

A Cross Sectional Study to Estimate the Risk of Developing Chronic Obstructive Pulmonary Disease Among Flour Mill Workers

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ABSTRACT

Introduction: Flour dust is a heterogeneous substance with respiratory sensitizing properties. Wheat flour is a complex organic dust with a large diversity of antigenic or allergic components. In this study the association for risk of developing COPD among flour mill workers will be assessed using Peak expiratory flow rate and lung function questionnaire.

Method: 101 flour mill workers were approached and consented for the assessment. Peak expiratory flow rate (PEFR) were assessed using peak flow meter and risk of developing COPD were assessed using lung function questionnaire (LFQ).

Result: 7(6.93%) out of 101 flour mill workers were falling under a risk of developing COPD and 94(93.07%) were falling under no risk of developing COPD.

23(22.77%) out of 101 flour mill workers were found to have minimum obstruction and 78(77.23%) were found to have no obstruction.

Conclusion: It was concluded that there were no significant association found for risk of developing COPD among flour mill workers.

Keywords: Flour mill workers, COPD, P.E.F.R., Lung function questionnaire.

INTRODUCTION

Industrialization has been established to optimally fulfil various human needs. Over the course of time, some industries exert hazardous effect on the health of human beings. ^[1] The respiratory health effects have been documented in workers exposed to a variety of dusts in small and large-scale industries which generate dust during their production process. ^[2] Diseases of the upper respiratory tract are widespread in worker exposed to various dusts. ^[3]

Flour dust is a heterogeneous substance with respiratory sensitizing properties and long-

term exposure to it may cause acute or chronic respiratory disease. ^[1]

Wheat flour is a complex organic dust with a large diversity of antigenic or allergic components. The antigens involved can be wheat flour proteins, flour parasites, silica, fungi, insects or technical additives such as enzymes. ^[2] Wheat flour consists of water soluble albumins, salt- soluble globulins, gliadins and glutens. ^[2] Albumins and globulins appear to be the most important proteins contributing to immediate hypersensitivity reactions to wheat proteins. ^[2] Gliadin and glutenin account for a high proportion (80%) of the wheat proteins.

^[2]Gliadin and glutenin have also been found effectively implicated in wheat flour-related allergic diseases and these are the risk factor of COPD. Chronic obstructive pulmonary disease is a preventable and treatable disease state characterized by progressive airflow limitation that is not fully reversible.

Prevalence of COPD in all over the world: The total burden of COPD is about 14.84 million in 2011, 55.3 million in 2016 and 65 million in 2021. ^[7]

Prevalence of COPD in the India, 11.4% in the male and 7.4% in the female, in 2021. ^[8]

MATERIALS & METHODS

METHODS

This study was a cross-sectional study conducted on 101 flour mill workers in and around Pune by convenient sampling method within 6 months. Workers selected were having experience of at least 7 years in flour mills within age group of 25-65 years. Flour mill workers who have been already diagnosed with COPD and having history of lung disease or other respiratory disorders that may confound the diagnosis of COPD were excluded from the study.

The study was done after obtaining ethical clearance from the ethical committee. Participants fulfilling the inclusion and exclusion criteria were selected and written consent was taken. The participants were assessed for P.E.F.R. value with Peak flow

meter and risk of developing copd was assessed with Lung function questionnaire. Descriptive statistics was analyzed using Microsoft excel sheet and chi square test was analyzed using OpenEpi and Chi square test was performed to find out the correlation between LFQ and PEF.R. Levels of significance was set at p value <0.05

RESULT

In this study 101 flour mill workers were assessed for P.E.F.R. and risk of developing copd between the age group of 25 years to 65 years. The Peak Flow Meter was used for assessment of P.E.F.R. (Peak Expiratory Flow Rate) and lung function questionnaire was used for risk of developing copd.

Table 1: Demographic characteristics of participants(n=101)

VARIABLES	MEAN±SD
Age(in years)	44.65±11.21
LFQ	23.06±1.53
PEFR(in L/min)	334.38±44.38

Table 2: Risk of COPD based on LFQ

VARIABLES	TOTAL
At risk	7(6.93%)
No risk	94(93.07%)

LFQ Categorization

<18 = at risk

>18 = no risk

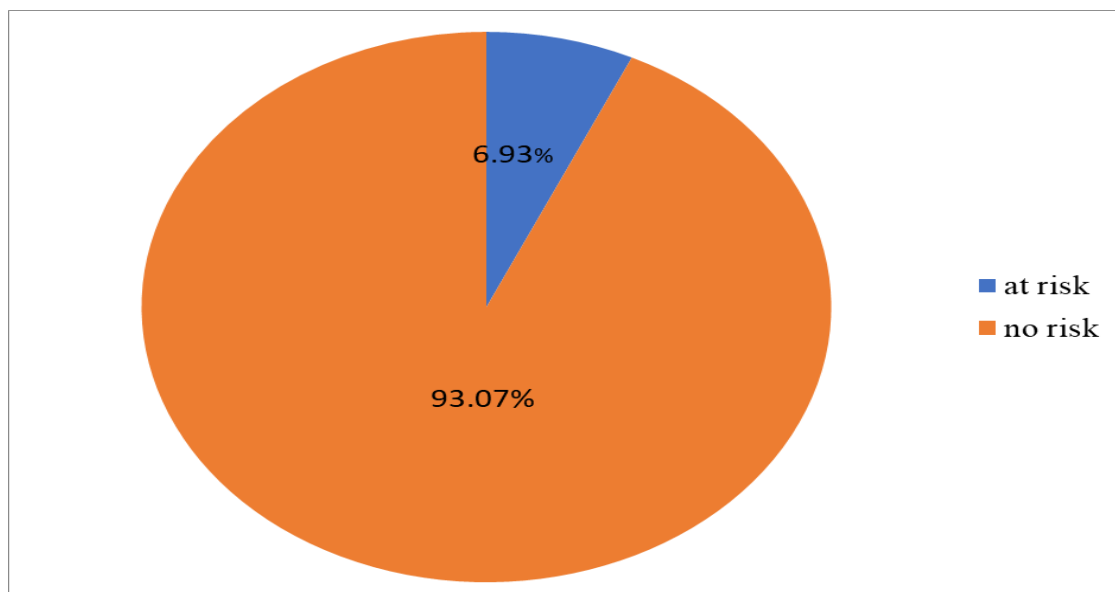


Table 3: Risk of COPD based on PEFR

VARIABLES	TOTAL
No obstruction	78(77.23%)
Minimum obstruction	23(22.77%)
Moderate obstruction	0(0%)
Maximum obstruction	0(0%)

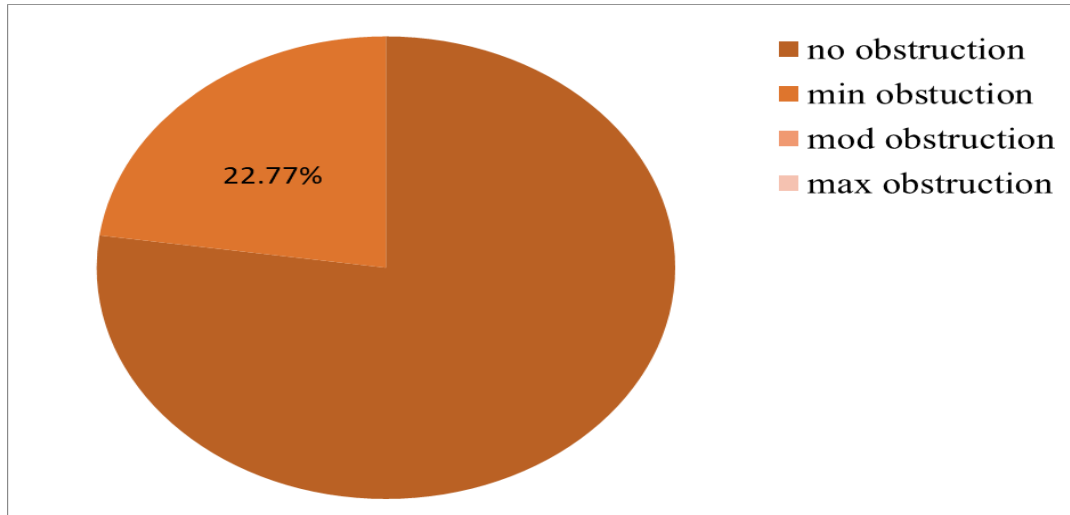


Table 4: Association Between LFQ and PEFR

VARIABLES	P VALUE
LFQ and PEFR	0.9081

Not significant at $p < 0.05$. No significant association found between risk of developing COPD and expiratory flow rate which indicates that there is no significant correlation between risk of developing COPD and expiratory flow rate.

A total of 101 flour mill workers falling under age group of 25-65 were the subject population of this study.

7(6.93%) out of 101 flour mill workers were falling under a risk of developing COPD and 94(93.07%) were falling under no risk of developing COPD.

23(22.77%) out of 101 flour mill workers were found to have minimum obstruction and 78(77.23%) were found to have no obstruction.

No significant association found between risk of developing COPD and expiratory flow rate which indicates that there is no significant correlation between risk of developing COPD and expiratory flow rate.

DISCUSSION

Chronic obstructive pulmonary disease (COPD) is a significant public health concern globally, with occupational exposures being

identified as one of the key risk factors for its development.

The purpose of this study was to find out the risk of developing COPD among flour mill workers.

A cross-sectional study was done which included 101 flour mill workers within the age group of 25 to 65 years. The findings of our study reveal that majority of flour mill workers were falling under the category of no significant risk based on LFQ which signifies that they have no risk of developing COPD in future.

23(22.77%) and 78(77.23%) out of 101 flour mill workers were falling under the category of minimum obstruction and no obstruction. 7(6.93%) and 94(93.07%) were falling under the category of, at risk and no risk of developing COPD in future. There were no workers who had moderate and maximum obstruction of airways.

Now a days, flour mill workers aware about safety measures, proper equipment usage, and hygiene practices at the workplace. This includes training on handling machinery safely, wearing protective gear, maintaining cleanliness to prevent contamination, and being vigilant about potential hazards like dust explosions

This study has found that mean age of workers was 44.65 years, mean PEFr was 334.38 L/min(which signifies no obstruction) and mean LFQ score was 23.06(no risk).

Concerning the previous study, higher prevalence of respiratory symptoms which causes COPD in flour mill workers. Wheat flour is a complex organic dust with a large diversity of antigenic or allergic components. The antigens involved can be wheat flour proteins, flour parasites, silica, fungi, insects or technical additives such as enzymes. [2] Wheat flour consists of water soluble albumins, salt- soluble globulins, gliadins and glutens. As the flour dust particles easily enter the respiratory tract of an exposed person. These particles attach to the inner wall of the respiratory tract and disturb the process of inhalation and exhalation of air. The inner cell wall of the respiratory tract does not accept the foreign particles (flour dust), causing a slight irritation in the respiratory tract. It may be due to unhygienic condition and poorly ventilated work place. [2]

Today's flour mill machinery often incorporates advanced dust control systems to minimize airborne flour particles. This includes the use of enclosed systems, ventilation systems, personal protective equipments and dust extraction equipment to capture and remove flour dust before it can be inhaled by workers.

Implementation of modern milling techniques and machinery could have reduced the generation of respirable dust, consequently lowering the risk of respiratory conditions.

In contrast, older machines may lack effective dust control measures, leading to higher levels of airborne flour particles and

increased risk of respiratory diseases such as COPD (Chronic Obstructive Pulmonary Disease) or asthma among workers.

Our analysis revealed that older workers in flour mill industries are more likely than younger to have minimum obstruction.

Ageing is process likely linked to chronic and disabling disease which may be possible reason for this finding.

As age increases defense mechanism of body will decline and vulnerability to health risk likely increase which may be other possible explanation.

CONCLUSION

Our study concluded that there were no significant association found for risk of developing COPD among flour mill workers. No significant association found between risk of developing COPD and expiratory flow rate.

Declaration by Authors

Ethical Approval: Approved

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Conflict of Interest: None

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