Original Article

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Quick Response Code:

Website: www.jehp.net

DOI: 10.4103/jehp.jehp_1626_23

Therapeutic patient education: Impact on lung function in Moroccan adult asthma patients?

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Received: 10-10-2023
Accepted: 12-01-2024
Published: 28-09-2024

Abstract:

BACKGROUND: Despite the availability of effective asthma medications, the condition remains poorly controlled, making it one of the most common emergency room and physician visits each year. Appropriate asthma education programs are needed to maintain or improve optimal lung function in asthmatics. This study aimed to evaluate changes in lung function parameters in adult asthmatics before and after a structured educational intervention.

METHODS AND MATERIALS: We conducted a quasi-experimental study with 157 adult asthma patients in the Pneumology Department of the Hassan II University Hospital in Fez, Morocco. The study was performed in three phases: patient recruitment and baseline data collection (March–May 2022), planning and implementation of educational sessions (June–July 2022), and lung function evaluation 3 months later (September–October 2022) after training. Sociodemographic and clinical data were collected through a questionnaire. Spirometry was also performed before education and 3 months after. All patients received a structured and collective educational intervention. Pre- and post-education results were compared using the Wilcoxon test for qualitative variables and the paired sample *t*-test for quantitative variables.

RESULTS: There was a statistically significant improvement ($P < 0.001$) in pulmonary function parameters (as a percentage of the reference value): forced expiratory volume in one second (FEV1), forced vital capacity (FCV), and peak expiratory flow rate (PEFR) sequentially increased from 66.73 ± 20.84 to 70.64 ± 19.06; 74.74 ± 17.29 to 79.67 ± 16.15 and 67.51 ± 23.39 to 71.93 ± 21.57.

CONCLUSIONS: Our results suggest that an educational intervention can be beneficial in reducing alterations in lung function in adult asthmatics.

Keywords:

Bronchial asthma, forced expiratory volume, forced vital capacity, patient education, peak expiratory flow rate, respiratory function test

Introduction

Asthma is a common chronic respiratory disease that affects approximately 300 million people worldwide and causes about 250,000 deaths each year.[1] It is characterized by inflammation and narrowing of the small airways in the lungs, resulting in asthma symptoms, which may include coughing, wheezing, shortness of breath, difficulty breathing, or a combination of these symptoms. Thus, respiratory function tests, especially spirometry, are used to objectively monitor asthmatic patients.[2] Spirometry can be used to assess the variability of obstruction and the variability of its reversibility.[1]

Respiratory function tests should be an essential part of asthma patients' follow-up to assess the effectiveness of treatment and its possible adjustments.[3] Forced expiratory volume in one second (FEV1) is the best

How to cite this article: El Abed H, Ragala ME, Lahsen HA, Benjelloun MC, Halim K. Therapeutic patient education: Impact on lung function in Moroccan adult asthma patients? J Edu Health Promot 2024;13:353.

parameter to assess the severity of bronchial obstruction. Failing that, peak expiratory flow rate (PEFR) is a simple, repeatable measure of bronchial obstruction that correlates well with FEV1. The patient can perform this measurement himself.

Furthermore, normal lung function is an essential component of good disease management. The Global Initiative for Asthma (GINA) has proposed six criteria for assessing asthma control, including the absence of daytime and nighttime symptoms, absence of activity limitations, non-use of controller medications, absence of exacerbations, and normal lung function as measured by FEV1 or PEFR which should be 80% or more of the theoretical value.[4]

Several previous studies recommended therapeutic patient education (TPE) and self-management training to improve patients' skills and showed that education and information about the disease can help patients improve asthma control, lung function, and quality of life.[5–8] Again, there is increasing evidence that ongoing patient education contributes to the optimization of lung function, primarily by encouraging effective self-care to achieve established management goals.

TPE must be an essential component of chronic disease management, including asthma.[1] It involves structured activities, including psychosocial support, designed to make patients aware and informed about their illness, hospital care, organization and procedures, and their health- and illness-related behaviors.[9] It also aims to help them understand their illness and treatment, cooperate and assume responsibility for their care, and help them maintain and improve their quality of life.[10] To this end, we have opted for the reasoned action theory,[11] as we aim to change our patients' behavior. In several studies, this theory has been shown to contribute significantly to behavior change[12] and be effective in predicting and explaining a wide range of health-related behaviors.[13–15] It should also be noted that no previously published study has developed a program content based on the theory of reasoned action for Moroccan adult asthmatics. Finally, various studies have documented the effectiveness of therapeutic patient education on parameters of respiratory function in asthmatics.[16-18]

This study aimed to investigate the effects of a structured TPE intervention on lung function in adult asthmatics.

Materials and Methods

Study design and setting

We conducted a quasi-experimental study among 157 adult asthmatics consultants at the University Hospital of Fez. The study's aim was to assess the effectiveness of an educational program on lung function (FEV1, forced vital capacity [FCV], and peak expiratory flow rate [PEFR]).

After obtaining their consent, patients completed a questionnaire to collect data related to their sociodemographic and clinical status. Lung function (FEV1, FCV, and PEFR) was measured before the educational intervention for all patients and 3 months after for only 132 patients.

Study patients and sampling

We included in the study adult asthmatic patients aged at least 18 years, whose asthma was confirmed by functional and/or clinical exploration for at least 6 months. Patients with disabilities or lung diseases other than asthma were excluded.

The sample size was estimated at 156 participants by G*Power software to achieve an effect size of 0.2 for ACT score change calculated from a pilot study in which the ACT score after the educational intervention increased from 19.4 ± 14.1 to 20.4 ± 2.8. Research power was set at 80% and a two-sided significance level of 0.05.

Data collection tool and technique

- ***Survey***

All patients completed a questionnaire containing open-ended and closed-ended questions about their sociodemographic profile (age, gender, education level, residential area, smoking status, etc.) and clinical profile (disease length, body mass index [BMI], treatment, comorbidities, etc.).

- ***Pulmonary function measurement***

Forced expiratory volume in one second (FEV1), FCV, and Tiffeneau ratio (FEV1/FCV) were measured by spirometry. Peak expiratory flow rate (PEFR) was measured using a peak flow meter.

- ***Educational intervention:***

The content of the educational sessions was based on the expressed needs of patients. It covered the pathophysiology of asthma, causes and complications, inhalation techniques, drug action and possible side-effects, asthma triggers and their avoidance, warning signs, attack management, and a healthy lifestyle.

All participants benefited from two 2-h group sessions (10–12 patients). After that, patients could contact the educator by phone to get more information.

- ***Statistical analysis:***

Collected data were analyzed for descriptive (mean, standard deviation, percentage, etc.) and comparative analysis using IBM SPSS Statistics 25 software. The

pre-and post-intervention results were compared with the Wilcoxon test for qualitative variables and the paired sample *t*-test for quantitative variables. The normality of continuous variables was verified by the Kolmogorov–Smirnov test. *P* values < 0.05 were considered significant.

Ethical considerations

Ethical approval was obtained from the local ethics committee (N°15/2022) in accordance with the Helsinki recommendations. Each patient then signed written consent to participate in the study. The informed consent provided full information on the aims and importance of this study so that participants could make an informed decision to enrol or withdraw from the study at any time if they so wished. In addition, the following considerations were ensured: voluntary participation; anonymity; confidentiality, and protection against risks or harms.

Results

Sociodemographic and clinical profile

The study included 157 patients who participated in educational sessions. All patients completed a lung functional exploration pre-education and only 132 of them did so after education.

The mean age was 50.62 ± 14.39 years. In total, 71.34% were women, 71.34% were married, more than half were uneducated, and 80.25% lived in the city. Regarding smoking status, 67.51% were non-smokers and 31.84% were passive or ex-smokers. The average duration of the disease was 11.25 years, finally, and only 25.48% were covered by health insurance [Table 1].

Regarding the clinical profile [Table 2], the mean BMI was 27.06 ± 4.30 kg/m^2 and 22.93% of the participants were obese. Next, 65.60% had at least two comorbidities related to asthma. Three-quarters (74.52%) were taking a combination of inhaled corticosteroids and long-acting bronchodilators (ICS + LABA), and more than half (56.69%) had severe asthma classified as grades 4 and 5.

Additionally, 56.69% had allergic rhinitis, 29.30% had gastroesophageal reflux disease, 11.46% lived in homes with plants and/or pets, and 9.55% lived in inadequately ventilated and/or sunny households.

Pre-education pulmonary function results

Before education, patients' pulmonary function tests revealed breathing impairment [Table 3]. The mean FEV1 (as a percentage of reference value) was 67.10 ± 20.75; FCV was 74.05 ± 17.99 and PEFR was 67.51 ± 23.39 [Table 2]. Finally, only 26.75% and 32.48% of patients, respectively, had FEV1 and PEFR at or above 80% of the reference value.

Table 1: Sociodemographic and clinical characteristics of patients

Categories	Effective (*n*=157)	Percentage (%)	Mean±SD
Gender			
Female	112	71.34	
Male	45	28.66	
Age			50.62±14.39
Duration of asthma			11.25±9.78
Marital status			
Single	25	15.92	
Married	112	71.34	
Divorced	6	3.82	
Widowed	14	8.92	
Educational level			
No schooling	84	53.50	
Primary	36	22.93	
Secondary	25	15.92	
Higher	12	7.65	
Residence			
Urbain	126	80.25	
Rural	31	19.75	
Coverage by health insurance			
Yes	40	25.48	
No	117	74.52	
Smoking status			
Ex-smoker	25	15.92	
Non-smoker	106	67.51	
Passive smoker	25	15.92	
Active smoker	1	0.65	

Post-education pulmonary function results

Three months after TPE, a significant improvement in lung function parameters (as a percentage of reference values) was observed [Table 3]. Means of FEV1, FCV, the Tiffeneau ratio (FEV1/FCV), and the peak expiratory flow rate (PEFR) increased respectively from 66.73 ± 20.84 to 70.64 ± 19. 06 with an effect size of 0.348; from 74.74 ± 17.29 to 79.67 ± 16.15 with an effect size of 0.340, from 86.98 ± 15.56 to 87.30 ± 14.93 with a low effect size of 0.024 and from 67.51 ± 23.39 to 71.93 ± 21.57 with an effect size of 0.307. At the same time, the proportion of patients with FEV1 at or above 80% of reference value improved significantly from 26.75 to 33.33% (*P* = 0.029). However, there was no significant change in the proportion of patients with Tiffeneau ratio values greater than or equal to 70% (*P* = 0.796) and a PEFR higher than or equal to 80% (*P* = 0.456).

Discussion

Therapeutic patient education is an essential non-pharmacological intervention in chronic disease management. It is an opportunity for patients to acquire decision-making, technical and social skills, intending to enable them to reason, make health choices, achieve their life projects, and optimize their use of the healthcare system's resources.[19] Previous research has shown that

Table 2: Clinical characteristics of patients

Categories	Effective (*n*=157)	Percentage (%)	Mean±SD
BMI			27.06±4.30
Obesity			
No	121	77.07	
Yes	36	22.93	
Asthma stage			
1	7	4.46	
2	33	21.02	
3	28	17.83	
4	82	52.23	
5	7	4.46	
Controller medication			
None	7	4.46	
ICS	33	21.02	
ICS + LABA	94	59.87	
(ICS + LABA) +LAMA/OCS	23	14.65	
Number of Comorbidities			
0	12	7.64	
1	42	26.76	
2 and more	103	65.60	
Allergic rhinitis			
No	68	43.31	
Yes	89	56.69	
Gastroesophageal reflux disease			
No	111	70.70	
Yes	46	29.30	
Presence of animals and/or plants			
No	139	88.54	
Yes	18	11.46	
Insufficiently ventilated and/or sunny habitat			
No	142	90.45	
Yes	15	9.55	

BMI=body mass index, ICS=inhaled corticosteroids, LABA=long-acting beta 2-agonists, LAMA=long-acting muscarinic antagonists, OCS=oral corticosteroids

Table 3: Comparison of study variables before and after therapeutic education

Variables	Categories	*n*	Pre-education	Post-education	*P*	Effect size (Cohens d)
FEV1 (%) (Mean±SD)		132	66.73±20.84	70.64±19.06	<0.001	0.348
FCV (%) (Mean±SD)		132	74.74±17.29	79.67±16.15	<0.001	0.340
FEV1/FCV (%) (Mean±SD)		132	86.98±15.56	87,30±14,93	<0.001	0.024
PEFR (%) (Mean±SD)		157	67.51±23.39	71.93±21.57	<0.001	0.307
FEV1 ≥80% Effectif (%)	Yes	132	42 (26.75)	44 (33.33)		
	No		115 (73.25)	88 (66.67)	0.029	0.190
	Missing		0	25		
FEV1/FCV ≥70% Effectif (%)	Yes	132	137 (87.26)	115 (87.12)		
	No		20 (12.74)	17 (12.88)	0.796	0.022
	Missing		0	25		
PEFR ≥80% Effective (%)	Yes	157	51 (32.48)	55 (35.00)	0.456	0.058
	No		106 (67.52)	102 (65.00)		
	Missing		0 (0)	0 (0)		

therapeutic patient education is an essential element in improving asthma control[5,10,20] and the quality of life of asthmatic patients.[6,21,22]

In previously reported asthma education programs, effects have been variable, likely due to differences in content, methods, educator training, and ability to influence patient behavior, patient motivation, and patients' educational, psychosocial, and economic context.[23] However, most evidence indicates that when self-care education is provided through high-quality interventions, it improves medication adherence and most asthma-related outcomes.[6,24]

In our research, there was no control group. We evaluated the effects of TPE over a short period of 3 months. This resulted in a significant improvement in lung function (FEV1, FCV, and PEFR), not withstanding the small effect size (between 0.30 and 0.35). This improvement occurred even without changing patients' previous pharmacological treatment, which underlines the importance of the educational approach in asthma management. The observed improvement can be explained by the enhanced patient compliance and knowledge previously reported in a published article[25] as a result of the educational intervention involving many disease aspects, that is, pathophysiology, triggers, drug action and use, and attack management.

Nevertheless, although lung function is increasing, the proportion of patients with normal lung function (FEV1 and DEP <80% of reference value) remains to be improved to achieve a satisfactory level. Consequently, continuous TPE, environmental control, medication compliance and potential adjustment could be optimal solutions to achieve this goal.

In contrast, the parameters most used in the literature to assess the effect of patient education on lung function are FEV1, FVC, and PEFR. FEV1 is actually the volume of air expelled during the first second of forced expiration after a forced inspiration. A decrease in this measure is proportional to the degree of bronchial obstruction[26] and is a strong independent predictor of exacerbation risk, even after symptom frequency adjustment.[27]

Forced vital capacity (FVC), defined as the maximum amount of air you can exhale after breathing in as deeply as possible, provides information on gas trapping.[28,29]

PEFR is the rate of airflow that can be forcefully exhaled through the lungs. It is measured after complete inhalation of the lungs. A potential advantage of using PEFR measurements is providing an objective marker of airway obstruction and enabling patients to determine when it is necessary to adjust treatment or seek medical assistance. A reduction in peak expiratory flow is an effective indicator of worsening asthma.[30]

The current study showed that the bronchial asthma training program improved pulmonary function. Also, several previous studies have reported similar results. Thus, Sobh *et al*.[3] findings showed a significant improvement in FEV1 in patients educated on inhalation techniques compared with the control group at post-education visits. Likewise, Felix *et al*.[6]; Elbanna *et al*.,[7] and Zhang *et al*.[10] reported a significant improvement in FEV1 after patient education about many aspects of the disease, such as asthma pathophysiology, whereas Dierick's findings were not statistically significant in terms of FEV1 enhancement.[31] In contrast, in the study by Paoletti *et al*.,[18] there was a significant increase in FEV1 and PEFR (in % of predicted value) in an educated group of Italian asthmatics compared with a control group. FEV1 mean increased from 80% to 85.7% and PEFR from 75.7% to 82.9% ($P < 0.001$). Finally, according to Maricoto *et al*.,[32] there were improvements in the functional parameters FEV1, FCV, and PEFR (in percentages of the predicted values) in post-inhaler education.

Study limitations

Our study did not include a control group, and the follow-up period after TPE was short (only 3 months). Therefore, although most functional asthma parameters improved with educational intervention, future studies with larger sample sizes, control groups and longer follow-up periods could be recommended.

Conclusion

We have proved that an educational program for asthma patients as a complement to routine medical care has an important contribution to disease control. In this study, this benefit was evidenced by an improvement in respiratory function test parameters. Finally, identifying patients' needs, beliefs and behaviors may indicate areas where improvements need to be focused to support patients and design future interventions.

Acknowledgement

We would like to express our sincere gratitude to all the healthcare providers working in the Pneumology Department of the Hassan II University Hospital in Fez, and to all patients who took part in the study.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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