Illness Perception, Self-Efficacy, and Medication Adherence in Patients With Coronary Artery Disease: A Path Analysis of Conceptual Model

Soheil Mobini, MSc student[1], Atefeh Allahbakhshian, PhD[1] (iD),
Reza Shabanloei, PhD[1] and Parvin Sarbakhsh, PhD[2]

Abstract

Introduction: Illness perception and self-efficacy in patients with coronary artery disease (CAD) may affect medication adherence, which is one of the most important challenges in disease management in this group of patients.

Objective: The present study aimed to investigate the factors influencing medication adherence in CAD patients, especially the effect of illness perception and self-efficacy.

Methods: This study was cross-sectional and conducted from April to September 2021. A total of 259 patients with confirmed CAD were selected by convenience sampling method based on inclusion criteria. Illness perception, self-efficacy, and medication adherence were investigated using Brief IPQ, SCSES, and MARS_10 questionnaires, respectively. The data were analyzed using the STATA software (version 14) and the regression path analysis method.

Results: Patients had moderate illness perception and high self-efficacy, and 61.8 of them adhered to their medication regimen. Greater illness perception, better self-efficacy, and higher education had a positive effect on medication adherence, and increasing age had a negative effect on it. The final path model shows a good fit of the data in the model ($\chi2$: 0.37, df: 274, $\chi2$/df: 0.36, CFI: 1, IFI: 0.95, TLI: 1.07, and RMSEA: 0.00).

Conclusion: The results of the present study suggest that patients' illness perception can play an important role in predicting self-efficacy in disease management and the level of medication adherence in patients with CAD. To improve self-efficacy and medication adherence, future intervention studies should focus on the patient's illness perceptions and their improvement.

Introduction

Coronary artery disease (CAD) is the most common cause of death in developed and developing countries and has an annual mortality rate of about 7 million (Abubakar et al., 2015; Alizadehsani et al., 2018). In Iran, CAD is the most common cause of death, which accounts for approximately 50% of the death rate per year (Hatmi et al., 2007). This disease can lead to severe consequences such as congestive heart failure, acute pulmonary edema, cardiogenic shock, and a high mortality rate (Hosseinzade et al., 2013). It seems that considering the progressive and chronic nature of CAD, controlling and managing the disease is an important measure (Lindholm & Mendis, 2007). In the meantime,

medication adherence is a modifiable, important behavior, and also a cornerstone of CAD management (Zullig et al., 2017). Today, medication therapy is known as one of the effective approaches for the treatment of CAD patients alone and together with other procedures such as angioplasty

---

[1]Faculty of Nursing and Midwifery, Tabriz University of Medical Sciences, Tabriz, East Azerbaijan, Iran
[2]Faculty of Public Health, Tabriz University of Medical Sciences, Tabriz, Iran

Corresponding Author:
Atefeh Allahbakhshian, Faculty of Nursing and Midwifery, Tabriz University of Medical Sciences, Tabriz, East Azerbaijan, Iran.
Email: atefebakhhsian@gmail.com

and coronary artery bypass surgery (Hinkle & Cheever, 2018). But in the meantime, medication adherence in patients with CAD as a chronic, progressive, and lifelong disease is one of the important challenges facing disease management (Ni et al., 2022). The treatment of chronic diseases is mainly accompanied by the long-term use of many different types of drugs, and improved medication adherence can have a significant effect on the health of patients, but due to insufficient medication adherence, their full benefits are often not realized (Brown & Bussell, 2011). According to the results of studies, the rate of medication non-adherence in heart diseases ranges from 33% to more than 55% (Al-Ganmi et al., 2018; Allahbakhshian & Gholizadeh, 2020). Medication non-adherence can cause adverse consequences such as frequent admissions, increased use of medical services and care costs, reduced quality of life, and increased mortality (Park et al., 2015; Vervloet et al., 2012). Medication adherence is one of the dimensions related to adherence to treatment; in a report, the World Health Organization (WHO) classified the factors of adherence to treatment into five groups: socioeconomic, health care team and system, therapy, patient, and condition-related factors (Organization, 2003). On the other hand, one of the variables that can predict patients' behaviors in disease management, including medication adherence, is illness perception which refers to the patient's organized beliefs about his/her disease and affects adaptive responses, health, and adherence to a healthy lifestyle (Al-Smadi et al., 2016; Miyazaki et al., 2018). Illness perception is the main factor in predicting the patient's presence and active performance in the treatment and subsequent outcomes (Zare et al., 2016). Among these, one of the concepts influencing the behaviors related to disease management in patients with chronic diseases is self-efficacy was defined by bandura in 1977, shows the beliefs and judgments of a person about his/her abilities in performing duties and responsibilities throughout his/her personal life (Park et al., 2015). It is important to determine the factors affecting self-efficacy in improving its level because it is not possible to improve the level of self-efficacy without identifying such factors (Hatef et al., 2018). Meanwhile, illness perception can be effective on self-efficacy in patients with chronic diseases (Mohammadi et al., 2022). Self-efficacy can be considered an effective factor in improving self-care and controlling CAD (Barnason et al., 2003). Although there have been some studies on the relationship between the above variables, this is the first study that simultaneously and comprehensively investigates the relationship between illness perception, self-efficacy and, medication adherence in patients with CAD in a conceptual model and by examining the effect of mediating variables and there is no similar study that has simultaneously examined the relationship between these three variables in this group of patients. Besides, although according to the results of previous studies, having a correct, appropriate and real illness perception may be effective in creating and changing self-efficacy and medication adherence, and effective self-efficacy also plays a role in the medication management and adherence but contradictory and different results have been obtained in some studies that have investigated the relationship between illness perception, self-efficacy and medication adherence, such as the existence of a negative relationship or no significant relationship between the illness perception and self-efficacy with medication adherence (McCulley et al., 2018; Saarti et al., 2016).

Therefore, the present study aims to investigate the relationship between illness perception, self-efficacy, and medication adherence and to identify the direct, indirect, and total effects of demographic, clinical, and behavioral variables on medication adherence and especially focusing on the role of illness perception and self-efficacy in CAD patients.

Review of Literature

In 2018, Miyazaki et al. conducted a study to investigate the relationship between medication adherence and illness perception in patients with atrial fibrillation treated with direct oral anticoagulants. This study determined that illness perception can affect adherence to the medication regimen in patients. The illness perception is one of the factors that can be changed and it is an essential factor in medication adherence in patients with chronic diseases (Miyazaki et al., 2018). In the study conducted by Kim et al. in 2020 with the presence of people with type 2 diabetes aged 50 years and older, it has been reported that illness perception can play an important role as a significant factor in medication adherence and the existence of self-efficacy and medication adherence in good level are among the effective factors for maintaining the desired level of health (Kim et al., 2021b). In 2020, Gutierrez and Sakulbumrungsil published a study aimed at evaluating the factors associated with medication adherence in patients with hypertension in the Philippines in the form of a systematic review. In the results of this study, it is reported that factors such as young age, celibacy, low education level, low health literacy, low knowledge, negative attitude towards the disease, low social support, low self-efficacy, and low illness perception are factors that can go along with poor medication adherence (Gutierrez & Sakulbumrungsil, 2021). In Mohammadi et al.'s study, the relationship between illness perception and self-efficacy is mentioned. In this study, illness perception and self-efficacy had a positive relationship and patients in this study in a high level of illness perception and self-efficacy. The researchers in this study admit that the illness perception should be evaluated in patients who have weak self-control skills and nurses can help patients in this field by carrying out interventions to improve illness perception and self-efficacy (Mohammadi et al., 2022). In the study by Saarti et al. in 2016, approximately 71% of the participants adhered to the medication regimen for high blood pressure.

Those people who had higher scores related to illness perception had lower mean scores of medication adherence, however, no significant statistical relationship was observed between illness perception and medication adherence (Saarti et al., 2016).

Due to a myriad of variables affecting the control and management of chronic diseases, medication adherence in patients plays an integral role in ensuring the effectiveness of healing process. In spite of some preceding studies featuring and exploring the existing relationship between medication adherence and other involved variables such as illness perception and self-efficacy, due to the different results of studies and the unique differences of patients suffering from CAD as a disease with its adverse consequences and high mortality rate, the present study was deemed relevant to subject matter. Therefore, the present study seeks to amend the lack of relevant literature review through careful assessment of factors influencing CAD patient's medication adherence, especially those associated with aforementioned involved variables. In this study, the presented model makes use of the path analysis method conducted simultaneously and for the first time within a controlled group of CAD patients.

Theoretical Framework

In this study, illness perception and self-efficacy were considered as two variables that may be related to medication adherence in patients with CAD. Regarding illness perception and self-efficacy, Leventhal's self-regulatory model and Bandura's theories are mentioned respectively. Leventhal's self-regulatory model was proposed in 1980 and is also known as the common-sense model. Previous studies investigated illness perception based on Leventhal's self-regulatory model and classified this variable into five dimensions: identity, timeline, consequences, cause, and cure/control (Hale et al., 2007). Additional research added illness coherence, concern, and emotional manifestations to these five dimensions, and the control dimension was divided into two dimensions: personal control and treatment control (Moss-Morris et al., 2002). Leventhal believes that people use the advice given to manage their disease when they have a correct illness perception that this can lead to a reduction in mortality, complications, and consequences of the disease and an improvement in quality of life (Leventhal et al., 1992). The researches of Leventhal and his colleagues show that knowing the illness perception leads to the recognition of factors affecting the adaptation and acceptance of the disease process and leads to the improvement of support programs for patients. In addition, it also provides the possibility that the guidelines and nursing programs be designed carefully based on evidence and provide more effective help to respond to the needs of patients (Broadbent et al., 2009). According to Bandura, self-efficacy is a dynamic cognitive process in which a person

evaluates his ability to perform a specific task. According to him, the higher the perceived self-efficacy in people, the more ability they will have in choosing challenging behaviors, the more effort they will have and the more success in doing them, and the more stable they will be when problems arise and people that have a low self-efficacy, they will dedicate less effort to do a task or reach a goal, and they may have a greater desire to leave it. Self-efficacy leads to changes and differences in people's performance, feeling, and thinking (Bandura & Cervone, 1986). Based on the existing theories, we assumed that there is a possibility of a relationship between these two variables with medication adherence. However, the review of the literature observed the contradictory results in studies such as the absence of correlation or positive or negative coefficients in the relationship between variables, which made this study be conducted for the first time in patients with CAD to investigate the effects and relationship between these variables in a model by path analysis.

Methods

Design

This was a cross-sectional and descriptive correlational study from April to September 2021. The article is written in the path analysis method.

Hypotheses

1. Illness perception affects self-efficacy in patients with CAD referred to the specialized heart clinic.
2. Illness perception affects medication adherence in patients with CAD referred to the specialized heart clinic.
3. Self-efficacy affects medication adherence in patients with CAD referred to the specialized heart clinic.
4. Illness perception and self-efficacy are predictors of medication adherence.

Sample

To access research samples, the researcher referred to the cardiovascular medical and training center and its specialized clinic, affiliated to Tabriz University of Medical Sciences from April to September 2021. A total of 259 eligible patients with confirmed CAD were selected and included in the study based on the inclusion criteria and convenience sampling method. The purpose of the study was explained to the participants and if they wanted to participate in the study, informed consent was obtained from them and the questionnaires were completed in the form of separate interviews and receiving information from the patients themselves to avoid bias in the study. The sample size in this study was calculated based on a descriptive

correlation study and using the formula mentioned below, but the article was written based on the path analysis method. One of the minimum sample size recommendations for SEM is 200 which is based on having a sufficient sample size to reduce the likelihood of convergence problems and to obtain unbiased estimates or standard errors. This sample size is enough to perform path analysis, according to the references related to SEM models, which suggest a minimum sample size of 200 (Jackson, 2001).

The standard normal deviate for $\alpha = Z\alpha = 1.9600$
The standard normal deviate for $\beta = Z\beta = 1.2816$
$C = 0.5 * \ln[(1+r)/(1-r)] = 0.2027$
Total sample size $= N = [(Z\alpha + Z\beta)/C]2 + 3 = 259$

Research Tools

Brief Illness Perception Questionnaire

The Brief Illness Perception Questionnaire (BIPQ), developed by Broadbent et al. (2006), was used to assess the patients' illness perception. This questionnaire consists of 9 items that evaluate illness perception based on an 11-point Likert scale. The possible score range for the first eight questions is from 0 to 10. Question 9 is open-ended and ranks from 1 to 3 based on the three items of lifestyle, stress, and heredity as the cause of the disease of the participants from their point of view. The first five items are cognitive perceptions, including consequences, timeline, personal control, treatment control, and identity. Items 6 and 8 investigate emotional aspects including concern and emotional representation and question 7 investigates the understanding of illness or comprehensibility (Broadbent et al., 2006). To compute the total score of illness perception, the reverse scores of items 3, 4, and 7 will be added to items 1, 2, 5, 6, and 8 and the final score range is from 0 to 80. Scores 0–27, 28–55, and 56–80 indicate low, moderate, and high illness perception, respectively. Higher scores mean that participants have considered their disease as a serious and threatening disease, and lower scores indicate a more optimistic view of the disease (Nur, 2018). For this questionnaire, internal consistency reliability has been reported using Cronbach's alpha coefficient ($\alpha = 0.8$) and the total test-retest reliability coefficient for the 6-week interval ranged from 0.42 to 0.75 (Broadbent et al., 2006). The Persian version of the illness perception questionnaire has been confirmed by Bazzazian with appropriate validity and reliability (Bazzazian & Besharat, 2010).

The Sullivan's Cardiac Self-Efficacy Scale

In the present study, Sullivan's Cardiac Self-Efficacy Scale (SCSES) was used to evaluate self-efficacy, which was designed by Sullivan et al. (1998). This questionnaire consists of 16 questions and assesses the patient's self-efficacy based on a 5-point Likert scale ranging from 0 to 4: 0 (not

at all sure), 1 (low), 2 (moderate), 3 (high), and 4 (I am very sure). This questionnaire investigates self-efficacy in three dimensions: control symptoms subscale (questions 1–10), lifestyle-related questions (questions 11–12), and maintain function subscale (questions 13–16) (Fors et al., 2015). The possible score range is 0 to 64. Scores 0–22, 23–32, and 33–64 indicate low, moderate, and high self-efficacy, respectively (Keshavaraz et al., 2020). Sullivan et al. reported a Cronbach's alpha coefficient of 0.90 and 0.87 for symptom control and maintain functioning dimensions, respectively (Sullivan et al., 1998). In Iran, Varaei et al. have investigated the validity and reliability of this questionnaire, and the reliability of this questionnaire has been reported ($\alpha = 0.97$) (Varaei et al., 2017).

The Medication Adherence Report Scale

The MARS-10 questionnaire was designed by Katherine Thompson and consists of 10 items with yes–no answer format and evaluates three dimensions related to medication adherence: the patient's behavioral dimension in medication adherence (questions 1–4), the patient's attitude towards medication adherence (questions 5–8), and the evaluation of the patient's attitudes to negative side effects towards taking medication from their point of view (questions 9–10). The score range is 0 to 10, scores 5 and below indicate medication non-adherence, and 6 and above indicate medication adherence (Wang et al., 2020). It is expected that the patient will answer yes to questions 7 and 8 and answer no to other questions with a positive attitude and medication adherence (Prabahar et al., 2020). Cronbach's alpha coefficient of this questionnaire was calculated as 0.75 (Thompson et al., 2000). In Iran, the validity and reliability of the Persian version of this questionnaire on patients with bipolar disorders have been confirmed ($\alpha = 0.82$) (Javadpour et al., 2013).

The Abbreviated Mental Test

In this study, the Abbreviated Mental Test (AMT) questionnaire was used to evaluate the cognitive status of the participants. This questionnaire was first designed by Hodkinson in 1972 (Hodkinson, 1972) and contains 10 questions, each question has one score and scores between 7 and 10 indicate the absence of cognitive disorders and a normal state (de Caso et al., 1994). The psychometry of this tool was done in 2014 by Foroughan et al. in Iran and the validity and reliability of the Persian version of the AMT have been appropriate ($\alpha = 0.76$) (Bakhtiyari et al., 2014).

Demographic and clinical data of patients were also collected using a standardized questionnaire.

Inclusion/Exclusion Criteria

Inclusion criteria included: (1) Being at least 18 years old, (2) Patients with CAD confirmed by a cardiologist, (3) Ability to take medications independently, (4) The ability to communicate, (5) CAD diagnosed at least 6 months ago (Gholami et al., 2018), (6) Being treated with cardiac drugs, (7) Absence of psychiatric disorders according to the patient's medical record, (8) Absence of cognitive disorders (assessed by the AMT questionnaire), (9) Willingness to participate in the study. Exclusion criteria included: (1) Patients in the acute stage of the disease, (2) Having a malignant or difficult to cure disease, (3) Declaring dissatisfaction and unwillingness to continue participating in the study.

Institutional Review Board Approval

For anonymity, the information in this section is not included in the main text.

Statistical Analysis

Data analysis was carried out by the path analysis method to determine the direct, indirect, and total effects of behavioral, clinical, and demographic variables on medication adherence in STATA ver. 14. Path coefficients were all standardized. In this study, the reported *p*-value for the path coefficients demonstrates the significance of the relationships between the variables. The significance level bar was considered .05, and as a result, a *p*-value of less than .05 was considered significant. Also, chi-square/df of ≤ 2, comparative fit index (CFI) of ≥ 0.95, Tucker-Lewis index (TLI) of ≥ 0.95, and root mean square error approximation (RMSEA) of < 0.06 were used to evaluate the model fit (Fabrigar et al., 1999). This sample size was big enough to allow the inclusion of 16 independent variables in the path regression analysis. The recommended sample size for pass analysis is a minimum of 10 subjects for each included variable (Kline, 2015). As mentioned earlier, demographic, clinical, and behavioral variables were included in the model, and the hypothetical relationships between these variables are shown in Figure 1.

Results

Sample Characteristics

A total of 259 eligible patients with confirmed CAD were included in the present study. Table 1 shows the demographic and clinical characteristics of the participants. The mean $\pm$ SD of participants' age was 63.05 ± 6.31 years. More than half of the participants were men (68.7%) and 97.3% of the participants were married. A total of 93.8% of the participants had an associate degree and below and others had a bachelor's and MA. The majority of the participants were

self-employed (45.9%). Most of the participants lived in cities (93.1%) and 6.9% lived in villages. A total of 75.7% of study subjects had no sufficient income. Among the underlying diseases, hypertension, diabetes, and hyperlipidemia, hypertension was the most prevalent disease (65. 3%). Antiplatelet drugs (78.8%) were the most common drugs used by the participants. A total of 38.6% and 8.1% of participants had a history of angiography and coronary artery bypass graft, respectively. The ejection fraction in most participants (62.6%) was in the range of 40%–50%.

Illness perception, self-efficacy, and medication adherence status are shown in Table 2 and the direct, indirect, and total effects of demographic, clinical, and behavioral variables on medication adherence are also shown in Table 3. Moreover, the results showed direct, indirect, and total effects of demographic, clinical, and behavioral variables on medication adherence, although all these effects were not significant. It should be noted that illness perception and self-efficacy were also influenced by some demographic, clinical, and behavioral variables (Al-Smadi et al., 2016; Sarkar et al., 2007) (Figure 2). Furthermore, the mean $\pm$ SD of illness perception was 44.45 ± 3.22, which showed a moderate illness perception. Results also demonstrated that the mean $\pm$ SD of self-efficacy was 34.06 ± 7.57, which indicates a high self-efficacy level. Also, more than half of the participants (61.8%) adhered to their medication regimen (mean $\pm$ SD $= 6.01 \pm 1.09$). Table 4 shows the response rate to questions of the medication adherence questionnaire.

Illness Perception and Self-Efficacy

Regarding the effect of behavioral variables, illness perception had a direct effect on self-efficacy, and people with a higher illness perception had a more favorable self-efficacy.
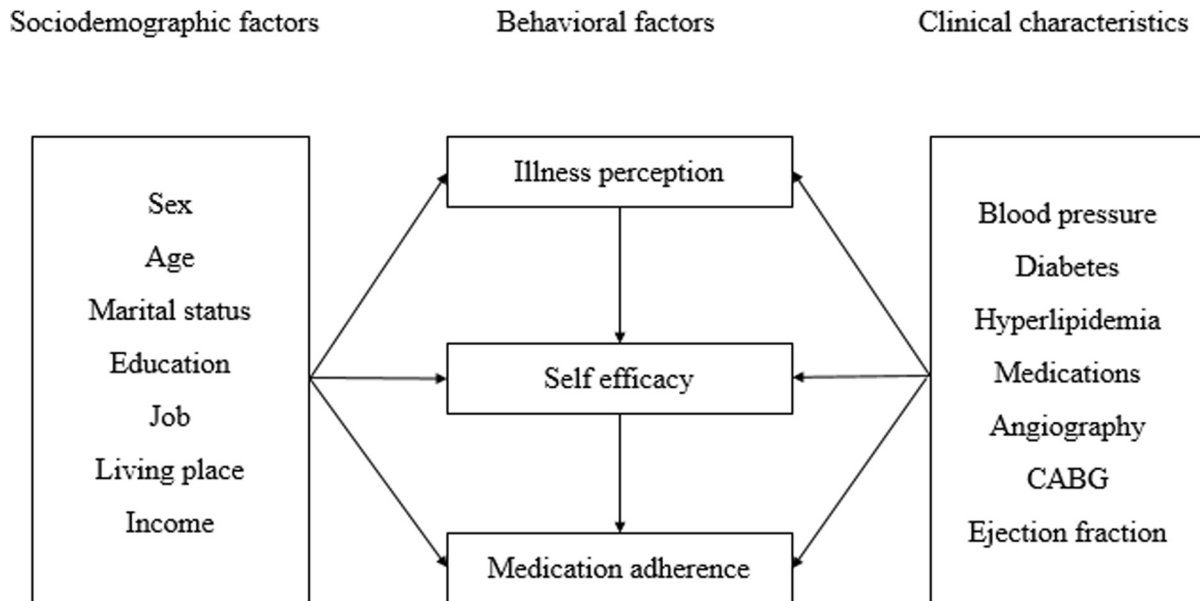
Illness Perception and Medication Adherence

Illness perception also had an indirect effect on medication adherence, that is, a perception of the threatening and serious conditions of the disease led to better medication adherence. Illness perception also had an indirect effect on medication adherence through self-efficacy.

Self-Efficacy and Medication Adherence

Self-efficacy had a direct effect on medication adherence, and higher self-efficacy had a positive effect on medication adherence.

Results of the present study also revealed that greater illness perception ($\beta = 0.03$), better self-efficacy ($\beta = 0.09$), and higher education ($\beta = 0.2$) had a positive effect on medication adherence, and increasing age ($\beta = -0.05$) had a negative effect on it. Table 5 shows a summary of the final state of the studied model, which indicates the good fit of the data

Figure 1. Self-efficacy can be influenced by the illness perception and influence the medication adherence. Also, behavioral variables can be influenced by demographic and clinical variables.

in the model ($\chi 2$: 0.37, df: 274, $\chi 2$/df: 0.36, CFI: 1, IFI: 0.95, TLI: 1.07, and RMSEA: 0.00).

Discussion

The present study aimed to investigate medication adherence determinants in CAD patients, especially the effect of illness perception and self-efficacy. CAD is one of the most important challenges facing the health system in every country. CAD prevalence is directly related to increasing age and can affect a significant part of the population (Duncan et al., 1996). Medication adherence is the cornerstone of CAD management (Zullig et al., 2017). Medication non-adherence can cause adverse clinical outcomes. In this group of patients, such frequent admissions increased mortality (Park et al., 2015). Medication adherence is a multifactorial phenomenon and is influenced by several factors, therefore, it is important to identify these factors because non-adherence has a negative effect on the effectiveness and costs of treatment under chronic conditions with long-term treatments (Gast & Mathes, 2019; Sabaté & Sabaté, 2003). This was the first study that investigated the relationship between illness perception, self-efficacy, and medication adherence in CAD patients. Data analysis was carried out using the path analysis method that made it possible to more accurately investigate the interactions between multiple factors and thus determine the direct, indirect, and total effects of demographic, clinical, and behavioral variables on medication adherence. Results showed that more than half of the participants (61.8%) adhered to their medication regimen, which is consistent with previous studies (He et al., 2022; Pedersen et al., 2022; Silva Tinoco et al., 2021). It was also shown that greater illness perception, better self-efficacy, and higher education had

a positive effect on medication adherence, and increasing age also had a negative effect on it. It is important to identify medication adherence determinants, including demographic, behavioral, and clinical variables, to improve the medication adherence status and prevent the subsequent consequences. Medication adherence can reduce the mortality rate in this group of patients by 20% within 1 year (Kulkarni et al., 2006). As we mentioned earlier, 61.8% of the participants adhered to their medication regimen. However, different degrees of medication adherence have been reported in different studies. The medication adherence rates among CAD patients were reported at 42.9% in one study (Padilha et al., 2021) and 70.9% in another one (Silva Tinoco et al., 2021). In another study, the rate of non-compliance to medication regimen in this group of patients was reported as 70% (Allahbakhshian & Gholizadeh, 2020) and in a study on patients, after cardiac angiography, only 32% of patients had a high level of adherence to the drug regimen (Allahbakhshian et al.). In another study on medication adherence in patients with chronic diseases (diabetes, hypertension, or both) in Saudi Arabia, Prabahar et al. reported that 76.44% of patients adhered to their medication regimen (Prabahar et al., 2020). Overall, medication adherence in people with chronic disorders is estimated to be approximately 50% on average (Sabaté & Sabaté, 2003). However, to achieve acceptable treatment outcomes in people with chronic diseases, the average adherence to treatment including medication adherence should be 80% or higher (Basım et al., 2021). However, differences in demographic and clinical variables and questionnaires used in previous studies may affect these results.

As mentioned earlier, greater illness perception, better self-efficacy, and higher education had a positive effect on

Table 1. Sociodemographic and Clinical Characteristics of the Participants (n = 259).

Variable		Number(Percent)
Sex	Male	178(68.7)
	Female	81(31.3)
Age	63 ≥	112(43.2)
	> 63	147(56.8)
Marital status	Married	252(97.3)
	Single	1(0.4)
	Widow	6(2.3)
Education level	Primary	58(22.4)
	Less than a diploma	71(27.4)
	Diploma	84(32.4)
	Associate degree	30(11.6)
	Bachelor	14(5.4)
	Master's degree	2(0.8)
Job	Government job	6(2.3)
	Self-employment	119(45.9)
	Retired	53(20.5)
	Housewife	81(31.3)
Place of living	City	241(93.1)
	Village	18(6.9)
Income	Income < Expenses	196(75.7)
	Income = Expenses	63(24.3)
	Income > Expenses	0(0)
History of angiography	Yes	100(38.6)
	No	159(61.4)
History of CABG	Yes	21(8.1)
	No	238(91.9)
EF	< 30	8(3.1)
	30–40	35(13.5)
	40–50	162(62.6)
	50 >	26(10)
	No information available	28(10.8)
Medications	Beta-blockers	137(52.9)
	Angiotensin-converting enzyme inhibitors	43(16.6)
	Angiotensin receptor blockers	112(43.2)
	Calcium channel blockers	22(8.5)
	Nitrates	159(61.4)
	Statins	168(64.9)
	Diuretics	24(9.3)
	Anticoagulants	204(78.8)
	Gastrointestinal	83(32)
	Non cardiac drugs	58(22.4)
History of hypertension	Yes	169(65.3)
	No	90(34.7)
History of diabetes	Yes	73(28.2)
	No	186(71.8)
History of hyperlipidemia	Yes	52(20.1)
	No	207(79.9)

CABG = coronary artery bypass graft; EF = ejection fraction.

medication adherence and increasing age had a negative effect on it. High education increases the probability of medication adherence and vice versa (Ni et al., 2019). In a study on CAD patients, Lu et al. found that people with higher education had better medication adherence (Lu et al., 2020). However, there are some studies indicating the lack of any relationship between these two variables (Shariatinia, 2018). There are several studies on the effect of age on medication adherence. Some previous studies on CAD patients showed no significant relationship between age on medication adherence (Padilha et al., 2021; Zyryanov et al., 2020). However, results of a systematic review of cancer patients

Table 2. The Mean (SD) Scores of Illness Perception, Self-Efficacy, and Medication Adherence (*n* = 259).

Variable	Score	Category	N(%)	Mean(SD)
The BIPQ	0–27	Low illness perception	0(0)	44.45(3.22)
	28–55	Moderate illness perception	258(99.6)	
	56–80	High illness perception	1(0.4)	
The SCSES	0–22	Low self-efficacy	16(6.2)	34.06(7.57)
	23–32	Moderate self-efficacy	89(34.4)	
	33–64	High self-efficacy	154(59.4)	
The MARS_10	0–5	Non-compliance	99(38.2)	6.01(1.09)
	6–10	Compliance	160(61.8)	

BIPQ = Brief Illness Perception Questionnaire; SCSES = Sullivan's Cardiac Self-Efficacy Scale; MARS_10 = Medication Adherence Rating Scale_10.

Table 3. The Standardized Direct, Indirect, and Total Effects of Different Sociodemographic, Behavioral, and Clinical Factors on Medication Adherence (*n* = 259).

Variables	Direct effects	Indirect effects	Total effects	*p*-values
Sex	0.04	0.36	0.4	.13
Age	−0.01	−0.04	−0.05	**.00**
Marital status	0.31	0.09	0.41	.2
Education	0.02	0.18	0.2	**.00**
Job	0.02	0.04	0.07	.53
Living place	−0.34	0.17	−0.17	.44
Income	0.01	0.14	0.15	.23
Blood pressure	0.2	−0.07	0.13	.23
Diabetes	−0.07	0.02	−0.05	.62
Hyperlipidemia	0.05	0.07	0.12	.3
Beta-blockers	0.14	0.04	0.19	.19
Angiotensin-converting enzyme inhibitors	0.007	0.05	0.06	.75
Angiotensin receptor blockers	0.01	0.03	0.04	.74
Calcium channel blockers	0.02	0.17	0.19	.44
Nitrates	0.07	−0.07	0.003	.97
Statins	0.13	0.05	0.18	.1
Diuretics	−0.03	−0.22	−0.25	.16
Anticoagulants	0.21	−0.01	0.2	.09
Gastrointestinal drugs	0.04	0.02	0.07	.39
Non cardiac drugs	−0.09	−0.05	−0.14	.26
Angiography	−0.002	−0.03	−0.03	.78
CABG	−0.2	−0.01	−0.21	.28
EF	0.002	0.03	0.04	.57
Illness perception	0	0.03	0.03	**.00**
Self-efficacy	0.09	0	0.09	**.00**

CABG = coronary artery bypass graft; EF = ejection fraction.

treated with oral anticancer drugs showed the best medication adherence among the middle age and poor medication adherence among younger and older people (Mathes et al., 2014). Participants had a moderate illness perception (44.45 ± 3.22). Similarly, Nur et al. reported moderate illness perception among patients with ischemic heart disease (Nur, 2018).

Illness Perception and Self-Efficacy

The present study showed that illness perception had a direct effect on self-efficacy. Patients with greater illness perception had a greater ability to perform activities and behaviors related to self-efficacy. A total of 59.4% of the participants had high self-efficacy (34.06 ± 7.57). In a study on CAD patients, Barham et al. reported that the self-efficacy score was 34, which this score was at a moderate level according to the number of questions and rating scales (Barham et al., 2019). Illness perception can be effective in improving self-efficacy in chronic diseases (Mohammadi et al., 2022). The results of Mohammadi et al.'s study also confirm this relationship. They showed a significant and positive relationship between illness perception and self-efficacy in patients with type 2 diabetes, that is, patients with a greater perception of illness conditions, including the effect of the disease on their lives, had more abilities in performing activities related to self-efficacy and disease management (Mohammadi et al., 2022). However, Knowles et al. found a significant but negative relationship between these two variables (Knowles et al., 2020). Al-Amer says that the relationship between illness perception and self-efficacy can be a theoretical sequence in which illness perception can predict self-efficacy. In fact, a person's general idea about his/her illness can have a better effect on his/her self-confidence to achieve certain skills or the ability to perform self-care activities (Al-Amer et al., 2016). In their study on patients with type 2 diabetes, Kim et al., except for the two dimensions of the illness perception questionnaire, referred to other dimensions as strong predictors of self-efficacy in disease management (Kim et al., 2021a).

Illness Perception and Medication Adherence

The present study showed that illness perception indirectly affected medication in such a way that is people who perceived their illness as a serious and threatening disease had better medication adherence behaviors. Strengthening and increasing patients' illness perception can be considered a basic strategy in educational interventions to increase medication adherence (Doust Mohammadi et al., 2018). Consistent with the present study, DoustMohammadi et al.
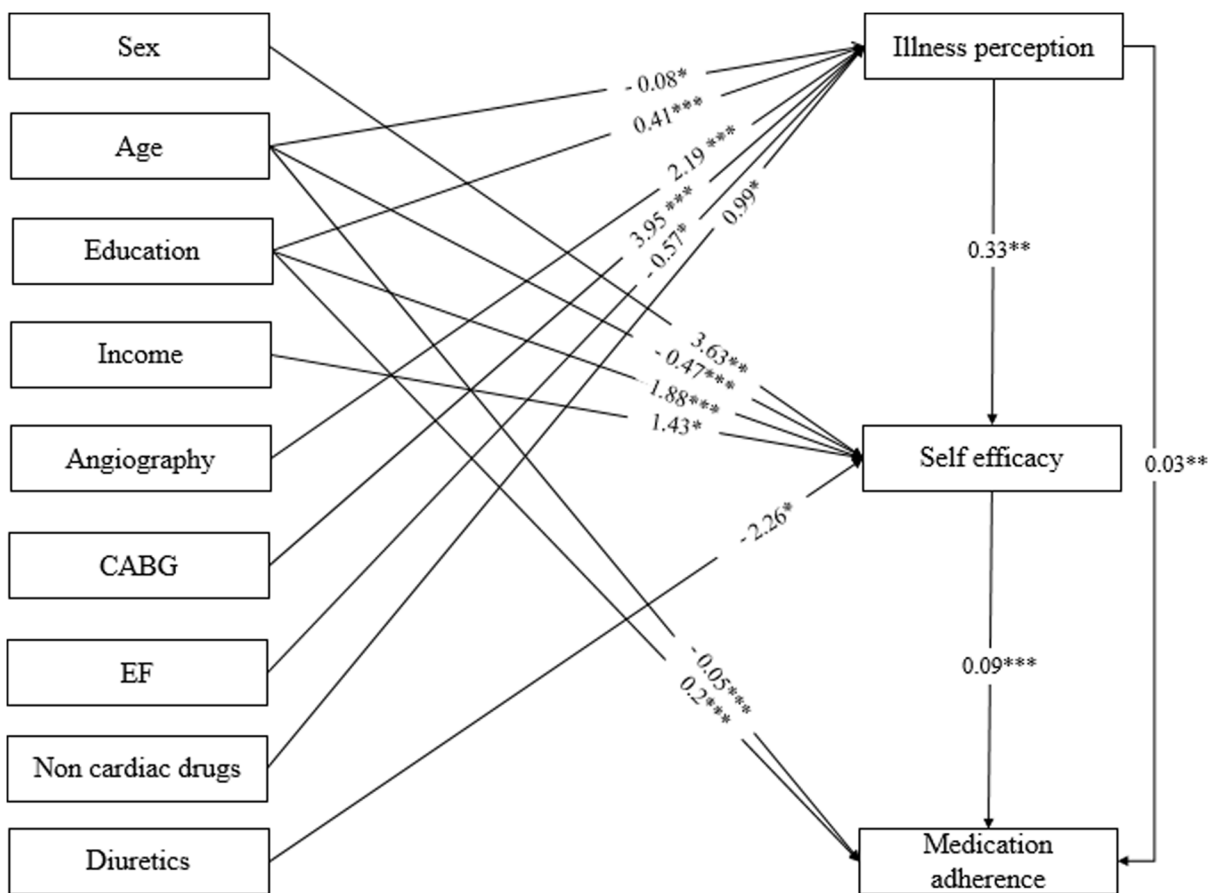
Figure 2. Standardized path coefficients and the interaction between the variables, which has shown only statistically significant paths (*p* < .05). **p* < .05; ***p* < .01; ****p* < .001.

Table 4. Participants' Trends Toward Medication Commitment (*n* = 259).

Questions	Yes, N(%)	No, N(%)
Do you ever forget to take your medication?	112(43.2)	147(56.8)
Are you careless at times about taking your medication?	171(66)	88(34)
When you feel better, do you sometimes stop taking your medication?	42(16.2)	217(83.8)
Sometimes if you feel worse when you take the medication, do you stop taking it?	97(37.5)	162(62.5)
I take my medication only when I am sick.	251(96.9)	8(3.1)
It is unnatural for my mind and body to be controlled by medication.	194(74.9)	65(25.1)
My thoughts are clearer on medication.	247(95.4)	12(4.6)
By staying on medication, I can prevent getting sick.	248(95.8)	11(4.2)
I feel weird, like a 'zombie' on medication.	96(37.1)	163(62.9)
Medication makes me feel tired and sluggish.	39(15.1)	220(84.9)

Table 5. Summary of Final Model Fit Statistics.

Model fit index	Value
$\chi 2$	0.37
df	274
$\frac{\chi}{df}$	0.36
CFI	1
TLI	1.07
IFI	0.95
RMSEA	0.00
90% CI	0.00–0.14
SRMR	0.001

$\chi 2$ = Chi-square test; df = degree of freedom; CFI = comparative fit index; TLI = Tucker–Lewis index; IFI = incremental fit index; RMSEA = root mean square error of approximation; CI = confidence intervals; SRMR = standardized root mean square residual.

confirmed the significant relationship between illness perception and medication adherence (Doust Mohammadi et al., 2018). Miyazaki et al. also reported in their study that

illness perception is a fundamental and effective factor for medication adherence in patients with chronic diseases (Miyazaki et al., 2018). However, in a study of hypertensive patients, Saarti et al. reported that the average illness perception score was higher in people with poor medication adherence, although this study showed no relationship between illness perception and medication adherence (Saarti et al., 2016).

Self-Efficacy and Medication Adherence

The results of the present study revealed that more than half of the participants adhered to their medication regimen (61.8%) and had a high level of self-efficacy (59.4%). In this study, self-efficacy had a direct and positive effect on medication adherence. Self-efficacy can be considered an effective factor in improving self-care and CAD management (Barnason et al., 2003) and facilitating medication adherence (Martos-Méndez, 2015), which is consistent with the results of some studies. In a study titled medication adherence and predictive factors in patients with cardiovascular disease, Al-Ganmi et al. found that self-efficacy was significantly effective on medication adherence (Al-Ganmi et al., 2019). Shen et al. also found a significant and positive relationship between self-efficacy and medication adherence and referred to self-efficacy as an independent predictor of medication adherence (Shen et al., 2020). However, in a study of a group of adults with rheumatoid arthritis, McCulley et al. reported that people with higher self-efficacy had poorer medication adherence. In this study, the researchers said that the reason for this result is unclear. Still, they have speculated that patients with better self-managing skills or believing in it, so might decide not to take their medication regularly. It is also possible that the current results reflect the effect of confounding variables (McCulley et al., 2018). In a study, Daniali et al. reported no correlation between self-efficacy and medication adherence in patients with chronic disease (Daniali et al., 2017). Poor illness perception and self-efficacy at a low level can be associated with poor medication adherence (Gutierrez & Sakulbumrungsil, 2021).

Limitations of the Study

This study was cross-sectional and there is a possibility of changing people's attitudes and behaviors in the long term, which can affect the results. Since the questionnaire used in this study to investigate medication adherence also recorded the attitude of the patients towards the medication use and its side effects, the experience and attitude of the participants towards the disease-related conditions have an impact on their medication adherence. In addition, self-reported questionnaires were used to evaluate the behavioral variables, which may have influenced the study's rigor.

Recommendations

The present study evaluated illness perception and self-efficacy as two behavioral variables affecting medication adherence. Moreover, the effect of demographic and clinical variables was also investigated. However, variables such as health literacy, social support, mental health, quality of life, and other psychological, social, cultural, and spiritual factors can affect the studied variables, which are recommended to be considered in future studies. Variables that, even though they may even be identifiable, cannot be accurately controlled have not been evaluated in the present study. It seems that the participants' attitudes and experiences of the disease, which are always personal and unique attitudes for each person, have been able to have an impact on the results of the present study. This was a cross-sectional study and the perceptions and beliefs of people with chronic disorders will change over time. Therefore, it is suggested to evaluate the patients' illness perception in the long term and groups with a larger population, and its relationship with other variables and their effects, as mentioned earlier, should be considered because this case may increase the generalizability of the study.

Implications for Practice

Considering the importance of management and control of chronic diseases, among which medication adherence plays one of the most important roles in this field, evaluating the level of illness perception in patients and then trying to improve it and improve the abilities of patients, all of them can be effective in improving medication adherence, among which health professionals, especially nurses, due to their greater communication with patients and their active presence can play an important role in this matter by assessing the illness perception and ability of patients. In addition, the results of this study showed the effects of some demographic and clinical variables on the main variables. For example, low levels of education and increasing age are among the factors that have influenced medication adherence, as a result, nurses should focus more on this group of patients in their care and training considering these issues.

Conclusions

The present study proved the effects of the behavioral variables, that is, of illness perception and self-efficacy, on medication adherence in CAD patients. Participants had moderate illness perception, and also high self-efficacy, and more than half of the participants adhered to the drug regimen. A person's interpretation and illness perception in the face of a health threat and higher self-efficacy can affect a person's confidence in developing a specific skill or ability to change health behaviors (Lau-Walker, 2006; Schwarzer & Warner, 2013). Since the responsibility for the successful

management of a chronic disease should not rest solely with the patient (Wolf et al., 2007), health professionals, especially nurses, can play an effective role in this regard. They can evaluate the patient's perception of their illness, predict their self-efficacy, and act to improve it (Lau-Walker, 2004). Nurses also can play an important role in improving medication adherence in people with chronic disorders by assessing the severity of the disease, the patient's functional status, communication systems, monitoring educational programs, strengthening health literacy, and patient awareness (Lee et al., 2017).

Author Contributions

Soheil Mobini: contributed to the conception of this study and gathering the data. Atefeh Allahbakhshian: contributed to the conception and design of this study and supervised the whole study process. Reza Shabanloei: contributed to the conception and design of this study. Parvin Sarbakhsh: contributed to the analysis of the data of this study.

Declaration of Conflicting Interests

Funding

Institutional Review Board Approval

ORCID iD

Atefeh Allahbakhshian ⓘD https://orcid.org/0000-0003-2367-3577

References

Abubakar, I., Tillmann, T., & Banerjee, A. (2015). Global, regional, and national age-sex specific all-cause and cause-specific mortality for 240 causes of death, 1990-2013: A systematic analysis for the global burden of disease study 2013. *Lancet*, *385*(9963), 117–171. https://doi.org/10.1016/S0140-6736(14)61682-2

Al-Amer, R., Ramjan, L., Glew, P., Randall, S., & Salamonson, Y. (2016). Self-efficacy, depression, and self-care activities in adult Jordanians with type 2 diabetes: The role of illness perception. *Issues in Mental Health Nursing*, *37*(10), 744–755. https://doi.org/10.1080/01612840.2016.1208692

Al-Ganmi, A. H. A., Al-Fayyadh, S., Abd Ali, M. B. H., Alotaibi, A. M., Gholizadeh, L., & Perry, L. (2019). Medication adherence and predictive factors in patients with cardiovascular disease: A comparison study between Australia and Iraq. *Collegian*, *26*(3), 355–365. https://doi.org/10.1016/j.colegn.2018.10.002

Al-Ganmi, A. H. A., Perry, L., Gholizadeh, L., & Alotaibi, A. M. (2018). Behaviour change interventions to improve medication adherence in patients with cardiac disease: Protocol for a mixed methods study including a pilot randomised controlled trial. *Collegian*, *25*(4), 385–394. https://doi.org/10.1016/j.colegn.2017.10.003

Alizadehsani, R., Hosseini, M. J., Khosravi, A., Khozeimeh, F., Roshanzamir, M., Sarrafzadegan, N., & Nahavandi, S. (2018). Non-invasive detection of coronary artery disease in high-risk patients based on the stenosis prediction of separate coronary arteries. *Computer Methods and Programs in Biomedicine*, *162*, 119–127. https://doi.org/10.1016/j.cmpb.2018.05.009

Allahbakhshian, A., & Gholizadeh, L. (2020). Is beliefs about medication a factor in adherence to the medicine in patients undergoing coronary angioplasty? *Crescent Journal of Medical and Biological Sciences*, *7*(3), 414–420.

Allahbakhshian, A., Nazif, R., Ghahramanian, A., Tabrizi, F. J., & Ostovar, S. (2021) Predictors of Iranian patients' medication adherence after coronary angioplasty. *Morbidity and Mortality*, *3*(6), 10.

Al-Smadi, A. M., Ashour, A., Hweidi, I., Gharaibeh, B., & Fitzsimons, D. (2016). Illness perception in patients with coronary artery disease: A systematic review. *International Journal of Nursing Practice*, *22*(6), 633–648. https://doi.org/10.1111/ijn.12494

Bakhtiyari, F., Foroughan, M., Fakhrzadeh, H., Nazari, N., Najafi, B., Alizadeh, M., & Mostafa, Q. (2014). Validation of the Persian version of abbreviated mental test (AMT) in elderly residents of Kahrizak charity foundation. *Iranian Journal of Diabetes and Metabolism*, *13*(6), 487–494.

Bandura, A., & Cervone, D. (1986). Differential engagement of self-reactive influences in cognitive motivation. *Organizational Behavior and Human Decision Processes*, *38*(1), 92–113. https://doi.org/10.1016/0749-5978(86)90028-2

Barham, A., Ibraheem, R., & Zyoud, S. e. H. (2019). Cardiac self-efficacy and quality of life in patients with coronary heart disease: A cross-sectional study from Palestine. *BMC Cardiovascular Disorders*, *19*(1), 1–12. https://doi.org/10.1186/s12872-019-01281-7

Barnason, S., Zimmerman, L., Nieveen, J., Schmaderer, M., Carranza, B., & Reilly, S. (2003). Impact of a home communication intervention for coronary artery bypass graft patients with

ischemic heart failure on self-efficacy, coronary disease risk factor modification, and functioning. *Heart & Lung*, *32*(3), 147–158. https://doi.org/10.1016/S0147-9563(03)00036-0

Basım, P., Argun, D., & Özdenkaya, Y. (2021). Self-reported medication adherence in differentiated thyroid cancer survivors: Role of illness perception and medication beliefs. *Head & Neck*, *43*(2), 428–437. https://doi.org/10.1002/hed.26488

Bazzazian, S., & Besharat, M. A. (2010). Reliability and validity of a Farsi version of the brief illness perception questionnaire. *Procedia-Social and Behavioral Sciences*, *5*, 962–965. https://doi.org/10.1016/j.sbspro.2010.07.217

Broadbent, E., Ellis, C. J., Thomas, J., Gamble, G., & Petrie, K. J. (2009). Further development of an illness perception intervention for myocardial infarction patients: A randomized controlled trial. *Journal of Psychosomatic Research*, *67*(1), 17–23. https://doi.org/10.1016/j.jpsychores.2008.12.001

Broadbent, E., Petrie, K. J., Main, J., & Weinman, J. (2006). The brief illness perception questionnaire. *Journal of Psychosomatic Research*, *60*(6), 631–637. https://doi.org/10.1016/j.jpsychores.2005.10.020

Brown, M. T., & Bussell, J. K. (2011). Medication adherence: WHO cares? Paper presented at the Mayo clinic proceedings.

Daniali, S. S., Darani, F. M., Eslami, A. A., & Mazaheri, M. (2017). Relationship between self-efficacy and physical activity, medication adherence in chronic disease patients. *Advanced Biomedical Research*, *6*, 1–7.

de Caso, J. G., Rodriguez-Artalejo, F., Claveria, L., & Coria, F. (1994). Value of Hodkinson's test for detecting dementia and mild cognitive impairment in epidemiological surveys. *Neuroepidemiology*, *13*(1-2), 64–68. https://doi.org/10.1159/000110360

Doust Mohammadi, S., Norouzi, K., Dalvandi, A., & Norouzi, M. (2018). The level of illness perception and its relationship with adherence to the medical regimen in the elderly with hypertension. *Iranian Journal of Rehabilitation Research*, *4*(3), 40–46.

Duncan, A. K., Vittone, J., Fleming, K. C., & Smith, H. C. (1996). Cardiovascular disease in elderly patients. Paper presented at the Mayo Clinic Proceedings.

Fabrigar, L. R., Wegener, D. T., MacCallum, R. C., & Strahan, E. J. (1999). Evaluating the use of exploratory factor analysis in psychological research. *Psychological Methods*, *4*(3), 272–299. https://doi.org/10.1037/1082-989X.4.3.272

Fors, A., Ulin, K., Cliffordson, C., Ekman, I., & Brink, E. (2015). The cardiac self-efficacy scale, a useful tool with potential to evaluate person-centred care. *European Journal of Cardiovascular Nursing*, *14*(6), 536–543. https://doi.org/10.1177/1474515114548622

Gast, A., & Mathes, T. (2019). Medication adherence influencing factors—an (updated) overview of systematic reviews. *Systematic Reviews*, *8*(1), 1–17. https://doi.org/10.1186/s13643-019-1014-8

Gholami, M., Tarrahi, M. J., Hossein Pour, A. H., Valiniaei, S., & Bazgir, Z. (2018). The relationship between health literacy and perceived self-efficacy in cardiovascular patients hospitalized in Khorramabad educational hospitals in 1396. *Journal of Nursing Education*, *7*(3), 14–21.

Gutierrez, M. M., & Sakulbumrungsil, R. (2021). Factors associated with medication adherence of hypertensive patients in the Philippines: A systematic review. *Clinical Hypertension*, *27*(1), 1–15. https://doi.org/10.1186/s40885-021-00176-0

Hale, E. D., Treharne, G., & Kitas, G. (2007). The common-sense model of self-regulation of health and illness: How can we use it to understand and respond to our patients' needs? *Rheumatology*, *46*(6), 904–906. https://doi.org/10.1093/rheumatology/kem060

Hatef, M., Sharif Nia, H., Mousavinasab, N., Esmaeili, R., & Shafipour, V. (2018). Self-efficacy and prediction of associated factors in patients with chronic diseases. *Journal of Mazandaran University of Medical Sciences*, *28*(162), 86–94.

Hatmi, Z., Tahvildari, S., Gafarzadeh Motlag, A., & Sabouri Kashani, A. (2007). Prevalence of coronary artery disease risk factors in Iran: A population based survey. *BMC Cardiovascular Disorders*, *7*(1), 1–5. https://doi.org/10.1186/1471-2261-7-32

He, Q.-H., Zheng, J., Liu, J.-L., Wang, J., & You, L.-M. (2022). Predictors of medication adherence of patients with coronary heart disease after percutaneous coronary intervention: A structural equation modeling based on the extended theory of planned behavior. *Journal of Cardiovascular Nursing*, *37*(4), 350–358. https://doi.org/10.1097/JCN.0000000000000755

Hinkle, J. L., & Cheever, K. H. (2018). *Brunner and Suddarth's textbook of medical-surgical nursing*. Wolters kluwer india Pvt Ltd.

Hodkinson, H. (1972). Evaluation of a mental test score for assessment of mental impairment in the elderly. *Age and Ageing*, *1*(4), 233–238. https://doi.org/10.1093/ageing/1.4.233

Hosseinzade, T., Paryad, E., Kazemnejad, E., & Asiri, S. (2013). A study of self-efficacy in patients with coronary artery disease and its predictors. *Qom University of Medical Sciences Journal*, *7*(2), 41–48.

Jackson, D. L. (2001). Sample size and number of parameter estimates in maximum likelihood confirmatory factor analysis: A Monte Carlo investigation. *Structural Equation Modeling*, *8*(2), 205–223. https://doi.org/10.1207/S15328007SEM0802_3

Javadpour, A., Hedayati, A., Dehbozorgi, G.-R., & Azizi, A. (2013). The impact of a simple individual psycho-education program on quality of life, rate of relapse and medication adherence in bipolar disorder patients. *Asian Journal of Psychiatry*, *6*(3), 208–213. https://doi.org/10.1016/j.ajp.2012.12.005

Keshavaraz, N., Naderifar, M., Firouzkohi, M., Abdollahimohammad, A., & Akbarizadeh, M. R. (2020). Effect of telenursing on the self-efficacy of patients with myocardial infarction: A quasi-experimental study. *Signa Vitae*, *16*(2), 92–96.

Kim, H., Sereika, S. M., Lingler, J. H., Albert, S. M., & Bender, C. M. (2021a). Illness perceptions, self-efficacy, and self-reported medication adherence in persons aged 50 and older with type 2 diabetes. *Journal of Cardiovascular Nursing*, *36*(4), 312–328.

Kim, H., Sereika, S. M., Lingler, J. H., Albert, S. M., & Bender, C. M. (2021b). Illness perceptions, self-efficacy, and self-reported medication adherence in persons aged 50 and older with type 2 diabetes. *Journal of Cardiovascular Nursing*, *36*(4), 312–328. https://doi.org/10.1097/JCN.0000000000000675

Kline, R. B. (2015). *Principles and practice of structural equation modeling*. Guilford publications.

Knowles, S. R., Apputhurai, P., O'Brien, C. L., Ski, C. F., Thompson, D. R., & Castle, D. J. (2020). Exploring the relationships between illness perceptions, self-efficacy, coping strategies, psychological distress and quality of life in a cohort of adults with diabetes mellitus. *Psychology, Health & Medicine*, *25*(2), 214–228. https://doi.org/10.1080/13548506.2019.1695865

Kulkarni, S. P., Alexander, K. P., Lytle, B., Heiss, G., & Peterson, E. D. (2006). Long-term adherence with cardiovascular drug

regimens. *American Heart Journal*, *151*(1), 185–191. https://doi.org/10.1016/j.ahj.2005.02.038

Lau-Walker, M. (2004). Relationship between illness representation and self-efficacy. *Journal of Advanced Nursing*, *48*(3), 216–225. https://doi.org/10.1111/j.1365-2648.2004.03190.x

Lau-Walker, M. (2006). Predicting self-efficacy using illness perception components: A patient survey. *British Journal of Health Psychology*, *11*(4), 643–661. https://doi.org/10.1348/135910705X72802

Lee, Y.-M., Yu, H. Y., You, M.-A., & Son, Y.-J. (2017). Impact of health literacy on medication adherence in older people with chronic diseases. *Collegian*, *24*(1), 11–18. https://doi.org/10.1016/j.colegn.2015.08.003

Leventhal, H., Diefenbach, M., & Leventhal, E. A. (1992). Illness cognition: Using common sense to understand treatment adherence and affect cognition interactions. *Cognitive Therapy and Research*, *16*(2), 143–163. https://doi.org/10.1007/BF01173486

Lindholm, L. H., & Mendis, S. (2007). Prevention of cardiovascular disease in developing countries. *The Lancet*, *370*(9589), 720–722. https://doi.org/10.1016/S0140-6736(07)61356-7

Lu, M., Xia, H., Ma, J., Lin, Y., Zhang, X., Shen, Y., & Hravnak, M. (2020). Relationship between adherence to secondary prevention and health literacy, self-efficacy and disease knowledge among patients with coronary artery disease in China. *European Journal of Cardiovascular Nursing*, *19*(3), 230–237. https://doi.org/10.1177/1474515119880059

Martos-Méndez, M. J. (2015). Self-efficacy and adherence to treatment: The mediating effects of social support. *Journal of Behavior, Health & Social Issues*, *7*(2), 19–29. https://doi.org/10.5460/jbhsi.v7.2.52889

Mathes, T., Pieper, D., Antoine, S.-L., & Eikermann, M. (2014). Adherence influencing factors in patients taking oral anticancer agents: A systematic review. *Cancer Epidemiology*, *38*(3), 214–226. https://doi.org/10.1016/j.canep.2014.03.012

McCulley, C., Katz, P., Trupin, L., Yelin, E. H., & Barton, J. L. (2018). Association of medication beliefs, self-efficacy, and adherence in a diverse cohort of adults with rheumatoid arthritis. *The Journal of Rheumatology*, *45*(12), 1636–1642. https://doi.org/10.3899/jrheum.171339

Miyazaki, M., Nakashima, A., Nakamura, Y., Sakamoto, Y., Matsuo, K., Goto, M., & Urata, H. (2018). Association between medication adherence and illness perceptions in atrial fibrillation patients treated with direct oral anticoagulants: An observational cross-sectional pilot study. *PloS One*, *13*(9), e0204814. https://doi.org/10.1371/journal.pone.0204814

Mohammadi, F. M., Tehranineshat, B., Farjam, M., Rahnavard, S., & Bijani, M. (2022). The correlation between resilience, self-efficacy and illness perception in patients with type 2 diabetes: A cross-sectional study. *Clinical Diabetology*, *11*(3), 175–182

Moss-Morris, R., Weinman, J., Petrie, K., Horne, R., Cameron, L., & Buick, D. (2002). The revised illness perception questionnaire (IPQ-R). *Psychology and Health*, *17*(1), 1–16. https://doi.org/10.1080/08870440290001494

Ni, Z., Dardas, L., Wu, B., & Shaw, R. (2019). Cardioprotective medication adherence among patients with coronary heart disease in China: a systematic review. *Heart Asia*, *11*(2), 1–12.

Ni, Z., Wu, B., Yang, Q., Yan, L. L., Liu, C., & Shaw, R. J. (2022). An mHealth intervention to improve medication adherence and health outcomes among patients with coronary heart disease:

Randomized controlled trial. *Journal of Medical Internet Research*, *24*(3), e27202. https://doi.org/10.2196/27202

Nur, K. R. M. (2018). Illness perception and cardiovascular health behaviour among persons with ischemic heart disease in Indonesia. *International Journal of Nursing Sciences*, *5*(2), 174–180. https://doi.org/10.1016/j.ijnss.2018.04.007

Organization, W. H. (2003). *Adherence to long-term therapies: evidence for action*. World Health Organization.

Padilha, J. C., Santos, V. B., Lopes, C. T., & Lopes, J. d. L. (2021). Prevalence of pharmacological adherence in patients with coronary artery disease and associated factors. *Revista Latino-Americana de Enfermagem*, *29*, 1–11. https://doi.org/10.1590/1518-8345.4554.3464

Park, L. G., Howie-Esquivel, J., Whooley, M. A., & Dracup, K. (2015). Psychosocial factors and medication adherence among patients with coronary heart disease: A text messaging intervention. *European Journal of Cardiovascular Nursing*, *14*(3), 264–273. https://doi.org/10.1177/1474515114537024

Pedersen, E., Primicerio, R., Halvorsen, K. H., Eggen, A. E., Garcia, B. H., Schirmer, H., & Waaseth, M. (2022). Medication adherence among persons with coronary heart disease and associations with blood pressure and low-density-lipoprotein-cholesterol. *European Journal of Clinical Pharmacology*, *78*(5), 857–867. https://doi.org/10.1007/s00228-022-03276-4

Prabahar, K., Albalawi, M. A., Almani, L., & Alenizy, S. (2020). Assessment of medication adherence in patients with chronic diseases in Tabuk, Kingdom of Saudi Arabia. *Journal of Research in Pharmacy Practice*, *9*(4), 196.

Saarti, S., Hajj, A., Karam, L., Jabbour, H., Sarkis, A., El Osta, N., & Khabbaz, L. R. (2016). Association between adherence, treatment satisfaction and illness perception in hypertensive patients. *Journal of Human Hypertension*, *30*(5), 341–345. https://doi.org/10.1038/jhh.2015.86

Sabaté, E., & Sabaté, E. (2003). *Adherence to long-term therapies: evidence for action*. World Health Organization.

Sarkar, U., Ali, S., & Whooley, M. A. (2007). Self-efficacy and health status in patients with coronary heart disease: Findings from the heart and soul study. *Psychosomatic Medicine*, *69*(4), 306–312. https://doi.org/10.1097/PSY.0b013e3180514d57

Schwarzer, R., & Warner, L. M. (2013). Perceived self-efficacy and its relationship to resilience. In *Resilience in children, adolescents, and adults* (pp. 139–150). Springer.

Shariatinia, S. (2018). Antihypertensive drugs adherence in heart disease patients referring to the Imam Reza Clinic in Shiraz.

Shen, Z., Shi, S., Ding, S., & Zhong, Z. (2020). Mediating effect of self-efficacy on the relationship between medication literacy and medication adherence among patients with hypertension. *Frontiers in Pharmacology*, *11*, 1945.

Silva Tinoco, M., Camila de Souza Groia-Veloso, R., Domingos dos Santos, J. N., Martins Cruzeiro, M. G., Menezes Dias, B., & Moreira Reis, A. M. (2021). Medication regimen complexity of coronary artery disease patients. *Einstein (16794508)*, *19*, 1–7.

Sullivan, M. D., LaCroix, A. Z., Russo, J., & Katon, W. J. (1998). Self-efficacy and self-reported functional status in coronary heart disease: A six-month prospective study. *Psychosomatic Medicine*, *60*(4), 473–478. https://doi.org/10.1097/00006842-199807000-00014

Thompson, K., Kulkarni, J., & Sergejew, A. (2000). Reliability and validity of a new medication adherence rating scale (MARS) for the psychoses. *Schizophrenia Research*, *42*(3), 241–247. https://doi.org/10.1016/S0920-9964(99)00130-9

Varaei, S., Shamsizadeh, M., Cheraghi, M. A., Talebi, M., Dehghani, A., & Abbasi, A. (2017). Effects of a peer education on cardiac self-efficacy and readmissions in patients undergoing coronary artery bypass graft surgery: A randomized-controlled trial. *Nursing in Critical Care*, *22*(1), 19–28. https://doi.org/10.1111/nicc.12118

Vervloet, M., Linn, A. J., van Weert, J. C., De Bakker, D. H., Bouvy, M. L., & Van Dijk, L. (2012). The effectiveness of interventions using electronic reminders to improve adherence to chronic medication: A systematic review of the literature. *Journal of the American Medical Informatics Association*, *19*(5), 696–704. https://doi.org/10.1136/amiajnl-2011-000748

Wang, D., Ross, B., Xi, C., Pan, Y., Zhou, L., Yang, X., & Liu, Z. (2020). Medication adherence and its correlates among patients affected by schizophrenia with an episodic course: A large-scale multi-center cross-sectional study in China. *Asian Journal of Psychiatry*, *53*, 102198. https://doi.org/10.1016/j.ajp.2020.102198

Wolf, M. S., Davis, T. C., Osborn, C. Y., Skripkauskas, S., Bennett, C. L., & Makoul, G. (2007). Literacy, self-efficacy, and HIV medication adherence. *Patient Education and Counseling*, *65*(2), 253–260. https://doi.org/10.1016/j.pec.2006.08.006

Zare, L., Hassankhani, H., Doostkami, H., Brien, F. O., & Aghdam, A. M. (2016). Illness perception, treatment adherence and coping in persons with coronary artery disease undergoing angioplasty. *Open Journal of Nursing*, *6*(07), 549–557. https://doi.org/10.4236/ojn.2016.67058

Zullig, L. L., Ramos, K., & Bosworth, H. B. (2017). Improving medication adherence in coronary heart disease. *Current Cardiology Reports*, *19*(11), 1–13. https://doi.org/10.1007/s11886-017-0918-y

Zyryanov, S. K., Fitilev, S. B., Vozzhaev, A. V., Shkrebniova, I. I., Shindryaeva, N. N., Klyuev, D. A., & Voronko, Y. G. (2020). Medication adherence in patients with stable coronary artery disease in primary care. *Research Results in Pharmacology*, *6(2)*, 97–103. https://doi.org/10.3897/rrpharmacology.6.54130