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Awareness of environmental risk factors contributing to asthma exacerbations among asthmatic patients in the Jazan region, Saudi Arabia

Luai Alhazmi, MD[a], Omar Oraibi, MD[a], Areej Areeshi, MS[a], Nirmin Alhazmi, MS[a], Alyaj Hakami, MS[a], Talal Kariri, MS[a], Eyas Akish, MS[a], Abdullah Alamer, MS[a], Ahmed Sayed, MD[a], Mohammed Ali Madkhali, MD[a], Mohammed Somaili, MD[a], Tawfeeq Altherwi, MD[a], Ahmed Alhazmi, MS[a], Mohammed A. Madkhali, MD[a], Abdulrahman Hakami, MD[a,*]

Abstract

Bronchial asthma is a common chronic airway disease marked by reversible obstruction and bronchial hyperresponsiveness. Effective management relies on patient understanding of the condition and available treatments. This study aimed to assess awareness of asthma risk factors, exacerbations, and disease severity among the population in the Jazan region of Saudi Arabia. A cross-sectional observational study was conducted through social media platforms, targeting individuals from various cities in the Jazan region. A total of 633 participants completed structured questionnaires designed to assess their knowledge of asthma and its environmental risk factors. Data were analyzed using Statistical Package for the Social Sciences software. Out of the 633 participants, 506 (79.9%) demonstrated good awareness of the relationship between environmental risk factors and asthma exacerbations, while 127 (20.1%) exhibited poor awareness. Nearly all participants (99.2%) had prior knowledge of asthma, and 437 (69%) were aware of the link between environmental factors and exacerbations, making efforts to reduce exposure. House dust mites were identified as the most frequently reported cause of asthma exacerbations (69.5%), followed by respiratory infections (67.1%). A significant association was found between educational level and awareness of asthma's environmental triggers ($P = .020$), with participants holding bachelor's and diploma degrees showing higher levels of awareness compared to other educational groups. The overall level of awareness regarding environmental risk factors associated with asthma exacerbations was satisfactory, though gaps remain in understanding specific triggers such as respiratory infections, cold weather, and exercise. Educational attainment and a formal asthma diagnosis were significantly associated with greater awareness. Targeted educational interventions may help bridge these knowledge gaps, enhancing asthma management, and reducing exacerbations in the region.

Keywords: asthma exacerbations, awareness, environmental factors, Jazan region, risk factors

1. Introduction

Chronic lower respiratory tract inflammation, commonly known as asthma, is a widespread condition. Individuals with upper airway inflammatory illnesses are more likely to experience frequent chronic lower airway inflammation. Scientific understanding of asthma's definition and pathogenesis continues to improve, making it essential for healthcare professionals treating upper or lower airway inflammation to stay informed on these developments.[1]

Numerous risk factors contribute to asthma, increasing the likelihood of either developing the disease, or exacerbating its symptoms. These risk factors can be classified as indoor or outdoor allergens and air pollutants.[2] Common indoor air pollutants include tobacco smoke, excessive use of detergents, household pesticides, furred animals, and cockroaches.[3] Allergens such as cockroach dander, dust mites, molds, pollen, and furry animals, along with non-allergens like cold air, exercise, infections, smoke, and tobacco, trigger immune reactions that cause prolonged airway inflammation.[4]

Asthma affects all age groups. According to the Global Initiative for Asthma, the disease currently impacts 300 million people globally. Uncontrolled asthma can diminish the quality of life, restrict participation in activities, and, in some cases, lead to death. It is considered a severe global health issue,

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The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

[a] *Internal Medicine Department, Faculty of Medicine, Jazan University, Jazan, Saudi Arabia.*

** Correspondence: Abdulrahman Hakami, Internal Medicine Department, Faculty of Medicine, Jazan University, Jazan 45142 - PO Box 2097, Saudi Arabia (e-mail: Chestdr20@gmail.com; ayhakame@jazanu.edu.sa).*

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with the prevalence of asthma varying across different populations, ranging from 1% to 18%.[5] Epidemiological studies show that asthma is more common among children, particularly boys, making it the most prevalent chronic illness in this demographic.[6]

Asthma is one of the most common chronic respiratory conditions, affecting millions of people worldwide.[7] The prevalence of asthma continues to rise globally, particularly in regions with rapid urbanization and changing environmental conditions.[8] Various studies have shown that environmental factors, such as air pollution and allergens, significantly contribute to asthma exacerbations.[1,9] Education and early diagnosis play crucial roles in managing asthma, as studies have consistently shown that patients with a higher level of health literacy are better equipped to manage their symptoms and prevent exacerbations.[10]

In Saudi Arabia, over 2 million individuals are estimated to suffer from asthma, with prevalence rates among children ranging from 8% to 25%.[11,12] Asthma not only affects physical health but also significantly impacts the quality of life, leading to missed school or workdays, emergency hospital visits, and hospitalizations. The burden also extends to parents and caregivers.[13–16]

Patients with asthma need to understand the nature of their disease and its management. Research has shown that educating patients significantly improves compliance with treatment plans for chronic illnesses. Self-management education programs are designed to help asthmatic patients enhance healthcare practices, reduce morbidity, and limit the cost of care.[17]

A 2015 study assessed the Saudi population's knowledge and awareness of bronchial asthma. The study revealed that the majority of patients lacked adequate knowledge about asthma and were misusing their medications, which resulted in ineffective management and frequent emergency department visits.[18,19] Based on this knowledge gap, we hypothesized that there is insufficient awareness about asthma among residents of the Jazan region. This study was conducted to assess the awareness of asthma risk factors and exacerbations in Jazan and to explore strategies for educating the population about the disease.

2. Methodology

2.1. Study design and subject selection

We conducted a survey-based, cross-sectional observational study from January 2023 to December 2023, utilizing a validated questionnaire. The survey was distributed via online platforms to reach participants from multiple cities within the Jazan region. The study included mentally competent adults (aged 18 and above) who voluntarily agreed to participate. Individuals who declined participation, those with mental health conditions affecting decision-making, and those unable to make informed decisions were excluded. In total, 633 individuals were successfully enrolled in the study. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) was used.

2.2. Sample size and data collection method

The sample size was calculated using the formula: initial sample size = $[(z^2 \times p \times q)]/d^2$. We adopted a pretested, validated questionnaire from previous studies, which was then translated into Arabic for local relevance.[20,21] To ensure clarity and minimize bias, a pilot study was conducted with 10 to 15 participants to identify and resolve any technical issues or ambiguities in the questions. The final questionnaire consisted of 23 questions across 2 domains. The first section, comprising 6 questions, focused on the demographic and clinical characteristics of the participants. The second domain, consisting of 17 questions, assessed the awareness of asthmatic patients regarding the relationship between environmental risk factors and asthma exacerbations. For the 12 awareness-related questions, a standard scoring system was used: correct answers were awarded 2 points, neutral responses received 1 point, and incorrect answers were given 0 points. After data collection, participants who scored 75% or higher (at least 18 out of 24 points) were categorized as having good awareness of the association between environmental risk factors and asthma exacerbations.

2.3. Ethical consideration

The main authority for approval and assessment of the work was the Scientific Research Ethics Committee (REC) at Jazan University. The committee accepted the study's reference number, REC- 44/09/596. All necessary official permissions were obtained prior to data collection. All participants were informed of the study objectives. The participants were assured that no harm would occur if they decided to participate in the study. They will also be assured of anonymity and confidentiality of their data. Informed consent was obtained from all participants.

2.4. Statistical analysis

The Statistical Package for Social Sciences (IBM SPSS version 26, IBM, New York) was used to analyze all data. Figures were created using Microsoft Excel. Descriptive statistics were used to present demographic data and assess the awareness of asthmatic patients regarding the association between environmental risk factors and asthma exacerbation. Univariate associations between socioeconomic variables and knowledge/perception were established using χ^2-test and Fisher exact tests. *P*-value of <.05 was considered an indicator of statistical significance.

3. Results

3.1. Socio-demographic characteristics

This study included 633 participants. Most participants (46.1%) were aged 18 to 25 years. In terms of educational level, 348 (55%) had bachelor's degrees, and 158 (25%) had high school education. The employment rate was approximately 277

Table 1

Socio-demographic characteristics of the study participants (n = 633).

Variable	Categories	Frequency	Percent
Age (in years)	18–25	292	46.1
	26–35	114	18
	36–45	113	17.9
	>45	114	18
Educational level	Primary school	8	1.3
	Secondary school	21	3.3
	High school	158	25
	Diploma	66	10.4
	Bachelor's degree	348	55
	Master's degree	22	3.5
	Doctorate degree	10	1.6
Occupation	Housewife	11	1.7
	Student	204	32.2
	Employed	277	43.8
	Unemployed	121	19.1
	Retired	20	3.2

(43.8%), the student rate was 204 (32.2%), the unemployment rate was 121 (19.1%), and the retirement rate was 20 (3.2%) (Table 1).

3.2. Awareness of the association between the environmental risk factors and asthma exacerbation

Awareness of the association between environmental risk factors and asthma exacerbations was assessed using validated questionnaires in 633 participants. The mean awareness score was found to be 19.6 ± 3.58 (range, 0–24). Approximately 506 (79.9%) participants had good awareness, and the remaining 127 (20.1%) had poor awareness (Fig. 1).

A 99.2% of the participants had heard of asthma before, and 210 (33.2%) had received a diagnosis. The majority (93.7%) of the participants thought that environmental risk factors played a role in asthma exacerbations. Regarding factors and their association with asthma exacerbations, 599 (94.6%) of the participants thought that smoking exposure has a role in asthma exacerbations, 589 (93%) thought that dust mites play a role in asthma exacerbation, 582 (91.9%) thought that excessive use of detergents and pesticides may cause asthma exacerbations, and 504 (79.6%) mentioned that pets dander has a role in asthma exacerbations. Of the participants, 311 (49.1%) thought that mildew may cause asthma exacerbations, and 308 (48.7%) thought the same about pollen. Of the participants, 473 (74.7%) mentioned cold weather, and 587 (92.7%) said respiratory infections played a role in asthma exacerbations. 437 (69%) were already aware of the association between environmental risk factors and asthma exacerbations and tried to decrease exposure; 349 (79.9%) out of them have noticed a decrease in the number of asthma exacerbations (Table 2).

3.3. Numbers and causes of asthma exacerbations in asthmatic patients

In terms of the number of asthma exacerbations that occurred in asthmatic patients in the last year, 73 (34.8%) of the participants had asthma exacerbations 3 times in the previous year, 52 (24.8%) had asthma exacerbations twice, 48 (22.9%) had only 1 episode, and 37 (17.6%) had 4 episodes (Fig. 2).

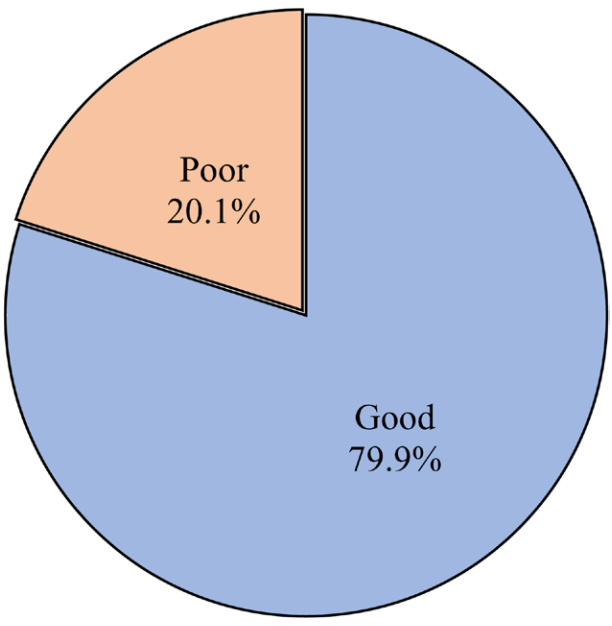

Figure 1. Level of awareness of the association between the environmental risk factors and asthma exacerbation.

Regarding the causes of exacerbations in asthmatic patients, the most frequently reported cause of asthma exacerbations was house dust mites, as mentioned by 146 (69.5%) of the participants, followed by respiratory infections as stated by 141 (67.1%) of the participants, excessive use of detergents as mentioned by 137 (65.2%), and cold and dry weather, which was reported by 125 (59.5%) of the participants. Participants also mentioned air pollutants, smoking, and pet dander (Fig. 3).

3.4. The relationship between awareness and asthma exacerbations is based on demographic characteristics

When looking at what makes people aware of the link between environmental risk factors and asthma flare-ups, educational level was found to be significantly linked with awareness of the link between asthma and environmental risk factors ($P = .020$). People with bachelor's, diploma, and postgraduate education levels were more likely to be aware than people with lower educational levels. Having been diagnosed with asthma was also significantly associated with awareness of asthma and the role of environmental risk factors in exacerbations ($P = .001$). There were no significant associations between age, occupation, hearing about asthma, or awareness of the association between asthma and environmental risk factors ($P = .138$, 0.228, and 0.346, respectively) (Table 3).

4. Discussion

Asthma is a chronic inflammatory condition affecting the airways, leading to breathing difficulties in patients. Understanding the factors associated with acute exacerbations of asthma is crucial, as this knowledge can reduce the frequency of exacerbations and potentially decrease the need for hospitalization. In this study, we aimed to assess the awareness of asthmatic patients in the Jazan region regarding environmental risk factors and their role in asthma exacerbations.

The results indicated a significant level of awareness among participants, with 79.9% of participants demonstrating good awareness of environmental factors that contribute to asthma exacerbations. This aligns with findings from similar studies conducted in Saudi Arabia, where general awareness of asthma among populations was also high.[16] However, 20.1% of participants exhibited low awareness, highlighting the need for targeted education campaigns to bridge these knowledge gaps, particularly concerning specific triggers such as respiratory infections, cold weather, and exercise.[17]

The association between educational level and awareness was significant, with participants holding bachelor's degrees or higher showing a greater understanding of environmental risk factors.[18] This finding aligns with other studies that similarly highlight the pivotal role of education in promoting health literacy regarding environmental triggers.[19,22] Additionally, participants with a prior asthma diagnosis were significantly more aware of the factors contributing to exacerbations. This observation echoes previous research emphasizing the value of early diagnosis and education in managing chronic conditions like asthma.[23] However, our results diverged from some studies that suggested age and occupation might influence asthma awareness. In our study, there was no significant association between age, occupation, or general awareness of asthma, suggesting that education level plays a more crucial role in awareness than these other demographic factors, which aligned with a local study done on Asthma Awareness in Saudi Arabia, they found no association between age and occupation.[24] This discrepancy highlights the need for targeted educational interventions rather than demographic-based awareness strategies.[25]

House dust mites (69.5%) and respiratory infections (67.1%) were the most frequently identified causes of exacerbations by

Table 2

Awareness of the association between the environmental risk factors and asthma exacerbation.

Variable	Yes	No	I don't know
	N (%)		
Have you ever heard about asthma?	628 (99.2)	4 (0.6)	1 (0.2)
Have you been diagnosed with asthma in the past?	210 (33.2)	402 (63.5)	21 (3.3)
Do you think that the environmental risk factors have a role in asthma exacerbations?	593 (93.7)	7 (1.1)	33 (5.2)
Do you think that smoking exposure has a role in asthma exacerbations?	599 (94.6)	17 (2.7)	17 (2.7)
Do you think that house dust mite that present in the furniture, carpets and curtains have a role in asthma exacerbations?	589 (93)	16 (2.5)	28 (4.4)
Do you think that excessive use of detergents and other household pesticides may cause asthma exacerbations?	582 (91.9)	16 (2.5)	35 (5.5)
Do you think that pets dander have a role in asthma exacerbations?	504 (79.6)	37 (5.8)	92 (14.5)
Do you think that cockroaches have a role in asthma exacerbations?	151 (23.9)	210 (33.2)	272 (43)
Do you think that mildew that present in places with high humidity like walls of bathrooms have a role in asthma exacerbations?	311 (49.1)	108 (17.1)	214 (33.8)
Do you think that pollens have a role in asthma exacerbations?	308 (48.7)	133 (21)	192 (30.3)
Do you think that molds have a role in asthma exacerbations?	270 (42.7)	112 (17.7)	251 (39.7)
Do you think that cold and dry weather has a role in asthma exacerbations?	473 (74.7)	62 (9.8)	98 (15.5)
Do you think that respiratory infections have a role in asthma exacerbations?	587 (92.7)	15 (2.4)	31 (4.9)
Do you think that air pollutants like dust, chemicals, smog, ozone and other air pollutants may cause asthma exacerbations?	597 (94.3)	12 (1.9)	24 (3.8)
If you are already aware of the association between the environmental risk factors and asthma exacerbation, have you tried before to decrease the exposure to them?	437 (69)	68 (10.7)	128 (20.2)
If yes, have you noticed any decrease in numbers of asthma exacerbations?	349 (79.9)	59 (13.5)	29 (6.6)

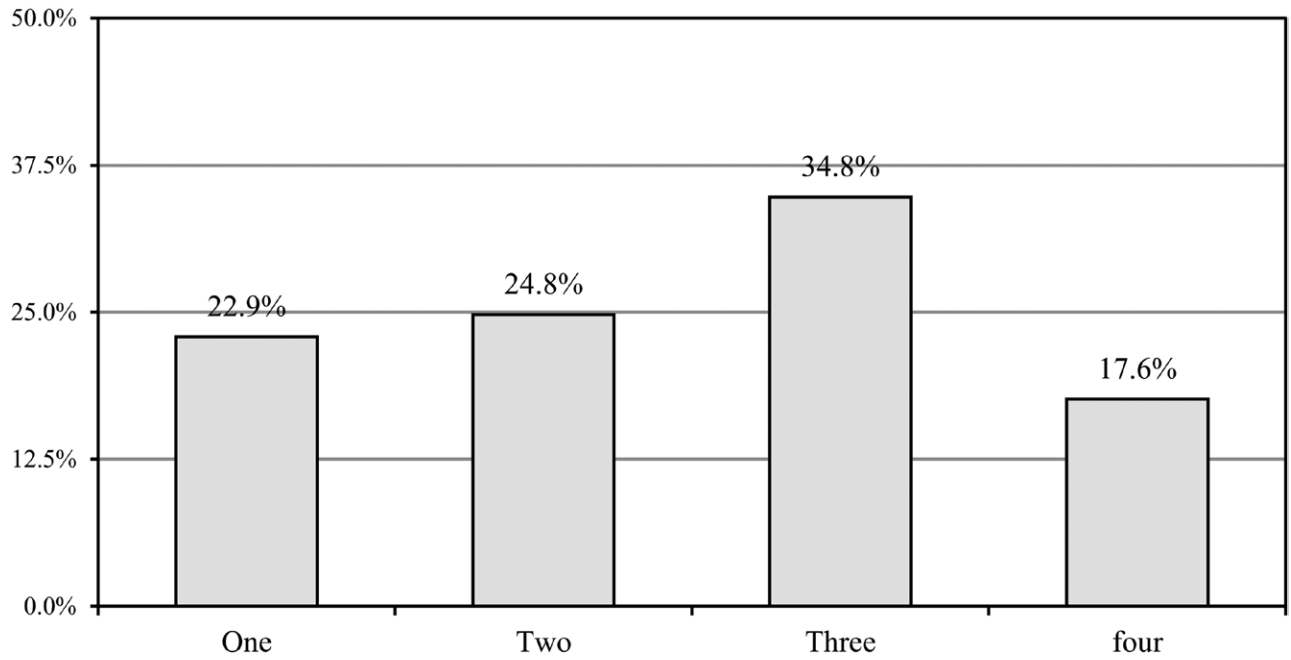

Figure 2. The number of asthma exacerbations that happened to asthmatic patients in the last year (n = 210).

participants.[26] These findings are consistent with global studies, which often identify dust mites and respiratory infections as major asthma triggers.[27] Cold and dry weather was also reported by 59.5% of participants as a significant factor, which supports previous findings that climatic conditions play a role in asthma symptoms.[28,29] This consistency across studies reinforces the well-established link between environmental conditions and asthma exacerbations.[30]

Our study also revealed that the majority of participants (69%) were already aware of the association between environmental factors and asthma exacerbations and actively attempted to minimize exposure. Among those who took action, 79.9% noticed a decrease in the frequency of exacerbations, underscoring the practical benefits of awareness and preventive behavior.[31,32] This finding is in line with similar studies that reported improvements in health outcomes through education on environmental risks.[33,34] The fact that these outcomes are consistent across diverse populations emphasizes the universal importance of continuous education on environmental risk factors to improve the health and quality of life for asthmatic patients.[35] Optimizing the medical service system is essential, including the integration of patient education into standard care, the provision of telemedicine services for enhanced accessibility, and the training of healthcare providers to counsel patients on environmental risk factors. Enhancing social support is crucial, as community-based initiatives and support groups provide emotional reinforcement, education on self-management, and pragmatic guidance for minimizing environmental exposure.

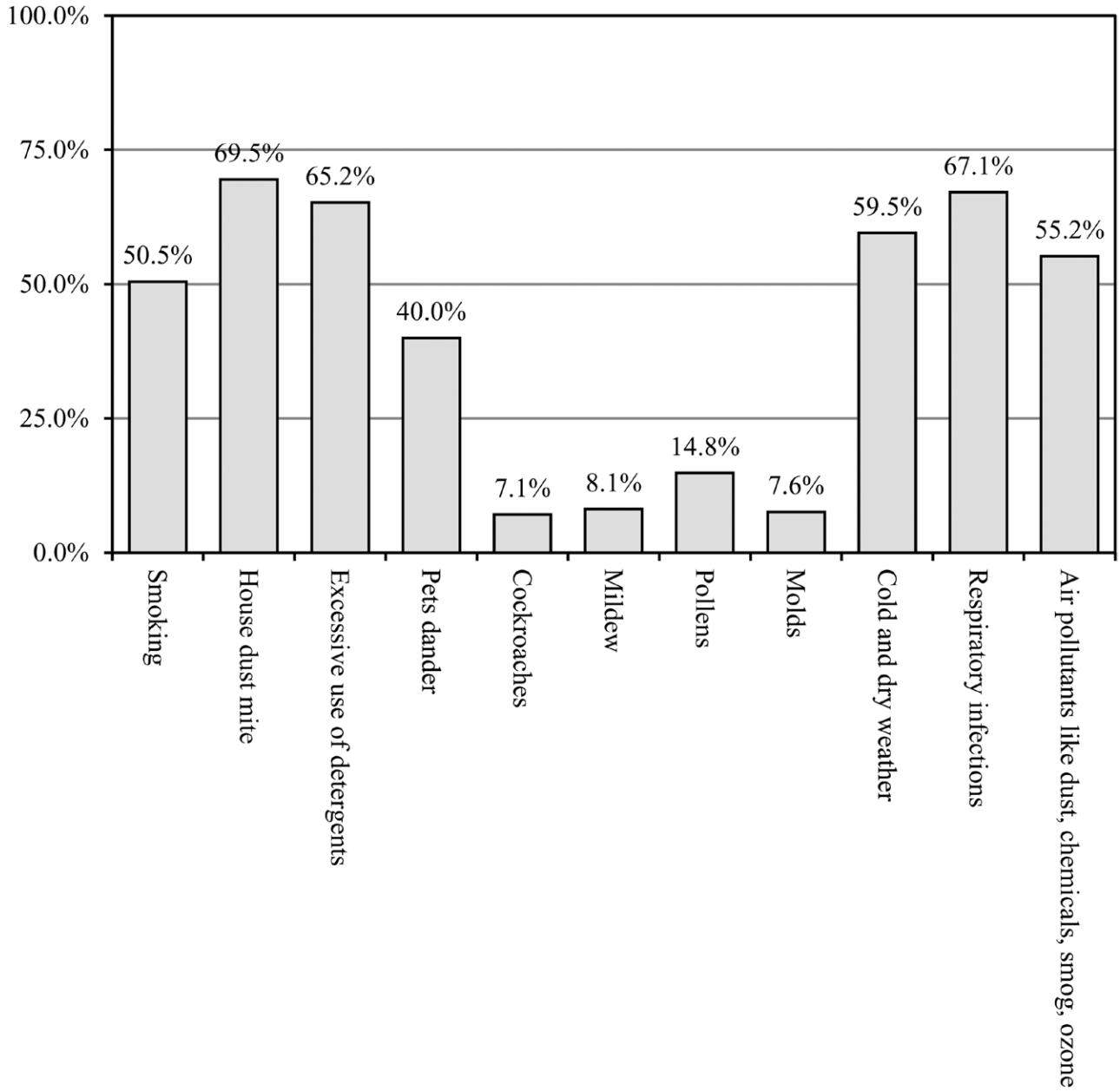

Figure 3. The most frequent cause of exacerbation in asthmatic patients (n = 210).

Family engagement in asthma management can enhance comprehension and regulation of triggers. These measures collectively establish a more robust support structure that enables asthma patients to manage their condition proficiently.[36]

In terms of the frequency of asthma exacerbations, the study found that participants who experienced more frequent exacerbations were more likely to report specific environmental triggers, such as dust mites and respiratory infections. These findings are consistent with another study where dust was the most frequently reported cause of asthma exacerbations.[37]

In conclusion, the high level of awareness observed in this study is encouraging, yet there are still knowledge gaps that need to be addressed through targeted education, particularly focusing on less-recognized triggers like exercise and certain allergens. The link between higher education and better awareness also suggests that healthcare initiatives should prioritize educational outreach, especially in communities with lower educational attainment. This study did not specify aspects of education, such as the setting of health education courses or the cultivation of scientific literacy. Future studies should address these factors to provide a more comprehensive understanding of their impact on asthma awareness. Additionally, beyond comparing educational attainment levels, it would be valuable to explore how specific educational aspects, like health education and scientific literacy, influence awareness of environmental risk factors for asthma. This could lead to more targeted educational interventions.

Author contributions

Conceptualization: Luai Alhazmi, Omar Oraibi, Abdulrahman Hakami.
Data curation: Areej Areeshi, Nirmin Alhazmi, Alyaj Hakami, Talal Kariri, Eyas Akish, Abdullah Alamer.
Formal analysis: Luai Alhazmi, Abdulrahman Hakami.
Funding acquisition: Mohammed A Madkhali.
Investigation: Ahmed Sayed.
Project administration: Mohammed Ali Madkhali.

Table 3

Factors associated with awareness about the association between environmental risk factors and asthma exacerbations.

Variable	Categories	Level of awareness		*P*-value
		Poor	Good	
Age (in years)	18–25	63 (21.9)	225 (78.1)	.138
	26–35	26 (23)	87 (77)	
	36–45	23 (20.4)	90 (79.6)	
	>45	14 (12.3)	100 (87.7)	
Educational level	Primary school	0 (0)	8 (100)	.020*†
	Secondary school	7 (33.3)	14 (66.7)	
	High school	39 (24.7)	119 (75.3)	
	Diploma	19 (28.8)	47 (71.2)	
	Bachelor's degree	57 (16.4)	291 (83.6)	
	Master's degree	5 (22.7)	17 (77.3)	
	Doctorate degree	0 (0)	10 (100)	
Occupation	Housewife	1 (9.1)	10 (90.1)	.228
	Student	37 (18.1)	167 (81.9)	
	Employed	55 (19.9)	222 (80.1)	
	Unemployed	32 (26.4)	89 (73.6)	
	Retired	2 (10)	18 (90)	
Have you ever heard about asthma?	Yes	125 (19.9)	503 (80.1)	.346†
	No	2 (50)	2 (50)	
	I don't know	0 (0)	1 (100)	
Have you been diagnosed with asthma in the past?	Yes	29 (13)	194 (87)	.001*
	No	90 (23.1)	299 (76.9)	
	I don't know	8 (38.1)	13 (61.9)	

† *P*-values calculated using Fisher exact test; other *P*-values were calculated using the Chi-square test.

* Significant *P*-value < .05.

Resources: Mohammed Somaili.
Software: Tawfeeq Altherwi.
Visualization: Ahmed Alhazmi.
Writing – original draft: Luai Alhazmi, Omar Oraibi, Abdulrahman Hakami.
Writing – review & editing: Luai Alhazmi, Omar Oraibi, Abdulrahman Hakami.

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