANOVA

While comparing pre-test values of FEV1/FEV6 for three positions supine , sitting and 45° rotative prone , the one – way ANOVA results showed that the calculated F- value (27.822) is greater than F-critical value (3.158) and also the p value (3.6911) is greater than 0.05.Thus there is a significant difference between these three positions.

TABLE-VI

Source of variation	Sum of square	DF	Mean square	F- value	P-Value	F critical value
Between groups	127.92	2	63.9611	33.5621	2.7373	3.1588
Within groups	94.9275	57	1.66339			
Total	222.849	59				

ANALYSIS OF POSTTEST VALUES OF FEV1/FEV6 IN THREE POSITIONS USING ONE WAY ANOVA

While comparing post-test values of FEV1/FEV6 for three positions supine , sitting and 45° rotative prone , the one – way ANOVA results showed that the calculated F- value (33.5621) is greater than F-critical value (3.158) and also the p value (2.7373) is greater than 0.05.Thus there is a significant difference between these three positions.

TABLE-VII

ANALYSIS OF PRE AND POST-TEST VALUES OF FEV1 IN THREE POSITIONS USING DEPENDENT‘t’ TEST

Positions	Pre test	Pos ttest	‘t’ value	Critical ‘t’ values
Sitting	3.193	3.533	5.6015	1.7291
Supine	2.5905	3.013	7.2599	
45° Rotative prone	3.654	3.9325	4.1106	

In all three positions, the calculated‘t’ value is greater than critical ‘t’ value. Thus there is significant difference between pre and post test values of FEV1 in three different positions.

GRAPH-I

ANALYSIS OF PRE AND POST-TEST VALUES OF FEV1 IN THREE POSITIONS USING DEPENDENT‘t’ TEST

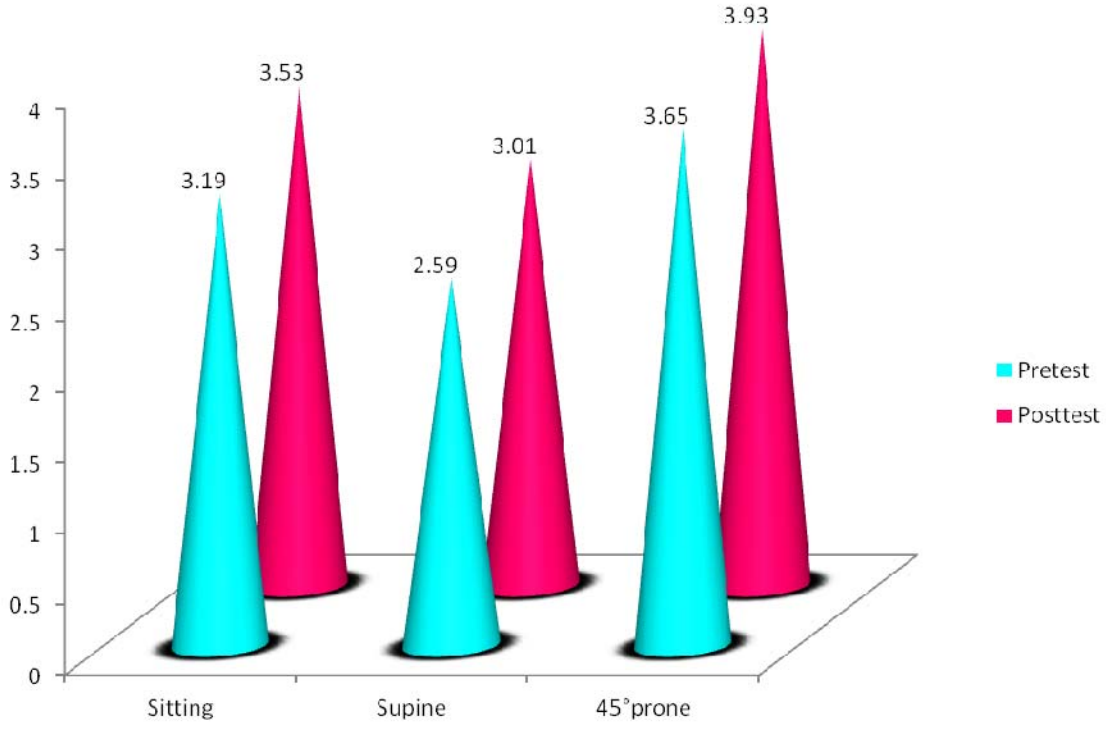

TABLE-VIII

ANALYSIS OF PRE AND POST-TEST VALUES OF FEV1/FVC IN THREE POSITIONS USING DEPENDENT‘t’ TEST

Positions	Pre test	Post test	‘t’ value	Critical ‘t’ values
Sitting	80.37	81.68	7.4095	1.7291
Supine	79.185	80.105	6.2506	
45° Rotative prone	82.7	83.57	8.8704	

In all three positions, the calculated‘t’ value is greater than critical ‘t’ value. Thus there is significant difference between pre and post test values of FEV1/FVC in three different positions.

GRAPH-II

ANALYSIS OF PRE AND POST-TEST VALUES OF FEV1/FVC IN THREE POSITIONS USING DEPENDENT‘t’ TEST

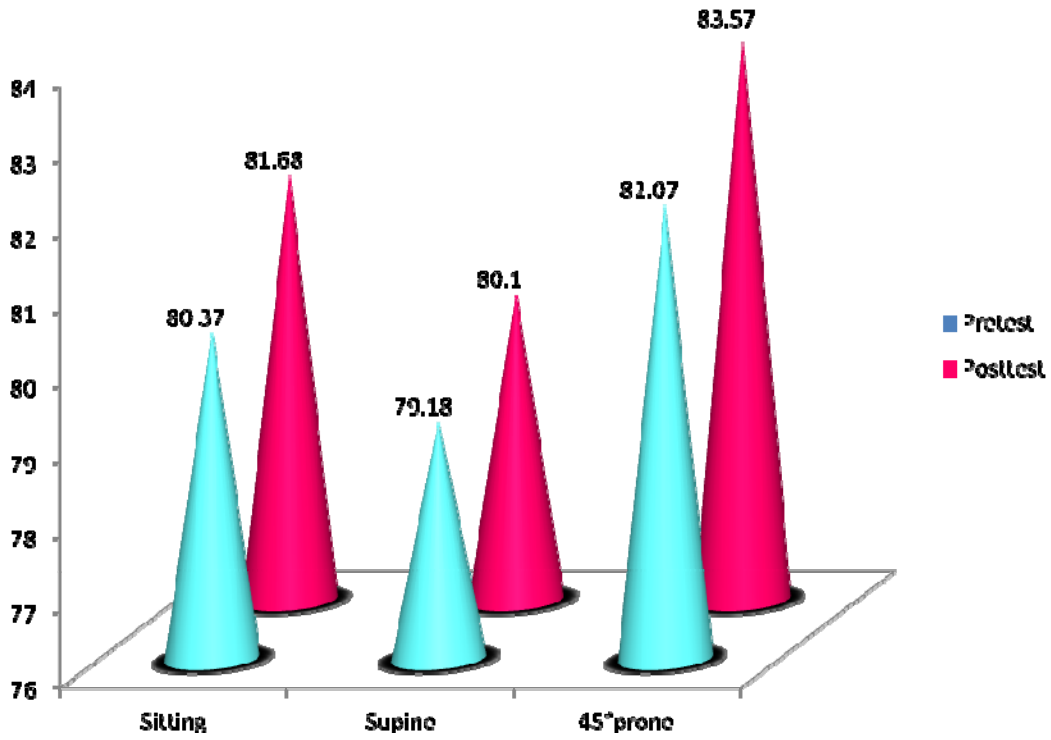

TABLE-IX

ANALYSIS OF PRE AND POST-TEST VALUES OF FEV1/FEV6 IN THREE POSITIONS USING DEPENDENT‘t’ TEST

Positions	Pre test	Post test	‘t’ value	Critical ‘t’ values
Sitting	80.54	81.32	15.2804	1.7291
Supine	79.24	79.98	9.4361	
45° Rotative prone	81.48	82.54	22.9875	

In all three positions, the calculated‘t’ value is greater than critical‘t’ value. Thus there is significant difference between pre and post test values of FEV1/FEV6 in three different positions.

GRAPH-III

ANALYSIS OF PRE AND POST-TEST VALUES OF FEV1/FEV6 IN THREE POSITIONS USING DEPENDENT‘t’ TEST

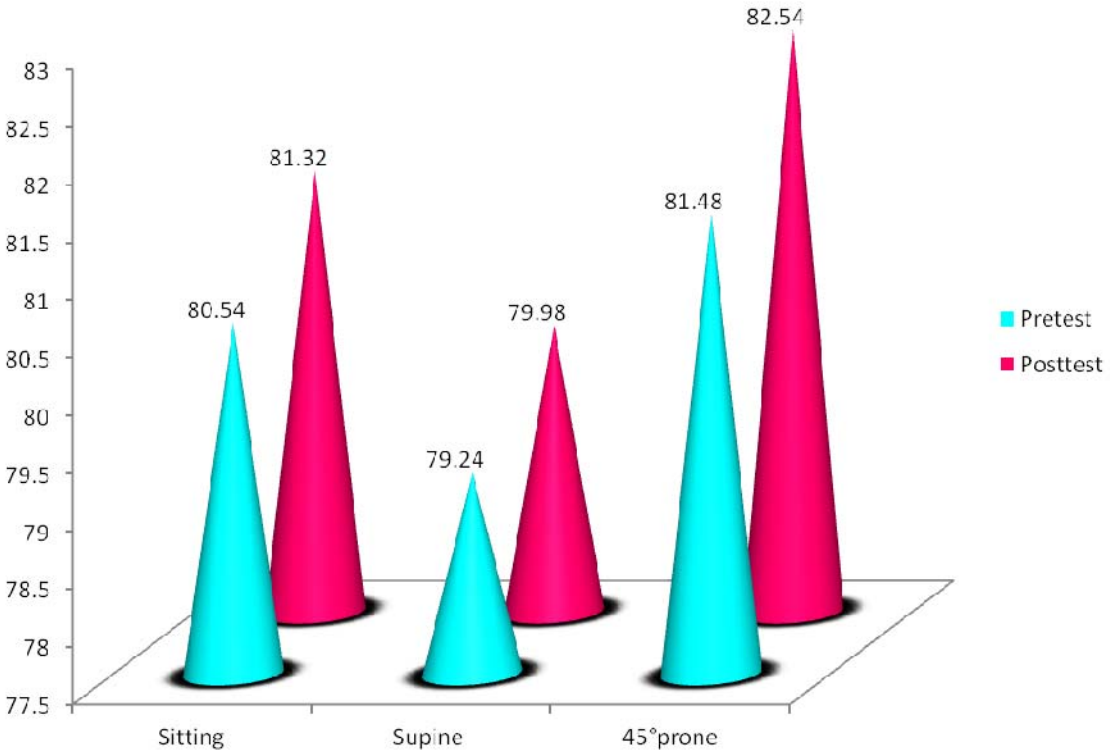

TABLE-X

ANALYSIS OF MEAN AND MEAN DIFFERENCE OF FEV1, FEV1/FVC AND FEV1/FEV6

Positions	FEV1			FEV1/FVC			FEV1/FEV6		
	Pre Mean	Post Mean	M.D	Pre Mean	Post Mean	M.D	Pre Mean	Post Mean	M.D
Sitting	3.19	3.53	0.34	80.37	81.68	1.31	80.54	81.32	0.78
Supine	2.59	3.01	0.42	79.28	80.10	0.91	79.24	79.98	0.74
45°pron e	3.65	3.93	0.28	82.7	83.57	0.87	81.48	82.54	1.06

USING MEAN VALUES:

While considering the pretest mean values of FEV1,FEV1/FVC and FEV1/FEV6 in sitting, supine, and 45°rotative prone position, the 45°rotative prone position has got high values than supine and sitting positions.

While observing the posttest mean values of FEV1, FEV1/FVC and FEV1/FEV6 in sitting, supine, and 45°rotative prone position. The 45°rotative prone position has got high values than supine and sitting positions.

V.DISCUSSION

This study was aimed to determine the effect of three different positions i.e., sitting, supine and 45° rotative prone positions on FEV1, FEV1/FVC and FEV1/FEV6 and also the effect of coughing and huffing techniques on these parameters in smoking population. Recent literatures state that smokers tend to have a greater reduction in vital capacity, forced expiratory volume and FEV1/FVC relative to nonsmokers (Johnson et al, 2001).

In this study, based on selection criteria 20 smokers were selected and they were involved for pre test assessment by Spiro Lab II for FEV1, FEV1/FVC and FEV1/FEV6 and the assessment was carried out in three different positions i.e., sitting, supine and 45° rotative prone position . After pretest assessment, the subjects were undergone for four weeks of treatment using coughing and huffing techniques and then they were involved for post test assessment.

The data were analyzed using one way ANOVA and students‘t’ test. While comparing pre-test values of FEV1 for three positions i.e., supine , sitting and 45° rotative prone , the one – way ANOVA results showed that the calculated F- value (15.088) is greater than F-critical value (3.158). Hence there is a significant difference between these three positions. While observing the post test values of FEV1 for three positions i.e., supine , sitting and 45° rotative prone , the one – way ANOVA results showed that the calculated F-

value (16.8142) is greater than F-critical value (3.158). Thus there is a significant difference in the post test values for these three positions.

While comparing pre-test values of FEV1/FVC for three positions supine, sitting and 45° rotative prone, the one – way ANOVA results showed that the calculated F- value (38.406) is greater than F-critical value (3.158). Thus there is a significant difference between these three positions. While observing the post test values of FEV1/FVC for three positions supine , sitting and 45° rotative prone , the one – way ANOVA results showed that the calculated F- value (36.066) is greater than F-critical value (3.158). Thus there is a significant difference in the post test values for these three positions.

While analyzing pre-test values of FEV1/FEV6 for three positions i.e., supine , sitting and 45° rotative prone , the one – way ANOVA results showed that the calculated F- value (27.82) is greater than F-critical value (3.158). Thus there is a significant difference between these three positions. While observing the post test values of FEV1/FEV6 for three positions i.e., supine , sitting and 45° rotative prone , the one – way ANOVA results showed that the calculated F- value (35.5621) is greater than F-critical value (3.158). Hence there is a significant difference in the post test values for these three positions. Thus, in the one way ANOVA analysis of all pretest and post test values with respect to three different positions i.e., supine , sitting and 45° rotative prone it has been shown that the FEV1, FEV1/FVC and FEV1/FEV6 values have got significant difference between the three positions.

While observing the paired‘t’ test result of FEV1 for sitting, supine and 45° rotative prone position, the calculated ‘t’ values are 5.6015, 7.2599 and 4.1106 respectively which are greater than the ‘t’ table value 1.729. Hence there is a significant difference between pre and post test values of FEV1 following four weeks of coughing and huffing techniques. Likewise, While observing the paired‘t’ test result of FEV1/FVC for sitting, supine and 45° rotative prone position, the calculated ‘t’ values are 7.4095, 6.2506 and 8.8704 respectively which are greater than the ‘t’ table value 1.729. Hence there is a significant difference between pre and post test values of FEV1/FVC following four weeks of coughing and huffing techniques. In addition to this, while considering the paired‘t’ test result of FEV1/FEV6 for sitting, supine and 45° rotative prone position, the calculated ‘t’ values are 15.2804, 9.4361 and 22.9875 respectively which are greater than the ‘t’ table value 1.729. Hence there is a significant difference between pre and post test values of FEV1/FEV6 following four weeks of coughing and huffing techniques. Thus, the paired ‘t’ test results of FEV1, FEV1/FVC and FEV1/FEV6 for sitting, supine and 45° rotative prone position has shown that there is a significant difference between the pre and post test values.

Moreover while analyzing the mean values, the pretest mean values of FEV1 in sitting, supine, and 45°rotative prone position have come as 3.19, 2.59 and 3.65 respectively. In addition to this, the pretest mean values of FEV1/FVC have shown as 80.37, 79.28 and 82.7 and the pretest mean values of FEV1/

FEV6 have shown as 80.54, 79.24 and 81.48. Thus, the pretest mean values of FEV1, FEV1/FVC and FEV1/FEV6 in three different positions have shown that the 45°rotative prone position has got high values than supine and sitting positions.

While analyzing the post test mean values of FEV1 in sitting, supine, and 45°rotative prone position, it has given the values as 3.53, 3.01 and 3.93 respectively. In addition to this,the pretest mean values of FEV1/FVC have come as 81.68, 80.10 and 83.57 and the pretest mean values of FEV1/ FEV6 was given as 81.32, 79.98 and 82.54. Thus, the post test mean values of FEV1, FEV1/FVC and FEV1/FEV6 in three different positions have also shown that the 45°rotative prone position has got high values than supine and sitting positions.

While observing the mean difference values, the mean difference values of FEV1 for sitting, supine and 45°rotative prone position it have shown as 0.34, 0.42 and 0.28. Thus there is a significant improvement in FEV1 parameter following four weeks of coughing and huffing interventions in smokers. The mean difference values of FEV1/FVC for sitting, supine and 45°rotative prone position it have shown as 1.31, 0.91 and 0.87. Thus there is a significant improvement in FEV1/FVC parameter following four weeks of coughing and huffing interventions in smokers. The mean difference values of FEV1/FEV6 for sitting, supine and 45°rotative prone position it has come as 0.78, 0.74 and

1.06. Thus there is a significant improvement in FEV1/FEV6 parameter following four weeks of coughing and huffing interventions in smokers.

The results of this study are similar to the findings of Atsuhiro et al, 2009. The reason for increased FEV1, FEV1/FVC and FEV1/FEV6 in 45°rotative prone and sitting position might be due to rectus abdominus muscle and its force production ability with respect to hip joint status. During forced expiration the rectus abdominus muscle is mainly working. In the sitting and 45°rotative prone position, both the hip joints are in flexion. It gives an advantage for excessive force production to rectus muscle by increasing its efficiency. But, in case of supine position both the hip joints are in extension where the rectus muscle cannot work efficiently and thereby the forced expiration cannot be achieved adequately. Moreover, the effectiveness of coughing and huffing techniques has been proved by many researchers like Pryor et al, 1999. This study has also got the similar improvement on respiratory parameters following four weeks of coughing and huffing interventions in smokers.

VI.CONCLUSION

This study concludes that there is a significant improvement on FEV1, FEV1/FVC and FEV1/FEV6 following the interventions of coughing and huffing techniques in smokers. While considering three different positions, 45° rotative prone position is the most effective position for the transfer of the intrabronchial secretions to the proximal airway. Thus this study also concludes that 45° rotative prone position is effective for coughing up secretions especially in smoker population.

VII.LIMITATION AND RECOMMENDATIONS

LIMITATIONS:

- Nutritional factors, psychological status of the subjects and influence of climate could not be controlled during the period of the study
- Only male smokers were included in this study
- Influence of drug action was not controlled
- Smoking habit was not controlled during the study period
- Influence on respiratory parameters due to variation in age and BMI of the study subjects were not controlled

RECOMMENDATIONS:

- Similar study can be done for patients with other respiratory diseases, especially condition like atelactasis
- Further research can be done with more number of subjects under a supervised training program
- Further studies can be done to know the difference in respiratory parameters of males and females on various other positions
- Other airway clearance techniques can be studied on various position

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IX.APPENDIX

APPENDIX-I

PATIENT PROFILE

Name:

Age:

Sex:

Occupation:

Date of Admission:

Date of Assessment

Referred by:

Chief complaints:

History:

Past medical history

Present medical history

Family history

Social history

Associated problems

Vital signs

Blood pressure:

Respiratory rate:

Heart rate:

Temperature:

OBJECTIVE ASSESSMENT

ON OBSERVATION:

Built:

Color:

Chest shape:

Symmetry:

Breathing pattern:

Respiratory rate:

Chest movement:

Intercostals retraction:

Periphery/ extremities:

Clubbing:

Cyanosis:

Edema:

Respiratory distress:

Type of respiration:

Usage of accessory muscles:

Vocal fremitus:

On examination:

ON PALPATION:

Tracheal deviation:

Chest expansion

Axillary level:

Nipple level:

Xiphoid level:

Tenderness

Edema:

ON AUSCULTATION:

Breath sounds:

Heart sounds:

ON PERCUSSION:

Dyspnoea Examination:

INVESTIGATION:

X-ray:

ECG:

Echo cardiography:

ABG analysis:

Blood Test:

Pulmonary Function Test

DIAGNOSIS:

APPENDIX-II

TREATMENT PROCEDURE

SITTING:

Sitting in a chair with the trunk extended and the hips and knees flexed as near as possible to right angle

SUPINE:

Lying on a bed with a pillow supporting the head. Both legs were extended.

FORTY-FIVE DEGREE ROTATIVE PRONE:

Left side lying with the trunk tilting forward at 45°. right hip and right knee were bend at 90°. The left arm was at the back of the trunk pillows were set under the right thigh and right arm to maintain the body position without effort.

TREATMENT PROCEDURE –II

PROCEDURE FOR DIRECTED COUGH

1. Explain to the patient that deep breathing and coughing will help to keep the lungs expanded and clear of secretions.

2. Assist the patient to a sitting position, or to a semi-Fowler's position if sitting position is not possible.

3. Standard directed cough procedure (see below for modifications):

a. Instruct patient to take a deep breath, then hold the breath, using abdominal muscles to force air against a closed glottis, then cough with a single exhalation.

b. Take several relaxed breaths before the next cough effort.

c. Document teaching accomplished, procedures performed, and patient response in the patient record.

4. Alternate standard "huff" directed cough procedure

a. Instruct patient to take 3–5 slow deep breaths, inhaling through the nose, exhaling through pursed lips, using diaphragmatic breathing. Have the patient take a deep breath and hold it for 1–3 seconds.

b. Exhale from mid-to-low lung volume (to clear secretions from peripheral airways). Take a normal breath in and then squeeze it out by contracting the abdominal and chest wall muscles, with the mouth (and glottis)

open while whispering the word “huff” (sounds like a forced sigh) during exhalation. Repeat several times.

c. As secretions enter the larger airways, exhale from high-to-mid lung volume to clear secretions from more proximal airways. Repeat maneuver 2–3 times.

d. Take several relaxed diaphragmatic breaths before the next cough effort.

e. Document teaching accomplished, procedures performed, and patient response in the patient record.

5. Modified directed cough procedure for:

a.Patients who have had abdominal or thoracic surgery. Instruct patient to place hand or a pillow over the incision site and apply gentle pressure while coughing. Caregiver may assist with incision support during coughing. Support chest tubes as necessary.

b.Quadriplegic patients. Clinician places palms on the patient’s abdomen, below the diaphragm, and instructs the patient to take 3 deep breaths. On exhalation of the third breath, clinician pushes forcefully inward and upward as the patient coughs (similar to abdominal thrust maneuver performed on an unconscious patient with an obstructed airway).

PROCEDURE FOR HUFF FORCED EXHALATION

1.Take 3–5 slow deep breaths, inhaling through the nose, exhaling through pursed lips, using diaphragmatic breathing.

2.Take a deep breath and hold it for 1–3 seconds.

3.Exhale from mid-to-low lung volume (to clear secretions from peripheral airways).

4.Take a normal breath in and then squeeze it out by contracting the abdominal and chest wall muscles, with the mouth and glottis open, while whispering the word “huff” (sounds like a forced sigh) during exhalation. Repeat several times.

5.As secretions enter the larger airways, exhale from high-to-mid lung volume to clear secretions from more proximal airways. Repeat maneuver 2–3 times.

6.Take several relaxed diaphragmatic breaths before the next cough effort.

7.Clinician documents teaching accomplished, procedures performed, and patient response in the patient record.


KG Hospital


KG Hospital
KGH

APPENDIX-III

DESCRIPTION OF THE DEVICE

Spirolab is a new generation spirometer, it facilitates the total valuation of lung function. The product is designed for use by specialists who require a simple, compact device but one at the same time capable of calculating more than 30 spirometric parameters.

Spirolab makes **FVC**, **VC**, **IVC**, **MVV** and **breathing pattern** tests and calculates an index of test acceptability (test quality control) and a measure of reproducibility; and also gives functional interpretation with 11 possibile levels following the latest **ATS** (American Thoracic Society) classification.

The main spirometric parameters are measured and displayed and all data with Flow/Volume and Volume/time curves can be printed out in seconds by the built-in thermal printer.

The Flow/Volume curve is shown in real time.

Each test can be repeated several times. The best parameters are always available for rapid reference or printing. Several sets of predicted (or reference) values can be selected from five different authors. For example, in general within the European Union the values recommended by the **ERS** (European Respiratory Society) are used.

The device also calculates the response to drug administration, that is the percentage change between spirometry results obtained after the subject takes a

drug and those prior to the drug (**PRE/POST**) plus the results of a bronchial challenge test or a bronchodilation test. A comparison of data is made between **POST** (after-drug) and **PRE** (before drug administration).

The keyboard is organized to be quick and user friendly, thanks to the 15 programmed keys.

The internal memory can contain more than 1000 spirometry tests complete with Flow/Volume and Volume/time curves.

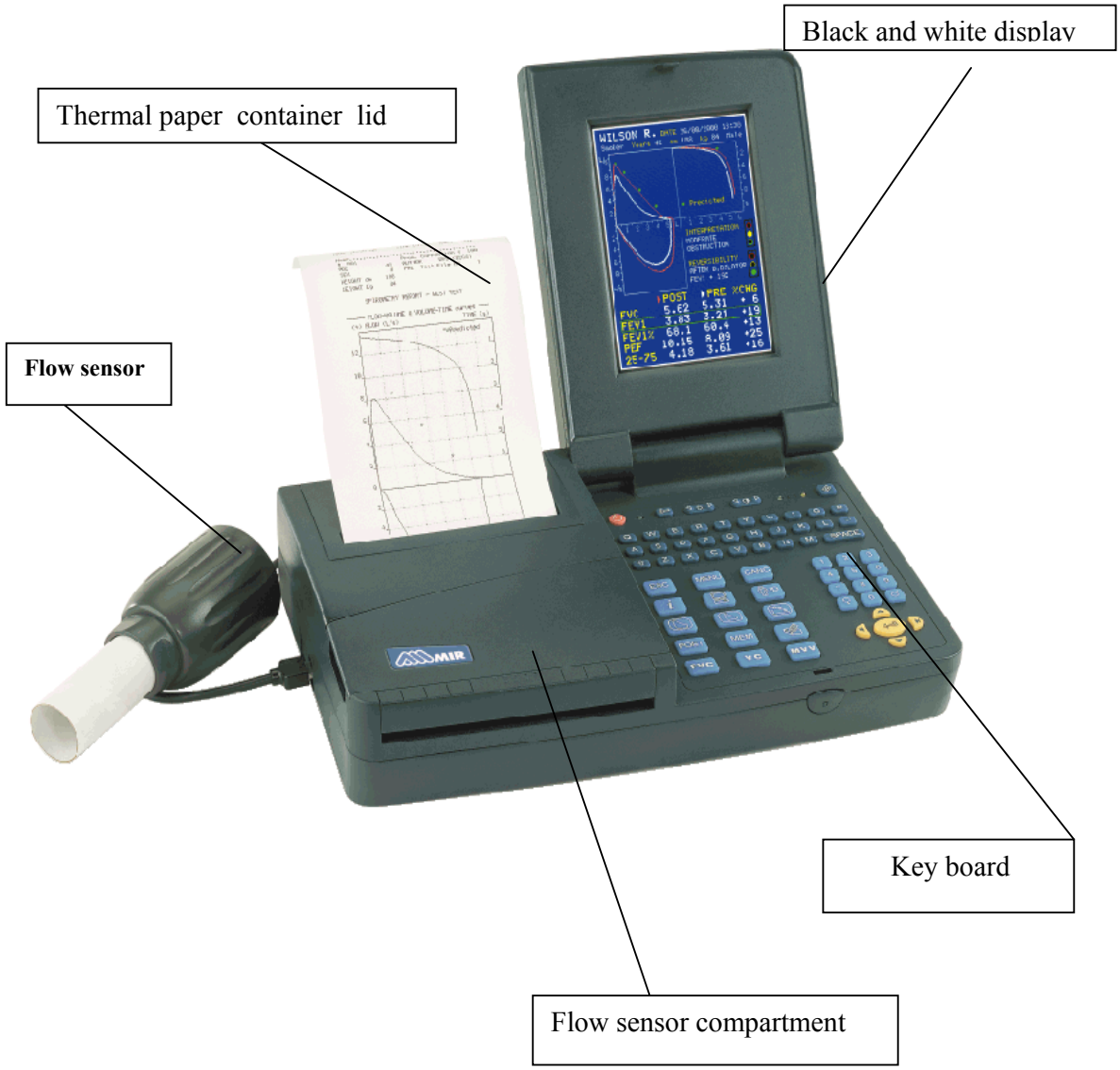
Spirolab is supplied with an RS-232 optoisolated serial communication port, which guarantees excellent electrical protection (> 4 KV) both for the doctor and for the subject, and respects the most severe European safety requirements (EN 60601-1).

The machine can be connected directly to the *serial* port of a printer using the standard RS 232 communication port. To connect to the *parallel* port an optional serial to parallel converter is required.

The internal software (or firmware) inside the device can be upgraded quickly and simply from a PC.

To make this upgrade consult the manufacturer or an authorized representative.

SPIROLAB II


Black and white display
Thermal paper container lid
Flow sensor
Key board
Flow sensor compartment

APPENDIX – IV

S.No	FEV1/FVC (pre test)	FEV1/FVC (post test)

DATAS OF FEV1/FVC

S.No	FEV1/FEV6 (pre test)			FEV1/FEV6 (post test)		
1	SITTING	SUPINE	45^0PRONE	SITTING	SUPINE	45^0PRONE
	79.1	78.2	81.5	80.2	79.2	82.4
2	78.9	71.5	80.2	79.8	78.5	81.3
3	79.8	78.3	82.3	81.4	78.4	83.4
4	80.1	79.2	81.6	82.4	80.3	82.4
5	79.3	79.5	83.4	81.5	81.5	84.6
6	81.3	77.2	82.6	83.4	78.3	83.3
7	81.5	78.4	83.7	82.5	79.4	84.3
8	79.6	79.6	81.8	80.5	80.2	82.6
9	81.4	80.2	86.7	80.6	82.2	87.4
10	80.6	81.5	82.7	82.5	80.6	83.4
11	79.3	80.8	81.3	81.4	81.7	82.6
12	81.2	79.7	84.1	82.4	80.9	85.2
13	81.9	80.9	83.8	82.8	81.4	84.7
14	80.7	77.9	81.6	81.7	79.3	82.4
15	81.4	78.6	82.9	82.3	79.2	83.9
16	78.8	80.7	82.1	80.6	82.3	84.2
17	79.5	78.9	80.9	81.4	79.8	81.6
18	79.7	77.9	82.4	80.5	78.1	83.2
19	80.6	78.6	83.7	82.6	79.4	83.4
20	82.7	80.1	84.7	83.4	81.4	85.2

DATAS OF FEV1/FEV6

S.No	FEV1 (pre test)			FEV1 (post test)		
1	SITTING	SUPINE	45^0PRONE	SITTING	SUPINE	45^0PRONE
	79.2	78.9	81.2	80.2	79.1	82.3
2	79.8	79.5	80.2	80.3	80.2	81.6
3	80.1	78.5	81.5	81.4	79.3	82.7
4	81.9	74.4	82.9	82.5	78.2	83.7
5	80.9	79.2	81.8	81.4	80.1	82.7
6	81.3	80.4	82.4	81.2	81.3	83.3
7	79.5	80.9	80.2	80.4	81.2	81.1
8	78.9	78.9	79.9	79.3	79.4	80.4
9	80.4	80.9	81.3	81.2	81.2	82.4
10	81.3	79.6	82.4	82.3	80.2	83.3
11	81.6	77.6	82.4	82.4	78.2	83.7
12	79.8	78.4	80.4	80.3	79.3	81.2
13	80.6	78.7	81.4	81.4	79.4	82.4
14	81.5	79.9	82.3	82.3	80.2	83.7
15	81.7	80.2	82.4	82.6	81.6	83.6
16	80.4	79.3	81.3	81.3	80.7	82.4
17	79.7	78.5	80.7	80.2	79.4	81.6
18	80.3	77.7	81.4	81.2	78.6	82.7
19	81.3	80.8	82.2	82.2	81.2	83.3
20	80.7	79.6	81.8	81.3	80.8	82.7

DATAS OF FEV1

	SITTING	SUPINE	45^0PRONE	SITTING	SUPINE	45^0PRONE
1	2.86	2.23	2.96	2.96	2.81	3.56
2	4.76	4.03	4.98	4.76	4.21	4.78
3	2.35	2.19	2.76	2.78	2.27	3.62
4	2.86	2.13	3.71	3.12	2.19	3.89
5	2.64	2.07	2.92	3.24	2.92	3.59
6	2.59	2.13	2.97	3.58	2.45	3.87
7	4.09	3.17	4.38	4.12	3.52	4.52
8	2.7	2.29	3.86	3.58	2.98	4.21
9	3.71	3.12	4.13	3.97	3.58	4.32
10	3.23	2.86	3.97	3.87	3.06	4.21
11	3.52	2.53	3.86	3.79	3.29	3.98
12	2.06	2.02	2.83	2.49	2.29	2.92
13	3.07	3.03	4.11	3.81	3.49	4.31
14	2.29	2.07	2.89	2.59	2.28	3.57
15	3.57	3.12	3.91	3.72	3.39	3.89
16	3.21	2.72	3.86	3.58	3.19	3.97
17	4.09	2.18	4.01	4.15	3.06	4.21
18	2.94	2.52	3.21	3.38	3.12	3.48
19	3.12	2.29	3.78	3.49	2.97	3.86
20	3.57	3.11	3.89	3.69	3.19	3.89

APPENDIX-V

CONSENT FORM

This is to certify that I …… freely and voluntarily agree to participate in the study " **A STUDY TO ANALYSE THE EFFECT OF VARIOUS POSITIONS ALONG WITH COUGHING AND HUFFING TECHNIQUES ON RESPIRATORY PARAMETERS IN SMOKERS**".

I have been explained about the procedure and the risks that would occur during the study. Questions have been answered to my satisfaction.

Participant

Witness:

Date:

I have explained and defined the procedure to which the subject has consented to participate.

Researcher:

Date: