

Occupational Asthma Severity among Flour Mill Workers and Adherence to Preventive Guidelines

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Abstract

Aims: To assess the prevalence of occupational asthma among flour mill workers in Giza governorate and adherence to preventive guidelines.

Design: A cross-sectional study

Method: This study was conducted from August 2018 till November 2018 in Egypt. Data were collected through Occupational asthma questionnaire, Spirometry test record, and Workplace observational checklist.

Results: The findings represented that 100% of flour mill workers complained of occupational asthma, 31.1%, and 27.9% of them had moderate and intermittent degree respectively. Concerning occupational asthma symptoms, 68% of flour mill workers complained of persistent cough, 45.9% of them waked up at night due to shortness of breath, and all of them complained of chest wheezing. Moderate and severe airway obstruction represented 18% and 17.2% of them respectively. There were lack of most of preventive measures in the flour mill.

Keywords: Occupational asthma, Flour Mill Workers, and Preventive Guidelines.

Introduction

The flour dust is one of the most common hazards in the flour mills. It is the finely ground particles of cereal or pulses (including contaminants) which result from any grinding process and from any subsequent handling and use of that flour. Flour dust is a hazardous substance; it is a respiratory sensitizer and the cause of allergic rhinitis. It is also an irritant and may give rise to short term respiratory, nasal and eye symptoms. It may provoke an asthmatic attack in flour mill workers with or without pre-existing disease, lead to chronic bronchitis and is known to cause occupational asthma.¹

Occupational asthma is an international problem affecting large number of workers. Few studies were done on occupational asthma in Egypt focusing mainly on asthma symptoms. A study done to investigate the presence of occupational asthma among workers at flour mills of south Cairo which indicated that 25% of mills workers had asthma related to work, the asthma symptoms appeared during work and improved after leaving workplace. Also, the asthmatic workers had lower level of spirometric parameters in relation to non-asthmatic.²

Therefore, **the aim of this study** was to assess the prevalence of occupational asthma among flour mill workers in Giza governorate and adherence to preventive guidelines.

Research Questions: To achieve the aim of the study the following research questions were formulated:

1. What is the prevalence of occupational asthma among flour mill workers?

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2. What are the occupational asthma degrees and symptoms prevailing among flour mill workers?
3. What is the impact of occupational asthma on lung function of flour mill workers?
4. What are the preventive measures applied in the flour mill?

Materials and Method

Research Design: A cross-sectional design will be utilized to fulfill the aim of the study.

Subjects: A convenient sample of 122 flour mill workers from El-Haram flour mill constituted the subjects of the study. The sample size was calculated based on a G-power version 3.1.1 for power analysis. A Power of .95 ($\beta = 1 - .95 = .05$) at alpha .05 (one-sided) was used as the significance level, and effect size= 0.3 was utilized. The inclusion criteria were working at least one year in the flour mill, full-time (8 hours a day for 6 days per week). The exclusion criteria were having a history of bronchial asthma before joining the work or family history and having present or past history of severe respiratory infections as extensive pulmonary tuberculosis. These criteria were according to British Occupational Health Research Foundation [BOHRF].³

Setting: This study was conducted at South Cairo & Giza Mills & Bakeries Company. It is the largest company in Egypt for the manufacture of flour and has the largest number of workers. It includes 950 workers. El-Haram Mill Branch was selected to implement the study because it includes the largest number of workers. It includes 300 workers out of 950 workers in all mills of the company. In addition, El-Haram mill is the main branch of the company.

Tools of data collection: Data were collected using two tools: **I:** Occupational Asthma Questionnaire: It structured by the researcher based on extensive literature reviews. It included three parts: **(a)** Workers' personal characteristics which was consisted of 9 questions **(b)** Occupational asthma symptoms: It included 22 questions related to reported asthma symptoms as wheezing and tightness in the chest, cough and whether these symptoms improved when the worker was away from work.....etc. **(c)** occupational asthma flare-ups symptoms: It consisted of 3 questions related to reported sudden symptoms as coughing, shortness of breath, and wheezing.

II: Spirometry Test Record: Spirometry is a standard test used to measure how well patient lungs are functioning. The test works by measuring airflow into and out of patient lungs using spirometer. To make a spirometry test, the patient sit and breathe into a small machine (spirometer). This medical device records the amount of air patient breathe in and out to measure the Forced Expiratory Volume in one second (FEV1) and the speed of patient breathe. The readings were recorded by the researcher. Spirometry tests used to diagnose asthmatic patients⁴.

III: Workplace Observational Checklist: It was developed by the researcher based on Stobnika and Gorny⁵. It included five preventive measures that should be available in the workplace to minimize the risks that may contribute to occupational asthma among workers. A) Flour dust control measures. B) Ventilation measures. C) Personal Protective Equipment. D) First aid facilities. E) Waste management measures.

Ethical Consideration: The research proposal and the tools were submitted to the Committee of Research Ethics at the Faculty of Nursing, Cairo-University. Approval to start the study was obtained on 28 May 2018. A written approval was obtained from the director of the medical sector at South Cairo & Giza Mills & Bakeries Company at 8, July 2018 to collect data from the workers who are working at El-Haram flour mill.

Also, written informed consents were obtained from the workers who were working at El-Haram flour mill after explaining the aim of the study, its benefits and risks if any, duration of the study, data collection tools and the procedure of the study. The researcher informed the workers that all data gathered during the study would be confidential and they had the right to withdraw from the study at any time without giving any reason and without any pressure from the head of the department. Besides, workers were informed that the obtained data would be used for the purpose of this study and it would not be reused in other studies except with their permission.

Statistical Analysis: The collected data were tabulated and analyzed using personal computer and statistical package for the social science (SPSS) program version 22. Descriptive statistics utilized were frequency, percentage, mean, and standard deviation.

Results

Findings is presented in three parts: 1) Description of flour mill workers' personal characteristics. 2) Description of occupational asthma and lung function among flour mill workers. 3) Preventive measures applied in the flour mill.

Part I: Description of flour mill workers' personal characteristics (Table 1): In relation to personal characteristics of flour mill workers, table (1) shows that, 51.6% and 23% of workers aged 45 to less than 55 and from 25 to < 45 years old respectively with a mean of 48.11 ± 8.61 years. Also, the table reveals that 40.1% of workers had work experience of 20 to less than 30 years while 18% had work experience of 1 - < 10 years with a mean of 17.86 ± 8.69 years. As for history of smoking, 17.2% were moderate smokers and 6.6% were heavy smokers.

Part II: Description of occupational asthma and asthma flare-up symptoms among flour mill workers (Tables 2 & figure 1). Regarding prevalence of occupational asthma, 100% of flour mill workers complained from occupational asthma. As indicated in figure (1), 31.1%, 27.9% of flour mill workers had moderate and intermittent degree of occupational asthma respectively. Concerning occupational asthma symptoms, table (2) shows that 68% of flour mill workers complained of persistent cough and 82% coughed up sputum on most days, 45.9% waked up at night from shortness of breath. Moreover, table (2) shows that 27.9% of workers exposed to asthma flare-ups in the form of sudden cough, wheezing, and shortness of breathing.

Part III: Description of degrees of airway obstruction based on scores of lung function (figure 2). As indicated in figure (2), 27.9% of flour mill workers had normal lung function while 36.9% of them had mild airway obstruction. Moderate and severe airway obstruction represented 18% and 17.2% respectively.

Part IV: Preventive measures applied in the flour mill (Tables 3 & 4). Regarding preventive measures applied by flour mill workers, table (3) shows that the available measures were only those that are undertaken by workers. Table (4) indicates that there were good working extraction units and all equipment were clean and in good repair, the rest of the preventive measures were not available.

Table (1) Percentage distribution of flour mill workers' personal characteristics (n=122).

Personal characteristics	Frequency	%
Age / year		
25 < 35	13	10.7
35 < 45	15	12.3
45 < 55	63	51.6
55 – 60	31	25.4
$\bar{x} \pm SD$	48.11 ± 8.61 years	
Duration of work:		
1 - < 10	22	18
10 - < 20	39	32
20 - < 30	49	40.2
30- 38	12	9.8
$\bar{x} \pm SD$	17.86 ± 8.69 years	
History of smoking:		
No	82	67.2
Yes:	40	32.8
< 10 cigarettes/day (light smoker)	11	9
10-20 cigarettes/day (moderate smoker)	21	17.2
> 20 cigarettes/day (heavy smoker)	8	6.6

Table (2) Percentage distribution of occupational asthma & flare-ups symptoms among flour mill workers (n=122).

Variables	N	%
Occupational asthma symptoms:		
Chest wheezing	122	100
Breathless when the wheezing was present	122	100
Presence of wheezing without having cold	122	100
Presence of wheezing during or after work	122	100
Wheezing improved during holidays or weekend	121	99.2
Wheeze or cough gets worse during the working time	114	93.4
Woken up with a feeling of tightness in the chest at any time	57	46.7
Persistent cough	83	68
Cough up sputum on most days	100	82
Wake up at night from persistent cough	46	37.7
Short of breath during sleeping flat on the back	77	63.1
Short of breath on walking up a slight incline	105	86.1
Wake up at night from shortness of breath	56	45.9
Asthma flare-ups symptoms	34	27.9

*Responses aren't mutually exclusive.

Table (3) Availability of preventive measures toward flour dust control in the flour mill.

Preventive measures	Available
Flour dust control:	
Fast delivery of flour	Yes
Short storage time of flour	Yes
Automatically closing doors	No
Restriction of entrance to areas with high dust levels	No
Relevant warning signs clearly displayed	No
Washing hands facilities	Yes
Taking shower facilities	No
Storage places of working clothes	Yes
Avoidance of eating, drinking, or smoking at the mill	Yes

Table (4) Availability of preventive measures toward ventilation and Personal Protective Equipment (PPE) in the flour mill.

Preventive measures	Available
Ventilation:	
All areas are ventilated sufficiently	No
There are extraction units	Yes
Extraction units are in good working condition	Yes
The filter screens are free from any buildup of dust	No
There are air conditioning units / fans	No
All equipment are clean & in good repair	Yes
Personal Protective Equipment (PPE):	
Adequate for the task in dusted areas	No
Adequate arrangements for the storage, cleaning or disposal of dusted P.P.E	No
a. Overalls	No
b. Gloves	No
c. Face/dust masks	No
d. Respiratory equipment	No

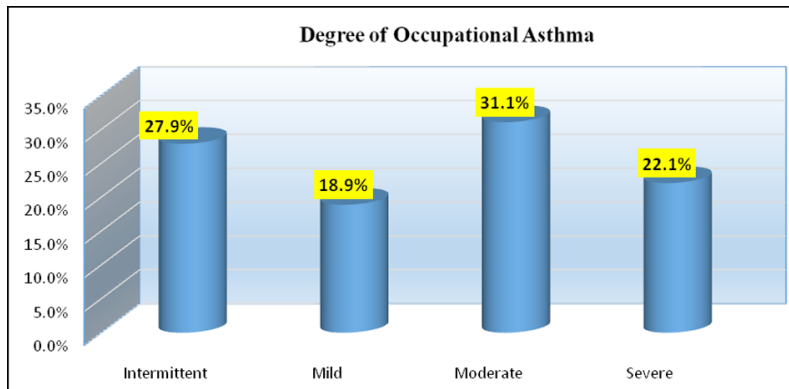


Figure (1) Percentage distribution of occupational asthma degree among flour mill workers (n=122).

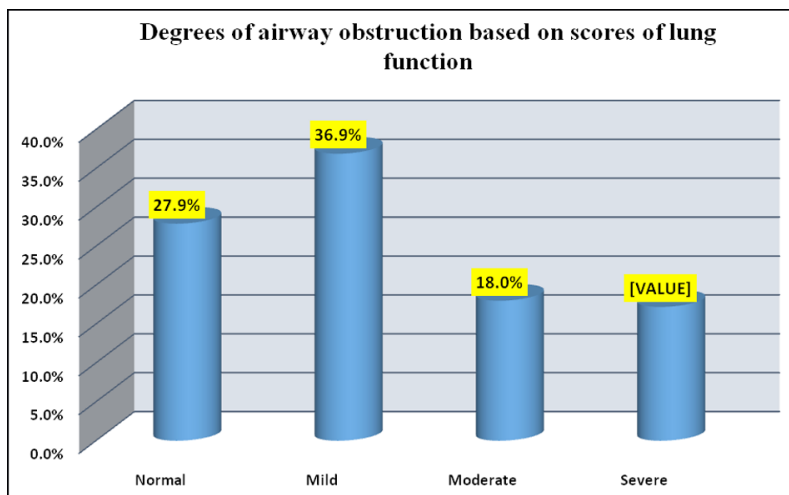


Figure (2) Percentage distribution of airway obstruction based on scores of lung function among flour mill workers (n=122).

Discussion

Concerning the prevalence of occupational asthma among flour mill workers, the current study revealed that all flour mill workers included in the study complained of occupational asthma. This finding was in agreement to some extent with the results of El-Gewily et al² study done in two flour mills at South Cairo on 120 flour mill workers, they found that more than one quarter of them complained of occupational asthma. In addition, this finding was in agreement to some extent with Ajeel, & Al-yassen⁶. Study done in flour mills at Basrah on 185 flour mill workers and found around half of flour mill workers complained of occupational asthma.

In relation to degrees of occupational asthma, the current study indicated that around one third of flour mill workers had moderated degree of occupational asthma and more than one quarter had intermittent degree of occupational asthma. The results of this study might be related to the flour mill workers who participated in the study had work experience for more than 10 years in the flour mill, this is according to Groene et al⁷, they represented that continuous and prolonged exposure to flour dust increased likelihood of reported higher degree of occupational asthma.

Regarding occupational asthma symptoms that were prevailing among flour mill workers, the current study indicated that, all of the flour mill workers had occupational asthma symptoms, around half of them woken up with tightness in chest at any time and most of them had improved chest wheezing during holidays or weekend. They attributed the cause of their chest wheezing to the flour dust. These findings were consistent with El-Gewily et al², they found that all of flour mill workers had occupational asthma symptoms, one third of them woken up with tightness in chest at any time and a majority of them had improved chest wheezing during holidays or weekend.

In relation to degrees of airway obstruction based on lung function scores of flour mill workers, the current study revealed that more than one quarter of flour mill workers had normal lung function and more than one third of them had mild degree of airway obstruction. However, less than one quarter of them had either moderate or severe airway obstruction. These findings agreed to some extent with El-Gewily et al² they found that, more than two thirds of flour mill workers had normal lung function and the quarter of them had mild degree of airway obstruction, while the minority of them had severe airway obstruction.

Regarding preventive measures applied by flour mill workers, the current study shows that the available measures were only those that are undertaken by workers as fast delivery of flour and short storage time of flour. Moreover, there were good working extraction units and all equipment were clean and in good repair, the rest of the preventive measures were not available. These findings were in agreement with Hosseinabadiet al⁸ who studied the relationship between lungs function and flour dust in flour factory workers in Iran and found lack of preventive measures in environmental conditions as improper ventilation systems and deficiency in equipment used in the milling process that led to excessive workload on the studied workers.

Conclusion

The results of this study indicated that occupational asthma was prevalent among all flour mill workers and all of them had definite occupational asthma symptoms. In addition, more than one third of them had moderate and severe airway obstruction. More than half of them had moderate persistent and severe persistent occupational asthma degree. Moreover, there were lack of most of preventive measures.

Recommendations: Based on the findings of this research, the following are recommended:

1. Periodic medical examination for early detection and early management of occupational asthma.
2. Pre-employment and in-job training for workers on preventive measures of occupational asthma.
3. More researches to study the effect of more potential confounding factors on the level of exposure, and effective ways of managing occupational asthma.

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