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## RESEARCH ARTICLE

# ADAPTATION OF A REMOTE THERAPEUTIC EDUCATION PROGRAM FOR ASTHMA PATIENTS IN THE CONTEXT OF THE COVID 19 PANDEMIC

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### ABSTRACT

**Objective:** Show the contribution of therapeutic education in the management of asthma, by highlighting the benefits felt by asthma patients after a TPE program carried out remotely during the Covid 19 pandemic. **Methods:** This prospective longitudinal study compared two groups of 60 asthma patients, group A (30 patients) benefiting from a TPE program respecting the HAH protocol and the reference group B (30 patients) not benefiting from this program. The latter includes four sessions at the rate of one session per quarter, the first session defined the educational diagnosis of the patient for the two groups then, the second and third sessions assessed the skills of the patients in group A, the fourth session assessed the benefits of TPE for both groups. For statistical analysis we used SPSS version 26 software. Means and standard deviations to characterize continuous quantitative variables. The percentages and frequencies were used to describe the qualitative variables. In addition, the chi-square test and Fisher's test were used to compare the percentages between group A having benefited from the TPE program and the reference group B as appropriate. The Mann-Whitney comparison nonparametric test was also used. To assess the magnitude of the difference and the effect between the two groups A and B we presented the statistics of the effect size: Eta squared ( $\eta^2$ ) for the Mann - Whitney Wilcoxon test, V de cramer for the test chi-square comparison. **Results:** The benefits of TPE were assessed by the acquisition or not of the various skills: - Self-care skills were acquired for 60% of patients in group A, against 3.3% for group B, the difference in percentages with group B is significant at the 1% level with a size of very large effect of 0.744 -Coping skills were 76.7% for the group of patients who completed the TPE program, compared to 6.7% for the reference group; Fisher's test shows a significant difference with a very large effect size of 0.752. Also, concerning drug education, almost 70% of patients in group A recognized the benefit of drug education against 23.3% for group B. Fisher's test shows a significant difference at the 5% threshold with a very large effect size of 0.838. Regarding quality of life, almost 70% of patients in group A judged that TPE provides a better quality of life compared to 46.7% in group B.

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## INTRODUCTION

Asthma is a major global health problem, with an estimated 300 million asthmatics worldwide affecting all age groups, with increasing prevalence in many developing countries, increasing treatment costs and which constitutes an increasingly important burden for patients and society (1). In 2019, WHO reports that 262 million people suffered from asthma and that this disease caused 461,000 deaths, most of these deaths occur in low- and middle-income countries where underdiagnosis and insufficient treatments remain problematic.

(2)Morocco, with percentages between 8.5% and 12.5% of asthma, is part of the so-called moderate prevalence areas (3). Asthma management is part of an ongoing cycle of assessment, adjustment of treatment and review of reaction; it is therefore important to train patients in essential techniques and in personal care.(4) According to GINA, these techniques are as follows: informing the patient about the disease, inhalation techniques, adherence to treatment, the written action plan for asthma control, self-monitoring of symptoms or expiratory flow advanced and regular medical examinations (4).

Indeed we underline the importance of this assumption of responsibility by the medical treatment but especially the therapeutic education which must be dispensed to the patients, like their families, and close relatives of the elderly (5). According to HAH Therapeutic Patient Education (TPE) aims to help patients acquire or maintain the skills they need to best manage their life with chronic disease. It is an integral and permanent part of the care of the patient.(6)The TPE is intended for patients with chronic diseases whose specificity is not to be cured even if, for some of them, are in remission or stabilization (7). Several scientific studies in different countries have focused on the beneficial effects of TPE, our study took place at the Pneumology department of Ibn Rochd University Hospital in Casablanca, where we seek to show the contribution of TPE in the management of asthma. Due to the health crisis, Covid 19 pandemic, the study was interrupted and the follow-up of the TPE sessions could not be done, only one group session had taken place in person. We therefore resumed the study by adapting to the health context with individual monitoring of remote patients, the digital tool used is the WhatsApp video call application. Indeed, to reduce the transmission of SARS-CoV-2, the cause of the COVID-19 disease, public health experts have recommended social distancing, and for patients to stay at home, medical professionals have turned to social distancing, reorganized to provide remote care using Tele-Medicine technology like audio and video services this transition to a virtual practice happened overnight(8)

## PATIENTS AND METHODS

**Type of study:** This is a long-distance prospective cohort study carried out at the level of the pneumology department of the IBN ROCHD University Hospital Center in Casablanca for a period of one year.

**Study population:** The size of our sample includes 60 patients split into two groups:

**Group A (n = 30):** patients benefiting from the distance education method via the WhatsApp video call application. **Group B (n = 30):** patients seen at the first TPE session via the WhatsApp video call application and not benefiting from the TPE program.

During the consultations, the distribution of groups A and group B was made by the authors, ensuring the parity of the two groups to minimize bias in the study.

**Inclusion criteria:** patients aged between 18 and 55 years, asthma diagnosed for at least one year according to the GINA standard, partially or not controlled.

**Exclusion criteria:** Patients over 55, Patients with COPB, Patients with DTB, Patients with cardiac pathology.

**Ethical considerations:** An ethical file relating to the study has been approved by the ethics committee for biomedical research of the Faculty of Medicine and Pharmacy of Casablanca under the number: 02/2020. The patients were contacted by phone call for explanations of the resumption of the study adapted to the health context with follow-up by the WhatsApp video call application and gave their consent.

**Method:** According to the HAH protocol (9), the individual TPE sessions are organized once per quarter, the first session was organized for the 2 groups the same month then the second and third sessions only for group A, finally the fourth session was scheduled for both groups the same month.

**First TPE session: Elaboration of the educational diagnosis (for the 2 groups A and B):** Individual session by WhatsApp video call where we filled out the therapeutic educational assessment interview sheet which included 5 axes: patient data, anamnesis, patient knowledge, patient know-how to do, patient know-how. Regarding the patient's know-how to do, we observed the use of the patient's inhaled treatments by WhatsApp video call. We have explained the following points of knowledge of the disease with an explanation using a teaching aid the anatomical board of the bronchi. Then, we resumed the use of the inhaled treatment of each patient by making corrections of use. Also, we explained the asthmogenic factors and insisted on the elimination of these factors. Finally, we inform patients of the schedule set up for the follow-up of the TPE sessions.

**Second TPE session: Personalized TPE program with learning objectives (Only for group A):** This second individual session was carried out by WhatsApp video call, to validate or correct the following skills:

- ) Cognitive skills (knowledge of disease and treatment)
- ) Gestural skills: Mastery of inhaled devices,
- ) Behavioral skills: Avoidance of aggravating factors, strategy in case of exacerbation, Adaptation skills: self-confidence, emotional management, and stress management,

The teaching material consists of videos referred to the website of the Swiss pulmonary league (10) These videos are accessible to everyone, and we have sent them to each patient for the use of the different types of inhalers. The instruction given was to view them well and to reproduce the same gestures for a better inhalation.

**Third TPE session: Follow-up of the personalized learning program (Only for group A)**

This third session individual, was carried out by WhatsApp video call, to validate or correct the following skills:

- ) Cognitive skills (knowledge of disease and treatment)
- ) Gestural skills: Mastery of inhaled devices,
- ) Behavioral skills: Avoidance of aggravating factors, strategy in case of exacerbation,
- ) Adaptation skills: self-confidence, managing emotions and controlling stress,

This third session followed the same instructions as the second, with the same objectives and above all to see the progress or not of the patients.

**Fourth TPE session: Assessment of acquired skills, program progress (for both groups A and B)**

This fourth session individual, has been carried out by WhatsApp video call, to evaluate the therapeutic education program for all patients on the following points:

- ) Patient's feelings about the benefits of TPE,
- ) The acquisition by the patient of self-care skills,
- ) The acquisition by the patient of adaptation skills,
- ) Continue or stop the TPE program.

### Statistical analysis

**Data analysis and processing:** The sample size is 60 patients divided into two groups: Group B (reference) and group A who benefited from the TPE program. To format the results of the various TPE sessions, we have taken all the socio-demographic data, an anamnesis, and four sections on the TPE: knowledge and management of the disease, quality of life and the benefits of the TPE.

**Table 1. Results of the Kolmogorov Smirnov and Shapiro-Wilk Normality test**

Variables	Kolmogorov Smirnov			Shapiro Wilk		
	Value	dof	Sig.	Value	dof	Sig.
Definition of Asthma (V1)	,313	60	,000	,772	60	,000
Strategy in case of exacerbation (V2)	,337	60	,000	,756	60	,000
Inhalation device use skills (V3)	,261	60	,000	,811	60	,000
Environmental skills (V4)	,458	60	,000	,552	60	,000
Inhalation chamber use skills (V6)	,484	60	,000	,474	60	,000

Kolmogorov's test of normality Smirnov and Shapiro Wilk show that the normality assumption was not accepted since the p-values were all less than 5%. So we accept the null hypothesis according to which the distribution of the variables (V1, V2, V3, V4, V5, V6) does not follow a Gaussian or normal distribution

These data in the form of a questionnaire were entered via the Google-Forms platform dedicated to the design of online questionnaires. Although our study was not online, however, we took advantage of this technology to create the input mask that allowed us to enter data. We then exported this data to an Excel file on which we performed statistical processing. The objective was to find out if the data contained duplicate data that may bias our analysis. The data collected, were processed, and analyzed with SPSS 26.0 software (IBM SPSS Statistics for Windows, version 26 IBM Corp., Armonk, NY, USA). Qualitative variables are expressed as a percentage and quantitative variables are averaged with one standard deviation. The frequency comparisons are carried out with the Chi-square test or the exact Fisher test as the case may be and that of the means by the non-parametric Mann-Whitney test for the comparison of the means for two independent samples.[11] The application of statistical tests, was preceded by the verification of the condition of normality through the test of Kolmogorov-Smirnov and Wilk-Shapiro[12]for continuous quantitative variables: The asthma severity index, the skills in using the inhalation device, the environmental skills, the skills in using the inhalation chamber, the strategy in the event of an exacerbation followed a normal distribution (Table 1). To assess the magnitude of the difference and the effect between the two groups A and B, we presented the statistics of the effect sizes: Eta squared ( $\eta^2$ ) for the Mann - Whitney Wilcoxon test, V de cramer for the chi-square test.[13]. Cohen's criterion was used to classify effect sizes into small, low, medium, large.[14]

## RESULTS AND ANALYZES

**Table 2. Sociodemographic data of the sample studied:** The mean age of the sample was 36.53 with a standard deviation of 13.46 years. The percentage of female patients was 73.3%.

As for marital status, almost half of the sample is made up of married people, 43.3% were single. Along with the number of children, 48.3% of patients have 1 child versus 31% had more than 4 children. For educational level, out of a total of 60 patients, a quarter of the sample were illiterate, 26% had a university level. In relation to the activity variable, we note that almost 22% are active against 63.3% in a situation of inactivity. As for patients' income, most of the sample, 63.3%, had no source of income. By type of dwelling, almost all the patients resided in apartments compared to only 3, 3% at studio level. Patients with medical coverage represented a quarter of the sample studied, 15 out of a total of 60 patients. Table 3 provides a comparative report of the clinical characteristics of group A and group B. In terms of asthma control, it was clear that there were no major differences between group A and group B ( $\chi^2(1) = .577$ ;  $p > .05$ ). Regarding the type of treatment used, we note that the inhaler aerosol was the most used device for both groups A and B ; without significant difference at the 5% level ( $\chi^2(2) = 1.143$ ;  $p > .05$ ). Regarding the causes of non-control, certain similarities are observed for the 2 groups: exposure to allergens as well as rhinitis were present for about half of each group, 46.7% for group A and 53, 3% for group B. The difference was not significant at the 5% level ( $\chi^2(1) = .267$  ;  $p > .05$ ). Likewise, stopping medical treatment as soon as the patient gets better was noted for about a third of each group, 36.7% for group A and 33.3% for group B without any statistically significant difference to be noted. ( $\chi^2(1) = .073$  ;  $p > .05$ ).

**Table 2. Sociodemographic data of the sample studied (n = 60)**

Variables	Workforce (n = 60)	Frequency
Group		
A	30	50.0%
B	30	50.0%
Age in years		
(Mean $\pm$ Standard deviation)	36.53 $\pm$ 13.64 years	
Sex		
Feminine	44	73.3%
Male	16	26.7%
Marital status		
Single	26	43.3%
Divorced	04	6.7%
Married	30	50.0%
Number of children		
01	28	48.3%
02	02	3.4%
03	10	17.2%
Over 4	27	31.0%
Educational level		
Illiterate	15	25.0%
Primary	15	25.0%
Secondary	14	23.3%
Superior	16	26.7%
Activity		
No	38	63.3%
Yes	22	36.7%
Income in Dhs		
Any	38	63.3%
Monthly income <2000 Dhs	02	3.3%
Monthly income > 2000 Dhs	05	8.3%
Monthly income > 4000 Dhs	12	20.0%
Monthly income > 8000 Dhs	03	5.0%
Type of dwelling		
Apartment	58	96.7%
Studio	02	3.3%
Assurance		
No	45	75.0%
Yes	15	25.0%

Source: Study data

Table 3. History, Clinical characteristics of the sample

Variables	Group				Chi-square / Fisher P-value ; Effect size
	NA = 30		NB = 30		
	ni	%	ni	%	
Passive smoking					
No	23	76.7%	27	90.0%	2 (1) = 1.920 p> .05
Yes	7	23.3%	03	10.0%	
Active smoking					
Non-smoker	30	100.0%	28	93.3%	2 (1) = 2.069 p> .05
Weaned	0	0.0%	02	6.7%	
Asthma severity					
Mild persistent asthma	07	23.3%	06	20.0%	2 (2) = 2.803 p> .05
Moderate persistent asthma	16	53.3%	11	36.7%	
Severe persistent asthma	07	23.3%	13	43.3%	
Control level					
Not controlled	03	10.0%	05	16.7%	2 (1) =, 577 p> .05
Partially controlled	27	90.0%	25	83.3%	
Type of treatment					
Aerosol inhaler	26	86.7%	26	86.7%	2 (2) = 1.143 P> .05
Diskus	03	10.0%	04	13.3%	
Others	01	3.3%	00	0.0%	
Persistent exposure to allergens					
No	16	53.3%	14	46.7%	2 (1) =, 267 P> .05
Yes	14	46.7%	16	53.3%	
Stop treatment as soon as he feels better					
No	19	63.3%	20	66.7%	2 (1) =. 073 P> .05
Yes	11	36.7%	10	33.3%	
Rhinitis					
No	16	53.3%	14	46.7%	2 (1) =, 267 P> .05
Yes	14	46.7%	16	53.3%	
Lack of means					
No	26	86.7%	23	76.7%	2 (1) = 1.002 P> .05
Yes	04	13.3%	07	23.3%	
Undisciplined					
No	29	96.7%	22	73.3%	2 (1) = 6.405 P <.05 Vcramer=, 327
Yes	01	3.3%	08	26.7%	
Lack of information					
No	20	70%	14	40%	2 (1) = 1.697 P> .05
Yes	10	30%	16	60%	

Source: Study data

Table 4. Knowledge of the disease

Variables		Group		Test results and P-value	
		NA = 30	NB = 30		
Mean score of the definition of Asthma (Mean ± Standard deviation)		1.93 ±, 87	1.50 ±, 82	U = 315 † P <.05 2 =, 282	
Asthma Advisory		Contagious	1	1	2 (2) =, 610 p> .05
		Serious	1	1	
		Hereditary	28	28	
Triggers	Mites	No	16	9	2 (1) = 0.067 p> .05
		Yes	14	21	
	Pollution	No	5	3	2 (1) =, 706 p>. 05
		Yes	25	27	
	Stress	No	22	6	2 (1) =, 000 p <.05
		Yes	8	24	
	Passive smoking	No	20	13	2 (1) = 0.119 p> .05
		Yes	10	17	
	Emotions	No	23	7	2 (1) =, 000 p <.01
		Yes	7	23	
Onset of inhalers		No	20	25	2 (1) =, 233 p> .05
		Yes	10	5	
Side effects of inhaled corticosteroids		No	15	22	2 (1) =, 110 p> .05
		Yes	15	8	
Signs of crisis		No	1	2	2 (1) = 1.000 p> .05
		Yes	29	28	
Rinsing the mouth after using inhaled corticosteroids		No	9	2	2 (1) =, 042 p <.05
		Yes	21	28	
Knowledge of the inhalation chamber		No	20	10	2 (1) = .019 p <.05
		Yes	10	20	
Medicines in crisis		Corticosteroids	7	6	2 (2) = 0.162 p> .05
		Ventolin	23	20	
		Others	0	4	

† :Result relating to the U statistic of the nonparametric Mann-Whitney test equivalent to the parametric test of the student test for comparison of the mean of two independent samples.

**Table 5. Know-How to do: Disease management**

Variables	Group				Test result and P-value	
	NA = 30		NB = 30			
	ni	%	ni	%		
Inhalation device use skills (Avg ± SD)	3.1 ±, 80		3.2 ±, 89		U = 415.50; p> .05	
Environmental skills (Avg ± SD)	1.37 ±, 49		1.17 ±, 38		U = 360 ; p> .05	
Inhalation chamber use skills (Mean ± SD)	1.10 ±, 55		1.73 ± 1.17		U = 317.50; p =, 04 Vcramer =, 04	
Fund medical treatment	Stop treatment as soon as he gets better	10	33%	10	33%	2 (2) =8.61; p = .01; Vcramer = .38
	No	8	27%	17	57%	
	Yes	12	40%	3	10%	
Behavioral skills : Strategy in case of exacerbation	1.97 ±, 61		1.67 ±, 55		U = 339.50; p> 0.05	
Medical monitoring	Irregular	21		29		2 (2) =7.680; p = .01; Vcramer =, 36
	Regular	9		1		

**Table 6. Social skills: Quality of life**

Variables	Group				Chi-square - Fisher and p-value
	NA = 30		NB = 30		
	ni	%	ni	%	
Practice of Sports Activity					Fisher = 2.052; p> .05
No	19	63.3%	24	80.0%	
Yes	11	36.7%	06	20.0%	
Know how to be respiratory					2 (2) = 2.803 p> .05
Big problem	7	23.3%	6	20.0%	
A lot of problems	16	53.3%	11	36.7%	
Some problems.	07	23.3%	13	43.3%	
No stress					2 (1) = 1.963 p> .05
No	26	86.7%	29	96.7%	
Yes	04	13.3%	01	3.3%	
Stress related to covid-19 disease					2 (1) = 3.068 p> .05
No	11	36.7%	05	16.7%	
Yes	19	63.3%	25	83.3%	
Stress related to the covid-19 vaccine					2 (1) = 3.068 p> .05
No	11	36.7%	05	16.7%	

**Table 7. Benefits of therapeutic education**

Variables	Groups				Chi-square / Fisher; p value; Vcramer
	NA = 30		NB = 30		
	ni	(%)	ni	(%)	
Self-care skills					Fisher = 38.721 p <.001 Vcramer =, 744
Acquired	18	60.0%	1	3.3%	
Average Acquired	12	40.0%	11	36.7%	
Not acquired	0	0.0%	18	60.0%	
Adaptation skills					Fisher = 38.177 P <.000 Vcramer=, 752
Acquired	23	76.7%	2	6.7%	
Average Acquired	7	23.3%	14	46.7%	
Not acquired	0	0.0%	14	46.7%	
Emergency call for asthma exacerbation during the TPE period					2 (1) = 2.069 p> 0.05
No	30	100.0%	28	93.3%	
Yes	00	0.0%	02	6.7%	
TPE Reviews					Fisher = 22.010 P <.0001 Vcramer= 0.582
Not useful	01	3.3%	02	6.7%	
Useful	12	40.0%	27	90.0%	
Very useful	17	56.7%	01	3.3%	
Continuity TPE sessions					2 (2) = 15.023 P <.0001 Vcramer =, 500
Distance	27	90.0%	13	43.3%	
Face-to-face	03	10.0%	14	46.7%	
Will not	00	0.0%	03	10.0%	
Benefits : Drug education					Fisher = 7.481 P <.0001 Vcramer =, 838
No	09	30.0%	23	76.7%	
Yes	21	70.0%	07	23.3%	
Benefits Psychological support					2 (1) =, 693 p> 0.05
No	08	26.7%	19	63.3%	
Yes	22	73.3%	11	36.7%	
Benefits Better quality of life					2 (1) =, 218 p> 0.05
No	09	30.0%	16	53.3%	
Yes	21	70.0%	14	46.7%	

**Table 8. Quality of life after TPE sessions**

Variables	Group				Chi-square - Fisher and p-value	
	nA = 30		nB = 30			
	ni	%	ni	%		
Evolution of the disease						
	Negative	04	13.3%	12	40.0%	Fisher = 7.811 P < .05 Vcramer =, 363
	Positive	15	50.0%	06	20.0%	
	Others	11	36.7%	12	40.0%	
Know how to be respiratory						
	No problem	03	10.0%	02	6.7%	Fisher = 6.797 P > .05
	Big problem	01	3.3%	00	0.0%	
	A lot of problems	05	16.7%	14	46.7%	
	Some problems.	21	70.0%	14	46.7%	
Asthma related stress						
	No	13	43.3%	05	16.7%	2 (1) = 5.079 P < .05 Vcramer = 0.291
	Yes	17	56.7%	25	83.3%	

However, for the differences the indiscipline was much more marked in group B. The chi-square comparison test shows a significant difference at the 5% threshold ( $\chi^2(1) = 6.405$ ;  $p < .05$ ) with a size of significant effect of .327.

**Table 4. Knowledge of the disease:** On a 5-point scale ranging from (Very good 5) to (None: 1), we asked patients to define Asthma, the mean response score obtained was  $1.93 \pm 0.87$  for group A and  $1, 5 \pm 0.82$  for group B. The Mann – Whitney U nonparametric comparison test was significant at the 5% level ( $U = 315$ ;  $p < .05$ ). However, for both groups the definition given of asthma was zero to poor, 0% response "Very good" and "Good". Nevertheless, for almost most of the two groups asthma was an inherited disease. For asthma triggering factors, it was noted that the stress and emotion variables were significant at the 5% level ( $\chi^2(1) = 0.00$ ,  $p < .05$ ).

Concerning the onset of action of inhalers, the patients in group A who knew the onset of action were 21 out of a total of 30 against 8 for group B. The chi-square test shows a non-significant difference at the 5% level. ( $\chi^2(1) = 233$ ,  $p > .05$ ). For the signs announcing an asthma attack, the patients of the two groups A and B knew the warning signs of an attack, it is noted that there are no significant differences at the significance level at the 5% level. ( $\chi^2(1) = 1.000$ ,  $p > .05$ ). Regarding the medical treatment used in the event of a seizure, it is noted that the use of Ventolin by patients in group A concerned 76% of the sample against 66% of group B. Treatment with corticosteroids came in second position as a drug used in crisis situations. The difference in medication consumption between the two groups was not significant at the 5% level. ( $\chi^2(2) = 0.162$ ,  $p > .05$ )

**Table 5. Know-How to do: Disease management:** On a 5-point scale ranging from very good (5) to poorly done (1). Patients in both groups were assessed for their skills in using the inhalation device. The average score obtained for this skill was  $3.1 \pm 0.8$  for group A against  $3.2 \pm 0.9$  for group B, which is not a very different score. The Mann-Whitney nonparametric comparison test was insignificant at the 5% level ( $U = 415.50$ ;  $p > .05$ ) As for environmental skills, the evaluation results show that group A had a score of  $1.37 \pm 0.49$ , a score slightly higher than that of the reference group B ( $1.17 \pm 0.38$ ). The Mann-Whitney test was non-significant ( $U = 360$ ,  $p = 0.08$ ) at the significance level of 5%. For skills related to the use of the inhalation chamber, the patients were evaluated on the degree of mastery of the inhalation chamber, the evaluation results show that group A had a score of

$1.10 \pm .55$ , a score lower than that of the reference group B ( $1, 73 \pm 1.17$ ). This difference is because patients in group B were more likely to have an inhalation chamber. For behavioral skills, we investigated whether patients adopted behavioral changes to avoid aggravating factors and adopted an exacerbation strategy. A score of 3 to 1 point was awarded for these behavioral skills (3: Acquired, 2, Moderately Acquired, 1: Poorly acquired). The results show that the patients in group A presented a score higher than the reference group, ( $1.97 \pm .61$  against  $1.67 \pm .55$ ). The comparison of scores between these two groups does not show any significant differences at the 5% level. ( $U = 339.50$ ;  $p > 0.05$ ). Regarding the basic medical treatment, it was found that stopping treatment as soon as the patients felt better was observed in almost 33% of both groups. Those who respected the treatment were 27% for group A and almost half in the reference group (57%). The chi-square test shows a significant difference ( $\chi^2(2) = 8.61$ ;  $p = .01$ ) at the 1% level with an effect size (Vcramer) of .38.

**Table 6. About the know-how dimension: quality of life,** patients were assessed on several criteria. The practice of physical activity does not show significant differences between group A and group B despite a slight difference between those who practice sport (11 out of 30) for group A versus (6 out of 30) for group B. ( $p > 0.05$ ). As for breathing skills, the percentage of patients with "major respiratory problems" was 23.3% for group A and 20% for group B, the scores are almost identical. Regarding stress, only 4% of group A and 1% of group B presented no stress, no significant difference at the 5% level. As a result, we sought to understand the origin of this stress, which was linked to the Covid 19 disease, 63.3% for group A and 83.3% for group B, ditto for the anti-Covid-19 vaccine both groups presented significant results.

**Table 7. Benefits of therapeutic education:** Self-care competence was evaluated in both groups A and B. This competence, including gestural competence, was acquired for 60% of patients in group A against 3.3% for group B. The difference in the percentages is highly significant at the 1% level with a very large effect size of 0.744. Also, it was necessary to assess coping skills in both groups of patients. The mastery of this skill was 76.7% for the group of patients who followed the education program against 6.7% for the reference group. Fisher's test shows a significant difference with a very large effect size of 0.752. The benefits of TPE concerning drug education, almost 70% of patients in group A recognized the benefit of drug education compared to 23.3%

for group B. Fisher's test shows a significant difference at the threshold of 5% with a very large effect size of 0.838 (Large effect) (Fisher's test 7.481,  $P < 0.001$ ,  $V_{\text{cramer}} = 0.838$ ). As for the benefits in relation to quality of life, it was found that almost 70% of patients in group A judged that TPE ensures a better quality of life compared to 46.7% for group B. Similarly, the benefit of TPE providing psychological support, was recognized as beneficial for 73.3% of group A against 36.7% for group B. However, we learned that 2 patients in group B, group who did not benefit from the TPE had recourse to the emergency department for exacerbation of asthma during the period of the TPE, 6.7% against 0% for group A. Due to health restrictions and preventive measures linked to the Covid-19 pandemic, the therapeutic education program was carried out remotely via the WhatsApp video call application, on this point we questioned the patients for the continuity of the TPE sessions, the distancing mode was used in almost 90% of group A against 43% in group B. Only 10% of group B disagreed with the continuity of the TPE sessions. The chi-square test for comparing the percentages between the two groups was very significant at the 5% level ( $\chi^2(2) = 15.023$ ;  $p = 0.001$ ). The effect size was large ( $V_{\text{cramer}}$  of 0.500).

**Table 8. Quality of life after TPE sessions:** We asked patients from both groups to rate the degree of progression of their disease. The evolution was positive in half of group A having benefited from the therapeutic program against 20% in the reference group. Fisher's test shows a significant difference at the 5% threshold with a large effect size which was 0.363 according to the  $V_{\text{cramer}}$  statistic. As for breathing skills, the percentage of patients with "major respiratory problems" was 3.3% for group A and 0% for group B, the two scores decreased compared to the first session. Also the percentage of patients with "quite a few respiratory problems" constituted 16.7% of group A against 46.7% of group B. Regarding stress, at the end of the TPE program the stress linked to the Covid 19 disease had decreased, as had the stress linked to the anti-covid 19 vaccine, some patients having been vaccinated. We wanted to point out only the disease of asthma and to question our patients on the stress related to this disease, the observation is that the level of stress was felt less in group A (56.7%) compared with group B (83.3%). The difference in percentages between these two groups was significant at the 5% level with a mean effect size of 0.3.

## DISCUSSION

In the context of the pandemic, as explained above we had to adapt for the continuity of this educational program. The TPE requires health professionals to move from a counseling relationship to a relationship focused on education allowing the patient to take an active role in his management of his disease (15). The teaching approach of the TPE then allows close contact with the patient where the relationship between caregiver and patient changes. The TPE implies that the caregiver modifies his posture to adopt an educational posture which corresponds to an attitude of listening, and of cognitive and psychosocial support (16). Indeed during the educational assessment, an educational relationship is introduced, it is deeper and gives a privileged moment between the therapist and his patient thus making it possible to lay the foundations for a successful therapeutic alliance (17). To preserve this relationship we have opted for communication with eye contact and therefore have chosen the WhatsApp video call

application. WhatsApp is a communication application facilitating the exchange of instant messages, images, videos and voice calls via an Internet or 4G connection, which has been installed on the smartphones of more than two billion people in more than 180 countries in the world.(18) In times of COVID-19, when many healthcare facilities switch to various forms of telemedicine consultations, WhatsApp becomes more relevant than ever (19) In addition, in hospitals, the WhatsApp application is used for different reasons, between colleagues and with patients; doctors use WhatsApp to share scientific information and communicate about clinical situations, request information or give directions, send patient data in the form of images or videos (20) Some doctors report that patients often ask them to use WhatsApp to facilitate communication and to send videos for an assessment before a consultation (20).

In a study on creating a smartphone app for asthma patients, the authors used videos with content that included information about the disease, medication adherence, and the role of different medications as educational materials. The authors reported that patients and caregivers are increasingly interested in adapting mobile technology to help manage chronic disease.(21) In our study, we also used the videos of the Swiss pulmonary league as an educational aid for learning the gestural skills of inhalers.(10) In Germany, a single-center study with 165 asthma patients was conducted using online videos from the German Respiratory League for teaching inhalation technique. Authors Muller T. et Al reported that the use of these videos improved inhalation technique for 75.3% of these patients.(22) In our study the use of videos had been proposed to group A, 60% of the patients acquired the gesture skills of the inhalers at the end of the proposed program. During this research work, we asked patients about the usefulness of these sessions, the opinions of patients with regard to the TPE were useful to very useful according to 60% of patients in group A and 93.3% for group B. The proportion of patients who did not recognize the usefulness of the TPE program was very low. As in the Finnish cross-sectional study carried out on 170 asthma patients, which assessed the quality of advice received during education sessions.

It showed that asthma patients were generally satisfied and they also appreciated the interaction with the healthcare professional (23). As the authors Atman and AL interviewed in their online cross-sectional study 129 asthma patients, of these 64 patients had previously received asthma education (trained patients), while 65 participants had never received asthma education (untrained patients). In the trained group, 90% were satisfied with their asthma education (24). However, we noticed that an important variable should not be neglected, it is stress, we made the difference between the stress linked to the disease covid 19 and that linked to asthma. In the first months of the pandemic we noted that the 2 groups had high scores compared to Covid 19, especially since these patients were very worried because it is also a respiratory disease. This new disease has had a negative impact on the mental health of asthma patients, especially at the onset of the pandemic when they learned that COVID-19 was deadly for patients with chronic conditions such as asthma.(25) Indeed, asthma patients believed to be more vulnerable to the disease than others, many of them followed preventive measures and self-quarantined to avoid infection.(25) Furthermore, pulmonologists at the University Hospital of Liège in Belgium, at the start of the epidemic, feared that infection with the SARS-CoV-2 virus would trigger an uncontrollable wave of asthmatic

exacerbations (26). The authors Underner and Al explain that patients with chronic respiratory conditions, including asthma, were initially considered to have a higher risk of infection with this new virus, however this is still discussed in early Chinese studies ; asthma does not appear to be a risk factor for COVID-19, but in the United States, American patients hospitalized for COVID-19 in March 2020, showed an increased risk of hospitalization for COVID-19 for asthmatics (27). Moreover, in April 2020, in the United Kingdom, an online qualitative study carried out on concerns related to COVID-19 disease in patients with respiratory diseases, 85% of whom are asthma patients; showed deep concern for these patients with increased stress and anxiety.(28) Likewise, in Colombia a cross-sectional study conducted by telephone survey of asthma and COPB patients showed that these patients had similar frequencies of risk of depression, of stress perceived by the disease COVID-19(29)In our study for the two groups, for the 60 patients, 73.3% presented stress linked to Covid-19. Regarding the stress related to the disease, we evaluated this data at the end of the program because the patients who benefited from the TPE sessions had a lower percentage than that of group B, however the figures were not negligible : 56.7 % for group A and 83.3% for group B, an average of 70% for the 60 patients. In the cross-sectional study conducted at the hospital 20 Aout in Casablanca on 100 asthma patients, the authors assessed the prevalence of depressive and anxiety disorders in these patients using the Asthma Control Questionnaire and the 'Asthma Quality of Life Questionnaire as evaluation tools .The results of the study showed that an anxiety disorder is found for 53% of cases (30) That is to say a figure lower than our study but which remains important even if the samples are different.

Futhermore the authors Stenberg et Al analyzed in a review of the literature the advantages of TPE programs on chronic diseases, they reported the psychosocial impact of TPE with less distress related to the disease and more hope for the future.(31) In our study, 50% of group A had a positive opinion on the course of the disease after the TPE program. Regarding the psychological support provided during the TPE sessions, the patients recognized that the psychological support helped them in the daily management of their disease. In fact, we were able to observe that for 73.3% of patients in group A, psychological support was beneficial during the TPE sessions. Asthma is experienced differently for each patient depending on the representations that each has of their disease. In some patients, the psychological experience can take a central place and determine the evolution of asthma(32)For the management of the psychological dimension of this disease, therapeutic education programs occupy a central place as well as cognitive-behavioral therapies and also relaxation (32)In a TPE program, we will seek to develop the psychosocial skills of the patient allowing him to cope with the asthma attack, but also to manage asthma on a daily basis such as, for example, the realistic acceptance of the disease (33) Finally, the contribution of TPE for group A made it possible to avoid having to resort to the emergency room for exacerbations, no patient needed to go to the emergency room during the TPE program. The American study carried out at the pulmonology department of the Bronx-Lebanon Hospital Center in New York through a therapeutic education program with 231 asthma patients showed that the TPE sessions made it possible to reduce the number of visits in emergencies and hospitalizations (34)

**Limits and strength of the study:** The absence of measurement of the PEF during the sessions could supplement the benefits of the TPE, it would have been necessary to make available individual flow meters to each patient. The TPE program was carried out via the WhatsApp video application, a study adapted to the pandemic context, thus making it possible to expand what we can offer remotely thanks to new technologies.

## Conclusion

The study on therapeutic education has shown that several benefits are provided in the management of asthma, in particular drug education, a better quality of life and also psychological support. In order to maintain this follow-up with the patients, it would be useful to continue these sessions for some face-to-face patients and for others who are more expert in their treatment, remote follow-up. Thus the patient will understand that he is always accompanied in the management of his disease and will become more involved in his self-education.

## Thanks

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## Abbreviations list

**TPE** : Therapeutic patient education  
**WHO** : World Health Organization  
**HAH** : High Authority of Health  
**GINA** : Global Initiative National for Asthma  
**COPB** : Chronic Obstructive Pulmonary Bronchitis  
**DTB** : Dilatation of the Bronchi  
**PEF** : Peak expiratory flow

**Conflict of interest:** No conflict of interest

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