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Evaluation Of The Treatment Satisfaction And Medication Adherence Among Chronic Pulmonary Obstructive Diseases Patients –A Cross Sectional Study

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ABSTRACT
In the world, COPD is the third leading cause of death. Patients with Chronic obstructive lung disorders often have adherence rates of 10% to 40%. The study's objective was to assess how well patients with obstructive lung disorders adhered to their inhaled medication regimens. Between 2023 and 2024, a total of 325 participants with COPD or asthma were included in the trial, with a mean age of 63.04 ± 11.29. Beliefs about Medications Questionnaire, Adherence to Refills and Medications Scale, Test of Adherence to Inhalers. The majority of responders (3.87 points per question) seemed to be persuaded that their medication was necessary. Overall, the patients' adherence levels were moderate Seventy-four percent of patients showed intermittent non-compliance. Chronic obstructive lung disease patients had adhere to their treatment to a considerable degree. Adherence to medication is significantly impacted by one's beliefs about medicines. Three independent factors independently predict improved medication adherence: not smoking, being unemployed, and believing that medicine is necessary. Two independent predictors of lower medication adherence are the frequency of hospital admissions for disease exacerbations in the previous year and the perception that medications are harmful.

Keywords- treatment adherence, patient compliance, chronic pulmonlolary diseases, beliefs

1. Introduction

COPD is one of the most common causes of morbidity, mortality, and increased health costs among chronic diseases characterized by persistent respiratory symptoms caused by a substantial exposure to noxious particles or gases, cigarette smoking being the most relevant risk factor.[1,2]

Chronic conditions success is determined by the adherence to drug therapy, defined by the World Health Organization (WHO) as 'the extent to which a person's behavior (taking medication, following a diet, or executing lifestyle changes) corresponds with the agreed recommendations from a healthcare provider.'[3] As this concept of adherence is expressed, it includes not only compliance to pharmacological and nonpharmacological treatments but also the extent to which the patient's behavior matches agreed recommendations from the prescriber (e.g. smoking cessation, dietary restriction, regular physical activities, and periodical medical consultations). Long-term adherence is a major unmet medical need in chronic conditions, negatively influencing short- and long-term prognosis. In addition, poor adherence to treatment increases disease-related costs and may contribute to treatment gaps in COPD care.[3,4] Almost half of patients with COPD do not adhere to their medications.[5]

Satisfaction of patient with their medications is shown to affect treatment-related factors, such as their likelihood of continuing use of their medication, using their medication correctly, and adherence of their medication regimen.[6,7]

Limited information is available on the long-term treatment satisfaction and potential correlation with treatment adherence of patients with COPD in the real-life setting & its potential impact. To address this gap of information, a observational study to primarily explore the patients' satisfaction with COPD treatment in a clinical, setting. Furthermore, evaluation how treatments satisfaction is related to clinical parameters, quality of life, illness perception and treatment adherence.

2. Methods Study design, participants

In the study period (November 2023–Sep 2024), 378 patients with COPD or asthma were being treated at the pulmonology outpatient clinic. Thirty-five of those patients did not meet the inclusion criteria and 12 patients refused to take part in the study. Therefore, 331 patients were included in the study and received questionnaire

The study group ultimately included 325 patients with COPD or asthma (51.08% of whom were men). The mean age of the patients was 63 11 years. Study qualification was conducted by a trained team comprising two specialist nurses. All the qualified patients completed standardised questionnaires following their appointment with the clinic. Sociodemographic data were obtained from the medical register and are presented in Table 1. All the patients were informed about the study process and methods and about their right to withdraw from the study at any time. All the patients provided informed written consent to participate in the anonymous study

Table 1. Sociodemographic and clinical characteristics of the patients studied.

Variable		Total
AGE (in years)	Mean ± SD	64.72 ± 10.14
	Median	64.72
Socioeconomic status	Upper Lower	113 (28.8)
	Lower Middle	170 (43.3)
	Upper middle	110 (28.0)
Sex	Male	225
	Female	168
Marital status	Unmarried	86 (26.46%)
	Married	239 (73.54%)
Education	Tertiary	67 (20.62%)
	Secondary	141 (43.38%)
	Vocational	87 (26.77%)
	Primary	30 (9.23%)
Place of residence	Urban area	205 (63.08%)
	Rural area	120 (36.92%)
Smoking status	Non-smoking	58
	Smoking	133
	Quit smoking	31
	Alcoholic	2
	Ex-Smoker	1
Number of cigarettes smoked a day	1–4	54 (16.62%)
	5–9	46 (14.15%)
	10–14	18(5.54%)
	Around 1 pack	11 (3.38%)
	More than 1 pack	1 (0.31%)
	Non-smoker	195(60.00%)
Number of hospital admissions due to exacerbations over the last year	0	71 (21.85%)
	1	125 (38.46%)
	2–3	113 (34.77%)
	4–5	14 (4.31%)

	>5	2 (0.62%)
Comorbidities	Respiratory Neurodegenerative Metabolic disorder Cardiovascular Bone None	11 5 10 46 1 320
Duration of disease	10 years 1–4 years 5–10 years >10 years	126 (38.77%) 68 (20.92%) 122 (37.54%) 126 (38.77%)
Number of inhaled medications used	1 2 3 or more	97 (%) 44 (%) 251 (%)
Medications *	SABA SAMA + SABA ICS ICS+LABA ICS+LAMA+LABA Others	74 (18.82) 250 (63.61) 189 (48.1) 7 (1.78) 135 (34.35) 149 (37.91)

The following conditions had to be met in order for a patient to be eligible for inclusion in the study: the patient had to be over 18, have a diagnosis of an obstructive pulmonary disease (such as COPD or asthma), be cognitively capable of understanding the study's goals and procedures, and be able to complete questionnaires (Mini Mental State Examination 18).

2.1 The following standardised questionnaires were used in the study:

Patients' opinions about medicines are evaluated using the opinions about Medicines Questionnaire (BMQ). The survey comprises four topics that evaluate the respondents' views regarding the excessive use medications by physicians, the negative effects of medications, the need for medication, and their concerns regarding medications. On a 5-point Likert scale, 1 represents strongly disagree and 5 represents strongly agree. A subscale's overall score is calculated by adding the item scores from each subscale. Stronger views toward medications are indicated with higher scores [9]. The questionnaire's psychometric qualities were found to be satisfactory for both the Polish and original versions (Cronbach's alpha ranges were 0.64–0.82 and 0.6-78, respectively)[13].

Test of Adherence to Inhalers (TAI), which assesses patients with COPD and asthma for adherence to inhaled drugs. Twelve questions make up the questionnaire, which evaluates intermittent, intentional, and unintentional non-compliance. Two additional items, nos. 11 and 12, are included in the 12-item TAI. These items have a score range of 2 to 4 and are scored as 1 or 2 (where 1 = terrible and 2 = good). The purpose of these items is to identify two potential causes of unconscious non-compliance. Both intentional and sporadic patterns of non-compliance were identified when scores of < 24 were found for items #1 through #5 and items #6 through #10. When at least one of the final two items (#11 and #12) of the questionnaire had a score of 1, it was considered unconscious non-compliance.

Adherence to Refills and Medications Scale (ARMS), It is employed to evaluate medication compliance [15]. ARMS is divided into two domains: remembering to take prescriptions as prescribed (8 items) and remembering to refill them (4 items). There are twelve questions in all, and the options are "none," "some," "most," and "all the time." The frequency with which people take their prescribed medications as directed, forget to take them, purposefully not take them, forget to refill new prescriptions, skip doses of medications without consulting a doctor, adjust dosages on their own out of well-being or absentmindedness, put off purchasing medications because of their high cost, and buy medications in bulk were all covered by the survey's questions. The range of

scores on the questionnaire is 12-48, with higher scores suggest less adherence. The Morisky adherence and the initial ARMS showed a strong correlation. The Morisky adherence scale and the original ARMS had a strong correlation (Spearman's rho = -0.651, $p < 0.01$). Compared to the Morisky scale, the ARMS had a stronger correlation with refill adherence metrics [15]. The Polish version of the questionnaire had a Cronbach's alpha range of 0.775–0.958 [16].

Statistical analysis- In order to analyze quantitative variables—that is, variables expressed as numbers—means, standard deviations, medians, quartiles, minimum and maximum values. The number and percentage of occurrences of each value computed in order to analyze qualitative variables, or those that cannot be stated numerically. low predicted values in the tables, the Fisher's exact test was used, or the chi-square test (with Yates' adjustment for 2 × 2 tables) used to compare the values of qualitative variables between groups. The Mann-Whitney U-test utilized to compare the values of quantitative variables between two groups, and the Kruskal-Wallis test employed to compare the values of quantitative variables between three or more groups. When differences statistically significant were found, Dunn's post-hoc analysis are used. To analyze correlations between quantitative variables, the Spearman's correlation coefficient was employed. Using linear regression, a multifactor analysis of the independent effects of several variables on a quantitative variable carried out. The regression model's parameter values, together by a 95% confidence interval, are presented as the results. In the study, a significance level of 0.05 was applied. As a result, any p-value less than 0.05 considered to be indicative of a significant association. R, version 3.6, was used to conduct the analysis.

2.2 Ethical Considerations

The study was approved by the Institutional ethics Committee at the SGT University (approval no.EC/NEW/INST/2022/3046). All participants provided informed written consent after a thorough explanation of all the procedures involved. All patients were informed about the purpose and nature of the study and provided informed written consent to par- ticipate in the study. All patients completed all questionnaires. The study was conductedin accordance with the tenets of the Declaration of Helsinki.

3. Results

3.1 Sociodemographic and Clinical Characteristics of the Patients Studied

The socio-demographic characteristics of the patients studied are shown in Table 1.Most patients were in a relationship (73.54%), had secondary education (43.38%), lived in urban areas (63.08%) and were retired (48.31%). Forty per cent of patients were smokers. The largest proportion of respondents had been hospitalised once due to exacerbations of their disease (38.46%).

3.2 Medication Adherence (ARMS, TAI) and Beliefs about Medicines (BMQ)

The patients were uncertain about the overuse of medicines by doctors (a mean of 3.19 points per question) and about the harmful effects of medicines (a mean of 2.82 points per question) and did not know if they were concerned about taking their medication(a mean of 3.33 points per question) (Table 2A). The respondents tended to be convinced of the necessity of their medication (a mean of 3.87 points per question).

Table 2. (**A**) BMQ, ARMS and TAI results; (**B**) Correlation analysis between beliefs about medicines (BMQ) and treatment adherence (ARMS, TAI).

A- BMQ, ARMS and TAI results				
Questionnaire		**Score Range**	**Mean per Question**	**Mean ± SD**
BMQ	Belief that medicines are overused by doctor	4–20	3.19	12.74 ± 3.18
	Belief that medicines are harmful	4–20	2.82	11.29 ± 2.70
	Belief in the necessity of medication	5-25	3.87	19.35 ± 2.97
	Concerns about medicines	5-25	3.33	16.67 ± 3.25
ARMS	Total ARMS score	12–48	1.76	21.15 ± 6.23
	Medication taking as prescribed	8–32	1.68	13.41 ± 4.44
	Refills on schedule	4–16	1.94	7.74 ± 2.21
TAI	Sporadic non-compliance			74.15%
	Deliberate non-compliance			59.69%
	Unconscious non-compliance			11.38%

B—Correlation analysis between beliefs about medicines (BMQ) and treatment adherence (ARMS, TAI)

Questionnaire		**Belief that medicines are overused by doctors**	**Belief that medicines are harmful**	**Belief in the necessity of medication**	**Concern about the medicine**
ARMS	Total ARMS score Medication taking	r = 0.301, $p < 0.001$*	r = 0.382, $p < 0.001$*	r = −0.167, $p = 0.003$*	r = 0.317, $p < 0.001$*
	Medication taking as prescribed	r = 0.281, $p < 0.001$*	r = 0.361, $p < 0.001$*	r = −0.179, $p = 0.001$*	r = 0.304, $p < 0.001$*
	Refills on schedule	r = 0.281, $p < 0.001$*	r = 0.351, $p < 0.001$*	r = −0.124, $p = 0.026$*	r = 0.282, $p < 0.001$*
	Sporadic non -compliance	r = −0.351, $p < 0.001$*	r = −0.366, $p < 0.001$*	r = 0.132, $p = 0.017$ *	r = −0.334, $p < 0.001$*
	Deliberate non -compliance	r = −0.441, $p < 0.001$ *	r = −0.435, $p < 0.001$ *	r = 0.072, $p = 0.197$*	r = −0.48, $p < 0.001$*
	Unconscious non -compliance	r = −0.21, $p < 0.001$*	r = −0.245, $p < 0.001$*	r = 0.153, $p = 0.006$ *	r = −0.186, $p = 0.001$ *

The patients reported moderate levels of overall adherence (21.15 6.23), adherence to taking medications as prescribed (13.41 4.44) and adherence to refills on schedule (7.74 2.21). A total of 74.15% of patients demonstrated sporadic non-compliance, 59.69% exhibited deliberate non-compliance and 11.38% exhibited

unconscious non-compliance with inhaled medications.

3.3 Impact of BMQ on ARMS and TAI

The overall ARMS score and its two subscales were significantly ($p < 0.05$) and positively ($r > 0$) linked with the beliefs that doctors overuse medications, that medicines are dangerous, and that concerns over medications are. Consequently, the lower the level of adherence (i.e., the higher the score on the ARMS) in all categories, the larger the view that physicians overuse medications (Table 2B). There was a substantial ($p < 0.05$) and negative ($r < 0$) correlation found between the belief that doctors overuse medications and the absence of random, intentional, and unconscious non-compliance Belief in the need for medication was negatively ($r < 0$) and significantly ($p < 0.05$) linked with the two ARMS subscales and the overall ARMS score, as well as with the absence of sporadic and unconscious non-compliance. Thus, the greater the conviction regarding the essentiality of medication, the greater the degree of adherence (i.e., the lower the score) across all aspects. Belief that medications are dangerous and worries about medications were adversely ($r < 0$) and significantly ($p < 0.05$) connected with the absence of intermittent, intentional and unintentional non-adherence. Thus, lower adherence to inhaled medications corresponds with increased worries regarding pharmaceuticals.

3.4 Regression Analysis—ARMS

According to Table 3A, the results of the linear regression model indicate that three factors—not smoking (R = 1.983), being jobless (R = 5.073), and believing that medication is necessary—are significant ($p < 0.05$) independent predictors of a lower total ARMS score and a higher level of adherence. On the other hand, the total ARMS score (which indicates a lower level of adherence) is raised by the number of hospital admissions brought on by exacerbations in the last year and the belief that medications are hazardous (R = 1.897 and R = 0.417, respectively). The R2 coefficient for this model was 33.17%, indicating that the variables in the model account for 33.17% of the variation in the overall ARMS score. Random factors and variables not included in the model determine the remaining 66.83% (Table 3A)

According to the results of the linear regression model, the number of hospital admissions for exacerbations in the previous year (R = 1.364) and the belief that medications are harmful (R = 0.278) significantly reduce the level of adherence to taking medications. On the other hand, being unemployed (R = 3.195) and believing in the necessity of medication (R = 0.34) are significant ($p < 0.05$) independent predictors reducing the "medication taking as prescribed" subscale score. The R2 coefficient for this model was 28.61%, meaning that the variables in the model account for 28.61% of the variation in the subscale score for "medication taken as prescribed." Random factors and variables not included in the model account for the remaining 71.39% (Table 3A).

The results of the regression analysis demonstrated that the following factors are significant ($p < 0.05$) independent predictors in raising the level of refill adherence: being a working pensioner (R = 1.033), being an old-age pensioner (R = 0.711), being unemployed (R = 1.877), not smoking (R = 0.825), and believing that medication is necessary (R = 0.11). One predictor that lowers the level of refill adherence is the belief that medications are hazardous (R = 0.14). The factors included in the model account for 34.47% of the variation in the "refills on schedule" subscale score, according to the model's R2 coefficient of 34.47%. Random factors and variables not included in the model account for the remaining 65.53% (Table 3A).

3.5 Regression Analysis—TAI

According to the results of the linear regression model, living in a rural location (R = 0.848) is a significant predictor that increases the level of occasional non-compliance, while not smoking (R = 1.113) is a significant ($p < 0.05$) independent predictor that decreases the level of non-compliance. The R2 coefficient for this model was 36.01%, indicating that the factors in the model account for 36.01% of the variation observed in the "sporadic non-compliance" variable. Random factors and variables not included in the model determine the remaining 63.99% (Table 3B).The frequency of hospital admissions for exacerbations in the previous year (R = 0.806), living in a rural region (R = 0.97), and the perception that doctors overuse medication are independent predictors that

raise the amount of intentional non-compliance. The remaining 46.61% depends on variables that were not included in the model, as well as random factors (Table 3B).

Living in a rural location (R = 0.97), the number of hospital admissions for exacerbations in the previous year (R = 0.806), the perception that doctors overuse medications (R = 0.211), and worries about medications (R = 0.15) are independent factors that raise the amount of purposeful non-compliance. A predictor that lowers the degree of purposeful non-compliance is not smoking (R = 1.956). The R2 coefficient for this model was 53.39%, indicating that the factors in the model account for 53.39% of the variation observed in the "deliberate non-compliance" variable. Random factors and variables not included in the model determine the remaining 46.61% (Table 3B).

The idea that medication is necessary is a significant ($p < 0.05$) independent predictor that lowers the amount of unconscious non-compliance, according to the linear regression model (R = 0.022). The R2 coefficient for this model was 21.67%, indicating that the factors in the model account for 21.67% of the variation observed in the "unconscious non-compliance" variable. Random factors and variables not included in the model account for the remaining 78.33% (Table 3B).

A												
Feature		ARMS										
		Total Score				Medication Taking as Prescribed				Refills on Schedule		
		Parameter	95%CI		p	Parameter	95%CI		p	Parameter	95%CI		p
Sex	Female	Ref				ref				ref			
	Male	−0.588	−1.987	0.812	0.411	−0.3	−1.332	0.732	0.569	−0.288	−0.777	0.202	0.251
Age	[years]	−0.048	−0.12	0.024	0.191	−0.047	−0.1	0.006	0.082	−0.001	−0.026	0.024	0.945
Place of residence	Urban area	Ref				ref				ref			
	Rural area	1.248	−0.031	2.528	0.057	0.853	−0.09	1.797	0.077	0.395	−0.053	0.843	0.085
Marital status	Single	Ref				ref				ref			
	In a relationship	−0.122	−1.538	1.294	0.866	−0.344	−1.388	0.700	0.519	0.222	−0.274	0.717	0.381
Professional status	Economically active	ref.				ref.				ref.			
	Working pensioner	−1.512	−4.185	1.16	0.268	−0.48	−2.451	1.491	0.634	−1.033	−1.968	−0.097	0.031 *
	Old-age pensioner	−1.276	−3.293	0.742	0.216	−0.565	−2.053	0.923	0.457	−0.711	−1.417	−0.005	0.049 *
	Disability pensioner	0.356	−1.937	2.648	0.761	0.011	−1.68	1.701	0.99	0.345	−0.457	1.147	0.4
	Unemployed	−5.073	−8.607	−1.538	0.005 *	−3.195	−5.802	−0.589	0.017 *	−1.877	−3.114	−0.64	0.003 *
Smoking status	Regular smoker	ref.				ref.				ref.			
	Occasional smoker	−0.569	−2.596	1.459	0.583	−0.143	−1.638	1.352	0.851	−0.426	−1.135	0.284	0.241
	Non-smoke	−1.983 *	−3.688	−0.277	0.023 *	−1.158	−2.416	0.1	0.072	−0.825	−1.422	−0.228	0.007 *
Number of hospital admissions due to	0	ref.				ref.				ref.			
	1	1.227	−0.444	2.897	0.151	0.925	−0.307	2.157	0.142	0.302	−0.283	0.887	0.312
	2–3	1.897 *	0.199	3.596	0.029 *	1.364	0.111	2.616	0.034 *	0.534	−0.061	1.129	0.079

exacerbations over the last year	More than 3	1.865	−1.181	4.912	0.231	1.056	−1.19	3.302	0.358	0.809	−0.257	1.876	0.138
Duration of disease	Up to 5 years	ref.				ref.				ref.			
	5–10 years	0.683	−0.95	2.316	0.413	0.781	−0.423	1.985	0.205	−0.098	−0.669	0.474	0.738
	>10 years	1.299	−0.436	3.034	0.143	0.98	−0.3	2.259	0.135	0.32	−0.288	0.927	0.303
Do you know how to self-monitor your asthma?	Yes, definitely	ref.				ref.				ref.			
	Yes	0.214	−1.764	2.191	0.832	0.53	−0.929	1.988	0.477	−0.316	−1.008	0.376	0.372
	Uncertain	1.012	−1.276	3.3	0.387	0.716	−0.971	2.403	0.406	0.296	−0.505	1.097	0.469
	No/No, definitely not	1.4	−0.952	3.752	0.244	1.244	−0.49	2.979	0.161	0.156	−0.667	0.979	0.711
BMQ	Belief that medicines are overused by doctors	−0.105	−0.402	0.191	0.487	−0.085	−0.303	0.134	0.45	−0.021	−0.125	0.083	0.694
	Belief that medicines are harmful	0.417	0.053	0.781	0.025*	0.278	0.009	0.546	0.043*	0.14	0.012	0.267	0.033*
	Belief in the necessity of medication	−0.34	−0.562	−0.117	0.003*	−0.229	−0.393	−0.065	0.007*	−0.11	−0.188	−0.033	0.006*

Table 3. Results of linear regression analysis (**a, b**)

A

Feature		ARMS											
		Total Score				Medication Taking as Prescribed				Refills on Schedule			
		Parameter	95%CI		p	Parameter	95%CI		p	Parameter	95%CI		p
Concerns about medicines		0.175	−0.083	0.434	0.185	0.123	−0.067	0.314	0.206	0.052	−0.039	0.143	0.262

B

Feature		TAI											
		Sporadic Non-Compliance				Deliberate Non-Compliance				Unconscious Non-Compliance			
		Parameter	95%CI		p	Parameter	95%CI		p	Parameter	95%CI		p
Sex	Female	ref				ref				ref			
	Male	0.384	−0.247	1.014	0.234	0.226	0.363	0.814	0.453	-0.075	-0.187	0.037	0.188
Age	[years]	0.0.23	-0.01	0.055	0.171	-0.007	-0.037	0.023	0.647	-0.001	-0.007	0.004	0.656
Place of residence	Urban area	ref				ref				ref			
	Rural area	-0.848	-1.424	-0.27	0.004*	-0.97	-1.508	-0.431	<0.001	0.049	-0.053	0.152	0.344
Marital status	Single	ref				ref				ref			
	In a relationship	0.402	-0.236	1.04	0.218	0.358	-0.238	0.954	0.24	0.056	-0.057	0.169	0.334
Professional status	Economically active	ref				ref				ref			
	Working pensioner	-0.964	-2.168	0.24	0.118	-0.221	-1.345	0.904	0.701	-0.036	-0.249	0.178	0.744
	Old-age pensioner	-0.291	-1.2	0.618	0.531	0.009	-0.84	0.858	0.984	0.077	-0.085	0.238	0.533
	Disability pensioner	-0.31	-1.343	0.722	0.556	-0.6	-1.564	0.365	0.224	0.035	-0.148	0.219	0.706
	Unemployed	0.347	-1.245	1.939	0.6669	0.929	-0.558	2.416	0.222	0.168	-0.115	0.45	0.246
Smoking status	Regular smoker	ref				ref				ref			

	Occasional smoker	0.152	-1.066	0.761	0.744	0.402	-0.451	1.255	0.356	0.127	-0.035	0.289	0.125
	Non-smoke	1.113	0.344	1.881	0.005*	1.956	1.238	2.673	<0.001	0.01	-0.126	0.146	0.881
Number of hospital admissions due to exacerbations over the last year	0	ref				ref				ref			
	1	0.036	-0.789	0.716	0.924	0.806	-1.509	-0.103	0.205	-0.014	-0.148	0.119	0.832
	2–3	0.022	-0.744	0.787	0.956	-0.592	-1.307	0.123	0.106	0.02	-0.116	0.156	0.777
	More than 3	0.653	-0.719	2.025	0.352	-0.392	-1.674	0.89	0.509	-0.202	-0.445	0.042	0.106
Duration of disease	Up to 5 years	ref				ref				ref			
	5–10 years	0.065	-0.67	0.801	0.862	-0.173	-0.86	0.514	0.623	0.014	-0.117	0.144	0.837
	>10 years	0	-0.782	0-781	0.999	0.167	-0.563	0.897	0.654	-0.023	-0.162	0.116	0.747
Do you know how to self-monitor your asthma?	Yes, definitely	ref				ref				ref			
	Yes	-0.032	-0.923	0.859	0.944	0.001	-0.831	0.834	0.997	0.099	-0.059	0.257	0.222
	Uncertain	-0.258	-1.289	0.772	0.624	-0.478	-1.441	0.484	0.331	-0.023	-0.206	0.16	0.802
	No/No, definitely not	-0.513	-1.572	0.546	0.343	-0.665	-1.654	0.325	0.189	-0.005	-0.193	0.183	0.959

Table 3. *Cont.*

B											
Feature	TAI										
	Sporadic Non-Compliance				Deliberate Non-Compliance				Unconscious Non-Compliance Parameter			
	Parameter	95%CI		p	Parameter	95%CI		p	Parameter	95%CI		p
BMQ: Belief that medicines are overused by docters	-0.122	-0.256	0.012	0.074	-0.211	-0.336	-0.086	0.001*	-0.002	-0.026	0.0222	0.872
BMQ: Belief that medicines are harmful	−0.112	−0.276	0.052	0.18	−0.044	−0.197	0.109	0.572	−0.017	−0.046	0.012	0.247
BMQ: Belief in the necessity of medication	0.067	−0.033	0.167	0.19	0.072	−0.022	0.165	0.134	0.022	0.004	0.04	0.017*
BMQ: Concerns about medicines	−0.017	−0.133	0.1	0.78	−0.115	−0.224	−0.006	0.04	−0.002	−0.022	0.019	0.873

Table 3. *Cont.*

p—multi-factor linear regression; * statistically significant relationship ($p < 0.05$); ARMS—Adherence to Refills and Medications Scale; BMQ—Beliefs about Medicines Questionnaire.

4. DISCUSSSION

The purpose of this study was to evaluate patient adherence to inhaled therapy for obstructive lung illnesses using ARMS and TAI in connection to BMQ and sociodemographic information. We showed that patients' views toward medications had a substantial impact on their adherence, and that overall adherence to treatment was modest. Three independent factors independently predicted improved medication adherence: not smoking, being unemployed, and believing that medicine is necessary. Conversely, the frequency of hospital admissions brought on by disease exacerbations in the previous year and the conviction that medications are hazardous were independent predictors of worse drug adherence.

In daily clinical practice, patients with asthma and COPD typically have adherence rates of little more than 50% [18]. According to data from observational studies that mimic actual clinical practice settings, patients with obstructive lung disorders often have adherence rates between 10% and 40% [19, 20]. Patients in this trial reported a moderate level of compliance with inhalation treatment. Up to half of the patients purposefully disregarded their inhalation prescriptions, whereas the majority of them just occasionally did so. In a research by

Duarte-de-Araújo, out of patients with COPD, 16.7% did not follow their inhaled therapy, while 31.3% had poor treatment adherence [12].According to study, the asthma group and the COPD group had poor adherence rates of 50% and 63.9%, respectively [21]. Merely 14.15% of COPD patients in the Polan´ski et al. research conducted in Poland showed good drug adherence [22]. Compared to COPD patients, asthma patients tended to be more satisfied with their inhaler devices [21]. Additionally, the asthma group was shown to be substantially more satisfied with inhaled medication when using an inhaler, according to the Plaza et al. study [23]. Asthma and COPD patients did not start the Sánchez-Nieto study with significantly different adherence rates, and the only factor associated with low adherence was the participant's gender (female) [24].

Patients who take multiple medications may see their treatments as dangerous or ineffective due to a higher likelihood of experiencing adverse effects. Patients with a strong belief that taking their medication is essential for their health show much higher levels of adherence than patients without this perception [9]. According to the current study, individuals who felt their medication was necessary reported higher rates of adherence than those who did not. The mean BMQ—Necessity score was greater in COPD patients who adhered to their inhalation medication, according to a research by Duarte-de-Araújo [12]. Certain attitudes regarding the need for medication were positively correlated with medication in a research by Brandstetter et al. in Particular beliefs regarding the need for medicine were linked to better medication adherence in both COPD and asthma patients, but general beliefs regarding the dangers and overprescription of drugs only affected medication adherence in asthma patients [11]. As a result, it is reasonable to infer that the majority of asthmatic and COPD patients do not actually take their medications as prescribed because of beliefs that medications are dangerous or likely to have negative effects.

The results of this investigation demonstrated that smokers had a higher likelihood of not following their treatment plan. Furthermore, a regression study demonstrated that improved medication adherence is independently correlated with quitting smoking. Likewise, Duarte-de-Araújo's study discovered a statistically significant inverse relationship between smoking and medication adherence. Nevertheless, the research did not find a statistically significant correlation between adherence and clinical or demographic factors [12]. Smoking patients with chronic diseases are less likely to follow advice than non-smoking patients.

Research substantiates the correlation between heightened adherence and the degree of symptom management. Patients with asthma and COPD who have had prior hospital hospitalizations as a result of aggravation of their condition are associated with worse adherence rates. According to a retrospective analysis by Toy et al., there was a 2.6% decrease in hospital visits, a 3.1% decrease in hospital days, and a 1.8% decrease in ER visits for every five percentage points increase in adherence [26]. Improved adherence is linked to a decreased risk of severe exacerbations of COPD, fewer hospital admissions for COPD, and a statistically significant decreased risk of COPD-related death [20]. Asthma patients with high medication adherence had lower ED visits ($p = 0.0004$) and hospital admissions ($p = 0.0303$) in the Nittala et al. trial [27]. The three-year TORCH (Towards a Revolution in COPD Health) clinical study revealed that patients who do not take their medications as prescribed have a nearly two-fold increased risk of hospital re-admission and a more than two-fold increased risk of mortality [20]. According to a research by Vestbo et al., patients who adhered to their treatment regimens well had an annual rate of 0.15 hospital admissions owing to exacerbations, whereas those who did not had an annual rate of 0.27 [20]. Moreover, research indicates a correlation between improved adherence and higher asthma control as well as a decrease in Asthma patients with high medication adherence had lower ED visits ($p = 0.0004$) and hospital admissions ($p = 0.0303$).

Economic inactivity is one of the variables mentioned in the literature as having an effect on adherence in patients with chronic illnesses. Our research revealed a correlation between patients with obstructive lung illnesses who are unemployed and greater drug adherence. The results presented in the literature run counter to this finding. Haynes et al. [30] identified financial hardship as a contributing factor in patients' non-adherence, which prevented them from filling prescriptions. Because their dyspnea makes it difficult for them to do their jobs, patients with COPD frequently have to quit their jobs. Male patients with asthma who were also low-income patients visited the ER more frequently, according to the Nittala et al. study [27]. Polanski et al. discovered in their research that economic inactivity patients with COPD who were economically inactive had significantly worse adherence [22]. Patients who are unemployed, and thus have low incomes, find it difficult to purchase their medications, which negatively affect their treatment compliance. However, because they are less obligated and have more free time, patients who are economically inactive can dedicate more of it to following treatment

suggestions for things like medicine, doctor's appointments, However, because they are less obligated and have more free time, patients who are economically inactive can dedicate more of it to following treatment suggestions for things like medication, check-ups, doctor's appointments, and breathing exercises. Economically inactive people, however, lack the resources to follow complicated treatment plans. Ineffective treatment compliance is linked to a higher frequency of exacerbations and complicates the management of disease symptoms, both of which have an indirect impact on the patient's capacity to work and learn.

Furthermore, a higher frequency of short-term impairment and a higher rate of job absence are linked to poor adherence [31]. To further understand the part these factors play in individuals with COPD and asthma adhering to their treatment regimens, more research is required.

5. STUDY LIMITATIONS

There are various restrictions on our investigation. Self-rating instruments were used to evaluate medication adherence. Therefore, it's possible that the evaluation of the degree of treatment adherence was not objective. It doesn't seem that ARMS has been verified by objective adherence measurements, like calculating the percentage of days covered. To mitigate any bias stemming from social desirability, the study's anonymity was disclosed to the patients. The absence of analyses among patient groups with varying underlying diseases could potentially represent a study drawback. Nevertheless, research has demonstrated that variations in treatment adherence and treatment-related beliefs are independent of sociodemographic factors and disease-related characteristics. [9,12]

6. PRACTICAL IMPLICATIONS

Particular measures are necessary when patients receiving long-term treatment have inadequate adherence to therapy. Finding out if patients accept their treatment and how much they follow it through is important. Treatment success depends on giving patients rational justifications for their course of action. Because of their past interactions with and attitudes toward medications, elderly patients should pay special attention to this. Engaging in a conversation with patients about their worries about medications may also help lower the likelihood of purposeful non-compliance. Clinical practice should regularly employ the assessment of treatment adherence and factors that hinder it.

7. CONCLUSIONS

1. Patients with pulmonary disorders with occlusion adhere to inhaled therapy with a modest degree of consistency.
2. Adherence to inhaled drugs is significantly impacted by beliefs about medicines.
3. Three independent factors independently predict improved drug adherence to inhaled therapy: not smoking, being unemployed, and believing that medication is necessary. Conversely, the number of hospital admissions resulting from disease exacerbations in the last year and the conviction that medications are hazardous are separate factors that influence lower drug adherence to inhaled therapy.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

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