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Factors associated with non-adherence to cardiac rehabilitation in patients with coronary disease

Factores asociados con no-adherencia a rehabilitación cardiaca en pacientes con enfermedad coronaria

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Abstract

Background: Cardiovascular disease is the leading cause of death in the world and approximately half of these are due to coronary heart disease. The most affected countries are those of medium and low income, as Colombia. There are interventions such as cardiac rehabilitation for these patients, however 7.5%-29.0% of coronary patients are referred and of these 40%- 55% manage to finish and adhere to the treatment.

Objective: To determine the factors associated with non-adherence of patients with coronary heart disease to CRP (Cardiac rehabilitation program) in a Cali clinic between 2017 and 2019.

Methods: Retrospective study of cases and controls where a bivariate and multivariate analysis of 99 patients was performed. 46 cases were not adherent to the PRC and 56 controls adherent to it.

Results: 21% of the patients correspond to the male gender with an average age of 63.2 ±10.25 years; an association was evidenced between the anxiety variable evaluated with the HADS scale and non-adherence to the CRP with an OR of 0.26 (CI 95%: 0.07-0.84; p: 0.0114).

Conclusion: The presence of anxiety is an associated factor in patients with non-adherence to CRP. It is considered highly relevant to have an interdisciplinary team in the CRP. The correct application of questionnaires such as the HADS allow identifying these types of situations at a personal level helping to improve adherence to the CRP and thus achieve the multiple benefits evidenced in the programs.

Resumen

Antecedentes: Las enfermedades cardiovasculares son la principal causa de muerte en el mundo y aproximadamente la mitad de ellas se deben a enfermedad coronaria. Los países más afectados son los de ingresos medios y bajos como el nuestro. Existen intervenciones como la rehabilitación cardíaca para estos pacientes, sin embargo 7.5%-29.0% de los pacientes coronarios son referidos y de estos el 40%-55% logran finalizar y adherirse al tratamiento.

Objetivo: Determinar los factores asociados a la no adherencia de pacientes con enfermedad coronaria al PRC (Programa de rehabilitación cardiaca) en una clínica de Cali entre 2017 y 2019.

Métodos: Estudio retrospectivo de casos y controles donde se realizó un análisis bivariado y multivariado de 99 pacientes, 46 casos no se adhirieron al PRC y 56 si lo hicieron.

Resultados: el 21% de los pacientes correspondieron al sexo masculino con una edad promedio de 63.2 ±10.25 años; se evidenció asociación entre la variable ansiedad evaluada con la escala HADS y la no adherencia a la PCR con una OR de 0.26 (IC 95%: 0.07-0.84; p: 0.0114).

Conclusión: La presencia de ansiedad es un factor asociado en pacientes con no adherencia al PRC y por eso se considera de gran relevancia que el programa cuente con un equipo interdisciplinario. La correcta aplicación de cuestionarios como el HADS permiten identificar este tipo de situaciones a nivel personal ayudando a mejorar esta adherencia y así lograr los beneficios propuestos en el programa.

Key study facts

Objective	To determine the factors associated with non-adherence of patients with coronary heart disease to the CRP (Cardiac Rehabilitation Program) in a clinic in Cali between 2017 and 2019.
Study design	Retrospective case-control study .
Source of information	"] Records of the cardiac rehabilitation program of a private clinic in the city of Cali, Colombia, in the period between 2017-2019.
Population / sample	Records of 99 patients
Statístic analisis	Bivariate and multivariate analisis
Principle findings	There was evidence of an association between the anxiety variable assessed with the HADS scale and non-adherence to CRP with an OR of 0.26 (95% CI: 0.07-0.84; p: 0.0114)

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Introduction

Cardiovascular diseases have been, and are expected to continue to be, the leading cause of death in the world. Each year, they cause 17.7 million deaths worldwide and are projected to increase, reaching 75% by the year 2030. Thus, about 23.6 million people will die from this cause (1,2). Low and middle-income countries account for the highest percentage of deaths due to cardiovascular diseases, reaching up to 80%, which has a significant impact on mortality and health services. It is estimated that these countries' total health expenditure from 2012 to 2013 was close to 14% (3).

At the national level, deaths due to cardiovascular diseases are considered a public health problem. They correspond to 28.7% of total registered deaths, of which 74% were attributed to coronary heart disease and cerebrovascular disease. Likewise, between 2010 and 2016, there was an increase in deaths due to cardiovascular causes (7,038deaths); in addition, during this period, an annual economic expenditure between 4,277 and 4,846 dollars per patient over 20 years of age with coronary heart disease was generated. This is a very high expense compared to the 602 annual healthcare dollars generated by a patient over 20 years old without cardiovascular disease. The increase in life expectancy is represented by a change in the population pyramid, leading secondarily to an increase in mortality from these diseases (1-3).

Colombia is facing a population change that impacts its demographic and epidemiological transition. In 2005, 63% of the population was between 15 and 64 years old, while in 2018, this population reached 68.2%, and the group aged ≥65 years went from 6.3% to 9.1% of the total population, which increased the prevalence of chronic noncommunicable diseases (4).

In this sense, cardiac rehabilitation programs are part of the care pathway for patients with coronary heart disease from the moment the individual presents the clinical event. Thus, cardiac rehabilitation programs improve patients' quality of life and functional status and reduce long-term mortality by 20-30% (5). However, only a limited number of patients with coronary heart disease are referred to a cardiac rehabilitation program; some authors state that 7.5%-29.0% of coronary patients are referred to a program, and of these, 40%- 55% can complete and adhere to treatment (6).

About the above, adherence to treatment is defined as "the capacity and/or attitude that each person has to modify lifestyles focused on good health, which is related to the indications given by the therapist and/or physician in charge of the treatment, in order to generate a desired preventive or therapeutic result" (7). For its part, within the model of adherence to long-term therapies, the WHO (8) defined adherence as "the degree to which a person's behaviour in taking medication, following a diet and making lifestyle changes corresponds to the agreed recommendations of a health care provider". In addition, WHO organized the factors associated with adherence to cardiac rehabilitation programs into five dimensions, which have reciprocal action and are:

1. Socioeconomic factors, including gender, age, socioeconomic stratum, unemployment, culture, distance from the treatment centre, and educational level.
2. Factors related to the health care system or equipment that refers to the health care system.
3. Disease-related factors such as the severity of symptoms, degree of disability, the severity of disease, and comorbidities.
4. Treatment-related factors such as duration of treatment and previous treatment failures.
5. Patient-related factors such as psychosocial stress, forgetfulness, anguish, low motivation, lack of knowledge of the treatment as well as the patient's perception of its effect (8).

These factors associated with adherence to the cardiac rehabilitation program have also been grouped into intrapersonal, clinical, interpersonal, logistical, cardiac rehabilitation program, and health system factors (9). Factors such as ethnicity, employment, practical support, and beliefs about the disease were found to exist even with little evidence of association to rehabilitation nonadherence to a cardiac rehabilitation program. In addition, the importance of paying particular attention to emotional problems has been highlighted (10,11). An excellent psychological state is relevant to achieving the desired effects in cardiac rehabilitation program patients.

This research aimed to determine the factors associated with nonadherence to cardiac rehabilitation in patients with coronary artery disease in a clinic in Cali, Colombia, between 2017 and 2019.

Materials and Methods

A retrospective case-control study was conducted using the records of patients with coronary heart disease who were part of the cardiac rehabilitation program of a private clinic in the city of Cali, Colombia, between 2017 and 2019. The variables taken from these records were adherence, gender, age over 60 years, origin, schooling, employment status, and marital status. Socioeconomic stratum, admission diagnosis, type of acute myocardial infarction (AMI) and/or angina, number of coronary vessels involved, type of coronary intervention and number of vessels intervened, myocardial ejection fraction after the procedure, body mass index at the beginning of the program, abdominal perimeter, qualitative result HADS scale, qualitative result HRQOL questionnaire, qualitative result Patient Health Questionnaire (PHQ-9) and smoking.

The case was defined as a patient with coronary artery disease linked to the cardiac rehabilitation program of the Cali clinic classified as nonadherent (not completing 80% or more of the 36 cardiac rehabilitation sessions). The control was the registry of patients with coronary artery disease who are linked to this program and classified as adherent (completing 80% or more of the 36 cardiac rehabilitation sessions). Inclusion criteria considered records of patients with disease linked for the first time in the PRC of the clinic in Cali.

Meanwhile, records of patients with coronary artery disease older than 79 years, diagnosed with mental illness, and under 18 years of age were excluded. The total population that met the selection criteria was included.

Anxiety and depression were assessed with the Hospital Anxiety

and Depression Scale (HADS) questionnaire, applied in a targeted manner on admission to the cardiac rehabilitation program (12) applied in a targeted manner at the time of admission to the cardiac rehabilitation program. This questionnaire has 14 questions divided into two subscales: seven questions correspond to the anxiety subscale and the other seven to the depression subscale, which are shown interspersed in the questionnaire. The selected option should reflect the patient's situation in the last week. The score values are from 0 to 3, where 0 suggests the absence of the symptom and 3 indicates a high frequency of the symptom. The results of the questions of each subscale were summed to obtain the final score. Thus, the result of less than 8 points was interpreted as usual, between 8 and 10 points doubtful or borderline, and ≥11 points indicative of clinical problems.

In turn, the Patient Health Questionnaire (PHQ-9) is a diagnostic tool for mental health disorders used by health professionals and is self-administered by the patient. It consists of 10 questions, each with 4 response options, inquiring about the person's motivation to do some things in life in the two weeks prior to the application of the survey. Each question has a severity index corresponding to: 0= "never", 1= "some days", 2= "more than half of the days" and 3= "almost every day". At the end, there is a question about the difficulty these nine items generated in daily activities (in case you checked yes to any of them).

The original MacNewQLMI questionnaire is a specific questionnaire to assess the quality of life of patients who have had a myocardial infarction. It was initially developed at MacMaster University in Ontario (Canada) to identify the main problems that appear after infarction. It has three dimensions: emotional, physical, and social (13).

Statistical analysis

The data belonged to a secondary source, taken from a database (DB) of patients with coronary artery disease attending a cardiac rehabilitation program in Cali. They were elaborated on in the Excel program. The total patient data included was 99 (46 cases and 53 controls). It was decided to include all the data and not to perform a sample calculation with the database in order not to reduce the number of these further; however, it should be noted that these 99 patients' data do correspond to a sample over time because only those who were active in the program between 2017 and 2019 were included. The identity of the patients is coded for confidentiality assurance reasons.

In addition, to ensure the quality of the information, a random sampling of 10% of the data and verification of duplicate data was performed. In this way, the variables included in the statistical analysis were selected, and the quality of their coding was verified. The data were exported to the Stata 14.0® program (Stata Corp, 2014, College Station, TX, USA). Likewise, an exploratory data analysis was performed to evaluate the distribution of the variables and univariate analysis. Qualitative variables were presented with frequencies and percentages; quantitative variables, according to the result of the Shapiro Wilk and Kolmogorov Smirnov tests, and their normality behaviour were represented with means and standard deviation or median and their interquartile range.

The evaluation of the association between each of the exposure variables and the outcome variable was performed based on a bivariate analysis using the Chi test2 or Fisher's exact test for values in the boxes below 5. The OR and its 95% confidence intervals were used to measure association. The independent qualitative variables were contrasted with the dependent variable using contingency tables. In this sense, the means of the quantitative variables were compared using Student's t-tests or the Mann-Whitney U test. With this, a multiple analysis was performed, and a saturated model was constructed where the independent variables that presented in their bivariate analysis a coefficient of $p < 0.25$ and the clinically relevant ones were included in the model, considering the control of confounding and the identification of effect modification. Subsequently, the exclusion of each of them was evaluated based on their significance and the model's plausibility using the Backward (14-16).

Ethical considerations

According to Resolution 8430 of 1993 of the Ministry of Health of Colombia in its article 11, this research is classified at a no-risk level. It was approved by the ethics committee of the Universidad Libre sectional Cali in approval minutes of April 16, 2020.

Results

Ninety-nine records that met the inclusion and exclusion criteria

Table 1. Sociodemographic characteristics of the study population

Sociodemographic Factors	Description	Frequency	Percentage
Genre	Female	28	28
	Male	71	72
Age Years	Years completed	63.2	±10.25
Age >60	No	46	46
	Yes	53	54
Procedence	Cali	83	84
	Outside Cali	12	12
	No Data	4	4
Schooling	Up to elementary school	22	22
	From incomplete high school to postgraduate studies	75	76
	No Data	2	2
Laboral	Does not work	10	10
	Labora	89	90
Marital Status	No Stable Union	75	76
	Stable Union	22	22
	No Data	2	2
Socioeconomic stratum	Medium/high	31	31
	Under	61	62
	No Data	7	7

were analysed; 46 (47%) corresponded to cases and 53 (53%) to controls. Furthermore, for this sample of 99 patients with 47% adherence, the power of this study is 37.6%.

The mean age was 63.2 ±10.25 years, and 54% presented an age over 60 years. Seventy-two percent of the patients were male, which prevailed in both cases and controls. Eighty-seven percent of the patients were from Cali. Likewise, 77% had incomplete secondary schooling up to postgraduate level, and 90% were not working then. Regarding socioeconomic strata, the highest percentage belonged to the low stratum, and the lowest percentage to the medium/high stratum (Table 1).

Of the total number of patients, 61 had 1-2 vessel involvement; 95 of them had coronary lesions, 29 underwent total lesion intervention, 46 underwent percutaneous transluminal coronary angioplasty (PTCA) with medicated STENT implantation, followed by 21 who underwent surgical myocardial revascularization (SMR). Eighty-three percent of the population had left ventricular ejection fraction (LVEF) greater than or equal to 40%. According to body mass index (BMI), 63% of the population is obese, with a median of 26 kg/m2 RI (24-28), with a mean abdominal circumference of 95 ±8.66. Only 4% of the patients presented active smoking at the time of being in the CRP (Tables 2 and 3).

Of the total number of participants, nine patients were at risk of depression, and 22 were at risk of Anxiety, according to the Hospital Anxiety and Depression Scale (HADS). According to the Patient Health Questionnaire (PHQ-9), 96 patients did not require intervention for depression, and the three that did require it were found to be of severe severity. Health-related quality of life (HRQoL), according to the Myocardial Infarction Questionnaire (QLMI), was good for 75% of the population (Table 3).

The bivariate logistic analysis showed an association between Anxiety assessed with HADS where the OR was 0.26 (95% CI: 0.086-0.77), and this association was statistically significant (p= 0.0114). In the case of the treatment-related variables, none showed an association with nonadherence in this analysis (Table 4). The confidence intervals obtained in the bivariate analysis are broad due to the small sample size of 99 patients. Table 5 shows the means of association between the variables of exposure and outcome for the quantitative variables, where no statistically significant association was found between them.

Multiple logistic regression was performed where the variables with a significance <0.25 in the bivariate analysis and with clinical relevance were included in the model. Additionally, the anxiety variable was obtained as the only variable associated with nonadherence to the program, using the Backward strategy based on the individual significance of each variable and evaluating the likelihood of the model, which was evaluated with the HADS questionnaire and with an adjusted OR of 0.26 (95% CI: 0.086-0.77) and had an initial model likelihood of 44.5 and a final model likelihood of 65.00. The rest of the variables entered the multivariate are considered confounders, making the association found in the bivariate analysis no longer significant. Possibly explained by the small sample size (99 patients) (Tables 6 and 7).

Discussion

This research evaluated the factors associated with nonadherence to CRP in patients with coronary artery disease in a clinic in Cali between 2017 and 2019. The analysis of the 99 records, 46 cases, and 53 controls show an association in the bivariate analysis with demographic and economic variables such as age >60 years, with mean age 63.2 ±10.25 years and crude OR 0.55. In a systematic review of cohorts that included 43 studies in 10 countries and 63,425 patients, authors reviewed prospective cohorts, and the factors associated with non-participation and/or abandonment of cardiac rehabilitation programs. In eight of these studies, advanced age was found to be a factor associated with nonadherence to the programs (OR range: 1.01-4.76); however, in another four studies, young age was reported as a factor associated with nonadherence (OR range: 1.04- 1.72) (9).

In a cohort study in 38 facilities with 4,413 patients with a mean age of 65 ±12 years, the association between organizational and patient factors and adherence to the cardiac rehabilitation program was demonstrated. Likewise, patients aged ≥65 years have the highest probability of adherence (OR: 1.56, 95% CI: 1.24-1.97) (17). In addition, another study with a prospective cohort of 1,658 patients with a mean age of 63.86 ±11.58; in the multivariate analysis, those >65 years completed the most significant number of sessions attended with an average of 24 (18).

In the case of the present study, the multivariate analysis did not reveal an association between age and nonadherence, which could be influenced by the small sample used for the analysis. In the case of those >6 years of age, some are employed or are pensioners, others have time available to adhere to the program but are economically dependent on their family and/or caregiver. Those of younger age who are in their productive years also present a significant nonadherence.

On the other hand, in the case of disease-related variables initially, the association was found between nonadherence and involvement of 1-2 vessels (OR: 0.56), involvement of 3 or more vessels (OR: 1.80) and LVEF ≤40% (OR: 2.34), an association that disappears in the multivariate. There is a relationship between variables related to the disease, treatment, and nonadherence, finding higher attrition in patients with a history of cardiovascular disease and greater participation of patients with surgical myocardial revascularization (MCR) with an OR range of 0.02-0.49 (9). Also, a relationship between adherence and heart failure has not been found, although it was significantly evidenced with MVR (p <0.001) (17).

The differs from the prospective study, which evaluated program dropout in patients with heart disease, in which no statistically significant difference was found in the group that performed more than 23 sessions and the group that performed ≤23 sessions (mean: 59 ±16 and 58 ±16, respectively) (19). Patients with RVM were less likely to drop out of the program (p <0.05). In turn, when a more significant number of coronary vessels are involved, there is a greater risk of presenting a decreased ejection fraction, arrhythmias, angina, and adverse effects to medications due to the need for polypharmacy; all of this may contribute to inadequate adherence to the program because the patient presents symptoms

Table 2. Clinical characteristics of the study population

Clinical Factors	Description	Frequency	Percentage
Non-adherence	No	53	53
	Yes	46	47
Admission diagnosis	IAM Con St	35	35
	Stable Angina	7	7
	Unstable Angina	1	1
	Sudden Death	0	0
	IAM Sin St	55	56
	Not available	1	1
Coronary vessel involvement	0	4	4
	1-2	61	62
	≥3	30	30
	Not available	4	4
Intervention of the totality of the involved vessels	No	66	67
	Yes	33	33
PMedical surgical procedure	Catheterization	7	7
	PTCA + Conventional stent	7	7
	PTCA + Medicated stent	46	46
	Myocardial revascularization	21	21
	Medical management	10	10
	PTCA+Medicated stent+Rvm	3	3
	Not available	5	5
Catheterization	No	92	93
	Yes	7	7
PTCA Conventional stent	No	92	93
	Yes	7	7
PTCA Medicated stent	No	53	54
	Yes	46	46
RVM	No	78	79
	Yes	21	21
Medical management	No	89	90
	Yes	10	10
PTCA Medicated stent RVM	No	96	97
	Yes	3	3
PTCA sMedicated stent y RVM	No	98	99
	Yes	1	1
FEVI ≤40	No	64	65
	Yes	13	13
	Not available	22	22
Smoking	No	93	94
	Yes	4	4
	Not available	2	2
Quantitative FEVI	%	53	RI (25-58)
Quantitative BMI	K/cm^2	26	RI (24-28)
Quantitative abdominal circumference	cm	95.4	DS ±8.66

Table 3. Questionnaires of the study population

Questionnaires	Description	Frequency	Percentage
Qualitative BMI	Normal	36	36
	Obese	62	63
	Not available	1	1
HADS Depression	No	90	91
	Yes	9	9
HADS Anxiety	No	77	78
	Yes	22	22
CVRS	Good	74	75
	Bad	25	25
PHQ Interpretation	Minimum	62	63
	Slight	22	22
	Moderate	11	11
	Moderately Severe	1	1
	Serious	3	3
PHQ Grouped	No intervention for depression	96	97
	Intervention is required for depression	3	3

Table 4. Clinical and demographic characteristics of the study population by comparison group and measures of association between exposure and outcome variables. Qualitative variables

Caracteristic	Description	N	Case	Control	OR	CI	p value
Genre	Male	71	33	38	1.00	0.38-2.66	0.996
	Female	28	13	15			
Age >60	Yes	53	21	32	0.55	0.25-1.23	0.144
	No	46	25	21			
Procedence	Cali	83	38	45	1.66	0.41-7.16	0.4157
	Outside Cali	12	7	5			
Laboral	Does not work	10	3*	7	2.18	0.46-3.80	0.2709
	Labora	89	43	46			
Schooling	Up to elementary school	22	10	12	1.05	0.36-3.08	0.9201
	From incomplete high school to postgraduate studies	75	35	40			
Marital status	Stable Union	75	35	40	0.95	0.32-2.74	0.9201
	No Stable Union	22	10	12			
Socioeconomic stratum	Medium/high	31	15	16	0.85	0.36-2.02	0.710
	Under	61	27	34			
IAM	With st elevation	35	16	19	0.94	0.40-2.20	0.885
	No st elevation	55	30	30			
Non-ST-elevation AMI	Yes	55	26	29	1.08	0.48-2.38	0.857
	No	44	20	24			
Stable Angina	Yes	7	3*	4*	0.85	0.18-4.03	0.843
	No	92	43	49			
Coronary vessel involvement	0 vessels	4	1*	3*	1		
	De 1 o 2 vessels	61	25	36	2.08	0.20-21.2	0.535
	≥3 vessels	30	17	13	3.92	0.36-42.2	0.259
IIntervention of the totality of the involved vessels	Yes	33	18	15	1.63	0.70-3.78	0.256
	No	66	28	38			
Cardiac catheterization	Yes	7	3*	4*	0.85	0.18-4.03	0.843
	No	92	43	49			

Caracteristic	Description	N	Case	Control	OR	CI	p value
PTCA Conventional stent	Yes	7	2*	5	0.44	0.08-2.36	0.336
	No	92	44	48			
PTCA Medicated stent	Yes	46	20	26	0.80	0.36-1.77	0.579
	No	53	26	27			
RVM	Yes	21	10	11	1.06	0.36-3.11	0.905
	No	78	36	42			
Medical Management	Yes	10	6	4*	1.84	0.40-9.43	0.365
	No	89	40	49			
PTCA medicated stent and RVM	Yes	3	2*	1*	2.36	0.21-26.9	0.488
	No	96	44	52			
FEVI ≤40	Yes	13	8	5	2.34	0.69-7.94	0.174
	No	64	26	38			
Qualitative BMI	Yes	62	30	32	1.17	0.51-2.67	0.706
	No	36	16	20			
HADS Depression	Yes	9	4*	5	0.91	0.23-3.63	0.899
	No	90	42	48			
HADS Anxiety	Yes	22	5	17	0.26	0.08-0.77	0.0114
	No	77	41	36			
CVRS	Yes	25	8	17	0.45	0.17-1.16	0.0980
	No	74	38	36			
PHQ Grouped	Yes	3	1*	2*	0.57	0.05-6.46	0.6470
	No	96	45	51			
Smoking	Yes	4	2*	2*	1.16	0.16-8.6	0.8830
	No	93	43	50			

Table 5. Clinical and demographic characteristics of the study population by measures of association between exposure and outcome variables. Quantitative variables.

Característica	Description	Central Trend	Dispersion	OR	IC	p-value
Age years	Years completed	63.2	DS ±10.25	0.98	0.94-1.02	0.337
Quantitative BMI	K/cm^2	26	RI (24-28)	1.10	0.99-1.23	0.086
Quantitative abdominal circumference	Cm	95.4	DS ±8.66	1.05	1.00-1.10	0.063
Quantitative LVEF	Percentage	53	RI (25-58)	1.00	0.98-1.02	0.716

Table 6. Multivariate model between exposure and outcome variables.

Variable	Description	n	Cases	Controls	OR	CI	p-value	OR adjusted	CI OR adjusted
			n=(%)	n=(%)					
Age >60	No	46	25	21	0.55	0.23-1.32	0.1429	0.51	0.18-1.42
	Yes	53	21	32					
Involvement of 1-2 coronary vessels	No	38	21	17	0.56	0.23-1.38	0.1659	0.67	0.04-10.28
	Yes	61	25	36					
Involvement ≥3 coronary vessels	No	69	29	40	1.80	0.070-4.71	0.1796	2.56	0.87-7.52
	Yes	30	17	13					
FEVI ≥40%	No	64	26	38	2.34	0.59-10.05	0.1662	2.61	0.68-10.04
	Yes	13	8	5					
HADS Anxiety	No	77	41	36	0.26	0.07-0.84	0.0114	0.30	0.08-1.13
	Yes	22	5	17					
Quantitative BMI	Kg/cm^2	-	-	-	1.1	0.99-1.23	0.086	1.04	0.85-1.27
Quantitative Abdominal Perimeter	cm	-	-	-	1.05	1.00-1.10	0.063	1.05	0.96-1.15

Tabla 7. Modelo multivariado final.

Variable	Description	n	Cases	Controls	p-value	OR	IC	OR adjusted	IC 95%	p-value
			n=(%)	n=(%)						
HADS Anxiety	No	77	41	36	0.0114	0.26	0.07-0.83	0.26	0.09-0.077	0.015
	SI	22	5	17						

with efforts that he or she tends to avoid. In this study, possibly due to the number of patients included, it was impossible to relate these clinical variables to nonadherence.

Regarding the patient-related variables, the abdominal perimeter and body mass index (BMI) measurement correlated with nonadherence (OR 1.05 and 1.10, respectively). Using BMI, a significant difference is evident in the mean for the group that performed more than 23 sessions of 27±4 and for the group that performed ≤23 sessions of 27±5 (p >0.05) (18) or the relationship between an elevated BMI and greater risk of nonadherence to the program (9). A systematic review of CTs, with 18 studies, does not show a relationship between BMI and nonadherence in the 519 patients included in the two arms of the study (20). With a prospective cohort, there was no evidence that it was a significant independent predictor; obesity was frequent in patients with coronary disease, 40% had a very high abdominal perimeter, and half dropped out of the program (18).

The increased symptom associated with initiating cardiac rehabilitation increases the risk of dropout (9,18). Thus, obesity due to excessive calories reflects long-standing unhealthy lifestyles and, in most cases, physical deconditioning due to sedentary lifestyles. Obese patients also have limited mobility in their limbs due to excess adipose tissue, which makes it difficult to exercise, increases muscle fatigue and sweating, and, at the beginning, may cause myalgia.

Thus, after multivariate analysis, the anxiety variable evaluated with the HADS questionnaire showed a significant association with nonadherence to the program (adjusted OR: 0.26). Several authors report similar results in their systematic review, showing that only one study has an association between Anxiety and participation in the program (9). On the other hand, five of the studies reviewed evaluated the relationship between depression and Anxiety with nonadherence, reporting a positive association, OR range 1.15 -7.18 (9). A group of patients who left the program early presented a higher risk of Anxiety, with a score on the respective component of the HADS ≥11 points (p= 0.058) (19). Likewise, in a retrospective review with 380 patients, anxiety symptoms were found to be related to leaving the program (21). Also, 397 Jewish and Ara patients were evaluated, finding an inverse association between Anxiety and staying in a programe, the higher the number of expressed anxiety symptoms, the lower the probability of staying in a program (22). Another study of a retrospective cohort of 4,784 patients shows that adults with moderate anxiety symptoms at program entry are more likely to drop out compared to adults with normal to mild anxiety symptoms (p <0.001) (23). Diagnosing or detecting anxiety is essential for the program's effectiveness (10).

Thus, it is shown that the result of the HADS questionnaire positive for Anxiety has a more significant association with nonadherence to the program. Cardiac rehabilitation programs in which quality of life and emotional state questionnaires are applied help to diagnose emotional states that require specialized intervention, such as psychology and/or psychiatry, which makes more comprehensive care possible. In recent years, little research has been done on the role of Anxiety in patients in these programs. However, it is known that the prevalence can be as high as 50% in patients suffering from cardiovascular complications (11).

The present study showed that Anxiety was a protective factor for nonadherence to the program. Thus, patients identified as anxious tend to drop out of the program less, so there are two possible explanations for this; the first is that the anxious patient receives treatment for their state of Anxiety, helping them to control and overcome it, for this must be taken into account that the program has an interdisciplinary team that includes a psychologist located in the same IPS where the cardiac rehabilitation therapy is performed, the comprehensive management of the patient makes the patient have clinical results motivating them to complete the treatment. The second possibility is that patients with Anxiety caused by their state of health are more adherent to the program since their Anxiety and concern drive them to seek, accept, and comply with the indications provided by the health personnel. Therefore, it should be emphasized that an acute coronary event is a situation that can be very significant in a person's state of mind.

Conclusions

The results found in this study show that patients who presented Anxiety have a higher risk of nonadherence to CRP. The support of an interdisciplinary team in developing cardiac rehabilitation programs and the knowledge and application of questionnaires such as the HADS to personally identify this type of situation is considered of great relevance. All this allows us to have elements to improve adherence to the program and provide the benefits of the program.

It is recommended that future research be carried out to include data from a more significant number of patients, where different institutions and patients from the subsidized and contributory health regimes can be included. In addition, evaluating a more significant number of characteristics related to the treatment in such a way that the program's quality can be improved, focusing on those variables that show statistically significant associations, is necessary. It is suggested that the statistical analysis be repeated with at least 152 data and 152 controls for a total of at least 304 patient data, and, in this way, the power of the study should be increased to 80% with a nonadherence rate of 40%.

Bias control

Since this is a secondary source of information, errors could be found in the tabulation of the data, for which data quality

control and coding were carried out, as well as verification of duplicate data. Another information bias can occur when creating dichotomous variables to make the calculations of the bivariate and multivariate analysis; this was controlled because the calculations were repeated 3 times by different operators. Confounding bias was controlled using logistic regression to define the variables associated with nonadherence. Selection bias was controlled by including both cases and controlling only the records of patients entering the program for the first time.

Weaknesses

Considering that the study was only carried out in a clinic that serves the contributory system population, it is impossible to extrapolate the data to the general population. The amount of patient data meeting the inclusion criteria is small despite collecting data over two years. Therefore, a power of 37.6% was obtained for this study. In addition, the lack of information meant that it was impossible to include variables referring to the pathological history of the patients.

Strengths

The source of information generated so that the clinic can make decisions regarding strategies to improve the adherence of patients who present factors associated with nonadherence to the program can be the basis for generating new studies to evaluate strategies to improve adherence. The data quality is excellent, and it is evident that no typing errors were found during quality control.

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