Analysis of the internal rules of the Health Council of a capital in the brazilian Northeast

Análise regimental do Conselho de Saúde de uma capital do Nordeste brasileiro

La estructura y función cardíaca entre hombres y mujeres

RESUMO

Objetivo: Comparar a estrutura e função do coração entre homens e mulheres.Método:Estudo transversal e descritivo, em uma amostra por conveniência (n=100) dividida em dois grupos: masculino (n=40) e feminino (n=60). O levantamento de dados foi realizado entre agosto e dezembro de 2019.As variáveis cardíacas e de características gerais foram comparadas entre os grupos (Teste T de Student).Resultados: O grupo feminino apresentou menores valores de diâmetros diastólico e sistólico do VE, diâmetro da aorta e menores espessuras da parede posterior do VE e do septo interventricular quando comparado ao grupo masculino. Não houve diferença entre os grupos para as variáveis E/A e E/e'. O grupo feminino demonstrou menores valores de volumes diastólico e sistólico finais do VE enquanto apresentou aumento da fração de ejeção e do encurtamento endocárdico do VE. Conclusão: O grupo feminino apresentou alterações da estrutura cardíaca e função sistólica, o que parece ser decorrente da diferente composição corporal entre homens e mulheres.

DESCRITORES: Sexo; Coração; Doenças não transmissíveis

ABSTRACT

Objective:Compare the structure and function of the heart between male and female. Methods:Cross-sectional and descriptive study, in a convenience sample (n=100) divided into two groups: male (n=40) and female (n=60). Data collection was carried out between August and December 2019. The cardiac variables and general characteristics were compared between the groups (Student's t test).Results:Female group had smaller values of LV diastolic and systolic diameters, aortic diameter, and lower thicknesses of the LV posterior wall and interventricular septum when compared to males. There was no difference between the groups for the variables E/A and E/e'. Female group showed lower values of LV end-diastolic and end-systolic volumes while it showed increased ejection fraction and LV endocardial shortening. Conclusion:Female group presents alterations of cardiac structure and systolic function, which seems to be associated with unequal body compositionbetween men and women.

DESCRIPTORS: Sex; Heart; Non-communicable diseases.

RESUMEN

Objetivo:Compararlaestructura y funcióndelcorazón entre hombres y mujeres. Método:Estudio transversal y descriptivo, en una muestra de conveniencia (n=100) dividida en dos grupos: masculino (n=40) y femenino (n=60). La recolección de datos se llevó a cabo entre agosto y diciembre de 2019.Lasvariables cardíaca ylas características generales se compararon entre grupos (t de Student). Resultados:El grupo femeninopresentóvaloresmásbajos de diámetro diastólico y sistólico del VI, diámetro aórtico y espesores de lapared posterior y del septo interventricular del VI más bajosencomparacióńconel grupo masculino. No hubo diferencia entre los grupos para lasvariables E/A y E/e'. El grupo femeninopresentóvaloresmásbajos de losvolúmenesteldiastólico y sistólico del VI, presentando aumento de lafracción de eyecciónde VI y acortamiento endocárdico. Conclusión: El grupo femeninomostróvaloresmásbajos de estructura cardíaca y función sistólica, lo que parece ser una característica asociada a diferencias enlacomposicióncorporalentrehombres y mujeres.

DESCRIPTORES: Sexo; Corazón; Enfermedades no transmisibles

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INTRODUCTION

Chronic non-communicable diseases (CNCDs), also known as non-communicable diseases, are considered a public health problem that affects all ages, regions and countries, especially the poorest sections of the population, as well as vulnerable groups, with low education and limited access to information and goods and services. [1] The main types of CNCDs are cancer, diabetes mellitus, chronic respiratory diseases and cardiovascular diseases, especially acute myocardial infarction and stroke. CNCDs are responsible annually for 41 million deaths worldwide, equivalent to 71% of all deaths, with cardiovascular disease being the most lethal (17.9 million/year). Each year, more than 15 million people between the ages of 30 and 69 die from CNCDs, with 85% of these deaths occurring in underdeveloped or developing countries. [1] In Brazil, the data presented show that, in 2007, the CNCD mortality rate was 540 deaths per 100,000 inhabitants, which represents 72% of all cases of death in the country. [2]

CNCDs result from an interaction between genetic, physiological, environmental and behavioral factors, however, their high prevalence is often related to inappropriate environmental behavior that can be modified, such as tobacco use, consumption of unhealthy diets, physical inactivity and excessive alcohol use. Together, these environmental factors, depending on the intensity and duration, can create a set of agents with a negative impact on the cardiovascular system, such as excess body weight, hyperglycemia, elevation of blood pressure and hyperlipidemia. [1]

Although these changes are a reality in the majority of the population, their incidence and prevalence, as well as consequences, are not always symmetrical, affecting individuals differently, for example, according to sex. Regarding cardiovascular diseases, results indicate, for example, that women have worse outcomes of coronary artery disease compared to men, with 17% dying within three years after the first myocardial infarction, while among men the rate is only 12%. [3]

In addition, women also demonstrate higher in-hospital mortality rates than men after acute myocardial infarction, at 16% and 11%, respectively. [4] Even in recent years, evidence has emerged that recognizes CVD risk factors unique to women [5] which, in particular, are common disorders of pregnancy, such as hypertension and gestational diabetes, as well as endocrine disorders frequently occurring in women of reproductive age (eg, polycystic ovary syndrome and early menopause); these changes are associated with the accelerated development of cardiovascular diseases in women and negatively impact their survival in the absence of the disease. [6]

For this reason, cardiovascular disease is no longer seen as a disease only for men, as was the perception in past decades, and since 1999, the American Heart Association has developed the first guide to cardiovascular disease prevention recommendations specifically for women.[7] However, risk factors for cardiovascular disease associated with sex are not yet fully understood and determined.

One of the main functions of the cardiovascular system is to maintain blood perfusion to peripheral organs and meet their demand for nutrients and oxygen. [8] At the center of this system is the heart, which develops several cardiac cycles of contraction (systole) and relaxation (diastole) per minute, causing the difference in pressure necessary to propel the blood along the blood vessels. [8] The good performance of these contraction and relaxation activities depends on several factors, intrinsic to the heart - such as the structure and integrity of the myocardium and/or cardiac chambers - and extrinsic, such as body mass and blood pressure. Since we did not find studies that compared the structure and function of the heart between men and women in the northern region of Mato Grosso, the aim of this study was to compare the structure and function of the heart between males and females. Knowledge of the structural and functional pattern of the heart can help to raise hypotheses about the occurrence of alterations between men and women that can support measures for the prevention and control of cardiovascular diseases in a

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more specific and appropriate way.

METHODS

This is a cross-sectional and descriptive study, in a convenience sample, of adult Brazilian individuals, over 25 years old, of both sexes, treated at a cardiology clinic, located in the city of Sinop/MT. A survey of data was carried out in 274 medical records, from the health care provided by the cardiologist and his team, between the months of August and December 2019. Of the total, 178 medical records were excluded from the study; of these, 92 were excluded because they did not present echocardiographic indicators; the other 86 were excluded due to missing or illegible data (n=46), previous history of acute myocardial infarction (n=27), cancer (n=4) and hepatitis (n=4). After defining the medical records to be used in the study (n=100), the patients were divided into two groups according to gender: 40 males and 60 females. The following variables were obtained from the medical record for a general description of the sample and comparison between males and females: age (in years), body weight (in kg), height (in m), body mass index (BMI, in kg/m2), heart rate (in bpm), blood pressure (in mmHg) and echocardiographic indicators of cardiac morphology and function. In addition, the categorical variables of pre-existing disease (among them, systemic arterial hypertension, diabetes mellitus and heart disease) and of daily habits (such as alcohol consumption, smoking and physical activity) were also selected. The study was submitted and approved by the Research Ethics Committee of the Federal University of Mato Grosso (UFMT) under protocol number CAAE08745418.7.0000.8097.

The echocardiographic examination of all patients was performed by a cardiologist specializing in ultrasound. The device used was a GE brand, Vivid-Q model, one- and two-dimensional mode, with pulsed, continuous, color and tissue Doppler. The echocardiographic parameters considered were: a) aortic (AO), left atrium (LA), LV diastolic (LVDD) and LV systolic (LVSD) diameters; b) diastolic thickness of the interventricular septum (IVST), of the LV posterior wall (LVPWT) and relative wall thickness of the left ventricle (RTWLV); c) wave amplitudes related to transmitral early diastolic velocity (E), transmitral late diastolic velocity (A) and early diastolic velocity of the mitral annulus (e') nodoppler; d) LV diastolic and systolic volumes (LVD and LVOT, respectively); e) LV mass(LVM); f) E/A and E/e' ratios; g) percentage of endocardial shortening (Endo. short), ejection fraction (EF) and E-wave deceleration time (EDT).

Data were described as mean and standard deviation or frequency and/or percentage. Regarding numerical variables, the comparison between the two groups according to sex was performed using Student's T test. The degree of independence between qualitative variables was determined using Pearson's $\chi 2$ (chi-square) test or Fisher's exact test. The confidence level used for all analyzes was 95%.

RESULTS

Table 1 presents the clinical and demographic profile of the participants. The average age, height and body weight of the individuals were 53±14 years, 1.63±0.10 cm and 77±16 kg, respectively, while the body mass index was 29±6 kg/m². Respectively, the mean values of heart rate and systolic and diastolic blood pressures were 74±11 bpm, 125±23 mmHg and 80±14 mmHg. Regarding the total number of individuals, 60% were female, and 69% declared to be sedentary, 10% smokers and 26% alcoholics. Regarding the frequency of chronic diseases, 21% reported having Diabetes Mellitus II, while 60% and 28% reported having systemic arterial hypertension and heart disease, respectively.

Data presented as mean ± SD or percentage. BMI, body mass index; HR, heart rate; SBP, systolic blood pressure; DBP, diastolic blood pressure; DM II, type II diabetes mellitus; SAH, systemic arterial hypertension.* The presence of chronic diseases and behavioral habits, such as physical activity and consumption of cigarettes and alcohol, were mentioned by the patient himself during the anamnesis. Nutritional status was characterized according to BMI (ratio between body weight - in kg - and the square of height - in m). Source: data obtained from medical records of patients treated at a cardiology clinic in the city of Sinop/MT.

Table 2 presents the clinical and demographic profile of the participants according to sex. The variables heart rate, systolic and diastolic blood pressure, body mass

Table 1 – Clinical and demographic profile of individuals treated at a cardiology clinic in the northern region of Mato Grosso between August and December 2019.

Variables	n=100
Age (years)	53 ± 14
Height (m)	1,63 ± 0,10
Weight (kg)	77 ± 16
BMI (kg/m²)	29 ± 6
HR (bpm)	74 ± 11
SBP (mmHg)	125 ± 23
DPB (mmHg)	80 ± 14
Sex (%)	
Female	60
Male	40
Chronic Diseases (%)*	
DM II	21
SAH	60
Heart diseases	28
Physical activity (%)*	
Active	31
Sedentary	69
Smoking habits (%)*	
Smoker	10
Non-smoker	58
Ex-smoker	32
Drinking habits (%)*	
Drinks alcohol	26
Doesn't drink alcohol	69
Ex-alcoholic	5

Source: authors data, 2019.

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index and age were not different between the three groups. Regarding body weight and height, females showed lower values when compared to males.

Table 3 presents data on heart structure and function. Females presented lower values of AO, LVDD, LVSD, IVST, LVPWT and LV mass when compared to males. Regarding the functional variables, females showed lower values of LVEDV and LVESV, while they presented increased ejection fraction and LV endocardial shortening; in addition, it presented a lower transmitral early diastolic velocity (E).There was no difference between the groups for the variables AE, RV, E/A, early diastolic mitral annulus velocity (e'), E/e' and E wave deceleration time (EDT).

Table 4 shows the results of the study of the association between qualitative variables and gender. There was no dependence relationship between age group and the categorical variables sedentary lifestyle, presence of diabetes mellitus and hypertension, heart disease, nutritional status and alcohol use. However, the study demonstrated a degree of dependence between sex and tobacco use.

DISCUSSION

Research that points out the health conditions of its population is essential for a good practice of care, including to promote the health of the population. In this observational study, when comparing cardiac structure and function between men and women in the northern region of Mato Grosso, we found that females had lower values of some variables of cardiac structure and increased systolic function variables. However, they were not associated with risk factors such as arterial hypertension, obesity and heart disease, but appear to be related to physiological differences in body composition between men and women, for example, body weight and height.

Attention to the impact of sex on the development of cardiovascular problems remained distant from the attention of the medical profession for many years, causing women's heart health to receive less atten-

Table 2 – Clinical and demographic profile according to sex of individuals treated at a cardiology clinic in the northern region of Mato Grosso between August and December 2019.

Variables	Sex		
	Male(n= 40)	Female (n=60)	P-value
Age (years)	52 ± 15	53 ± 14	0,768
Height (m)	1,71 ± 0,10	1,58 ± 0,10	<0,001
Weight (kg)	82 ± 16	74 ± 15	0,020
BMI (kg/m²)	28 ± 5	30 ± 6	0,127
HR (bpm)	72 ± 11	76 ± 11	0,071
SBP (mmHg)	126 ± 26	124 ± 21	0,680
DBP (mmHg)	83 ± 17	78 ± 12	0,098

Source: authors data, 2019.
Data presented as mean ± SD. BMI, body mass index; HR, heart rate; SBP, systolic blood pressure; DBP, diastolic blood pressure. BMI was obtained as the ratio between body weight - in kg - and the square of height - in m. Source: data obtained from medical records of patients treated at a cardiology clinic in the city of Sinop/MT.

Table 3 – Echocardiographic variables of cardiac morphology and function according to the sex of individuals treated at a cardiology clinic in the northern region of Mato Grosso between August and December 2019.

Variables	Sex		
	Male(n= 40)	Female (n=60)	P-value
Morphological			
AO (mm)	29 ± 4	28 ± 2	0,031
LA (mm)	36 ± 5	34 ± 5	0,117
RV (mm)	27 ± 3	26 ± 4	0,260
LVDD (mm)	51 ± 7	48 ± 5	0,006
LVSD (mm)	34 ± 8	31 ± 6	0,007
IVST (mm)	11 ± 7	9 ± 1	0,021
PWDT (mm)	10 ± 4	9 ± 1	0,002
LV Mass (g)	202±71	149±42	<0,001
Systolic			
LVEDV (ml)	129 ± 38	108 ± 31	0,003
LVESV (ml)	53 ± 32	39 ± 18	0,004
EF (%)	61 ± 11	66 ± 7	0,008
Endo. Short. (%)	33 ± 7	36 ± 5	0,008
Diastolyc			
E/A	1,19 ± 0,51	1,11 ± 0,38	0,362
E (m/s)	0,75 ± 0,19	0,86 ± 0,25	0,024
e' (m/s)	0,08 ± 0,04	0,10 ± 0,03	0,109
EDT (ms)	201 ± 37	210 ± 46	0,330
E/e' (c/ms)	9 ± 4	9 ± 3	0,961

Source: authors data, 2019.
Data presented as mean ± SD. AO, aorta; LA, left atrial diameter; RV, right ventricle diameter; LVDD, left ventricular end-diastolic diameter; LVSD, left ventricular end-systolic diameter; IVST, interventricular septum thickness in diastole; LVWT left ventricular wall thickness in diastole; LV, left ventricle; LVM, left ventricular mass; RWTLV Relative Wall thickness of the left ventricle; LVEDV, left ventricular end-diastolic volume; LVESV, left ventricular end-diastolic volume; EF, ejection fraction; Endo short., percentage of endocardial shortening; E, Transmitral early diastolic velocity; A, Transmitral late diastolic velocity; e', Early diastolic velocity of the mitral annulus; EDT, E-wave deceleration time. The comparison between groups was performed using Student's T test. Source: data obtained from medical records of patients treated at a cardiology clinic in the city of Sinop/MT.

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tion than men's by cardiologists.

This fact was evident in a European multicenter study [9] which involved 197 cardiology centers across Europe and 3799 participants - 2197 men and 1582 women; the study showed that: a) in the initial consultation, the probability of receiving an indication for an electrocardiogram during exercise was lower among women, b) women received less indication for angiography, c) the medical prescription of anticoagulants or cholesterol reducers was lower for women, even after the diagnosis of heart disease was confirmed, and d) women were less likely to be indicated for cardiac revascularization.

In addition, the study showed that the risk of having a heart attack - fatal or not - was twice as high among women as among men [9], bringing light, in general, to the fact that women have an adverse prognosis when they have stable angina and coronary artery disease. Among others, these results demonstrate the importance of a more appropriate look that considers the differences between men and women for the risk of heart disease. Under this theme, our study, with individuals from the northern region of Matogrosso, showed that women had lower values of some structural variables of the heart when compared to men (Table 3), among them, AO, LVDD, LVSD, IVST, PWDT and LV mass.

In addition, it showed lower values of the LVDV and LVSV, while it showed an increase in the ejection fraction and endocardial shortening of the LV. We were unable to observe differences between men and women regarding age, blood pressure, heart rate and BMI (Table 2). In addition, it was not possible to demonstrate a relationship of dependence between sex and the presence of diabetes mellitus, arterial hypertension, heart disease, physical activity, overweight and alcohol use (Table 4).

Thus, the differences in the structure and function of the heart (Table 3) between men and women, demonstrated in this study, do not seem to depend on the presence of classic risk factors for cardiovascular diseases evaluated in this study, such as obesity, arterial hypertension, smoking, among others; in contrast, the alterations seem to be involved with the body condition of the women, since they showed lower values of weight and height when compared to men (Table 2). This conclusion is reinforced by the fact that there is no difference between the male and female groups when we normalize the structural variables (AO, LA, RV, LVDD, LVSD, IVST e PWDT), in both groups, by body weight and height (data not shown), demonstrating that the relationship between heart structure and body morphometry is similar between the groups, that is, the size of the heart is relatively proportional to the body characteristics of both groups.

The main function of the heart is to generate pressure in the vascular system so that the blood circulates, in a continuous and rhythmic way, and supply the peripheral organs' demand for nutrients and oxygen. [8] The good performance of these contraction and relaxation activities depends on several factors, intrinsic to the heart - such as the structure and integrity of the myocardium and/or cardiac chambers - and extrinsic, such as body mass. Naturally, men and women have a difference in heart size, which reflects the different body composition between them, for example, grea-

Table 4. Relationship between clinical/demographic profile and sex of individuals treated at a cardiology clinic in the northern region of Mato Grosso between August and December 2019.

Variables	Sex		
	Male(n= 40)	Female (n=60)	P-value
Diabetes mellitus			
Yes	09 (13)	11 (18)	0,6195
No	31 (87)	49 (82)	
Arterial hypertension			
Yes	25 (62)	34 (57)	0,6788
No	15 (38)	26 (43)	
Heart disease			
Yes	29 (73)	41 (68)	0,8241
No	11 (27)	19 (32)	
Physical activity			
Yes	10 (25)	22 (37)	0,2761
No	30 (75)	38 (63)	
Tobacco use			
Yes1	22 (55)	17 (28)	0,0116
No	18 (45)	43 (72)	
Use of alcohol			
Yes2	09 (22)	13 (22)	0,9215
No	31 (78)	47 (78)	
Nutritional status			
Eutrophy 3	12 (30)	28 (47)	0,1443
Overweight 4	28 (70)	32 (53)	

Source: authors data, 2019.
Data presented in frequency and (percentage). The degree of independence between the categorical variables was determined using Pearson's 2 (chi-square) test. 1 Includes former smoker. 2 Includes former alcohol drinkers. 3 It includes thinness (BMI= <18.5 kg/m2) and Eutrophy (BMI= 18.6 – 24.9 kg/m2). 4 Includes overweight (BMI= 25.0 - 29.9 kg/m2) and obesity (BMI= >30 kg/m2). Source: data obtained from medical records of patients treated at a cardiology clinic in the city of Sinop/MT.

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ter muscle mass in men.

Thus, in the presence of a greater body mass, there is an increase in blood volume to supply the greater circulatory demand required by the muscle quantity, which generates persistent parietal stress in the myocardium and a compensatory increase in cardiac muscle mass. While in men the average weight of the heart is 300g, in women the average value is 250g. [10]

For this reason, it is plausible to believe that the structural differences demonstrated in our study only reflect the nature of body composition, as mentioned in the previous paragraph, associated with the male or female sex, which determines the size of the heart and, consequently, the lowest values of cardiac structure and mass, since women showed lower stature and body weight. Similar echocardiographic differences were demonstrated when evaluating 295 volunteers (67% female) in the city of Vitória/ES, who even established different reference values (through percentiles) for males and females. [11]

As for systolic function, to our surprise, women had higher ejection fraction values (Table 3). These results differ from those obtained, demonstrating equality in the ejection fraction between males and females. [11] Ejection fractions above 55% are classified within the normal range [12], although the values are different between men and women in our study, both are in a satisfactory condition (men: 60%; women: 66%, on average). Thus, differences should not be considered an unfavorable clinical factor between men and women.

A limitation of this study is inherent to the fact that the sample is a convenience sample, in particular, attended in a medical clinic, which determines a specific character for the population. Thus, the extrapolation of our results to the general population needs to be viewed with care.

CONCLUSION

In conclusion, the female group showed lower values of some cardiac structure variables and increased systolic function variables, which seems to be a characteristic associated with physiological differences in body composition, such as weight and height, between men and women, demonstrated in this study. However, it is important to be aware of risk factors for cardiac alterations unique to women, which may arise, especially during pregnancy and/or reproductive phase. Thus, the study of cardiac structure and function should be an important point of attention in women's health.

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