Socio-demographic Variables and Centrality of Religiosity in Association With Illness Cognitions and Medication Adherence in Romanian People With Chronic Disease.

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Abstract

Objective: The aim of the study was to identify the link between socio-demographic variables and religiosity (named predictors) on the one hand and disease assessment and medication adherence (named criterion variables) on the other. **Methods:** A cross-sectional design was used. The sample consists of 118 (67.2% women) people with chronic illness ages ranging from 18-86 .years. Data were collected during the period December 2018-May 2019, on the Romanian version of the Centrality of Religiosity (CRS 15) Scale, Illness Cognition Questionnaire (ICQ) and Drug Attitude Inventory (DAI 10). Canonical Correlation Analysis (CCA) was used in order to examine the correlation between the two sets of variables. **Results:** Two canonical functions revealed two combination of maximize of the correlations. The analyses showed that a low age (-.55), a high income (0.77) and a high level of religious information (0.40) was associated with a low level of negative consequences of the disease felt in daily life (-0.52), a high level of ability to manage the negative consequences of the disease (0.67) and a low level of adherence (-0.67). The analyses also showed that a high income (0.35), low participation in public religious activities (-0.79), low frequency of personal prayer (-0.40) and minimal religious experiences (-0.66) are associated with low perceived benefits of long-term disease (-0.84) and with low adherence (-0.48). **Conclusion:** The present study suggests a holistic approach to adherence in which the consideration of socio-demographic factors and religiosity can explain the nature of non-adherence.

Keywords: religiosity, medication adherence, illness cognitions, CRS 15, ICQ, DAI 10.

1. Introduction

Medication adherence is a complex phenomenon involving individuals assuming greater responsibility for taking part in health care decisions, and involves a clinician-patient partnership that fits with assisted living communities and medical practice (Gould and Mitty, 2010). Adherence is defined as: "The extent to which patient behavior is consistent with recommendations accepted by the prescriber." It was adopted as an alternative to compliance in an attempt to emphasize that the patient is free to decide whether to adhere to the doctor's recommendation and that this should not be considered a reason to blame the patient. Adherence develops the definition of compliance by emphasizing the need for agreement (Weinman and Horne, 2005). Medication adherence is influenced by several factors including: lifestyle, psychological issues, health information, support systems, perceived medication effects. The patient's personal attributes have the greatest influence on adherence (Cutler and Everett, 2010). Poor adherence to medication regimes contributes substantially to worsening disease, increases

health care costs, and causes death (Osterberg and Blaschke, 2005). The aim of this study was to explore the association of two sets of variables in a sample with people with chronic illness. The first set was composed by socio-demographic characteristics and the five centrality religiosity subscales: intellect (INT), ideology (IDE), public practice (PBP), private practice (PPR) and religious experience (REX). The second set was composed by the three illness cognition subscales: helplessness (HPL), acceptance (ACC), perceived benefits (PBN) and adherence (DAI).

1.1 Religiosity and adherence

At least three ways of the impact of religion on health are known: (a) provide the framework for stress reduction and copping in difficult life situations, (b) provide social support, (c) promote a healthy lifestyle (Aukst-Margetić and Margetić, 2005). Spirituality, religiosity and personal beliefs have been associated with compliance with medication among heart failure patients (Alvarez et al., 2016). Among people with dialysis disabilities, religious beliefs have been associated with life satisfaction, while religious behaviors have been associated with satisfaction with medical care. There were no associations between religiosity and adherence to treatment (Berman et al., 2004). Effects of religion on treatment compliance have been identified among people with schizophrenia and depression, concluding that although religious beliefs and spirituality are an important source of hope and understanding, they may interfere with adherence to treatment (Zagożdżon and Wrotkowska, 2017) . Among people with HIV, religious practices had a positive influence on adherence to treatment, while religious beliefs had a negative influence (Parsons et al. 2006). Religiosity, positive and negative religious coping taken together explained a substantial proportion of the adherence to treatment among epilepsy (Lin et al. 2018). Spirituality/ religiosity dominant among hypertensive patients, was lead to spiritual attachments of patients with a supreme being potentially increased their trust in the expectation of divine healing instead of adhering adequately with their anti-hypertensive medications (Kretchy et al. 2013). Researchers suggests that religious belief and practice involve both ordinary psychological processes and unique psychological-spiritual contents. That assumption reveal that religion exerts its influence through common psychological channels like social support, healthy behavior, a sense of coherence, and medical compliance. On the other hand, by orienting motivation towards matters of ultimate concern and attributing sacredness to ordinary activities, religion also plays a distinctive role in human life (Alves et al. 2010 apud Jones, 2004). Decreasing levels of anxiety, depression and lack of hope, the spirituality and religiosity contribute to increasing psychological well-being, indirectly affecting physical health (Ahmadi et al. 2015). Religious individuals also tend to engage in fewer negative health behaviors (eg, smoking, alcohol consumption, poor diet), perceive themselves as being healthier than the average person, and have decreased mortality and morbidity, compared with those who are less religious (Steffen et al. 2001)

1.2. Illness cognitions and adherence

Disease perceptions are cognitively organized representations or beliefs that patients have about their disease. These representations have been shown to be important determinants of the behavior associated with medication adherence and functional recovery (Petrie et al. 2007 apud

Leventhal et al. 1997). This is indicated by many studies. An analysis of medication adherence studies in older adults with hypertension identified personal, interpersonal, organizational, and social factors as predictors. Personal factors recorded the most predictors in the subcategories of behavioral, biological, psychological agents (Oori et al. 2018). The important role of disease perceptions has helped to predict the results of Hepatitis C treatment, thus providing support for addressing maladaptive perceptions, by including psychological pre-treatment (Langston et al. 2016). Studying the impact of protective factors (acceptance and resilience) and vulnerability (fear, depression, anxiety) on medication adherence and quality of life among patients with cardiovascular disease, it was observed that acceptance predicted adherence to medication among women (Alemán and Wheel, 2018). Previously unknown relationships have been discovered between illness cognitions and cholesterol control, and between illness cognitions and medication adherence in patients with diabetes. Improved levels have been found in patients whose knowledge of the disease matched that of an expert model of hypercholesterolemia (Brewer et al. 2002).

1.3. Current study
The current study explored the association of a set of predictors consisting of socio-demographic variables and the dimensions of religiosity and a set of dependent variables consisting of dimensions of cognitive assessment of the disease and adherence to medication. The aim of the study was to identify associations between socio-demographic variables and religiosity on the one hand and the dimensions of cognitive assessment of disease and medication adherence on the other. With reference to this goal, we assumed that there is a significant association between religiosity and medication adherence among patients with chronic diseases. We have explored the above relationships among a group of adult patients with various chronic physical conditions and associated morbidity. Studies suggests that adults have a higher level of religiosity (Davie and Vincent, 1998) and that among adults, religiosity is associated with fewer depressive symptoms, higher quality of life and less cognitive devaluation (Abdala et al. 2015).

2. Method
A cross-sectional design was used. Data were collected across December 2018-May 2019 and the patients with chronic illnesses were recruited from hospitals, health centers and family doctors network in three city of Romania, on the basis of an informed consent. We have complied the privacy requirment of the data collection sites. Sampling was based on convenience. The study included only patients who agreed to participate. Patients who did not complete all questionnaires were excluded from the study. Participants did not receive any monetary compensation.

2.1 Ethical Considerations
This study is part of the author's doctoral dissertation. The agreement and permission to collect data were obtained on the basis of the report on the purpose of the study, submitted to the institutions. Along with the questionnaires the participants also received a report that revealed the purpose of the study and the anonymity and confidentiality clauses.

2.2 Participants

The study included patients with chronic physical conditions associated with comorbidities. Socio-demographic data included age, gender, marital status, residential environment, educational level, income, religious confession (see Table 1).

Table 1. The socio-demographic characteristics of the participants

Characteristics	Mean (±SD) or n (%)
Age	60.41 (11.80)
Gender	
Male	42 (35.6)
Female	74 (62.7)
Not specified	2 (1.7)
Residential environment	
Village	32 (27.1)
City	84 (71.2)
Not specified	2 (1.7)
Marital status	
Single	8 (6.8)
Married	85 (72.0)
Others	21 (17.8)
Not specified	4 (3.4)
Education level	
Gymnasium	14 (11.9)
Vocational school	17 (14.4)
Lyceum	24 (20.3)
Post-secondary education	11 (9.3)
College	1 (0.8)
University	48 (40.7)
Not specified	3 (2.5)
Income	
Below 1500 RON	28 (23.7)
Between 1500-3000 RON	45 (38.1)
Between 3000-6000 RON	22 (18.6)
Over 6000 RON	17 (14.4)
Religious confession	
Orthodox	69 (58.5)
Seventh-day Adventists	23 (19.5)
Catholics	7 (5.9)
Baptists	5 (4.2)
Pentecostals	3 (2.5)
Others	9 (7.6)
Not specified	2 (1.7)

2.3 Measures

The instruments were translated into Romanian using the forward-backward translation design and following the guidelines given by the literature (Beaton et al. 2000).

2.3.1. To assess religiosity, The Romanian version of Centrality of Religiosity Scale (CRS 15) was administered. The scale is derived from the English version and was validated by the author. The items were formulated in a simple and appropriate language for the concept. The scale consists of 15 items divided in five subscales: intellect (1, 6, 11), ideology (2, 7, 12), public practice (3, 8, 13), private practice (4, 9, 14) and religious experience (5, 10, 15). Each subscale contains three items that measure the objective or subjective frequency or the intensity of personal religious constructs. The measurement is done by five levels of Likert scale, except certain items that have a different coding. For events that may occur less regularly, subjective frequencies are asked in five levels (never, rarely, occasionally, often and very often). For events where the frequency has an insignificant role (eg, belief in something divine), the intensity or importance is evaluated with: not at all, not very much, moderately, quite a bit, very much so. The item that refers to participation on religious service is coded as follows: more than once week and once a week – 5, one or three times a month – 4, a few times a year – 3, less often – 2 and never – 1. The item that refers to objective frequency of prayer is coded as follows: several times a day and once a day – 5, more than once a week – 4, once a week and one or three times a month – 3, a few times a year and less often – 2 and never -1. The subscale results are the average of the items. The total result (CRS 15) is the sum of the subscale's results. For the present sample, the Cronbach alpha for the CRS 15 (mean = 3.95; SD = 0.76) was 0.93. For the subscales, Cronbach alpha were as follows: 0.78 for Intellect (mean = 3.95; SD = 0.76), 0.71 for Ideology (mean = 3.59; SD = 0.96), 0.89 for Public Practice (mean = 3.93; SD = 1.09), 0.77 for Private Practice (mean = 4.27; SD = 0.78) and 0.85 for Religious Experience (mean = 3.56; SD = 0.92). The power of discrimination of the scale may be used for the categorization of the groups according to scores: 1.0 to 2.0 not religious; 2.1 to 3.9 religious and 4.0 to 5.0 high religious (Huber and Huber, 2012; Gheorghe, 2019). The good psychometric qualities of the scale were also obtained in other studies (Zarzycka and Rydz, 2014; Krok, 2015).

2.3.2. To assess illness cognitions, we used a scale adapted from The Illness Cognition Questionnaire (Evers et al. 2001). The scale measures illness cognitions in chronic condition through three subscales in which patients assign the meaning of the disease they are facing. Helplesness refers to the negative consequences of the disease in everyday life, acceptance addresses the recognition of the disease and the ability to manage the negative consequences of the disease, and the perceived benefits relate to the long-term consequences. Measurement is done on the four-levels of Likert scale (1 = not at all, 2 = somewhat, 3 = to a large extent, 4 = complete). The score of the whole scale is achieved by summing the scores of the three subscales. The high scores indicate the presence of the cognitions in the respondent. The scale has good psychometric qualities and is suitable for use in research and clinical practice (Lauwerier et al. 2010; Verhoof et al. 2014). In the present study the Cronbach alpha for the scale was 0.84. For the subscales, Cronbach alpha were as follows: 0.86 for Helplesness (mean =

12.40; SD = 4.35), 0.73 for Acceptance (mean = 15.69; SD = 3.26) and 0.82 for Perceived benefits (mean = 15.41; SD = 4.12).

2.3.3. To assess medication adherence, we used a scale adjusted from Drug Attitude Inventory (DAI 10) (Hogan et al. 1983). The scale contains 10 items with yes/no, response. The scale scores vary between -10 and 10. Scoring below 0 indicates low adherence. The scores between 0-5 indicate average adherence and scores between 6-10 good adherence. Good psychometric qualities have ensured the use of scale in various studies (Saleem et al. 2011). In the current study, the Cronbach alpha of the scale was 0.80 (M = 1.81, SD = 4.90).

2.4 Procedure
Each respondent in the study was provided the anonymity and confidentiality of the responses. Participation in the study was voluntary, based on informed consent. Collecting the answers was done by pencil-paper procedure.

2.5 Statistical Analysis
We conduct preliminary analyses to examine the descriptive statistics and the association of all analyzed variables in the study. For non-normal variables, non parametric tests (Kruskall-Wallis and Mann-Whitney) were conducted to evaluate the possible inter-group differences. The associations between variables in the study were calculated through bivariate correlations between the questionnaire-based variables (religiosity, ilness cognition, medication adherence). We used Canonical Correlation Analysis (CCA) with SPSS v.20 in order to examine the correlation between two sets of variables.

3. Results

3.1 Preliminary analyzes
Based on socio-demographic variables, significant differences were identified in terms of income, education level and age. Respondents with a income below 1500 RON (Mean rank = 30.18) reported a significant ($U = 177.00$; $z = -2.58$; $p = 0.01$) higher level of adherence compared to people with an average income of 3000-6000 RON (Mean rank = 19.55). A significant difference ($U = 108.50$; $z = -3.05$; $p = 0.002$) in the level of adherence was found among people with an income below 1500 RON (Mean rank = 27.63) and those with an income above 6000 RON (Mean rank = 15.38). Individuals with an income ranging from 1500-3000 RON reported a significant ($U = 217.00$; $z = -2.62$; $p = 0.009$) higher level of adherence (Mean rank = 35.18) compared to persons with an income over 6000 RON (Mean rank = 21.76). Significant differences were found (H (5) = 12.29; $p = 0.031$) on adherence by level of education. The results of group comparisons are shown in Table 2.

Tabel 2. Mann-Whitney comparisons

Factor	Grup	N	Mean rank	U	z
DAI	Below 1500 RON	28	30.18	177.00	-2.58**
	Between 3000-6000 RON	22	19.55		
DAI	Below 1500 RON	28	27.63	108.50	-3.05**
	Over 6000 RON	17	15.38		
DAI	Between 15000-3000 RON	45	35.18	217.00	-2.63**
	Over 6000RON	17	21.76		
DAI	Gymnasium	14	19.64	68.00	-2.04*
	Vocational school	17	13.00		
DAI	Gymnasium	14	25.46	84.05	-2.54
	Lyceum	24	16.02		
DAI	Gymnsium	14	45.14	145.00	-3.25
	University	48	27.52		

Note: DAI- adherence; ** $p < 0.01$; $p < 0.05$

3.2 Associations analysis of study variables

Bivariate correlations between the variables included in the first and second sets are shown in Table 2. Age significantly negative correlate with acceptance and significantly positive correlate with medication adherence. Income significantly negative correlate with helplesness and medication adherence and significantly positive correlate with acceptance. Education level significantly negative correlate with helplesness and medication adherence.

Table 2. Bivariate correlation between the variables in set 1 and set 2

	HPL	ACC	PBN	DAI
AGE	0.14	-0.20*	-0.02	0.36**
Income	-0.37**	0.23*	0.09	-0.35**
Education level	-0.32**	0.16	0.09	-0.25**
INT	0.04	0.31**	0.45**	-0.11
IDE	0.03	0.24**	0.37**	-0.04
PPB	0.12	0.20*	0.39**	0.05
PPR	0.10	0.07	0.30**	-0.1
REX	-0.01	0.30**	0.47**	-0.08

Note: INT- intellect; IDE- Ideology; PPB- public practice; PPR- private practice; REX- religious experience; HPL- helplesness; ACC- acceptance; PBN- perceived benefits; DAI- adherence; ** $p < .01$; * $p < .05$.

3.3 Canonical correlation

Canonical Correlation Analysis (CCA) is a multivariate statistical model that facilitates the study of the interrelations between several independent variables and several dependent variables. Canonical correlation identifies the optimal structure or dimensionality of each set of variables

that maximizes the relationship between sets of independent and dependent variables. The canonical correlation does not stop at the derivation of a single relationship between sets of variables, but a series of pairs of canonical variants can be derived. The canonical correlation develops a number of independent canonical functions that maximize the correlation between dependent and independent sets of variables (Hair et al. 1998). The multivariate statistical model used in the study is shown in Figure 1. The canonical correlation analysis was conducted between the first set of variables that included socio-demographic variables and the dimensions of religiosity and the second set that included the dimensions of the illness cognitions and adherence. The number of canonical functions generated was equal to the number of variables in the second set, namely 4 functions. The four canonical correlations varied between 0.22 and 0.58. The first canonical correlation was 0.58 (52% variance explained) the second was 0.51 (35% variance explained), the third was 0.30 (10% variance explained) and the fourth was 0.22 (5% variance explained). Of the four canonical functions, only the first two were statistically significant, with all four dimensions included, $\chi^2 (32) = 3.01$, $p < 0.000$ and the one in which the first dimension was excluded: $\chi^2 (21) = 2.30$, $p < 0.01$.
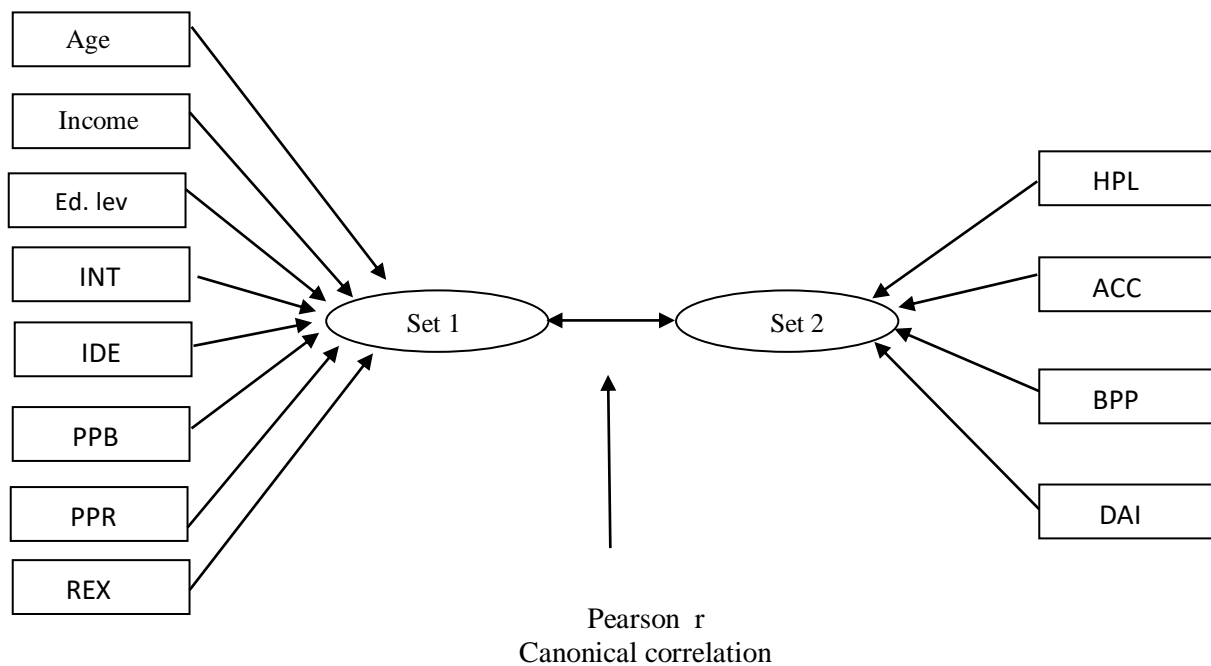

Figure 1. Illustration of the first function in a canonical correlation analysis with eight predictors and four criterion variables. Ed. lev- educational level; INT- intellect; IDE- ideology; PPB- public practice; PPR- private practice; REX- religious experience; HPL- helplesness; ACC- acceptance; BPP- perceived benefits; DAI- adherence.

The other two combinations were not statistically significant. The test results are shown in Table 3. The first test indicates whether all 4 combined sizes are statistically significant. The second

test indicates whether after the elimination of the first dimension, the other three combinations lead to a significant result.

Table 3. Results of testing the four canonical correlations between the two sets of variables.

	Wilk's λ	**χ^2**	df
1	0.42	3.01**	32
2	0.64	2.30**	21
3	0.86	1.27	12
4	0.95	1.02	5

The combination of the last two dimensions, and the last taken alone, are not statistically significant. For the assessment of the contribution of each individual variable, the standardized canonical coefficients were used, which at values above 0.3 indicate the significant contribution of each individual variable.

Table 4. Canonical correlations and standardized canonical coefficients between study variables.

	First Canonical Variate		Second Canonical Variate	
	Correlation	Coefficient	Correlation	Coefficient
Socio-demographic characteristics and religiosity dimensions (set 1)				
Age	-0.55	-0.36	-0.44	-0.30
Income	0.77	0.48	0.35	-0.40
Education level	0.67	0.26	-0.16	-0.19
INT	0.40	0.37	-0.75	-0.25
IDE	0.32	0.02	-0.56	-0.10
PPB	0.16	-0.07	-0.79	-0.51
PPR	0.20	-0.02	-0.40	0.42
REX	0.53	0.21	-0.66	-0.41
Illness cognitions dimensions and DAI (set 2)				
HPL	-0.52	-0.34	-0.32	-0.22
ACC	0.67	0.40	-0.38	0.09
PBN	0.53	0.29	-0.84	-0.89
DAI	-0.67	-0.59	-0.48	-0.43
Eigenvalue	0.52		0.35	
Cr	0.58		0.51	
R^2	0.34		0.26	

*Note***:** INT- intellect; IDE- ideology; PPB- public practice; PPR- private practice; REX- religious experiences; HPL- helplesness; ACC- acceptance; PBN- perceived benefits, DAI- adherence; Cr- canonical correlation; R^2- squared correlation.

Wilks's λ represents an inverse effect size or the amount of variance not shared between the variable sets (Sherry and Henson, 2005). By taking $1 - \lambda$, we found an overall effect of for the full model. For the first canonical function of all dimensions, $R^2 = 0.58$ (1-λ), the model explains 58% of the variance divided between the two sets of variables, and for the second canonical function with 3 variables, $R^2 = 0.36$, the model explains 36% variance divided between the two sets of variables. The analyses showed that a low age (-.55), a high income (0.77) and a high level of religious information (0.40) was associated with a low level of negative consequences of the disease felt in daily life (-0.52), a high level of ability to manage the negative consequences of the disease (0.67) and a low level of adherence (-0.67). The analyses also showed that a high income (0.35), low participation in public religious activities (-0.79), low frequency of personal prayer (-0.40) and minimal religious experiences (-0.66) are associated with low perceived benefits of long-term disease (-0.84) and with low adherence (-0.48). All the statistical tests used to test the proposed model were significant at $p < 0.000$ (Pillais = 0.74; Hotellings = 1.02; Wilks = 0.42; Roys = 0.34).

Discussions
The purpose of the study was to examine the relationship between a set of predictors composed of socio-demographic variables and the dimensions of religiosity and a set of dependent variables composed of dimensions of the illness cognitions and adherence. A number of two canonical functions have been identified, with a variance explained of 58% and 36% respectively. These values suggest that both canonical functions have significant associations that can be interpreted. The results of the first canonical function indicated that low age, high income, and a high level of religious information are associated with a low level of negative consequences of illness felt in everyday life, with a high level of ability to manage the negative consequences of the disease and with low adherence. The second canonical function indicated that high income, low participation in public religious activities, a low frequency of personal prayer, and minimal religious experiences are associated with low perceived benefits of long-term illness and low adherence.

Literature review revealed different results between age and medication adherence. Some studies showed a statistically significant relationship between age and medication adherence: some articles demonstrated that increased age is correlated with higher medication adherence and others studies found no significant relationship. (Krueger et al. 2015). In patients hospitalized for cardiovascular disease, predictors of lower medication adherence included younger age, medicaid insurance and baseline nonadherence (Cohen et al. 2012). Berner et al. (2019) found that older participants were more likely to be medication adherent.

Studies that explored the relationship between income and medication adherence found that middle average income was associated with higher medication adherence (Berner et al. 2019). Not significantly association between medication adherence and income level was found by Moosazadeh and Shafipour, (2017) in patients with hearth failure. The results of a meta-analisys (DiMatteo, 2004) showed that the average of the correlation between income, social status and adherence is generally positive and significant, but this effect is visible in adult studies and in studies using numerical income measurement.

Religiosity has been positively associated with adherence in some studies, and in others, an opposite or mixed effect has been determined (Freire de Medeiros et al. 2017; Badanta-Romero et al. 2018).

The study has some limitations. A first limitation refers to the associations of variables that have been examined in a small number of physically ill patients. Another limitation is the design of the study that does not allow for causal inferences between the variables. The third relates to the degree of generalization of results that is only applicable to adults with chronic illness.

Conclusion

Chronic diseases have negative repercussions on quality of life, severely and negatively affecting physical functioning (Hopman et al. 2009). The present study suggests a holistic approach to medication adherence in which consideration of socio-demographic factors and religiosity can explain the nature of non-adherence in Romanian patients. The results of the study may have implications in medical care.

Declarations

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