Original Article

Medication Adherence and its Related Factors in Patients Undergoing Coronary Artery Angioplasty

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ABSTRACT

Introduction: Percutaneous Coronary Intervention (PCI) has no effect on coronary artery atherosclerosis, thus the modification of physiological risk factors seems essential to prevent coronary artery disease (CAD). Then PCI patients have to receive multiple drug therapies in an attempt to prevent the recurrence of cardiac events. In spite of the evidence based on medication adherence to prevent post-PCI CAD development, medication adherence is the main concern for health care system. Accordingly, this study aims to determine the medication adherence and its related factors among these patients.
Methods: In this cross-sectional study, the statistical community was the patients undergoing PCI at medical educational hospital of Dr. Heshmat in Rasht, Iran. 269 patients were selected by convenient sampling method. The data were collected by a questionnaire consisting of 4 parts, namely the socio-individual factors, Morisky medication adherence scale, hospital anxiety and depression scale and cardiac patient's self-efficacy scale. Data analysis was done by descriptive statistics and the significance variables in univariate analysis were examined in a multi logistic regression model through considering co-linearity.
Results: The results showed that 75 patients (28%) didn't adhere to the medication. In addition, the majority of them were reported to have clinical anxiety (44.2%) and mild depression (55.8%). Also, based on the results derived from multiple logistic regressions, only the spouse's educational level and family history of coronary artery disease were significant predictors of medication adherence.
Conclusion: The current study findings display lack of complete post-PCI medication adherence, which underscores the importance of the existence of cardiac rehabilitation systems in the society. Therefore, it is recommended that cardiac rehabilitation centers be built in the society.

Introduction

Coronary artery disease (CAD) is one of the most prevalent cardiovascular diseases and one of the main problems in health areas worldwide.[1] CAD can cause limitations in the individual's life for a long time.[2] Besides controlling the risk factors, treating CAD includes medication treatment and revascularization.

Revascularization involves Percutaneous Coronary Intervention (PCI) and Coronary Artery Bypass Graft Surgery (CABG).[3] Although PCI is effective in the lesion treatment, this intervention isn't therapeutic[4] because this procedure has no effect on coronary artery atherosclerosis.[5] Thus, the modification of physiological risk factors is essential to preventing the progression of CAD. Then, PCI patients have to receive multiple drug therapies so as to prevent the cardiac events recurrence such as vascular restenosis.[6,7] The drugs reducing death rate or myocardial infarction in the patients with CAD clinical evidence include anti-platelet drugs, beta blockers, angiotensin converting enzyme inhibitors, angiotensin receptor 2 enzyme inhibitors and lipid lowering agents especially statins.[5]

In spite of the existing evidence which underlines medication adherence as an important factor preventing CAD development and post-PCI cardiac recurrence, medication adherence is still a major identified problem and a significant source of concern for health care providers and health care system,[6,7] coupled with the fact that a large number of the patients don't adhere to the treatment regime after 6 months.[6] Since these patients underestimate their disease severity and mistakenly believe that through a short-time hospitalization and performing rapid process and immediate success following this procedure, they get cured.[7] The studies have revealed that medication nonadherence in cardiovascular patients is quite high.[3,8] So that in the research by Aghabeykan et al., it has been suggested that almost 31% of the patients didn't follow the medication adherence.[3] In the study by Young-Jung et al., medication nonadherence was high, so that 61.3% of PCI patients didn't adherence to their medication.[7] Nonadherence is

associated with higher costs and also adverse clinical outcomes.[9] In addition, it can bring about lots of problems such as hypertension, pathologic changes, aggravated cardiac function related symptoms, re-hospitalization, requiring revascularization and increased deaths rate.[7]

The reasons for medication non-adherence are multifaceted and could pertain to factors as diverse as the health system, the patient's characteristics (demographics, cultural and behavioral), treatment programs (e.g. the patient trusting the physician) and socioeconomic factors.[3,4] Also, studies have revealed that psychosocial factors including anxiety, depression and self-efficacy may influence medication adherence and CAD patient's prognosis.[10,11] As a matter of fact, anxiety and depression have been found to be associated with the patients' poor adherence to their medication.[7,10,11] Self-efficacy is also known as a significant predictor of health promoting behaviors.[7] Self-efficacy can be defined as the patients' interaction with the disease and their belief in their own capability of initiating behavioral changes to attain certain preset goals. (Encouraging the patients to get involved in their own treatment and enhancing their self-efficacy have been shown to play vital roles in improving the associated clinical consequences.[12]

Actually, low self-efficacy can create emotional, motivational and cognitive responses leading to poorer medication adherence.[7] Thus, in order to prevent the disease symptoms recurrence, it is imperative to execute befitting treatments and care interventions at the right time. Furthermore, to ensure the patients will follow up on these programs it is imperative that they develop a realistic understanding of the disease alongside a good enough self-efficacy so as to be actively involved in care activities.[13]

Considering the important role of post-PCI medication adherence in the disease symptoms not recurring and short-term hospitalization of these patients after this procedure, there seems to be sufficient ground on which to assess such patients' adherence state. It is because if the determining factors are identified, effective strategies can be developed to improve the medication adherence of the patients and increase their quality of life, as a result while reducing the likelihood of their symptoms recurrence. Then, in view of the relatively high PCI statistics in the Guilan province, and given the significance of medication adherence and its undeniable role in the clinical outcomes of such patients, and the high that non-adherence could impose on the patients and health system, this study sets out to determine the medication adherence and its related factors in the patients undergoing Coronary Artery Angioplasty.

Materials and methods

In this cross-sectional descriptive analytical study, the statistical community comprised the patients undergoing percutaneous coronary intervention at Rasht Medical Educational Hospital of Dr. Heshmat, 6 months following PCI performance, in 2017. The sample size was determined as 269 patients based on LA point's study results, with 95% confidence and error estimation level as 5% and P=0.772. The participants were selected by convenient sampling out of the people referring to the specialized clinic of Dr. Heshmat. The data were collected after announcing the research objectives and acquiring the informed oral consents from the patients. The study questionnaire consisted of 4 parts, including the socio-demographic factors, Morisky medication adherence scale, hospital anxiety and depression scale and cardiac patient's self-efficacy scale.

Morisky Medication Adherence Scale-MMAS (4-item) was applied in order to analyze the medication adherence in the present research. This scale includes 4 items graded as "Yes" with score 1 and "No" with score 0. As a result, the minimum score of this scale indicates the best medication adherence.[4] To establish the validity and reliability of medication adherence scale, the questionnaire was translated into Persian and then retranslated again into English by an English language expert after the Persian version was sent to expert panel consisting of 12 nursing experts. The CVR and CVI were achieved for all of the phrases of higher than 80% of score. Then, 13 questionnaires were filled out by the patients in a pilot study. Then, these patients filled out the questionnaire after 2 weeks and the intra-class correlation between the two steps for medication adherence scale was 93.46.

To determine anxiety and depression, hospital anxiety and depression scale (HADS) developed by Zigmond and Snaith was applied to measure the outpatient community's anxiety and depression level. This scale was made up of two subscales, 7 items of which were employed to measure the depression and 7 items to measure anxiety. Each of the items of this scale was rated on 4-point spectrum, according to the symptoms' severity ranging from score 0 (None) to score 3 (Severe). The maximum score for each subscale was 21 and for total scale 42, reflecting the emotional disorder. The cutoff points 0-7 were considered lack of clinical symptom, 8-10 mild depression or anxiety, 11-21 clinical depression or anxiety for both subscales.[14] This scale had been previously normalized and validated by Kaviani et al., and the results suggested that HADS possessed the required validity to be applied in Iranian clinical population.[15] Moreover, Sullivan's 5-option Likert cardiac self-efficacy scale was used in order to determine the self-efficacy, where the responses to each of the questions represented 5 points on the Likert scale (0 and 4). The self-efficacy scores ranged from 0 to 20, with higher scores denoting a higher level of self-efficacy to maintain function.[16] In this study, to establish the validity, the questionnaire was sent to some experts in the cardiovascular nursing field and the results showed all items had content validity ratio (CVR) and content validity index (CVI) above 75%. Also, to establish the tool reliability, Cronbach's alpha coefficient test was used to determine the internal consistency of the questionnaires, with α being 0.92.

The inclusion criteria were lack of mental disorders according to the patient's medical records and patients' own account on any use of effective psychiatric drugs,

and doing the PCI for the first time. The exclusion criteria included delay in referring or not referring to hospital, or not being willing to participate.

The frequency (%), mean (SD) or median were used to describe the data. Univariate and multivariable logistic regression model was performed to assess the relationship between the socio-individual variables, anxiety, depression and cardiac self-efficacy scores with the patients' medication adherence. All variables with significant level of 0.1 in the univariate analyses were examined in the multivariable models.

The present study is a part of an approved proposal supported by the Ethics Committee of Guilan University of Medical Sciences Research Department (ethical code: 1930596704).

Results

The majority of the patients were male (59.1%), married (92.6%), illiterate (46.5%), with illiterate spouses (40.5%), living with their spouse and children (59.1%) and urban (60.6%). Also, most of them were retired (36.9%) and housewives (81.8%), respectively. The clinical anxiety and mild depression were reported in 44.2% and 55.8% of the patients, respectively (Table.2). Moreover, Table2 presents the status of anxiety and depression, cardiac self- efficacy and medication adherence in these patients. The results indicated that 75 patients (28%) did not adhere to their medication. From the univariate logistic regression analyses, the medication adherence was associated with the patient's spouse's education (P=0.043), the family history of coronary artery disease (P=0.038) and the history of hypertension (P=0.096). All variables with significant level of 0.1 in the univariate analyses were examined in the multivariable models.

Table 1. Demographic characteristics of patients

Characteristics	N (%)
Age*	58.86(10.16)
≤44	22(8.2)
45-64	163(60.6)
≥65	84(31.2)
Gender	
Male	159(59.1)
Female	110(40.9)
Family history of coronary artery disease	
Yes	137(50.9)
No	132(49.1)
History of hypertension	
Yes	145(53.9)
No	124(46.1)
History of underlying disease	
Yes	127(47.2)
No	142(52.8)
History of CVA	
Yes	6(2.2)
No	262(97.4)
History of HLP	
Yes	6(2.2)
No	262(97.4)
History of DM	
Yes	19(7.1)
No	249(92.6)

*Mesn (SD)

Table 2. The score of patients' depression, anxiety, cardiac self- efficacy and medication adherence status

Characteristics	N (%)
Depression	
lack of clinical symptom	51 (19)
Mild depression	150 (55.8)
Clinical depression	56 (20.8)
Anxiety	
lack of clinical symptom	15(5.6)
Mild anxiety	117(43.5)
Clinical anxiety	119(44.2)
Medication adherence	
Desirable	189(70.3)
Undesirable	75(28)
Cardiac self-efficacy	
Median	7
(IQR)$^{\epsilon}$	11
Range	0-20

*The difference cases of 100% is the result of missing, $^{\epsilon}$Interquartile range

Also, the patient's education (P=0.203), the number of medications (P=0.700), cardiac self-efficacy (P=0.194), anxiety (P=0.824) and depression scores (P=0.659) were not associated with the medication adherence.

The data showed that the odds of medication non-adherence could be higher in the patients with illiterate or poorly literate spouses than the patients with a spouse holding higher education (OR=2.64 and OR=2.95, for the patients with illiterate or poorly literate spouses versus the patients with a spouse holding high school diploma or higher level education, respectively) (Table 3).

Although, the data analysis by the patients' gender revealed that this relationship was significant only among the male patients (P=0.025). The odds of medication nonadherence in the men with illiterate, or poorly literate spouses compared to the men whose spouses had high school diplomas or higher spouses were 5.982 (95%CI=1.637-21.868) and 5.027 (95%CI=1.354-18.670), respectively.

The adherence among the patients with the family history of coronary artery disease (CAD) was 1.782 times more than those without CAD history. It has also been observed that in the individuals with a hypertension history, the medication adherence was 1.592 times more than those without hypertension.

In the multiple logistic regression analysis, because of the strong relationship between the patients' family history of CAD and hypertension (70% of the patients with family history of CAD had hypertension), the variables were not included in the models, simultaneously. Only the spouse's education and the family history of CAD were the independent predictors of the medication adherence. Controlling for the family history of CAD, the adjusted odds of medication adherence in men with illiterate or poorly literate spouses were 3.14 and 3.37 against men whose wives had high school diploma or higher education, respectively. Also controlling for the patient's spouse's education, the patients with family history of CAD were 2.06 times more likely to adhere than those without this history (Table 3).

Table3. Significant predictors of medication adherence in univariate and multiple logistic regression analysis

Predictor of medication adherence	Univariate				Multivariable			
	Exp (B)	95% CI.		P	Exp (B)	95% CI.		P
Spouse's education								
(vs. diploma or higher)				0.04				0.01
Under diploma	2.94	1.23	7.04	0.01	3.37	1.39	8.17	0.00
Illiterate	2.64	1.12	6.19	0.02	3.13	1.31	7.50	0.01
Family CAD*	1.78	1.03	3.07	0.03	2.06	1.15	3.67	0.01
Hypertension*	1.59	0.92	2.75	0.09				

*Yes vs. no

Discussion

Post-PCI medication non-adherence is one of the common problems that can result in adverse treatment outcomes.[17] Since revascularization has no effect on the underlying atherosclerotic process, post revascularization medication adherence procedures such as PCI are strongly recommended on a routine basis.[5]

In the present research, about a third of the participants reported post-PCI medication non-adherence, identical to some other studies.[3] The underlying causes could include lack of post-PCI cardiac rehabilitation system, lack of sufficient training or support for the patients to follow the procedure. While poor adherence is often viewed as a serious alarm for the patients and the health care systems, a worse state, non-adherence, can compromise the useful treatment effects, increase the signs and symptoms and the complications, thus leading to re hospitalizations or even death.[18] Thus, an improvement in these patients' medication adherence can significantly decrease the incurred costs. The evidence showed that the individuals undergoing PCI for the first time may have some conceptions of their improvement process that can be incompatible with the reality and, consequently, lead to experiencing more anxiety following this procedure.[19] In this study, one of the inclusion criteria was undergoing PCI for first time.

Anxiety related results have indicated that the majority of the participants suffered from clinical anxiety that can result from the mentioned reason. On the one hand, this method is a stressful event for many patients and creates anxiety before and after the treatment.[20] In the research by Astin et al., it was found that the mean anxiety score for the PCI patients was higher than that for the general population.[21] Besides, about depression, it has been shown that the majority of the participants suffered from mild depression. In the study by Ebadi, depression has been found among the angioplasty patients.[17] The depression influencing health outcomes has been widely studied in the cardiovascular sufferers. In general, depression is associated with increased mortality and impaired health status.[22] Overall, the significance of anxiety and depression in this group of the patients is due to these factors' role in the medication adherence. Because it seems that the recognized negative emotions leave adverse effect on the cardiovascular patients' health and can affect health behaviors adherence.[21] However, in the current research, no significant association has been found between anxiety and depression and post-PCI medication adherence, the finding is inconsistent with

that of the survey by Swardfager et al., since in that study, it was suggested that the major depression disorder associated with nonadherence increases.[10] Of the reasons behind this incongruence, we can mention the population difference in the two studies because the study community of Swardfager et al., consisted of CAD patients and not just the ones undergoing angioplasty.

As for cardiac self-efficacy status, the results derived from this research suggest poor cardiac self-efficacy in this group of patients. In the study by Son on the PCI patients, it was observed that the mean self-efficacy score in the cardiac sufferers was 9.410 (4.69),[7] which was more than that for the present study. This may be because of the participants' aging since it seems as age goes up, the physical and mental capabilities decline, and conflicts with chronic diseases gradually reduce the individual's empowerment to achieve optimal self-efficacy.[13]

Medication nonadherence is a multifaceted problem[3] which may be affected by various factors. In this study, multiple logistic regression results illustrated that only the spouse's education and the family history of coronary artery disease are independently associated with the PCI patient's medication adherence. So that, if one controls for the family history of coronary artery disease, the odds of medication non-adherence are greater among men with illiterate or poorly literate spouses, compared with men whose spouses have high school diplomas or higher education. Also, controlling for the patient's spouse's education, the sufferers with the family history of coronary artery disease have higher medication adherence odds compared with the ones lacking such record in their family. In fact, the patients supported by their family members, especially their spouses, recover faster in comparison with those not being cared for.[20] Then it appears that when the spouses are more educated and consequently, possess a better knowledge about the disease process and its influencing factors on their treatment acceleration, the patients will be further supported by their spouses that can affect the patients' adherence condition. Regarding the variable, namely, the family members' cardiac problem affliction record, the primary reason might be those with a family member afflicted with a cardiac problem will have a higher motivation for adherence because of having witnessed their family member suffering from and going through their chronic heart condition, not recovering permanently, and thus believe that with or without taking medication, their disease won't be cured completely. While in other studies, other variables such as age, gender, hypertension record, the consumed drugs'

costs, depression and anxiety and self-efficacy, etc. have all been the medication adherence predictors in the patients,[5,7-9,14,23] in this study, however, other study variables didn't seem to reveal a significant relationship with the medication adherence in the coronary angioplasty patients. Of the main reasons, we can point out the difference in the conducted studies in terms of the study community, population differences, diverse measurement scales and the study design bringing about various findings.

As for the limitations of the present research, one could refer to the use of the patients' self-reports about their medication adherence which influences the findings; other limitations include the convenient sampling method that may not have depicted a clear picture of the research community. However, considering the aforementioned limitations, some larger and stronger designed studies are required to be performed in order to represent an obvious image of the medication adherence.

Conclusion

The current study findings display a lack of complete post-PCI medication adherence, the issue denoting the importance of cardiac rehabilitation systems in the society. Generally speaking, PCI patients have a short hospitalization period which can result in getting insufficient training from the health care team. On the other hand, the majority of the patients assume that this procedure can lead to their comprehensive recovery from the disease, while revascularization doesn't stop their underlying atherosclerotic process.

Thus, despite PCI being effective in treating the obstructive lesion, the majority of the patients have to receive multi medication adherence to prevent cardiac recurrent events such as restenosis.

Therefore, it is recommended cardiac rehabilitation centers be built in the society, so that the patients could benefit from the necessary supports and training to attain maximum recovery from such procedures and avoid the heavy costs induced by the recurring signs and symptoms incurred on the patient and the health care systems.

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Ethical issues

None to be declared.

Conflict of interest

The authors declare no conflict of interest in this study.

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