

A Study on Pulmonary Function among Workers of Sugar Factory in Villupuram District- A Cross-Sectional Study

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ABSTRACT

The organic dust of sugarcane contains high concentrations of bioaerosols such as bacteria, actinomycetes, and fungi of plant and animal origin cause pulmonary impairment among sugar factory workers.

Aim: 1) To find out the overall prevalence of pulmonary impairment of sugar factory workers.

Study Design: A cross-sectional study was conducted on 152 permanent sugar factory workers at the factory. Simple Random Sampling is used.

Materials and Method: A semi-structured questionnaire is used for collecting data and their medical history. The pulmonary function Forced Vital Capacity (FVC), FEV1 is the amount of air you can force from your lungs in one second. FEV1/FVC (%) was recorded by a portable computerized digital Spirometer. To access the effect of occupational exposure, the workers were divided into three groups based upon their experience i.e. 6-10 years, 11-15 years, and 16-20 years.

Results: The overall prevalence of pulmonary impairments was found to be 31.06%. Among impairments, 58.3% are restrictive 33.3% are obstructive and 8.3% are disease caused by mixed impairments. Among diseased 63% are non-smokers and 37% are smokers.

Conclusions: This study illustrated there is an association between years of experience and pulmonary impairment. The sugar factory workers have to know awareness about safety standards and measures like wearing Masks, Gloves while working, thereby reducing pulmonary impairments. By adopting modern innovative technologies by the management in the sugar factory, thus reducing pulmonary impairments is possible.

Keywords: Occupational Health, Pulmonary impairment, Health Promotion

INTRODUCTION

Pulmonary dysfunction is one of the worldwide health burdens. According to WHO report it is estimated that 235 million people suffer from asthma (pulmonary problem). These pulmonary problems cause nearly 4 million deaths per year. The Indian sugarcane industry plays a leading role in the global sugar market; it is the world's second-largest producer after Brazil. Tamilnadu is one of the largest sugar producer's states in India. Villupuram is the largest district in the state. 30% of the population directly and indirectly involved in Sugarcane farming. "Bagassosis" is one of the respiratory disease caused by inhalation of substance called bagasse dust, which is commonly described under the heading of hypersensitivity pneumonitis and is also known as a variant of farmers' lung. Bagasse is produced from sugarcane crushing which is 0.5–3 microns in size known as respirable dust, to which sugar factory workers are exposed by their occupation. The aim of this study is to find out the overall prevalence of pulmonary impairment of sugar factory workers

MATERIALS & METHODS

A semi-structured questionnaire is used for collecting data and their medical history. The permission to carry out the study was brought from the management of

the Sugar factory. The data obtained from the study was entered and coded in Microsoft Excel and exported to SPSS (version 23). Descriptive statistics were used to calculate the prevalence. The Cochran-Armitage test is performed in Epi Info.

Ethical clearance was obtained from the institutional ethical committee of SRM School of Public Health, SRM Institute of Science and Technology before the commencement of the study. Informed consent was taken from each participant during the study and the objective of the study was clearly explained.

Selection of samples:

The study sample comprised of male permanent workers employed in the sugar factory, Villupuram. There were 234 permanent employees, based upon our inclusion and exclusion criteria 152 participants were selected. Simple Random Sampling and lottery techniques were used.

Inclusion criteria: 1) Only male workers 2) Age of workers between 24-58 years 3) Experience above 6 years in the Sugar factory industry.

Exclusion criteria: Those who are not willing to participate in the study.

Pulmonary Function Testing:

The test was performed by the portable computerized digital Spirometer. The Procedure of the test was explained to every participant and given a trial before doing their pulmonary function test. Each participant tries 3 times and the best of the reading was noted for better efficacy. Spirometry tests were performed by all the participants. The pulmonary impairments were classified as per Miller's prediction quadrant.

Statistical Analysis

Cochran-Armitage test and Chi-square were used for statistical analysis. Cochran-Armitage test for trend will take account of any trend of infection level

($p = \text{infected}/\text{total}$) with dosage. Chi-square for linear trend analysis through Epi Info the OR states how likely a factory worker is to become ill/diseased based on the level of exposure to silica, organic dust, bagasse, etc.

RESULT

The overall Prevalence of pulmonary impairment among 152 Samples was 31.6% where n=48 and 68.4% where n=104 found healthy.

Table 1: FVC, FEV1, FEV1/FVC % Values of Participants.

	FVC	FEV1	FEV1/FVC
Mean	2.70	2.48	90.87
Median	2.79	2.48	90.87
Std.Deviation	0.583	0.562	106.666

Table 2: Percentage of Impairments among the total participants.

Outcome	(n)	Percentage%
Healthy	104	68.4%
Diseased	48	31.6%
Total	152	100%

Table 3: Percentage among the Impairments.

Outcome	(n)	Percentage%
Restrictive	28	58.3%
Obstructive	16	33.3%
Mixed	4	8.3%
Total	48	100

Among the Impairments, 58.3% where (n=28) are suffering from the restrictive type of impairments and 33.3% where (n=16) and Mixed impairment had 8.3%.

Table 4: Association between years of experience and exposure

Years of Exposure	Healthy	Diseased	Odds Ratio
6-10 Years	31	10	1.00
11-15 Years	43	13	0.937
16-20 Years	30	25	2.583

A factory worker exposed to 11 to 15 years of work in the factory has similar exposure status as a factory worker for 6-10 years that is being exposed to this silica, dust, etc. from 6 to 15 years does not have much impact on their health (OR=0.937 for exposure is 2 and OR=1 for exposure is 1). On the other hand, a worker who exposed to more than 15 years (i.e. 16 to 20 years exposure =3) is nearly 3 times (2.583) as likely to become ill compared to those working in the factory for 6 to 10 years

(exposure=1). Chi square is used to find the association of year of experience and exposure. The p value is 0.019 which shows that there is statistical significance between year of experience and exposure.

CONCLUSION

This is the first study carried out in the Villupuram district in Tamilnadu among the sugarcane workers upon our knowledge. The working in the sugarcane industry can cause the pulmonary abnormalities, (Tab.2) so it is very much important to follow safety standards and measures like wearing Masks, Gloves while working and it avoids the maximum exposure. The sugarcane processing industry involves different sub-departments, (Godown workers, Engineering workers, purifying Workers) which are performed in distinct processing units. The only limitation of the study is it fails to interpret the exposure and outcome of each department done by Bohadana et al and Nikhade et al. This study clearly explains in the increase in years of experience causes pulmonary impairments. So, this explains clearly use of safety measures should be addressed immediately and health promotion and awareness should be regularly monitored.

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