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The relation of psychological and socio-demographic variables to medication adherence in chronic obstructive pulmonary disease patients: A cross-sectional study in Greece

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ABSTRACT

Background: Several studies have shown that non-adherence is a common and increasing problem regarding the individuals with chronic illnesses including chronic obstructive pulmonary disease (COPD) patients. This study aimed to investigate the influence of psychological and socio-demographic variables on medication adherence among patients with COPD. **Methods:** A sample of 177 participants was recruited from three General Hospitals in the border area of Athens, consisting of COPD patients. Measurements were conducted with the following instruments: The Medication Adherence Rating Scale, the Center for Epidemiologic Studies Depression Scale (CES-D), and the Multidimensional Health Locus of Control (MHLC). **Results:** The results indicated that medication adherence was associated positively with the dimensions of internal health locus of control and doctors measured by MHLC questionnaire. It was also related negatively to depression measured by CES-D scale. **Discussion:** This present study demonstrates the importance of depression in understanding medication adherence of COPD patients as well as the contribution of health beliefs.

KEY WORDS: Adherence, chronic obstructive pulmonary disease, depression, health beliefs, medication

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) represents a major public health issue in Western countries [1] given its increasing incidence [1,2] and the detrimental consequences on mortality, quality of life (QoL) [3], and societal cost [4-6].

According to the World Health Organization (WHO) estimates, currently 210 million people have COPD, and 3 million people died of COPD in 2005. The WHO predicts that COPD will become the fourth leading cause of death worldwide by 2030 [7]. The burden of COPD assessed by disability-adjusted life years ranks 10th worldwide [8]. Total deaths from COPD are projected to increase by more than 30% in the next 10 years unless urgent preventive measures are in place [7].

Management of COPD becomes suboptimal when physicians fail to prescribe appropriate therapies, due to poor adherence to evidence-based guidelines and under diagnosis [9], or when patients fail to adhere to prescribed treatment regimens. COPD therapy is complex and consists of oral and inhaled respiratory drugs as well as oxygen therapy. Previous studies have shown inadequate adherence to respiratory therapy, such as inhaled corticosteroids [10], long-term oxygen therapy [11], or nebulized therapy [12,13], in COPD. This inadequate adherence is of concern as it may affect QoL [12].

Adherence to medications and treatments has been defined in several ways for chronic disease patients. One definition of adherence includes a person's behavior concerning taking medication, following a diet and making changes in lifestyle in accordance with health professional recommendations [14]. Another common definition is the extent to which people follow the instructions they are given for prescribed treatments [15].

Health Psychology offers a number of models that seek to help us understand the factors which influence an individual's adherence to a medical regime. One such model, which is relevant to the topic we study here, is Leventhal *et al.*' self-regulatory model, which suggests that cognitive factors influence a range of illness coping behaviors and outcomes among people experiencing illness or disease. This related concept of patient self-management involves care planning collaborative problem solving and decision-making to manage COPD and treatment including medications [16].

Therefore, it is obvious that a factor which contributes to the patient's self–management, and hence medication

adherence are health beliefs. Heath beliefs reflect individuals' beliefs regarding the extent to which they are able to control or influence health outcomes. They are also expected to develop and change over the course of illness, and hence, the experience of different treatments is likely to influence them [17]. Regarding the role and the importance of health beliefs, recently it has been recognized that internal health locus of control (LOC) that is the patient's preference to focus on his/her personal control on the disease management and is significantly and positively related to physical and social functioning, bodily pain, general health perception, and the physical component score in hemodialysis (HD) patients [18]. A higher personal control is also associated with lower emotional response, better understanding on behalf of the patient of his/her disease as well as higher medication adherence [19]. The findings suggest that by identifying patients' beliefs about an illness and its treatment, it might be possible to obtain more insight into the (mal-) adaptive responses to the illness [19].

Finally, it has been indicated that better health-related quality of life (HRQoL) in dialysis patients is associated with higher control beliefs, lower illness and treatment disruptiveness, lower consequences and fewer symptoms [19,20]. In general, it is evident that an individual with internal LOC may be more willing to follow treatment recommendations as he or she believes that the path of disease progression may be controlled via personal ability and action; action in this sense referring to adherence [21]. The positive reinforcement maintaining behavior is derived from the belief that hard work and ability leads to desired positive outcomes [22]. In contrast, individuals who believe that their fate is determined largely by chance or by other persons and not by their own actions may less likely to adhere to therapy because they feel that their actions may not appreciably affect outcomes or [22]. These individuals would attribute advances or declines in health to natural remission or progression of the disease.

Past studies have shown that non-adherence is a common and increasing problem by those with chronic illnesses including COPD patients [23,24]. These studies tended to examine non-adherence as a whole, including important behavioral and lifestyle changes such as starting a smoking cessation program, adhering to an exercise program, and wearing oxygen. Because of the multiple medications that COPD patients need on a daily basis, a study of non-adherence directly related to medication - taking behavior was thought to be important for this population. Although a considerable number of articles on COPD have been published, there are a limited number of studies indicating the relation of medication adherence to depression as well as health beliefs in these patients [16,25,26]. Furthermore, studies of health beliefs and adherence have produced mixed findings. Consequently, the assessment of this relation needs to be better understood and addressed more fully. In Greece, this is the first study performed investigating the possible relations between medication adherence and psychological variables in COPD patients.

The purpose of this study is: (a) To examine the association of medication adherence with mental health and health beliefs in COPD patients and (b) to determine whether socio-demographic (gender, age, education, family, and work status), clinical (years of treatment), and psychological (depression and health LOC) factors are involved in these patients' medication adherence.

We mainly hypothesize that a high level of medication adherence is related to a better mental health, indicating fewer symptoms of depression, as well as internal and doctor - attributed health LOC. Further, we hypothesize that chance or others - attributed LOC are associated with lower level of medication adherence.

MATERIALS AND METHODS

Participants

A cohort of 184 COPD patients was recruited from three General Hospitals in the broader area of Athens. From this cohort, 177 patients provided full data on the variables studied while the remaining 7 patients were excluded having incomplete data because they decided during the interview to discontinue their participation. Selection criteria included: (a) >18 years of age; (b) ability of communication in Greek; (c) diagnosed with COPD; (d) satisfying the level of cooperation and perceived ability.

The rate of response was very high, reaching 99%. Thus, the total sample includes almost all patients of these three hospitals, consisting of 105 males (59.3%) and 72 females (40.7%). Participants were, on average, 62.4 years old. With regards to the variable of marital status, 117 patients (66.1%) were married, 37 (20.9%) were single, and 23 (13.0%) divorced or widowed. Further, concerning the educational level, the majority of patients (40.1%) had a university education, 34.5% had secondary, and 25.4% had an elementary education. Regarding the work status, 149 patients (84.2%) were retired or households, 14 (7.9%) were employees, and 14 (7.9%) were freelancers. The group of COPD patients included individuals with a mean length of treatment measured in years 6.43 ± 5.39. Patients who participated in this study were undergoing current treatment for a varied period. In this respect, they could be categorized into two distinct groups: (a) COPD patients who recently commenced treatment (<4 years) and (b) COPD patients on long-term treatment (>4 years). A cutoff period of 4 years of treatment was agreed on because it was considered that a period of 3-4 years is required for patient adjustment to the diagnosis and treatment of a chronic illness [27]. 102 patients (57.6%) had recently commenced treatment (<4 years) while 75 (42.4%) were on long-term treatment (>4 years).

Participants were Greek adults having signed a consent form for participation. All subjects had been informed of their rights to refuse or discontinue participation in the study according to the ethical standards of the Helsinki Declaration. Ethical permission for the study was obtained from the scientific committees of the participating hospitals. The study took place between October 2009 and November 2010.

Procedure

Measurements were conducted with the following instruments:

1. The Medication Adherence Report Scale (MARS) was developed for measurement of adherence to a wide range of medication regimens [28]. The five statements comprising the scale are: "I forget to take my diabetes medicines," "I alter the dose of my diabetes medicines," "I stop taking my diabetes medicine for a while," "I decide to miss out a dose of my diabetes medicine," "I take less diabetes medicine than instructed." The MARS was scored in accordance with standard practice with a maximum score of 25 by summing the score from the five questions, each with a five-point response scale (from "always true" to "never" - scored 1-5) [28]. The higher score reflects higher adherence level. [28]. According to Axelsson (2011), a cutoff point of <20 indicates an abnormal pattern of medication adherence while scores above 20 indicate a normal pattern of medication adherence among patients [29]. This means that a score, which is below 20 points, indicates a problematic pattern of a patient's adherence. On the contrary, the normality of the adherence is related to a score above 20 points. The MARS has previously been used in samples with chronic disease and has shown good internal reliability [29,30]. Specifically, it has been used to assess factors associated with medication non-adherence in patients with COPD indicating its appropriateness and validity [31].
   In this study, the above questionnaire was used to assess patients' adherence to medication that they take as a result of COPD.
2. The Center for Epidemiologic Studies Depression Scale (CES-D) [32,33] is a 20-item self-report measure of depression. Scores range from 0 to 60, with higher scores indicating more symptoms of depression. CES-D scores of 0-15 are considered indicative of not depressive symptomatology, 16-26 are indicative of mild depression, and scores of 27 or more are indicative of severe depression [34]. These classifications have been used in a number of studies [34,35].
3. The Multidimensional Health Locus of Control (MHLC) is a self-report tool measuring a patient's beliefs about control over health outcomes. Health LOC is one of the widely used measures of individuals' health beliefs and has been designed to determine whether patients are internalists or externalists. It includes three orthogonal dimensions (namely, internal, chance, and powerful others). A revised form of the MHLC further subdivides the powerful others scale into two separate scales: Doctors and others [36]. The brief description of the theory explores the fact that health LOC is a degree to which individuals believe that their health is controlled by internal or external factors. Whether a person is external or internal is based on a series of statements. The statements are scored and summed to find the above. Externals refer to the belief that one's outcome is under the control of powerful others (i.e., doctors) or is determined by fate, luck, or chance. Internals refers to the belief the one's outcome is directly the result of one's behavior [36,37]. The 4 categories are not mutually exclusive and scores may weight in a particular direction. Higher scores indicate the stronger presence of the specific dimension of beliefs. In this study, the above questionnaire was used to assess patients' LOC related to COPD.

Statistical Analysis

Kolmogorov–Smirnov tests were performed to check whether the values of the sample would fall within a normal distribution. Statistical analyses were also performed with the use of independent-samples *t*-test and one-way ANOVA to investigate potential effects of psychological as well as socio-demographic factors on medication adherence. Independent-samples *t*-test analysis was used to check differences between patients who recently commenced treatment (<4 years) and those on long-term treatment (>4 years). Finally, to assess the associations between adherence, LOC, depression and duration of treatment, intercorrelations were used. A *P* value of 0.05 or less was considered to indicate statistical significance. All analyses were performed with the Statistical Package for the Social Sciences (SPSS 13.0 for Windows).

RESULTS

The values of the total cohort were found to pass the normality distribution test. Full descriptive clinical data of the sample are presented in Table 1.

Investigating the differences between COPD patients with a normal and those with an abnormal pattern of medication adherence, the results indicated that patients, who were more adherent to medication, showed less depressive symptoms. They also presented higher scores on internal and doctors LOC as well as lower scores on others - attributed LOC [Table 2].

Further, the results of independent-samples *t*-test analysis regarding the differences between patients, who present mild depression as well as patients with severe depression, indicated that patients with severe depression were less medication adherent and less focused on doctors and others - attributed health LOC [Table 2].

Table 1: Clinical characteristics of the sample (*N*=177)

Clinical characteristics	COPD patients
Pattern of adherence (mean±SD)	22.61±2.68
Normal (20-25 score) (mean±SD)	133 (75.1%) (24.02±1.13)
Abnormal (<20 score) (mean±SD)	44 (24.9%) (18.36±0.94)
Degree of depression (mean±SD)	28.89±8.18
No depression (0-15)	0 (00.0%)
Mild depression (16-26)	70 (39.5%)
Severe depression (>26)	107 (60.5%)
Health locus of control dimensions (mean±SD)	
Internal	27.22±3.04
Chance	23.99±6.02
Doctors	15.89±2.53
Others	12.87±3.67

COPD: Chronic obstructive pulmonary disease patients, SD: Standard deviation

Concerning the differences between the two categories of duration of treatment, patients with more than 4 years of treatment presented higher scores of depression and a more internal - attributed LOC. They were also less focused on others - attributed LOC [Table 2].

To assess the associations between adherence, LOC, depression and duration of treatment, inter correlations were used. Medication adherence was associated positively with internal LOC as well as doctors and negatively with depression and duration of treatment [Table 3]. Further, duration of treatment was related positively to internal LOC and depression and negatively to the dimension of others LOC [Table 3].

Regarding the effects of socio-demographic and clinical variables on medication adherence, the results indicated that younger patients (<45 years) were significantly ($P < 0.01$) more adherent (24.50 ± 0.50) than the elders (>45 years) (22.26 ± 2.77). Furthermore, married patients presented significantly ($P < 0.01$) higher scores of medication adherence (23.51 ± 2.07) in comparison to singles (22.58 ± 2.26) as well as divorced/widowed (17.01 ± 0.03). Concerning work status, those who were not working indicated significantly ($P < 0.01$) less adherence (21.97 ± 2.76) than patients who were working (24.66 ± 0.47). There was no statistically significant relation with regards to the variables of gender and level of education. Finally, patients on long-term treatment (>4 years) presented significantly ($P < 0.01$) lower scores of medication adherence

Table 2: Mean scores±SD of depression, medication adherence, and health locus of control dimensions

Scale	COPD patients with an abnormal pattern of adherence (<20) Mean±SD (*N*=44)	COPD patients with a normal pattern of adherence (20-25) Mean±SD (*N*=133)	*P* value
CES-D - Depression	35.47±6.02	26.71±7.63	*P*<0.01
Health locus of control dimensions			
Internal	24.91±3.28	27.98±2.54	*P*<0.01
Chance	22.97±2.20	24.33±6.81	0.04
Doctors	14.25±2.87	16.43±2.15	*P*<0.01
Others	13.66±1.27	12.61±4.14	0.01
Scale	**COPD treatment (<4 years) Mean±SD (*N*=102)**	**COPD treatment (>4 years) Mean±SD (*N*=75)**	
CES-D - Depression	25.60±5.02	33.36±9.46	*P*<0.01
Health locus of control dimensions			
Internal	26.50±3.60	28.20±1.61	*P*<0.01
Chance	24.36±7.52	23.49±2.96	0.29
Doctors	15.87±2.51	15.92±2.57	0.90
Others	14.23±2.64	11.02±4.06	*P*<0.01
Scale	**COPD patients with mild depression (16-26) Mean±SD (*N*=70)**	**COPD patients with severe depression (>26) Mean±SD (*N*=107)**	
MARS - Medication adherence	23.60±1.36	21.97±3.11	*P*<0.01
Health locus of control dimensions			
Internal	27.00±2.20	27.36±3.49	0.39
Chance	23.20±6.96	24.51±5.30	0.18
Doctors	16.40±1.63	15.56±2.93	0.01
Others	13.80±2.33	12.27±4.23	*P*<0.01

N=177. Independent-samples *t*-test showing differences between patients with an abnormal and normal pattern of adherence, the two categories of duration of treatment as well as patients with mild and severe depression. MARS: Medication adherence report scale, CES-D: Center for epidemiologic studies depression, COPD: Chronic obstructive pulmonary disease, SD: Standard deviation

Table 3: Inter-correlations between medication adherence, health locus of control dimensions, depression and duration of COPD treatment

Inter-correlations	MARS-Medication adherence	MHLC-Internal	MHLC-Chance	MHLC-Doctors	MHLC-Others	CES-D-Depression	Duration of COPD treatment
MARS-Medication adherence	-	0.44**	0.06	0.26**	−0.07	−0.42**	−0.43**
MHLC-Internal	-	-	−0.29**	0.41**	−0.13	0.13	0.21**
MHLC-Chance	-	-	-	0.41**	0.02	0.00	−0.08
MHLC-Doctors	-	-	-	-	0.29**	0.06	0.03
MHLC-Others	-	-	-	-	-	−0.26**	−0.23**
CES-D-Depression	-	-	-	-	-	-	0.43**
Duration of COPD treatment	-	-	-	-	-	-	-

**P<0.01; N=177. MARS: Medication adherence report scale, MHLC: Multidimensional health locus of control, CES-D: Center for epidemiologic studies depression, COPD: Chronic obstructive pulmonary disease

(21.69 ± 2.99) than those who recently commenced treatment (<4 years) (23.29 ± 2.21).

DISCUSSION

This study shows a strong correlation of medication adherence to depression as well as health LOC in COPD patients.

Concerning the relation between the dimensions of health LOC and the variable of medication adherence in the total sample, COPD patients, who focus on themselves to face their problems related to the disease, present a higher level of medication adherence. These results correspond to previous findings showing that a higher personal control is associated with better understanding of COPD as well as higher adherence to medication [16]. Most studies that have used the MHLC questionnaire have observed significant associations between adherence and high internal LOC [38]. Individuals who believe that, in general, their actions play a large role in determining their circumstances may tend to adhere to the prescribed treatment regimen because they believe that they can affect their own health [21].

With respect to the relation of medication adherence to external LOC, high powerful others have been shown to be independently related to better adherence [39]. In a study of renal dialysis patients, those who reported high powerful other LOC had the best adherence [40]. Azlin *et al*. have shown in their research regarding LOC among non-adherent hypertensive patients undergoing pharmacotherapy that respondents with external LOC ("doctors") have better drug adherence [41]. In our study, COPD patients who are more adherent focus on the medical staff and less on other people.

It is obvious that adherence emphasizes not only the need for agreement but also the extent to which the patient's behavior matches the agreed recommendations from the prescriber and the prescription.

As far as depression is concerned, the findings have demonstrated the negative association between level of medication adherence and depressive symptoms. COPD patients who report poor QoL and more depressive symptoms are more likely to be poorly adherent to treatment [26]. Furthermore, patients with depression who undergo dialysis report greater feelings of hopelessness, compromising cognitive abilities. Hopelessness, cognitive distortions, and fatigue produce negative expectations of the future that may affect individual ability to carry out prescribed therapies and lead to inadequate fluid and dietary adherence behaviors [42]. Akman *et al*. found double the likelihood of dietary non-adherence in depressed chronic kidney disease (CKD) patients when compared to patients without depression [43]. Further, based on the results of the present study, patients with severe depression are presented less focused on external factors with regards to LOC that is doctors and others. These findings are in agreement with the findings of other studies which have shown that belief in powerful others is associated with lower scores of depression in older people [44]. Further, Meyers has indicated in a study concerning religiosity and health LOC as predictors of depression and anxiety in women with breast cancer that a significant negative correlation was found between powerful others LOC and level of depression [45].

Regarding socio-demographic features and specifically the relation between age and medication adherence, findings are controversial. While some investigators have found older patients to have better adherence, others have shown younger patients to be more successful adherers[46]. Specifically, some previous studies in asthmatic patients have shown that increasing age is associated with increasing adherence [47,48], possibly because older people may have learned from their own experience how best to manage their disease. In this study, there was a significant association between age and adherence, with the majority of the respondents of the older age group (45 years and above) was noted to be non-adherent to the prescribed medication. This could be explained by the fact that in advanced age health problems are different and multiple. The use of amount of pills is greater than in youth causing in this way non-adherence [49]. Moreira *et al*. [49] observed that the average number of daily pills (≥8 pills per day) in older patients and the most advanced stages of CKD were statistically associated with non-adherence to drug therapy. Further, the elderly have memory problem and become forgetful, complexity of drug regimen and have encountered more medication side effects [49].

Further, marital status might influence patients' adherence to medication positively [50]. In our study, patients who are married seem to adhere better than the singles and the divorced or widowed. This is a finding which is in agreement with other studies' results[51]. The help and support from a spouse could be the reason why married patients are more adherent to medication. Other studies have shown that divorced/widowed patients undergoing HD, compared to singles and married, indicate a more compromised QoL, reporting poorer physical health and social relations, more negative perception of their environment, as well as poorer overall QoL/health. On the basis of these findings, married patients seem to experience a better QoL. Similar evidence in the literature indicates that the status of marriage in these patients may be significantly correlated to an enhanced physical and emotional well-being as well as better medication adherence [50,51].

Further, findings have demonstrated that pensioners and homemakers are less adherent to medication treatment. Perhaps, this relates to the fact that pensioners are the older patients who have shown that they are not so good adherers. This finding may also be associated with pensioners' as well as homemakers' lower income in comparison to the income of those patients who have the ability to work and are still productive. The demographic parameter of income is very important because it brings to the surface the matter of cost. Cost is a crucial issue in patient's adherence, especially for patients with chronic disease as the treatment period, could be life-long [52]. Health-care expenditure could be a large portion of living expenses for patients suffering from chronic disease. Cost and income are two interrelated factors. Healthcare cost should not be a big burden

if the patient has a relatively high income or health insurance. A number of studies found that patients who had no insurance cover [53] or who had low income [54] were more likely to be non-adherent to treatment.

With respect to the variable of the duration of treatment, acute illnesses are associated with higher adherence than chronic illnesses [55]. In addition, longer duration of the disease may adversely affect adherence [56]. Similarly, a longer duration of treatment period might also compromise patient's adherence [56]. In one trial that compared 6 and 9 months treatment of tuberculosis, adherence rates were 60% and 50% for the two regimens, respectively [57]. In another study comparing preventive regimens of 3, 6, and 12 months, adherence rates were 87%, 78%, and 68% for the three regimens, respectively [58]. Other studies have indicated that HD patients on long term of treatment had increased deficits in physical, social, and environmental QoL, mental health as well as medication adherence [27].

Limitations in our study warrant mention. First, there is a need for future research to use prospective and longitudinal study designs to examine the interaction between adherence to medication and mental health as well as health beliefs in patients with COPD.

Another methodological issue relates to the sample representativeness. Studies on the broader COPD population and recruiting even larger samples to enable effective multi-group analysis should be pursued in future research.

Further, measuring medication adherence in the COPD population can be impacted by numerous other factors besides medications including comorbid conditions or important behavioral and lifestyle changes such as starting a smoking cessation program, adhering to an exercise program, and wearing oxygen. In future studies, the above variables should be examined using in this way consistent and standardized measures of adherence.

Based on the findings presented above, we could claim that a correlation has been estimated between the variables of medication adherence and depression as well as health LOC. Further research is needed to estimate a potential 'causal' association.

Despite its limitations, the present study demonstrates the importance of psychosocial factors in understanding medication adherence of patients with COPD. It is important for health professionals to identify and attempt to remove their patients' barriers to medication self-management and optimal medication adherence. Staff can impact patient satisfaction with care and include patients as active team members to identify barriers to medication adherence and to create individualized care plans for patients.

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