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Original Article

Factors Predicting Medication Adherence in Patients with Chronic Obstructive Pulmonary Disease: Evidence from a Cross-Sectional Study

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Abstract

Introduction: Medication adherence is crucial for effective management of chronic obstructive pulmonary disease (COPD). However, the medication adherence rates among patients with COPD is generally low due to various influencing factors. This study aimed to identify predictors of medication adherence among Vietnamese patients with COPD.

Methods: A cross-sectional study was conducted at a tertiary hospital in Central Vietnam. A total of 104 patients diagnosed with COPD were conveniently recruited between March and June 2022. Data were collected using three structured questionnaires, including demographic and health-related characteristics form, the Beliefs about Medicines Questionnaire, and the General Medication Adherence Scale (GMAS). Descriptive statistics, independent t-test, Chi-square test, univariate logistic regression analysis, and multivariable logistic regression were used for data analysis.

Results: Up to 41.3% of participants adhered to medication. Medication adherence was higher among younger individuals, those with education levels above high school, those with fewer medications, and those who held a stronger positive belief about the necessity of medication.

Conclusion: The overall medication adherence rate was moderate. It was significantly influenced by age, educational level, number of medications, and beliefs about the necessity of medication. These findings suggest that healthcare providers should prioritize identifying and supporting patients who are at risk of non-adherence. Moreover, intervention programs should aim to enhance patients' awareness of the necessity of medication in managing COPD.

Introduction

According to the World Health Organization, chronic obstructive pulmonary disease (COPD) is the third leading cause of death worldwide, imposing a significant burden on both the economy and society, particularly in low- and middle-income countries.[1] In 2019, approximately 391.9 million cases of COPD were reported globally, comprising 10.3% of the population aged 30 to 79 years.[2] It resulted in 3.2 million deaths annually, accounting for about 5% of total global deaths each year.[1] Currently, there is no cure for COPD; however, its symptoms can be managed through interventions such as oxygen therapy, pulmonary rehabilitation, nutritional support, lifestyle adjustments, self-management, and respiratory medications administered via inhalation and oral routes.[3]

Medication adherence is referred as following prescribed medications for an illness.[4] It is considered a key factor in managing and controlling COPD.[3] Previous studies have demonstrated that patients' medication adherence reduces disease symptoms, enhances lung function, decreases the risk of exacerbation, reduces hospitalization rates, and reduces treatment costs.[5-7] However, adherence to medication among patients with COPD is generally low, with rates of adherence being less than 50%.[8,9] Moreover, it is influenced by numerous factors. Socio-demographic factors include age, gender, educational level, occupation, marital status, living conditions, and monthly income.[8-11] Disease-related factors, such as the number of comorbidities, the number of daily medications, the duration of COPD, and the number of hospital admissions during the year due to exacerbation, also play a role.[9-11] Additionally, beliefs in medicine have

been associated with medication adherence in patients with COPD.[8]

In Vietnam, COPD is also a common disease, affecting 7% to 10% of the population.[7] Regarding medication adherence, recent studies have reported that the adherence rate among outpatients with COPD ranged from 24.3% to 78.8%.[7,12,13] Notably, previous research instruments for measuring medication adherence have inadequately considered financial factors, which are critical in developing countries like Vietnam, where out-of-pocket expenses constitute a substantial portion of health expenditures.[14,15] Recently, the General Medication Adherence Scale (GMAS) originated from a developing country can address the limitations of earlier tools.[14] However, there is a notable absence of studies utilizing GMAS to assess medication adherence in Vietnamese patients with COPD. Furthermore, cultural beliefs have been shown to influence adherence behaviours, suggesting that Vietnamese patients may exhibit different adherence patterns compared to those in other countries due to these cultural differences.[16]

Previous studies highlighted numerous factors influencing medication adherence among patients with COPD. However, research on this issue remains scarce in Vietnam. Consequently, the current study employed the GMAS to measure medication adherence and identify its predictors among Vietnamese patients with COPD.

Materials and Methods

Design and Samples

This cross-sectional study was conducted at Da Nang C hospital, a tertiary hospital in Central Vietnam, from March to June 2022. Inclusion criteria include individuals aged 18 years or older, diagnosed with COPD according to the Global Initiative for Chronic Obstructive Lung Disease (GOLD) 2021 guidelines,[3] undertaking COPD medications for a minimum of six months, and able to communicate in Vietnamese. Those exhibiting cognitive impairment, as determined by the Six Item Cognitive Impairment Test with a score exceeding 7 points, were excluded from the study.[17] Ultimately, a total of 8 patients were excluded based on these criteria.

The sample size was determined using G*Power ver. 3.1.9.4.[18] For the logistic regression analysis, the input was a 2-tailed analysis, with an α error probability of 0.05, a power of 0.80, probability of medication adherence variable was 0.45 and 0.30.[19] Consequently, the calculated sample size was 104 individuals. A total of 104 participants were invited to join the study, and all agreed to participate and complete the questionnaires, resulting in a 100% response rate.

Study Measurements

Data were collected using three structured questionnaires. The first questionnaire was designed to gather information regarding participants' demographic and health-related characteristics. This included age, gender, marital status, educational level, occupation, comorbidities, the duration of COPD, the number of hospital admissions within the past year, and the number of medications prescribed.

The second questionnaire is the Beliefs about Medicines Questionnaire (BMQ), developed by Rob Horne and colleagues in 1999, which measured participants' beliefs regarding their medications. This scale comprises 10 items divided into two subscales: BMQ-specific necessity (5 items) which measures beliefs about the necessity of medication, and BMQ-specific concern (5 items) which assesses concerns about prescribed medications. Each item was rated on a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The sum score for each subscale is from 5 to 25, with higher scores indicating stronger beliefs in the necessity of medications and greater concerns regarding side effects and toxicity.[20] The BMQ has been translated and validated in Vietnamese, demonstrating acceptable reliability, with Cronbach's alpha coefficients of 0.64 for the necessity subscale and 0.62 for the concern subscale.[21]

The third questionnaire is the GMAS which was developed by Naqvi and colleagues in 2019 to specifically assess medication adherence among patients with chronic illnesses.[22] This scale contains 11 items covering three domains of medication adherence: patient behaviour (5 items), additional disease and pill burden (4 items), and financial constraints (2 items). All items were rated on a Likert scale with four options: always, mostly, sometimes, and never, corresponding to 3, 2, 1, and 0 points, respectively. The total score for the GMAS was from 0 to 33, categorizing participants into non-adherence (0-26 points) and adherence (27-33 points). The GMAS has been translated and validated in Vietnamese, achieving a Cronbach's alpha of 0.81, indicating strong reliability.[23] Additionally, a pilot study involving 30 patients with COPD at Da Nang C Hospital demonstrated satisfactory reliability for the BMQ-specific necessity (0.80), BMQ-specific concern (0.84), and GMAS (0.81).

Data Collection

After receiving the ethical approval from the Ethics Committee in Biomedical Research at Da Nang University of Medical Technology and Pharmacy (No. 193/QD-DHKTYDDN) on March 2, 2022, along with permission from Da Nang C hospital, data were collected by the research team at the Department of Respiratory Medicine and the Outpatient Department of the hospital. Participants who met the inclusion criteria were screened for cognitive function; those scoring 7 or below were directed to a separate room, where researchers introduced the study and obtained informed consent. Upon agreement, participants received questionnaires, which they typically completed in approximately 15 minutes.

Data Analysis

Data analysis was performed using the Statistical Package for Social Science version 22.0 (SPSS Inc., Chicago, Illinois, US), with an alpha level of 0.05. Descriptive statistics, including frequency, percentage, mean, standard deviation, and range, were employed to describe the participants' characteristics, medication beliefs, and medication adherence. Independent t-test and Chi-square test were utilized for variable comparisons, while Fisher's Exact test was applied when cell percentages were less than 5%. Additionally, univariate logistic regression analysis examined associations between participants' characteristics, medication beliefs, and medication adherence. Variables showing significance in univariate analysis were included in the multivariable logistic regression.

Results

Characteristics of Participants

As shown in Table 1, the majority of participants were male (90.4%), married (81.7%), and retired (90.4%). Over half of the participants reported having comorbidities (61.5%) and had been hospitalized one or two times during the past year because of COPD (78.8%). Approximately half of the participants had been diagnosed with COPD for less than 5 years (46.1%). The mean (SD) age of participants was 71.36 (±7.67) years. On average, participants were prescribed 45.57 (±1.78) different medications. Additionally, the mean scores for beliefs regarding medication necessity and concerns about medications were 19.70 (3.22) and 15.62 (3.30), respectively.

Table 1. Characteristics of the participants (n = 104)

Characteristics	No. (%)
Gender	
Male	94 (90.4)
Female	10 (9.6)
Marital status	
Married	85 (81.7)
Divorced/widowed	17 (16.4)
Single	2 (1.9)
Educational level	
High school or lower	45 (43.3)
Above high school	59 (56.7)
Occupation	
Retirement	94 (90.4)
Government staffs	5 (4.8)
Unskilled workers	5 (4.8)
Comorbidities	
Yes	64 (61.5)
No	40 (38.5)
Duration of COPD	
<5 years	48 (46.1)
5-10 years	34 (32.7)
>10 years	22 (21.2)
Number of hospital admissions	
≤2 times	82 (78.8)
>2 times	22 (21.2)

Medication Adherence of the Participants

The mean scores across three domains of medication adherence were as follows: Patient behavior 10.44 (2.85), additional disease and pill burden 8.85 (2.42), and financial constraints 4.13 (1.30). Overall, 41.3% (n = 43) of participants were classified as adherent to their medication regimen, while 58.7% (n = 61) were categorized as non-adherent.

Factors Predicting Medication Adherence

Univariate logistic regression analysis identified four factors significantly associated with medication adherence of participants, including age ($P = 0.019$), educational level ($P < 0.001$), number of medications ($P = 0.001$), and beliefs about medication necessity ($P < 0.001$). The results are detailed in Table 2. Following this, these factors were included in a multivariable logistic regression analysis. As illustrated in Table 3, younger patients, those with educational levels exceeding high school, fewer prescribed medications, and stronger beliefs regarding the necessity of medications exhibited higher rates of medication adherence.

Discussion

Medication adherence is a key component for the effective management of COPD.[3] Optimal patient adherence to prescribed medications enhances treatment effectiveness, prevents complications, and reduces healthcare costs.[5-7] In the current study, only 41.3% of participants adhered to their prescribed medications for COPD, indicating a relatively low rate of adherence within this population. This finding aligns with previous studies conducted in other countries, where medication adherence rates were below 50%.[8,9]

In our study, the adherence rate for patients with COPD was higher than in previous studies in Vietnam, which reported rates ranging from 24.3% to 37.4%.[12,13] This discrepancy may be attributed to differences in the methods used to measure medication adherence. In the current study, medication adherence was assessed using the GMAS, a newly developed instrument that examines multiple factors and categorizes adherence into two levels: adherence and non-adherence.[23] In contrast, earlier studies used the Test of Adherence to Inhaler (TAI) or the Morisky Medication Adherence Scale (MMAS), which classify adherence into three levels: good, moderate, and poor.[12,13] The GMAS may have produced higher adherence rates in our study because of its broader approach. In addition, the current study took place in a hospital where patients generally had higher educational levels than

Table 2. Univariate logistic regression analyses of the relationship between studied factors and medication adherence

Variable	N (%)		OR (95% CI)	*P*
	Adherence	Non-Adherence		
Age	69.20 (6.50)*	72.86 (8.10)*	0.93 (0.88 - 0.99)	0.019
Gender				
Male	37 (86.0)	57 (93.4)	1	-
Female	6 (14.0)	4 (6.6)	2.31 (0.61 - 8.75)	0.217
Marital status				
Single	1 (2.3)	1 (1.6)	1	-
Married	33 (76.7)	52 (85.2)	1.58 (0.09 - 26.07)	0.751
Divorced/widowed	9 (20.9)	8 (13.1)	1.77 (0.62 - 5.05)	0.284
Educational level				
High school or lower	8 (18.6)	37 (60.7)	1	-
Above high school	35 (81.4)	24 (39.3)	6.74 (2.68 - 16.99)	<0.001
Occupation				
Retirement	39 (90.7)	55 (90.2)	1	-
Government staffs	3 (7.0)	2 (3.3)	2.11 (0.34 - 13.26)	0.424
Unskilled workers	1 (2.3)	4 (6.5)	0.35 (0.04 - 3.28)	0.359
Comorbidities				
Yes	23 (53.5)	41 (67.2)	1	-
No	20 (46.5)	20 (32.8)	1.78 (0.79 - 3.98)	0.158
COPD duration				
<5 years	25 (58.1)	23 (37.7)	1	-
5-10 years	11 (25.6)	23 (37.7)	0.44 (0.18 - 1.09)	0.079
>10 years	7 (16.3)	15 (24.6)	0.43 (0.15 - 1.24)	0.118
Number of hospital admissions				
≤2 times	36 (83.7)	46 (75.4)	1	-
>2 times	7 (16.3)	15 (24.6)	0.59 (0.22 - 1.62)	0.31
Number of medications	3.81 (1.40)*	5.10 (1.85)*	0.61 (0.46 - 0.81)	0.001
Medication beliefs				
Beliefs about medication necessity	22.67 (1.76)*	17.60 (2.19)*	3.22 (2.11 - 4.92)	<0.001
Concerns about medication	15.20 (3.32)*	15.90 (3.29)*	0.94 (0.83 - 1.06)	0.293

* Mean (SD).

Table 3. Factors predicting medication adherence among patients with COPD

Variable	OR	95% CI	*P*
Age	0.78	0.63 - 0.97	0.025
Educational level			
High school or lower	-	-	-
Above high school	42.57	2.26 - 800.79	0.012
Number of medications	0.39	0.17 - 0.88	0.023
Beliefs about medication necessity	5.52	2.21 - 13.83	<0.001

those in other hospitals.[12,13] It was demonstrated that patients with higher education tend to be more aware of the benefits of their medications, which often leads to better adherence.[9,24]

In contrast, medication adherence in the current study was lower than in another study that reported an adherence rate of 57.6%.[24] It could be explained by the difference in the age of the participants. The average age in our study was higher 71.36 (7.66) years compared to the earlier study 60.12 (12.91) years. Older adults frequently experience memory loss, which can lead to forgetting to take their medication. As a result, medication adherence tends to be lower among older people.[25]

In the current study, multivariable logistic regression analysis identified several predictors of medication adherence among patients with COPD. The findings revealed that age, educational level, the number of medications, and beliefs about medication necessity significantly influenced medication adherence. Specifically, older patients exhibited a lower rate of medication adherence. This finding is similar to that reported in the recent studies.[24,25] This trend can be attributed to older individuals often facing multiple health conditions, which can result in complex medication regimens and cognitive decline.[25] Forgetfulness is a

significant reason many older patients do not take their medications as prescribed. To improve adherence among this population, it is advisable to prescribe medications that are simple and easy to remember or provide caregiver support during medication administration.[26]

In the present study, medication adherence was significantly greater among patients with higher educational levels. This finding is similar to previous studies conducted in Nepal[11] and Vietnam.[24] It is plausible that patients with higher educational attainment possess more positive beliefs regarding their medications and have a better understanding of the importance of adherence to treatment. Consequently, adherence to prescribed medications tends to be greater in this group.[27] Additionally, our findings indicated that patients with a higher number of medications were significantly less likely to adhere to their prescribed medication. Previous studies have similarly reported that taking multiple medications is associated with poorer adherence among patients with COPD.[10,11] The increased variety of medications contributes to a more complex treatment regimen, which can pose challenges for patients, particularly older individuals, in terms of remembering the timing and instructions associated with each medication. Consequently, this complexity diminishes the likelihood of medication adherence among these patients.[28]

Beliefs in medication necessity emerged as a significant predictor of adherence among patients with COPD in this study. The findings suggest that patients who possess a stronger belief in the necessity of their medications are more likely to exhibit higher adherence compared to those with weaker beliefs. A study conducted in Portugal corroborated this result, demonstrating a positive association between beliefs in medication necessity and adherence among elderly patients.[29] Furthermore, research conducted in Jordan indicated that an increased belief in medication necessity significantly enhances adherence levels, with an odds ratio of 4.22 (95% CI = 2.59-6.87; $P < 0.01$).[30] These findings highlight the importance of patients' beliefs regarding medication necessity, as they positively influence both the psychological and cognitive dimensions of medication use. Consequently, fostering a strong belief in the necessity of medications is essential for enhancing patients' acceptance and trust in the therapeutic effects of medication.[31,32] Therefore, there is a pressing need for strategies aimed at bolstering patients' beliefs about medication to improve adherence rates.

To minimize measurement bias, the Vietnamese versions of the BMQ and GMAS were tested for validity and reliability before use. However, medication adherence was measured using GMAS, a self-report scale, which may overestimate adherence due to recall bias and social desirability. Additionally, due to resource limitations, data were conveniently collected from a single hospital in Central Vietnam that primarily treats older adults, potentially limiting the representativeness of the sample for the broader population of patients with COPD in the country. Furthermore, this study examined the relationship between selected factors and medication adherence, yet it may have overlooked other significant factors, such as family support and the patient-healthcare provider relationship, which could predict patients' adherence.

Research Highlights

What is the current knowledge?

- COPD is a significant global health problem that causes a substantial burden on the healthcare system.
- COPD management remains a challenge because of patients' non-adherent behaviors to medication.
- There are various factors affecting medication adherence.

What is new here?

- About 41.3% of the participants adhered to their medications.
- Age, educational level, the number of medications, and beliefs about medication necessity were factors predicting medication adherence among patients living with COPD in Vietnam.

Conclusion

The adherence rate to medication among Vietnamese patients with COPD is relatively low. Factors such as age, educational level, number of medications, and beliefs regarding the necessity of medication have been identified as significant predictors of adherence. Healthcare providers should prioritize patients at high risk for non-adherence, particularly the elderly and those with lower educational attainment. Intervention strategies should focus on increasing patients' understanding of the importance of medication in managing COPD. Future research should involve a larger cohort across various regions of Vietnam to gain insights into medication adherence among diverse ethnic groups affected by COPD. Furthermore, the relationship between medication adherence and other factors, particularly modifiable ones, warrants further investigation.

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Authors' Contribution

Conceptualization: All authors.
Data curation: Le Huyen Trinh, Nguyen Thi Bich Hop.
Formal analysis: Le Huyen Trinh, Tran Thi Hoang Oanh.
Investigation: Le Huyen Trinh, Nguyen Thi Bich Hop.
Methodology: Le Huyen Trinh, Luu Thi Thuy, Nguyen Thi Bich Hop.
Writing–original draft: Luu Thi Thuy, Tran Thi Hoang Oanh, Pham Thi Thuy.

Writing–review & editing: All authors.

Competing Interests

The authors declare that there is no conflict of interest regarding this study.

Data Availability Statement

The findings of this study are available from the corresponding author on reasonable request.

Ethical Approval

This study received approval from the Ethics Committee in Biomedical Research at Da Nang University of Medical Technology and Pharmacy (No. 193/QD-DHKTYDDN) on March 2, 2022, along with permission from the hospital. Participants were informed of the study' purpose, their rights to participate or withdraw, and the confidentiality of their data. Informed consent was obtained before administering the questionnaires.

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