Original Article

PREVALENCE OF, AND FACTORS ASSOCIATED WITH ASTHMA AMONG TEENAGER STUDENTS IN ERBIL CITY

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Abstract

Background: Asthma is a common chronic disease among teenager students, and has led to a significant morbidities and disabilities. Few comprehensive studies have estimated the prevalence of asthma in Erbil city. **Objectives:** To find out the prevalence of asthma in 12 to 19-year-old teenager students in Erbil city and to identify the factors that are associated with prevalence of asthma.

Methods: A cross-sectional study was carried out on 2000, 12 to 19-year-old students in Erbil city, during the academic year 2021-2022. The questionnaire was developed by the researcher. The data were analyzed by SPSS, version 25, software. A p-value of ≤ 0.05 was considered, statistically significant.

Results: The prevalence of physician-diagnosed asthma was 7.0%. Significant association ($p < 0.001$) was detected between the prevalence of asthma and the following factors: using gaseous heating system, using kerosene heating system, insecticides spray use, presence of dampens on the wall, household pets, smoking, having plants at house and spending some time at the house or public garden, while there was no significant association between the prevalence of asthma and the following factors: allowing household pets in bed (p 0.895), using home generator ($p = 0.160$), presence of a factory ($p = 0.139$) or generator ($p = 0.474$) near the house, exposure to irritant substances during work after the school hours ($p = 0.150$).

Conclusions: The prevalence of asthma in Erbil city, Iraqi Kurdistan Region was 7.0 %. The rate of asthma and asthma related symptoms is highly effected by many of risk factors like heating system inside the house and house related factors such as presence of dampens, molds, household pets, presence of plants and flowers in the house and smoking among 12 to 19-year-old teenager.

Keywords: Asthma, Prevalence, Erbil City, Teenager students.

Introduction

Asthma is a chronic airways disorder characterized by recurrent attacks of chest tightness, wheezing, cough and breathlessness. Symptoms of asthma vary in severity and frequency, and are related to one or more of airflow obstruction, bronchial hyper-responsiveness and underlying inflammation (Al-Moamary et al., 2021). Asthma is defined by the history of respiratory symptoms such as 'wheeze, shortness of breath, chest tightness and cough that vary over time and intensity, with variable expiratory airflow limitation'. Asthma diagnosis requires the presence of more than one of the respiratory symptoms, worsening of the symptoms at night and exacerbation of the symptoms by viral infection, exercise, allergens, changing weather or smoke (Alavinezhad & Boskabady 2018). Asthma can occur in both genders, at all ages, especially during adolescence and childhood. Currently,

much research is directed to the explanation of the underlying causes of asthma, which remain unknown. The risk for development of asthma is supported by evidence for a mixture of genetic, environmental, and lifestyle factors. There is no cure for this disease so preventive strategies and management are being effectively applied at the community level to prevent the onset of the condition and to control worsening of asthma symptoms in the future (Gref 2017; Forno et al., 2017). It isn't clear why some people get asthma and others don't, but it's probably due to a combination of environmental and inherited (genetic) factors and exposure to various irritants and substances that trigger allergies (allergens) and can trigger signs and symptoms of asthma. Asthma triggers are different from person to person and can include, genetic predisposition with environmental exposure to house dust mites, cockroaches, pollen and carpets, active and passive tobacco smoke, and air pollution can irritate airways (Saeedfar et al., 2017). Teenager with asthma are at risk of significant morbidity and disability that affect their general health and wellbeing (Halwani et al, 2016). The severity variation of asthma can lead to different degrees of disability on emotional aspects, school attendance, social and physical activities of adolescents. Furthermore, adolescents with the lowest physical activity caused by asthma may have a higher risk of asthma attacks (Lochte et al., 2016). Few comprehensive studies have estimated the prevalence of asthma in Erbil city, accordingly, the researchers decided to carry out this study. The objectives of the study were to find out the prevalence of asthma in a sample of teenager students in Erbil city, and to identify the factors that are associated with prevalence of asthma.

Method

A cross sectional study was carried out in Erbil city, Iraqi Kurdistan region, during the 1st of November 2021 to the 30th of October 2022. Two thousand teenager students were included in the study. Those were taken from 30 intermediate and secondary schools that had been selected by the "Probability Proportional to Size – PPS" Sampling Technique.

A multi-stage cluster sampling technique was used to choose the study sample randomly depending on the updated information taken from the general directorate of education in Erbil city.

The sample size was estimated by the Epi info 7 computer program. The following information had been entered into the program: Number of students: 200, 000 students, the estimated prevalence of asthma was set at 10%, absolute precision was set at 2%, design effect was set at 2, and a 95% confidence interval was chosen. Accordingly, the estimated sample size was 1980. For convenience, 2000 students were included in the study.

The study was approved by the research ethics committee of college of medicine of Hawler Medical University and a facilitation letter was obtained from the general directorate of education in Erbil city. Oral consent was taken from the students before starting the interview.

The data collection was through interviewing the students of the 30 intermediate and secondary schools in Erbil city. The data collection was done during five days of the week except holidays if present. Sample selection of students was by direct interview, it begins at 8:30 a.m. and ends at 5:30 p.m., but fifty students especially males refused to make the interview due to a reason or another.

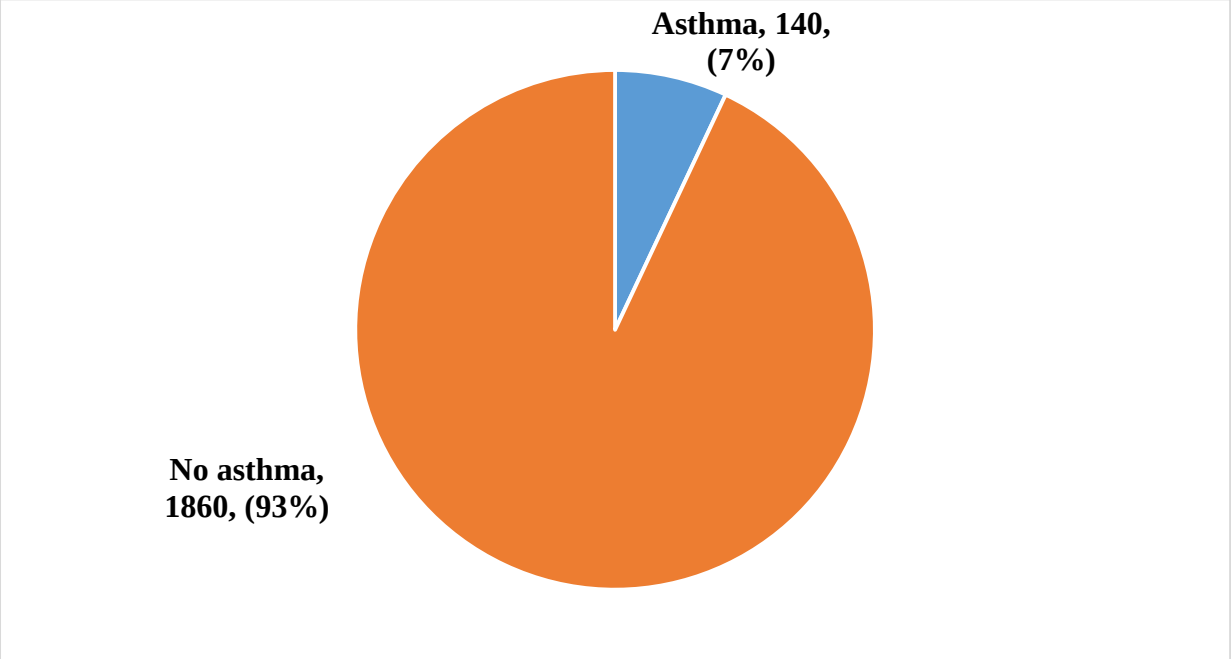
The questionnaire format was originally developed in English language and translated to Kurdish. The Kurdish translation was validated by an independent translator holding bachelor degree in English language through conducting back translation to English to ensure accuracy.

The study instrument (questionnaire) was developed by the researcher through proper utilization of available relevant literature review (European Community Respiratory Health survey (ECRHs) for the prevalence and clinical history of asthma. The questionnaire consisted of three parts. The first one is the sociodemographic characteristics variables and that consisted of 15 questions such as (age, gender, residency, years of education, father's educational level, mother's educational level, father's occupation, mother's occupation, house ownership, income, car ownership, number of rooms in the house, having a private room, and smoking status), the second part consisted from exposure to risk factor and clinical history.

Results:

The prevalence of asthma was 7% among teenager students (Figure 1).

Figure 1. Overall prevalence of asthma.



The prevalence of asthma among those who are using gaseous heating system (13.2%) was significantly higher than the prevalence (5.1%) among those not using gaseous heating system ($p < 0.001$). The prevalence of asthma among those using kerosene heating system (13.8%) was significantly higher than the prevalence (4.9%) among those not using kerosene heating system ($p < 0.001$). The prevalence of asthma among those using insecticides spray (9.1%) was significantly higher than the prevalence (6.1%) among those not using insecticides spray ($p <0.001$), also the prevalence of asthma among those having plants at home (8.2%) was significantly higher than the prevalence (3.7%) among those who don't have plants at home ($p <0.001$) (Table1).

Table 1. The association between the prevalence of asthma and exposure to risk factors.

		No asthma	Asthma	P*
Variables. n=2000	**N**	**No. (%)**	**No. (%)**	**P***
Type of heating system inside the house: n=2000**				
Gaseous	1530	1452(94.9)	78 (5.1)	<0.001
No	470	408(86.8)	62 (13.2)	
Yes				
Kerosene				
No	1536	1460(95.1)	76 (4.9)	<0.001
Yes	464	400(86.2)	64 (13.8)	

Presences of dampness on the wall				
No	1406	1384(69.2)	22 (1.1)	<0.001
Yes	594	476(23.8)	118 (5.9)	
Having household pets				
No	1644	1556(94.6)	88 (5.4)	<0.001
Yes	356	304(85.4)	52 (14.6)	
Allow them in your bed. n=356				
No	181	155(85.6)	26 (14.4)	0.895
Yes	175	149(85.1)	26 (14.9)	
Always use insecticides spray at home.				
No	1406	1320(93.9)	86 (6.1)	0.021
Yes	594	540(90.9)	54 (9.1)	
Presence of plants in the house (flowers) or other.				
No				
Yes	534	514(96.3)	20 (3.7)	<0.001
	1466	1346(91.8)	120 (8.2)	

*Chi-square test. **Most of study sample use more than one of heating system.

There was a significant association between the prevalence of asthma and the following factors: spending some time in house garden or public garden ($p < 0.001$), source of smoke (e.g. restaurant) near your house ($p = 0.001$), working after school hours ($p < 0.001$), smoking ($p < 0.001$) and type of smoking (cigarettes) ($p = 0.002$), while no significant association between prevalence of asthma and use a home generator, presences factory near the house and exposure to irritant substances during work after the school. (Table 2).

Table 2. The association between the prevalence of asthma and exposure to risk factors.

		No asthma	**Asthma**	**P***
Variables. n=2000	**N**	**No. (%)**	**No. (%)**	**P***
Spending some time in house garden or public garden.				
No				
Yes	1149	1089(94.8)	60(5.2)	<0.001
	851	771(90.6)	80(9.4)	

Always use a home generator.				
No	1810	1688(93.3)	122(6.7)	0.160
Yes	190	172(90.5)	18 (9.5)	
Is there any of the following near the house?				
Factory				
No	1782	1652(92.7)	130(7.3)	0.139
Yes	218	198 (90.9)	20 (9.1)	
Generator				
No	1200	1112(92.7)	88(7.3)	0.474
Yes	800	735 (91.9)	65(8.1)	
Is there source of smoke (e.g. Restaurant) near your house?				
No	1514	1392(91.9)	122(8.1)	0.001
Yes	486	441(90.8)	45 (9.2)	
Working after school hours.				
No	1790	1684(94.1)	106(5.9)	<0.001
Yes	210	176(83.8)	34(16.2)	
Exposure to irritant substances during work after the school. n=210				
No	108	84(77.8)	24(22.2)	0.150
Yes	102	77(75.5)	25 (24.5)	
Type of exposure. n=102				
Dust	31	25(80.6)	6(19.4)	0.081
Chemicals	14	12(85.7)	2(14.3)	
gases	26	26(100.0)	0(0.0)	
others	31	29(93.5)	2(6.5)	
Smoking.				
No	1892	1770(93.6)	122(6.4)	<0.001
Yes	108	90(83.3)	18(16.7)	

Type of smoking. n=108				
cigarette	34	22(64.7)	12(35.3)	0.002
Argyle	38	34(89.5)	4(10.5)	
others	36	34(94.4)	2(5.6)	

***Chi-square test.**

It's evident in table 3 that 6.7% of the asthmatics had family history of asthma compared with 21.4% of non-asthmatics (p= 0.031). Around have (44.3%) of the asthmatics had history of disease other than asthma compared with 15.6% of non-asthmatics (p =0.001), only 9.3% of asthmatics take medication for diseases while 17.9% of non-asthmatics take medication for diseases (p =0.001). Regarding history of allergies, no significant association was detected between the prevalence of asthma with history of skin allergy and hay fever (p = 0.132 and p = 0.914 respectively) but it's evident in the table that 30.0% of asthmatic had allergic sinusitis compared with 18.8% of no asthmatic (p = 0.003) but there is no significant association with allergic laryngitis (p = 0.190) and food allergies (p = 0.200). The table shows that almost all the asthmatics had symptoms related to chest tightness, waking up and coughing while few of the non-asthmatics well feel such symptoms (p = 0.001) as presented in (table 3.3).

Table 3. The association between the prevalence of asthma and clinical history.

Variables. n=2000	**No asthma (n=1860) No.(%)**	**Asthma (n=140) No.(%)**	**Total (n=2000)**	**P***
Family history of asthma.	398 (21.4)	85 (60.7)	483(24.15)	0.031
History of diseases other than asthma.	290(15.6)	62(44.3)	352 (17.6)	0.001
Taking medication for any disease.	327(17.9)	13(9.3)	340 (17.0)	0.001
History of presence of the following allergies.				
Skin Allergy	598 (32.6)	36 (25.7)	634 (31.7)	0.132
Hay fever (rhinitis)	384 (20.6)	28 (20.0)	412 (20.6)	0.914
Allergic sinusitis	350 (18.8)	42 (30.0)	392 (19.6)	0.003
Allergic Laryngitis	514 (27.6)	52 (37.1)	566 (28.3)	0.190
Food allergy	460 (24.7)	85 (60.7)	540 (27.0)	0.200
waking up because of asthma in the last 12 months?	14 (0.7)	136 (97.1)	150 (7.5)	<0.001

Frequency of wheezing or whistling in the last 12 months? n=156				
Everyday	0(0.0)	12 (8.6)	12 (0.6)	0.003
At least once a week	0(0.0)	32 (22.8)	32 (1.6)	
Occasionally	16(0.8)	96 (68.6)	112 (80.0)	
Wakening up with a feeling of tightness in your chest at any time in the last 12 months?	19 (1.1)	138 (98.6)	157 (7.8)	<0.001
Waking up with a feeling of tightness in the chest at any time in the last 12 months.	10(0.5)	134 (95.7)	144 (7.2)	0.001
Attack of shortness of breath that come on at rest during the day at any time in the last 12 months.	14 (0.8)	130 (92.9)	144 (2.2)	0.001
Waking up by an attack of shortness of breath at the night in the last 12 months.	10 (0.5)	138(98.6)	148 (7.4)	0.001
Coughing in the early morning in winter.	20 (1.1)	130 (96.4)	150 (7.5)	0.001
Coughing during the day, or at night, in winter.	18 (0.1)	135 (96.4)	153 (7.6)	0.001

*Chi-square test.

The prevalence rate of symptoms of asthma are significantly higher among asthmatics than non-asthmatics. The other symptoms that are related to asthma are significantly higher among asthmatics than the non-asthmatics (p =0.001). The visits to medical staff were significantly higher among asthmatics than non-asthmatics (p= 0.001). The history of COVID-19 was significantly high (53.6%) among asthmatics compared with 19.0% among non-asthmatic (p = <0.001) (Table 4).

Table 4. The association between the prevalence of asthma and clinical history.

Variables. n=2000	**No asthma (n=1860) No.(%)**	**Asthma (n=140) No.(%)**	**Total (n=2000)**	**P***
Bringing up of phlegm at the early morning in winter.	27 (1.5)	135 (96.4)	162 (8.1)	0.001
Bringing up of phlegm during the day, or at night, in winter.	20 (1.1)	133 (95.0)	153 (7.6)	0.001
Worsening of symptoms (cough, phlegm, shortness of breath) in the last 12 months.	23(14.5)	135 (85.5)	158 (7.9)	0.001

Shortness of breath when hurrying on level ground or walking up a slight hill.	44 (2.3)	115 (82.1)	159 (8.0)	0.001
Taking any medicines including inhalers, aerosols or tablets for asthma.	45 (2.4)	111 (79.2)	156 (7.8)	0.001
Taking any medication for the treatment of allergy	35 (1.8)	120 (85.7)	155 (7.7)	0.001
Visiting the following medical staff in the previous 12 months because of breathing problems. n = 159.				
Nurse				
Physiotherapist	25 (1.3)	105 (75.0)	130 (6.5)	0.001
Practitioner of 'alternative' medicine	1(0.1)	3(2.2)	4 (0.2)	
	0 (0.0)	25(17.8)	25 (1.3)	
History of covid-19.	353(19.0)	75(53.6)	428 (21.4)	<0.001

***Chi-square test.**

Discussion:

Asthma is an important health issue among teenager globally and a major concern for health authorities worldwide (Mohamed Hussain 2018). It is a common heterogeneous chronic disorder of airways causing airflow obstruction with reversible and recurring symptoms due to bronchial hyper responsiveness and underlying inflammation. Severe asthma is a major cause of morbidity and health care costs and affects 10% of all patients with asthma (Carr and Kraft, 2017). Asthma currently affects 8.6% of all children younger than 18 years in the United States (Ramratnam et al., 2017). Most patients with asthma suffer from severe symptoms including coughing, shortness of breath, wheezing and sleep disturbance. Our study revealed that 7.0 % of adolescents in Erbil city were asthmatics. The rate was nearly comparable to rates mentioned in many studies as follows: study conducted among intermediate and secondary school students in Saudi Arabia, the prevalence of asthma was found to be 8.2% (Musharrafieh et al., 2020) and with a result of a study done on 1222 Portuguese students which showed that the prevalence of asthma was 8.9 % (Flores et al., 2022). Also similar with a result of a study done on Iranian adolescents where the prevalence of asthma was 8% (Rahimian et al.,2021). In this study, we observed highly significant associations between asthma and multiple housing-related risk factors, including housing dampness and exposures to mold, this result is in agreement with a study done in Iraq, Basrah city (Sherhan 2018) on ninety-six asthmatic patients triggered related to housing- factors, including the presence of mold, mold spots, mold odor, cockroach, water damage, and incense burning, the random-effect pooled or ranged from 1.43 to 1.73. Indoor dampness and the presence of mold in the household were shown to be associated with increased asthma risk in a previously conducted study by Sio & Chew (2021). Also, in agreement with a study done in Saudi Arabia by Stridsman et al. (2017). Other reported triggers that are difficult to avoid in the school environment included poor air quality, mold, a poorly cleaned environment and building reconstructions. As such, all staff members in a school have the responsibility to ensure that asthmatic children do not get worse in the school setting. They should therefore have knowledge about asthma, allergic diseases and factors that trigger symptoms. Regarding the type of heating system inside the house, the results of the current study showed that the highest percentage of asthma disease was among those using kerosene and gaseous heating system. This finding is in agreement with a result of a study done in Iraq by AbdulJabbar& Rashid (2021). Regarding household pets, the current study demonstrated a significant association between prevalence of asthma and household pets. This result is in agreement with another study conducted in Iran by Idani et al. (2019) which found that there was a significant association between household pets and asthma (p

<0.001). Also, in agreement with a study done by Fernandes et al. (2018) who found that keeping pets at home constituted a risk factor for active asthma and emphasized the importance of factors influencing this association, including the time at which the pet was owned, age at exposure, number of animals, allergen load in the home, and family history of atopy. Therefore, the aforementioned factors might modulate the expression of sensitization to animal allergens. Furthermore, the result of the present study showed significant association between the presence of a factory near the house and prevalence of asthma. This finding is in agreement with a result of a study done by Mohamed Hussain (2018) in Saudi Arabia which showed that the presence of brick factory near the residences of the studied population posed a significant risk factor for asthma. Also, in agreement with a study done in Portugal by Flores et al. (2022) on 1222 adolescent students. They concluded that the factor that greatly contributes to the increase in the prevalence of asthma is environmental pollution. Air pollution has been associated with several adverse human health outcomes, namely respiratory symptoms and chronic diseases such as asthma. Smoke exposure has adverse effects on the health of teenager, it is estimated that teenagers living with smoking parents passively smoke 30-150 cigarettes per year. Also found that current heavy passive smoking was related to an increase in the prevalence of wheezing and asthma, particularly in teenagers with a family history of allergy and increase in respiratory symptoms such as nocturnal cough, exercise-induced wheezing and nocturnal awakenings caused by wheezing, especially if more than 10 cigarettes per day are smoked in the home (Fernandes et al.,2018). Some investigators reported high asthma prevalence rate among teenagers with passive smoking and a history of asthma in the family (Kuti & Omole 2016). It also varied from region to region due to the variability of extrinsic allergens that might play a major role in infection of susceptible children (Mohamed Hussain 2018). The present study showed that quarter of study result had positive family history and that in agreement with systematic review study done by Sio & Chew (2021) on Asian population. The family medical history of asthma (any family members) was most frequently studied and significantly associated with an increased risk of asthma. The family history of asthma was the most frequently reported risk factor for asthma development in Asia with the highest risk estimate for asthma development. Also, in agreement with a study done on Iraqi adolescents (Al-Abayechi, 2019). Regarding to allergies, the results of our study showed that the majority of study sample have allergic rhinitis and allergic sinusitis. This result is in agreement with a result of a study done in Karaj, Iran by Tavakol et al. (2020) where 49.4%, 36.6%, and 32.7% respectively of the adolescents have allergic rhinitis, sinusitis and eczema. In addition, our study showed that the majority of the study sample had history of wakening up with a feeling of wheezing and tightness in the chest at any time in the last 12 months and that was in agreement with result of study done by Alruwaili & Elwan (2018). The present study revealed that the prevalence of current (past 12 months) wheeze was 16.8% in the study population, and 72.1% of them reported less than 4 wheezing attacks in the last 12 months.

Up to the researchers' knowledge, this is the first comprehensive study that is conducted in Erbil city, Iraqi Kurdistan Region to estimate asthma prevalence among teenagers. Results of this study may act as a baseline for further asthma studies in our region.

Fifty students especially in male school refuse to make the interview with the researcher because they didn't have enough time and they didn't want to participate in the study.

Conclusions:

The prevalence of asthma in Erbil city, Iraqi Kurdistan Region was 7.0 %. The rate of asthma and asthma related symptoms is highly effected by many of risk factors like heating system inside the house and house related factors such as presence of dampens, molds, house hold pets, presence of plants and flowers in the house and smoking among 12 to 19-year-old teenager. Awareness campaigns on asthma are recommended to be conducted by Ministry of Health for teenagers at the schools.

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