

Research Article

Knowledge, Attitude and Practice of Lebanese Community Pharmacists toward Chronic Obstructive Pulmonary Disease

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ABSTRACT

Inclusion of a pharmacist showed that pharmacy-led patient education can positively impact treatment outcome, chronic obstructive pulmonary disease (COPD) knowledge, medication adherence, quality of life, significant reduction in hospital admission rates, and emergency department visits. The objectives were to assess the degree of COPD knowledge in Lebanese community pharmacists as well as their attitudes and practice toward disease management. Between January and May 2018, a cross-sectional survey enrolled 709 Lebanese community pharmacists. A committee was created to build up the questionnaire; it was composed of two physicians (one infectious disease specialist and one pulmonologist) and eight pharmacists, with long expertise in community and hospital pharmacy. It comprised 12 questions assessing knowledge, 12 questions for attitude, and 13 questions for practice. Higher attitude ($\beta = 0.56$) and higher practice ($\beta = 0.41$) were associated with higher knowledge score. Higher knowledge ($\beta = 0.10$) and practice ($\beta = 0.16$) scores as well as female gender ($\beta = 0.60$) were significantly associated with higher attitude scores. Higher knowledge ($\beta = 0.13$) and higher attitude ($\beta = 0.19$) showed significant association with higher practice scores. Female gender ($\beta = -0.94$), however, was significantly associated with decreased practice score. Our study highlights the importance of assessing the capabilities of pharmacists of achieving their support role in COPD patients. In order to improve community pharmacists' knowledge of COPD, ultimately improving patient outcomes, further education is crucial.

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1. INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a prevalent and slowly progressing disease characterized by persistent respiratory symptoms and airflow limitation due to airway or alveolar abnormalities [1]. It is caused by long-term exposure to noxious gases and other agents such as industrial pollutants and, most importantly, tobacco smoking [2]. COPD can result in worsening breathlessness, restricting daily activities, and affecting the quality of life of patients and their families [3,4]. Also, if the disease is exacerbated, patients may experience an increase in medical emergencies and hospitalizations, risk of mortality, and health-care expenditure [5,6].

COPD was ranked eighth as a cause of disease burden as measured by disability-adjusted life years by the Global Burden of Disease Study in 2015 [7]. A systematic review and meta-analysis estimating global and regional COPD prevalence found a high and growing prevalence, with the highest percentage increase in the Eastern Mediterranean region between 1990 and 2010 (118.7%) [8].

The disease is noncurable, yet it is preventable and treatable [1]. The management of COPD is symptomatic, with pharmacological and non-pharmacological treatments such as pulmonary rehabilitation [9]. An effective management requires long-term adherence to pharmacotherapies; in fact, a systematic review reported a clear association between adherence to COPD treatments and both clinical and economic outcomes [10], while other studies showed that nonadherence increases hospitalization and exacerbation rates, thus having significant deleterious effects on a patient's outcomes [10,11]. However, the rates of adherence to medication usage in COPD

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patients continue to be low [12]. Patient education has been shown to be crucial for the successful management of COPD. It should include information of their condition, warning signs and symptoms, pathology, and appropriate treatment [13].

In Lebanon, a cross-sectional study was carried out in 2012 to estimate the prevalence of COPD in residents aged 40 years and above. The obtained prevalence was 9.7% (95% CI: 8.5–10.9); however, only 20.2% of the cases were already diagnosed by a physician [14]. Moreover, the BREATHE study, conducted in 10 countries in the Middle East and North Africa (MENA) region, showed that in Lebanon, 71.8% of COPD patients were still smoking and only 30.6% were receiving respiratory treatments. The BREATHE study also concluded that patient awareness of COPD is suboptimal and the treatment expectations are undervalued by patients, suggesting the need of better patient education and more effective communication between the patient and the physician [15].

Inclusion of a pharmacist to the formula has been tested in several countries (India, Canada, and Jordan). In fact, three randomized controlled trials [16–18] showed that pharmacy-led patient education can positively impact treatment outcome, COPD knowledge, medication adherence, quality of life, significant reduction in hospital admission rates, and emergency department visits [19].

Community pharmacists are at the core of patient's education, especially education related to chronic diseases; they play an essential role in counseling, disease prevention, and management [20]. As the first place people visit for health consultation, the community pharmacy in Lebanon is the primary opportunity for COPD prevention and management; in fact, 90% of Lebanese pharmacists agreed that patients come to them first for counseling [21].

No previous epidemiological studies from Lebanon have assessed the level of knowledge of community pharmacists regarding COPD. We therefore conducted this study in order to explore the knowledge, attitude, and practice (KAP) of Lebanese community pharmacists regarding COPD.

2. MATERIALS AND METHODS

2.1. General Study Design

Between January and May 2018, a cross-sectional survey, using a proportionate random sample of community pharmacies in all five Lebanese districts of Lebanon (Beirut, Mount Lebanon, North, South, and Bekaa), was carried out. An online software was used to randomly select the community pharmacies sample using the list of pharmacies provided by the Lebanese Order of Pharmacists (OPL). Similar methodology was used in previous papers [22–35].

2.2. Sample Size

It was assumed that there would be one pharmacist working in each pharmacy when calculating the sample size needed for each district. Epi info was used for sample size calculations; using a population size of 3032 pharmacies, a confidence level of 95%, a 95% confidence interval, and assuming that 50% of the pharmacists were familiar with the current COPD guideline in the absence of similar studies in the country, a total sample of 384 pharmacists was deemed necessary.

2.3. Survey Development

A committee was created to build up the questionnaire; it was composed of two physicians (one infectious disease specialist and one pulmonologist) and eight pharmacists, with long expertise in community and hospital pharmacy. A pilot study was then done on 10 community pharmacists prior to the finalization and distribution of the survey instrument to make sure that the questions were clear and understandable. The pilot study revealed no need for modification; its results were thus included in the study.

The questionnaire contained two different sections. [Section 1](#) investigated the sociodemographic characteristics, including years of experience in community pharmacy practice and the highest degree earned. [Section 2](#) assessed pharmacists' KAP toward COPD: 12 questions assessed knowledge, 12 questions assessed attitude, and 13 questions assessed practice. The Cronbach's alpha for the three scales were recorded as follows: knowledge scale (0.684), attitude scale (0.805), and practice scale (0.699).

2.4. Survey Distribution

Data collection was done by interviewers who received interview skills training and were independent from the study. Interviewers explained the study objectives to the pharmacist prior to the interview. Participants were handed the self-administered questionnaire after obtaining their informed written consent. The completion of the questionnaire needed 10 min. The investigator was made available to the participant for any clarification needed.

The questions describing the scores are summarized in [Table 1](#). The total knowledge score was computed by adding the number of points obtained from correct answers and ranged up to a maximum of 20 points. The practice variable is the sum of answers on 13 questions. A numerical value of 1 was given for each correct answer/practice and 0 for false/negative practice. The total practice score ranged from 0 as to no practice to 13 reflecting a full positive practice. Pharmacists' attitude score was assessed using 12 questions and ranged between a minimum of 0 and a maximum of 12. An arbitrary system was used to classify the participants in two categories using the median based on their responses in terms of knowledge (i.e., poor, moderate, and good knowledge), attitude, and practice and dividing the score into three categories using the visual binning option in Statistical Package for Social Science (SPSS).

2.5. Data Analysis

SPSS version 23 (IBM Corp., Armonk, NY) was used for the statistical analyses. Descriptive statistics were presented using mean and standard deviation for continuous measures, frequencies and percentages for categorical variables.

The Student's *t*-test and analysis of variance test were used to assess the association between each continuous independent variable (KAP scores) and the sociodemographic variables. Multivariable linear regression models were done to explore factors associated with the KAP scores as dependent variables and taking all variables that showed a $p < 0.1$ in the bivariate analysis as independent

Table 1 | Description of the questions forming the knowledge, attitude and practice scores

Knowledge score		
Questions	Correct answer	Coding
1. What is the difference between COPD and chronic bronchitis?	COPD is the combination of emphysema and chronic bronchitis	1 point
2. What are the common symptoms of COPD?	<ul style="list-style-type: none"> • Shortness of breath • Cough • Sputum production • Wheezing 	1 point per correct answer
3. What are the risk factors for COPD?	<ul style="list-style-type: none"> • Smoking • Exposure to air pollution • Lung infections • Exposure to fumes, chemicals and dust found in many work environments 	1 point per correct answer
4. What changes takes place in the body when you have COPD?	<ul style="list-style-type: none"> • Always get inflamed and swollen • Thick mucus secretion 	1 point per correct answer
5. What complications can COPD lead to?	Both heart problems and chest infections	1 point
6. Is COPD contagious?	• No	1 point
7. Can COPD be completely cured?	• No	1 point
8. Are antibiotics indicated in patients with COPD exacerbation with a viral etiology?	• Yes	1 point
9. What antibiotics would you give to the patient with COPD exacerbation?	Quinolones Beta-lactams	1 point per correct answer
10. What is the duration of antibiotics treatment in a patient with COPD exacerbation?	14 days	1 point
11. Do you think that steroids could be prescribed to patients to treat COPD exacerbation?	Yes, they are indicated when the patient is wheezing	1 point
12. Is smoking an important cause of COPD?	• Yes	1 point
Practice score		
1. You always do a patient's medication review (dose, dosage form, duration of therapy, etc.) regarding the concomitant treatments of COPD.	a. Strongly agree b. Agree c. Neither agree nor disagree d. Disagree e. Strongly disagree	Strongly disagree = 1 to Strongly agree = 5
2. Drug-related problems are recorded and forwarded to the physician.	a. Strongly agree b. Agree c. Neither agree nor disagree d. Disagree e. Strongly disagree	Strongly disagree = 1 to Strongly agree = 5
3. Do you usually teach/give advices for your patients on how to use the metered-dose inhaler even if they do not ask you?	• Yes	1 point
4. When a patient is using a metered dose inhaler, do you tell him to shake the canister just before taking a puff?	• Every time	1 point
5. Do you counsel patients regarding the best time to take the inhalers?	• Yes	1 point
6. Do you usually teach/give advices for your patients on how to use the powder inhalers even if they do not ask you?	• Yes	1 point
7. When a patient is using steroids by inhalation, do you counsel him about rinsing the mouth after inhalation?	• Every time	1 point
8. Do you assess the patient's knowledge deficit when they come for counseling?	• Yes	1 point
9. Do you assess the patient's expectations of their COPD therapy?	• Yes	1 point
10. Do you counsel the patient about worsening of COPD symptoms?	• Yes	1 point
11. Do you refer the patient to a physician in case of COPD exacerbations?	• Yes	1 point
12. Do you prescribe mucolytics for patients with COPD exacerbation?	• Yes	1 point
13. If yes which one?	• N-acetylcysteine	1 point

(Continued)

Table 1 | Description of the questions forming the knowledge, attitude and practice scores—Continued

In summary, how much do you agree on the role of the pharmacist in patient education and awareness regarding the following subjects	Attitude score				
	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Smoking cessation					
Effect of second hand smoking					
Use of inhalers					
Role of nutrition					
Exercise					
Drug-drug and drug-food interactions					
Long-term treatment effect					
Importance of patient compliance					
Vaccines for the prevention of acute exacerbation					
Drug use and auto-prescription					
Antibiotic misuse or abuse					
Use of humidifier					

variables. Moreover, Cronbach's alpha was recorded for reliability analysis for each scale. To calculate the p value of the statistical significance, the Bonferroni correction compensates for that increase by testing each individual hypothesis at a significance level of α/m , where α is the desired overall alpha level and m is the number of hypotheses/tests conducted [36]. Concerning the KAP scores, we tested 11 hypotheses/variables in each model, with a desired error α of 0.05; therefore, the Bonferroni correction would test each individual hypothesis at a p value of $0.05/11 = 0.004$.

3. RESULTS

3.1. Sociodemographic and Other Characteristics of the Participants

Of the 850 questionnaires distributed, 709 (83.41%) questionnaires were collected back from community pharmacists. The percentage of the pharmacists recruited per district was as follows: Beirut 105 of 1408 (7.4%), Mount Lebanon 364 of 2602 (13.99%), North 19 of 595 (3.19%), South 123 of 722 (17.03%), and Bekaa 78 of 568 (13.73%). The sociodemographic and other characteristics of the pharmacists are summarized in Table 2. The results showed that the mean age of the pharmacists was 35.51 ± 10.82 years, with 58% females, 57.9% having a bachelor degree in pharmacy, 52.8% living in Mount Lebanon, and 46.5% having patients from mixed demographic areas. In addition, 30.9% of them practiced pharmacy for more than 12 years and 66.2% worked 40+ hours/week. Finally, 63.4% were pharmacy owners (employers).

3.2. Description of the KAP Scores

3.2.1. Knowledge score

The results showed that the mean knowledge score was 13.15 ± 2.40 (median = 13; minimum = 5; maximum = 18). The results showed that 456 (64.3%) had adequate knowledge. When dividing the score into three categories, the results showed that 253 (35.7%) had poor knowledge (scores ≤ 12), 244 (34.4%) had moderate knowledge (scores between 13 and 14), whereas 212 (29.9%) had good knowledge (scores of 15 and above).

Table 2 | Sociodemographic and other characteristics of the participants

Variables	N (%)
Gender	
Male	294 (42)
Female	406 (58)
Educational level	
BS Pharmacy	406 (57.9)
Pharm. D.	183 (26.1)
Masters	96 (13.7)
PhD	16 (2.3)
District	
Beirut	105 (15.2)
Mount Lebanon	364 (52.8)
North Lebanon	19 (2.8)
South Lebanon	123 (17.9)
Bekaa	78 (11.3)
Demographic area	
Poor	45 (6.6)
Middle	282 (41.3)
Rich	38 (5.6)
Mixed	317 (46.5)
Daily number of patients	
<10	35 (4.9)
10–50	251 (35.4)
50–100	215 (30.3)
>100	208 (29.3)
Years of practice	
Less than 6 months	19 (2.7)
6 months to less than a year	37 (5.2)
1 year to less than 3 years	109 (15.5)
3 years to less than 6 years	133 (18.9)
6 years to less than 12 years	189 (26.8)
12 years or more	218 (30.9)
Weekly working hours	
1–16	46 (6.5)
17–31	51 (7.2)
32–40	142 (20.1)
>40	468 (66.2)
Pharmacy position	
Owner	448 (63.4)
Staff	259 (36.6)
	Mean \pm SD
Age (in years)	35.51 \pm 10.82

3.2.2. Attitude score

The results showed that the mean attitude score was 9.76 ± 2.59 (median = 10; minimum = 0; maximum = 12). The results showed that 347 (48.9%) had positive attitude.

3.2.3. Practice score

The results showed that the mean practice score was 15.82 ± 3.03 (median = 16; minimum = 5; maximum = 20). The results showed that 347 (48.9%) had adequate practice. When dividing the score into three categories, the results showed that 290 (40.9%) had poor

practice (scores ≤ 15), 276 (38.9%) had moderate practice (scores between 16 and 18), whereas 143 (20.2%) had good practice (scores of 19 and above).

3.3. Bivariate Analysis

3.3.1. Knowledge

The results of the bivariate analysis showed that a significantly higher mean knowledge score was found in Bekaa (42.73) compared to all other districts and in pharmacists having patients with mixed demographic areas (40.72) compared to all other categories (Table 3).

Table 3 | Bivariate analysis of factors associated with the knowledge, attitude and practice scores

Variables	Knowledge (mean \pm SD)	Attitude (mean \pm SD)	Practice (mean \pm SD)
Gender			
Male	39.64 \pm 5.87	9.44 \pm 2.70	16.34 \pm 2.76
Female	40.43 \pm 5.60	9.99 \pm 2.46	15.44 \pm 3.15
<i>p</i> -value	0.073	0.006	<0.001
District			
Beirut	40.51 \pm 5.74	9.41 \pm 2.56	15.48 \pm 3.01
Mount Lebanon	40.09 \pm 5.53	9.72 \pm 2.68	15.54 \pm 3.13
North Lebanon	36.31 \pm 5.35	10.57 \pm 1.57	15.68 \pm 2.18
South Lebanon	38.92 \pm 5.72	10.13 \pm 2.43	16.69 \pm 2.68
Bekaa	42.73 \pm 5.85	9.48 \pm 2.76	16.37 \pm 2.91
<i>p</i> -value	<0.001	0.13	0.001
Educational level			
BS pharmacy	39.89 \pm 5.91	9.77 \pm 2.49	15.93 \pm 2.86
Pharm. D.	40.60 \pm 5.34	9.81 \pm 2.65	15.60 \pm 3.35
Masters	39.67 \pm 5.60	9.61 \pm 2.71	15.70 \pm 3.07
PhD	40.68 \pm 6.42	9.06 \pm 4.04	16.25 \pm 3.04
<i>p</i> -value	0.455	0.675	0.813
Demographic area			
Poor	40.17 \pm 5.13	10.37 \pm 2.17	16.26 \pm 2.47
Middle	39.88 \pm 5.86	9.54 \pm 2.76	15.58 \pm 3.05
Rich	37.60 \pm 6.34	9.10 \pm 3.33	15.81 \pm 2.51
Mixed	40.72 \pm 5.45	10.00 \pm 2.35	16.04 \pm 3.12
<i>p</i> -value	0.021	0.012	0.069
Daily number of patients			
<10	41.48 \pm 5.94	9.20 \pm 2.92	16.45 \pm 2.29
10–50	40.25 \pm 5.64	9.76 \pm 2.49	15.83 \pm 3.04
50–100	40.39 \pm 5.23	9.93 \pm 2.38	15.86 \pm 3.10
>100	39.29 \pm 6.19	9.66 \pm 2.86	15.65 \pm 3.05
<i>p</i> -value	0.074	0.406	0.528
Years of practice			
Less than 6 months	41.68 \pm 5.31	10.68 \pm 1.29	15.68 \pm 2.56
6 months to less than a year	40.00 \pm 5.85	9.67 \pm 2.62	15.24 \pm 3.05
1 year to less than 3 years	39.74 \pm 5.67	9.91 \pm 2.41	15.49 \pm 3.16
3 years to less than 6 years	40.30 \pm 6.11	9.87 \pm 2.37	15.57 \pm 3.12
6 years to less than 12 years	40.69 \pm 5.11	9.79 \pm 2.57	15.92 \pm 2.92
12 years or more	39.52 \pm 5.86	9.57 \pm 2.80	16.17 \pm 3.03
<i>p</i> -value	0.269	0.501	0.25
Weekly working hours			
1–16	38.84 \pm 6.43	9.86 \pm 2.09	14.82 \pm 3.35
17–31	40.70 \pm 5.32	9.68 \pm 2.58	14.49 \pm 2.83
32–40	40.11 \pm 5.33	9.51 \pm 2.64	15.46 \pm 2.97
>40	40.16 \pm 5.76	9.84 \pm 2.59	16.18 \pm 2.97
<i>p</i> -value	0.415	0.582	<0.001
Pharmacy position			
Owner	40.34 \pm 5.55	9.87 \pm 2.59	16.16 \pm 2.94
Staff	39.62 \pm 5.99	9.55 \pm 2.59	15.22 \pm 3.09
<i>p</i> -value	0.106	0.116	<0.001

In addition, higher knowledge was significantly but weakly associated with higher practice ($r = 0.26$) and higher attitude ($r = 0.294$).

3.3.2. Attitude

A significantly higher attitude score was found in females compared to males (9.99 vs 9.44) and in pharmacists having patients from poor demographic area (Table 3). In addition, higher attitude was significantly but weakly associated with higher practice ($r = 0.234$).

3.3.3. Practice

A significantly higher mean practice score was found in males compared to females (16.34 vs 15.44), in South Lebanon (16.69) compared to all other districts, in pharmacists with a PhD degree (16.25) compared with all other degree holders, in pharmacists working more than 40 hours a week (16.18) compared to other categories, and in pharmacy employers compared to employees (16.16 vs 15.22) (Table 3). In addition, higher age was significantly but weakly associated with higher practice score ($r = 0.081$; $p = 0.035$).

Finally, higher knowledge was associated with better attitude ($r = 0.294$; $p < 0.001$) and better practice ($r = 0.26$; $p < 0.001$), whereas better attitude was associated with better practice ($r = 0.234$; $p < 0.001$).

3.4. Multivariable Analysis

The results of a first linear regression, taking the knowledge score as the dependent variable, showed that higher attitude ($\beta = 0.56$), higher practice ($\beta = 0.41$), and working in Bekaa compared to Beirut ($\beta = 2.25$) were significantly associated with a higher knowledge score. However, working in South Lebanon

($\beta = -2.05$) and North Lebanon ($\beta = -4.42$) compared to Beirut were significantly associated with decreased knowledge score (Table 4, Model 1).

A second linear regression, taking the attitude score as the dependent variable, showed higher knowledge ($\beta = 0.10$) and practice ($\beta = 0.16$) scores, as well as female gender ($\beta = 0.60$) were significantly associated with higher attitude scores (Table 4, Model 2).

A third linear regression, taking the practice score as the dependent variable, showed that higher knowledge ($\beta = 0.13$), higher attitude score ($\beta = 0.19$), and working in South Lebanon compared to Beirut ($\beta = 0.99$) were significantly associated with a higher practice score, while female gender ($\beta = -0.94$) was significantly associated with lower practice scores (Table 4, Model 3).

4. DISCUSSION

Previous studies have recognized the pharmacists' responsibility and role in education, counseling, prevention, and management of COPD [13,16–18]. Interventions led by community pharmacists have been found to be beneficial on treatment outcomes in COPD patients according to international studies [37,38]. While a recent study by van der Molen et al. [39] acknowledged that key providers of support for patients with COPD are community pharmacists, this study is the first evaluating KAP of Lebanese community pharmacists toward COPD patients. In addition, to our knowledge, there is only one other study conducted worldwide addressing the same topic [40].

4.1. KAP Regarding COPD

Community pharmacists' involvement has been found to have a positive impact on patients internationally [41–43]. In fact, a lower number of prescriptions for exacerbations (oral high

Table 4 | Multivariable analysis

Variables	Unstandardized β	Standardized β	p -value	Confidence interval	
Model 1: Linear regression taking the knowledge score as the dependent variable					
Attitude score	0.565	0.254	<0.001	0.411	0.719
Perception score	0.414	0.219	<0.001	0.282	0.547
Bekaa compared to Beirut	2.259	0.124	<0.001	1.008	3.510
South Lebanon compared to Beirut	-2.052	-0.136	<0.001	-3.095	-1.009
North Lebanon compared to Beirut	-4.425	-0.126	<0.001	-6.810	-2.040
Rich demographic area compared to poor	-2.321	-0.092	0.008	-4.028	-0.613
Model 2: Linear regression taking the attitude score as the dependent variable					
Knowledge score	0.105	0.232	<0.001	0.072	0.137
Perception score	0.160	0.187	<0.001	0.097	0.223
Gender (females vs males)	0.604	0.116	0.001	0.234	0.975
Model 3: Linear regression taking the perception score as the dependent variable					
Knowledge score	0.134	0.256	<0.001	0.096	0.172
Working >40 hours weekly compared to 1–16 hours	0.679	0.106	0.006	0.191	1.167
Attitude score	0.195	0.166	<0.001	0.110	0.280
Gender (females vs males)	-0.941	-0.154	<0.001	-1.372	-0.510
South Lebanon compared to Beirut	0.998	0.125	<0.001	0.444	1.551
Working 17–31 hours weekly compared with 1–16 hours	-1.137	-0.097	0.011	-2.010	-0.264

dosage corticosteroids or antibiotics use, use of contraindicated medication, and lower use of powder inhalers in elderly patients) was observed among pharmacists who provided comprehensive pharmacy care compared to those who did not [41]. Moreover, better adherence to treatment and a clinically relevant improvement [42] as well as a reduction in the number of physician's visits [43] were seen in patients who received pharmacists' interventions compared to those who did not. Also, the Finnish 10-year COPD program had significant positive consequences: no further increases in COPD prevalence, reductions in smoking prevalence, and in COPD-related hospitalizations [44]. Further studies should assess the effect of those interventions on mortality and morbidity.

However, and in order to achieve a successful involvement, seeking the valuable, trustful scientific knowledge is a priority. It is therefore important that pharmacists know where and how to find the current care guidelines and how to have a counseling practice based on evidence [45,46]. The results from this study show that over half (52.3%) of the community pharmacists self-assessed to have good knowledge of COPD key issues and up-to-date care guidelines. Our results are similar to another Finnish study who agreed that community pharmacists were familiar with the COPD guidelines [40]. Other reported studies in Europe identified that the level of knowledge is suboptimal. Therefore, continuing education must be implemented to help pharmacists cope with the new guidelines and above all know how to transfer this knowledge into evidence-based counseling [47,48].

Moreover, results revealed that 48.9% of pharmacists have a positive attitude and perceive that they can be instrumental providers of medication-related counseling and of support for COPD patients' treatment; our results are lower than those obtained in a Finnish study where most community pharmacists considered COPD patients counseling to be meaningful and that they play an important role in COPD patients' treatment [40]. This is expected given the developing status of Lebanon versus that of Finland, a well-developed country.

The survey revealed that counseling offered by Lebanese community pharmacists regarding COPD involves medicinal product and lifestyle recommendation. Our findings showed that most pharmacists, while counseling COPD patients, not only focus on advice related to use of medicines (correct use of inhalers, counseling on steroid-containing products, safety, etc.) but also recognize the importance of their role regarding nutrition, physical activity, and smoking cessation, which can be as much as important than other factors as stated by the international guidelines [49,50].

Our results are different than those previously reported in developed countries such as Finland, Belgium, and the Netherlands because we have shown herein that Lebanese pharmacists play a more proactive role regarding the subjects discussed with their patients and their input in lifestyle changes: smoking cessation, physical exercise, and so on. In all other countries, authors declared that pharmacists discuss mainly topics related to the product itself, including but not limited to the dose of the drug, inhalation technique, and its side effects with COPD patients, whereas counseling about smoking cessation and physical activity is usually less tackled [51,52]. Same findings were seen in other therapeutic area, where health-care professionals focus more on medication counseling rather than patients' lifestyle changes [53], while the modern role and responsibility of pharmacists in chronic diseases need to focus more on the area of wellness and not only on drugs [54]. This could be related to a cultural specificity of the Lebanese context, where

the pharmacist plays the role of a primary health-care agent, and the patient relies on the pharmacist for counseling about all health issues, and not only those that are medication related, for economic and practical reasons [55].

4.2. KAP Relationship Regarding COPD

Our findings showed a positive and significant relationship between the three components (KAP), meaning that the increase of one component leads to the increase of the other two. It is thus important to find out the attitude influencers to improve practice of pharmacists. There are no other studies discussing this association with COPD; however, similar findings were also seen in other areas [56,57].

Regarding gender differences in this study, gender was a significant predictor of attitude, where females scored better and being a male was associated with better practice. Although this finding contradicts with the study conducted in Finland where no significant difference was found, it is in accordance with previous studies conducted on KAP of patients toward diabetes where a positive correlation was found between female participants and attitude score [57,58]. However, these results might not be clinically significant in daily practice; continuing education sessions should target all pharmacists to increase their knowledge, thus, improving their attitude and practice toward COPD or any other chronic disease.

4.3. Practice Implications and Future Studies

Since almost half of the respondents showed to have a poor knowledge, there is a need for an increase in awareness among pharmacists about COPD (particularly clinically related guidelines) and better counseling that should be more patient oriented. This is supported by several studies where it was shown that pharmacists as well as other health-care providers who were aware of the current care guideline or participated in learning activities used the information more extensively for the benefit of the patients [45,47,59]. In addition, a systematic review showed that community pharmacists can successfully screen patients at risk of COPD and have a positive impact on those patients [60]. It also showed that community pharmacists can play a major role in smoking cessation and the COPD management in at-risk patients [60].

Consequently, for the pharmacists to continue fulfilling his role as a health promoter, continuing education remains needed to optimize his competency and skills for optimal counseling of COPD patients. The education should include aspects concerning the treatment and lifestyle changes. In order to develop the best pharmacy education program and needs, further quantitative and qualitative studies from both pharmacists and patients' perspectives should be completed. In fact, exploring patients' opinions about the information they need has to be taken into account. This would help community pharmacists develop better self-management strategies of COPD patients. Also, the finding concerning gender differences with respect to females showing a better attitude and males a higher practice toward COPD should be further studied in order to assess whether it is a real occurrence.

Chronic obstructive pulmonary disease is one of many chronic diseases that require a long-term health plan. The need for frequent and continuous monitoring in such disease management gave rise to early developments in telehealth and telemonitoring. These innovations are enhanced regularly by high-tech improvements, with their main goal to improve the management of these chronic diseases and prevent disability and death. The mHealth—health-care and public health practice supported by mobile devices, is one of these advancements that can improve service delivery and impact patient outcomes [61]. The strong bond people have nowadays with their mobile phones and their tendency to carry them everywhere may give health-care professionals the opportunity for continuous connection with their patients and a continuous monitoring of their symptoms. This method should be tested among Lebanese patients to check for its impact on service delivery to patient outcomes.

4.4. Limitations and Strengths

The survey was filled by community pharmacists in the five districts of Lebanon; however, the percentages are low compared to the total number of pharmacists in each district as registered in the OPL; therefore, our results are not representative of the whole country. However, it is possible that respondents were unlikely to be representative of all Lebanese pharmacists. An information bias is also possible because the pharmacist could have not understood and over- or underestimated a certain question. In addition, a confounding bias is also possible. Although the questionnaire was not changed after being piloted, this does not preclude it being a humble instrument. The method of distribution/collection, working of questions, and options all might contribute to a very high expectation of positive findings. However, we have no reason to believe that other conducted studies could have drastically different outcomes.

5. CONCLUSION

In this study, over half of the Lebanese community pharmacists self-assessed as being knowledgeable of key components and treatment of COPD. Half of the participants showed a positive outlook toward COPD and credited counseling. The three KAP components demonstrated a positive relationship. Therefore, it is important to acknowledge the importance of assessing the capabilities of pharmacists of achieving their support role in COPD patients. Also, continuing education is still needed to optimize community pharmacist's knowledge about COPD in order to reach better patient outcomes in COPD management and treatment.

CONFLICTS OF INTEREST

The authors declare they have no conflicts of interest.

AUTHORS' CONTRIBUTION

SH and PS conceived and designed the survey and were involved in the statistical analysis and data interpretation. SH wrote the manuscript. RZ, SS and AH contributed to the writing as well.

MA, CY and NK were involved in the data collection and entry. SH, AH, RH, HS, KI and PS prepared the questionnaire. HS edited the paper for English language. All authors read the manuscript, critically revised it for intellectual content, and approved the final version.

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ETHICAL ASPECT

The ethics committee of the Lebanese University estimated that there is no need for ethical approval as the study was observational and respected participants' confidentiality.

REFERENCES

- [1] Vogelmeier CF, Criner GJ, Martinez FJ, Anzueto A, Barnes PJ, Bourbeau J, et al. Global strategy for the diagnosis, management, and prevention of chronic obstructive lung disease 2017 report. GOLD executive summary. *Am J Respir Crit Care Med* 2017;195:557–82.
- [2] Vestbo J, Hurd SS, Agustí AG, Jones PW, Vogelmeier C, Anzueto A, et al. Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease: GOLD executive summary. *Am J Respir Crit Care Med* 2013;187:347–65.
- [3] Rabe KF, Hurd S, Anzueto A, Barnes PJ, Buist SA, Calverley P, et al. Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease: GOLD executive summary. *Am J Respir Crit Care Med* 2007;176:532–55.
- [4] Cooper CB. Airflow obstruction and exercise. *Respir Med* 2009;103:325–34.
- [5] Price D, Freeman D, Cleland J, Kaplan A, Cerasoli F. Earlier diagnosis and earlier treatment of COPD in primary care. *Prim Care Respir J* 2011;20:15–22.
- [6] Miravittles M, Murio C, Guerrero T, Gisbert R; DAFNE Study Group. Decisiones sobre Antibioticoterapia y Farmacoeconomía en la EPOC. Pharmacoeconomic evaluation of acute exacerbations of chronic bronchitis and COPD. *Chest* 2002;121:1449–55.
- [7] Vos T, Allen C, Arora M, Barber RM, Bhutta ZA, Brown A, et al. Global, regional, and national incidence, prevalence, and years lived with disability for 310 diseases and injuries, 1990–2015: a systematic analysis for the Global Burden of Disease Study 2015. *Lancet* 2016;388:1545–602.
- [8] Adeloje D, Chua S, Lee C, Basquill C, Papan A, Theodoratou E, et al. Global and regional estimates of COPD prevalence: systematic review and meta-analysis. *J Glob Health* 2015;5:020415.
- [9] Thakrar R, Alaparathi GK, Krishna Kumar SK, Vaishali K, Zulfequer CP, Aanad R. Awareness in patients with COPD about the disease and pulmonary rehabilitation: a survey. *Lung India* 2014;31:134–8.
- [10] van Boven JFM, Chavannes NH, van der Molen T, Rutten-van Mölken MPMH, Postma MJ, Vegter S. Clinical and economic impact of non-adherence in COPD: a systematic review. *Respir Med* 2014;108:103–13.

- [11] Vestbo J, Anderson JA, Calverley PMA, Celli B, Ferguson GT, Jenkins C, et al. Adherence to inhaled therapy, mortality and hospital admission in COPD. *Thorax* 2009;64:939–43.
- [12] Charles MS, Blanchette CM, Silver H, Lavallee D, Dalal AA, Mapel D. Adherence to controller therapy for chronic obstructive pulmonary disease: a review. *Curr Med Res Opin* 2010;26:2421–9.
- [13] Effing T, Monnikhof EM, van der Valk PD, van der Palen J, van Herwaarden CL, Partidge MR, et al. Self-management education for patients with chronic obstructive pulmonary disease. *Cochrane Database Syst Rev* 2007;CD002990.
- [14] Waked M, Khayat G, Salameh P. Chronic obstructive pulmonary disease prevalence in Lebanon: a cross-sectional descriptive study. *Clin Epidemiol* 2011;3:315–23.
- [15] Idrees M, Koniski ML, Taright S, Shahrour N, Polatli M, Ben Kheder A, et al. Management of chronic obstructive pulmonary disease in the Middle East and North Africa: results of the BREATHE study. *Respir Med* 2012;106:S33–S44.
- [16] Suhaj A, Manu MK, Unnikrishnan MK, Vijayanarayana K, Mallikarjuna Rao C. Effectiveness of clinical pharmacist intervention on health-related quality of life in chronic obstructive pulmonary disorder patients - a randomized controlled study. *J Clin Pharm Ther* 2016;41:78–83.
- [17] Davis E, Marra C, Gamble JM, Farrell J, Lockyer J, FitzGerald JM, et al. Effectiveness of a pharmacist-driven intervention in COPD (EPIC): study protocol for a randomized controlled trial. *Trials* 2016;17:502.
- [18] Jarab AS, Alqudah SG, Khmour M, Shamssain M, Mukattash TL. Impact of pharmaceutical care on health outcomes in patients with COPD. *Int J Clin Pharm* 2012;34:53–62.
- [19] Harris IM, Phillips B, Boyce E, Griesbach S, Hope C, Sanoski C, et al. Clinical pharmacy should adopt a consistent process of direct patient care. *Pharmacotherapy* 2014;34:e133–e48.
- [20] Hume AL, Kirwin J, Bieber HL, Couchenour RL, Hall DL, Kennedy AK, et al. Improving care transitions: current practice and future opportunities for pharmacists. *Pharmacotherapy* 2012;32:e326–e37.
- [21] Hallit S, Zeenny RM, Sili G, Salameh P. Situation analysis of community pharmacy owners in Lebanon. *Pharm Pract (Granada)* 2017;15:853.
- [22] Hajj A, Hallit S, Azzo C, Abdou F, Akel M, Sacre H, et al. Assessment of knowledge, attitude and practice among community pharmacists towards dental care: A national cross sectional survey. *Saudi Pharm J* 2019;27:475–83.
- [23] Hallit S, Hajj A, Shuhaiber P, Iskandar K, Ramia E, Sacre H, et al. Medication safety knowledge, attitude, and practice among hospital pharmacists in Lebanon. *J Eval Clin Pract* 2019;25:323–39.
- [24] El-Haddam A, Hallit S, Raad EB. Can diabetes self-management program improve patients' knowledge? A real life evaluation study of lebanese diabetic adults. *J Pharm Pract Community Med* 2018;4:137–43.
- [25] Zahreddine L, Hallit S, Shakaroun S, Al-Hajje A, Awada S, Lahoud N. Knowledge of pharmacists and parents towards antibiotic use in pediatrics: a cross-sectional study in Lebanon. *Pharm Pract* 2018;16:1194.
- [26] Karaoui LR, Deeb ME, Nasser L, Hallit S. Knowledge and practice of patients with diabetes mellitus in Lebanon: a cross-sectional study. *BMC Public Health* 2018;18:525.
- [27] Hajj A, Hallit S, Ramia E, Salameh P. Medication safety knowledge, attitudes and practices among community pharmacists in Lebanon. *Curr Med Res Opin* 2018;34:149–56.
- [28] Ramia E, Zeenny RM, Hallit S, Salameh P. Assessment of patients' knowledge and practices regarding their medication use and risks in Lebanon. *Int J Clin Pharm* 2017;39:1084–94.
- [29] Sacre H, Obeid S, Choueiry G, Hobeika E, Farah R, Hajj A, et al. Factors associated with quality of life among community pharmacists in Lebanon: results of a cross-sectional study. *Pharm Pract* 2019;17:1613.
- [30] Sacre H, Tawil S, Hallit S, Sili G, Salameh P. Mandatory continuing education for pharmacists in a developing country: assessment of a three-year cycle. *Pharm Pract* 2019;17:1545.
- [31] Sacre H, Tawil S, Hallit S, Hajj A, Sili G, Salameh P. Attitudes of Lebanese pharmacists towards online and live continuing education sessions. *Pharm Pract* 2019;17:1438.
- [32] Hallit S, Zahreddine L, Saleh N, Shakaroun S, Lahoud N. Practice of parents and pharmacists regarding antibiotics use in pediatrics: a 2017 cross-sectional study in Lebanese community pharmacies. *J Eval Clin Pract* 2019.
- [33] Zeidan RK, Hallit S, Zeenny RM, Salameh P. Lebanese community-based pharmacists' interest, practice, knowledge, and barriers towards pharmacy practice research: a cross-sectional study. *Saudi Pharm J* 2019;27:550–557.
- [34] Iskandar K, Raad EB, Hallit S, Chamoun N, Usta U, Akiki Y, et al. Assessing continuing education practices and preferences amongst Lebanese hospital pharmacists. *Pharm Pract* 2018;16:1159.
- [35] Saade S, Ghazala F, Farhat A, Hallit S. Attitudes towards continuous professional development: a study of pharmacists in Lebanon. *Pharm Pract* 2018;16:1103.
- [36] Miller Jr, RG. Simultaneous statistical inference. New York, USA: McGraw-Hill; 1966.
- [37] National Institute for Health and Welfare, Chronic Diseases, general information; 2014. Available from: <https://thl.fi/en/web/chronic-diseases/general-information-about-chronic-diseases-affecting-public-health>.
- [38] Kankaanranta H, Harju T, Kilpeläinen M, Mazur W, Lehto JT, Katajisto M, et al. Diagnosis and pharmacotherapy of stable chronic obstructive pulmonary disease: the finnish guidelines. *Basic Clin Pharmacol Toxicol* 2015;116:291–307.
- [39] van der Molen T, van Boven JFM, Maguire T, Goyal P, Altman P. Optimizing identification and management of COPD patients - reviewing the role of the community pharmacist. *Br J Clin Pharmacol* 2017;83:192–201.
- [40] Heikkilä JM, Parkkamäki S, Salimäki J, Westermarck S, Pohjanoksa-Mäntylä M. Community pharmacists' knowledge of COPD, and practices and perceptions of medication counseling of COPD patients. *Int J Chron Obstruct Pulmon Dis* 2018;13:2065–74.
- [41] Ottenbros S, Teichert M, de Groot R, Griens F, Sodihardjo F, Wensing M, et al. Pharmacist-led intervention study to improve drug therapy in asthma and COPD patients. *Int J Clin Pharm* 2014;36:336–44.
- [42] van Boven JFM, Stuurman-Bieze AGG, Hiddink EG, Postma MJ. Effects of targeting disease and medication management interventions towards patients with COPD. *Curr Med Res Opin* 2016;32:229–39.
- [43] Wright D, Twigg M, Barton G, Thornley T, Kerr C. An evaluation of a multi-site community pharmacy-based chronic obstructive pulmonary disease support service. *Int J Pharm Pract* 2015;23:36–43.
- [44] Kinnula VL, Vasankari T, Kontula E, Sovijarvi A, Saynajakangas O, Pietinalho A. The 10-year COPD Programme in Finland: effects on quality of diagnosis, smoking, prevalence, hospital admissions and mortality. *Prim Care Respir J* 2011;20:178–83.

- [45] Moreo K, Greene L, Sapir T. Improving interprofessional and coproductive outcomes of care for patients with chronic obstructive pulmonary disease. *BMJ Qual Improv Rep* 2016;5.
- [46] Vainio KK, Korhonen MJH, Enlund KH, Hirvonen AM. The perceived role and skills of pharmacists in asthma management after in-house training. *Pharm World Sci* 2001;23;6–12.
- [47] Kurko T, Linden K, Pietilä K, Sandström P, Airaksinen M. Community pharmacists' involvement in smoking cessation: familiarity and implementation of the National smoking cessation guideline in Finland. *BMC Public Health* 2010;10;444.
- [48] Verma A, Harrison A, Torun P, Vestbo J, Edwards R, Thornton J. Are pharmacists reducing COPD'S impact through smoking cessation and assessing inhaled steroid use? *Respir Med* 2012;106;230–4.
- [49] Global Initiative for Chronic Obstructive Lung Disease (GOLD). From the global strategy for the diagnosis, management and prevention of COPD; 2016. Available from: <http://goldcopd.org/>.
- [50] Miravittles M, Vogelmeier C, Roche N, Halpin D, Cardoso J, Chuchalin AG, et al. A review of national guidelines for management of COPD in Europe. *Eur Respir J* 2016;47;625–37.
- [51] Tommelein E, Tollenaere K, Mehuys E, Boussery K. Pharmaceutical care for patients with COPD in Belgium and views on protocol implementation. *Int J Clin Pharm* 2014;36;697–701.
- [52] Driesenaar JA, De Smet PAGM, van Hulten R, Hu L, van Dulmen S. Communication during counseling sessions about inhaled corticosteroids at the community pharmacy. *Patient Prefer Adherence* 2016;10;2239–54.
- [53] Chong WW, Aslani P, Chen TF. Pharmacist–patient communication on use of antidepressants: a simulated patient study in community pharmacy. *Res Social Adm Pharm* 2014;10;419–37.
- [54] Smith RE, Olin BR. Wellness: pharmacy education's role and responsibility. *Am J Pharm Educ* 2010;74;69.
- [55] Iskandar K, Hallit S, Raad EB, Droubi F, Layoun N, Salameh P. Community pharmacy in Lebanon: a societal perspective. *Pharm Pract (Granada)* 2017;15;893.
- [56] Mehralian G, Yousefi N, Hashemian F, Maleksabet H. Knowledge, attitude and practice of pharmacists regarding dietary supplements: a community pharmacy- based survey in Tehran. *Iran J Pharm Res* 2014;13;1457–65.
- [57] Fatema K, Hossain S, Natasha K, Chowdhury HA, Akter J, Khan T, et al. Knowledge attitude and practice regarding diabetes mellitus among Nondiabetic and diabetic study participants in Bangladesh. *BMC Public Health* 2017;17;364.
- [58] Rahaman KS, Majdzadeh R, Naieni KH, Raza O. Knowledge, attitude and practices (KAP) regarding chronic complications of diabetes among patients with type 2 diabetes in Dhaka. *Int J Endocrinol Metab* 2017;15;e12555.
- [59] Bell HT, Granas AG, Enmarker I, Omli R, Steinsbekk A. Nurses' and pharmacists' learning experiences from participating in interprofessional medication reviews for elderly in primary health care - a qualitative study. *BMC Fam Pract* 2017;18;30.
- [60] Fathima M, Naik-Panvelkar P, Saini B, Armour CL. The role of community pharmacists in screening and subsequent management of chronic respiratory diseases: a systematic review. *Pharm Pract (Granada)* 2013;11;228–45.
- [61] World Health Organization. mHealth: New horizons for health through mobile technologies: Second Global Survey on eHealth (Global Observatory for eHealth). Geneva: World Health Organization; 2011. Available from: http://www.who.int/goe/publications/goe_mhealth_web.pdf (Accessed on March 1, 2019).