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Original Research

Insights into Asthma Understanding and Medication Compliance: A Study of Knowledge and Adherence among the Lebanese Population

Nadia Al M, Emilie F, Farah El H, Sarah C, Sara M, Sami El K, Ahmad El O, Souheil H, Nada H F, Diana M

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Abstract

Background: The causes of the global surge in asthma cases are still unknown. It has been hypothesized that trigger factors and non-adherence to inhaler devices hinder optimal asthma treatment. The objective of this study was to evaluate adherence to the use of inhalers among Lebanese asthmatic patients and assess patient knowledge about asthma. **Methods:** This is a cross-sectional multicenter study conducted on adult patients with asthma recruited through community pharmacies in Lebanon. Participants filled out the questionnaire that assessed the adherence to the inhalers and evaluated their asthma knowledge. **Results:** Among 172 asthmatic patients with a mean age of 31.79 ± 20.92 years, 55.8% females, only 9.9% were adherent to asthma medications with a relatively low asthma knowledge (mean score of 66.74 ± 9.096). Significantly higher asthma knowledge scores were observed in married versus unmarried (p=0.027), in higher educational level compared to a lower level (p=0.039), and in individuals who sleep less than 6 hours/day compared to higher sleep hours (p=0.001). However, unmarried participants and individuals who sleep more than 6 hours/day had higher adherence to asthma medications with a p-value of 0.049) and 0.014. Regression results showed that higher educational level and individuals had significantly higher asthma knowledge scores (p=0.012), while patients who sleep more than 6 hours had lower knowledge scores (p=0.004). **Conclusion:** The study highlights that improper use of inhaler devices is common among enrolled participants. In addition, the study shows that the rate of non-adherence to the regimen is high and patients have a low level of knowledge about the proper use of the inhalers.

Keywords: asthma, adherence, inhaler devices, patients

Nadia Al Mazrouei*. Pharmacy Practice and Pharmacotherapeutics Department, College of Pharmacy, University of Sharjah, nalmazrouei@sharjah.ac.ae
Emilie Feghali*. School of Pharmacy, Lebanese International University, Beirut, Lebanon, emilie.feghali@gmail.com
Farah El Husseiny. School of Pharmacy, Lebanese International University, Beirut, Lebanon.
Sarah Cherri. School of Pharmacy, Lebanese International University, Beirut, Lebanon, . sarashere940@gmail.com
Sara Mansour. School of Pharmacy, Lebanese International University, Beirut, Lebanon, sara.a.mansour@hotmail.co
Sami El Khatib. Department of Biomedical Sciences, School of Arts and Sciences, Lebanese International University, Bekaa, Lebanon, Center for Applied Mathematics and Bioinformatics (CAMB) at Gulf University for Science and Technology (GUST), Kuwait. sami.khatib@liu.edu.lb
Ahmad El Ouweini. College of Pharmacy, Gulf Medical University, Ajman, United Arab Emirates, dr.ahmedelouweini@gmu.ac.ae
Souheil Hallit. School of Medicine and Medical Sciences, Holy Spirit University of Kaslik, P.O. Box 446, Jounieh, Lebanon, Applied Science Research Center, Applied Science Private University, Amman, Jordan. souheilhallit@hotmail.com
Nada H. Farrag. School of Life and Medical Sciences, University of Hertfordshire-Hosted by Global Academic Foundation, Cairo, Egypt, n.hazem@gaf.edu.eg
Diana Malaeb. College of Pharmacy, Gulf Medical University, Ajman, United Arab Emirates, dr.diana@gmu.ac.ae

INTRODUCTION

Asthma is a common respiratory disease characterized by airway hyper responsiveness to direct or indirect stimuli[1]. It is more prevalent in the younger population, with a slight difference in the prevalence between males and females[2,3]. In low and middle-income countries, the mortality burden from asthma is around 250,000 deaths per year[4]. Concerning the Lebanese population, it is documented that asthma affects approximately 4.8% with a variable pattern and intensity of symptoms depending on different etiological factors[5]. Symptoms include wheezing, shortness of breath, and chest tightness that may be accompanied by a cough causing nocturnal and early morning expiratory airflow limitations[6]. Asthma treatment options can be either delivered through the oral or inhaled route. However, the inhaled route is preferred due to its better pharmacodynamics and favorable side-effect profile[7].

Although asthma may not be “cured”, prevention and control of the symptoms can be achieved by proper management[3]. According to the current guidelines, asthma control is defined by attaining therapeutic goals characterized by the absence or

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minimization of daytime and nocturnal symptoms, reduction in exacerbation, minimal requirement of rescue therapy, improvement in lung function, and limited influence on daily activities[8]. It is crucial to possess adequate knowledge about asthma to ensure sustained effectiveness in controlling the condition and enhancing the overall quality of life. Adherence to the recommended medication regimen and appropriate use maximize drug delivery to the lungs with limited systemic absorption and minimal side effects[9]. Even though this disease is a major public health problem and the current treatment is based on well-established evidence-based guidelines, previous literature documented that asthma control is sub-therapeutic in many patients and the clinical management is not always optimal[10]. The leading reasons for poor asthma control include non-adherence to long-term medication, incorrect use of the inhaler techniques, exposure to trigger factors and poor asthma knowledge[11]. Furthermore, there is a bidirectional relationship between sleep quality and asthma symptoms where poor sleep quality worsens asthma severity, and more severe symptoms can cause poor sleep[12]. Specifically, sleep disturbances can be a burden among asthmatic patients and considered as a barrier for medication adherence[13].

Raising awareness and enhancing patient education about asthma are cornerstones in achieving therapeutic goals. Thus, increasing the optimal therapeutic asthma control involves using inhaled corticosteroids and bronchodilators, implementing the prompt action in medical consultation, and initiating rapid treatment in asthmatic crisis[14].

In Lebanon, community pharmacies serve as accessible points for patients seeking guidance and immediate consultation, particularly those with asthma. Patients frequently visit pharmacies for initial assessment and advice, where pharmacists' direct patients to appropriate medical care. Subsequently, patients consult physicians who prescribe necessary medications. Following prescription, patients procure their medications independently, bearing the financial responsibility themselves. However, the economic crisis that has affected Lebanon since 2019 has significantly impacted healthcare financing, rendering the National Social Security Fund inactive. As a result, patients are largely responsible for funding their own medication expenses, with only a minority possessing insurance coverage, primarily those with higher socioeconomic status. In instances where insurance is available, coverage varies widely, ranging from 50 to 100%. Numerous investigations have been carried out on Lebanese asthma patients which examined the relationship between diet and asthma[15], explored predisposing factors during pregnancy[16-18], and developed a scale to assess asthma risk factors[19,20]. Additionally, the prevalence of asthma[21,22], the influencing factors[23], and the evaluation of the quality of life have been included in the research focus[24]. However, there is a lack of studies that specifically assess knowledge about asthma and patients' adherence to medications in the context of the Lebanese population. Therefore, the primary goal of this study is to examine the depth of understanding concerning this condition and ascertain the degree of adherence to prescribed medications among Lebanese individuals with asthma.

MATERIAL AND METHODS

Study Design

A cross-sectional study was conducted between February and May 2019 on Lebanese asthmatic patients from community pharmacies distributed in different Lebanese geographic areas. Pharmacies were randomly selected from the list of community pharmacies provided by the Lebanese Order of Pharmacists (OPL), the official pharmacists association in Lebanon.

Inclusion and Exclusion Criteria

Patients with physician-diagnosed asthma and who were on inhaled medical treatment for asthma were eligible for study enrollment. A current asthma status was defined by a diagnosis confirmed by a physician, in addition to wheezing/ whistling in the chest over the past 12 months. Participants with a chronic respiratory condition other than asthma such as cystic fibrosis were excluded from the study.

Ethical Approval

The Institutional Review Board of the Lebanese International University school of pharmacy approved the study. Written informed consent was obtained from participants above 18 years and from the parents of patients below 18 years before study enrollment.

Tools and procedures

Standardized questionnaires were distributed to the participants meeting the inclusion criteria to document the adherence to asthma medications. Well-trained pharmacists interviewed eligible patients through face-face interviews to ensure the quality of research. The questionnaires were collected anonymously from all age groups and patient's identity was not collected. The questionnaire encompassed a section on demographics, including age, gender, and the average number of sleeping hours each day**.**

In addition to the sociodemographic characteristics, the questionnaire assessed the adherence to the asthma medication by asking each participant to answer 10 questions. The questions were "During the last 7 days, how many times did you forget to take your usual inhalers?", " Do you forget to take inhalers?", "When you feel good about your illness, do you stop taking your inhalers?", "When you are on vacation or weekend, do you stop taking your inhalers?", "Do you stop taking your inhalers because of fear of side effects?", "Do you take fewer inhalations than those prescribed by your doctor?", "Do you stop taking your inhalers because you believe they interfere with your everyday or working life?", "Do you stop taking your inhalers because you have difficulties to pay them?". Participants responded on a 5-point Likert scale (all of the time=1, more than half of the time=2, approximately a half of the time=3, less than half of the time=4, never=5) and a total score was computed by summing the responses obtained for all the questions. The score was out of 50 and the results were then categorized into non-adherent (total score < 45), intermediate adherence (total score ranging 46-49), and adherent (total score=50)[25].

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The third section evaluated asthma knowledge among participants and comprised 17 questions rated on a 5-points Likert scale, with answers ranging from "strongly agree" to "strongly disagree". This part covered the main causes of asthma, risk factors, and side effects of the inhalers. Responses to each item were graded from 1 to 5 and greater weight was assigned to correct answers. That is, if a true statement obtained a correct response of "strongly agree," a score of 5 was assigned. Scoring gradually decreased until a score of 1 was reached when that item received a response of "strongly disagree." In the same way, if an affirmation that was false received a response of "strongly disagree" a score of 5 was assigned. Scoring gradually decreased until only 1 point was given for a response of "strongly agree." The total scores ranged from 17 to 85, with higher scores indicating greater asthma knowledge[26].

Outcomes

The main aim of this research was to assess the extent to which Lebanese individuals with asthma comply with the usage of inhalers. Additionally, the secondary objective was to examine the level of knowledge that patients possess regarding asthma.

Sample size

The CDC's Epi info software was used to calculate the required minimal sample size. Considering adherence to asthma medications of 26.5%[25], a minimum sample size of 299 patients was required to allow for a study power of 80%, and a confidence interval of 95%.

Data Entry and Statistical Analysis

The statistical analysis was performed using the Statistical Package for Social Sciences (SPSS) version 21.0. Descriptive statistics were used to describe patient characteristics, with frequencies and percentages for categorical variables and means ± standard deviations (or medians and interquartile ranges IQR) for continuous variables. Pearson Chi-square test was used to evaluate the association between the levels of medication adherence and all the sociodemographic characteristics. All reported p-values are two-sided, with alpha set at a significance level of 0.05.

RESULTS

Sample characteristics

A total of 172 patients were enrolled in the study with a mean age of 31.79 ± 20.92 years; the majority were females (55.8%) and unmarried (68%; Table 1). Only 15.7% had higher educational attainment (university degree) and 46.3% reported a medium economical level. Most participants were on metered dose inhaler (54.1%) and had more than 6 hours of sleep per night (73.3%). In the total sample, adherence to asthma medication and knowledge levels were relatively low with mean scores of 43.69 ±5.31 and 66.74 ±9.09, respectively.

Bivariate analysis of asthma knowledge score

The results of the bivariate analysis showed a significantly higher mean asthma knowledge score in married participants compared to unmarried ones (68.96 versus 65.69 respectively, with a p-value of value 0.027). A higher mean score was found in higher educational level with a p-value of 0.039. Patients who were sleep less than 6 hours per day had significantly higher mean asthma knowledge score compared to patients who sleep more than 6 hours with a p-value of 0.001 as illustrated in table 2.

Bivariate analysis of adherence score

A significantly higher percentage of adherence on asthma medication were found in unmarried participant when compared to married ones (13.7% and 1.8%, P value 0.049 respectively), and with those who sleep more than 6 hours per day when compared to patients who sleep less than 6 hours per day (11.1% and 6.5%, P value 0.014) as illustrated in table 3.

Multivariable analysis

The results of the multi linear regression showed that participants with higher educational level (Beta 0.186; p-value 0.012) had significantly higher asthma knowledge scores whereas patients who sleep more than 6 hours versus less than 6 hours per day (Beta -0.224; P value 0.004) were significantly associated with lower asthma knowledge score (Table 4). On the other hand, when taking adherence to asthma medication as dependent variable in logistic regression, showed that patients who sleep less than 6 hours per day are less likely to be intermediate adherent versus non adherent when compared to those who sleep more than 6 hours.

DISCUSSION

In accordance with recent reports from the World Health Organization (WHO), asthma stands as the most prevalent chronic ailment in children and a significant no communicable disease (NCD) afflicting both pediatric and adult populations[27]. Consequently, medication adherence plays a crucial role in controlling the surge of asthma cases[28]. To our knowledge this is the first study to evaluate asthma knowledge and medication adherence in a nationally representative sample of Lebanese adults with asthma. Our study showed that over half of the study participants (55.8%) were non-adherent to asthma medications, and only 9.9% were adherent to treatment. This adherence rate is higher than the rate reported in a previous study conducted in Lebanon (30%)[29]

Additionally, lower adherence rates were reported in Iraq (15.8%), Jordan (16.3%), the UAE (29.7%), Qatar (37.1%), and the United States of America (33.9%)[29,30]. Furthermore, our findings reported lower compared to studies conducted in Kenya (51.5%) and Western Ethiopia (62.1%)[31,32]. The ESMAA study, concluded unsatisfactory levels of asthma control in the Middle East and North Africa regions, with less than one-third of the patients exhibiting controlled disease. Findings also emphasize the need for improved treatment access, medication adherence, follow-up, and education among healthcare providers and patients[33]. Similar research in Lebanon and the Gulf and Near East (GNE) highlighted that asthma care and

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Table 1: Sociodemographic characteristics and comprehensive scores for asthma medication adherence and knowledge in the total sample.

Characteristic	Frequency (%)
Age	
Mean ±SD (years)	31.79 ± 20.92
Gender	
Male	76 (44.2)
Female	96 (55.8)
Marital status	
Unmarried	117 (68.0)
Married	55 (32.0)
Educational level	
Less than university	145 (84.3)
University	27 (15.7)
Economical level	
Low (<1.5 million L.L)	23 (15.4)
Medium (>1.5 million L.L <3 million L.L)	69 (46.3)
High (>3 million L.L)	57 (38.3)
Physical activity index	
Not active	145 (84.3)
Active	27 (15.7)
Inhalers	
Metered Dose Inhalers	93 (54.1)
Metered Dose Inhalers + spacer	14 (8.1)
Turbuhaler	30 (17.4)
Accuhaler	31 (18.0)
Dry powder inhaler (DPI)	4 (2.3)
Number of sleeping hours per day	
Less than 6 hours	46 (26.7)
More than 6 hours	126 (73.3)
Number of chambers in the house	
Mean ±SD	5.32 ±1.27
Number of members living in the house	
Mean ±SD	4.09 ±1.39
Asthma knowledge score	
Mean ±SD	66.74 ±9.09
Asthma medication adherence score	
Mean ±SD	43.69 ±5.31
Asthma medication adherence, categories	
Adherent	17 (9.9)
Intermediate adherence	59 (34.3)
Non-adherent	96 (55.8)
L.L: Lebanese Lira	
SD: Standard Deviation	

Table 2: Association of asthma knowledge scores with sociodemographic factors.

Variables	Mean asthma knowledge score ±Std	Mean difference	95 % Confidence Interval	P value
Gender				
Male	67.05 ±8.93	0.71 ±1.40	-2.053; 3.473	0.613
Female	66.34 ±9.34			
Marital status				
Unmarried	65.69 ±8.42	3.27 ±1.47	0.369; 6.173	**0.027**
Married	68.96 ±10.10			
Educational level				
Less than university	66.30 ±8.49	-3.84 ±1.84	-7.492; -0.206	**0.039**
University	70.15 ±10.03			
Economical level				
Low (<1.5 million L.L) vs	67.78 ±10.52			
Medium (>1.5 million L.L <3 million L.L)	65.54 ±10.50	2.24 ±2.20	-3.08; 7.57	0.402
High (>3 million L.L)	68.47 ±6.33	-0.69 ±2.25	-6.16; 4.78	
Physical activity index				
Not active	66.57 ±9.03	-1.10 ±1.91	-4.872; 2.670	0.565
Active	67.67 ±9.53			
Inhalers				
Metered Dose Inhalers vs	67.40 ±8.46			
Metered Dose Inhalers + spacer	64.43 ±5.55	2.96 ±2.62	-4.5; 10.44	
Turbuhaler	66.70 ±9.93	0.69 ±1.92	-4.77; 6.17	0.605
Accuhaler	66.00 ±10.96	1.39 ±1.89	-4.01; 6.80	
Dry powder inhaler (DPI)	65.50 ±13.52	1.89 ±4.67	-11.41; 15.20	
Number of sleeping hours per day				
Less than 6 hours	70.43 ±8.47	5.04 ±1.52	2.039; 8.053	**0.001**
More than 6 hours	65.39 ±8.96			

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Table 3. Bivariate analysis of adherence score

Variables	Adherence			P value
	Non adherent (N=96)	Intermediate adherence (N=59)	Adherent (N=17)	
Gender				
Male	58 (60.4)	31 (32.3)	7 (7.3)	0.303
Female	38 (50.0)	28 (36.8)	10 (13.2)	
Marital status				
Unmarried	61 (52.1)	40 (34.2)	16 (13.7)	**0.049**
Married	35 (63.6)	19 (34.5)	1 (1.8)	
Educational level				
Less than university	81 (55.9)	48 (33.1)	16 (11.0)	0.429
University	15 (55.6)	11 (40.7)	1 (3.7)	
Economical level				
Low (<1.5 million L.L)	15 (65.2)	6 (26.1)	2 (8.7)	
Medium (>1.5 million L.L <3 million L.L)	40 (58.0) 29 (50.9)	27 (39.1) 18 (31.6)	2 (2.9) 10 (17.5)	0.064
High (>3 million L.L)				
Physical activity index				
Not active	80 (55.2)	51 (35.2)	14 (9.7)	0.82
Active	16 (59.3)	8 (29.6)	3 (11.1)	
Inhalers				
Metered Dose Inhalers	51 (54.8)	35 (37.6)	7 (7.5)	
Metered Dose Inhalers + spacer	6 (42.9)	5 (35.7)	3 (21.4)	0.548
Turbuhaler	17 (56.7)	11 (36.7)	2 (6.7)	
Accuhaler	19 (61.3)	7 (22.6)	5 (16.1)	
Dry powder inhaler (DPI)	3 (75.0)	1 (25.0)	0 (0.0)	
Number of sleeping hours per day				
Less than 6 hours	34 (73.9)	9 (19.6)	3 (6.5)	**0.014**
More than 6 hours	62 (49.2)	50 (39.7)	14 (11.1)	

Table 4: Multivariable linear regression

Variables	**Standardized coefficients Beta**	**Confidence interval**	**P value**
Linear regression			
Dependent variable: Knowledge score			
Marital status			
Married vs Unmarried	0.098	-1.014;4.843	0.199
Educational level			
University vs less than university level	0.186	0.874; 6.856	**0.012**
Sleeping hours More than 6 hours vs less than 6 hours	-0.224	-7.672; -1.499	**0.004**
Multinomial regression			
Dependent variable: Adherence			
Variables	**Odds Ratio**	**Confidence interval**	**P value**
Intermediate adherence vs non adherent			
Marital status			
Unmarried vs married	0.927	0.412;2.084	0.854

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Sleeping hour			
less than 6 hours vs more than 6 hours	0.33	0.132;0.823	**0.017**
Economical level			
Low (<1.5 million L.L) vs high (>3 million L.L)	0.863	0.264;2.827	0.808
Medium (>1.5 million L.L <3 million L.L) vs high (>3 million L.L)			
	1.234	0.538;2.829	0.619
Adherent vs non adherent			
Marital status			
Unmarried vs married	0.5048	0.565;45.072	0.147
Sleeping hours			
less than 6 hours vs more than 6 hours	0.896	0.205;3.925	0.896
Economical level			
Low (<1.5 million L.L) vs high (>3 million L.L)			
Medium (>1.5 million L.L <3 million L.L) vs high (>3 million L.L)	0.605	0.106;3.443	0.571
	0.214	0.042;1.105	0.066

control in Lebanon, as well as in other areas of the world, fall short of the goals specified in international guidelines for asthma management[34,35].

These collective findings affirm a prevailing challenge in Lebanon, where a substantial proportion of asthmatic patients grapple with substandard adherence to inhaler use and prescribed treatment plans. This is comparable to the prevalence of uncontrolled asthma in other parts of the world. In North Africa, the prevalence of uncontrolled asthma has been found to be 50.9%[36]. In Europe, the prevalence of uncontrolled asthma ranged from 48.5% in Turkey to 56.2% in Lithuania[37].

Analysis of demographic factors in our study revealed no significant gender-based differences in adherence (44.09% for males and 43.38% for females). Conversely, a study in eastern Ethiopia reported higher adherence among females (55%) compared to males[38]. Marital status emerged as a potential influence, with divorced individuals exhibiting the highest adherence (47.75%), followed by single (44.61%), married (42.4%), and widowed (39.7%) individuals. These findings contrast with the Ethiopian study, which identified higher adherence levels among married participants (59.7%), followed by single (25.7%), widowed (10%), and divorced individuals (4.6%)[38]. Additionally, our study identified a correlation between higher economic status and increased adherence, consistent with Ethiopian findings[38].

Sleep duration emerged as a significant factor affecting both adherence and asthma knowledge among Lebanese asthmatic patients. Patients with shorter sleep duration (<6 hours) had lower adherence scores compared to those with normal or longer sleep duration. Similar findings were reported in studies conducted in the USA, which highlighted the association between short sleep duration and increased asthma attacks, frequent ED visits and recurrent hospitalizations[39,40]. These data support that non-adherent patients sleep less than adherent patients during the night, where poor sleep quality could be related to poor disease control. Moreover, patients with shorter sleep duration in this study had higher asthma knowledge scores, which could be attributed to increased healthcare interactions and awareness. The association between sleep quality and the level of adherence should be assessed in future studies to evaluate the true impact of sleep on medication adherence. Despite these findings there is a need for continuous patient education, regular monitoring, counsel on inhaler use, and increase adherence.

Our study discerned no gender-based differences in asthma knowledge, with married participants exhibiting a significantly higher mean knowledge score compared to their single counterparts. These findings parallel a study in Saudi Arabia, which linked asthma knowledge to marital status and educational level[41]. Notably, higher educational levels in our study correlated with superior asthma knowledge, echoing the Saudi Arabian study's findings.

Furthermore, our study illuminated a positive association between physical activity and asthma knowledge, in harmony with existing literature highlighting the clinical benefits of increased physical activity in asthma management such as improved lung function, asthma control, exacerbation rate, and healthcare use[42].

In the Lebanese population, Pharmacists play a key role in proper asthma control and adherence to the medication, thus preventing asthma exacerbation and limiting the symptoms to achieve therapeutic goals. Hence, the easy access to the pharmacy and affordability to get the proper counseling support the pharmacist's role to be a game changer in patient adherence to medication and disease management. Furthermore, community pharmacists monitoring treatment outcomes is an effective technique to increase the quality of medication therapy for asthma patients in medical care[29]. In support, a study in Australia revealed that Pharmacists' interventions could increase patients' awareness of asthma and medications used to treat asthma [22].

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In summary, our study provides a comprehensive analysis of asthma adherence, knowledge, and associated factors in Lebanon, shedding light on critical challenges and potential interventions to enhance disease management. The multifaceted influences of demographic, socioeconomic, and lifestyle factors underscore the need for tailored approaches in promoting adherence and improving asthma outcomes. Future interventions should leverage the integral role of healthcare providers, particularly pharmacists, and prioritize continuous patient education and monitoring to achieve optimal asthma control and enhance patient well-being.

Clinical Implications

The study raises the need for practical measures that should be implemented to raise awareness about the proper use of inhalers. Our study highlights the need for optimal education about the step-wise use of inhalers to minimize pitfalls associated with the use. Also, sustained counseling sessions for asthmatic patients are essential to disseminate knowledge about all aspects of asthma and its management strategies among patients and to dispel their myths and misconceptions associated with diseases and their therapy. This will help patients participate in self-management plans and better control their asthma. Furthermore, our results also show the importance of patient education concerning adherence and compliance to the regimen prescribed by their primary care physician. This greatly impacts the improvement of their disease state and their daily life.

Study Limitations

There are limitations in this study. First, we relied on self-reporting of inhaler techniques, i.e., participants described their way of using inhalers, self-estimated the number of sleeping hours per day, and adherence to the use of medications, which is subject to patient recall and reporting bias. Second, the study has a cross-sectional design and causality cannot be proved. Third, although the sample was randomly selected from different Lebanese regions, the study did not cover the assessment of all types of inhalers and involved a small sample both which hinder the generalizability of the results. Finally, the study used scales which are not validated in Arabic language. Nonetheless, the authors believe their findings are noteworthy since they are consistent with other recent studies.

CONCLUSION

The study highlights that improper use of inhaler devices is common among enrolled participants. In addition, the study shows that the rate of non-adherence to the regimen is high and patients have a low level of knowledge about the proper use of the inhalers. Education is an essential part of treatment for all asthma patients. It should not be limited to providing knowledge but ideally should be aimed at altering behavior. Pharmacists and patients must work together to develop an asthma care program for a life free from asthma symptoms. Pharmacists can inform patients about the correct use of medications and inhalers, the risks of their incorrect use, and triggers avoidance.

AUTHORS CONTRIBUTION

DM, FH, and EF analyzed and interpreted the collected data from study participants. DM, SH contributed to idea conceptualization study design, and interpretation of data. FH, EF, LA, MB, NM and NF were major contributors to writing the manuscript. SK and SEK contributed to reviewing the final version of the article. All authors read and approved the final manuscript.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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