Acta Poloniae Pharmaceutica – Drug Research, Vol. 79 No. 5 pp. 725-734, 2022
DOI: 10.32383/appdr/155353
Received 24 April 2022, Received in revised form 29 June 2022, Accepted 12 October 2022

ISSN 2353-5288
Polish Pharmaceutical Society

GENERAL

COMMUNITY PHARMACIST-DRIVEN INTERVENTIONS IN COPD: IMPROVING KNOWLEDGE, ATTITUDE AND HEALTH STATUS

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Abstract: COPD is a chronic condition requiring care from a multidisciplinary team in which pharmacists play an important role. We aimed to evaluate the impact of structured pharmacist-patient counseling on patients' knowledge, and attitudes about medicines and the impact of COPD on patients' health status. A prospective study was conducted in ten community pharmacies. Patients were counseled using a detailed approach after completing validated questionnaires. The patients returned to a pharmacy for a follow-up after three months. Four validated questionnaires have been used to assess different aspects of patient's knowledge about the disease, their attitudes about medicines, and the impact of the disease on patients' health status: COPD Assessment Test (CAT), Modified Medical Research Council Dyspnea Scale (mMRC), Bristol COPD Knowledge Questionnaire (BCKQ), and The Beliefs about Medicines Questionnaire (BMQ). Pharmacists recruited 83 COPD patients, from which 73 patients attended a follow-up visit. Before pharmacist intervention, the CAT median score was 20. After counseling, the CAT score decreased to 18 ($p < 0.05$). The highest improvement in patient knowledge was observed for inhaled bronchodilators (28.2%), vaccination (25.8%), oral steroids (24.4%), and smoking (24.2%). The median score for necessity increased, whereas the harm and concern median scores considerably decreased ($p < 0.05$) after counseling. The results showed significant improvements in all aspects covered throughout pharmacist-patient counseling. Based on our results, the proactive role of the pharmacist in the care of COPD patients may be beneficial to patients, physicians, and healthcare by improving care, and alleviating the strain on overloaded doctors by containing the costs.

Keywords: COPD, pharmacist, counseling, self-care, patient outcome, health status

Chronic obstructive pulmonary disease (COPD) is a common respiratory condition described by an abnormal chronic inflammatory response in the airways and lungs attributable to noxious particles or gasses. COPD is considered to be a preventable and treatable disease. Co-morbidities and exacerbations add to the severity of its manifestation (From the *Global Strategy for the Diagnosis, Management and Prevention of COPD*, Global Initiative for Chronic Obstructive Lung Disease, GOLD, 2019) (1). Risk factors that may influence COPD development are inhalation of tobacco smoke, chemicals, and occupational dust, and smoke inhalation from heating fuels. Other factors, such as low birth weight and respiratory infection which affect lung growth, can possibly raise an individual's risk of developing COPD (1).

The burden of COPD continues to be high and is a common cause of mortality and morbidity worldwide (2, 3). COPD is recognized as the second most frequent non-infectious disease in the world, causing 2.7 million deaths annually. Global mortality is anticipated to have a two-fold increase by 2030 (4). The global prevalence of COPD ranges from 8.4% to 15% and is led by macro-demographic changes. When WHO regions were observed, the highest prevalence is reported in the Americas (15.2% in 2010), and the lowest was in South East Asia (9.7% in 2010). The increase in COPD between 1990 and 2010 was the lowest in the European region (22.5%), while the highest increase was detected in the Eastern Mediterranean region (118.7%) (2). This might be explained by the prevalence of the use of tobacco in these settings. A common consensus among experts is that COPD is often underdiagnosed and self-reported. Thus, exact prevalence rates are noticeably higher, even in high-income countries (5). Moreover, a report from the European Union

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(EU) indicated that expenses from COPD were approximately 4.7 billion euros annually for outpatient care (6-9).

Several trials have been conducted assessing the benefits of educational interventions carried out by pharmacists for the general COPD population. Pharmacists play an important role in managing the overall treatment and prevention of the progression of this disease through patient education (10-12). A patient's decision to adhere to a proposed treatment is likely to be affected by his/her beliefs about medicines, as well as beliefs about the illness that the medication is intended to treat or prevent (13). Moreover, it was shown that patients' knowledge and perceptions about the disease and treatment were associated with higher health-related quality of life (14). COPD as a chronic condition requires multidisciplinary team care and active patient involvement. Community pharmacists are well positioned to contribute technical knowledge to the doctor-based education of inhalation techniques, known to be poor in 50-80% of patients (15, 16). Furthermore, a "White paper" issued by American Pharmacists Association Foundation has clearly identified that easy access to pharmacies combined with sufficient clinical knowledge puts pharmacists in a position to effectively support patients with COPD (17). Reinforcement and adoption of the COPD self-care models were proposed as strategies to increase adherence to GOLD guidelines in clinical practice (18).

Although current evidence supports the idea that pharmacists may improve the care of patients with COPD, based on our knowledge, these implications have never been examined in our healthcare system. Thus, the aim of our study was to conduct such an analysis and carry out a study to assess patients' knowledge about the disease, attitudes about medicines, the impact of COPD on patients' health status, and provide structured counseling by community pharmacists.

MATERIAL AND METHODS

A prospective study was conducted in ten different community pharmacies. They were located in eight towns and cities, representing various geographic areas, like central, northern, western, eastern, north-western, and north-eastern regions, in order to reduce the bias in patients' sociodemographic and cultural characteristics, as well as their income. The prospective intervention study was conducted in a six-month period (May–October 2019).

Community pharmacists were invited to take part in the study by an online call posted on the websites of the relevant institutions in the field of pharmacy. All pharmacists who agreed to gather data attended a compulsory one-day educational course with the aim of improving their knowledge of managing patients with COPD. The pharmacists' main training objectives included education on (1) disease, (2) therapy, (3) structured patient education, (4) adherence, (5) inhalation technique, and (6) COPD action plan (19). Assessment of the pharmacists' therapeutic knowledge was carried out in a test form by the pharmacist educators, before and after the training. Pharmacists' skills in inhaler use were practically assessed.

Inclusion criteria consisted of patients with a physician-confirmed COPD diagnosis. Patients with prescribed COPD medications (present physician's diagnosis of asthma, ICD-10 code J44) were eligible to enter the study.

At baseline, patients were interviewed by a pharmacist, using several validated questionnaires (described below). The second step conceded individual pharmacist-patient counseling. Community pharmacists' intervention included structured education about the illness, how to act in case of acute exacerbation, COPD risk factors, and triggers, expectations with regards to treatment outcomes, medication counseling, inhalation technique instruction, non-pharmacological approach, breathing exercises, airway clearance techniques, relaxation techniques, nutritional management, vaccination recommendation, adherence and motivational support in smoking cessation. Additionally, a COPD action plan was provided to every patient. The patient returned to the same pharmacy for a three-month follow-up. The pharmacists once again completed all questionnaires through patient interviews. Patients' responses were validated against pharmacists' documentation from the first visit.

Ethical approval was obtained from the Ethics Committee of the Serbian Society of Community Pharmacists (No 18/2).

Questionnaires

Four validated questionnaires were used to assess different aspects of patient knowledge about the disease, their attitudes about COPD medicines, and the impact of COPD on patients' health status as follows:

COPD Assessment Test (CAT) is an eight-item questionnaire proposed to quantify the impact of the disease on a patient's health status and provide insight into the effectiveness of treatments in the prevention or management of COPD exacerbations. It employs a score of 0-40 to indicate the impact of the

disease, in which a high CAT score indicates a high impact and vice versa. A CAT score of 5 implies no significant impact on the patient's health status, ≤ 10 is low impact, 11-20 is medium, > 20 is high, and > 30 is a very high impact of COPD on the patient's health status (20).

The Modified Medical Research Council Dyspnea Scale (mMRC) employs a simple grading system from 0 to 4 to assess a patient's level of dyspnea. This scale describes the degree of disability that breathlessness asserts on regular daily activities using five simple statements. Upon measuring dyspnea, it has been used to evaluate the effect of treatment and to compare treatments among patients (21, 22).

The Bristol COPD Knowledge Questionnaire (BCKQ) is a multiple-choice questionnaire comprised of 13 topics. Each of the topics contains five statements for which there are clear correct answers with responses structured as "True", "False", and "Do Not Know". This tool has been used to characterize COPD-related knowledge for patients. It allows the effectiveness of education to be assessed and compared after educational interventions (23).

The Beliefs about Medicines Questionnaire (BMQ) general and specific, has been used to assess patients' beliefs about medicines (24). BMQ consists of a set of 18 questions, the first half related to harm and overuse of the treatment in general, and the last half concerning perceived treatment benefits, and specific treatment concerns. Answers to all 18 questions were marked on a 5-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = uncertain, 4 = agree, 5 = strongly agree) and a total score per BMQ scale was calculated. A higher score indicated patients' perception that medications are generally overused, overprescribed, or harmful, while the higher necessity score implies patients' view of benefit from the medications (24).

Statistical analysis

Statistical analyses were performed using SPSS version 25 (SPSS Inc., Chicago, IL, USA). A Chi-square test for independence (or Fishers's Exact test, where appropriate), Mann-Whitney test, or t-test were applied to assess the differences in investigated proportions or quantitative variables. The results of the descriptive analysis were given as mean ± standard deviation (SD) for metric continuous variables, median with interquartile range [IQR] for ordinal variables, and frequency (n,%) for categorical variables. McNemar's test and Wilcoxon Signed Ranks test were used to compare patients' test scores and attributable categories (CAT, mMRC, knowledge, beliefs) before and after the counseling. A p-value < 0.05 was considered statistically significant (two-sided test) in all cases.

RESULTS

In the first phase of the study, community pharmacists recruited 83 COPD patients, out of which 73 (89%) patients attended a follow-up visit three months later. Patients who didn't attend a scheduled follow-up visit (non-responders) were younger 54.4 ± 12.8 years, compared to responders 67.4 ± 10 years ($p < 0.05$). No significant differences in gender proportions, smoking status, BMI, presence of co-morbidities, or disease control (number of COPD medications, number of exacerbations, number of hospitalizations due to exacerbations, mMRC score, CAT score) were found between the responder and non-responder groups. However, non-responders tended to express stronger overuse perceptions (overuse score 12 [10-15]) compared to responders (10 [8.75-12], $p < 0.05$).

Patients

Demographic and clinical data of the remaining 73 patients are given in Table 1, according to

Table 1. Characteristics of patients at the first visit.

Patient characteristics mean ± SD; median [IQR]; or n (%)	mMRC score 0-1 (n = 32)	mMRC score ≥ 2 (n = 41)	p-value
Demographic			
Gender, male	22 (68.8)	19 (46.3)	0.056
Age, years	66 ± 9.2	68.2 ± 10.4	0.355
≥ 65 years	19 (59.4)	29 (70.7)	0.310
BMI, kg/m^2	25.6 ± 3.5	26.6 ± 4.3	0.322
underweight [a], BMI ≤ 21 kg/m^2	1 (3.1)	5 (12.2)	0.228
normal [a], 21 < BMI < 25 kg/m^2	15 (46.9)	10 (24.4)	0.098
overweight, 25 ≤ BMI < 30 kg/m^2	11 (34.4)	18 (43.9)	0.513

Table 1. Characteristics of patients at the first visit (cont.).

Patient characteristics mean ± SD; median [IQR]; or n (%)	mMRC score 0-1 (n = 32)	mMRC score ≥ 2 (n = 41)	p-value
obese, BMI ≥ 30 kg/m^2	5 (15.6)	8 (19.5)	0.723
Smoking	12 (37.5)	13 (31.7)	0.605
Unintentional body weight loss in the previous 3-6 months	7 (21.9)	11 (26.8)	0.626
loss, kg	4.1 ± 2.8	5 ± 2.3	0.490
COPD			
Age when COPD diagnosed, years	60 ± 8.7	55.6 ± 10.3	0.058
Duration of inhaler use, years	6.2 ± 5.4	9.4 ± 7	0.036
Long-term oxygen therapy	1 (3.1)	10 (24.4)	0.018
Vaccination, Pneumococcal	2 (6.3)	1 (2.4)	0.578
Vaccination, Influenza	16 (50)	22 (53.7)	0.756
At least one exacerbation in the previous 12 months	19 (59.4)	28 (68.3)	0.430
Hospitalization due to exacerbation in the previous 12 months	4 (12.5)	14 (34.1)	0.033
CAT score	19 [12.25-21]	24 [18-30]	< 0.001
> 30 (very high impact of COPD on patient's health status)	9 (28.1)	27 (65.9)	0.001
Inhalation therapy			
Anticholinergics	18 (56.3)	15 (36.6)	0.094
SABA	7 (21.9)	11 (26.8)	0.626
Inhalation corticosteroids	3 (9.4)	5 (12.2)	0.702
Combinations (anticholinergics + LABA; corticosteroids + LABA)	31 (96.9)	35 (85.4)	0.127
Oral therapy			
Theophylline	6 (18.8)	7 (17.1)	0.853
Aminophylline	2 (6.3)	7 (17.1)	0.283
Mucolytic agents	1 (3.1)	0	-
Antibiotics	4 (12.5)	6 (14.6)	0.792
Corticosteroids	1 (3.1)	3 (7.3)	0.626
Comorbidities, number	1 [1-1.75]	1 [1-2]	0.251
Acute illness [b]	5 (15.6)	17 (41.5)	0.017
Asthma	4 (12.5)	13 (31.7)	0.654
Diabetes	3 (9.4)	7 (17.1)	0.497
Heart failure	1 (3.1)	10 (24.4)	0.018
Hypertension	25 (78.1)	29 (70.7)	0.475
Cotherapy	18 (56.3)	21 (51.2)	0.669
Antihypertensive agents	16 (50)	15 (36.6)	0.250
Oral antidiabetics	2 (6.3)	1 (2.4)	0.578
Statins	3 (9.4)	1 (2.4)	0.313
Spacer	1 (3.1)	6 (14.6)	0.127

SD – standard deviation; IQR – interquartile range; SABA – short-acting beta-agonists; LABA – long-acting beta-agonists;
a – BMI groups defined by Divo M.J., Cabrera C., Casanova C., et al. Comorbidity Distribution, Clinical Expression and Survival in COPD Patients with Different Body Mass Index. Chronic. Obstr. Pulm. Dis. 1, 229 (2014);
b – acute illness described as hospitalization at intensive care unit, stroke, the need for gastrointestinal surgery, or acute illness that lasts longer than five days.

the mMRC score obtained at the baseline visit. According to the GOLD guidelines, the mMRC dyspnea score of ≥ 2 is considered to represent COPD patients who are more symptomatic.

Furthermore, unexplained weight loss in the past 3-6 months was reported in 24.7% of cases (18), with an average loss of 4.7 kg. Acute illness described as hospitalization at the intensive care unit, stroke, the need for gastrointestinal surgery, or acute illness that lasts longer than five days, was reported in almost a third of the studied population (22, 30.1%). Interestingly, only 7 patients (9.6%) confirmed the use of a spacer when administering medication from a metered-dose inhaler.

In the context of previous counseling about inhaler technique as well as healthcare professionals involved in counseling, half of the patients were counseled by both the attending physician and pharmacist (37, 50.7%), whereas an inhalation technique was demonstrated to almost 70% of patients before entering the study (Table 2). Most of the patients received prior counseling once (25, 34.2%) or twice a year (20, 27.4%). Three times in a year 14 (19.2%) patients were counseled, while more than three times 11 (15.1%) patients reported being counseled.

Medications

The majority of patients (66, 90.41%) reported the use of combination therapy (anticholinergics + LABA or corticosteroids + LABA). Tiotropium, an anticholinergic bronchodilator, was used by more than a third of all patients (24, 35.6%). Theophylline was used as a bronchodilator in the treatment of COPD in 13 patients (17.8%), while oral aminophylline in addition to inhaled therapy was used in 12.3% of the observed patient population (n = 9). Antibiotics were prescribed to 10 (13.7%) patients during the study period. Oral corticosteroid treatment has been noted in only 4 patients (5.5%).

In regards to co-therapy, most patients were prescribed antihypertensives (31, 42.5%), followed by statins (4, 5.5%) and oral antidiabetics (3, 4.1%).

Other data

This study noted physician follow-up for the majority of patients (47, 64.4%) in the last three months. When asked about immunization, interesting results were detected after the pharmacist-patient interview. Nearly half of the patients included in the study had not received the influenza vaccine (35, 48%), and the pneumococcal vaccine was not made available to almost all of the patients (70, 95.9%).

Twenty-six patients (35.6%) reported no exacerbation during a one-year period, while 47 patients (64.4%) stated they had experienced at least one exacerbation in the last year. An average occurrence of exacerbation per patient noted was 2 [1-3], with a total range of 1-5. Furthermore, 24.7% of patients (18) confirmed to have suffered an exacerbation that required hospitalization. The pharmacist reported that the average time spent on first counseling was 37 ± 11 minutes per patient (total range 20-60 minutes).

CAT score

Before the pharmacist intervention, the CAT score was a median of 20 [16-27]. After pharmacist-patient counseling, the median value of the CAT score decreased to 18 [14-25] ($p < 0.05$). The number of patients within different CAT categories, showing the impact of COPD on patients' health status is presented in Table 3. The decrease in the CAT category (decreased impact) was observed for 13 patients, whereas the increase in the impact of the disease was observed in six patients using Wilcoxon Signed Ranks rank test ($p = 0.088$).

Table 2. Healthcare professionals involved in counseling COPD patients and techniques applied.

Activity	Health professionals/technique	n (%)
Counseled by	Both physician and pharmacist	37 (50.7)
	Physician only	26 (35.6)
	Pharmacist only	10 (13.7)
Counseling technique	Demonstration of inhaler technique	51 (69.9)
	Verbal instructions	32 (43.8)
	Written instructions	24 (32.9%)
	Practicing under the guidance of an expert	16 (21.9)

mMRC score

The median mMRC score before pharmacist intervention was 2 [1-3], and after the counseling, it decreased to a median of 1 [1-2] ($p < 0.05$). The number of more symptomatic patients (mMRC ≥ 2) decreased from 41 (56.2%) to 34 (46.6%), after the pharmacist intervention ($p = 0.065$). Nine patients reported a lower level of dyspnea, whereas an increase in mMRC score was noted in two patients at the follow-up. There were no statistically significant differences between statements covered with this questionnaire before and after pharmacist counseling, except for statement No.4 (I have to stop to inhale after 100 meters) ($p < 0.01$). The distribution of mMRC scores is presented in Table 3.

Bristol questionnaire

The average score for correct answers in patients before counseling performed by the pharmacist was 40.1%. Results significantly improved as anticipated to 56.6% after patients received counseling ($p < 0.05$). The average increase in the frequency of correct answers was calculated to be 19.2 ± 11%, with a wide range of 1.4-49.3% (Table 4). The highest improvement in patient knowledge was observed for inhaled bronchodilators (28.2%), vaccination (25.8%), oral steroids (24.4%), and smoking (24.2%). Statistically significant improvement in knowledge ($p < 0.05$) was observed for 45 out of 65 items, in total (62.5%), as presented in Table 4.

Beliefs about medicines questionnaire (BMQ)

Patients' beliefs about medicines significantly changed after pharmacist-patient counseling, except for patients' attitudes toward medications being generally overused. The median score for necessity increased, whereas the harm and concern median scores considerably decreased ($p < 0.05$). Table 5 summarizes the results before and after the counseling.

DISCUSSION

To the best of our knowledge, ours is the first study in the country, to investigate the impact of an education intervention conducted by pharmacists in patients diagnosed with COPD. More male patients than females participated in the study, which is not in line with current WHO data, as the disease now affects men and women almost equally (25). This is due mostly to the fact that man tends to smoke at a higher rate than women in our country. According to available national data, 41.2% of the adult population smokes every day or occasionally. The proportion equals 43.6% in males, and 38.8% in female adults (26). Moreover, more smokers were identified among men than women in our study population. Similar to published data in the country, more than a third of COPD patients (34%) reported smoking regularly. This fact requires prompt action. Pharmacists should actively aid COPD patients in quitting smoking through education and

Table 3. The percentage of patients according to the impact of COPD on patient's health status and mMRC dyspnea scale.

		Pharmacist intervention n (%)		
		Before	After	p-value
Impact on patient's health status	CAT score			
Low	0-10	6 (8.2)	10 (13.7)	0.125
Medium	11-20	31 (42.5)	29 (39.7)	0.774
High	21-30	27 (37)	28 (38.4)	-
Very high	31-40	9 (12.3)	6 (8.2)	0.453
mMRC dyspnea scale	mMRC score			
no breathlessness except on strenuous exercise	0	9 (12.3)	11 (15.1)	0.687
shortness of breath when hurrying on the level or walking up a slight hill	1	23 (31.5)	28 (38.4)	0.227
walks slower than people of the same age on the level because of breathlessness or having to stop to catch a breath when walking at their own pace on the level	2	22 (30.1)	21 (28.8)	-
stops for breath after walking ~100 m or after a few minutes on the level	3	16 (21.9)	11 (15.1)	0.267
too breathless to leave the house, or breathless when dressing or undressing	4	3 (4.1)	2 (2.7)	-

Table 4. The frequency of correct answers to the Bristol COPD Knowledge Questionnaire.

Bristol COPD questionnaire		Correct answers before counseling (%)	Increase in correct answers after counseling (%)		
Question	Topic		average	range	number of items (out of 5) with p-value < 0.05
1	Epidemiology	31.8	21.4	9.6-38.4	5
2	Etiology	49.3	10.7	5.5-17.8	3
3	Symptoms	54.2	1.4	1.4-11	3
4	Breathlessness	40.8	8.9	4.1-15.1	3
5	Phlegm	44.4	16.2	1.4-38.4	3
6	Infections	46	15.3	9.6-28.8	4
7	Exercise	41.4	15.4	6.8-28.8	4
8	Smoking	51	24.2	6.8-49.3	3
9	Vaccination	34.8	25.8	15.1-43.8	3
10	Inhaled Bronchodilatators	34.5	28.2	15.1-37	4
11	Antibiotics	40.8	22.4	17.8-27.4	2
12	Oral steroids	30.4	24.4	16.4-28.8	4
13	Inhaled steroids	21.4	21.4	12.3-30.1	4

Table 5. Impact of pharmacist-patient counseling on patients' beliefs about medicines.

	Pharmacist intervention median score [IQR] (total range)		
Beliefs	Before	After	p-value
General			
Harm	14 [11-15.5] (8-25)	11 [10-14.5] (7-24)	0.001
Overuse	10 [8-12] (5-15)	10 [8-12] (5-15)	0.967
Specific			
Necessity	20 [17-22] (10-25)	21 [20-23] (11-25)	< 0.001
Concern	15 [12-18] (7-25)	12 [10-15] (6-25)	< 0.001

IQR – interquartile range

recommending proper treatment, as research has revealed that even brief counseling of 3 minutes leads to quitting rates of up to 10% (1).

GOLD Guidelines highlight the importance of assessing inhalation techniques to improve the efficacy of treatment (1). According to our data, a minority of patients reported using a spacer when administering medication from a metered-dose inhaler. Hardly one-fifth of patients (21.9%) were educated by practicing under the guidance of an expert (a pharmacist or physician). Most data suggest that patients will receive maximal benefit from their medications if properly counseled and instructions repeated on a regular basis. Vanoverschelde et al. have shown that the percentage of patients performing correct steps per type of inhaler ranged widely from 6-100% in Belgian community pharmacies (27). Other studies confirmed poor inhalation technique in COPD patients, with female gender, older age, lack of previous experience, and the lower GOLD group being the most significant predictors of incorrect technique (28). Favorably, several studies have confirmed that community pharmacists can deliver effective training in correct inhaler techniques (29, 30). Besides the initial education, repeated counseling on the proper inhaler technique is essential to achieve treatment efficacy (28). In our study, pharmacists found it took 37 ± 11 minutes on average per patient counseling (total range of 20-60 minutes) which is slightly more than formerly published data of at least 30 minutes (31). This might be explained by an assumption that patients did not receive sufficient counseling previously when receiving care in our healthcare system.

However, it should be kept in mind that this was the first delivery of structured, but extensive counseling provided to the patients and that regular follow-up and repeated counseling would require less time, which would be more suitable and feasible for community pharmacy regular practice. In addition, new interventions such as online platforms and digital tools might have a significant impact on patient outcomes. Interestingly, Schnoor et al. reported that even a relatively simple intervention involving an online platform with educational material, eHealth intervention SARA (Service Apothecary Respiratory Advice) decreased asthma and COPD exacerbation rates in 382 Dutch pharmacies. The platform contains comprehensive information about inhalation, medications, usage, and side effects; inhalation instruction videos; informational videos about asthma and COPD; and a pollen forecast (32).

COPD patients have a higher risk of complications, such as pneumonia and other respiratory diseases, as infection can trigger 50-70% of exacerbation (33). We compared our data to recommendations in the context of vaccination. The influenza vaccine was not received by nearly half of our patients, whereas the pneumococcal vaccine was not given to nearly all patients. The immunization rates in our study are far lower than in the other settings (34, 35). Fathima et al. have reported a flu vaccination rate of 86.5% and a pneumonia vaccination rate of 40.5% before pharmacist counseling (35). Six months after the counseling, the rates of 96% for flu and 81% for pneumococcal vaccination were reported (35). Again our study revealed a necessity for prompt action to manage this issue. The Centre for Disease Control and Prevention recommends all patients with COPD receive an annual flu vaccine and pneumococcal vaccine once before the age of 65 and at least twice more after the age of 65 (36). The recent systematic review (2020) has emphasized the importance of influenza vaccination counseling as one of the five pharmacist's interventions within long-term health management: (1) long-term follow-up and consultation; (2) prevention and treatment of exacerbations; (3) influenza vaccination reminder; (4) self-care management support; and (5) integrated care with other healthcare providers (37).

Validated questionnaires have been used to gather the data on a sample of patients. The CAT score, used to quantify the impact of the disease on a patient's health status, showed yielded interesting results. Prior to the intervention, we noted a median value of 20, indicating the high impact of the COPD on patient's health status. However, after the pharmacist intervened, this value decreased significantly to 18, downgrading the impact of the disease on their health status to a medium impact. This finding suggests a benefit of pharmacist counseling, as literature data consider a change of even 2 units as significant. One may also argue that the effectiveness of treatments in the management of COPD has improved based on CAT score results, after pharmacist involvement. Conversely, mMRC data implying the degree of disability that breathlessness asserts did not show significant improvement before and after pharmacist counseling. This may be explained by the lack of data needed to use this questionnaire in its entirety, as it is suggested to have an objective measure of breathing, such as pulmonary function tests and walk tests, in order to interpret the data in a correct manner. Also, the mMRC scale inclines to be stable over time (38, 39).

BCKQ has been applied to evaluate the effectiveness of education and to compare it after educational interventions (23). Our results were as anticipated, as we have confirmed that the patient's knowledge about COPD, significantly improved after the pharmacist conducted a counseling session. Table 4 reports an increase in knowledge (proportion of correct answers) for 13 different aspects: epidemiology, etiology, symptoms, breathlessness, phlegm, infections, exercise, smoking, vaccination, inhaled bronchodilators, antibiotics, oral steroids, and inhaled steroids. Interestingly, the lowest average increase in correct answers was observed for symptoms in general and breathlessness. More specifically, patients have learned about the relationship between dyspnea and the narrowing of the bronchial tubes. In contrast, only a lower number of patients acquired that shortness of breath can be caused by a large meal, or that rapid weight loss should not be taken as a common symptom in COPD. The results indicate the need for tailored counseling about non-pharmacological measures and nutrition during long-term follow-up. According to the current findings, nutritional support in COPD requires targeted multi-modal interventions, following also the disease-course approach (40, 41). Since dietary factors can affect lung function, disease development and progression, outcomes and health-related quality of life (41, 42), other healthcare professionals such as dietitians should be included in long-term patient management, providing nutritional status assessment and nutritional depletion prevention and treatment in patients with COPD. Altogether, a collaborative care model is advocated to achieve continuity of care and improvement in COPD patient outcomes (37, 43, 44). The involvement of community pharmacists is highly encouraged, as most patients with COPD may have limited contact time with physicians (9).

This is the first study on the use of BMQ in the Serbian population suffering from COPD. The patients understood the benefits of properly using COPD medications, whereas the attitudes toward harmful or adverse effects declined significantly. The results again highlight the importance of pharmacist involvement in the care of COPD patients. The studies have consistently shown a positive association between the patients' knowledge and perception about the disease and treatment and, with good adherence, better therapy outcomes, decreased mortality, and improved patients' health-related quality of life (10, 14, 35, 45-47). Although the pharmacists' interventions of varying complexity were assessed in numerous studies, such as improving early detection and diagnosis, supporting smoking cessation, improving inhaler use and technique, promoting vaccination rates, and supporting/monitoring management plans, the interventions were characterized as practical and feasible (37).

Being an expert with an effective understanding of the disease and knowledge of treatment options needed for its management, the pharmacist could contribute to the detection, assessment, treatment, and management of patients affected by COPD in our healthcare system. To address this growing health issue, the collaborative efforts of the healthcare community where community pharmacists have an active role and can contribute to each of these areas noticeably should be considered.

The main limitation of the study is the lack of a control group. The patients accepted to participate in the study voluntarily, which could cause a selection bias. Including the patients which are more motivated to manage their disease might result in higher outcome estimates. Next, the potential changes in COPD therapy between both study visits were not recorded, which could influence the results of the study. Further, the patients who were lost due to follow-up were younger and tended to express a stronger overuse perception of the medicines. That finding might indicate the necessity of developing and testing the different sets of information that should be delivered to the patients, related to their level of interest or time constraints. Given that the patients were predominantly older, their cognitive skills needed for effective understanding of the questionnaires (health literacy), or vision problems, were not assessed.

CONCLUSION

The results showed significant improvement in all aspects covered throughout pharmacist-patient counseling. The proactive involvement of pharmacists in the care of COPD patients could improve treatment outcomes. Further studies are needed to explore the features and outcomes of continuity of care in patients with COPD.

Funding

This research was funded by the Ministry of Education, Science and Technological Development, the Republic of Serbia through a Grant Agreement with the University of Belgrade-Faculty of Pharmacy No: 451-03-68/2022-14/200161.

Acknowledgments

The authors would like to thank the patients and community pharmacists who participated in the study.

Conflicts of interest

The authors declare no conflict of interest.

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