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ORIGINAL ARTICLE

Effect of Smoking on Chest Expansion, Respiratory and Lung Functions

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ABSTRACT

Objective: To highlight the effect of smoking on chest expansion, respiratory and lung functions.

Study Design: Case control study.

Place and Duration of Study: Department of Pulmonology, Ghulam Muhammad Mahar Medical College, Sukkur from 1st June 2021 to 30th November 2021.

Methodology: One hundred and fifty individuals were enrolled. Interviews were taken in form of focal group discussion from each smoker (n=100) and non-smoker (n=50) participants about smoking history and their clinical pulmonary systems. Age of smoking, average consumption of cigarette was also some of the questions asked and responses were documented from smokers. Respiratory lung function test was conducted in all of the individuals using chest expansion and lung function test was performed in all individuals using spirometry and respiratory-muscle test. The spirometry measurements were calculated through forced expiratory volume calculation within 1st second (FEV_1) and the vital capacity (FVC) and FEV_1/FVC ratio. All measurements were taken as average of three trials.

Results: Majority of the study participants were in the age group of 13-25 years. Highest frequency of smoking was observed within 1-3year. Majority of the smokers (48%) were taking ≤10 cigarettes in a day. Low nicotine dependence was observed in 90% of the smokers.

Conclusion: Majority of the participants were taking ≤10 cigarettes in a day. Chest expansion was considerably higher in smokers as compared to non-smokers.

Keywords: Cigarette smoking, Youth, Respiratory distress, Chest expansion

INTRODUCTION

Cigarette smoking is a major health problem that leads to many life threatening disorders and worsens the already existing condition. Its prevalence is escalating with every passing year and posing major health risks to many populations especially among young people. In addition to various other complications, it became the key problem of cardiovascular and respiratory diseases. Consequently, habit of smoking badly affects normal respiratory functioning of the body.[1-3] Respiratory function test (RFT) gives early indication of respiratory system deterioration even before appearing clinical symptoms, thus can be prove helpful in reducing the incidence of respiratory disease in smokers.[4-6]

Respiratory function test can be performed in number of ways including lung volume, chest expansion measurement, respiratory muscle strength and flow with spirometry.[5,6] Measurement of chest expansion can be taken by simply measuring diameter and circumference and it is an inexpensive way.[4] Maximal expiratory and aspiratory pressure are also simple, non-invasive and inexpensive method for finding muscle strength that can be measured at mouth. Lung volume show functioning of respiratory system.[7] Spirometry is also considered useful tool for screening respiratory health.[5]

It has also showed smoking effect on adults and decreased pulmonary/respiratory functioning such as expiratory and aspiratory volume and forced vital capacity was observed among smokers.[8-10] These lead to air-way obstruction and air-way diseases among adult smokers.[11] Duration and intensity of smoking further worsens the case and further deteriorate the health condition of both elderly and young smokers.[12] Present study was designed for highlighting the effect of cigarette smoking on lung/pulmonary functioning.

MATERIALS AND METHODS

This case control study was conducted at Department of Pulmonology, Ghulam Muhammad Mahar Medical College Sukkur from 1st June 2021 to 30th November 2021 and 150 individuals were enrolled for assessing their chest expansion and lung function. The inclusion criteria consisted of history of active smoking since last three years. Informed approval from institutional review committee as well as each enrolled participant was taken. The exclusion criteria specified that those participants suffering from lung disease, upper respiratory tract infections, carcinoma, auto immune disorders and passive smokers. Interviews were taken in form of focal group discussion from each smoker (n=100) and non-smoker (n=50) participant about smoking history, and their clinical pulmonary systems. Non-smoker was labelled as non-smoker and enrolled as participant only if the individual has never smoked. Age of smoking, average consumption of cigarette was also some of the questions asked and responses were documented from smokers. Respiratory function test was conducted in all of the individuals using chest expansion and lung function test was performed in all individuals using spirometry and respiratory-muscle test. Chest expansion details were documented through circumference measurements and diameter. All the individuals were asked for compete inhaling and exhaling in standing posture. The variance difference between both expansion and inhalation was used for calculating chest expansion. Chest-circumference was measured through tape at three various levels including axilla, xiphoid-process for middle chest, 10th costal-cartilage for inferior chest. Chest diameter measurement was done through calliper at AP, ML directions. The spirometry measurements were calculated through forced expiratory volume calculation within 1st second (FEV_1) and the vital capacity (FVC). All measurements were taken as average of three trials. Data was analyzed through SPSS version 25.0.

RESULTS

Majority of the study participants were in the age group of 15-18 years. Smoking history showed that highest frequency of smoking was observed within 1-3 year followed by 4-6 years and 7-12 months (Table 1). Smoking habits of study participants were also recorded. It highlights that, majority of the smokers (48%) were taking ≤10 cigarettes in a day. On the other hand, considerable number of smokers (30% and 22%) was taking upto 20 and 30 cigarettes in a day, respectively. Low nicotine dependence was observed in 90% of the smokers (Table 2)

The chest circumference value of axilla and 10th costal cartilage showed a statistically significant difference between the non-smoker and smoker with a decrease observed in case of smokers. Similarly, chest diameter was also decreased in smokers. Spirometry showed a significant difference in FVC with a mean decrease observed in smokers (Table 3)

Table 1: Mean age and smoking history of participants (n=100)

Smoking habits	No.	%
Smoking age (years)		
<15	29	29.0
15 – 18	71	71.0
Duration of smoking		
<1 month	6	6.0
1–3 month(s)	2	2.0
4–6 months	4	4.0
7–12 months	16	16.0
1–3 years	48	48.0
4–6 years	21	21.0
7–9 years	5	5.0

Table 2: Smoking habits and nicotine dependence (n=100)

Smoking habits	No.	%
Cigarette number/day		
≤10	48	48.0
11–20	30	30.0
21–30	22	22.0
Nicotine dependence		
Low	90	90.0
Medium	7	7.0
High	3	3.0

Table 3: Comparison of chest expansion among smokers and non-smokers

Chest expansion	Non-smokers (n=50)	Smokers (n=100)	p-value
Chest circumference (cm)			
Axilla	5.74±1.63	4.67±2.13	<0.05
Xiphoid process	5.33±1.68	5.28±2.32	
10th costal cartilage	4.65±1.18	4.23±2.05	
Chest diameter (cm)			
AP	3.55±0.59	3.07±0.71	<0.05
ML	3.53±0.45	3.29±0.86	
Spirometry (litre)			
FEV_1	2.97±0.63	2.69±0.63	<0.05
FVC	3.08±0.69	2.71±0.63	

DISCUSSION

Cigarette smoking is causing significant damage to overall health of the person mainly pulmonary or respiratory system. Many studies highlight that cigarette smoke not only causing problems for smokers but also to passive smokers thus causing deterioration of overall all the system. Respiratory function test gives early indication of respiratory system malfunctioning even before start appearing clinical symptoms.[13-15] Present study was designed for the evaluation of respiratory functioning in cigarette smoking individuals. All study parameters were significantly raised in smokers in contrast to non-smokers. Forced vital capacity, chest wall expansion and maximal expiratory muscle strength all was different and higher among smoker group.

Previous studies also tried to find out the association of cigarette smoking with malfunctioning of respiratory system.[11] In present study, chest expansion was higher among smokers as compared to non-smokers. This finding suggests that, smoking badly affect the chest expansion. Chest expansion reduction became visible by noticing reduction in chest wall movement and flexibility that would ultimately influence the pattern of breathing, leading to dyspnea. Similar has been reported in other studies somewhere else.[16,17] Average number of cigarette smoked every day was less than 10 which is also similar to previously reported studies.[17] Thus, it highlights that, smoking elicits temporary and sometime permanent changes in respiratory functioning such as coughing, airway obstruction and airway irritation.[18-20]

Result of present study might prove helpful for cessation of cigarette smoking especially among youngsters. It leads to various short term problems including cough, airway irritation to number of long term implication and life-threatening complications even to cancer. It not only elicits response to smokers itself but also to other people through passive smoking.

CONCLUSION

Most of the smokers started smoking in the age of 15-18years and the duration of smoking was 1-3 years. Majority of the participants were taking ≤10 cigarettes in a day. Chest expansion was considerably higher in non-smokers as compared to smokers. These findings would prove beneficial to encourage youth to quit smoking in early to prevent further deterioration in their health.

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