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Depression and anxiety and their relationship with the anthropometric profile of patients in Cardiac Rehabilitation Phases I and II

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Abbreviations
CR: cardiac rehabilitation
WHO: World Health Organization

ABSTRACT

Introduction: Depression is a mental state disorder that affects a good number of people around the world and that, along with anxiety, is a wide-reaching problem that can strike patients after undergoing heart surgery.
Objectives: To determine the levels of depression and anxiety, and their relationship with overweight and obesity, in patients attending cardiac rehabilitation phases I and II.
Method: Fifty patients receiving cardiac rehabilitation (25 in phase I and 25 in phase II) were selected. The Hospital Anxiety and Depression Scale (HADS) was used to screen anxiety and depression disorders. In addition, the anthropometry of the participants was examined and Kolmogorov-Smirnov and Shapiro-Wilk normality tests were performed. Mean, standard deviation and Pearson correlation coefficient with a significant degree of $p<0.050$ were also applied.
Results: The 50 participants (66% men) had an average age of 63.86±10.99, with postoperative diagnosis of coronary-artery bypass grafting (44%), coronary angioplasty (40%), atherosclerotic disease (4%), aortic valve replacement (4%), atrial septal defect closure (4%), implanted pacemaker (2%) and physical deconditioning (2%). Depression was found at 36% and anxiety at 30%.
Conclusions: There is a high prevalence of depression and anxiety in cardiac rehabilitation programs; its frequency is higher in phase I compared to phase II. Moreover, we found that there is a slight-mild correlation between anxiety versus normal weight and obesity, as well as depression versus overweight.
Keywords: Cardiac rehabilitation, Heart failure, Depression, Anxiety

Depresión y ansiedad y su relación con el perfil antropométrico de los pacientes en rehabilitación cardíaca fases I y II

RESUMEN

Introducción: La depresión es una alteración del estado mental que afecta a muchas personas alrededor del mundo y que, junto con la ansiedad, constituye un problema a nivel mundial que puede afectar a los pacientes en el período posqui-

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rúrgico cardiovascular.
Objetivo: Determinar los niveles de depresión y ansiedad, y su relación con el sobrepeso y la obesidad, en pacientes que asisten a rehabilitación cardíaca fases I y II.
Método: Se hizo la selección de 50 participantes de rehabilitación cardíaca (25 de fase I y 25 en fase II). Se utilizó la Hospital Anxiety and Depression Scale (HADS) para la detección de trastornos de ansiedad y depresión. Además, se valoró la antropometría de los participantes y se realizaron pruebas de normalidad de Kolmogorov-Smirnov y Shapiro-Wilk; como también, la media, desviación estándar y el coeficiente de correlación de Pearson con un grado significativo de p<0,05.
Resultados: Los 50 participantes (66% hombres) tenían una edad promedio de 63,86±10,99, con diagnósticos posoperatorios de revascularización miocárdica (44%), angioplastia coronaria (40%), enfermedad aterosclerótica (4%), reemplazo de válvula aórtica (4%), cierre de comunicación interauricular (4%), marcapasos implantado (2%) y desacondicionamiento físico (2%). Se encontró una depresión de 36% y ansiedad de 30%.
Conclusiones: Existe una alta prevalencia de depresión y ansiedad en los programas de rehabilitación cardíaca, su frecuencia es mayor en la fase I en comparación con la II. Además, se encontró que existe una correlación moderada leve entre la ansiedad y el normopeso y la obesidad, al igual que entre la depresión frente al sobrepeso.
Palabras clave: Rehabilitación cardíaca, Insuficiencia cardíaca, Depresión, Ansiedad

INTRODUCTION

Depression is an alteration of the mental state that affects many people around the world. Currently, this mental disorder represents a great socioeconomic burden for all states and it is considered the main cause of disability globally.

According to the World Health Organization (WHO), depression is commonly associated with feeling of sadness, alteration of mood and hope, and lack of motivation[1]. As well as it is the lack of interest in leisure activities accompanied by the inability to develop basic activities of daily life. On the other hand, anxiety is an emotion determined by a feeling of tension and worry reflected in psychic and physical changes[2].

The Anxiety and Depression Association of America (ADDA) defines that adolescents tend to be more likely to suffer mental disorders, in a 17%[3], and that this figure may continue into adulthood. Among the most common mental disorders are agoraphobia (4.5%) and social phobia (1.5%), disruptive behavior (3.3%) and depression (1.7%)[3]. In 2015, 16.1 million people over the age of 18 presented a depressive episode in the United States, and at least one depressive every year[4].

Moreover, obesity is considered a multifactorial metabolic disease of chronic course, determined mainly by physiological, metabolic, molecular, genetic and social elements; also, the environmental factors and the lifestyle contribute with the development of this disease[5]. Overweight and obesity are associated with an imbalance where the intake of calories exceeds energy expenditure, coupled with an increase in intake of foods rich in calories and fat content, and a decrease in performing physical activity[6].

In addition, in the last 20 years, the rate of obesity has increased in both, developed and developing countries. In Mexico, according to data from the United Nations International Children's Emergency Fund (UNICEF) and the National Public Health Survey, there is a prevalence of obesity of 35% over the total population[7]. Meanwhile, the National Health and Nutrition Survey (*ENSANUT*, after its Acronym in Spanish) reveals that one out of three adults is overweight or obese, with a growing trend towards the second. There are several factors contributing to the increase in body weight with impaired health: hypercaloric diet, sedentary lifestyle, smoking, alcoholism, impaired sleep and wakefulness, and stress. The latter is one of the main risk factors for chronic noncommunicable diseases, such as obesity. In addition, stress represents one of the first signs of alteration on the mental state: tension, irritability, fatigue, stress, anxiety and depression.

Currently, the association towards the body image is linked to food and plays a key role in the development of obesity through the construction of the visual perception of our body. This process is widely related to the aesthetic values promoted by the same society and the aesthetic ideal, which causes people's dissatisfaction with respect to their body image[8]. Thus, changes in mood are a trigger for some cardiovascular, renal and humoral diseases. The emotional status has also been associated with the development of some types of cancer (breast, prostate, colon and endometrium)[9].

Some regions such as the frontal cortex, the hippocampus, the amygdala and the nucleus accumbens are associated with changes in emotional state and behavior. Likewise, some regulating mood substances are involved in the modulation or excitation of these states[10]. Consequently, alterations on brain function, such as anxiety and depression may be linked to food disorders, such as emotional hunger. This psychological disorder refers to the use of food as a strategy to deal with negative emotions, with an increase on carbohydrates' ingestion. An association has also been found between depressive traits and body mass index[11].

In this way, changes in human behaviors are often influenced by a social, environmental and political context[12]. In turn, it is important to recognize the cardiac rehabilitation (CR), which is defined by the WHO as: "The set of activities needed to ensure people with cardiovascular disease a physical, mental and social optimum state which allows them to take, by its own means, a place as normal as possible in society."[13,14]

This rehabilitation presents phases that depend on the patient's time and evolution:

- Phase I: During the hospitalization after a cardiac event (acute coronary syndrome and posterior to a percutaneous coronary intervention or a cardiac surgery of any kind).
- Phase II: Cardiovascular rehabilitation at discharge. It is done in a gym specialized in CR.
- Phase III: Early maintenance.
- Phase IV: Late maintenance. It starts after completing Phase III; although some groups present Phases III and IV together.

Therefore, this study aims to determine the levels of depression and anxiety and its existing relationship with overweight and obesity in patients attending Phases I and II of CR.

METHOD

Design

An observational, descriptive, cross-sectional, multicenter study was conducted in 50 individuals, with the presentation of quantitative variables. Participants signed an informed consent where they authorized their participation in the research and the use of information for academic purposes in agreed places, where they were informed the conditions and processes.

Individuals

Fifty participants of cardiac rehabilitation (25 of Phase I and 25 for Phase II) were selected, who should have an equal age or over 18 years of age, being enrolled to the program of CR and express their desire to participate voluntarily in the research by signing the informed consent.

There were excluded from the possibility of being selected those with alterations that could interfere with or bias the development and the answers to the study, such as: psychiatric disorders, cognitive deficits and the desire not to participate.

Materials

Previous to testing, participants filled a questionnaire for the extraction and validation, individually and organized, of personnel data. This instrument allowed to collect information on data and sociodemographic characteristics of the participants; behaviors and lifestyles were also determined.

We used the Hospital Anxiety and Depression Scale (HADS)[11] for detecting emotional disorders of the kind of anxiety and depression. This measuring instrument consists of 14 items that show great reliability and validity in the diagnosis and detection of anxiety and depression in people with a poor or unfavorable physical condition. Consumption habits, both of alcoholic drinks and of other substances that can alter consciousness and the emotions were also considered, as well as the type of daily lifestyle.

Furthermore, for measuring vital signs, morphological and anthropometric variables were used: a measuring rod (Adult Acrylic Halter Wall Kramer 2104) to determine the height of the individuals, a tape measure (Asmico 150 cm 60 Fiber glass) for the

perimeters and circumferences, and a balance (Tezzio Digital Balance TB-30037) to determine the weight and electrical bioimpedance and to calculate the percentages of body composition.

Procedures

To all the individuals included in the study, a questionnaire was applied in order to identify sociodem-

Table 1. Sociodemographic characteristics.

Variables	Male (n=33)	Female (n=17)	Total	
			Nº	%
Age (years, mean±SD)			50	63,86±10,99
Academic level				
Primary school	19	11	30	60,0
High school	7	-	7	14,0
University	7	6	13	26,0
Marital status				
Single	4	5	9	18,0
Married	22	4	26	52,0
Free union	4	1	5	10,0
Widower	3	7	10	20,0
Diagnosis				
CABG	17	5	22	44,0
Angioplasty	15	5	20	40,0
Atherosclerotic disease	1	1	2	4,0
Valve replacement	1	1	2	4,0
ASD closure	-	2	2	4,0
Pacemaker	-	1	1	2,0
Deconditioning	-	1	1	2,0
Cardiac rehabilitation phase				
I		18	7	25
II	15	10	25	50,0
Nutritional status according to BMI				
Underweight	2	-	2	4,0
Normal weight	19	8	27	54,0
Overweight	10	5	15	30,0
Obesity	2	4	6	12,0
Size (cm, mean±SD)	168±5,97	156,12±5,84	50	163,92±8,17
Weight (kg, mean±SD)	69,08±11,07	64,06±13,26	50	67,38±11,97
Body composition (%, mean±SD)				
Body fat	25,04±5,94	32,09±8,15	50	27,44±7,49
Muscle	39,16±4,12	33,83±3,78	50	37,35±4,71
Water	51,95±5,03	46,56±6,03	50	50,12±5,92

ASD, atrial septal defect; BMI, body mass index; CABG, coronary artery bypass grafting, SD, standard deviation.

ographic characteristics and healthy behaviors and habits in an individualized, monitored and supervised manner.

For the identification of behaviors and lifestyles, several attributes were grouped: tobacco consumption, alcoholic drinks, hydrating and energizing drinks; frequency of consumption of fatty foods, fruits and vegetables, the type of breakfast consumed daily, and physical activity.

After the questionnaire, the HADS depression and anxiety scale was applied, which was also individually and monitored, without crossing out or modifications. Participants were explained that the information obtained would be confidential and would only be used for scientific purposes.

Likewise, values of body weight and percentages of fat, muscle, bone and water were determined by bio-electrical impedance, whose use was adjusted taking into account calibration and surface stability. For the body mass index, the equation proposed by Quetelet and its interpretation by the WHO were used, as recommended by Salazar *et al*[9].

Statistical analysis

The Kolmogorov-Smirnov and Sharipo-Wilk tests were used for determining the normality between anxiety and depression with the nutritional status of participants, as well as with respect to the age and gender.

With the data collected, it was determined: the mean and its standard deviation, and the Pearson correlation coefficient, with a significant degree of $p<0.05$ (95% CI). The values are obtained through the SPSS statistical systems and Microsoft Excel for Windows.

RESULTS

Fifty participants (66% men) with an average age of 63.86±10.99 were selected. Among the sociodemographic characteristics, 60% of individuals were found to have a primary education level, 14% secondary, and 26% university. On the other hand, 52% of the participants were married, 20% widowed, 18% single and 10% in free consensual union (**Table 1**).

On admission diagnoses associated to cardiac disease were found: myocardial revascularization (44%), angioplasty (40%), atherosclerotic disease (4%), aortic valve replacement (4%), closure of atrial septal defect (4%), implantation of pacemakers (2%) and physical deconditioning (2%); these patients were in phases I (50%) and II (50%) of CR (**Table 1**). The participants had an average height of 163.92± 8.17 cm and an average weight of 67.38±11.97 kg. Likewise, it was determined that 54% of the individuals had a normal weight; however, 42% were overweight and obese (30% and 12%, respectively). Moreover, women had a higher percentage of body fat than men and lower values of muscle mass and water.

Among the cardiovascular risk factors of the population under study, there were found history of diabetes mellitus (28%), high blood pressure (74%) and overweight/obesity (42%). Besides, there were identified others as: dyslipidemia (36%), smoking (48%), depression (36%) and anxiety (30%) (**Table 2**).

Table 2. Cardiovascular risk factors (n=50).

Characteristics	Total	Male	Female
Overweight and obesity	21 (42)	12 (24)	9 (18)
Sedentary lifestyle	44 (88)	29 (58)	15 (30)
Dyslipidemia	18 (36)	10 (20)	8 (16)
High blood pressure	37 (74)	26 (52)	11 (22)
Diabetes mellitus	14 (28)	5 (10)	9 (18)
Smoking	24 (48)	18 (36)	6 (12)
Depression	18 (36)	10 (20)	8 (16)
Anxiety	15 (30)	8 (16)	7 (14)

Data are expressed in n(%)

It is noteworthy that patients under CR have a high percentage of depression (36%) and anxiety (30%) and 20% of them have two disorders at the same time. It is also important to know that the depression values (Phase I [48%] *vs* Phase II [24%] and anxiety (Phase I [48%] *vs* Phase II [12%]) are higher in Phase I of the CR. Regarding the normality tests of Kolmogorov-Smirnov and Sharipo-Wilk, these indicate that there is no significant relationship with a non-linear tendency in patients with anxiety and depression regarding nutritional status and, specifically, obesity (**Table 3**). Also, it was possible to correlate through Pearson's r (**Table 4**) the un-

derweight with respect to depression (1.000) and anxiety (1.000). The latter was higher in individuals of ordinary weight (0.338 *vs* 0.065), lower in overweight (0.017 *vs* 0.204) and, finally, for obesity correlation was 0.435 for anxiety and -0.101 for depression. Which means that there is a slight moderate correlation between anxiety and normal weight or obesity, as well as depression is related with overweight.

DISCUSSION

This research has been intended for determining the levels of depression and anxiety and their existing relationship with overweight and obesity in patients attending Phase I and II CR. Through it, we found that there is a slight moderate correlation between anxiety and the patient with normal weight or obesity, as well as between depression and overweight.

Symptoms of depression and anxiety are associated with cardiac risk and may be determined on admission to CR programs, through questionnaires that can be self-administered or applied by such programs' staff. In this research were found greater levels of depression compared to anxiety; as well as important risk factors such as: smoking, obesity, excessive alcohol consumption and therapeutic non-adherence.

Depression and anxiety appear to have attributable risk associated with mortality, comparable to other risk factors known as smoking or ischemic heart disease[13]. Many of the patients who had symptoms of anxiety and depression, in addition, suffered from diabetes, high blood pressure and other cardiovascular risk factors such as dyslipidemia and smoking, which coincides with other alike research[13-16], where there was identified that smokers, obese people, and those with excessive alcohol consumption had higher depressive symptoms and were more likely not to comply with their medica-

Table 3. Normality test (n=50).

Variables	Nutritional status	Kolmogorov-Smirnov*			Shapiro-Wilk		
		Statistical	df	Significance	Statistical	df	Significance
Anxiety	Underweight	0,260	2	-			
	Normal	0,176	27	0,032	0,898	27	0,012
	Obesity	0,270	6	**0,197**	0,892	6	**0,331**
	Overweight	0,300	15	0,001	0,821	15	0,007
Depression	Underweight	0,260	2	-			
	Normal	0,172	27	0,040	0,920	27	0,040
	Obesity	0,251	6	**0,200****	0,927	6	**0,557**
	Overweight	0,260	15	0,007	0,846	15	0,015

* Correction of the significance of Lilliefors. df, degree of freedom.
** This is a lower limit of the true significance.

Table 4. Correlation between anxiety and depression variables versus anthropometric measures (Pearson's r method).

Variables	Body weight				Body composition		
	Underweight (n=2)	Normal weight (n=27)	Overweight (n=15)	Obesity (n=6)	Body fat (n=50)	Water (n=50)	Muscle (n=50)
Anxiety	1,000	0,338	-0,017	0,435	0,067	-0,166	0,056
Depression	1,000	0,065	0,204	-0,101	0,026	-0,089	0,095

tion and perform less favorable health behaviors.

Moreover, hospitals and CR programs must incorporate screening and treatment of anxiety and depression to prevent morbidity and mortality associated with these disorders. According to Pourafkari *et al*[14], CR programs reduce levels of anxiety and depression in patients after coronary artery bypass grafting. The evidence confirms the beneficial effects of therapy for mental disorders, the prognosis of heart disease and the quality of life[15,16]; nonetheless, the therapeutic approach to treatment after cardiac events and rehabilitation is a matter of controversy[15-17]. It includes: psychological consulting[18], pharmacotherapy with antidepressants[19]and with statins[20], as well as physical exercise[21]. These therapeutic strategies have been studied individually or in combination and encouraging results have been obtained[22].

Likewise, these interventions accomplished decreased levels of depression and generate a positive impact on heart diseases; in fact, CR programs with structured activities have shown beneficial effects on the psychological and cardiovascular states of patients[23].

Other aspects must be considered, as the gender gap and the presence of social support, in order to establish interventions in these patients with cardiac diseases. In this research, it was found that the majority of individuals (54%) had a normal weight and 42% were overweight and obese; women had a higher body fat percentage than men and lower muscle mass and water values; in addition, the depression (Phase I 48% and Phase II 24%) and anxiety (Phase I 48% and Phase II 12%) values are greater in Phase I of the CR compared to Phase II, a finding that can coincide with the functional limitation and the need for help in the self-care activities in Phase I, as it is the social support. Meanwhile, in Phase II, physical exercise programmatically and more intense, with respect to Phase I, in addition to preventing cardiovascular mortality and comorbidity, it gives these subjects a more positive image of themselves as people capable of physical activities[24].

There are studies which have shown that physical exercise and training programs, due to significant improvements in motor function and to the benefits related with physical activity, are associated with a better quality of life and others results favorable to health, such as: decrease in anxiety and depressive symptoms, the control of body weight and several cardiovascular risk factors, the realization of many activities related to health care, and the adherence to the treatment and the CR program as such[25,26].

CONCLUSIONS

There is a high prevalence of depression and anxiety in cardiac rehabilitation programs, with greater frequency in Phase I versus Phase II. Furthermore, we find that there is a slight moderate correlation between anxiety and normal weight and obesity, as well as between depression and overweight.

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