Original Research Article

Peak expiratory flow rate analysis among construction workers

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Received: 17-11-2020 / Revised: 06-01-2021 / Accepted: 05-02-2021

Abstract

Background: Construction workers who are employed in building and construction work like masonry, mixing of concrete plastering etc are exposed to silica, dust and cement. Most of them have decrease in pulmonary functions. Most of them have decrease in peak expiratory flow rate (PEFR). Early diagnosis is important as they are prone for occupational lung diseases such as chronic bronchitis, emphysema, bronchial asthma. **Aim:** To study pulmonary function test such as peak expiratory flow rate among construction workers compared with people working in clean environment. **Materials and methods:** The study was undertaken in 60 construction workers employed in building and construction work like masonry, mixing of concrete plastering etc. 100 healthy controls who work in clean atmosphere were also selected. Peak expiratory flow rate was measured by using Spirowin spirometer. **Results:** The mean PEFR of group 1 is 73.98 ± 13.78 and group 2 is 80.86 ± 19.07 liters. There is a decrease in the mean values of PEFR in group 1 compared to group 2 and the value is statistically significant ($p < 0.05$). **Conclusion:** In the present study shows that decrease in PEFR is statistically significant.

Key words: Construction workers, lung function, Peak Expiratory Flow Rate, Spirometry

Introduction

Millions of people are working daily in dusty environment [1]. They are exposed to different types of occupational health hazards developing occupational lung diseases. Workers engaged in building and construction work are at risk of developing impaired lung function due to exposure to high levels of dust generated at the construction site. Individuals working in dusty environment face the risk of inhaling particulate materials that may lead to adverse respiratory effects [2]. The occupationally related lung diseases are most likely due to the deposition of dust in the lung and are influenced by the sort of dusts, the period of exposure, the concentration and size of the airborne dust in the breathing zone [3]. All construction sites generate high level of dust typically from concrete,silica, asbestos, cement, wood, stone, sand etc. Construction dust is classified as PM-10, i.e., particulate matter of less than 10 µm diameter, and workers are at risk of inhaling these particles [1]. Silica is a mineral found in the earth's crust. Airborne silica dust is generated during chasing or drilling into concrete, brick work, ripping up old concrete, excavating sites with sandstone or clay. Workers are exposed to this airborne dust in construction site.Exposure to silica can cause chronic bronchitis, emphysema, acute and chronic silicosis, lung cancer etc [4]. Cement dust causes mucous hypersecretion initially, followed by lung function impairment, obstructive lung disease, restrictive lung disease and pneumoconiosis etc[4,5]. Dust particles which are inhaled and lodged in the lung irritate and setup an inflammatory reaction. Healing of this inflammation causes fibrosis leading to defective oxygen diffusion and impaired lung function [4] .In occupational respiratory diseases, spirometry is one of the most important diagnostic tools. It plays a significant role in diagnosis and prognosis of these diseases and describes the effect of restriction or obstruction on the lung function [6]. In view of the fact that various airborne particulate dusts puts the workers health into jeopardy, this study was undertaken to asses the effect of dust exposure on lung function of construction workers as compare to that of people working in clean environment.

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Materials and methods

Type of the study: cross sectional observational study

The present study was carried out after getting the permission from institutional ethical committee. The study was done in Gandhi medical college, Secunderabad for duration of 3 years i.e. from June 2009 to May 2012.

Study population: A total of 160 subjects were selected for the study. They were classified into two groups based on their occupation. Group 1 consisted of 60 subjects who were construction workers who worked for more than 5 years. Group 2 consisted of 100 subjects who worked in clean atmosphere. The study was done to compare lung function test, among long term construction workers and people working in clean atmosphere.

Inclusion criteria: The study was undertaken in 60 construction workers employed in building and construction work like masonry, mixing of concrete plastering etc. 100 apparently healthy control subjects who work in a clean atmosphere were also selected. All subjects were matched for age, height, weight and all were non smokers.

Exclusion criteria: Subjects with clinical abnormalities of vertebral column and thoracic cage, anemia, diabetes mellitus, hypertension,

pulmonary tuberculosis, bronchial asthma, chronic bronchitis, emphysema and other respiratory diseases and subjects who had undergone abdominal or chest surgery were excluded from the study.

Methods

Peak expiratory flow rate was studied using Spirowin at a fixed time of the day to minimize diurnal variation. After taking detailed history and anthropometric data, the lung function tests were done from 9 am to 11 am in standing position. The test was repeated three times and the results were obtained as liters.

Statistical analysis: The results were subjected to statistical analysis and shown in tabular form**.** For comparisons between group1 and group 2 Student's t test is used. Mean and Standard deviation values of the parameters were calculated.

Results

Table 1 represents the age distribution and PEFR values among subjects and controls. The mean age for group 1 was 36 ± 8.6 and for group 2 is 39.4 ± 12.9 years. Statistically there is no significant difference of age between the groups ($p > 0.05$). The mean PEFR of group 1 is 73.98 ± 13.78 and mean PEFR of group 2 is 80.86 ± 19.07. There is a decrease in the mean values of PEFR in group 1 in compared to group 2 but the value is statistically significant ($p < 0.05$).

Table 1: age distribution and PEFR values among subjects and controls

Age(in years)	Group 1 (Construction Workers)	Group 2 (Controls)
25-34	27	49
35-44	23	19
45-54	8	16
55-64	1	10
65-74	1	6
PEFR	73.98 ± 13.78	80.86 ± 19.07

Discussion

The mean duration of exposure in the Present study is more than 5 years which is similar to previous study [1] where the mean duration of exposure was in range 6-10 years. Total of 60 males & 100 controls were included in the present study. In Smilee Johncy et al study 61 healthy male subjects and 60 controls were included. All were employed in building and construction work like masonry, mixing the concrete, plastering etc. In the present study age group is from 20-60 years when compared to Smilee Johncy et al study where age ranging was from 20 to 50 years and in Dr. Rajula Tyagi et.al study 20-39 year age group were included [7]. In the present study on spirometry all the 60 subjects who were involved in construction work showed significant reduction in PEFR, this was correlating with previous studies [1, 7, 8]. Some Previous studies showed decrease in PEFR who were working in silica and cement mill [3, 9-11] and are similar to the present study.

Conclusion

The present study shows that decrease in PEFR is statistically significant. Pulmonary dysfunction in long term construction workers is generally of restrictive nature but also shows sign of decreased flow. The Spirowin showed reduction in lung volumes and expiratory flow rates in construction workers .

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Conflict of Interest: Nil
Source of support:Nil