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Original Article

Left Ventricular Hypertrophy and Kidney Injury Associated to Cardiovascular Disease in Diabetic Patients with Arterial Systemic Hypertension.

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ABSTRACT

T*he cardiovascular diseases (CVD) is, without a doubt, one of the main causes of mortality worldwide. The risk factors that leads to CVD is Arterial Hypertension and Diabetes Mellitus, which is diagnosed everyday frequently. Approximately, a fourth part of the population suffers Hypertension and the prevalence of Diabetes Mellitus type 2 is about 6 – 8% on the adult population, every day, these comorbidities are related to the development of dysfunctional kidney diseases and chronic kidney disease as they both inflicts damage on the long term, as well, an augment of the ventricular mass which occurs as an adaptability change because of a pressure overload of the ventricle.*

Objective: *correlate left ventricular hypertrophy and kidney failure associated with cardiovascular disease in diabetic patients with systemic arterial hypertension.*

Methodology: *Non-experimental, descriptive, observational and transversal study. A total of 50 patients of both sexes, over 30 years old with diagnosis of Diabetes Mellitus and Hypertension. The population recruited was conformed of 30 patients with hypertension, over 30 years old that met the inclusion criteria, A clinical record of every patient was made, evaluated weight, height, and body mass index; paraclinical test were made such as glycaemia, creatinine, EKG and TTE, also it was calculated the GFR.*

Results: *A patient with both hypertension and diabetes mellitus with normal kidney function or with dysfunctional kidney diseases is not a direct condition to present left ventricular hypertrophy, both concentric and eccentric as they are independent variables and they are not correlated according the Chi Square results.*

Keywords: *Hypertension, Type 2 Diabetes Mellitus, Left Ventricular Hypertrophy, LVH, CKD.*

1. INTRODUCTION:

The cardiovascular diseases (CVD) is, without a doubt, one of the main causes of mortality worldwide. The risk factors that leads to CVD is Arterial Hypertension and Diabetes Mellitus, which is diagnosed everyday frequently. Approximately, a fourth part of the population suffers Hypertension and the prevalence of Diabetes Mellitus type 2 is about 6 – 8% on the adult population. Both hypertension and diabetes are independent risk factors for the development of CVD. When they coexist they have a multiplying factor in the risk of complications both macro and micro vascular, thus, the development of Chronic Kidney Disease is associated with a very high cardiovascular risk in both general population and high cardiovascular risk population [1].

Although hypertension is a common health problem with devastating results, it is mostly asymptomatic until advanced stages. It can contribute to the pathogenesis of ischemic cardiomyopathy and stroke; Hypertension can develop also cardiac hypertrophy, aortic dissection and chronic kidney diseases. Its prevalence and vulnerability to suffer these complications is heightened with age [2].

The endothelium is a monolayer of cells that covers the luminal layer of the blood vessels, regulated the interactions and circulating proteins with the cells on the blood vessels, acting as a signal transmitter and sensor. Endothelium protects the

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arterial wall against the development of injuries and contributes to vascular homeostasis, regulates the cells interactions and circulating proteins with the resident cells on the blood vessels. It has also antithrombotic functions, controls the activity of smooth muscle cells of the medium layer and leukocyte adhesion to the wall of the blood vessels. Endothelial disfunction is an unbalance on the bioavailability of active substances originated on the endothelium that advances to the inflammation, vasoconstriction and increasing the vascular permeability. On the last decades it has shown that well-known coronary risk factors and emergent factors can induce endothelial disfunction [3].

Diabetes Mellitus Type 2 is one of the major causes of morbidity and mortality because of an accelerated process of arteriosclerosis and its impact is going to a pandemic proportions. About of 80% of cases with type 2 Diabetes is presenting insulin resistance and is associated with endothelial disfunction. Subclinical inflammation appears to be the causes of endothelial disfunction on insulin resistance. Otherwise, it has been shown that in musculoskeletal system, a faulty activity on the enzyme that synthetizes nitric oxide (NO) plays an important role on the insulin resistance of type 2 diabetes. In the fluted muscular cells it has been described that Insulin stimulates the production of NO, while the high glucose levels inhibits the production of NO. Also, endothelial disfunction occurs with vasodilation disfunction, and it appears to be a marker that integrates the vascular risk in arteriosclerotic patients; otherwise, until recent years, it was unknown if vasodilation function was in fact, a prognostic factor on its progression, and the manifestation of clinical events in patients with ischemic acute syndromes. Recently it has been shown that vasoreactivity, which depends on the endothelium, can predicts the recurrence of instability and the recurrence on clinical events in patients with acute coronary ischemia, thus, recovering endothelial functions is associated with a free of events survival rate [4].

Chronic Kidney Diseases (CKD) is another public health problem, because of its high prevalence, elevated public health cost and high morbidity and mortality. Its presence is associated with a high cardiovascular disease both in public population and high cardiovascular risk population. The presence of a reduced glomerular filtration or proteinuria are also high predictors on the development of terminal CKD on the long term. On the other hand, it does exist a high incidence and prevalence on the CKD because of its progression of age in elderly patients [5].

Left ventricular hypertrophy is defined as an augment of the ventricular mass which occurs as an adaptability change because of a pressure overload of the ventricle. In its development it can be observed changes on a molecular, cellular and extracellular level. It does exist considerable evidence that indicates that the augment of the muscle in arterial hypertension depends of a complex interaction between:

1. Hemodynamic factors: pressure overload, volume and a heightened peripheral resistance.

2. Humoral factors: catecholamine, angiotensin II, aldosterone, bradikynin, vasopressin, antidiuretic hormone, platelet factors, serotonin.

3. Genetic factors: alterations on interstitial matrix and age.

In Venezuela, the CVD represents, with Latin America, the first cause of mortality. Health statistics has shown that, in 2013, CVD represents 20.6% of death related causes; Diabetes Mellitus 7.6% and Strokes 7.7%, which establish a total of 35.9% of deaths related to CVD nationwide, being more frequent in females rather than in males [6,7].

Our aim was to correlate left ventricular hypertrophy and kidney failure associated with cardiovascular disease in diabetic patients with systemic arterial hypertension.

2. METHODS

Non-experimental, descriptive, observational and transversal study. A total of 50 patients of both sexes, over 30 years old with diagnosis of Diabetes Mellitus and Hypertension. The population recruited was conformed of 30 patients with hypertension, over 30 years old that met the inclusion criteria, representing 60% of the studied population of Pueblo Nuevo community, Falcon municipality, Falcon State. A clinical record of every patient was made in which we took the ones with the aforementioned comorbidities, made a physical exam auscultating in 60 seconds on the mitral focus and then palpated the pulse on the radial artery for another 60 seconds, then we took the blood pressure in supine and seated; then it was proceeded to evaluated weight and height, and with those records evaluated the body mass index; ran paraclinical test such as serum glycaemia, creatinine, EKG and TTE, also it was calculated the glomerular filtration rate.

3. RESULTS

This investigation was done with a population of 30 patients of both sexes, over 30 years old, with diagnosis of Diabetes Mellitus and Hypertension., its porpoise was to determine the correlation in both LVH and kidney injury associated with CVD. It was used the IBM

– SPSS Statistics Ver. 21 program. It was used the Chi Square independence test to determine the relation in both studied variables. The studied population shown that had a standard age of 63.10 years old with a Standard Deviation of ± 8.39 years old.

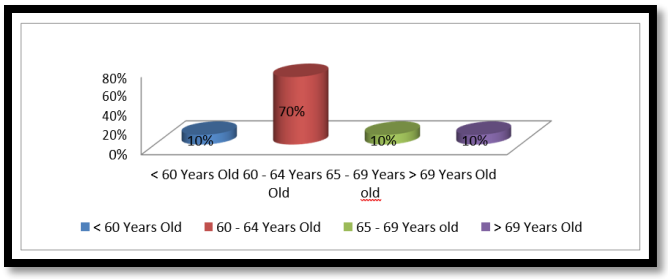

Fig. 1: Distribution of the population according to age.

In relation to sex, it was observed a symmetrical population distribution; it was determined that it was composed of 15 patients of both sexes

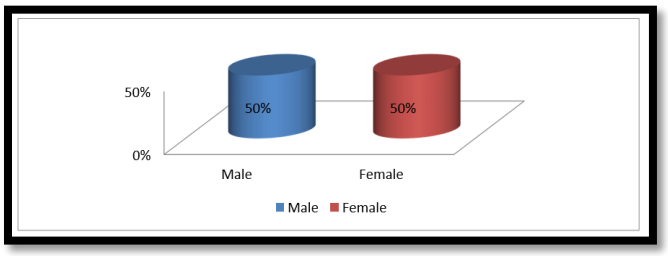

Fig. 2: Distribution of the population according to sex

According of the data recollected in both height and weight of the patients it was calculated the BMI with the indicated parameters, and it was observed that the standard BMI of the patients was of 24.73 Kg/m2 with a Standard Deviation of ± 4.05 Kg/m2. According to obesity, it was observed that 65% of the population (19 patients) were categorized with overweight – pre – obesity, eight (8) patients (25%) were categorized with grade 1 obesity, and 3 patients (10%) with BMI between 35 – 39.9 Kg /m2, which they were classified as a grade 2 obesity.

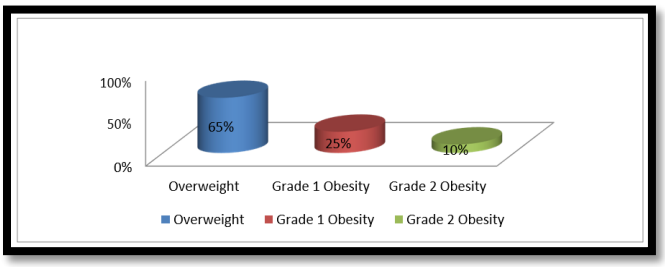

Fig. 3: Distribution of the population according to the categorization of Obesity.

In relation of the cardiovascular risk factors it was obtained that in the realized examination of patients they referred psychobiological and familiar background:

Table 1: Distribution of the Population according to the psychobiological habits and familiar background.

Habits and Background	Answers	Frequency	Percentage
Smoking	Yes	8	25%
	No	22	75%
Ethylic habits	Yes	21	70%
	No	9	30%
Familiar background	Yes	30	100%
	No	0	0%

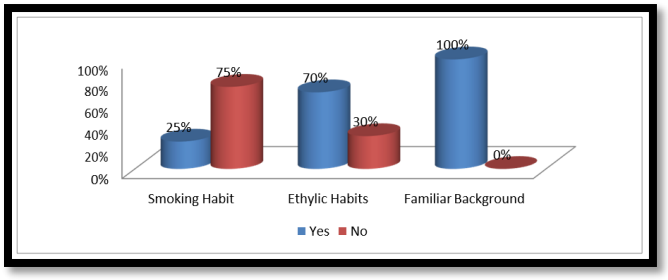

Fig. 3: Distribution of the Population according to the psychobiological habits and familiar background.

It was shown that 215% of the patients has smoking habits, also, 22 of them (79%) of the population has ethylic habits, as well it has been determined that the absolute majority of the patients (100%) has familiar background associated to the studied comorbidities aforementioned.

On relation to Hypertension it was determined that 12 patients, which it is 40% of the total population were categorized with Stage I systemic arterial Hypertension and the majority of the patients (60%) of the patients, 18 of them were categorized in Stage II arterial systemic hypertension according the JNC 8.

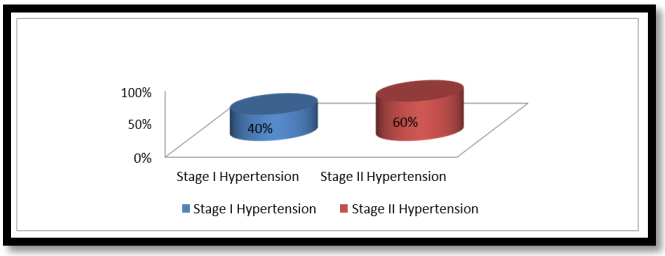

Fig. 4: Distribution of the population according to the stages of hypertension according the JNC 8

In relation of the serum glycaemia values, the standard value was of 113.9 mg/dL, although it is important to point out that 80% of the patients (24 in total) were on the normal range of glycaemia and 6 of them (20%) were registered with abnormal glycaemia values, in other words, over 126 mg/dL according the ADA guidelines.

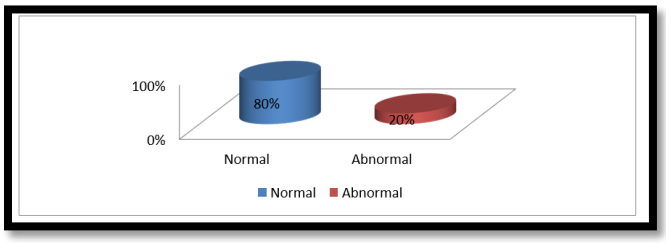

Fig. 5: Distribution of the population according to the serum values of glycaemia.

It was determined the creatinine values to every patient, noting that the standard levels were 0.69 mg/dL with a typical deviation of 0,27 mg/dL; 90% of the patients (27 of them) were in the normal creatinine range and 3 of them representing the 10% of the population were registered with abnormal creatinine levels (over 1.3 mg/dL)

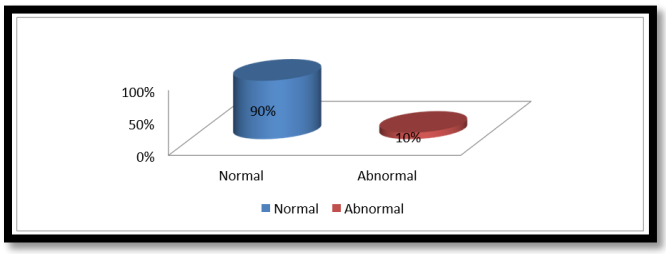

Fig. 6: Distribution of the population according to the serum values of creatinine

The glomerular filtration rate was determined, the standard value was of 108.47 mL/min/1.73m2. It is important to point out that 50% of the population (15 in total) were on the stage 1 of the classification with a normal GFR or higher with evidence of kidney injury. 12 of the patients (49%) were stage with a slight decrease of the GFR and evidence of kidney injury, 10% of the population were classified on stage 3a with a moderated decrease of the GFR with or without evidence of kidney injury. Another test was ran in relation of the results and it was determined that 40% of the patients (12 in total) didn't have kidney injury, on the other hand, 60% of them (18 patients), the results indicated that had a dysfunctional kidney disease

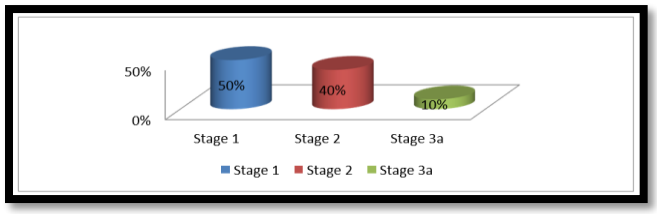

Fig. 7: distribution of the population according to the GFR.

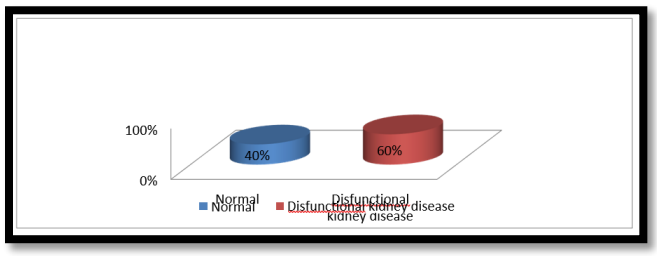

Fig. 8: Distribution of the population according to the classification of Kidney Injury

It is important to point out that were performed a transthoracic echocardiography to every one of the patients and it shown results related with LVH; 12 of the patients (40%) were classified the hypertrophy as concentric (> 0.5) and 18 of the patients (60%) had eccentric hypertrophy (> 1.0)

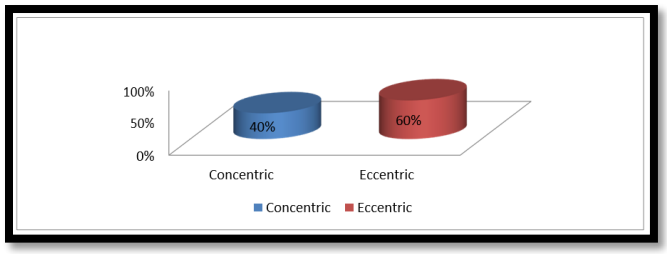

Fig. 9: Distribution of the population according to the type of Left Ventricular Hypertrophy.

With the main porpoise of determine the relation between the LVH and kidney injury it was used the independence test of Chi – Square to determine the relation in between variables with both are qualitative or categorical; in this procedure it was evaluated 2 hypothetical cases: Null Hypotheses (Independent) Vs. Alternative Hypotheses (Correlation). Correlating the studied variables it was obtained the following results:

Table 1: Chi – Square test.

	Valor	d.f	Asymptotic Sig. (bilateral)	Exact Sig. (bilateral)	Exact Sig. (unilateral)
Chi - Square	,035	1	,852		
Continuity correction	,000	1	1,000		

Likelihood ratio	,035	1	,852		
Fisher's exact statistic				1,000	,612
Linear by linear association	,033	1	,856		
N de valid cases	30				

The value of Chi – Square was .035 with 1 freedom degree and a asymptotic significance of .852 which resulted greater than .05 (p > 0.5), for it was taken the statistical decision of accepting the Null hypotheses, because there's not enough evidence to reject it and conclude that the variables aren't correlated on the studied population. This result indicates that kidney injury is independent of the type of left ventricular hypertrophy with a confidence level of 95% and an error margin of the 5%. This indicates that a patient with a normal result or a dysfunctional kidney disease is not a direct condition to present LVH, both concentric and eccentric.

4. DISCUSSION:

According to the analyzed data: in relation to the sociodemographical characteristics of the studied population, most of them had an age lower than 65 ages old with a standard age of 63.10 years old with a symmetric statistic in both sexes (50% female and 50% male). According the BMI, the standard was 24.73kg/m2 with a standard deviation of de

± 4.05 Kg/m2. In relation of cardiovascular risk factors it is important to point out that the majority of the population has smoking habits, ethylic and the absolute majority was associated with familiar background of the studied comorbidities. In relation of hypertension, 40% of them were categorized as stage 1 hypertension and 60% of them as stage 2 hypertension; glycaemia levels were in standard 113.9 mg/dL with a typical deviation of ± 41.82 mg/dl, with 20% of them with glycaemia levels above 126 mg/dL according ADA guidelines, also creatinine levels were analyzed determining that 90% represented the normal rage of creatinine and 10% represented levels above 1.3 mg/dL (Antouan A. Et Al – Venezuela, 2011). In relation of the transthoracic echocardiography, 100% of the population had LVH with a 40% of the patients' having concentric hypertrophy (> 0.5) and 60% an eccentric hypertrophy (> 1.0) (Diaz. A et al – Falcon, 2015). Correlating LVH and kidney injury with statistical test of Chi – Square it was obtained a bilateral asymptotic significance of .852 which resulted above .05 (p > .05), thus, taking the statistical decision of accepting the null hypotheses, on other words, there's no relation between the studied variables and they are independents on this investigation.

5. CONCLUSIONS:

A patient with both hypertension and diabetes mellitus with normal kidney function or with dysfunctional kidney diseases is not a direct condition to present left ventricular hypertrophy, both concentric and eccentric as they are independent variables and they are not correlated according the Chi Square results.

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