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Determination of the prevalence of asthma and asthma symptoms in bakery workers in Malatya

Adem Taha Ozdemir^{a,*}, Mehmet Kayhan^b, Erdem Topal^c

^aInonu University, Faculty of Medicine, Department of Family Medicine, Malatya, Türkiye

^bBolu Abant İzzet Baysal University, Faculty of Medicine, Department of Family Medicine, Bolu, Türkiye

^cInonu University, Faculty of Medicine, Department of Pediatric Allergy and Immunology, Malatya, Türkiye

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Abstract

Aim: Asthma is one of the most commonly reported occupational lung diseases. Studies indicate that one of the primary causes of occupational asthma is baker's asthma. This study aims to determine the prevalence of asthma and asthma-related symptoms among bakery workers in Malatya, Turkey.

Materials and Methods: Designed as a cross-sectional study, this research was conducted through a survey to assess the prevalence of asthma, the frequency of asthma symptoms, and factors influencing asthma among bakery workers in Malatya between December 2022 and May 2023.

Results: The study included 142 participants, comprising 139 men and 3 women. Of the participants, 35.5% had been working for over 21 years, while 34% had been employed for less than 10 years. Approximately 20% of participants reported atopic complaints. While 6.3% of workers were previously diagnosed with asthma, 14.1% had at least two asthma-related symptoms. The risk of asthma was notably higher among workers in dough production compared to those in other departments.

Conclusion: Occupational exposure appears to significantly contribute to the increased frequency of asthma among bakers working in dough production.



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Introduction

Lung diseases are among the most frequently diagnosed occupational illnesses worldwide [1]. Asthma, in particular, is one of the most commonly reported occupational lung diseases [2]. It is defined as a chronic condition marked by recurrent episodes of difficulty breathing and wheezing, which vary in severity and frequency [3]. Atopy is a significant risk factor in the development of asthma [4]. Atopy refers to an increased formation of IgE antibodies against foreign antigens introduced via inhalation, ingestion, or contact [5]. Various studies show that approximately 50% of asthma cases are linked to atopy [6].

Occupational asthma is characterized by airway narrowing, hypersensitivity, and inflammation, triggered by specific environmental exposures in the workplace [7]. Occupational asthma most commonly affects bakers, people working in dusty environments, spray painters, healthcare workers, miners, individuals exposed to chemicals, agri-

cultural workers, welders, barbers and hairdressers, and food processing workers [2]. Among these, baker's asthma is the most prevalent form of occupational asthma [8,9]. Consequently, this study aims to determine the prevalence of asthma and asthma symptoms among bakery workers in Malatya.

Materials and Methods

Our study, a cross-sectional survey, assessed asthma prevalence, the frequency of asthma symptoms, and factors affecting asthma among bakery workers in Malatya between December 2022 and May 2023. During the study period, 1,000 bakers in central Malatya were approached, with a sample size of 131 calculated based on an asthma prevalence rate of 11.9% reported in Sigari et al.'s study, providing 95% confidence and 85% power [10]. In total, 142 participants were included. The study utilized questions from the European Community Respiratory Health Survey (ECRHS) to comprehensively evaluate asthma. A simple random sampling method was used to select participants, and data were collected through face-to-face interviews with those who consented to participate. Partici-

*Corresponding author:

Email address: ademtahaozdemir@gmail.com (Adem Taha Ozdemir)

pants were asked, “Have you been diagnosed with asthma by a physician?” Those who answered affirmatively were classified as having asthma. Participants reporting symptoms such as runny nose, sneezing, eye redness and tearing, and skin redness and itching were classified as having an atopic predisposition. Ethical approval for the research was obtained from the İnönü University Ethics Committee (Decision No 2022/3942). Additionally, permission was secured from the Malatya Chamber of Bakers, and participants provided informed consent.

Statistical analysis

Data were analyzed using SPSS (Statistical Package for the Social Sciences; SPSS Inc., Chicago, IL), Version 22. Quantitative data are presented as frequency (n) and percentage (%). Differences between categorical variables were compared using the Pearson chi-square test and Fisher’s exact test, as appropriate.

The Pearson chi-square test was used to assess the association between two categorical variables. For this test to be valid, the expected frequency in each cell must be at least 5. When this assumption was not met, Fisher’s exact test was applied. Fisher’s exact test provides more reliable results, particularly when sample sizes are small or when the assumptions of the chi-square test are violated.

Results

A total of 142 participants, comprising 139 (97.9%) men and 3 (2.1%) women, were included in the study. Of these, 17 (12.2%) were 27 years old or younger, 44 (31.7%) were between 28 and 38 years old, 52 (37.4%) were between 39 and 49 years old, and 26 (18.7%) were 50 years old or older. Among the employees, 48 (34%) had been working as bakers for less than 10 years, 43 (30.5%) had been working for 11–20 years, and 50 (35.5%) had been working for more than 21 years. Regarding their job positions in the bakery, 47 (33.1%) worked in dough production, 30 (21.1%) made pita from dough, 32 (22.5%) worked at the stove, and 33 (23.2%) worked at the counter. When the participants were evaluated according to their job position in the bakery, it was observed that the frequency of asthma was significantly higher among those working in dough production compared to those in other departments ($p < 0.05$). However, no significant relationship was found between the presence of asthma and the number of years spent working in the bakery ($p > 0.05$) (Table 1).

Among the study participants, 9 (6.3%) had been diagnosed with asthma by a doctor. According to the European Community Respiratory Health Survey (ECRHS), 20 (14.2%) employees reported having at least two asthma-related symptoms. When the asthma status of participants who answered “yes” to the ECRHS survey questions about asthma symptoms was compared, each question showed a statistically significant difference ($p < 0.05$). Additionally, all asthma patients had at least two asthma-related symptoms ($p < 0.05$) (Table 2).

In our study, individuals with an atopic disposition were significantly more likely to report at least two asthma-related symptoms compared to those without an atopic disposition ($p < 0.001$). However, there was no statistically significant difference when comparing individuals

with atopy-related complaints and those diagnosed with asthma ($p > 0.05$). Furthermore, individuals with an atopic disposition were found to have significantly more atopy-related and asthma-related complaints at work compared to those without atopic disposition ($p < 0.001$) (Table 3).

Discussion

In the study, 6.3% of participants received an asthma diagnosis from a physician, while 14.2% exhibited at least two asthma-related symptoms within the past year. Venables et al. reported that the occurrence of at least two asthma symptoms—such as cough, wheezing, chest tightness, wheezing in smoky or dusty environments, or waking up due to shortness of breath—demonstrates a sensitivity of 91% and a specificity of 85% for asthma diagnosis when these symptoms appear in specific situations over the past year [11]. In the study by Gyu-Young Hur et al., the prevalence of asthma among bakers was 13.5% [12]. Similarly, Sigari et al. found the asthma prevalence among bakers to be 11.9% [10], while Jacobs et al. reported a prevalence of 9% in their study [13]. In our research, the prevalence of asthma was lower compared to other studies. This may be attributed to our inclusion criteria, which only accounted for individuals with a prior asthma diagnosis. If pulmonary function testing (PFT) had been conducted on individuals with at least two symptoms, a significant number of these cases might have received an asthma diagnosis. Although we initially planned PFT testing for participants with two or more symptoms, logistical challenges following the February 6 earthquakes which resulted in the destruction or closure of many bakeries prevented access to these individuals for testing. Those who could be contacted by phone were advised to visit a respiratory diseases clinic in their city to undergo PFT testing and further assessment for asthma.

In our study, no statistically significant relationship was observed between atopy complaints and a diagnosis of asthma. However, individuals with an atopic predisposition were significantly more likely to exhibit at least two asthma-related symptoms compared to non-atopic individuals. Previous studies have reported a significant association between atopy and asthma [12,13]. The lack of statistical significance in the relationship between atopy symptoms and asthma diagnosis in our study may be attributable to the limited sample size and the absence of further diagnostic evaluation in participants presenting with more than one asthma-related symptom.

Additionally, workplace atopy and asthma complaints were more common among atopic individuals, consistent with findings from Jacobs et al. [13].

The primary factor in the development of baker’s asthma is the flour used in dough preparation. Tests have shown that the IgE response to wheat, rye, and other types of flour is significantly elevated in baker’s asthma. The duration of exposure to wheat flour and the concentration of wheat flour also play an important role in the development of this response [12]. When the individuals participating in our study were evaluated based on their position in the bakery, it was observed that the frequency of asthma was significantly higher among those working in dough production compared to those working in other areas. In the

Table 1. Comparison of bakers' working environment and working year findings and their asthma diagnosis.

		Total		I have asthma		I don't have asthma		p
		n	%	n	%	n	%	
How many years has he been working at the bakery?	Less than 10 years	48	34	3	6.3	45	93.8	0.387*
	Between 11-20 years	43	30.5	1	2.3	42	97.7	
	More than 21 years	50	35.5	5	10.0	45	90.0	
	Total	14	100	9	6.4	132	93.6	
In what position does he work in the bakery?	Dough production	147	33.1	7	14.9	40	85.1	0.040*
	Pita making	30	21.1	1	3.3	31	96.9	
	Fireside	32	22.5	1	3.1	31	96.9	
	Stand	33	23.3	0	0.0	33	100.0	
	Total	142	100	9	6.3	133	93.7	

*Fisher's exact chi-square test was performed.

Table 2. Comparison of participants' responses to ECRHS survey questions and their asthma status.

Those with asthma-related symptoms (ERCHS survey)		Total		I have asthma		I don't have asthma		p
		n	%	n	%	n	%	
Have you felt wheezing in your chest at any time in the last year, when you did not have the flu or cold?	Yes	15	11.8	6	40.0	9	60.0	0.001*
	No	127	88.2	3	2.4	124	97.6	
Have you ever woken up with a tightness in your chest in the last year?	Yes	17	11.6	6	35.3	11	64.7	0.001*
	No	125	88.3	3	2.4	122	97.6	
Have you had a bout of shortness of breath while resting during the day in the last year?	Yes	8	5.3	4	50.0	4	50.0	0.001*
	No	134	94.7	5	3.7	129	96.3	
Have you ever felt short of breath after exertion or strenuous movement in the last year?	Yes	22	14.6	8	36.4	14	63.6	0.001*
	No	120	85.4	1	0.8	119	99.2	
Have you ever woken up with an attack of shortness of breath in the last year?	Yes	9	6	5	55.6	4	44.4	0.001*
	No	133	94	4	3.0	129	97.0	
Have you ever woken up with a coughing fit in the last year?	Yes	12	8	5	41.7	7	58.3	0.001**
	No	130	92	4	3.1	126	93.9	
Those who have at least two of the asthma-related symptoms	Yes	20	12.6	9	45.0	11	55.0	0.001*
	No	133	87.4	0	0.0	133	93.7	

*Fisher's exact chi-square test was performed. **Pearson chi square test was performed.

Table 3. Comparison of individuals with atopic complaints according to the presence of asthma-related symptoms and the increase in atopy-asthma complaints at work.

		Presence of atopy		p
		Yes	No	
Presence of asthma	Yes	4(13.3%)	5(4.5%)	0.094*
	No	26(86.7%)	107(95.5%)	
Presence of at least two asthma-related symptoms	Yes	13(43.3%)	7(6.3%)	0.001*
	No	17(56.7%)	105(93.8%)	
Increasing asthma complaints in the workplace	Yes	6(20%)	1(0.9%)	0.001*
	No	24(80%)	111(99.1%)	
Increasing number of atopy complaints in the workplace	Yes	6(20%)	1(0.9%)	0.001**
	No	24(80%)	111(99.1%)	

*Fisher's exact chi-square test was performed. **Pearson chi square test was performed.

study conducted by Gyu-Young Hur and colleagues, it was found that individuals with higher exposure to flour had more respiratory symptoms [12]. According to a study by

Yaşar Keskin and colleagues, individuals working in the production areas of the bakery had a significantly higher prevalence of asthma compared to those working at the

counter [14]. Although the duration of exposure to wheat flour and the concentration of wheat flour were not calculated in our study, it was assumed that workers in dough production were exposed to greater amounts of flour. Consequently, a significantly higher prevalence of asthma was observed in these workers. It was considered that this increase was due to occupational asthma caused by flour exposure. However, diagnosing occupational asthma or asthma aggravated by work is not straightforward. Diagnosis is made based on a combination of history-taking, spirometry, serial peak expiratory flow (PEF) measurements, detection of specific and non-specific bronchial hyperresponsiveness both at work and away from work, and, if possible, skin prick tests and specific IgE measurements through immunological tests [16]. Furthermore, having a prior diagnosis of asthma does not rule out the possibility of occupational asthma [16,17].

The study was initially designed to reach a broader sample and include PFT tests, but these goals were hindered by the earthquakes centered in Kahramanmaraş on February 6.

Conclusion

In our study, it was observed that all asthma patients responded affirmatively to at least two of the questions related to asthma symptoms in the past year from the European Community Respiratory Health Survey (ECRHS) questionnaire. This suggests that the ECRHS questionnaire can be effectively used in asthma screening.

While our study provides significant results in raising awareness of baker's asthma, a more detailed and specific study is necessary for a definitive diagnosis of baker's asthma. To reduce the risk of baker's asthma, workplace measures should include improving ventilation in areas where flour is handled, requiring the use of masks during periods of intense flour exposure, organizing rest areas away from the dough production section, implementing job rotation, and, if necessary, employing individuals with asthma or atopic conditions in areas other than dough production. These measures can help prevent the development of baker's asthma.

Conflict of interest

The authors declare no conflict of interest.

Financial disclosure

This study received no financial support.

Informed consent

Informed consent was obtained from all participants.

Ethical approval

Ethics approval was granted by İnönü University Faculty of Medicine Scientific Research and Publication Ethics Board, dated October 25, 2022 (Session No. 17, Decision No. 2022/3942).

Author contributions

All authors contributed to this study.

References

1. Altuntaş EH. Protection from occupational lung diseases. *Current Chest Diseases Series*. 2019;7(2):16-27.
2. Stanton SC. Occupational and environmental lung disease: occupational asthma. *Chron Respir Dis*. 2010;7(1):35-46.
3. World Health Organization. Asthma. 2013. Available from: <https://www.who.int/health-topics/asthma>. Accessed November 1, 2023.
4. Gold MS, Kemp AS. Atopic disease in childhood. *Med J Aust*. 2005;182(6):298-304.
5. Jaakkola MS, Ieromnimon A, Jaakkola JJ. Are atopy and specific Ig E to mites and molds important for adult asthma? *Journal of allergy and clinical immunology*. 2006;117(3):642-8.
6. Discovery. E. Asthma in Children: Risk Factors, Clinical Features and Prevention.1.
7. Jaakkola MS, Gautrin D, Malo JL. Disease occurrence and risk factors. *Asthma in the workplace*, 4th ed, Malo JL, Chan-Yeung M, Bernstein DI (Eds), CRC Press, Boca Raton, FL. 2013:18-39.
8. Mannino DM. How much asthma is occupationally related? *Occup Med*. 2000;15(2):359-368.
9. Houba R, Doekes G, Heederik D. Occupational respiratory allergy in bakery workers: a review of the literature. *American journal of industrial medicine*. 1998;34(6):529-46.
10. Sigari N, Rahimi E, Yazdanpanah K, Sharifian A. Prevalence of asthma and rhinitis in bakery workers in the city of Sanandaj, Iran. *Iranian journal of allergy, asthma, and immunology*. 2007;6(4):215-8.
11. McKinlay K, Venables K. Respiratory symptoms questionnaire for asthma epidemiology: validity and reproducibility. *Thorax*. 1993;48(12):1289.
12. Hur GY, Koh DH, Kim HA, Park HJ, Ye YM, Kim KS, et al. Prevalence of work-related symptoms and serum-specific antibodies to wheat flour in exposed workers in the bakery industry. *Respiratory medicine*. 2008;102(4):548-55.
13. Jacobs JH, Meijster T, Meijer E, Suarathana E, Heederik D. Wheat allergen exposure and the prevalence of work-related sensitization and allergy in bakery workers. *allergy* 2008;63(12):1597-604.
14. Keskin Y, Lüleci NE, Topuzoğlu A, Golabi P, Özyaral O, Tülbentçi M. Effects of Working Environment on Respiratory Complaints and Respiratory Function in Bakery Workers. *Ttb Occupational Health and Safety Journal*. 2006;7(27):39-44.
15. Ömür A, Ayşe SB. Allergic diseases BD. In Ankara: Ankara University Faculty of Medicine; 2008. *J Allergy-Special Topics*. 1(2):23-8.
16. Alberts WM, Brooks SM. Advances in occupational asthma. *Clinics in chest medicine*. 1992;13(2):281-302.
17. Cartier A. Definition and diagnosis of occupational asthma. *The European respiratory journal*. 1994;7(1):153-60.