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EFFECT OF OCCUPATIONAL HAZARD ON FEV1/FVC RATIO AMONG CEMENT WORKERS OF GUWAHATI CITY---A CROSS SECTIONAL STUDY

Physiology

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ABSTRACT

Background: The aim of the present study is to observe any significant variations in the pulmonary function in response to the exposure to the cement dust particles.

Methods: Pulmonary function parameters were obtained from 30 cement dust exposed and 30 non cement exposed male individuals between 20-40 years using Medspiror (HELIOS) Electronic spirometer keeping the room temperature at 24 degree Celsius in the department of Physiology, Gauhati Medical College, Guwahati, Assam. For statistical analysis, the value of the pulmonary function parameters were presented as Mean±standard deviation

Results: It was observed that FEV1 showed a significant decrease value and simultaneous decrease in FEV1/FVC ratio among the cement dust exposed workers

Conclusions: We can conclude that exposure to the cement can lead to the occurrence of respiratory symptoms and mainly shows obstructive respiratory pattern of illness.

KEYWORDS

Age groups 20-40 years, Cement dust particles, Male, Medspiror (HELIOS) Electronic spirometer

INTRODUCTION:

COPD is defined as an inflammatory respiratory disease, largely caused by exposure to tobacco smoke. The disease is characterized by a progressive and incompletely reversible airflow obstruction. The value of the history and physical examination in diagnosing chronic obstructive pulmonary disease (COPD) is uncertain [1]. It has been demonstrated that dust particles have got adverse effects on the health of a human being; especially it has got adverse effect on respiratory system. Exposure of healthy persons to the pollutants may result in reductions in pulmonary function. Chronic pulmonary problems have been reported in one fifth of persons exposed to the pollutants. Most of the individuals exposed to the cement dust particles have been seen to complain of reduced pulmonary function parameters and along with that they complain of tightness of the chest , sometimes difficulty in taking respiration [2]. The safety of working in a highly dusty environment is of serious concern. Among the populations who are severely exposed to this occupational hazard are workers in cement plants.

The pollutants in the cement industry are emitted from the various production processes from the material such as the raw material, crusher, rotary kiln, cranes, mills, storage silos and packing section, etc [3].There are evidences of increased prevalence of respiratory symptoms among exposed cement workers but the level of the risk of developing chronic obstructive pulmonary disease (COPD) has been uncertain, as only very few such studies have been performed in the cement industry [4]. Cement is produced through a series of processes including quarrying, crushing, milling, blending, and kiln burning to form clinker, cement milling and packaging. Dust is emitted during these processes[5]. Exposure to Portland cement of smoking and nonsmoking Yugoslavian cement workers had been reported to significantly increase the prevalence of chronic bronchitis and airflow obstruction[6]. Mortality from COPD has increased substantially over the past 20 years [7]. A few studies have been performed related to the relationship of cement worker with that of obstructive lung disease in this part of the world. Out of all the values we get from the lung function tests, we mainly concerned with Fev1 and Fev1/Fvc ratio. Because it is the Fev1 and Fev1/Fvc ratio that is mainly affected in obstructive lung disease. Because in obstructive lung pathology the expiratory component is mainly affected.

In this study our aim is to see if there are any significant changes seen among the cement dust workers with respect to their lung function when compared to the other individuals of the same age group.

MATERIALS AND METHODS:

The study was conducted in the Department of Physiology, Gauhati Medical College, Guwahati, Assam, India. Study was performed after obtaining full consent from them. Thirty (30) healthy male individuals between 20-40 years not working in cement factory were selected by simplified random sampling from Guwahati city. 30 male cement workers were also selected of the same group from a cement factory of Guwahati city.

Material used was Medspiror (HELIOS) electronic spirometer

EXCLUSION CRITERIA:

1) All female individuals
2) Male individuals below 20 and above 40 years
3) Individuals suffering from Obstructive lung diseases like bronchial asthma, emphysema; Restrictive lung diseases like pneumoconiosis, tuberculosis;
4) Hypertensive and diabetes
5) All smokers
6) Individuals working in the cement factories for less than 1 year.

Method: Room temperature was maintained optimally at 24 degrees Celsius. All the subjects were tested upon between 9 am to 12 noon in order to rule out any alterations imposed by diurnal variations in respiratory parameters. Before the examination I took consent from the individuals The subject was allowed to sit comfortably in a chair and breathe normally. The mouthpiece placed snugly in his mouth and nose clip applied to his nose so that he breathes only through the mouth piece.

The subject was asked to breathe normaly. Now the subject was asked to take deep maximal inspiration and then expire forcefully up to its maximum point and the baseline forced vital capacity noted. After that the subject was allowed to maximally inspire and expire as quickly as they can for 15 seconds and the baseline maximal voluntary ventilation obtained.

RESULTS:

Mean age of cement workers and non cement workers were 27.63±5.82 and 29.46±5.01 respectively with no significant difference ("p" value 0.19). Mean values of FEV_1/FVC ratio of non cement and cement workers were found to be 84.93+-6.40 and 71.98+-12.99 respectively. Values obtained in these two different groups were compared by unpaired t-test. The results showed that there is significant difference in the FEV_1/FVC ratio between the cement workers and non cement workers ("p" <0.05)

TABLE 1- AGE DISTRIBUTION OF CEMENT WORKERS AND NON CEMENT WORKERS

Parameters	Non cement workers (Mean±SD)	Cement workers (Mean±SD)	p-value
Age (years)	29.46± 5.01	27.63 ± 5.82	0.19

TABLE 2- FEV1/FEV RATIO AMONG CEMENT WORKERS AND NON CEMENT WORKERS

Parameters	Non cement workers (Mean±SD)	Cement workers (Mean±SD)	p-value
FEV1/FVC ratio (in%)	84.93± 6.40	71.98 ±12.99	< .05

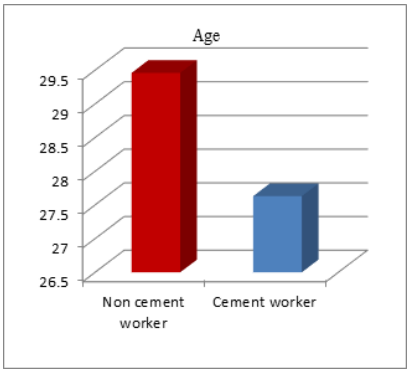

FIGURE 1: SHOWING THE AGE DISTRIBUTION AMONG TWO STUDY GROUPS

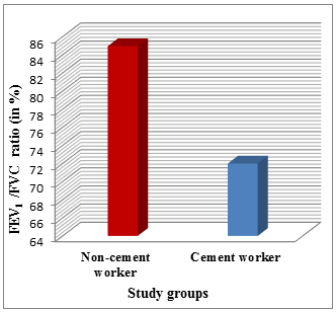

FIGURE 2: VARIATION OF FEV1/FVC RATIO AMONG TWO STUDY GROUPS

DISCUSSION:

Physiologically, only particles less than 10μm (also termed as fine dust) are known to be inhaled into the smaller bronchioles, thus affecting the ventilatory lung function and also responsible for the prevalence of respiratory symptoms [8].The workers who are constantly working in the cement factory for more than 1 year have been suffering from some of the respiratory illness most probably of obstructive in origin. It has been seen that these workers are not smokers and neither they have got any respiratory and any other systemic illness. Even after that there is significant decrease in the Fev1/Fvc ratio in these groups of people when compared with that of other individuals who are not working in the cement factory. There has to be some pathology related to that of cement particles that cause significant obstructive disease of lung. It has been seen that the cement workers were having some difficulties related to the expiration activities rather than inspiration.

CONCLUSION & FUTURE SCOPE:

Variation in the values of different lung function parameters among the individuals who are exposed to occupational hazards like the dust of cement factory is a very important topic for discussion. Further studies and similar experiments among larger study groups, known respiratory illness patients and among different genders and ethnic comparison should be conducted to get more information. There is a scope of study related to the extent of obstruction seen among the workers who are working in the industry for more than 1 year. For that further elaborate study can also be done.

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