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Knowledge and Awareness of Exacerbated Asthma and its Associated Risk Factors among the Population in the Northern Border Region, Saudi Arabia

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Abstract **Objectives:** Asthma is a serious illness that affects people of all ages worldwide. With the right diagnosis, treatment and medication, asthma symptoms can be managed. To lessen the burden of asthma, it is imperative for the population in Northern Border region, Saudi Arabia to be aware of aggravated asthma and its risk factors. **Methods:** A cross-sectional design was employed in this study, involving 462 participants selected through convenience to recruit the respondents. The questionnaire was validated before distribution to ensure reliability. SPSS version 27 was used to analyze the gathered data and both descriptive and inferential statistics were used to examine the results. **Results:** The prevalence of asthma was 7.4%, with 50% of respondents living with asthma for less than five years and 35.3% for more than ten years. A familial history of asthma was reported by 21% of participants and 15.6% had chronic conditions such as high blood pressure (26.4%) and diabetes (23.6%). While 79.0% recognized asthma as a chronic disease, gaps in awareness were observed, including the impact of frequent antibiotic use (52.2%) and recognizing severe symptoms in children (57.8%). The primary source of information was the internet (51.7%), with limited reliance on healthcare professionals (9.7%). Significant associations were found between knowledge levels and age, gender, marital status and employment, with younger participants (18-25 years), females and government employees demonstrating higher awareness ($p<0.05$). **Conclusion:** Overall, awareness of asthma and its risk factors was high, however, gaps remain in recognizing severe symptoms in children and the impact of antibiotic use. Chronic conditions and familial asthma history complicate management and reliance on the internet highlights the need for better healthcare provider engagement. Sociodemographic factors, including age, gender and employment, significantly influenced knowledge levels. Targeted training and health education are essential to reduce triggers and improve awareness.

Key Words Awareness, Exacerbated asthma, Knowledge, Population, Risk factors, Saudi Arabia

INTRODUCTION

A serious illness that affects people of all ages, asthma is a global health concern. It is a long-term condition that affects the airways that let air enter and exit the lungs [1,2]. Because these airways are irritated in asthmatics, they are extremely sensitive and frequently react to allergens or irritants. Asthma cannot be cured, but symptoms can be managed with the right diagnosis, treatment and medication [3].

According to estimates from the World Health Organization (WHO), 339 million people worldwide suffer from asthma and older persons account for the majority of asthma-related deaths. According to 2020 Global Initiative for Asthma (GINA) statistics, asthma affects 1-18% of people worldwide and has been becoming more common over time [4].

Asthma incidence is generally lower in rural settings, but this is because traditional rural habits offer protection from allergic disorders. On the other hand, many urbanization-related exposures are possible asthma risk factors [5,6]. Regretfully, low- and middle-income nations account for the

majority of asthma-related fatalities [7]. About 6% of Saudi Arabia's population, or 2 million people, suffer from asthma [8]. Additionally, children are far more likely than adults to have asthma, with regional differences ranging from 9 to 33.7% [9]. Between 8 to 25 percent of children have asthma, numerous causes, including rising urbanization rates, fast modernization and improving living conditions, are to blame for this increase in prevalence [10]. The severity variation of asthma can lead to different degrees of disability depending on emotional aspects, school attendance, social and physical activities of adolescents [11].

Fatigue, repeated hospitalizations, psychological issues and academic difficulties in children are only a few of the complications associated with asthma [12]. Asthma's potentially fatal acute exacerbation, which is marked by worsening symptoms, deteriorating lung function and increased airway inflammation, is one of its consequences [13]. An asthma awareness campaign is required in Saudi Arabia's Northern Border region due to the high prevalence of asthma in the country.

METHODS

Study Design and Population

A cross-sectional study was conducted from August 2024 to January 2025 in Northern Border region of Saudi Arabia. It was carried out in Saudi Arabia's Northern Border Region. Its entire size is 111,797 km^2 and its population is 373,577. This study included the population aged above 18 years of both genders living in the Northern Border region, Saudi Arabia, who agreed to complete the survey. We excluded people aged above 18 years who live outside the Northern Border region, those aged less than 18 years and those who refused to participate in the study. Socio-demographic details, chronic conditions and asthma history of participants, participants' level of knowledge and awareness about asthma and its associated risk factors were all included in the questionnaire [14,15]. Age, gender, nationality, education, occupation and place of living were all included in the first category. The second section recorded the clinical status of participants including smoking habits, chronic Conditions and asthma History. The third section contained 16 questions regarding the level of knowledge and awareness about asthma and its associated risk factors. It was conducted through an online questionnaire prepared in Arabic after reading and accepting the informed consent and distributed via an anonymous online survey using social media platforms, which targeted the population who live in Northern Border region of Saudi Arabia.

Knowledge Scores Computation

Sixteen questions were used to assess respondents' level of knowledge. Each correct answer was assigned a score of 1, while incorrect answers were assigned a score of 0. The total knowledge score ranged from 0 (lowest possible score) to 16 (highest possible score). The data were then transformed into a composite score and categorized into two groups: low knowledge (scores between 0 and 9) and high knowledge (scores between 10 and 16).

Ethics Approval of Research

Northern Border University's decision no. (114-24-H), dated January 22, 2025, granted ethical clearance for the study after it was requested by the College of Medicine's Ethical Committee (HAP-09-A-043).

Sample Size and Data Analysis

We estimated a sample size of 385 participants using Cochran's Formula, with a 5% level of significance, 5% margin of error, 95% confidence and an expected response distribution of 50%. The study participants' characteristics and replies were summed up and described using descriptive and inferential statistics. Using SPSS version 27, frequencies and percentages were computed for categorical variables, such as the participants' answers to awareness and knowledge questions. A p-value less than 0.05 indicated that there was a difference between variables. We tested the feasibility of the study by conducting a pilot study on 38 students prior to beginning data collecting; their replies were not incorporated into the main study.

RESULTS

Table 1 presents the demographic characteristics of the 462 participants in this study. The majority of respondents were Saudi nationals (94.8%), with a small proportion (5.2%) being non-Saudis. Most participants were aged 18-25 years (44.8%), followed by those aged 36-46 years (24.0%), while only 13.5% were above 46 years. Over half (53.3%) of the participants were married, while 43.7% were single. Females constituted the majority of the sample (80.5%) and 39.2% of

Table 1: Social demographic characteristics of the respondents (N = 462)

Variable	Category	Count	Percentage (%)
Nationality	Non-Saudi	24	5.2
	Saudi	438	94.8
Age	18-25	207	44.8
	26-35	82	17.7
	36-46	111	24.0
	More than 46 years	62	13.5
Marital status	Divorced	13	2.8
	Married	246	53.3
	Single	202	43.7
	Widow	1	0.2
Gender	Male	90	19.5
	Female	372	80.5
Job status	Government employee	178	38.5
	Not working	74	16.0
	Private sector employee	18	3.9
	Retired	11	2.4
	Student	181	39.2
City	Arar	348	75.3
	Others	46	10.0
	Rafha	66	14.3
	Turaif	2	0.4

Data has been presented has numbers (n) and proportion (%)

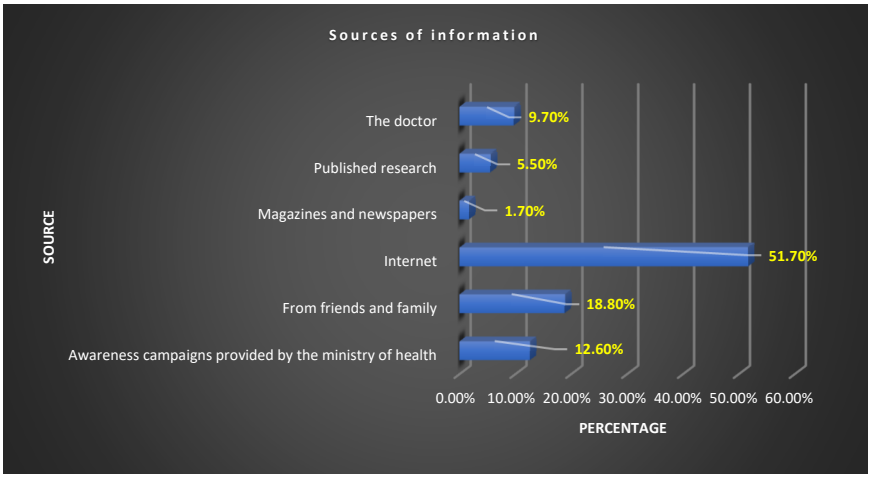

Figure 1: Side-bar graph showing methods used by participants to access information pertaining to asthma and its risk factors

Table 2: Participants' smoking habits, chronic conditions and asthma history (N = 462)

Research item	Variable	Count	Percentage (%)
Are you a smoker?	No	444	96.1
	Yes	18	3.9
If yes, how long [n = 18]	Less than 5 years	10	55.6
	From 5 to 10 years	2	11.1
	More than 10 years	6	33.3
Do you suffer from chronic diseases?	No	390	84.4
	Yes	72	15.6
If yes, what is it? [n = 72]	Diabetes	17	23.6
	Heart problems	4	5.6
	High blood pressure	19	26.4
	Obesity	11	15.3
	Thyroid diseases	8	11.1
	other	13	18
Do you suffer from asthma?	No	428	92.6
	Yes	34	7.4
If yes, how long? [n = 34]	Less than 5 years	17	50.0
	From 6 to 10 years	5	14.7
	More than 10 years	12	35.3
Is there a history of asthma in your family?	No	365	79.0
	Yes	97	21.0

Data has been presented has numbers (n) and proportion (%)

participants were students. Lastly, most respondents (75.3%) resided in the Northern Border Region city of Arar.

As shown in Table 2, the majority of participants (96.1%) reported not smoking, while 3.9% identified as smokers, with 55.6% of them having smoked for less than five years. Among the 15.6% of participants with chronic diseases, high blood pressure was the most prevalent condition, affecting 26.4%. The prevalence of asthma among participants was 7.4%, with 35.3% of those with asthma having experienced the condition for more than 10 years. Additionally, 79.0% of respondents reported no familial history of asthma.

The Table 3 highlights that most respondents (79.0%) were aware that asthma is a chronic disease with acute exacerbations triggered by allergens and 70.8% recognized the role of genetic, hereditary and environmental factors in its development. Additionally, 67.3% acknowledged asthma as potentially fatal and 86.2% understood that environmental changes, such as dust or cold weather, can aggravate symptoms. However, gaps were noted, with 26.0% unaware of the complications caused by frequent antibiotic use and 23.4% unfamiliar with severe asthma symptoms in children, such as difficulty speaking or lying flat.

Most participants recognized that exposure to cigarette smoke (79.9%) and perfumes or fumes (80.3%) could trigger asthma attacks, while 79.7% emphasized the importance of regular medical follow-ups. Furthermore, 75.6% understood the risks of sharing asthma medications without consulting a doctor and 66.0% recognized the need for pulmonary clinic referrals in some cases. Finally, 74.2% supported the establishment of specialized centers for asthma education and awareness and 53.5% reported prior research or reading on asthma.

Figure 1 shows that the majority of the participants (51.7%) utilize the internet to access information regarding to

Table 3: Assessment of participants' level of knowledge and awareness about asthma and its associated risk factors (N = 462)

Research item	Variable	Count	Percentage (%)
Did you know that exposure to allergens can cause an acute flare-up of asthma, a chronic condition?	I don't know	56	12.1
	No	41	8.9
	Yes	365	79.0
Are you aware that chest allergy and asthma are the same person?	I don't know	110	23.8
	No	103	22.3
	Yes	249	53.9
Did you know that asthma is influenced by environmental, genetic and inherited factors?	I don't know	73	15.8
	No	62	13.4
	Yes	327	70.8
Did you know that asthma can be a fatal disease?	I don't know	77	16.7
	No	74	16.0
	Yes	311	67.3
Did you know that infectious respiratory diseases increase asthma?	I don't know	72	15.6
	No	56	12.1
	Yes	334	72.3
Did you know that asthma can worsen when exposed to abrupt environmental changes like dust or cold weather?	I don't know	44	9.5
	No	20	4.3
	Yes	398	86.2
Do you know that the symptoms of asthma are shortness of breath and night cough?	I don't know	50	10.8
	No	41	8.9
	Yes	371	80.3
Did you know that frequent use of antibiotics increases asthma complications?	I don't know	120	26.0
	No	101	21.8
	Yes	241	52.2
Did you know that severe asthma attacks can result from either direct or indirect exposure to cigarette smoke?	I don't know	60	13.0
	No	33	7.1
	Yes	369	79.9
Did you know that exposure to perfumes, incense fumes or paint can trigger severe asthma attacks?	I don't know	51	11.0
	No	40	8.7
	Yes	371	80.3
Did you know that an asthma patient must follow up with the doctor regularly?	I don't know	48	10.4
	No	46	10.0
	Yes	368	79.7
Did you know that children with severe asthma symptoms can be aggressive and unable to talk in complete phrases or lie on their backs?	I don't know	108	23.4
	No	87	18.8
	Yes	267	57.8
Did you know that using another patient's asthma medicine without first getting a doctor's approval is wrong?	I don't know	68	14.7
	No	45	9.7
	Yes	349	75.6
Did you know that while asthma is a prevalent condition, a referral to a pulmonary clinic may occasionally be necessary when treating a patient at a primary care clinic?	I don't know	93	20.1
	No	64	13.9
	Yes	305	66.0
Did you know that the patient's physician is required to educate him on the signs and symptoms of asthma, how to manage the condition and how to stay away from triggers?	I don't know	66	14.3
	No	43	9.3
	Yes	353	76.4
Did you know that in order to improve asthma treatment, specialized clinics must educate and increase community and patient awareness?	I don't know	78	16.9
	No	41	8.9
	Yes	343	74.2
Have you previously read about or studied asthma?	I don't know	49	10.6
	No	166	35.9
	Yes	247	53.5

Data has been presented has numbers (n) and proportion (%)

asthma and its associated risk factors, then followed by information accessed from friends and family (18.8%). A small portion of participants (1.7%) access information via magazines and newspapers.

Table 4 shows that age, marital status, gender and job status all had p-values <0.05, indicating a statistically significant relationship with participants' knowledge. Younger participants (18-25 years) and males were more likely to have low knowledge ($p = 0.007$ and $p = 0.016$, respectively), while older participants, females and government employees demonstrated better knowledge ($p = 0.014$). Marital status also influenced knowledge, with married participants showing higher knowledge levels ($p = 0.048$). However, nationality and place of residence (city) did not show a significant association with knowledge levels ($p>0.05$).

Table 4: The Association between social demographic variables and participants' total knowledge on Asthma and its associated risk factors (N = 462)

		Knowledge levels		
Variable	Category	Low	High	p-value
Nationality	Non-Saudi	6 (4.5%)	18 (5.5%)	0.691
	Saudi	126 (95.5%)	312 (94.5%)	
Age	18-25	74 (56.1%)	133 (40.3%)	0.007
	26-35	24 (18.2%)	58 (17.6%)	
	36-46	21 (15.9%)	90 (27.3%)	
	46 and above	13 (9.8%)	49 (14.8%)	
Marital status	Divorced	2 (1.5%)	11 (3.3%)	0.048
	Married	61 (46.2%)	185 (56.1%)	
	Single	68 (51.5%)	134 (40.6%)	
	Widow	1 (0.8%)	0 (0.0%)	
Gender	Male	35 (26.5%)	55 (16.7%)	0.016
	Female	97 (73.5%)	275 (83.3%)	
Job status	Government employee	35 (26.5%)	143 (43.3%)	0.014
	Not working	24 (18.2%)	50 (15.2%)	
	Private sector employee	5 (3.8%)	13 (3.9%)	
	Retired	5 (3.8%)	6 (1.8%)	
	Student	63 (47.7%)	118 (35.8%)	
City	Arar	95 (72.0%)	253 (76.7%)	0.125
	Rafha	20 (15.2%)	46 (13.9%)	
	Turaif	2 (1.5%)	0 (0.0%)	
	Other	15 (11.4%)	31 (9.4%)	

Chi-square test used to determine statistical significance, p-value considered significant at p-value <0.05

DISCUSSION

Asthma remains a significant public health challenge, particularly in regions where environmental and lifestyle factors exacerbate its prevalence and severity [16]. In Saudi Arabia, asthma is one of the most common chronic diseases [17]. Factors such as pollution, urbanization and limited public awareness of effective management strategies further amplify its burden [18]. This study aimed to evaluate the knowledge and awareness of exacerbated asthma and its associated risk factors among the population in the Northern Border Region of Saudi Arabia.

The findings reveal that the prevalence of asthma among respondents was 7.4%, aligning with global estimates for adult asthma. Among those diagnosed, half (50%) had been living with the condition for less than five years, while 35.3% reported a history of more than ten years. These results are consistent with a study conducted in Saudi Arabia which reported a prevalence of 7.1%, with 57.2% living with asthma for less than five years and 29.9% having the condition for more than ten years [19].

Chronic conditions that exacerbate asthma symptoms and complicate management were prevalent among participants. Specifically, 15.6% reported chronic diseases, with high blood pressure (26.4%), diabetes (23.6%) and obesity (15.3%) being the most common. A familial history of asthma was reported by 21%, suggesting a genetic predisposition. These findings differ from a study that identified obesity (9.6%), high blood pressure (17.3%) and diabetes (15.5%) as less prevalent chronic conditions [20]. These differences may stem from variations in sample size, demographics and cultural factors. Spain's Mediterranean diet, rich in fresh vegetables, seafood and portion-controlled tapas, likely contributes to lower rates of these chronic conditions [21].

Most participants demonstrated strong awareness of asthma's key aspects, with 86.2% recognizing that environmental factors like dust and cold weather could aggravate asthma and 80.3% identifying symptoms such as shortness of breath and night cough. However, only 52.2% knew that frequent antibiotic use could worsen asthma complications and 57.8% were aware of severe symptoms in children, such as difficulty speaking or lying flat. These findings align with a study that reported a strong awareness of asthma and its risk factors among respondents [22].

The reliance on the internet as the primary source of information (51.7%) contrasts sharply with the relatively low reliance on professional sources such as doctors (9.7%) or published research (5.5%). This suggests limited engagement with healthcare providers and formal educational campaigns. Additionally, only 12.6% of participants reported gaining information from Ministry of Health campaigns, indicating limited outreach or participation. This pattern aligns with findings where over 60.1% of participants depended on the internet for asthma-related information [23,24]. Given the potential for misinformation online, there is a critical need to enhance public health campaigns and healthcare practitioners' roles in disseminating accurate information.

Sociodemographic factors significantly influenced knowledge levels. Younger participants (18-25 years) exhibited lower knowledge compared to older age groups ($p = 0.007$), potentially due to less life experience and exposure to health education. Female participants demonstrated higher knowledge levels than males ($p = 0.016$), possibly reflecting greater engagement with health information sources. Government employees showed significantly better knowledge compared to other employment categories ($p = 0.014$), likely due to access to

structured health education programs. These findings align with previous studies that found significant associations between knowledge levels and gender, age and job status [25,26].

This study's primary limitation is its cross-sectional design, which precludes establishing causality between knowledge levels and sociodemographic factors. Cross-sectional studies are also prone to biases, including measurement and selection biases, as well as confounding variables, which may impact result validity. The online nature of the questionnaire introduces selection bias, potentially excluding participants without internet access.

CONCLUSION

While overall awareness of asthma and its associated risk factors among participants was high, notable gaps remain, particularly regarding the impact of frequent antibiotic use and the recognition of severe symptoms in children. The presence of chronic conditions and a familial history of asthma further highlight the complexity of managing the disease. The reliance on the internet as the primary source of information underscores the urgent need for greater engagement with healthcare providers to address these knowledge gaps. Sociodemographic factors such as age, gender and employment significantly influenced knowledge levels, with younger participants and males demonstrating lower awareness. Therefore, training initiatives and health education are strongly suggested to decrease exposure to triggers and improve overall awareness.

Conflict of Interest

The authors have no conflict of interest to declare.

Author's Contributions

S E, EA and EF: conceived and designed the study. ZA, AA, FA, WA, EA, WG, RA and AAA: conducted research, provided research materials and collected and organized data. EF: analyzed and interpreted data. ZA, AA, FA, WA, EA, WG, RA and AAA: wrote the initial draft of the article. S E, EA: wrote the article's final draft and provided logistic support. All authors have critically reviewed and approved the final draft and are responsible for the content and similarity index of the manuscript.

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