

EFFECT OF CONTROL-BASED ASTHMA MANAGEMENT STRATEGY ON OCCUPATIONAL ASTHMA AMONG FLOUR MILL WORKERS.

¹Dr. Marwa Mamdouh Shaban, ²Prof. Nagah Mahmoud Abdou, ³Assistant. Prof. Afaf Abdel Rehim

¹Lecturer, Community Health Nursing Department, Faculty of Nursing, Cairo University, Egypt

²Professor at Community Health Nursing Department, Faculty of Nursing, Cairo University, Egypt

³Assistant Professor at Community Health Nursing Department, Faculty of Nursing, Cairo University, Egypt

Corresponding author

Dr. Marwa Mamdouh Shaban, Lecturer, Community Health Nursing Department,

Faculty of Nursing, Cairo University, Egypt.

E-mail: marwamamdouh.mamdouh70@gmail.com

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Abstract Background: Flour dust is a respiratory sensitizer and is known to cause occupational asthma. The asthmatic flour mill workers need effective occupational asthma management to achieve clinical control of the disease and maintain that control through the implementation of control-based management strategy.

Aim: To evaluate the effect of control-based asthma management strategy on occupational asthma control among flour mill workers in Giza Governorate.

Design: A quasi-experimental one group pretest-posttest design was utilized.

Sample: A purposive sample of 122 flour mill workers with occupational asthma.

Setting: This study was conducted at El-Haram mill of South Cairo & Giza Mills & Bakeries Company, was selected to implement the study.

Toolsof data collection: Five tools were used: a- Occupational Asthma Questionnaire, b- Inhaler Adherence and Satisfaction Questionnaire, and c- Inhaler Technique Observational Checklist, d- Workplace Observational Checklist, e- Spirometry Test Record.

Results: Moderate occupational asthma represented 31.1% of workers in pre-test which decreased to 28.7% and 18% in post and follow-up tests respectively. Also, the percentage of workers who had normal lung function increased from 27.9% in pre-test to 49.3% the in-follow-up test. There was a significant increase in inhaler adherence and satisfaction mean scores in post and follow-up tests than in pre-test. There was lack of most of the preventive measures in pre and follow-up tests.

Recommendation: Periodic medical examination for flour mill workers for early detection of occupational asthma. In-job training for workers on preventive measures of occupational asthma.

Key words: Occupational asthma, Flour Mill Workers, and Preventive Guidelines.

INTRODUCTION

Occupational asthma is an international problem affecting large number of workers. Exposure to grain and flour dust is the second commonest reported cause of occupational asthma. 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(El-Gewily, et al,2018).

Yawn, Brennehan, Ramey, Cabana, & Markson, (2014) mentioned that the asthmatic flour mill workers need effective occupational asthma management to achieve clinical control of the disease and maintain that control through the implementation of control-based management strategy. Control-based asthma management strategy is a worker-focused, individualized, flexible approach to occupational asthma management that allows adjustments to regimens over time, thus considering the variable nature of the disease within each worker.

Therefore, the aim of this study was to evaluate the effect of control-based asthma management strategy on occupational asthma control among flour mill workers in Giza Governorate.

Research Hypotheses:

To fulfill the aim of this study, the following research hypotheses were formulated:

H.1: Flour mill workers diagnosed with occupational asthma who are exposed to the control-based management strategy will have better degree of occupational asthma than before implementation of the strategy.

H.2: Flour mill workers diagnosed with occupational asthma who are exposed to the control-based management strategy will have better lung function score than before implementation of the strategy as evidenced by degree of airway obstruction.

H.3: Flour mill workers diagnosed with occupational asthma who are exposed to the control-based management strategy will report better adherence behavior to inhalers than before implementation of the strategy.

H.4: Flour mill workers diagnosed with occupational asthma who are exposed to the control-based management strategy will report better satisfaction to inhalers than before implementation of the strategy.

MATERIALS AND METHODS

Research Design: Quasi-experimental one group pretest-posttest design will be utilized to fulfill the aim of the study.

Subjects: A purposive 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 ($\beta = 1 - .05 = .95$) 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], 2017).

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 five 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. (c) occupational asthma flare-ups symptoms: It consisted of 3 questions related to reported sudden symptoms as coughing, shortness of breath, and wheezing.

II: Worker's Inhaler Adherence and Satisfaction Questionnaire: It was developed by the researcher based on extensive literature review. It included two parts *1st part.* Pre/ post worker's inhaler adherence: This part assessed the worker adherence to the use of inhaler, and it included 10 questions related to when to use the inhaler, using the inhaler only when on feeling breathless, missing out doses. *2nd part.* Pre/ post worker satisfaction with inhaler: This part assessed the workers' satisfaction regarding inhaler use. It included 10 questions related to inhaler preparation, using, keeping, carrying.

III: Inhaler Technique Observational Checklist: It is adopted from Basheti, Anticevitch, Armour & Reddel (2014). It consisted of ten steps that assess the workers way of using the inhaler. This tool was used as pre/posttest.

IV-Workplace Observational Checklist: It was developed by the researcher based on Stobnika and Gorny, (2015). 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.

V: 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 patients (Cirino,2017).

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

The study results will be presented in the following sequence:

Part I: Description of flour mill workers' personal characteristics (Tables 1).

Part II: Description of occupational asthma and lung function among flour mill workers in pre, post, and follow-up tests (Table 3,4& Figure 1, 2). This part will cover hypotheses 1 &2.

Part III: Workers' compliance to prescribed management (Table 5, Figure 3, 4).This part will cover hypotheses 3 & 4.

Part IV: Preventive measures applied in the flour mill (Table 6,7).

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. In addition to, 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 lung function among flour mill workers in pre, post, and follow-up tests(Table 3,4 & Figure 1, 2). Regarding prevalence of occupational asthma, Figure 1 reveals that all degrees of asthma percentages changed to the better. Moderate occupational asthma represented 31.1% of workers in pre-test which decreased to 28.7% and 18% in post and follow-up tests respectively. The percentage of severe asthma workers decreased from 22.1% in the pre-test to 20.5% and 12.3% in the post and follow-up tests respectively. As well, mild asthma increased from 18.9% in the pre-test to 22.9% and 36.9% in the post and follow-up tests respectively. Also, intermittent asthma increased from 27.9% to 32% in the follow-up.In addition to table 2shows a significant reduction in the means of occupational asthma degree in post, and follow-up tests ($F= 31.16, P= 0.006$).

Figure 2 clarifies that, the percentage of workers had normal lung function increased from 27.9% in pre-test to 49.3% the in-follow-up test. Moderate and severe airway obstruction represented 18% and 17.2% in the pre-test respectively decreased to 9.8% in the follow-up test.Table 3 shows a highly statistically significant difference between the means of airway obstruction scores in pre and follow-up tests ($t = 9.718, p = 0.000$).

Part III: Workers' compliance to prescribed management(figure 3,4-table5). As indicated in figure 3 regarding adherence of workers to inhalers, figure 3 shows that4.9% of them were adherent to inhaler in pre-test increased to 75.4% and 79.5% in post and follow-up tests respectively. Nonadherence represented 95.1%, 24.6% and 20.5% in pre, post and follow-up tests respectively.Regarding the workers satisfaction to inhaler, figure 4clarifies thatonly 4.1% of them were satisfied with using inhalers in pre-test increased to 60.7% and 42.6% in post and follow-up tests respectively.

Regarding non-pharmacological management table 5 shows that, 17.2% were moderate smokers in pre-test decreased to 16.3% and 12.2% in post and follow-up tests respectively. In relation to physical activity, 22.1% of flour mill workers did physical activity in pre-test increased to 36.8% and 63.1% in post and follow-up tests respectively. For breathing exercises, the table clarifies that only 6.5% did the exercises in pre-test compared to 67.2% and 86.1% in post

and follow-up tests respectively. Regarding influenza vaccine, table 5 shows that no one took influenza vaccine in pre-test and only 5.7% took the vaccine in post and follow-up tests. Also, the table indicates that 45.9% ate healthy diet in pre-test which increased to 90.1% in post and follow-up tests. In pre-test, the table shows also that 67.2% avoided the outdoor air pollutant while 94.2% avoided the outdoor air pollutant in post and follow-up tests.

Part IV: Preventive measures applied in the flour mill (Tables 6&7). Regarding preventive measures applied by flour mill workers, table 6 shows that the preventive measures to control flour dust remained the same as before the intervention. Table 7 shows that there was no change in ventilation measures in the follow-up test. There were good working extraction units, and all equipment were clean and in good repair in pre and follow-up tests. The rest of the preventive measures were not available.

DISCUSSION

Concerning degrees of occupational asthma among flour mill workers, the results of the current study showed that all degrees of occupational asthma percentages changed to the better in the post and follow-up tests than in pre-test (Figure 1). This supports hypothesis number one that the flour mill workers diagnosed with occupational asthma who are exposed to the control-based management strategy will have lower degree of occupational asthma than before implementation of the strategy.

These results were in the same line with a study done by Elbanna, Sileem, Bahgat & Ibrahim (2017) to determine the effect of bronchial asthma education program on asthma control among 84 adults at Mansoura district, Egypt. They found that the degree of asthma changed to the better in the post-test among most asthmatic patients. Also, the current results agreed with a study conducted by Rodrigues, Pereira & Dalcin (2014) to evaluate the effects of an outpatient education program among 63 patients with uncontrolled asthma in Brazil. They found improvement in post-test as around half of them had severe degree of asthma. Compared to most of them in pre-test. Moreover, in the current study, severe asthma represented only a minority of workers.

Related to lung function of flour mill workers, the results of the current study showed that the degree of airway obstruction based on lung function scores changed to be better in the post and follow-up tests than in pre-test (figure 2). This result supported hypothesis number two that flour mill workers diagnosed with occupational asthma who are exposed to the control-based management strategy will have better lung functions than before implementation of the strategy as evidenced by degree of airway obstruction. The results of the current study indicated that, only around one quarter of flour mill workers had normal lung function in pre-test increased to around half of them in follow-up test. Less than fifth of flour mill workers had moderate and severe airway obstruction in the pre-test, decreased to a minority in the follow-up test.

Regarding flour mill workers compliance to prescribed management. The results of the current study indicated that flour mill workers adherence practices toward inhaler (figure 3), the results of the current study showed a significant increase in inhaler adherence mean scores in post and follow-up tests than in pre-test among flour mill workers. These results supported hypothesis number three that flour mill workers diagnosed with occupational asthma who are exposed to the control-based management strategy will report better adherence behavior to inhalers than before implementation of the strategy. As shown in figure 3 that a minority of flour mill workers were adherent to inhalers in pre-test while most of them were adherent to inhalers in post and follow-up tests. These results agreed with results of Mohsen, Hanafy, Fathy & El-Gilany (2019) study. It was done in Mansoura Chest Hospital among 133 already diagnosed inpatient cases of Chronic Obstructive Pulmonary Disease (COPD) and found that around half of the patients were not adherent to prescribed inhalers.

Regarding the workers satisfaction to inhalers, the results of the current study showed that flour mill workers reported better satisfaction to inhalers in post and follow-up tests than in pre-test (figure 4). This result supported hypothesis number four that flour mill workers diagnosed with occupational asthma who are exposed to the control-based management strategy will report better satisfaction to inhalers than before implementation of the strategy. The minority of flour mill workers were satisfied with using inhalers in pre-test increased to around two thirds and more than one third of them in post and follow-up tests respectively. This result agreed with a study carried out by Galal et al., (2019) to evaluate medication adherence and treatment satisfaction among 474 asthmatic patients in Egypt, and they found that most asthmatic patients were unsatisfied with prescribed medications.

Concerning preventive measures applied in the flour mill, the results of the current study showed lack of environmental preventive measures for flour dust control (tables 6,7). These findings were in agreement with Hosseinabadi et al., (2013) who studied the relationship between lung 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. These findings might be related to lack of implementing occupational and environmental health guidelines as a result of high cost of engineering

controls as extraction units and individualized respiratory equipment (Shaban, Bader Eldin, Sharaa, 2021). In addition, lack of awareness of workers and administrative authorities as regards hazards of flour dust and preventive measures might have played part in the causation of these results. Moreover, inadequate income of workers might be a barrier to buy personal protective measures as respiratory equipment.

CONCLUSION

The results of this study indicated that all percentages of occupational asthma degrees changed to be better after the application of control-based management strategy. In addition, the percentage of flour mill workers had normal lung function increased in follow-up test than in pre-test. There was a significant increase in inhaler adherence mean scores in post and follow-up tests than in pre-test. As well, flour mill workers reported better satisfaction to inhalers in post and follow-up tests than in pre-test. Moreover, there were lack of most of the preventive measures in pre and follow-up tests.

RECOMMENDATIONS

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

- 1- Periodic medical examination for flour mill workers 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 research is needed to study the effect of more potential confounding factors on the level of exposure, and effective ways of managing occupational asthma.
- 4- Control-based management strategy should be applied in the Egyptian flour mills.
- 5- Enforcement of workplace preventive measures toward flour dust control.
- 6- Provide the Personal Protective Equipment (PPE) to flour mill workers and monitor their use.

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