

INFLUENCE OF HYPER- CHOLESTEROLEMIA, OVERWEIGHT AND OBESITY ON ARTERIAL HYPERTENSION AND DIABETES MELLITUS ON THE CARDIOVASCULAR RISK OF THE MEXICAN POPULATION

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INTRODUCTION

Cardiovascular diseases are a public health problem, specifically among older adults; however, in recent years it has claimed the lives of young people; It is estimated that they are the leading cause of death worldwide and in Mexico they are no exception; modifiable and non-modifiable risk factors are present in the general population regardless of age; They also occupy first place in morbidity and mortality in the world, are associated with non-communicable diseases such as high blood pressure, diabetes mellitus and unhealthy lifestyles such as a sedentary lifestyle and high-fat foods. It has been shown that the Latino population has a 30% probability of suffering from diabetes mellitus, an additional 40% if the mother is diabetic, which is why health promotion and education has failed to prevent chronic diseases.

The cardiovascular risk calculator is a tool that is based on the Framingham Heart Study and measures the chances of suffering a cardiac arrest in the next 10 years in people over 20; considers the following risk factors related to cardiovascular disease and they are: age, gender, diabetes mellitus, high blood pressure, hypercholesterolemia, smoking.

Velázquez and collaborators in 2003 in their study found that of a total of 38,377 (98.8%) subjects were included, 69.4% were women. The average age for the male gender was 39.4 ± 12.9 and for the female gender was 38.6 ± 13.0 , transmissible with the national health survey. The average national prevalence for hypertension was 30.05%, for diabetes 10.7%, for obesity 24.4%, for abnormal capillary glucose 12.7%, and for proteinuria 9.2%. The prevalence of hypertension and diabetes was directly related to age, body mass index

and waist circumference. The pyramidal distribution of the Mexican population determined that the majority proportion of NCD prevalence was significantly before the age of 54 years (> 75%).

Cerecero and collaborators in 2009 studied 342 cases with CVR and 684 controls. In overweight or obese workers, CVR exceeded that of those with normal weight. Family history of myocardial infarction was directly associated, and moderate-vigorous physical activity inversely, with CVR, in models with interactions between gender and physical activity; this relationship was maintained only in men. Conclusions. The results show the predominant role of moderate-vigorous physical activity as a lifestyle factor associated with lower CVR.

Alcocer et al (2011), calculated the risk with both methods in 1990 subjects of the 5803 included in the PRIT study. When SCORE was used, the method stratified 1853 patients into low risk, 133 into medium risk, and four into high risk. Using the Framingham method, 1,586 subjects were classified as low risk, 268 as medium risk, and 130 as high risk. The agreement between both scales to classify patients at the same risk was 98% in those classified as low risk, 19.4% among those classified as intermediate risk, and 3% in those classified as high risk. The Framingham model was better for calculating cardiovascular risk in the Mexican population because SCORE underestimates the risk.

The Lindavista study referred to by Vallejo (2014) reports on cardiovascular risk factors in Mexicans. Although they correspond to the baseline stage, they are interesting and coincide with those of National Health Surveys and with those of cross-sectional studies in which a high prevalence of cardiovascular risk factors. In this work they identified that three risk factors, both independently and together, can impose a high risk for the development

of cardiovascular diseases in the Mexican population.

This is an interesting and important study, which analyzes a homogeneous sample, which has its advantages; Perhaps follow-up is easier as these are relatively captive individuals, and future generations can also be followed, which would further enrich the results, as has happened with other studies such as the Framingham cohort. The information obtained from questionnaires and biological samples has incalculable value not only for obtaining current results but also for information that may be desired in the future. (Vallejo, 2014)

In the study by Pereira and collaborators in 2015, 3,645 articles were identified, of which 45 were selected; After examining and evaluating the methodological framework of the 45 articles, the information on these variables allowed us to add the sample of articles ($n = 7,192,262$) to conclude that Latin Americans have a high prevalence of overweight/obesity, sedentary lifestyle, smoking and alcoholism. They conclude that in the Latin American population there is a high prevalence of cardiovascular risk factors without significant differences by gender.

Castro and collaborators (2017) conducted an exhaustive review of clinical trials, bulletins, health/epidemiological surveys, review articles and health standards (from 1956 to 2016), mainly for the Mexican population. The results indicated that biochemical parameters, alterations in weight, circumferences, physical inactivity, alcohol intake and tobacco consumption are the main CVRFs for the Mexican population. There is little information that relates working conditions, work stress and hours of rest with cardiovascular diseases. Cardiovascular diseases (CVD) mainly affect the heart and blood vessels. They are responsible for 17.5 million deaths a year in the world. The main

CVDs are ischemic heart disease, Diabetes Mellitus II (DMII), liver diseases and cerebrovascular diseases. The increase in CVD has a direct relationship with cardiovascular risk factors (CVRF), the presence of which confers a greater probability of suffering from these diseases.

Sarre and collaborators (2018) argue that there are different methods to calculate the global risk of suffering and dying from cardiovascular disease, with the aim of identifying patients who can obtain the greatest benefit from treatment, whether pharmacological or not; However, these have been developed in specific population groups and take into account different factors, which does not allow their universal usefulness, a situation that we must take into account in our daily clinical practice and not forget that adequate evaluation requires comprehensive analysis., individualizing the situation of each patient and relying on the different tools at our disposal, which must only be used as a guide and not as a rule when making decisions.

Rocha and collaborators in 2018 found that the average age was 51.4 ± 12 years, 49.9% were men, 75% were married. The prevalence of high CVR was 21.6%, overweight and obesity in 58.7% of the population and modifiable CVR factors mainly in men. In the t test, a difference between gender was found only in VLDL (.005) and in the χ^2 in most of the variables studied. The average RR in this population was 2.4 ± 1.9 . The prevalence of CVR was higher than that found in other studies and a high prevalence of CVR factors was observed in the study group. Adherence to the Diagnostic Therapeutic Guides and CVR tabulators by the family doctor is recommended to promptly identify risk groups.

The (absolute) cardiovascular risk is the probability of anticipating a certain vascular episode in a certain period of time based on

the CVRF of the patient who belongs to a certain population group. Therefore, there is no universal system for calculating RCV. The European guidelines for cardiovascular prevention and dyslipidemia control, to which the SEA adheres through the CEIPC, recommend the use of the SCORE system to assess CVR in its version for countries with low CVR in primary prevention situations, that is, for individuals who have not yet had cardiovascular events. This system calculates the risk of cardiovascular death from atherosclerotic causes within 10 years considering the following risk factors: sex, age, smoking, SBP and CT. (Mustard, et al 2019)

The mortality trend from cardiovascular diseases presented three periods: between 1990-1997 there was an increase in both sexes; in 1997-2000 a decreasing trend and between 2000-2015 a stationary trend in women and increasing in men. Mortality due to ischemic heart diseases and hypertensive diseases increased in men and women with the consequent negative contribution to life expectancy. On the contrary, cerebrovascular diseases decreased with gains in life expectancy. Other heart diseases tended to decrease, increasing life expectancy in both sexes. (Davila, 2020)

Due to all of the above, the following question arises: **What is the influence of hypercholesterolemia, overweight and obesity on arterial hypertension and diabetes mellitus on the cardiovascular risk of the Mexican population?**

AIM:

To associate the influence of hypercholesterolemia, overweight and obesity on arterial hypertension and diabetes mellitus on the cardiovascular risk of the Mexican population.

DEVELOPMENT

RISK FACTOR'S

Risk factors are conditions, behaviors, lifestyles or situations that expose you to a greater risk of developing cardiovascular disease. Risk factors favor the appearance of diseases that are characterized because the arteries narrow and/or the blood does not circulate freely, thus causing circulatory disorders that lead to cardiovascular diseases. The World Health Organization speaks of five main risk factors for the development and control of non-communicable diseases (heart disease, diabetes and cancer): these are: smoking, harmful consumption of alcohol, unhealthy diet, physical inactivity and air pollution. (Honorary Commission for Cardiovascular Health; 2023)

SMOKING

Tobacco use is a global public health problem. According to the World Health Organization, smoking is the second leading cause of death in the world, with almost five million deaths annually. It is necessary to have information and analysis on tobacco consumption to be successful in the fight against smoking and thus better guide prevention and control measures. (Tapia, Kuri, González, and Hoy; 2001)

PHYSICAL INACTIVITY AND SEDENTARY LIFESTYLE

According to the World Health Organization (WHO), a large proportion of people worldwide are at risk of suffering from some type of chronic disease; as a result of decreased energy expenditure – and consequently increased body fat – as a result of sedentary behaviors and lack of physical activity

Various investigations have established that sedentary behaviors and lack of physical

activity in adolescents are partly determined by family factors. Attention has been directed mainly to the evaluation of the influence of family structure on adolescent behavior. It has been reported that adolescents who belong to single-parent families watch more TV than those who live with both parents. It has been proposed that the effects of family structure operate through different forms of supervision and control of adolescent behavior; That is, living in a single-parent family is considered to be associated with some types of risk behaviors, due to the lower ability to provide adequate supervision than families with both parents. (Lavielle, Pineda, Jáuregui and Castillo; 2014)

HEALTHY NUTRITION

Excess body weight (overweight and obesity) is currently recognized as one of the most important public health challenges in the world, given its magnitude, the rapidity of its increase and the negative effect it has on the health of the population that affects it. suffers. Overweight and obesity significantly increase the risk of suffering from chronic non-communicable diseases and premature mortality, in addition to the social cost of health. Currently, Mexico occupies second place in the world's prevalence of obesity in the adult population (30%), which is ten times higher than that of Japan or Korea (4%). Until 2012, 26 million Mexican adults were overweight and 22 million were obese, which represents a very important challenge for the health sector. Mexico must plan and implement cost-effective strategies and lines of action, aimed at the prevention and control of obesity in children, adolescents and adults. Global experience indicates that correct care for obesity and overweight requires the formulation and coordination of efficient multisectoral strategies that allow for the enhancement of protective factors for health,

particularly to modify individual, family and community behavior. (Barrera, Rodríguez and Molina; 20103)

RISK FACTORS DUE TO THE PRESENCE OF MAIN RISK FACTORS

There are other risk factors that develop due to the presence of the main risk factors and further increase the development of these diseases, these are: high blood pressure, obesity, high cholesterol, diabetes and stress. (Honorary Commission for Cardiovascular Health; 2023).

DIABETES

People diagnosed with type 2 diabetes have a burden of total metabolic and cardiovascular mortality; Both types of diabetes present with prolonged periods of hyperglycemia, which represents a high risk of increased microvascular and macrovascular complications. (Sanchez; 2019)

ARTERIAL HYPERTENSION

Treating only systemic arterial hypertension and not controlling other factors that are well known to increase cardiovascular risk can dramatically reduce the expected medium and long-term results of antihypertensive treatment. Therefore, it is crucial to know the prevalence of other factors and how they synergize and affect cardiovascular damage, as their number increases. In Mexico, the ENSANUT 2010 national survey, whose results were recently released globally, confirms that chronic non-communicable diseases continue to rise and obesity and overweight probably stand out for their notable increase. Hypertension in general maintained its prevalence and an increase in the detection percentage was highlighted. (Rosas, Palomo, Borrayo, Madrid, et al; 2016)

HIGH CHOLESTEROL

In Mexico, as in the rest of the Latin American countries, it is not known with complete certainty, to what extent international and national recommendations are followed and practiced by doctors who are involved in the treatment of lipid abnormalities. However, the increasing incidence and prevalence of cardiovascular diseases in our countries could point not only to the profound changes in lifestyle observed in the region, but also to a suboptimal implementation of therapeutic and preventive measures, aimed at controlling the pathogenic determinants of atherosclerosis. (Meaney, Vela, Ramos, Alemao and Yin; 2004).

STRESS

There is currently extensive evidence that the appearance of cardiovascular disease in the general population is highly influenced by psychosocial factors, which can play both an etiopathogenic and prognostic role. Although this relationship could be explained by the interaction of different dietary factors and differences in lifestyle, there is also some evidence that exposure to chronic stress could play a role. In experimental studies carried out in animals, it has been observed that chronic psychosocial stress could lead, through stimulation of the autonomic nervous system, to an exacerbation of coronary heart disease, with transient endothelial dysfunction or even necrosis. Stressors are defined as those external or internal stimuli that cause an increase in physiological activity in some or all individuals. In the medical literature, different stressors have been referred to, such as life changes, occupational stress, work situations with high demand and low control in decision making, lack of social support and physical situations such as extreme temperatures or high noise levels. The problem lies in the difficulty of defining and quantifying stress,

since there is an objective component (nature of the stressor) and a subjective component (how it is perceived). (Armario, del Rey and Martin; 2002).

OBESITY

Overweight and obesity constitute the most important health problem in Mexico that affects the population from an early age until adulthood. They are the main risk factor for the development of non-communicable or chronic degenerative diseases such as type 2 diabetes, high blood pressure, dyslipidemia, cardiovascular diseases, osteoarticular diseases, certain types of cancer such as breast, prostate and colon and sleep apnea, among other diseases. The high prevalence of overweight and obesity is related to changes in eating habits and lifestyle. The consumption of traditional diets based on foods rich in proteins, vitamins and minerals of plant or animal origin has been replaced by high-energy products with a high content of fats, particularly saturated fats, sodium and sugars. More than half of the population aged 18 and over (57.9 percent) does not do any sport or physical exercise in their free time. Lack of time, tiredness from work, health problems and laziness are the main arguments for physical inactivity. The number of overweight and obese people in Mexico is increasing and increases as age increases. In 2018, 22 percent of children under five years old were at risk of being overweight. At these ages, a high proportion (83 out of every 100) of girls and boys consume sweetened non-dairy beverages on a daily basis, followed by the intake of snacks, sweets and desserts, which constitutes a serious public health problem. (Kanter; 2021)

PREDISPOSING CONDITIONS

They are typical of people and their families, also called non-modifiable and

promote cardiovascular risk.

FAMILY BACKGROUND

Many diseases appear more frequently among close relatives. This is called “family aggregation.” Such is the case of cardiovascular diseases. The greater the family history aggregation, the greater the likelihood of developing heart disease. This same increased chance can be used to prevent the onset of heart disease. Family genetics may be a cardiovascular risk factor. Knowing the family health history and these antecedents are important for early actions to prevent cardiovascular disease in young adults. This condition not only weighs biologically, but also in the ways of life and lifestyle patterns that are learned in the family of origin and are perpetuated from generation to generation.

AGE AND GENDER

In general, men are at greater risk than women of suffering a heart attack. After age 65, cardiovascular risk is approximately equal in men and women when risk factors are similar, since the protective effect that estrogen would give women against heart disease is lost. Cardiovascular disease affects more women than men, and heart attacks are generally more serious in women than in men. A person will be more likely to develop diseases such as heart attack and stroke the more risk factors they have. (Honorary Commission for Cardiovascular Health; 2023)

MATERIAL AND METHODS

KIND OF INVESTIGATION

This research is a quantitative, ex post facto and cross-sectional study.

SOCIAL GROUP, POPULATION AND SAMPLE

The investigation was carried out in a

Municipality of the State of Mexico, called Tenancingo, which extends to the southeast of the municipality of Toluca. It has a distance of 48 kilometers from the state capital. It borders to the north with the municipality of Tenango del Valle and Joquicingo, to the south with Zumpahuacán, to the east with Malinalco and to the west with Villa Guerrero.

The study population is made up of 97,891 inhabitants, of which 48% are men and 52% are women, according to INEGI in 2015. (PRI, 2021)

The sample was made up of 1,596 inhabitants, 851 women and 745 men, with an age range of 20 to 77 years and an X of 59 years, of medium socioeconomic level, of Catholic religion, from the municipality of Tenancingo.

HYPOTHESIS

Risk factors affect the cardiovascular risk of the Mexican population.

H1. There is a statistically significant correlation between overweight and obesity with the score of cardiovascular risk variables in the Mexican population.

H2. There is a statistically significant correlation between hypercholesterolemia and arterial hypertension in the score obtained from the cardiovascular risk variables.

H3. There is a significantly significant correlation between diabetes and arterial hypertension with the score obtained in relation to cardiovascular risk

OPERATIONALIZATION OF VARIABLES

The definitions are described below:

Age: The greatest cardiovascular risk is found in the population over 65 years of age.

Gender: Cardiovascular disease is more common in men, however in those over 65 years of age the risk is equivalent.

Arterial hypertension: It is the continuous

or sustained elevation of blood pressure levels. Hypertension places greater resistance on the heart, which responds by increasing its muscle mass to cope with this overexertion.

Cholesterol: It is a natural fatty substance present in all cells of the human body necessary for the normal functioning of the body. Most cholesterol is produced in the liver, although it is also obtained through some foods.

Smoking: It is the addiction to tobacco caused, mainly, by one of its active components: nicotine. The addiction of this substance ends up conditioning the abuse of its consumption. It is the most important cardiovascular risk factor, since the incidence of coronary heart disease in smokers is three times higher than in the rest of the population.

Obesity: Patients who have increased abdominal fat have a significant increase in the risk of suffering from cardiovascular diseases.

Cardiovascular risk: They are those that are associated with a greater probability of suffering from cardiovascular disease due to high blood pressure, diet, cholesterol, tobacco, obesity and a sedentary lifestyle.

INSTRUMENTS

The WHO cardiovascular risk stratification tables were used (Table number 1);

PROCEDURE

It begins with the signing of informed consent by the research subjects, subsequently they are weighed, measured and the questionnaire with the variables to be studied is applied.

ANALYSIS OF DATA

A database was created in EXCEL with the variables studied, subsequently with a Pearson's Chi Square correlation coefficient, the SPSS statistical software was used. According to the measurement levels that were used in the scale, the statistical test

SCORE < 1% will be used: low risk SCORE ≥ 1 and $\leq 5\%$: moderate risk. SCORE ≥ 5 and $\leq 10\%$: high risk SCORE $\geq 10\%$: very high risk, likewise those correlational scores that showed a level of significance no greater than 0.05 were taken into consideration.

PILOT TEST

A pilot test was applied to 12 inhabitants with an age range between 36 and 55 years with an X of 43, a higher percentage of low cardiovascular risk and a lower percentage of moderate risk was found. It is determined that the risk is greater when you have an underlying disease such as hypertension and diabetes and a lower risk when the DHL is lower.

RESULTS

The gender with the greatest participation in this study was female. The age of greatest participation was 30 to 59 years.

Of the population studied, the majority of cardiovascular risk is low, followed by moderate risk and 10% of the population with a high risk.

In the grouped age and risk correlation, with a significance of zero, it is concluded that there is no correlation and in the different age groups there is a low cardiovascular risk in the majority of the population, moderate and high cardiovascular risk is also present, in smaller proportion. Regardless of whether there is a larger female population, there is a greater moderate and high cardiovascular risk in men.

The result with correlations is always zero, so there is no independence between the variables.

The correlation is made with hypertension, smoking, diabetes, overweight and obesity and no correlation was found given that the majority of the population has a low risk, so the researcher's hypothesis is rejected.

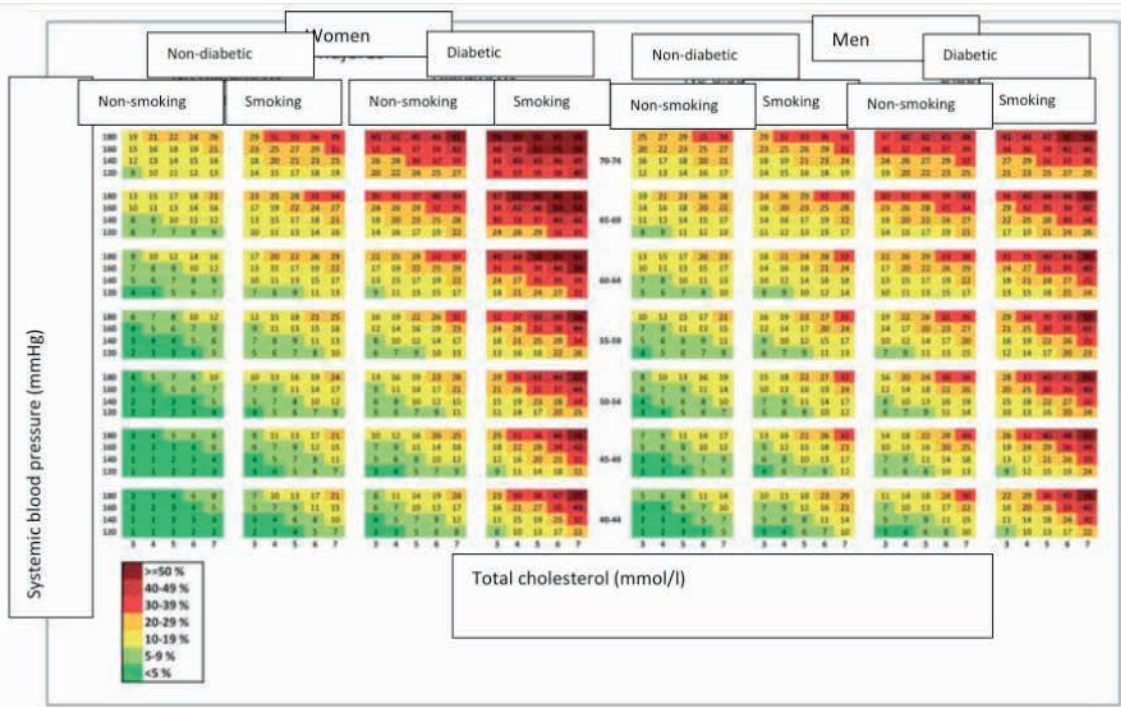


Table number 1. Cardiovascular risk stratification table based on the original Globorisk mathematical model, which was validated in the Mexican population.

To gage the risk		a	Percentage	Valid Percentage	Accumulated Percentage
Valid	Low risk	1203	75.4	75.4	75.4
	Moderate risk	231	14.5	14.5	89.9
	High risk	161	10.1	10.1	100.0
	Total	1595	100.0	100.0	

Table number 2: Cardiovascular risk of the population

Source: Applied instrument, 2023.

Chi-square tests		Asymptotic significance (bilateral)	
	Valor	df	
Pearson chi-square	524.994 ^a	8	.000
Likelihood ratio	472.696	8	.000
Linear by linear association	366.822	1	.000
Number of valid cases	1595		

A) 0 cells (0.0%) have expected a count less than 5. The minimum expected count is 12.11.

Table number 3. Grouped age and risk correlation

Source: Applied instrument, 2023.

Chi-square tests		Asymptotic significance (bilateral)	
	Valor	df	
Pearson chi-square	288.184 ^a	2	.000
Likelihood ratio	310.177	2	.000
Linear by linear association	271.787	1	.000
Number of valid cases	1595		

B) 0 cells (0.0%) have expected a count less than 5. The minimum expected count is 75.10.

Table number 4. Chi square test

Source: Applied instrument, 2023.

DISCUSSION

GENDER

According to the Honorary Commission for Cardiovascular Health (2023), risk factors are conditions, behaviors, lifestyles or situations that expose us to a greater risk of developing a disease; The WHO talks about five main risk factors such as smoking, harmful alcohol consumption, unhealthy diet, physical inactivity and air pollution. According to this Commission, men have a greater risk than women of suffering a heart attack. These data coincide with our study where it was found that regardless of the greater participation in women, men have a moderate to high risk of cardiovascular risk.

CARDIOVASCULAR RISK

Cardiovascular risk is defined as the probability that an individual has of suffering an acute myocardial infarction, cerebral hemorrhage, or embolism, and this depends largely on certain factors, which may be modifiable or non-modifiable. (Cardiavant, 2023) Alcocer et al (2011), with the Framingham method, classified 1,586 subjects as low risk, 268 as medium risk, and 130 as high risk; coincides with the data found in this investigation, 1203 at low risk, 231 at moderate risk and 161 at high risk.

CARDIOVASCULAR RISK FACTORS

Modifiable cardiovascular risk factors such as smoking, high cholesterol, overweight and obesity and non-modifiable ones such as diabetes and high blood pressure prevail in the Mexican population; In the study by Pereira and collaborators in 2015, 3,645 articles were identified, of which 45 were selected; After examining and evaluating the methodological framework of the 45 articles, the information on these variables allowed us to add the sample of articles (n = 7,192,262) to conclude

that Latin Americans have a high prevalence of overweight/obesity, sedentary lifestyle, smoking and alcoholism. They conclude that in the Latin American population there is a high prevalence of cardiovascular risk factors without significant differences by gender. In the present investigation, the presence of these risk factors present in the studied population coincides.

CONCLUSIONS

Regarding gender, the one with the greatest participation in this research was the female; With an age of mostly 30 to 59 years, with an average of 43, a population was found with arterial hypertension, hypercholesterolemia, diabetes mellitus, positive smoking, however, the cardiovascular risk is mostly low, followed by moderate risk and a minority of the population at high risk. Regardless of whether there is a larger female population, there is a greater moderate and high cardiovascular risk in men.

In the grouped age and risk correlation, it was found that in the different age groups there is a low cardiovascular risk in the majority of the population, moderate and high cardiovascular risk is also present, in a smaller proportion; with a significance of zero, it is concluded that there is no correlation.

It is concluded that there is no correlation between the variables studied, as the majority of the population has a low cardiovascular risk, which is why the researcher's hypothesis is rejected.

RECOMMENDATIONS

With the data found, it is necessary to develop health strategies such as an educational intervention program in nursing with emphasis on health promotion and education to treat individuals who present diseases as a risk factor and people who are not yet aware of them. one to prevent the evolution of a chronic disease.

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