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KNOWLEDGE AND ATTITUDE OF LEBANESE ADULTS TOWARDS ASTHMA IN BEIRUT, LEBANON

Farah Hatem Haidar
Pharm D Student, Faculty of Pharmacy, Beirut Arab University, Beirut, Lebanon,
farah.haidar306@gmail.com

Doaa Issa
Associate Professor, Pharmaceutical Sciences Department, Faculty of Pharmacy, Beirut Arab University, Beirut, Lebanon, d.issa@bau.edu.lb

Maha Aboul Ela
Professor of Pharmacognosy, Faculty of Pharmacy, Beirut Arab University, Beirut, Lebanon; Faculty of Pharmacy, University of Alexandria, Egypt, mahaaboulela@bau.edu.lb

Karim Raafat
Associate Professor, Faculty of Pharmacy, Pharos University, Alexandria, Egypt, k.raafat@bau.edu.lb

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Abstract

Asthma, a serious global health problem, has been an area of interest due to its increasing prevalence, expanding treatment costs, and rising burden on patients and the community. Since asthma cannot be cured, clinical episodes can be prevented and controlled by adequate management and sufficient knowledge of the disease. Appropriate treatment may relieve asthma symptoms and improve quality of life. However, poor knowledge of asthma disease and medication use, misdiagnoses, misuse of inhalers and inadequate self-management of disease symptoms may have a greater impact on the disease process. Therefore, assessment of the population's knowledge and attitude toward asthma is essential. To the best of our knowledge, no previous studies has assessed the population's knowledge and attitude regarding asthma in Beirut, thus this study was conducted to assess the knowledge and attitude of Lebanese adults regarding asthma in Beirut, Lebanon. Additionally, the goal of this study was to determine the incidence from the studied sample of participants with physician-diagnosed and physician-undiagnosed asthma treated by bronchodilators/inhaled corticosteroids (BD/ICS). Furthermore, to identify from the sample studied the participants having the likelihood of asthma disease and to highlight the natural products used by the participants in managing asthma-related symptoms. Four hundred participants were enrolled in a cross-sectional study that was carried out using web-based anonymous questionnaires about asthma disease evaluating their knowledge towards the disease and attitude in Beirut, Lebanon. The study revealed that Lebanese adults had an inadequate level of knowledge regarding asthma, its medications, and asthma triggers. This lack of knowledge was reflected in their attitude towards the disease. Moreover, our study showed that 9.1% of the asthmatic participants who were questioned were undiagnosed yet by the physician and 33.3% of those were using BD/ICS to relieve their asthma symptoms. Furthermore, it is noteworthy that 18.75% of the questioned participants had recurrent respiratory symptoms and had features that associated with asthma, thus increasing the risk of developing chronic airway disease and asthma. However, only 8.25% of questioned participants were asthmatic. In conclusion, there is a need to improve the Lebanese community's knowledge and attitude by increasing the level of awareness about the disease. Several recommendations were suggested to advance the knowledge of asthma in order to improve future health outcomes.

Keywords

Knowledge, Attitude, Asthma, Triggers, Misconceptions, Lebanon, Medications, Natural products

1. INTRODUCTION

Asthma is a widespread chronic respiratory disease (WHO,2021). It is primarily defined as a chronic inflammatory disease that affects the lower airways, promoting an increase in bronchial reactivity, hypersensitivity, and a decrease in the bronchial airflow (Lambrecht, Hammad,2015). Globally, asthma prevalence was assessed to range from 1 to 18% of the general population in different countries (GINA,2019). Nowadays, asthma affects around 300 million individuals, and it is predicted to reach an additional 100 million individuals by 2025 (Nunes, Pereira, Morais-Almeida, 2017; Dharmage, Perret, Custovic,2019). Recently in Lebanon, a first national study was conducted and revealed a prevalence of physician-diagnosed asthma of 6.7%, and that of current asthma 5% (Akiki, Saadeh, Farah, Hallit, Sacre, Hosseini, et al,2021). Consequently, this increase in asthma prevalence and incidence may be due to the effect of the "modern lifestyle" that includes a varied number of environmental risk factors (Nunes, Pereira, Morais-Almeida,2017).

Asthma is a non-communicable disease that can start at any age (Martinez, Vercelli,2013). It is characterized by recurrent episodes of respiratory symptoms that are wheezing, chest tightness, shortness of breath, and/or cough and by a variable expiratory airflow limitation. These symptoms may resolve spontaneously or in response to medication, however patients may have sporadic asthma attacks that could be life-threatening. In addition, respiratory symptoms vary over time and in intensity and this variation may be due to the exposure to variable triggering factors such as exercise, changes in weather, allergen or irritant, or viral respiratory infections that sensitize asthma and exacerbate its symptoms (GINA,2021). Asthma can also be triggered by some drugs such as beta-blockers, aspirin or other non-steroidal anti-inflammatory drugs (NSAIDs) (Morales, Lipworth, Donnan, Jackson, Guthrie,2017; Karakaya, Celebioglu, Kalyoncu,2013). Diagnosing an individual with asthma is simply the first step in reducing the symptoms, functional limitations, impairment in quality of life, and risk of adverse events that are associated with the disease (GINA,2021). Consequently, the diagnosis is based on the characteristic pattern of the respiratory symptoms and variable expiratory airflow limitation. Subsequently, identifying asthma risk factors is important for the diagnosis and prevention of the disease (American Lung Association,2020).

Each asthmatic patient must have his own treatment goals, taking into consideration various medical systems, the availability of medications, as well as cultural and individual preferences. In addition, pharmacotherapy and non-pharmacotherapy interventions are essential to achieve optimal asthma management, good symptom control and reducing future risk of asthma-related complications. The most recent asthma treatment recommended by GINA guidelines is categorized into two treatment tracks, with the key difference being the reliever medication (GINA,2021).

Overall, there is a strong patient approve for the use of complementary and alternative medicine as part of a broad asthma self-management plan. Consequently, natural products include a wide variety of herbs, vitamins, minerals, dietary supplements, and specialized diets (allergen-free diets) (George, Topaz,2013). Historically, plants were considered to be the primary source of products used in traditional medicine to manage asthma for centuries. Due to its simple access and renewable nature, along with their ability to promote anti-asthma activity mainly due to their anti-inflammatory and bronchodilator properties (Amaral-Machado, Oliveira, Moreira-Oliveira, Pereira, Alencar, Tsapis, et al,2020). Moreover, the primary ingredients in the herbal remedies that reduce asthma symptoms are flavonoids, phenolic acids, and terpenoids. Generally, commonly used herbal remedies include chamomile, mint, echinacea and ephedra as well as coffee and tea (contain natural methylxanthines) which are frequently used to supplement or replace short-acting beta-agonists (SABAs) in the rescue treatment of acute asthma (George, Topaz,2013). Despite the relevant anti-asthmatic activity of the natural products, research on the pharmacokinetics as well as efficacy, safety, and the dosage requirements to induce anti-asthma activity is still lacking (Amaral-Machado, Oliveira, Moreira-Oliveira, Pereira, Alencar, Tsapis, et al,2020). Therefore, all complementary and alternative medicine (CAM) self-management strategies must be assessed for timeliness and appropriateness, and discussed through a shared decision- making model (George, Topaz,2013). Even though asthma is a reversible bronchial disease, it cannot be cured. Nevertheless, appropriate management and adequate knowledge of the disease may prevent and control asthmatic clinical episodes (Martinez, Vercelli,2013).

To the best of our knowledge, there have only been few prior studies assessing the public's knowledge and attitudes towards asthma (Daniel, Inbaraj, Jenkins, Ramamurthy, Isaac, 2021; Weiss, Grant, Li, 1999; Razi, Bakırtaş, Demirsoy, 2011; Jumbe Marsden, Wa Somwe, Chabala, Soriano, Vallès, Anchochea, 2016), since most of the studies were conducted among asthmatic patients, family members or practitioners. Therefore, assessing the level of knowledge and attitude in the community is essential to collect missing scientific data that is important for planning future public health interventions. Consequently, this study was conducted to assess the knowledge and attitude of Lebanese adults towards asthma in Beirut, Lebanon. Moreover, the purpose of this study was to examine the effect of social demographic characteristics on asthma awareness among the public and to determine the incidence from the sample studied of participants with physician-diagnosed and physician-undiagnosed asthma

treated by bronchodilators/inhaled corticosteroids. Furthermore, to identify from the sample studied the participants with a likelihood of asthma disease to advise them to seek medical attention. Additionally, to highlight the natural products used by the participants in managing asthma-related symptoms as a secondary outcome.

2. MATERIALS AND METHODS

A cross-sectional descriptive study was conducted via web-based anonymous questionnaires for a random sample in the Beirut area, Lebanon, from November 2020 to February 2021. Where Beirut adult residents who were between 18 and 65 years old were invited to fill out a questionnaire after obtaining their informed consent. However, participants who did not meet the inclusion criteria were excluded.

The sample size was computed using the online "Raosoft®" calculator assuming Beirut's adult population to account for 2 million in 2020. Accordingly, a total of 385 participants and above would provide a representative sample with 5% margin error and 95% confidence level. Hence, 400 participants were selected randomly to fill the questionnaire.

The questionnaire was designed based on previous guidelines and prior questionnaires. It was created in English and then translated into Arabic, the native language in Lebanon. Moreover, it was reviewed and tested with a convenient sample of 10 participants and modifications were made accordingly. The questionnaire included demographic information such as age, gender, educational level, smoking habit,family history of asthma, and childhood history of allergic rhinitis or eczema as well as 3questions targeting asthmatic patients. The purpose of this part was to examine the characteristics of the population and the effects of these characteristics on asthma awareness among the public. In addition, to determine the incidence from the studied sample of participants with physician-diagnosed and physician-undiagnosed asthma treated by bronchodilators/inhaled corticosteroids. The questionnaire also included participant's knowledge and attitude toward asthma.

Furthermore, the questionnaire included, according to the International Primary Care Respiratory Group (IPCRG) and Global Initiative for Asthma (GINA) guidelines, an initial diagnosis of participants, who had a history of respiratory symptoms, with probability of having chronic airway disease or asthma. The Knowledge level was measured on a scoring scale assigning one point for each correct answer with a maximum score of 32.

The results were analyzed using IBM Statistical Package for the Social Science (SPSS®) version 23. Categorical data were expressed as frequencies (percentages) while continuous data as means ± the standard deviation (SD). One-way ANOVA test and Two-sample T test were used to compare means between different groups and to know if the differences between groups were statistically significant or not (after ensuring normality and variance homogeneity. All results will be considered "statistically significant" when the p-value ≤ 0.05 with a confidence interval of 95%.

3. RESULTS

3.1. Demographic Characteristics

Of the 400 participants who met inclusion criteria, 76% were females ,72.3% were between the age of 18 and 34 age range, 40% were bachelor's degree holders, almost equally distributed between medical (45.8%) and non-medical sectors (44.3%) and 67.8% were non-smokers. Additionally, 23.5% of the participants had suffered from childhood allergic rhinitis or eczema and 29.8% had a family member with asthma. Just 8.3% were asthmatics of those 90.9% were physician-diagnosed and 9.1% were not, 87.9% of them used inhalers and 48.5% had asthma for more than 10 years (Table 1).

Table 1: Demographic data of study population (n=400)

Characteristics	Subgroups	Number of participants	Percentages(%)
Age group (years)	18-34	289	72.3
	35-54	84	21
	55-65	27	6.8
Gender	Male	96	24
	Female	304	76
Highest level of education completed	High school or less	35	8.8
	College undergraduate	103	25.8
	Bachelor	160	40
	Postgraduate	97	24.3
	Not educated	5	1.3

Medical/non-medical sector	Medical	183	45.8
	Non-medical	177	44.3
	None	40	10
Smoking habit	Non-smoker	271	67.8
	Smoker	110	27.5
	Ex-smoker	19	4.8
Childhood allergic rhinitis or eczema	No	278	69.5
	Yes	94	23.5
	Don't know	28	7
Family member with asthma	No	281	70.3
	Yes	119	29.8
Asthmatic	No	367	91.8
	Yes	33	8.3
Estimating having asthma (Total=33, 8.3%)			
Physician-diagnosed asthma	No	3	9.1
	Yes	30	90.9
Use of inhaler (BD/ICS)	No	4	12.1
	Yes	29	87.9
Duration	< 1 year	3	9.1
	1-2 years	3	9.1
	3-5 years	5	15.2
	6-10 years	6	18.2
	> 10 years	16	48.5

3.2. Knowledge of Lebanese Adults about Asthma

3.2.1. Knowledge of asthma as a disease

The fact that asthma is a long-term inflammatory disease of the airways of the lungs was acknowledged by 79.5% (318) of the participants. Ninety-six percent of participants (384) did not agree that asthma is a contagious disease. Only 71% of participants (284) knew that asthma occurs at all ages. Ninety-five percent of participants (380) knew that difficulty breathing, 60.5% (242 participants) cough, 81.5% (326 participants) wheezing, and 74.8% (299 participants) chest tightness are all asthma symptoms. Almost 28.3% (113) of participants did not agree that asthma symptoms are due to the drying in lung mucous membranes and 53% of participants (212) did not agree that asthma may be curable. In addition, 77.5% of participants (310) knew that family history of asthma is a risk factor for developing asthma and 89.8% of participants (359) knew that spring season is the most related season to asthma symptoms. Further, more than 90% of participants agreed that tobacco smoke worsens asthma and that asthma attacks can be controlled. Ninety-seven percent of participants (388) agreed that using medicine, 27.5% of participants (110) agreed that using herbal products, 71.5% of participants (286) agreed that avoiding triggers, and 90.3% of participants (361) did not agree to use antibiotics to control asthma symptoms. Three hundred and nineteen participants (79.8%) of the participants agreed that asthmatic patients can practice their daily life activities successfully as non-asthmatic individuals (Table 2).

Table 2: Knowledge of Lebanese adults towards asthma as a disease

Statement related to disease	Number (%) of participants		
	Correct	Incorrect	Don't know
Asthma is defined as a long-term inflammatorydisease of the airways of the lungs.	318 (79.5)	10 (2.5)	6 (1.5)
Asthma is a contagious disease.	384 (96)	39 (9.8)	43 (10.8)
At what age can asthma occur?			
Childhood	317 (79.2)	83 (20.8)	0 (0)
Adolescence	394 (98.5)	6 (1.5)	0 (0)
Adulthood	398 (99.5)	2 (0.5)	0 (0)
All ages	284 (71)	116 (29)	0 (0)
I don't know	0 (0)	0 (0)	25 (6.3)

Which of these is/are asthma symptom(s)? Difficulty breathing Severe headache Coughs Wheezing High grade fever Chest tightness	 380 (95) 386 (96.5) 242 (60.5) 326 (81.5) 394 (98.5) 299 (74.8)	 20 (5) 14 (3.5) 158 (39.5) 74 (18.5) 6 (1.5) 101 (25.3)	 0 (0) 0 (0) 0 (0) 0 (0) 0 (0) 0 (0)
Asthma symptoms are due to the drying of lungmucous membranes.	113 (28.3)	134 (33.5)	153(38.3)
Asthma may be curable.	212 (53)	135 (33.8)	53 (13.3)
Family history of asthma is a risk factor in developing asthma.	310 (77.5)	35 (8.8)	55 (13.8)
Which season is most related to asthma symptoms?Spring Summer	359 (89.8)	20 (5)	21 (5.3)
Tobacco smoke worsen asthma.	378 (94.5)	3 (0.8)	19 (4.8)
Asthma attacks can be controlled.	375 (93.8)	5 (1.3)	20 (5)
If the previous statement is true, how to controlasthma symptoms? Use of medicine ex. Inhalers or daily tabletsUse of herbal products ex. Chamomile tea To avoid triggers ex. Tobacco smoke Use of antibiotics Don't know	 388 (97) 110 (27.5) 286 (71.5) 361 (90.3)	 12 (3) 290 (72.5) 114 (28.5) 39 (9.8)	 0 (0) 0 (0) 0 (0) 0 (0) 11 (2.8)
Asthmatics can be as successful as non-asthmatic patients in practicing their daily life activities.	319 (79.8)	57 (14.3)	24 (6)

3.2.2. Knowledge towards asthma medications

In our study, 54% of the participants were able to point out that drugs used for asthma attacks do not narrow airways in the lungs, 45.3% of the participants agreed that asthmatic patients should adhere to their medications even when symptoms are infrequent, and 53.5% of the participants did not agree that herbal products are more effective and safer than regular drugs (Fig.1).

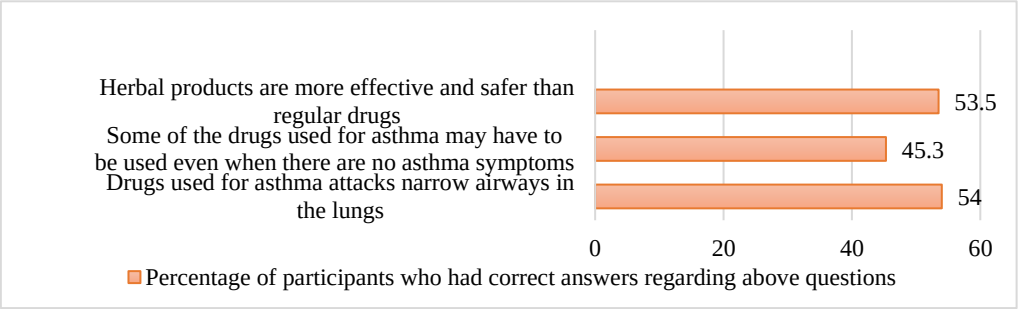

Figure 1: Knowledge towards asthma medications

3.2.3. Knowledge about asthma triggering factors

The results, of the current study, showed that 51.8% of the questioned participants knew that pollens, 77.8% climate change, 81.5% tobacco smoke, 75.3% respiratory tract infections and 56.3% knew that furry pets are triggering factors for asthma. Moreover, 45% of the questioned participants agreed that some drugs such as beta-blockers, aspirin or other NSAIDs can also trigger asthma. About 60% of the participants disagreed that the presence of cats or dogs at home has no impact on asthma patients and 72.5% of the participants had identified that some occupations such as carpentry, gardening, baking, and hairstyling are risky for asthmatics (Table 3).

Table 3: Knowledge about asthma-triggering factors

Statement	Number (%) of participants with correct answer
Which of the following may trigger asthma symptoms?	
Pollen	207 (51.8)
Climate change	311 (77.8)
Tobacco smoke exposure	326 (81.5)
Respiratory tract infections	301 (75.3)
Furry pets	225 (56.3)
Some medications may trigger asthma symptoms. (ex. ASPIRIN®, beta-blockers, pain killers)	180 (45)
The presence of cats or dogs at home has no impact on asthma patients.	240 (60)
Some occupations like carpentry, gardening, baking, and hairstyling are risky for asthma patients.	290 (72.5)

A score of 32 was calculated to evaluate the Lebanese adult's knowledge regarding asthma. The result showed that the participants had a mean score of 23.26 with a minimum of 9 and a maximum of 32 (Table 4).

Table 4: Descriptive statistics and analysis of knowledge score

	Number of participants	Minimum	Maximum	Mean	Std. deviation
Total score/32	400	9	32	23.26	4.59239

3.3 Attitudes of Lebanese Adults towards Asthma

3.3.1 Attitude towards asthma as a disease and its medication

The results showed that 66.3 % of participants (265) would consult a physician as a first response. Moreover, 47.3% of participants (189) would visit the physician when respiratory symptoms appeared at the beginning though 47% of participants (212) preferred not to self-treat. In addition, 59.9% of participants (270) thought that asthma would affect their quality of life such as participating in normal daily activities, tolerating physical exercises, and sustaining mood well-being, 80.3% of the participants (362) would stop smoking (if they were smokers), and 73.6% (332) would regularly exercise. Furthermore, 11.3% of participants (51) would think that their lungs are not more sensitive to any irritant if they took asthmatic medications and felt better with no symptoms. In addition, 67.8% of the participants (306) admitted that asthma symptoms would not completely disappear despite following the physician's treatment plan and 47.5% (214) would not be bothered from taking their medication for the rest of their lives (Table 5).

Table 5: Attitudes of Lebanese adults towards asthma

Statement	Variable	Number (%) of participants
Assume that for the past few days, you had asthma-like symptoms (for example, shortness of breath, coughing...)		
Statement related to disease		
The first thing you do is	Consult a physician	265 (66.3)
	Consult a pharmacist	55 (13.8)
	Use natural herbal products	26 (6.5)
	Use an antibiotic to manage symptoms	6 (1.5)
	Use an inhaler to relief symptoms without consulting the physician	48 (12.0)

When would you visit the physician?	When respiratory symptoms appear at the beginning When your respiratory symptoms get worse When your drug used is no longer effective as before You would not visit the physician	189 (47.3) 150 (37.5) 53 (13.3) 8 (2)
If you want to self-treat yourself, which do you prefer?	You would not self-treat Pills containing Cortisone The inhaler that opens airways to facilitate breathing ex. VENTOLIN® Inhaler containing Cortisone Other**	212 (53) 150 (37.5) 8 (2) 14 (3.5) 16 (4)
Do you think asthma will affect your quality of life such as participating in normal daily activities, tolerating physical exercises, and sustaining mood?	No Yes	130 (32.5) 270 (67.5)
Would you stop smoking (if you smoke)?	No Yes	38 (9.5) 362 (90.5)
Would you regularly exercise?	No Yes	68 (17) 332 (83)
Statement related to medications		
If you are on a drug prescribed by the physician, and then you felt better with no symptoms. That means:	Your lungs are not sensitive to any irritant It is okay to skip doses of the drug You are cured and no need for the drug anymore None of the above You don't know	51 (12.7) 20 (5) 47 (11.8) 206 (51.5) 76 (19)
Even if you follow a physician's treatment plan, do you think your asthma symptoms will completely disappear.	No Yes Don't know	306 (76.5) 71 (17.7) 23 (5.8)
It would not bother you if you have to take medication for long life.	No Yes	214 (53.5) 186 (46.5)

**other: herbal medicine (natural herbal mixtures), antihistamine drugs like XYZAL® (Levocetirizine), and HISTAMED-F® (Dexamethasone, Dexchlorpheniramine), and nebulizer with VENTOLIN®.

3.3.2 Attitudes towards the use of natural remedies for asthma

In this study, 41% of the participants (164) would use herbal products, 34.3% (137) preferred using herbal products over drugs, 52% (208) would try dietary supplements like magnesium, fish oil or vitamin C and 49.3% (197) would try herbal preparations such as st john's wort, chamomile, mint and ginseng to manage asthma symptoms. As well, upon asking participants to specify herbal products that they could use to manage their asthma symptoms, variant natural remedies were reported and presented in Table 6.

Table 6: Different natural remedies stated by participants for managing asthma

Natural remedies	Applying almond oil on the chest and massaging
	Drinking a hot tea of herb or a mixture of herbs that contain chamomile, mint, ginger, thyme, rosemary, tisane, green tea, ginseng, ephedra, sinna herbs, sage (meramieh), eucalyptus, or ivy leaves
	Drinking warm water with honey or ginger with honey or thymewith honey each morning
	Steam of added eucalyptus or mint or thyme leaves
	Taking a spoon of honey daily

	Drinking boiled aloe vera leaves extraction

3.4 Association of Participants' Knowledge Score with Demographics

Significant correlations were detected between the knowledge mean score and different demographic characteristics (Table 7).

Table 7: Association between participants' demographic background and knowledge score

Characteristics	Subgroups	Mean	SD	P-value
Age	18-34	23.37	4.59	
	35-54	22.81	4.59	0.59
	55-65	23.44	4.68	
Gender	Male	23.22	4.83	
	Female	23.27	4.52	0.92
Highest level of education	High school or less	21.17	3.71	0.01
	College	23.36	4.05	0.01
	undergraduate	23.05	4.85	0.03
	Bachelor	24.41	4.60	0.00
	Post graduate	20.20	6.26	0.65
	Not educated			
Medical/non-medical field	Medical	25.91	3.78	0.00
	Non-medical	21.02	3.99	0.69
	None	21.05	4.02	0.69
Smoking habit	Non-smoker	22.83	4.61	0.03
	Smoker	23.95	4.50	0.03
	Ex-smoker	25.37	4.02	0.02
Childhood allergic rhinitis or eczema	No	22.99	4.80	
	Yes	23.88	3.96	0.21
	Don't know	23.86	4.34	
Family member with asthma	No	22.69	4.65	0.00
	Yes	24.61	4.17	0.00
Asthmatic	No	23.14	4.60	
	Yes	24.58	4.31	0.09

3.5 Incidence from Sample Studied of Asthmatic Participants Treated by Inhalers

Physician-diagnosed asthma was well-defined by a positive answer to the question: "Has the physician ever diagnosed you with asthma?" The results showed that 8.3% of the participants (33) had asthma disease among which 90.9% (30) were physician-diagnosed with asthma and 9.1% (3) were undiagnosed by a physician. Furthermore, 84.8% of participants (28) of physician-diagnosed asthma and 3% of participants (1) of physician-undiagnosed asthma were using inhalers to relieve asthma symptoms (Fig.2).

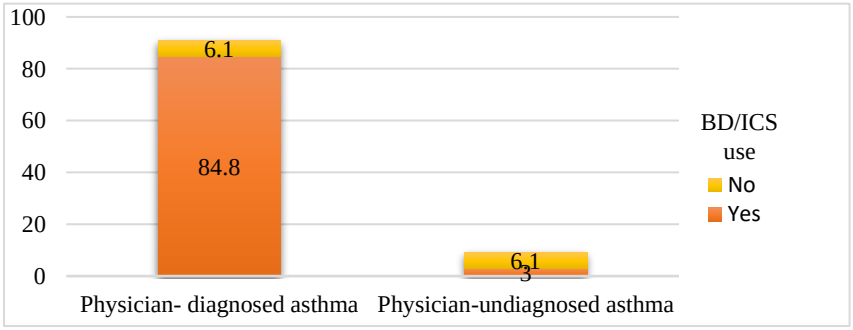

Figure 2: Percentage of participants with physician-diagnosed and undiagnosed asthmatreated by

bronchodilators/inhaled corticosteroids (BD/ICS) (N=33)

3.6 Initial Diagnosis of Participants Having a History of Respiratory Symptoms

According to IPCRG and GINA guidelines, screening questions were used to identify participants at risk of, or with a significant likelihood of having chronic airways disease, and respectively having asthma disease. This was based on participants' clinical history. Thus, participants with a history of recurrent respiratory symptoms (cough, wheezes, chest tightness and shortness of breath) and with excluding evidence of infection (no fever, sweats or colored sputum) were enrolled in screening questions. Consequently, 34.5% of participants had respiratory symptoms, and 18.75% of them had recurrent respiratory symptoms and characteristics of asthma, thus the likelihood of having chronic airways disease specifically asthma disease. Hence, 18.75 % of participants were having likelihood of asthma disease despite that only 8.25% were asthmatic.

4. DISCUSSION

Everyone needs to be aware of the etiology, physiology, risk factors, and dangers of overuse or underuse of medications for asthma. As a result, an evaluation of an individual's knowledge and attitude towards asthma would improve therapeutic outcomes. Due to the importance of the role of the population in asthma management, asthma patients as well as non-asthma individuals should be well-informed about the positive attitude towards the illness and treatment in order to achieve effective disease management in the community (GINA,2020).

Even though the overall responses of the Lebanese adults in the study, regarding the knowledge towards asthma, suggested a fair degree of uncertainty. It was remarkable that for questions targeting the *knowledge towards asthma as a disease*, almost correct responses were chosen by >70% of the participants. However, among these questions less than one-third of participants correctly characterized the statement "asthma symptoms are due to the drying in lung mucous membranes" as false and almost half of them knew that asthma could not be cured (GINA,2021). The result concerning the statement "asthma could not be cured" was the same as in a study performed in Chicago, which surveyed Chicago individuals to investigate the effects of asthma experience and social demographic characteristics on asthma awareness among the public (Weiss, Grant, Li, 1999). In addition, the previous result is almost the same in comparison with a study performed in Zambia which surveyed Zambians to determine their knowledge and perceptions of asthma (Jumbe Marsden, Wa Somwe, Chabala, Soriano, Vallès, Anchochea, 2016). Further, in our study 79.5% answered correctly, that asthma is a long-term inflammatory disease affecting the lungs. Furthermore, the majority of the questioned participants (96%) answered correctly by false the statement "asthma is a contagious disease", which is considered higher in comparison with the study performed in rural South India that surveyed healthy adults to assess the level of knowledge, attitude, and perception in the community (Daniel, Inbaraj, Jenkins, Ramamurthy, Isaac, 2021).

About 71% of the questioned participants chose correctly that asthma could occur at all ages. In contrast, 89.9% of the Chicago community answered correctly by false the statement "asthma onset always in childhood" (Weiss, Grant, Li, 1999). In addition, the participants' responses to the question of choosing the correct asthma symptoms were 95% chose correctly difficulty breathing, 60.5% chose correctly cough, 81.5% chose correctly wheezing and 74.8% chose correctly chest tightness. These results are comparable in comparison with the Indian study where 91.1% of Indian adults chose correctly difficulty breathing, 84.6% chose correctly cough, 86.8% chose correctly wheezing and 57.9% chose correctly chest tightness (Daniel, Inbaraj, Jenkins, Ramamurthy, Isaac, 2021). Family history of asthma is one of the most prevalent risk factors for developing asthma, about 77.5% agreed with that, which is almost similar to the individuals who were questioned in the Chicago study where 76.8% answered correctly (Weiss, Grant, Li, 1999). In contrast, the result in our study is considered higher in comparison with that in the Indian study where only 38.2% of Indian adults answered correctly (Daniel, Inbaraj, Jenkins, Ramamurthy, Isaac, 2021).

Allergen exposure especially in the pollen season/spring is one of the common triggering factors for asthma exacerbations and symptoms flare-ups (GINA,2021), 89.8% of participants knew that the spring season is the most season related to asthma symptoms flare-ups. A higher proportion (94.5%) of our study participants agreed that tobacco smoke worsens asthma compared to 86.6% in the Chicago community asthma study (Grant, Turner-Roan, Daugherty, Li, Eckenfels, Baier, McDermott, Weiss, 1999). Generally, asthma cannot be cured but clinical episodes can be prevented and controlled by appropriate management, use of avoidance measures and sufficient knowledge of the disease (Gare, Godana, Zewdu, 2020). About 93.8 % of the participants in our study

agreed that asthma attacks can be controlled. Besides, all asthmatic patients should be encouraged to adhere to medications especially when symptoms are infrequent, identify and may use inert side effects-free natural products and avoid, if possible, asthma triggering factors (GINA,2019). In our study, the majority of participants agreed that by the use of medicine asthma symptoms is controlled while almost half of Chicago participants only agreed with that which is low in comparison with our study (Weiss, Grant, Li, 1999). In addition, asthmatic patients can be as successful as non-asthmatic patients in practicing their daily life activities (GINA,2021), 79.8 % of questioned participants in our study agreed with previous statement and which is higher in comparison with the Chicago study where 84.9% of participants agree that asthma limits exercise (Weiss, Grant, Li, 1999).

Regarding *participants' knowledge towards asthma medications*, it was remarkable that almost half of the participants chose correct responses. Regarding *participants' knowledge about asthma triggering factors*, correct responses were chosen by > 45% of the participants. The results, of our study, showed that almost half of questioned participants knew that pollen and furry pets are triggering factors for asthma while 81.5% knew that tobacco smoke is a trigger also. These results are lower in comparison with the Chicago study where more than 80% of the surveyed participants choose pollen and furry pets as triggering factors (Weiss, Grant, Li, 1999). Moreover, some drugs such as beta-blockers, aspirin or other NSAIDs can also trigger asthma (Morales, Lipworth, Donnan, Jackson, Guthrie,2017; Karakaya, Celebioglu, Kalyoncu,2013). Indeed, only 45% of the questioned participants in our study agreed with the previous statement. Additionally, more than 50% of the questioned participants in our study knew that the presence of cats or dogs at home and that some jobs such as carpenter, gardener, baker, and hairdresser are risky for asthma patients.

Subsequently, the *mean knowledge score in our study indicates a moderate level of knowledge*. A reference score ranging from 0 to 22 was used, where three levels were determined based on Bloom's cut off point (High (80–100%), Moderate (60–79%), and Low level of knowledge (0–59%) (Daniel, Inbaraj, Jenkins, Ramamurthy, Isaac, 2021). The maximum score obtained on the overall knowledge of Lebanese adults about asthma was 32/32, and the scores ranged from 9 to 32. Also, the mean score 23.26/32 was equivalent to 72.69 %, thus moderate level of knowledge was concluded. The mean score signifies the overall knowledge of the Lebanese adults regarding asthma disease, its medications and asthma triggering factors.

In the present work, *the participants' attitudes towards asthma and its medications were investigated after supposing that each participant had asthma like symptoms (ex. shortness of breath, wheezing, coughing...) for the past few days*. Most of the participants (66.3%) would consult a physician as a first choice after experiencing asthma like symptoms. Other participants would consult a pharmacist and few would use natural herbal products. However, 12% of the participants would use an inhaler to relief symptoms without consulting the physician and 1.5% would use an antibiotic to manage symptoms. When asked about the reason to visit the physician after experiencing asthma like symptoms, almost half of the participants would visit the physician when their respiratory symptoms appear at the beginning. On the other hand, one third would visit when their respiratory symptoms get worse, few would visit when their drug used is no longer effective as before and 2% would not visit the physician. Additionally, almost half of the participants would not self-treat, one third would take pills containing Cortisone, and few would use an inhaler that open airways to facilitate breathing ex. Ventolin® or inhaler containing Cortisone. Moreover, 3.5% would use herbal medicine or antihistamine drugs like Xyzal® (Levocetirizine), Histamed-F® (Dexamethasone, Dexchlorpheniramine), or nebuliser with Ventolin®. In this study, more than 70% of the participants thought that asthma would affect their quality of life such as participating in normal daily activities, tolerating physical exercises, sustaining mood, and would quit smoking and regularly exercise in case of having asthma disease.

Regarding *participants' attitudes towards asthma medications*, half of the participants did not agree with the other options regarding the statement "If you are on a drug prescribed by the physician, and then you felt better with no symptoms". However, 23.6% of Zambian participants disagreed with the statement "when asthma attacks stop, you don't have asthma anymore" (Jumbe Marsden, Wa Somwe, Chabala, Soriano, Vallès, Anchochea, 2016). Besides, GINA guidelines encourage asthmatic patients to adhere to their controller medications even when symptoms are infrequent (GINA,2021). As well, the majority of the participants agreed that after following a physician's treatment plan, asthma symptoms will not completely disappear. Further, half of the participants would not bother when taking their medications lifelong while, the other half would be bothered.

Regarding *participants' attitude toward the use of natural therapies for asthma*, about half of the participants would use herbal products, dietary supplements like magnesium, fish oil or vitamin C or herbal preparations such as st john's wort, chamomile, mint and ginseng to manage their asthma symptoms. Furthermore, there are several studies of dietary supplements that discuss their role in asthma control especially magnesium and fish oils that reduce bronchial hyper-reactivity, pulmonary function, and inflammatory biomarkers (George, Topaz, (2013). In addition, one third of the participants prefer using herbal products over drugs to manage asthma symptoms. However, researches on the pharmacokinetics characteristics, safety, efficacy, and dosage required to provide anti-asthma activity is still minimal (Amaral-Machado, Oliveira, Moreira-Oliveira, Pereira, Alencar, Tsapis, et

al,2020).

Besides, upon asking participants to specify herbal products that they could use to manage their asthma symptoms, variant natural remedies were reported. Natural remedies included applying and massaging almond oil on the chest, drinking a hot tea of herb or a mixture of herbs such as chamomile, mint, ginger, thyme, rosemary, tisane, green tea, ginseng, ephedra, sinna, sage (meramieh), eucalyptus, or ivy leaves and drinking warm water with honey or ginger with honey or thyme with honey each morning. Other remedies included steaming of added eucalyptus or mint or thyme leaves, taking a spoon of honey daily and drinking boiled water of aloe vera leaves.

When *correlating the mean knowledge score with the participants' social demographic characteristics*, insignificant correlation was obtained for age variation, gender, uneducated participants, non-medical field, history of childhood allergic rhinitis or eczema, and asthmatic or not. However, males and females were of equal means (23.2) which indicates that there is no difference between genders in the knowledge of asthma thus it was unexpected for the gender to be insignificant. Further, uneducated participants were with the least mean (20.20), which may be significant since level of education affects participant's knowledge. Additionally, individuals with asthma should be significantly more knowledgeable on asthma disease and medications than those without, which is surprising to be insignificant with a second highest mean (24.58) and to be inconsistent with other studies (29,31). On the other hand, the level of education, belonging to the medical field, smoking habits, and having an asthmatic family member had a significant effect on the knowledge level in the current study. Although the majority of the participants were bachelor's degree holders, the postgraduates had the highest mean (24.41) compared with other educational levels. This pointed out that participants with high school or less, college undergraduate and bachelor degrees holders had lower knowledge than those with postgraduate degrees and this may be because the more the individual is educated the higher asthma knowledge he would have. Also, this result is consistent with the study that was performed in rural South India that surveyed healthy adults to assess the level of knowledge, attitude, and perception in the community (Daniel, Inbaraj, Jenkins, Ramamurthy, Isaac, 2021). Moreover, participants belonging to the medical field had the highest mean (25.91) in the study and that is significant since they are more knowledgeable about medical conditions like asthma disease. Additionally, participants who are ex-smokers had the second highest mean (25.37) in the study. This mean is higher than the means of those who smoke or do not smoke. Furthermore, participants who had an asthmatic family member had a higher mean than those who did not have which maybe because of the better knowledge attained by close observation of that family member and which is a good chance for better knowledge of asthma. This result also is consistent with the Indian study (Daniel, Inbaraj, Jenkins, Ramamurthy, Isaac, 2021).

Throughout this study, the percentage of participants with physician-diagnosed and physician-undiagnosed asthma who were using bronchodilators/inhaled Corticosteroids investigated. It is remarkable that 9.1% of the asthmatic participants were being un-diagnosed yet by a physician and 3% of those were using bronchodilators/inhaled Corticosteroids to relief their asthma like symptoms. This significant result must be highlighted for further investigations and the community should be aware of the importance of the physician's diagnosis and the negative consequences of the misuse of inhalers, thus, preventing the increase in asthma morbidity and misuse of medications.

In this study, the percentage of participants having likelihood chronic airways disease and likelihood asthma disease according to IPCRG and GINA guidelines investigated (GINA,2019; IPCRG guidelines,2006). Upon using screening questions to identify participants, who had a history of recurrent respiratory symptoms, were at risk of, or with significant likelihood of having chronic airways disease, and respectively having asthma disease, 18.75% of participants were having recurrent respiratory symptoms, thus the likelihood of having chronic airways disease. Furthermore, 18.75% of participants were having features that favored asthma disease, thus likelihood of having asthma disease. Clinical diagnosis is usually done based on the presence of symptoms and documented variability in expiratory airflow limitation as measured by pulmonary function testing.

Consequently, 11.5% of *non-asthmatic* participants were having likelihood asthma disease. Thus, 18.75 % of total participants were having likelihood asthma despite that only 8.25% of participants were asthmatic. These noticeable results should undergo further investigations to confirm them. Besides, educational programs about asthma screening and knowledge about the disease are essential to be done for the whole community.

To our knowledge, this is the first study conducted among a representative sample drawn from the Beirut district and exploring asthma knowledge and attitude among Lebanese adults 18 years old and above. Further, this study would add data about the incidence of the misuse of bronchodilators/inhaled Corticosteroids by the sample studied, and the incidence of the participants with likelihood of asthma disease in the Lebanese community. Therefore, this study would serve as a reference for the much-needed upcoming studies.

5. STUDY LIMITATIONS

Yet, our study has several limitations. The study was not done directly in the community, so the

information was self-reported, which might include the possibility of information bias. Additionally, more than half of the study population were females and college-educated, which could have enhanced participation and knowledge scores. Even though this may limit generalizability, the sample is diverse and random, with participants coming from all over Beirut area. Moreover, we were not able to confirm the diagnosis of asthma among asthmatic participants because of participants' anonymity in the study. However, we relied on the physician diagnosis.

6. CONCLUSION

The results of our study reveal insufficient level of knowledge and the negative attitudes of Lebanese adults towards asthma and shows different misconceptions. On the other hand, those belonging to the medical field, having higher degrees in science, and having asthmatic relatives have a good level of knowledge. Better investments in health education in school curriculums and public awareness campaigns with patients' engagement and education are essential components of asthma care. Therefore, our research indicates that there is an urgent need for effective programs that support raising public knowledge and awareness about asthma and enhancing adult Lebanese attitude towards asthma. For better health care outcomes, both physicians and pharmacists should be encouraged to pursue self-learning and continuing education that is critical for career advancement and licensure.

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