Original Article

Cardiac Rehabilitation, Altered Nutritional State, Dyslipedmia and the Impact on the Quality Of Life in Adults with Heart Failure.

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ABSTRACT

The cardiac rehabilitation programs are multidisciplinary, this consists on the application of a multifactorial program to cardiac patients, and, it's main objective is to ensure the patient a social, mental and physical optimal condition that can allows them to occupy by its own manners a place as normal as possible on the society.
Objective: Design a cardiac rehabilitation program on adults that presents an altered nutritional status and heart failure on ages of 45 – 75 years in the population.
Methodology: Prospective, non – concurrent, the population consisted of 30 patients of both sexes, over 30 years and less of 75 years with the diagnoses of heart failure and any nutritional altered status, personal and familiar background of diseases was obtained and then proceeded to perform the pre – test physical exam and paraclinical exams and also an electrocardiogram as well, and a post – test evaluation were performed to the patients after the cardiac rehabilitation program ended on the same conditions as the pre – test .
Results: Indicates that the cardiac rehabilitation program allowed, to the patients involved to perform better on the lifestyle, and lowered the symptoms referred by the patients before the program, with a 99% of confidence and a margin of error of 1%, meaning that the patient that has both heart failure and any altered nutritional status will be benefited, and by this, it will have limitations on the advance of the organic damage on the long term.

Keywords: *Cardiac rehabilitation, altered nutritional state, heart failure, dyslipidemia.*

1.　INTRODUCTION:

Cardiac rehabilitation programs consist of applying a multifactorial program to cardiac patients, consisting of a set of measures that aims to ensure patients an optimal physical, mental and social condition that allows them to occupy a place as normal as their own possible in society.

To a large extent, cardiovascular rehabilitation programs have been a therapeutic alternative since the 60s of the last century, designed in turn by the World Health Organization (WHO), which has provided extensive coverage for patients with chronic heart disease and for patients with a high cardiovascular risk; Obviously, the development and implementation of cardiovascular rehabilitation programs must be supervised by specialists in the area of cardiology, or, at least, that was taken into account until 1993, when new guidelines were developed on who could carry out these programs taking into account that from the same year, they can be carried out by professionals in the area of health sciences [1].

For more than 40 years, since the first WHO publication, indications and contraindications of it were maintained, especially in relation to patients with heart failure, however, the indications have been expanded, currently managing a large percentage of elderly patients with highly developed heart disease in heart failure and being carriers of pacemakers or implantable automatic defibrillators [2].

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The main and fundamental objective of cardiovascular rehabilitation is based on increasing the quality of life and improving its prognosis, specifying the multidisciplinary action that encompasses from the psychosocial point of view, as well as the control of risk factors and physical training, since that, in turn, this would improve the prognosis and life expectancy of the patients who underwent the program; Also, one of the great objectives of cardiovascular rehabilitation is adherence to the program itself, taking into account the risk-cost-benefit that can be provided to the patient due to the statistically significant existence of the decrease in mortality in these patients, especially those with heart failure[2].

Although these long-term benefits are promising with high levels of profitability. Still, the development of these programs has been insufficient. In the United States in 2001, only 10 to 20% of the more than 2 million patients with indications participated annually; patients who undergo these programs must be informed about the behavior they are going to learn and must continue for the rest of their lives, taking into account that these "life- long programs" must have strict vigilance (supervised physical training), for 8-12 weeks and afterwards they must be adapted to their daily life (Unsupervised training) [1].

In turn, the CR program can be beneficial for patients with different levels of changes in nutritional status, ranging from weight deficit to type III obesity, in which it is maintained that patients with an increase in mass index body benefits in relation to their increased body mass index greater than 30% in both the female and male sex. Therefore, the weight increase in body mass will be reduced and the quality of life will improve, in addition to reducing your cardiovascular risk [1, 2].

Taking into account the impact that CR has on the short and long-term effects, it is argued that cardiovascular rehabilitation has positive and promising effects on dyslipidemia; in this sense, it is understood that, according to the ATP IV study and existing dyslipidemias,

conclude that the evidence shows that the benefit with the use of statins is obtained with the appropriate use of the family of previously mentioned drugs adjusted to the maximum tolerated dose, in addition to there being no benefit in seeking specific goals and therapies combined with lipid lowering agents for the different types of hypercholesterolemia in levels of high-density cholesterol (HDL-c), low-density cholesterol (LDL-c), Apolioprotein B (Apo

B) and triglycerides (TGC),except for the borderline levels already established in the ATP- III study of c-HDL[3].

The Framinghan studies establish that patients with cardiovascular risk can present with heart failure, especially when they relate to its main symptoms, which are correlated with the Framinghan study and its major and minor diagnostic criteria[4].

In turn, compensated heart failure as an indication for cardiovascular rehabilitation is a subject of wide debate, since as long as it is compensated; it can be a candidate if it does not have a functional limitation that can interrupt its daily life. Not in accordance with this, this lends itself to a debate among those who present more advanced stages of heart failure in terms of their functional classes (NYHA III and IV) than their previous stages (NYHA I and II) due to their complications that they will present prior to CR, during and after the associated stress test, bearing in mind that the major complication is myocardial ischemia resulting from hypoperfusion during physical effort [4.5].

For this reason, it is proposed that said work can use cardiac rehabilitation in patients with the aforementioned comorbidities, thus reducing mortality rates from cardiovascular diseases, relating it to the risk factors that they possess according to the Framinghan study, relating them, positively, with the ATP - IV study and, in turn, the variations in nutritional status to obtain a progressive decrease in the complications that these may present in the long term [4, 5].

Due to the aforementioned, heart failure in patients with altered nutritional status through the cardiac rehabilitation program would have a merely positive impact on the population, since aerobic and calisthenics exercises would significantly reduce future complications in these patients, likewise, as the reduction of the signs and symptoms of the patients under study, in turn, increasing HDL cholesterol levels in the blood.

The study tools, in addition to the outpatient monitoring and analysis of patients with heart failure and alteration of nutritional status, will be based on the use of the electrocardiogram, HDL cholesterol levels, BMI, to assess the health status of patients prior to the program of rehabilitation and be reevaluated to see the results that this offers in their quality of life.

In Venezuela, cardiovascular diseases have a high prevalence in the national territory; However, it is taken into account that Venezuela is going through one of the most critical moments in its history, especially in the Health Sector, where the shortage of medicines together with the great medical-care crisis in health centers are increasingly It is more difficult to meet the demands of the general population, and, non-conforming, diseases such as heart failure, dyslipidemia, and changes in nutritional status are slowly becoming frequent reasons for consultation.

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demands of the general population, and, non-conforming, diseases such as heart

failure, dyslipidemia, and changes in nutritional status are slowly becoming frequent reasons for consultation.

The main porpoise of the investigation will be to know the number of patients that present the aforementioned pathologies and see their effect through rehabilitation, which is expected to have a high level of prevention of future complications.

1.1 METHODS

Prospective, Non-concurrent, quasi-experimental and transversal investigation; a total of 100 patients were recruited for the participation of this investigation with heart failure diagnosed in 2018, a total of 41 met the inclusion criteria were counted, of whom 11 people for various reasons of various kinds could not participate in the research, therefore, the final study population was made up of 30 patients, Once the approval of the informed consent was obtained, these patients were brought together again, where they were explained through consultation the information on the importance of cardiac rehabilitation in patients suffering from heart failure, and changes in nutritional status, emphasizing the great benefits it offers to improve the quality of life; A physical evaluation was performed before the cardiac rehabilitation

program, based on blood pressure, heart rate, weight, height, body mass index, abdominal circumference, cardiopulmonary, abdominal examination, and, finally, limbs and neurological examination; the nutritional status of the patients were evaluated, stratification and classification of heart failure according to stages and functional classes were performed according to the New York Heart Association (NYHA), which ranges from functional class I to functional class IV, evaluation by Borg effort scale, and paraclinical studies were performed, consisting in electrocardiography, and measuring the levels of high density lipoprotein cholesterol (HDL) taking into account the stages of underweight up to type III obesity, as well after the application of the cardiac rehabilitation program with the same conditions established in the pretest and the same clinical history format used in the first stage.

Statistical Analysis: This work was based on statistics, where the data collected by the instrument designed by the research authors was interpreted, and their results of the qualitative and quantitative variables were represented by tables, tables and graphs with frequency distribution, percentages, absolute and pre-test and post-test measurements. To determine the association between the variables, the statistical analysis was established from the Student's T distribution.

1.2 RESULTS

Table 1: Distribution Of The Population According Age, Gender And Educational Level.

| Sociodemographic Charateristics	Alternatives (Details)	Frequency	Percentage
Age (52,97 ± 5,25)	Under 50 Years Old	8	26,7%
	From 50 Years Old	19	63,3%
	Over 59 Years Old	3	10%
Gender	Female	16	53,3%
	Male	14	46,7%
Education Level	Illiterate	4	13,3%
	Primary	9	30%
	High School	10	33,3%
	University	7	23,3%

According to the results of the previous table, it can be pointed out that the population of adults who participated in this study had, at the time the research was carried out, an average age of 52.97 years, with a standard deviation of ± 5.25 years, for a minimum age of 45 and a maximum of 65 years, with an

amplitude of 20 years. The age range with the highest percentage in the population were patients over 50 years of age, where 73.3% of the population is concentrated, and in a lower percentage (26.7%), participants with ages under 50 years.
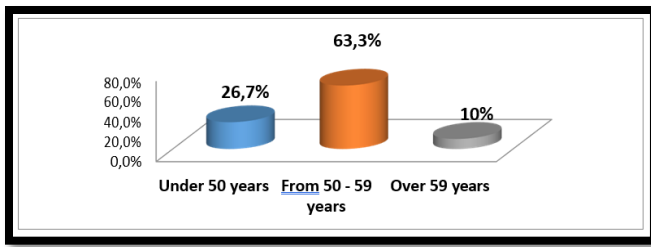
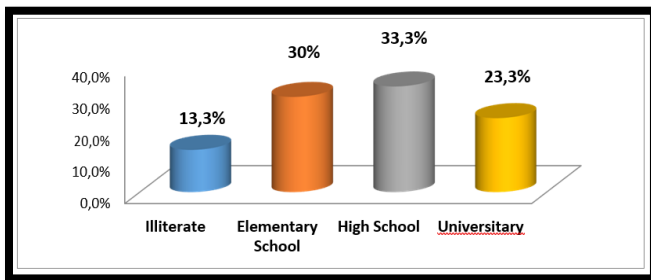**Fig. 1:** Distribution of the population according to age.

Regarding sex, the population is distributed in a more or less homogeneous way, since 53.3% are women (16 in totals) and 46.7% are the male representation of adults (14 in total).
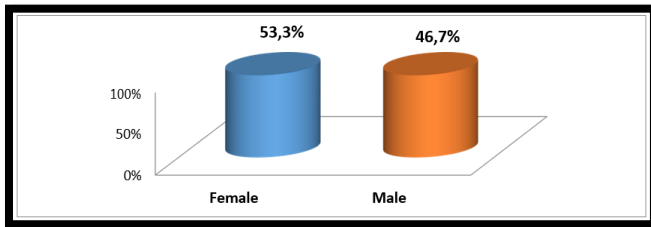
Fig. 2: Distribution of the population according the gender.

Regarding the level of education, it was observed that most of them (33.3%), that is to say 10 participants in total, have a secondary education level; 30% are located at the

level of primary education (9 patients); and 23.3% (7 participants) are university students. There are, however, a total of 4 patients (13.3%) who are illiterate


Fig. 3: Distribution of the population according of their educational level.

It is important to indicate that all the participants in this study, with the characteristics described above, had their heart failure determined, based on the criteria established for this purpose and it was possible to determine that a total of 12 patients (40%) presented Stage I Heart Failure and 60%, that is, 18 patients, were categorized with Stage II Heart Failure.
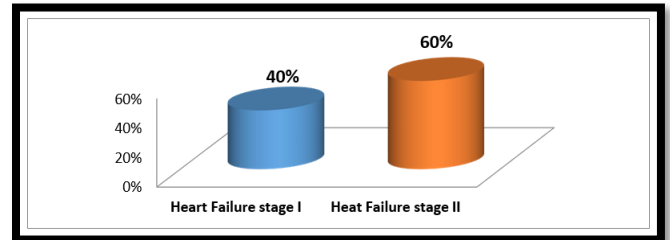
According to the results obtained, it was possible to determine that the initial average weight was 68,110 Kg, with a standard deviation of ± 14.42 Kg, with a minimum weight of 48,300 Kg and a maximum of 93,500 Kg, for an amplitude of 45,200 Kg. Likewise, their height was recorded and an average of 1.67 meters was observed, with a standard deviation of ± 0.09 meters, for a minimum size of 1.50 and a maximum of 1.94 meters, with a range or width of 0.44 meters. It should be noted that, based on these values, described above, the Body Mass Index was calculated for each and every one of the patients who made up the population in this study and an average BMI of 24.46 Kg / m was obtained., with a standard deviation of ± 5,07Kg / mts2, for a minimum BMI of 16.91Kg / mts2 and a maximum of 32.35 Kg / mts2, with an amplitude of 15.45 Kg / mts2

Table No2: Distribution of the population according to the results of the physical examination before the rehabilitation program
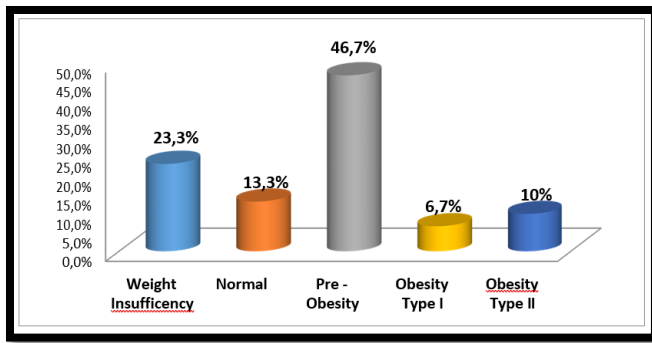
| Descriptive Measures	Variables		
	Weight	**Size**	**Bmi**
Average	68,110	1,67	24,46
Standard Deviation	± 14,42	± 0,09	± 5,07
Minimum	48,300	1,50	16,91
Maximum	93,500	1,94	32,35
Amplitude	45,200	0,44	15,45

Fig. 5: Distribution of the population according the nutritional status before the cardiac rehabilitation program.
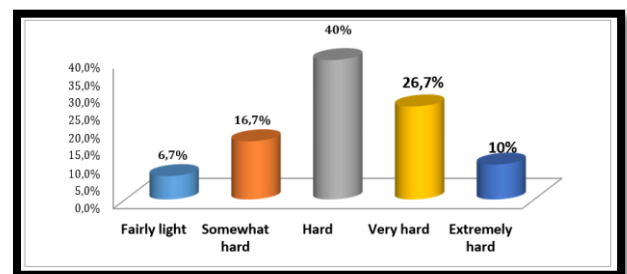
Similarly, it should be noted that each of the patients was also determined, before the rehabilitation program, their heart rates, HDL and the Borg Effort Scale and the following information was obtained:

Table 3: Distribution of the population according to the results of HR, HDL – C and the Borg's scale of perceived exertion before the rehabilitation
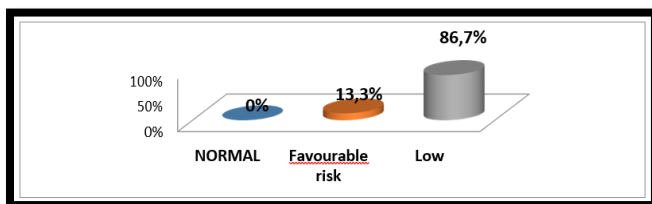
Alternatives (Details)		Frequency	Porcentage
Heart Rate	Tachycardia	19	63,3%
	Bradicard	8	26,7%
	Normal	3	10%
Hdl - C	Normal	0	0%
	Favorable	4	13,3%
	Low	26	86,9%
The Borg Scale Of Perceived Exertion	Light	2	6.7%
	Slightly Heavy	5	16.7%
	Heavy	12	40%
	Very Heavy	8	26.7%
	Extremely Heavy	3	10%
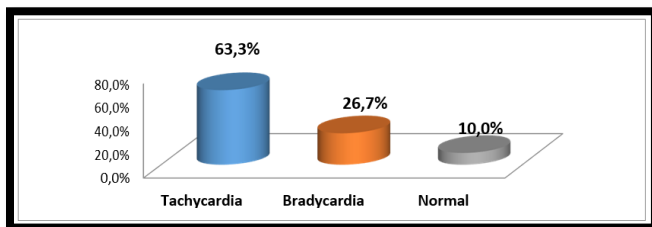
Fig. 6: Distribution of the population according the heart rate.

Fig. 7: Distribution of the population according of the levels of HDL-cholesterol

Fig. 8: Distribution of the population according of Borg's perceived exertion scale.

According to the results, it could be determined that: the initial mean SBP value was equal to 147 mmHg, with a standard deviation of ± 10.87 mmHg, for a minimum value of 130 and a maximum of 160 mmHg, with an amplitude of 30 mmHg. As for the DBP, the average was 90mmHg, with a standard deviation of ± 6.43mmHg, for a minimum value of 80 and a maximum of 100 mmHg, with an amplitude of 20 mmHg, Regarding the MBP, the average obtained was equal to 108.98 mmHg, with a standard deviation of ± 7.07 mmHg, for a minimum value of 100 and a maximum of 120 mmHg for amplitude of (20 mmHg.

Table 4: Distribution of the population according to the results of the tensional figures before the rehabilitation program

Descriptive Measures	Variables		
	SBP	**DBP**	**MBP**
Average	**174**	**90**	**108.98**
Standard Deviation	**± 10.87**	**± 6.43**	**± 7.07**
Minimum	**130**	**80**	**100**
Maximum	**160**	**100**	**120**
Amplitude	**30**	**20**	**20**

The main purpose of this program is, among others, to improve the quality of life of the patient, decrease the symptoms caused by heart failure, contribute to generate a social and economic impact due to the low cost that the cardiac rehabilitation program presents, allowing the application in outpatient settings and generate academic interest to deepen the study of cardiac rehabilitation in future research. At the end of the planned activities, we proceeded with the determination of the physical examination (weight, height, BMI, HR, and HDL-C), the Borg Effort Scale and the blood pressure figures after the application of the Cardiac Rehabilitation Program (Posttest), in similar conditions and the results obtained were as follows

Table 5: Distribution of the population according to the results of the physical examination after the rehabilitation program

Descriptive Measures	Variables		
	Weight	**Size**	**BMI**
Average	**64,600**	**1.67**	**23.20**
Standard Deviation	**± 12.46**	**± 0.09**	**± 4.29**
Minimum	**47,900**	**1.50**	**16.77**
Maximum	**86,200**	**1.94**	**29.83**
Amplitude	**38,300**	**0.44**	**13.06**

According to the results obtained, it was observed that the final average weight was 64,600 Kg, with a standard deviation of ± 12.46 Kg, with a minimum weight of 47,900 Kg and a maximum of 86,200 Kg, for an amplitude of 38,300 Kg. Likewise, a record of their height was taken and it was observed that, obviously, there was no variation with respect to the initial record. It should be noted that, based on these weight and height values, the Body Mass Index was calculated for each and every one of the patients who made up the population of this study and an average BMI of 23.20 Kg / m2 was obtained, with a standard deviation of ± 4.29 Kg / mts2, for a minimum BMI of 16.77Kg / mts2 and a maximum of 29.83 Kg / mts2, with an amplitude of 13.06 Kg / mts2. From these results obtained from the BMI, the nutritional status of each person was classified, according to the parameters established by the WHO, and it was observed that 8 patients, representing 26.7% of the population are classified with Weight insufficiency. Equal percentage of them were classified as normal. It should be noted that 43.3% (13 people of the population) were classified as pre-obese and a single patient, representing 3.3%, was classified as type I obesity. These results, referring to the classification of Patients

according to obesity after rehabilitation are graphically illustrated as follows:
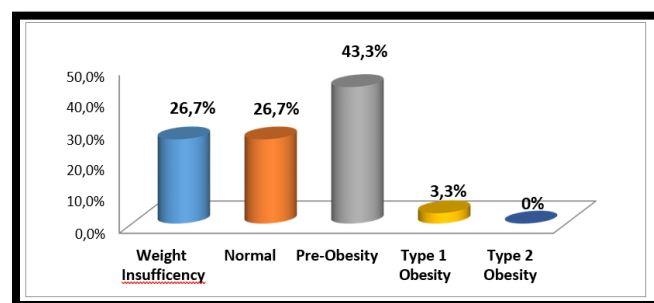
Fig. 8: Distribution of the population according the nutritional state after the cardiac rehabilitation program.

According to the results obtained from the HR after the rehabilitation program, it can be pointed out that the majority of the patients (93.3%), that is, 28 participants presented HR

figures categorized as normal and only one patient (3.3%) of the population presented bradycardia and another patient was categorized with tachycardia, as shown below; with regard to HDL, it was observed, according to the results obtained after the application of the rehabilitation program that a significant percentage of patients (more than 76%) present, according to their sex, normal HDL values, in the same way it was determined that the 23.3% of the population presented, according to HDL values, a favorable risk. It is important to
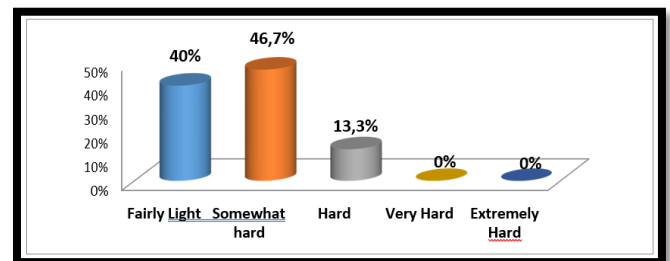
note that none of the patients, in this second measurement, presented low HDL figures; Regarding the effort during the physical work of the patients (determined with the Borg Effort Scale), after the rehabilitation program, it was observed that for 12 of the patients (40%) the effort was categorized as Light. In 46.7% the effort was valued as Lightly Heavy and in 13.3% as heavy. It is important to note that no patient in the population registered with Very Heavy or extremely heavy effort.

Table 5: Distribution of the population according to the results of HR, HDL-C, and the Borg's perceived exertion scale after the rehabilitation
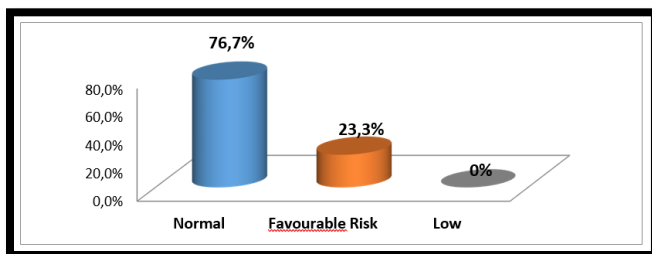
	Alternatives	Frequency	Percentage
Heart Rate	Tachycardia	1	3,3%
	Bradicardia	1	3,3%
	Normal	28	93,3%
HDL	Normal	23	76,7%
	Favourable	7	23,3%
	Low	0	0%
Borg's Perceived Exertion Scale	Light	12	40%
	Sligthly Heavy	14	46,7%
	Heavy	4	13,3%
	Very Heavy	0	0%
	Extremely Heavy	0	0%
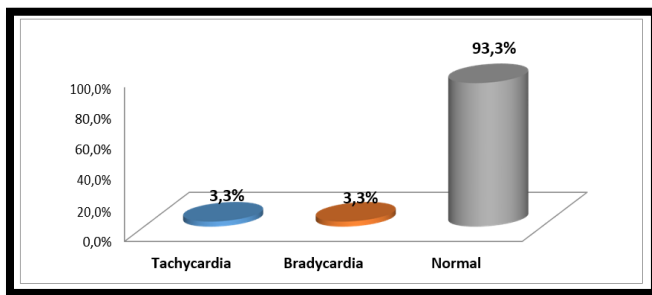
Fig. 9: Distribution of the population according the Heart Rate after the cardiac rehabilitation program.

Fig. 10: Distribution of the population according the HDL-Cholesterol levels after the cardiac rehabilitation program.

Fig. 11: Distribution of the population according the Borg's perceived exertion scale after the cardiac rehabilitation.

According to the results of this second measurement, it could be determined that: the mean value of SBP was equal to 133.67 mmHg, with a standard deviation of ± 8.08 mmHg, for a minimum value of 120 and a maximum of 150 mmHg, with an amplitude of 30 mm Hg. As for the DBP, the average was 80.67 mmHg, with a standard deviation of ± 7.39 mmHg, for a minimum value of 70 and a maximum of 90 mmHg, with an amplitude of 20 mmHg; Regarding the MBP, the average obtained was equal to 98.29 mmHg, with a standard deviation of ± 6.88 mmHg, for a minimum value of 86.60 and a maximum of 110 mmHg, for a width of 23.40 mmHg.

Table 7: Distribution of the population according to the results of blood pressure after the rehabilitation program

Variables

Descriptive Measures	TAS	TAD	TAM
Average	133.67	80.67	98.29
Standard Deviation	± 8.08	± 7.39	± 6.88
Minimum	120	70	86.60
Maximum	150	90	110
Amplitude	30	20	23.40

To determine the adequate statistical procedure to analyze the data, it was used the Kolmogorov-Smirnov Goodness-of-fit test in each of the evaluations carried out before and after rehabilitation

		BEFORE	AFTER
N		30	30
Normal Parameters	Typical Deviation	2,071	2,559
	ABSOLUT		
Most Extreme	Positive	,124	,177
Differences	Negative	,082	,088
		-,124	-,177
Z Of Kolmogorov-Smirnov		,725	1,032
Asymptotic Significance (Bilateral)		,669	,237

The contrast distribution is Normal.

The results obtained with this test demonstrate that all the bilateral asymptotic meanings are greater than .05 (p> .05), that is, not significant, this indicates that the distribution of the data Before and After the rehabilitation coincide with the Normal Distribution and therefore, Parametric Tests should be used for the analysis of the data. With the firm intention of verifying the statistical reliability of the results obtained and demonstrating the effectiveness of the cardiac rehabilitation program, the Student's t-test was applied to related population. The following hypotheses are tested: Null Hypotheses vs Alternative Hypotheses.

With the application of the Test of means for related samples, using the Statistical Program IBM - SPSS, the latest version obtained the following result:

Table 8: Average test results for related samples in records before and after rehabilitation

Test T For Related Samples	t Value	Grades Of Freedom	Signification (Bilateral)	P Value
Weight	8,007	29	.000	P < .01
BMI	8,152	29	.000	P < .01
FC	10,785	29	.000	P < .01
HDL	18,252	29	.000	P < .01
Borg's Scale	7,802	29	.000	P < .01
SBP	8,651	29	.000	P < .01
DBP	87,64	29	.000	P < .01
MBP	13,271	29	.000	P < .01

The results of this test: t = 8,007; 8,152; 10,785; 18,252; 7,802; 8,651; 8,764 and 13,271, with 29 degrees of freedom and a bilateral significance = .000 that was less than 0.01 (p <.01), in all cases, lead to making the statistical decision to reject the null hypothesis and accept the alternative hypothesis, with a confidence level of 99% and a significance level of 1%. This result indicates that the implementation of the

cardiac rehabilitation program was effective in significantly improving Weight, BMI, and HR. HDL, physical effort, SPB, DBP, MBP and therefore the quality of life of the patient, as well as reducing the symptoms caused by heart failure in adult patients who present nutritional status changes, cardiovascular risk and insufficiency cardiac in Stage I and II of the population.

2. DISCUSSION

In relation to the research carried out, the sociodemographic characteristics were established, obtaining that the population in question had a mean age between 45 to 75 years, the most predominant age being between 50 and 59 years of age, with 63.3% of the total corresponding to 19 people in the population, in turn, 53.3% of the population was a female population, which corresponds to 16 people in the population, and the remaining 46.7% was a male population, corresponding to 14 remaining people in the population (Garcia et al. Seville – Spain, 2017) In relation to the nutritional status of the evaluated population, it was determined by means of the tables of the world health organization (WHO) from the levels of underweight to obesity grade II, obtaining at a pre-test level, a minimum weight of 48,300 kilograms (Kg) and a maximum weight of 93,500 Kg, a minimum size of 1.50 meters and a maximum of 1.94 meters; in turn, after calculating body mass index (BMI) levels, it was concluded that 7 patients in the population corresponded to an underweight level (BMI <18.50 Kg / mts2), corresponding to 23.3% of the total population, 4 patients of the simple they had a normal BMI (18.51 -

24.99 Kg / mts2) corresponding to 13.3% of the population, 14 people in turn presented a pre-obesity level (25 - 29.99 Kg / mts2) corresponding to 46.7% of the population, and yet, a total of 5 patients were categorized into degrees of obesity, of which 2 patients had type I obesity (30 - 34.9 Kg / mts2) corresponding to 6.7% of the population and 3 had type II obesity (35 - 39.0 Kg / mts2) corresponding to 10% of the total population (Briceño Iragorry et al. Caracas - Venezuela, 2012),

Regarding the levels of heart failure, a total of 12 patients have stage I heart failure, corresponding to 40% of the population, while the remaining 18 patients have stage II heart failure, corresponding to 60% of the population. Dyslipidemia in the evaluated population initially showed in the pretest study low HDL cholesterol levels according to sex, mostly with 26 people in the population showing low HDL levels, corresponding to 86.7%, a result obtained in relation to those who have pre - obesity, type I obesity and type II obesity, and, nevertheless, 7 patients in the population who presented low HDL cholesterol levels were within the ranges of normal or underweight BMI. At the same time the quality of life of the patients in question was affected due to the aforementioned comorbidities, taking into account that a large part of them had clinical findings such as high blood pressure figures. There was a mean blood pressure figure of 147 mmHg for systolic blood pressure, 90 mmHg for diastolic blood pressure, with a mean blood

pressure of 108.98 for overall. In turn, each blood pressure was evaluated separately at its minimum and maximum levels, both SBP and DBP. The pre - test study showed a minimum SBP of 130 mmHg, maximum SBP of 160 mmHg, with a standard deviation of ± 10.87 mmHg, minimum DBP of 80 mmHg, maximum DBP of 100 mmHg with a standard deviation of ± 6.43 mmHg and a minimum MBP of 100 mmHg and a maximum MBP of 120 mmHg with a standard deviation of ± 7.07 mmHg. On the other hand, the population in question also presented pre-test clinical findings related to tachycardia, presenting 19 patients with more than 100 beats per minute (bpm), corresponding to 63.3% of the total population, also 8 people, corresponding to 26.7% of the population, presented bradycardia with less than 60 beats per minute (bpm) and the remaining 3 patients, corresponding to 10% of the population, presented normal heart rates.

In the same order of ideas, based on the perception of the effort made, stratification was performed using the Borg scale, in which relevant results were obtained within the study, since 40% corresponding to 12 patients in the population after performing a first round of cardiovascular and calisthenics activities, a heavy effort, following the same order of frequency, 8 people reported performing a very heavy effort corresponding to 26.7% of the total, 5 of them perceived a slightly heavy effort corresponding to 16.7% of the totality, 3 of them reported an extremely heavy effort with 10% of the totality and only 2 of them reported a light effort, corresponding to 6.7% of the population (Montero José et al, Madrid – Spain, 2009)

Prospectively, the studied population with the same characteristics was re-evaluated following the cardiac rehabilitation plan, yielding important results. First, a comparison of the averages of weight and BMI was made after the rehabilitation program, observing that the final average weight was 64,600 Kg with a standard deviation of 12.46 kg, with a minimum weight of 47,900 Kg and a maximum of 86,200 kg, with an amplitude of 38,300 Kg. From these obtained results, an average BMI of 23.20 Kg / m2 was obtained with a standard deviation of ± 4.29 Kg / mts2 for a minimum BMI of 16.77 Kg / mts2 and a maximum of 29.83 Kg / mts2 with an amplitude of 13.06 Kg / mts2. It is precise it should be noted that the post-test paraclinical studies carried out showed relevant results, in which it was observed that the normal levels of HDL according to sex prevailed in 76.7%, corresponding to 23 patients in the population and 7 of them were at favorable risk corresponding to 23.3% of the totality (Glenny Cristemis et al. Caracas – Venezuela, 2016)

In turn, heart rate was subject to significant changes, where almost all the patients prevailed, in which 28 of them were in a normal range of heart rate between 60 to 100

bpm, corresponding to 93.3% and only 2 of them presented alterations such as bradycardia and tachycardia respectively, corresponding to 3.3% of each of the total population

respectively. In relation to the blood pressure after the rehabilitation program, there were relevant changes, taking into account first of all an average blood pressure of: SBP of 133.67 mm Hg, with a standard deviation of ± 8.08 mmHg, DBP of 80.67 mmHg with a standard deviation of ± 7.39 and a MBP of 98.29 with a standard deviation of ±

6.88 mm / Hg. (Aldama Lazaro et al, Havana – Cuba, 2013).

Finally, in relation to the Borg scale, there were changes regarding the perception of the effort made, mainly, of the 30 patients, 14 patients reported slightly heavy efforts, corresponding to 46.7%, 12 of them reported light efforts corresponding to 40% and 4 of them reported performing heavy efforts, corresponding to 13.3% of the total population, at this time without registering any reference to very heavy efforts nor extremely heavy, obtaining positive results (Volterrani Maurizio et al, Rome – Italy, 2016)

Therefore, to perform the analysis of the results, the Kolmogorov-Smirnov Goodness of Fit test was used in each test performed before and after rehabilitation, as well as parametric tests in which the Student's t-test was applied for population related to which lead to the statistical decision to reject the null hypothesis and accept the alternate hypothesis, indicating that cardiac rehabilitation was effective in significantly improving weight, BMI, HR, HDL cholesterol, the perception of physical effort, the SBP, the DBP, the MBP and therefore, the quality of life of the patient. Lastly, the population is recommended to maintain healthy lifestyles and continue the cardiac rehabilitation program on an outpatient basis to enjoy the benefits that these bring and thus improve the quality of life in general, limiting the progression of organic damage

3. CONCLUSSIONS

A patient with heart failure, and any alteration of its nutritional status can be benefited by the cardiac rehabilitation program on the long term, according to the results obtained before and after the program, lowering the referred symptoms with a confidence level of 99% and an error margin of 1%, limiting the advance of organic damage on the long term.

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