Evaluation of cardiovascular risk according to Framingham tables in a Colombian population

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INTRODUCTION AND OBJECTIVE: Cardiovascular disease is the leading cause of death worldwide but is caused by a variety of risk factors leading to elevate mortality rates. The objective of this research was to determine the cardiovascular risk according to Framingham test in patients attending physiotherapy.

METHODS AND MATERIALS: A study observational and descriptive in which 462 patients were included; after the exclusion process was a sample of 338 subjects (256 women and 82 men) with a mean age of 47 ± 11 years. The Framingham test was used to estimate the risk of cardiovascular disease in patients attending physiotherapy. Anthropometric measurements, vital signs and a questionnaire to identify cardiovascular risk factors.

RESULTS: After the intervention, we observed that when applying the test of Framingham 76% had low risk, 13.6% medium risk and high risk 10.3%; Moreover 63.3% were overweight /obese, being higher in overweight men (27.02 ± 1.39 *vs.* 26.75 ± 2.23, p=0.337) and obesity for women (32.72 ± 8.38 *vs.* 31.35 ± 4.24, p=0.094).

CONCLUSION: In applying the test showed a low Framingham risk in most patients who attend physiotherapy and those women have a higher prevalence of family history for cardiovascular disease, hypertension, intake of fatty foods and obesity. Men are more likely to be overweight, smoking and alcohol intake; for diabetes were no significant differences.

Key Words: *Cardiovascular; Cardiovascular disease; Framingham; Risk factors; Overweight; Obesity*

INTRODUCTION

Hypertension is a cardiovascular risk factor very prevalent in the world, which is especially overwhelming in low and middle-income countries (1). Every year more people die from cardiovascular disease (CVD) than from any other cause. It is estimated that 17.5 million people died in 2012, representing 31% of all deaths worldwide. Of these deaths, 7.4 million were due to coronary heart disease, and 6.7 million due to cardiovascular accidents (CVA) (2). In Colombia they are the leading cause of death, both in men and in women over 45 years, surpassing even the violent deaths and deaths associated with all cancers combined. Likewise, ischemic heart disease and cerebrovascular disease are the two causes that produce the highest rates of disability and mortality in that country (3).

That said, it is widely accepted that age, gender, high blood pressure, smoking, dyslipidemia, sedentary lifestyle and diabetes are the greatest risks for the development of CVD among many more as shown in the book of Cardiovascular Risk Factors - Examination, evaluation, diagnosis and most relevant aspects of the risk factors; It is also recognized that risk factors for CVD group and interact multiplicatively to promote vascular risk (4).

At present, multiple systems for estimating cardiovascular risk are available (1), the functions most commonly used up to now have been those derived from the Framingham study (5), this allows, in an individual without atherosclerotic disease, to estimate the risk of suffering from ischemic heart disease in the next ten years from the data of age, sex, body mass index, systolic blood pressure (BP) and presence or absence of diabetes and smoking (6).

In Cúcuta, cardiovascular diseases are a priority in terms of public health (7,8). Therefore, the objective of the present study was to determine the cardiovascular risk according to the Framingham test in patients attending cardiopulmonary physiotherapy in the city of Cúcuta, Colombia. For this, it is very important to know the cardiovascular risk factors (CRF) most prevalent in the population that attends cardiopulmonary physiotherapy; due to the multiple noncommunicable chronic diseases associated with CRF. Also, to evaluate the individual risk and thus implement preventive strategies that includes a complete and direct intervention to the genesis of their alterations. That is why; the physiotherapist should focus their strategies to:

1. Guided interventions towards changing lifestyle and acquiring healthy habits. Also, promote the different lifestyles that have broadly revealed to be effective in cardiovascular prevention: Exercise, healthy diet, cessation of cigarettes and ingestion of alcoholic beverages in excess, weight control and abdominal perimeter.
2. Interdisciplinary work for pharmacological measures in the indicated cases, always depending on the intensity of the risk factor, as well as the overall cardiovascular risk. In different situations, despite the therapeutic strategies it is not possible to reduce the levels of a certain FRC to adequate targets. In these cases, acting on the other CRFs is decisive in reducing cardiovascular risk.

Therefore, the physiotherapy techniques of cardiovascular prevention to reduce the risk, is achieved initially through the stratification of cardiovascular risk. Then, it is necessary to modify behaviors and unhealthy lifestyles, together with the most effective therapeutic strategy aimed at the set of risk factors; since it is necessary to know, that our cardiopulmonary patients must intervene not only for the reason of consultation, but in a comprehensive manner with a focus aimed at mitigating future complications not only cardiopulmonary but multisystemic.

MOST COMMON CARDIOVASCULAR RISK FACTORS

Diabetes mellitus

It is a major risk factor for coronary heart disease and stroke (8). Different prospective studies have shown that diabetes has twice the risk in the

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incidence of coronary heart disease and stroke, increasing mortality from these diseases by 2 to 4 times. Based on the results of Haffner et al. (9), it is mentioned that the risk of CVD in patients with diabetes type 2 is like that of patients with previous myocardial infarction. The Atherosclerosis Risk in Communities (ARIC) study, with a follow-up of 13,790 subjects confirmed the high cardiovascular risk of subjects with diabetes type 2 (10). The risk of coronary disease in diabetic subjects was higher than that of non-diabetics. With regard to stroke, the risk in diabetic patients was like that in non-diabetic subjects with coronary disease. Recently, it has been observed that high levels of glycosylated hemoglobin, even in the range of values currently considered normal, increase cardiovascular risk (11,12). According to the guidelines of international societies, the presence of a fasting blood glucose >7.0 mmol/l (126 mg/dl) or a postprandial glycemic >11.0 mmol/l (198 mg/dl) is considered diabetes.

Arterial hypertension

In 1948 it was thought that high blood pressure was necessary to push blood through the rigid arteries at older ages, and that their existence was a normal element in aging, so it was considered appropriate to ignore labile elevations and systolic blood pressure (13). Rarely, isolated systolic hypertension was seriously considered (14). In turn, the Framingham study and other epidemiological studies showed that systolic and diastolic blood pressure have a continuous, independent, gradual and positive association with the parameters of cardiovascular evolution (15,16). Even normal-high blood pressure values (> 130/80 mmHg) are associated with an increased risk of CVD (17). It is also necessary to mention that this is the main challenge we have faced in recent years due to the high risk involved in terms of cardiovascular morbidity and mortality (18).

Overweight/Obesity

The American Heart Association (AHA) defines obesity as a major risk factor for cardiovascular disease (19). The risk is accentuated when obesity is predominantly abdominal (20). Obesity is an independent factor of the risk of mortality from all causes (21,22), a relationship that was identified by the Framingham researchers 40 years ago (23). Apart from alterations in the metabolic profile, when an excess of adipose tissue accumulates, various adaptations of the cardiac structure and functions are produced (24). Like what was observed with LDL-C. Studies carried out in Western countries have shown a relationship between obesity and cardiovascular mortality (25). Therefore, it is very important to consider the presence of a BMI ≥ 30 kg/m^2 or an abdominal perimeter at waist level ≥ 102 cm in men and ≥ 88 cm women as a cardiovascular risk factor (26). Currently, the prevention, control of overweight and obesity in adults and children has become a key element for the prevention of cardiovascular diseases (15).

Smoking

The risk associated with smoking depends on the amount smoked and the duration of the habit. In the INTERHEART study, the OR associated with smoking was 2.93, and it reached 9.16 in those who smoked more than 40 cigarettes a day, but even those who smoked between 1 and 5 cigarettes a day had an increased risk of 38%. In addition, he was responsible for 37% of the risk attributable to Acute Myocardial Infarction (AMI) in the INTERHEART study worldwide (27). In the study by Moreno-Esteban et al. (28) found that patients who continued smoking after an AMI had a greater risk of suffering a cardiovascular event than those who abandoned this habit (70.8% *vs.* 17.5%), and there was a higher mortality and a worse functional grade.

For this reason, tobacco consumption is the main preventable cause of morbidity and mortality in the world; it is an important risk factor for coronary and cerebrovascular disease, among other significant morbid conditions. Therefore, the cessation of smoking should be crucial because it generates important health benefits early and remembering that the risk affects not only the smoker but also those exposed passively (29).

Dyslipidemia

Elevated LDL (Low Density Lipoprotein) cholesterol is the main cause of coronary heart disease (CAD) (30). Researchers from the Framingham study have reported that elevated triglyceride levels are an independent risk factor (31). Dyslipidemia plays an important role along with insulin resistance which is acquired largely by obesity and physical inactivity, although genetic factors play a very important factor; this combination being the triggers for Metabolic Syndrome (32). Among the various factors involved in cardiovascular diseases, hypercholesterolemia, and mainly high cholesterol values linked to low density proteins (LDL-c), are considered major or causal factors (33,34), and the strategies aimed at achieving their control are the most effective. The Multiple Risk Factor Intervention Trial (MRFIT) showed a continuous and gradual relationship between cholesterolemia and total mortality due to ischemic heart disease (35). On the other hand, reducing cholesterolemia decreases the incidence and mortality due to ischemic heart disease and cardiovascular disease in general, both in primary and secondary prevention (36).

Physical inactivity

Several epidemiological studies have shown that there is a relationship between physical inactivity and CD (37). The relative risk of death from CD in a sedentary individual compared to an active individual is 1.9 (95% confidence interval [CI], 1.6-2.2)15. The WHO reported that the sedentary lifestyle is among the 10 most important causes of death and disability worldwide. Sedentary lifestyle can elevate lipid levels to the range of risk for Metabolic Syndrome and can act by altering the cardiovascular reserve mediated by coronary blood flow. On the other hand, healthy levels of physical activity in childhood can prevent obesity in childhood and later in adult life (38).

Alcohol intake

Alcohol is a drug of legal consumption related to multiple diseases that make it the third risk factor in years of life lost and lived with disability, only behind tobacco and high blood pressure (39). The relationship of alcohol consumption with CVD is currently under discussion, although there is evidence that small amounts, less than 25g/day, could be a factor that reduces the risk of ischemic heart disease, ischemic stroke and diabetes type 2 (39,40). Therefore, the effects of alcohol on health depend on the amount ingested and the patterns of consumption, typical presentation of curve J, which shows the effects of alcohol on health (41). In this curve, it has been described that low alcohol consumption is associated with a reduction in the general mortality of 18% and cardiovascular disease of 30% (42). On the other hand, excessive consumption may confer risk of CVD (43-45), has been directly associated with smoking (46) and is associated with a higher rate of general mortality (38).

Family background

The importance of hereditary factors is poorly understood. It is believed that heredity may be important in blood pressure, glucose tolerance, increased uric acid and plasma triglycerides, while in the families, environmental factors are related to lipoproteins, total cholesterol and the hematocrit. Studies have been carried out in which a direct relationship was observed between the family history of risk and cardiovascular disease (47,48). A study by Marenberg et al. showed that in youth, death from CVD is influenced by genetic factors; however, the genetic effects decrease in advanced ages in which environmental factors can play a more important role (49,50).

MATERIALS AND METHODS

An observational and descriptive study was carried out to quantify the cardiovascular risk, with a sample of 462 patients of which, after the exclusion process, there was a sample of 338 subjects (256 women and 82 men), with an average age of 47 ± 11 years, who attended cardiopulmonary physiotherapy, with different diagnoses such as hypertension, diabetes, asthma, COPD, cystic fibrosis, chronic bronchitis, physical deconditioning. These patients had to meet the inclusion criteria; which were: No personal history of acute myocardial infarction or heart disease. They had to sign an informed consent, which was reviewed and approved by the ethics committee of the IPS Rehabilitar Cúcuta and its respective research group RehabilitarCI and finally, it should guarantee the information provided to the researchers.

On the other hand, we excluded patients who did not meet the age range established to apply the Framingham test (30 years to 74 years), did not have inclusion criteria for the calculation of cardiovascular risk, did not sign informed consent, provided wrong information or do not wish to participate in the present investigation.

For the collection of sociodemographic, anthropometric and physiological data an instrument was used, which was completed by questioning the patient. The sociodemographic measurements (gender, age, ethnicity, identification of risk factors, personal history, family history), physiological (heart rate, and blood pressure) and anthropometric measurements (weight, height, BMI) were carried out using the balance (Health or Meter) previously calibrated (precision=0.1 g and 0.1 cm respectively), the weight and height of the evaluated patients were determined, placing the patient standing, with the head in Frankfort plane and with the shoulders relaxed to avoid lordosis. The Z score (Z-score) was obtained for the BMI (kg/m^2) through

TABLE 1
Characteristics of the population

Variables	Quantity	Feminine	Masculine	Average
Muestra total				338
Avg. Age				47 ± 11 años
Kind	338	256	82	100
		Ethnicity		
White	105	88	17	31.06
Mestizo	226	164	62	66.86
Afrocolombiano	7	4	3	2.07
		Risk factors		
Smoking	30	15	15	8.87
Alcohol intake	35	15	20	10.35
Hypertension arterial	88	69	19	26.03
Diabetes Mellitus	29	22	7	8.57
intake of fatty foods	102	79	23	30.17
History family	210	171	39	62.13
		Anthropologist – IMC		
Infrapeso	4	1	3	1.18
Normopeso	120	91	29	35.50
Overweight	123	87	36	36.39
Obesity	91	77	14	26.92
		Tensión arterial – Sistole		
< 120 mmHg	239	185	54	70.71
120 – 139 mmHg	62	45	17	18.34
140 – 159 mmHg	32	23	9	9.46
>160 mmHg	5	3	2	1.47

TABLE 2
Distribution of cardiovascular risk according Test of Framingham

Riesgo	Feminine (n=256)		Masculine (n=82)		Average (n=338)
	N	**%**	**N**	**%**	
Short	215	83.98	42	51.21	76.03
Medium	29	11.32	17	20.73	13.60
High	12	4.68	23	28.04	10.35

TABLE 3
Comparison of anthropologist (Men *vs.* Women)

IMC	Feminine (n=256)		Masculine (n=82)		Average (n=338)
	N	**%**	**n**	**%**	
Infrapeso	1	0.39	3	3.65	1.18
Normopeso	91	35.54	29	35.36	35.50
Overweight	87	33.98	36	43.90	36.39
Obesity	77	30.07	14	17.07	26.92

Excel, developed based on the WHO reference. The study population was categorized as underweight, normal weight, overweight and obesity.

The Framingham test protocol was performed according to the Framingham Heart Study "A Project of the National Heart, Lung and Blood Institute and Boston University with the Calculator prepared by R.B. D'Agostino and M.J. Pencina based on the publication of D'Agostino et al. in Circulation (51,52), where cardiovascular risk was calculated and the analysis was made considering three risk categories: low (<10%), medium (10% to 19%) and high (20%) (53). It should be noted that the Framingham test is a cardiovascular risk measurer for use in primary care, which predicts the risk at 10 years, in individuals 30 to 74 years of age, without CVD at baseline, using age as predictors, diabetes, smoking, systolic blood pressure with treatment or without treatment, body mass index (BMI) (52).

STATISTIC ANALYSIS

All the information collected was typed and analyzed through specific Excel filters and the STATA 12 program, so that the results obtained in the data collection were combined into descriptive statistics, composed of mean and standard deviation. And then compare between them using the Mann-Whitney U Test.

RESULTS

Of the 462 initial patients, 124 were excluded because they did not have the age allowed for inclusion in the Framingham test; therefore, the total sample was 338 patients with an average age for both genders of 47 ± 11 years. 75.73% (n=256) of the sample consisted of women and 24.26% (n=82) were men. The prevalence of cardiovascular risk factors from highest to lowest risk was: Family history (62.13%), food intake with high fat levels (30.17%), arterial hypertension (26.03%), food intake alcohol (10.35%), smoking (8.87%) and finally diabetes mellitus (8.57%). Most of them started together in the same patient Table 1 Likewise, a higher percentage of men compared to women were determined for risk factors of smoking (18.29% *vs.* 5.85%) and alcohol intake (24.39% *vs.* 5.85%); and on the other hand, women were more prevalent in arterial hypertension (26.95% *vs.* 23.17%), ingestion of fatty foods (30.85% *vs.* 28.04%) and family history (66.79% *vs.* 47.56%).

In the Table 2 shows the distribution of the studied population by cardiovascular risk category for each gender, with its respective risk prediction for cardiovascular disease at 10 years according to the Framingham test, the present investigation was able to determine that 76% of the population studied presented low risk, 13.6% medium risk and 10.3% high risk. On the other hand, when calculating the body mass index (BMI), by means of the weight on the squared height, it was determined that 1.18% of the total population presented underweight, 35.5% normal weight, 36, 39% and 26.92% for overweight and obesity respectively. Thus, the women with the highest prevalence of obesity (32.72 ± 8.38 *vs.* 31.35 ± 4.24, p=0.094) and little difference in normal weight (M:21.82 ± 3.76 *vs.* H:21.93 ± 2.85, p=0.790) compared to men. In turn, there were higher rates of overweight in men than in women (27.02 ± 1.39 *vs.* 26.75 ± 2.23, p=0.337).

DISCUSSION

The coronary or cardiovascular risk indicates the probability of presenting a coronary or cardiovascular disease in a determined period, generally 5 or 10 years (54). However, criticisms have emerged to predict 10-year risk in circumstances where the risk of a cardiovascular event is magnified in the longer term (lifetime risk) (55). This aggregate of risk factors of the sample under study allows us to identify that the family history (62.13%), overweight (36.39%), the intake of foods with high fat levels (30.17%) obesity (26.92%) and arterial hypertension (26.03%), are the most prevalent risk factors in the study population, although unlike the review by José et al. (56), it was found that those evaluated had a previous diagnosis as antecedent. obesity (28.3%), followed by high blood pressure HBP (11.6%), depression (10.1%), kidney disease (7.2%), diabetes mellitus (2.2%) and AMI (1,4%). In the previous study, risk factors such as depression, kidney disease and acute myocardial infarction were included, which in our study were not evident but are prevalent in cardiovascular diseases, which also influence the evolution of said disease, as they indicate different epidemiological studies (57-59). (Tables 1-3).

Similarly, to determine which population by gender had the risk factor of overweight/obesity was calculated the body mass index (BMI), and it was determined that 43.9% of men were overweight versus 33.9% that corresponds to women; and for obesity, women with 30% versus 17% of men, with a total of the sample with overweight/obesity of 63.3%. Likewise, as occurred in a study conducted in the departments of Caldas, Risaralda and Quindío where 42.9% had a BMI above normal, 31.2% with overweight and 11.7% with obesity, while 36.9% had abdominal obesity (55.4% women and 20.3% men). Thus, it is higher in women than in men as in the present investigation.

Therefore, the absolute risk of a patient with obesity should be taken into consideration from two components: the relative risk of morbidity and mortality associated with excess weight and fat distribution by itself and the excess risk associated with the most prevalent risk factors in the overweight/obese subject (55).

It is striking that the study population in the Framingham test has a relatively low prevalence of cardiovascular risk (76.03%); however, there were results with high cardiovascular risk (10.35%). It is notable for the percentages of risk factors found in the study, that there are triggers for CVD but that they have not yet been seriously presented in each patient who has more than two risk factors. Having said that, the population with the highest cardiovascular risk (28%) is men and in a smaller amount (4.68%) women; This is consistent with the work carried out by Jose GT and Col. in Pereira city with university employees (56), where the calculated risk levels of presenting CVD at 10 years indicate that 53.5% of the men evaluated have medium risk, on 28.6% low risk, while only 4.8% have high risk and in women 74% have low risk, while 18.7% risk medium and not finding high risk. There are similar data to conclude a higher incidence of men compare to women for the risk of CVD in the next 10 years; like the study by Edgardo et al. (6), where there was a low percentage (2.8%) of high-risk women compared to men.

CONCLUSION

When applying the Framingham test on the population, it was evidenced low risk in both women and men and it is estimated that the cardiovascular risk is compared with many aspects that are not taken as a basis of the Framingham test, but that surround cardiovascular disease; that is, the cardiovascular risk factors identified in the study as: the family history and the intake of fatty foods are the greatest predictors of cardiovascular disease, just as taking the body mass index shows that women have a higher prevalence of obesity than men.

Likewise, when comparing the prevalence of each one of the cardiovascular risk factors, we can conclude that the most prevalent cardiovascular risk factors in women are the family history, the intake of fatty foods, obesity and arterial hypertension. For men it was alcoholism and overweight and in diabetes there were no significant differences by gender. On the other hand, the items registered in the Framingham test, make it necessary to create own tables according to the characteristics of our Colombian population, since there may be cultural variation that in some important way modifies the risk. A cross-cultural validation of the Framingham scales or the PROCAM model to determine the therapeutic interventions according to the needs and cardiovascular risk of the Colombian population would be important and very helpful. At present, a large percentage of patients who attend physiotherapy are at low risk; therefore, it is the ideal opportunity to establish healthy lifestyle habits and prevent these FRC from increasing and affecting the basic pathology of our patient.

CONFLICT OF INTEREST

The author´s declare haven´t none conflict of interest

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