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Pulmonary Function Studies in Liquefied Petroleum Gas (LPG) Workers

KEYWORDS: FVC, PEFR, FEF25% , FEV1%., BMI

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ABSTRACT *This study is designed to find out health status of Petroleum gas (LPG) workers. LPG is a mixture of hydrocarbons derived from Crude oil distillation or other petroleum refining processes, which is gaseous at normal temperatures and pressures. Lung function tests are the best tests to find out respiratory status in different workers. Hence our study is performed to assess physical status & predictable future disorders. The purpose of this study is to cease future out comes.*

INTRODUCTION

Liquefied Petroleum Gas (LPG) was first used as portable fuel source as early as the mid 19th century[1]. Pulmonary function tests are the reliable & less expensive. Spirometric techniques are recommended by American thoracic society[2]. Spirometric techniques are useful to diagnose asthma, symptoms of breathlessness, bronchial responses, to diagnose different types of obstructive & restrictive lung disease, to identify who were at risk from pulmonary barotrauma while scuba diving, to assess preoperative risk assessment before anesthesia, response of treatment from respiratory disorders & to identify vocal cords dysfunction. In one study it was observed, people who are working in tobacco industry are suffering with serious lung disorders[3]. Inhalation of gas or tobacco dust may be related to air borne disorders[4]. LPG is an odourless mixture of gases. Hence for safety reasons a pungent compound called Ethyl mercaptan is added to make any leaks detectable. It is a colourless mixture of gases and when released to atmosphere vaporizes immediately thereby producing cooling effect in the air. This cooling effect causes condensation and freezing of the water vapours in the atmosphere making its leak visible. It is tasteless and non toxic. Continued and heavy exposure into the atmosphere may produce mild dizziness[5]. LPG is a mild anesthetic (C.N.S. Depressant) when breathed in high concentration in sufficient quantity over a period of time result in abdominal upset and head ache[6]. The product of combustion may produce lack of oxygen in the atmosphere (surroundings).

The potential health effects are concerned the LPG at high concentration produces central nervous system (CNS) depression and symptoms include head ache, nausea, dizziness, drowsiness, confusion, it may cause unconsciousness at 17000 ppm[7]. Normal Butane in high concentrations displaces oxygen leading to reduction of oxygen thereby producing life threatening asphyxiation especially in confined spaces. Clinically the features of oxygen depletion may present as hyperapnoea, tachycardia, muscular in-coordination, emotional upsets, abnormal fatigue from exertion, disturbed respiration, nausea, vomiting, inability to move freely, collapse, loss of consciousness, convulsive movements, gasping, possible respiratory collapse and death[8]. Exposure to chemical sensitizers such as Toluene di-isocyanate and plicatic acid, which is found in western red cedar can also induce airway hyper-responsiveness[9]. Exposure to ozone and to occupational sensitizing agents, such as western red cedar is also associated with the airway inflammation and results in an increase in bronchial hyper responsiveness over the baseline[9-10].

MATERIALS & METHODS:

This study was performed on LPG gas workers & subjects were divided in four groups based on their work experience. 1-5 yrs of experienced people as group I, 6-10 years of experienced people as group II, 11-15yrs of experienced people as group –III, 16-20yrs of experienced people as group IV. We performed FVC, PEFR, FEF 25% & FEV1%. This study is conducted on 80 members & divided into 20 persons per group. This study is performed in Alluri Sita Rama Raju Academy Of Medical Sciences, Eluru. The apparatus used to perform the tests is MEDSPIRER computerized pulmonary function testing equipment developed indigenously by MED SYSTEMS PVT LTD, Chandigarh, India. We excluded women workers, persons above 50years of age, diabetic, obese, recently suffered respiratory disordered people, smokers, alcoholics, T-tootlers & any chronic disordered LPG workers. Expansion of chest & respiratory rate & rhythm were observed. Height & weight were measured with the subject in light clothes without shoes & body mass index (BMI) was calculated Kg/m^2.

The considered subjects were interviewed and basic history was taken into consideration. The subjects were given proper precautions and self-consent form was taken before drawing blood. Ethical permission is taken from institution before performing examination.

We excluded people who are suffering with hemoptysis of unknown origin, pneumothorax, unstable cardiovascular status, thoracic, abdominal or cerebral aneurysms, cataracts or recent eye surgery, recent thoracic or abdominal surgery & also in conditions like nausea, vomiting or acute illness. These people are not advised to perform spirometric techniques.

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Statistical analysis wore done by using Microsoft excel 2010. **ANOVA was done to analyze data**. Ethical committee permission was taken. The results of this study were expressed as mean±standard deviation. P-value <0.05 was considered statistically significant.

Results:

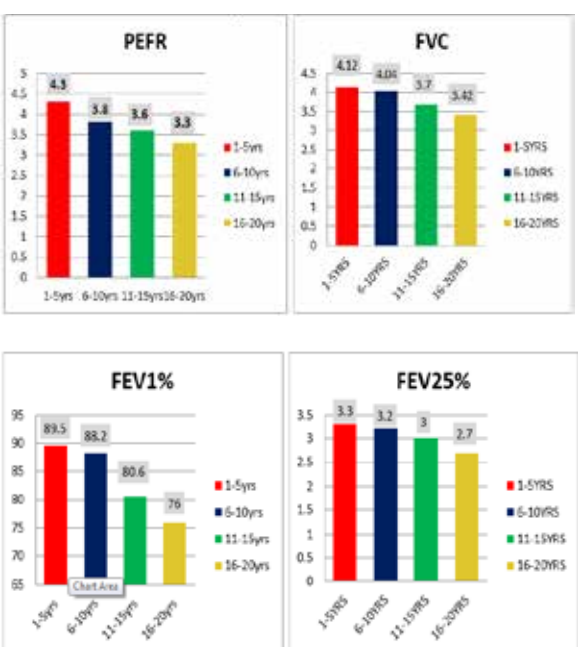
We performed FVC, PEFR, FEF 25% & FEV 1%. The changes in PEFR FEF_{25}% and FEV1% did not show any specific relationship with the young 1-10years duration of Exposure workers. The PEFR values were decreased in group-IV people than the other three age groups. FEF25% is decreased in group IV people as compared with other groups. FEV1% is decreased in group-III & group-IV people as compared with group-I & group-II. It is observed FEV1% is lower in group-IV people than other groups. We observed decrease in expansion of chest size as the age advances. No variation is observed in height & weight as the age advances. The FVC is decreased in senior workers & they are lesser than normal levels in senior workers.

S.NO	VARIABLE	1-5YRS	6-10YRS	11-15YRS	16-20YRS	VALUE
1.	HEIGHT	167.44	164.18	163	165.2	Not significant
2.	WEIGHT	68.08	69.78	65.73	69.2	Not significant
3.	BMI	24.38	25.65	24.46	25.34	Not significant
4.	EXPANSION OF CHEST	4.08	4.1	3.91	3.8	Statistically significant

Table – 1- General Considerations

S.NO	VARIABLE	1-5YRS	6-10YRS	11-15YRS	16-20YRS	VALUE
1.	PEFR	4.3	3.8	3.6	3.3	0.005
2.	FEF 25%	3.3	3.2	3.0	2.7	0.005
3.	FEV 1%	89.5	88.2	80.6	76	0.005
4.	FVC	4.12	4.04	3.7	3.42	0.005

TABLE 2 – Specific Parameters Considered



Discussion:

In this study we observed decreased in FVC, PEFR RATIO. We observed sudden increase in FEV1% in group –II people, later it is decreased. FEV1% is increased more than 5 years of experienced people than group-I people. FEF25% is increased in more than 5 years of experienced people than 1-5 years of experienced people. Y.I.A.I. Neaimi compared unexposed office staff & exposed cement factory worker's health status. They observed decrease in FEV1%, FVC & PEFR values in cement factory working group people than unexposed office staff people. They observed 64% of exposed people group have normal vital functions & 31% exposed working group have obstructive lung disease. They also observed 87% of non exposed people have normal vital functions & 8% of unexposed people are suffering with ventilatory disorders[11]. Jaya mary George observed increase in FEF, FEV, FEV1% in exercised persons as compared with normal young healthy people. They also observed physical exercise can improve lung function[12]. Zoadur rahim zahid studies indicate people working in tobacco industry may be prone to respiratory disorders. They observed decrease in FVC, FVC1 and FVC1% in tobacco workers as compared with normal office staff [4]. Ajay .KT & others observed significant decrease in PEFR levels in auto rikshaw workers. They compared 20years of pollution affectant auto rikshaw workers & 10years of pollution affectant auto rikshaw workers & irregular autorikshaw workers. The people who were been prone to pollution since 20years are suffering with bronchitis, various respiratory disorders & PEFR levels are decreased[13]. Rutamba alam & others observed decreased FVC, FEV1, PEFR & FEV1% in fuel filling workers than the control. They identified peripheral bronchial inflammation in senior workers[14]. A. Gulsvik & others performed pulmonary function tests (PFT) on non-smokers in different age groups & they observed increase in inspiratory capacity & lung volume in middle age group people. They observed decline in PFT values as their age advances[15]. Abay B Mane explained yoga can improve pulmonary capacities, chest wall expansion, forced expiratory lung volumes. They observed the changes by studying on sedentary & yogic population[16]. B Bakke & others observed decrease in FEV1 levels in both smokers & non smoker dust & gas exposed workers group. They noticed decreased FVC values in smokers & in dust & gas exposed workers. They found similar agents like oil mist, oil vapour & formaldehyde etc, these will diminish lung functions[17]. Subhrata moitra performed several studies on goldsmith exposed & unexposed workers. The outcomes of their study shows decreased FVC, PEFR, FEF25%, FEF50% & FEF75% levels in exposed goldsmith workers. People working under heavy fumes & gases environment since 5-10years are suffering with respiratory disturbances. They also observed lung functional capacity[18]. Sultan Ayaub Meo & others observed decrease in FVC, PEFR, FEV1%, FEF25%, FEF50% levels in petroleum workers when compared with control group. They did not observe any difference in fractional exhaled nitric oxide levels, when they compared exhaled & non-exhaled workers group[19]. Vaithiyanadane V & others assessed pulmonary function tests in swimmers & non swimmers. They observed increase in FVC, VC, FEV & MVV levels. Their parameters signifies physical activity can improve inspiratory & expiratory muscles activity[20].

Conclusion:

We observed decrease in FVC, PEFR, FEV25% & FEV1% in senior workers. We didn't observe much variation in 1-10 years of experienced people. It is preferable to use masks while performing work. LPG workers should practice

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yoga techniques or daily exercise, which may improve their health from upcoming disorders.

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