Case Study

Adherence of Patients with Coronary Heart Disease to Treatment Plan and its relation with HRQL

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Abstract

Coronary artery disease is a leading cause of morbidity and mortality worldwide. Its management involves a combination of lifestyle modifications and medical interventions. However, the effectiveness of treatments is highly dependent on patient adherence to the prescribed treatment regimen. To explore the adherence level of patients with coronary heart disease to treatment regimen, identify factors affecting adherence, determine health-related quality of life, and measure the relationship between adherence of coronary heart disease patients to treatment regimen and health-related quality of life. Cross-sectional study was conducted in outpatient cardiology clinics of three private hospitals in Jeddah City including 222 coronary patients under treatment. An interview format, pre-coded, pilot tested was used. Arabic version of the RAND 36-item health survey was used. 43.2% of patients followed multiple treatment plans (p=0.000). 73.9% of patients insignificantly had comorbid conditions. Factors that significantly affected adherence to the treatment plan were availability of medications (p=0.02), side effects of medications (p=0.001), patient-physician relationship (p=0.002), development of complication (p=0.001), follow-up schedule (p=0.000), continuous health education (p=0.000). There was a significant difference between non-adherent and adherent groups for all scales of the RAND 36-item health survey. The significant predictors include work status, the treatment plan, and associated comorbid conditions. More than half of CAD patients were non-adherent to their treatment regimen. Factors affecting adherence level include availability, side effects, development of complications, cost of medications, and patient-physician relationship.

Keywords: Adherence to treatment, Coronary artery disease, Quality of life, RAND questionnaire

Introduction

Heart diseases, particularly Coronary Artery Disease (CAD), are prevalent life-threatening causes of morbidity and mortality worldwide [1]. CAD is the third cause of leading mortality worldwide [2]. In order to minimize the disease's complications potential, prevent comorbidities, improve the quality of life, and minimize the damage the disease is putting on the individuals, the management plan of CAD is tailored to involve a combination of lifestyle modifications; mainly dietary modification and exercises together with medical interventions [3]. However, the effectiveness and success of the treatment plan are highly dependent on patient adherence to the prescribed regimen [3].

Several studies have investigated the impact of patient adherence on the health-related quality of life (HRQoL) in individuals with CAD [4, 5]. Furthermore, studies carried out in Saudi Arabia [5, 6] explored the factors influencing patient adherence to treatment in (CAD). The findings indicated that patient education, social support, patient-physician relationship, and communication patterns played crucial roles in promoting adherence [5, 6]. On the other hand, barriers such as medication side effects, forgetfulness, and lack of understanding about the importance of adherence were identified as factors contributing to non-adherence [6].

Moreover, many researches emphasized the role of psychosocial factors, such as social support and depression, in mediating the relationship between adherence and HRQoL [7, 8].

The higher the number of medications prescribed along with regimens, the more complicated the medication regimen, and the higher the cost of medication, the higher the risk of poor adherence. This was also proved in one study that was carried out in KSA [9]. The RAND 36-item health survey is among the most widely used instruments to assess the quality of life

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in chronically ill individuals [10]. Its validity, reliability, and responsiveness have been documented across various groups, including those differing in age, sex, socio-economic status, geographical region, and clinical conditions [11].

Understanding the impact of patient adherence on health-related quality of life is essential for optimizing the management of coronary artery disease [12]. Nevertheless, it is mandatory to assess the treatment plan in conjunction with patients' adherence to this plan, concomitant with the assessment of their impact on HRQoL [12]. Therefore, this research will be conducted to explore this relationship and identify the influencing factors affecting adherence to treatment and quality of life, our research objectives were to explore the adherence level of patients with coronary heart disease to their treatment regimen, to identify factors affecting adherence of patients with coronary heart disease to their treatment regimen, to determine the health-related quality of life among patients with coronary heart disease under treatment and measure the relationship between adherence of coronary heart disease patients to treatment regimen and health-related quality of life.

Materials and Methods

Study Setting and Population

A cross-sectional study design with a case-control approach was carried out in the outpatient cardiology clinics of three private hospitals in Jeddah City.

Sample Size and Technique

The total number of patients to be selected was estimated using the following formula: [13]

$$n0=Z2pq/e2 \quad (1)$$

Where; Z = critical value of the desired confidence interval (1.96 at 95%, 1.645 at 90%, 2.33 at 98%, and 2.575% at 99%) e= margin of error; 0.05 p= the estimated proportion of attribute that is present in the population; 0.50, q= 1-p; 0.50. Using this formula, the inclusion of a convenient, non-probability sample of about 222 patients with coronary heart disease under treatment was carried out during their follow-up visits to the outpatient clinics of the allocated hospitals.

Study Instrument

An interview specially prepared format in English and Arabic which is closed-ended, pre-coded, and pilot tested was used. Training of the data collectors on the use of this format was carried out. It included sociodemographic data, and information about the CAD patients' adherence to diet, exercise, and medications.

An Arabic version of the RAND health survey which is a standardized questionnaire for assessment of quality of life was also used. RAND 36-Item Health Survey is a generic questionnaire that measures eight health-related domains namely physical functioning (includes 10 items), role–physical (role limitations due to physical impairments, includes 4 items), bodily pain (includes 2 items), role–emotional (role limitations due to personal or emotional problems, include 3 items), emotional wellbeing (including 5 items), social functioning (include 2 items), vitality/fatigue (include 3 items), and general health (include 5 items). Higher scores represent more favorable health status [14].

Ethical Approval

The Ethical clearance for the study was obtained from the Ibn Sina National College Research and Ethics Committee (IRRB-01-01102023). Informed written consent was obtained from each participant before being included in the study. Privacy and confidentiality of participants and their data were assured. Ethical conduct was maintained during data collection and throughout the research process in accordance with the Helsinki Declaration [15].

Inclusion Criteria

Male or female patients with coronary heart disease under treatment attending the cardiology outpatient clinics of the three allocated private hospitals in Jeddah.

Exclusion Criteria

Patients without coronary heart disease, untreated coronary artery disease patients, and those with any psychiatric or memory problems.

Statistical Analysis

Data will be collected and coded before being entered into the Statistical Package for Social Sciences version 22 (SPSS Inc., Chicago, IL, USA). Descriptive statistics will be carried out for all variables. A suitable test of significance will be used. A P-value less than 0.05 will considered to be significant. Determination of the predictors affecting RAND domains will be determined using linear regression. Calculation of adherence score was done with the division of the sample according to adherence level into ***Non-Adherent*** (with a score of less than 60%) and ***Adherent*** (with a score of more than 60%). The percent scores for adherence were calculated using the following formula:

$$\text{Percent score} = \sum \text{Scores of questions selected} / \text{maximum possible score for these questions} \times 100 \quad (2)$$

Results and Discussion

This study included 222 coronary artery disease patients under treatment recruited from outpatient clinics of three private hospitals in Jeddah, KSA during their follow-up visits. The mean age in years of the adherent patients to the treatment plan was significantly younger than the non-adherent group [mean= 57.6 (8.06), 61.8 (7.06) respectively; p=0.000]. More than three-fourths (79.3%) of the studied patients were males (p=0.032), 81.1% were insignificantly

married, 55.0% were insignificantly working, and 51.4% were ever-smokers (p=0.046). The mean duration of coronary artery disease in years was significantly lower [5.2 (3.23; p= 0.008]. Less than half (43.2%) of the studied patients significantly followed multiple treatment plans like medications, diet, and exercise (p=0.000). Nearly three-fourths (73.9%) of the studied patients insignificantly had comorbid conditions; mainly diabetes mellitus and hypertension **(Table 1)**.

Table 1. General Description of the study population by their adherence level

	Non-adherent group		Adherent group		Total		p-value
	N=118	%	N=104	%	N=222	%	
Age in years							
Mean (Sd)	61.8 (7.06)		57.6 (8.06)		59.8 (7.82)		0.000*
Gender							
Male	100	84.7	76	73.1	176	79.3	0.032*
Female	18	15.3	28	26.9	46	20.7	
Education							
Basic	16	13.6	20	19.2	36	16.2	0.253
Secondary and more	102	86.4	84	80.8	186	83.8	
Marital Status							
Never married	28	23.7	14	13.5	42	18.9	0.051
Ever married	90	76.3	90	86.5	180	81.1	
Work status							
Not working	60	50.8	40	38.5	100	45.0	0.064
Working	58	49.2	64	61.5	122	55.0	
Smoking history							
Never smoke	50	42.4	58	55.8	108	48.6	0.046*
Ever smoke	68	57.6	46	44.2	114	51.4	
CAD duration in years**							
Mean (Sd)	6.4 (3.59)		5.2 (3.23)		5.8 (3.47)		0.008*
Treatment plan							
Single plan	86	72.9	40	38.5	126	56.8	0.000*
Multiple plans	32	27.1	65	61.5	97	43.2	
Self-reported response							
Not responding	26	22.0	4	3.8	30	13.5	0.000#
Responding	92	78.0	100	96.2	192	86.5	
Comorbid conditions&							
No	26	22.0	32	30.8	58	26.1	0.139
Yes	92	78.0	72	69.2	164	73.9	

*p-value is significant at <0.05 level
#Fisher Exact Test
**CAD=Coronary artery disease
&= mainly Diabetes mellitus and hypertension

Factors that significantly affected the adherence of patients to the treatment plan were availability of medications (p=0.02), side effects of medications (p=0.001), patient-physician relationship (p=0.002), development of complications (p=0.001), the follow-up schedule (p=0.000). They also included continuous health education (p=0.000), omitting medication (p=0.000), difficult change of dietary habits (p=0.000), and non-convenient with the effect of exercise (p= 0.000) **(Table 2)**.

Table 2. Factors affecting adherence to the treatment plan according to CAD patients' point of view

	Non-adherent group		Adherent group		Total		p-value
	N=118	%	N=104	%	N=222	%	
Availability of medication							
No	6	5.1	0	0.0	6	2.7	0.020#
Yes	112	94.9	104	100.0	216	97.3	
Cost of medication							
No	52	44.1	50	48.1	102	45.9	0.550
Yes	66	55.9	54	51.9	120	54.1	
Side effects of medications							

No	90	76.3	96	92.3	186	83.8	0.001*
Yes	28	23.7	8	6.7	36	16.2	
Patient-physician relationship							
No	16	13.6	2	1.9	18	8.1	
Yes	102	86.4	102	98.1	204	91.9	0.002#
Development of complication							
No	86	72.9	94	90.4	180	81.1	0.001*
Yes	32	27.1	10	9.6	42	18.9	
The follow up schedule							
No	76	64.4	12	11.5	88	39.6	0.000*
Yes	42	35.6	92	88.5	134	60.4	
Continuous health education							
No	78	66.1	32	30.8	110	49.5	
Yes	40	33.9	72	69.2	112	50.5	0.000*
Omitting medication due to forgetting their intake							
No	20	16.9	48	46.2	68	30.6	0.000*
Yes	98	83.1	56	53.8	154	69.4	
Difficult changing habits							
No	14	11.9	36	34.6	50	22.5	0.000*
Yes	104	88.1	68	65.4	172	77.5	
Non-convenient with the effect of exercise							
No	76	64.4	100	96.2	176	79.3	
Yes	42	35.6	4	3.8	46	20.7	0.000#

#Fisher Exact Test
*p-value is significant at <0.05 level

Table 3 illustrates that there was a significant difference between non-adherent and adherent groups for all scales of the RAND 36-item health survey; namely physical functioning (p=0.000), role limitations due to physical health (p=0.000), role limitations due to emotional problems (p=0.000), energy (p=0.000), emotional wellbeing (p=0.11), social functioning (p=0.005), pain (p=0.000) and general health (p=0.007) **(Table 3)**.

Table 3. Distribution of the scales of RAND 36-item Health survey and adherence level

	Non-adherent group	Adherent group	Total	p-value
Physical functioning Mean (Sd)	57.5 (21.35)	80.7 (16.43)	68.3 (22.40)	0.000*
Role limitations due to physical health Mean (Sd)	27.5 (16.6)	70.7 (15.43)	47.7 (11.94)	0.000*
Role limitations due to emotional problems Mean (Sd)	44.1 (2.89)	34.9 (3.42)	61.0 (3.22)	0.000*
Energy/fatigue Mean (Sd)	45.7 (1.67)	64.9 (6.47)	54.7 (9.35)	0.000*
Emotional well-being Mean (Sd)	53.5 (9.19)	69.3 (15.88)	60.9 (19. 7)	0.011*
Social functioning Mean (Sd)	58.5 (9.18)	81.3 (12.51)	69.14 (18.58)	0.005*
Pain Mean (Sd)	69.5 (2.13)	89.3 (4.62)	78.8 (2.37)	0.000*
General health Mean (Sd)	44.3 (7.36)	62.6 (4.93)	52.9 (8.62)	0.007*

*p-value is significant at <0.05 level

Collectively, the significant predictors of the eight scales of the RAND 36-item health survey among coronary artery disease patients were age, marital status, work status, duration of coronary heart disease, the treatment plan, associated comorbid conditions, and gender **(Table 4)**.

Table 4. Multiple linear regression model for the Relation between RAND 36-item Health Survey scales and CAD patients' attributes (Only significant predictors are presented in the table)

Scale	Attribute	R^2	β	Sig.	95%CI for β	
					Lower bound	Upper bound
Physical functioning	Age	.137	-.371	.000*	-1.416	-.709
	Marital status	.047	.261	.001*	4.929	19.736
	Work status	.062	.248	.000*	5.378	16.943
	Duration of CAD	.075	-.274	.000*	-2.597	-.946
	Treatment plan	.125	.354	.000*	10.360	21.575
	Co-morbid conditions	.030	-.173	.001*	-15.450	-2.132
Role limitations due to physical health	Age	.210	-.458	.000*	-3.092	-1.824
	Marital status	.023	.153	.023	2.277	30.342
	Work status	.131	.362	.000*	20.057	40.893
	Duration of CAD	.113	-.336	.000*	-5.572	-2.544
	Treatment plan	.095	.308	.000*	15.311	36.673
	Co-morbid conditions	.041	-.203	.002*	-31.780	-6.993
Role limitations due to emotional problems	Age	.180	-.425	.000*	-3.013	-.1.683
	Work status	.127	.356	.000*	20.103	41.624
	Duration of CAD	.158	-.397	.000*	-6.470	-3.431
	Treatment plan	.146	.383	.001*	22.615	43.985
	Co-morbid conditions	.049	-.221	.000*	-34.445	-9.009
Energy/fatigue	Age	.063	-.250	.000*	-.1.048	-.337
	Work status	.101	.318	000*	8.340	19.264
	Duration of CAD	.131	-.362	.000*	-3.028	-1.483
	Treatment plan	.056	.236	.000*	4.660	15.905
	Co-morbid conditions	.123	-.351	.000*	-23.341	-11.121
Emotional well-being	Marital Status	.051	.226	.001*	4.782	17.554
	Duration of CAD	.066	-.258	.000*	-2.157	-.723
	Treatment plan	.053	.230	.001*	3.930	14.018
	Co-morbid conditions	.062	-.249	.000*	-16.626	-5.305
Social functioning	Age	.090	-.300	.000*	-1.561	-.634
	Education	.028	.167	.013*	2.768	23.023
	Marital status	.023	.153	.023*	1.571	20.691
	Work status	.084	.290	.000*	9.352	23.927
	Duration of CAD	.108	-.329	.000*	-3.744	-1.676
	Treatment plan	.115	.339	.000*	12.298	26.690
	Co-morbid conditions	.091	-.302	.000*	-27.818	-11.374
Pain	Age	.351	-.315	.000*	-1.206	-.517
	Marital status	.020	.142	.035*	.561	14.883
	Work status	.074	.272	.000*	6.187	17.146
	Duration of CAD	.122	-.350	.000*	-2.921	-1.387
	Treatment plan	.079	.281	.000*	6.604	17.582
	Co-morbid conditions	.109	-.330	.000*	-22.118	-9.943
General health	Age	.035	-.187	.005*	-.757	-.135
	Marital status	.024	.155	.021*	1.146	13.600
	Work status	.034	.184	.006*	2.006	11.761
	Duration of CAD	.046	-.215	.001*	-1.854	-.460
	Treatment plan	.056	.236	.000*	4.027	13.711
	Co-morbid conditions	.057	-.239	.000*	-15.558	-4.643

*p-value is significant at <0.05 level

A cross-sectional study was carried out involving 222 patients with CAD under treatment during their follow-up visits to cardiology outpatient clinics of three private hospitals in Jeddah, KSA. The study aimed to explore the

adherence level of patients with coronary heart disease to their treatment regimens, identify factors affecting their adherence, determine the health-related quality of life among patients with coronary heart disease under treatment, and measure the relationship between adherence to coronary heart disease patients to treatment regimen and health-related quality of life. It was planned to achieve these objectives through the use of a specially prepared pilot-tested interview format together with an Arabic version of the RAND 36-Item Health Survey.

The present study revealed that 53.2% of the examined patients were non-adherent to their treatment regimen. One of the factors influencing adherence levels was the availability of medications, a finding supported by Veronika J. Wirts *et al*. in 2016 and Muhammad Jami Husain *et al*. in 2020 [16]. The cost of medication plays a crucial role in the adherence to treatment regimens for various diseases, including coronary heart disease. The current study found that 54.1% of the participants reported the insignificance of treatment cost on adherence levels. Similar research has shown a threefold increase in the rate of non-adherence, particularly among the elderly and women with low socio-economic standards [17]. A systematic review [17] indicated that 82% of its included studies found a significant association between high medication costs and non-adherence.

The side effects of coronary heart disease, whether stemming from the disease process itself or its medications, are significant contributors to discontinuation and non-adherence to the treatment plan [18, 19]. However, nearly one-fourth of our non-adherent group identified the development of medication side effects or disease complications as important causes for non-adherence.

A crucial factor for adherence and commitment to the treatment plan and follow-up visits is the patient-physician relationship, coupled with continuous health education. The majority of the studied patients in the present work significantly stated that a good patient-physician relationship, along with continuous health education, has an obvious effect on their commitment to follow-up visits, a finding consistent with similar studies [19, 20]. Physicians with effective consultation and communication skills can attract and motivate their patients for better compliance [19].

The present study revealed a significantly higher rate of non-adherence among the elderly, males, those with a longer duration of illness, and individuals with associated co-morbid conditions. Similar findings have been reported in other studies and are often explained by the possibility of reluctant behavior, a trait influenced by various environmental factors, including sociodemographic factors such as gender, marital status, duration of illness, and the presence of other co-morbid conditions. This behavior can impact the commitment to the treatment regimen in general and, specifically, adherence to dietary regimens and exercises [21, 22].

Furthermore, patient age plays a crucial role in memory impairment, affecting their ability to adhere to medication schedules. A previous study indicated that 84.9% of the studied population exhibited non-adherence to cardiovascular medications due to forgetfulness [22].

In coronary heart disease, adherence to the treatment regimen has implications for the quality of life. A study demonstrated that non-adherence is correlated with lower scores on the quality-of-life scales, particularly the physical functioning scale of the RAND 36-item health survey [23]. Similar conclusions were drawn in our research, where adherence levels significantly affected all scales, including the physical functioning scale.

A study conducted in Saudi Arabia in 2022 [24] found that chronic diseases, including coronary artery disease (CAD), are associated with lower quality of life scales due to their chronic nature, resulting in limitations, a multitude of symptoms, and polypharmacy with associated side effects. These effects are further exacerbated when there are additional co-morbid conditions [25].

Hence, coronary artery disease is a multifactorial illness, and interpreting the quality of life in its patients is a complex task [26]. Most previous studies have characterized health-related quality of life assessment as a subjective tool because of the self-reported nature of the data, which is based on patients' perceptions of their condition [27, 28]. Nevertheless, Alla *et al*. [29] and Scott *et al*. [30] eventually agreed on a multidimensional account that encompasses the physical, psychological, and social dimensions of HRQoL, as incorporated in the RAND-36 item health survey [31-33]. Therefore, the present study found higher scores for the RAND scales compared to previous studies in the KSA's Eastern region [34], Ethiopia [35], and Spain [36]. This might be explained by methodological differences, variations in the history of comorbidities, duration of the disease, treatment regimen, and adherence level.

In the present study, the lowest scores were observed for the role limitations due to the physical functioning scale, consistent with a study conducted in Spain [36] that indicated coronary artery disease (CAD) patients experience physical symptoms adversely affecting their ability to perform daily life activities [37]. The present study found that the highest scores were for the social functioning and bodily pain scales, aligning with a study in Spain [36]. These findings suggest that CAD patients may attempt to maintain a positive psychosocial attitude despite physical limitations in their daily activities, positively impacting their health-related quality of life [31]. For patients in Saudi Arabia, the availability of personal attendants and family members for religious and sociocultural reasons may also be important contributory factors [35].

The present work demonstrates that the treatment plan is the most significant attribute affecting physical and social functioning scales, while work status is the most significant one for both role limitations due to physical health and emotional problems. The presence of associated co-morbid conditions is an important significant attribute of the energy/fatigue scale.

Conclusion

The present study concludes that more than half of coronary artery disease (CAD) patients were non-adherent to their treatment regimens. Factors influencing adherence levels included the availability of medications, side effects, development of complications, medication costs, and the patient-physician relationship. Regarding the RAND 36-item health survey, the highest scores were observed for pain, social functioning, and physical functioning, while the lowest scores were for role limitations due to physical health and general health. The most significant attributes affecting the RAND 36-item health survey were the treatment plan, work status, and associated co-morbid conditions.

Recommendation

Emphasis should be placed on the development of a strong physician-patient relationship and the enhancement of physicians' communication skills, as they play a key role in delivering health education to patients. This, in turn, has a significant impact on patients' adherence to treatment plans and scheduled follow-ups. Achieving this goal involves continuous training for physicians and ongoing assessment of patient satisfaction. Additionally, there should be careful planning of health education tools and materials aimed at educating patients about the importance of adherence to all aspects of their treatment plans and the positive correlation between adherence levels and the improvement of quality of life.

Study Limitations

The main constraints identified in this study include limitations related to study design and sampling technique. Additionally, the absence of a comparison group, particularly from public hospitals, and the lack of patient follow-up were notable limitations.

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