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Research Article

Incidence of Metabolic Syndrome in Older Adults in Sucre (Colombia): Socio-Demographic, Physiological Variables and Lifestyles

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Abstract

Metabolic syndrome (MS) is an alteration of metabolic origin, product of the simultaneous manifestation of cardiovascular diseases (CVD) and abdominal obesity, characterized by increasing cardiovascular risk and diabetes. Therefore, we sought to determine the incidence of MS in a sample of adults over 60-63 years of age in the department of Sucre. Initially, bivariate analysis was performed, using chi-square test (Independence Test) for each of the factors (socio-demographic, physiological and lifestyle). Data Visualization comprised a mapping with principal component analysis (PCA) weighted - Multiple Correspondence Analysis (MCA) for qualitative variables and K-media Clustering to identify groups expressing common relationships. As well as Logistic Regression to determine the presence of metabolic syndrome with respect to the study variables. Physiological variables had greater significance in the presence of MS; logistic regression indicated that the variables were not significant for developing MS. The PCA showed that a disordered lifestyle alters the metabolism, and therefore develops CVD and Chronic non-communicable disease (CNCD) that lead to the appearance of MS, likewise a low academic training predisposes to have an unhealthy diet, rich in flours and fats that lead to the increase in Body Mass Index (BMI).

Keywords: Metabolic Syndrome; Cardiovascular Diseases; Obesity; Descriptive Statistics

Introduction

Advances in technology, such as household appliances, mobile devices and applications, means of transport, industrialization, etc., have generated significant changes in the development of countries, economies and environment, as well as improvements in the quality of life. However, the effects of these have led to changes and disturbances in the individual/population way of life, the environment, culture, socioeconomic and community network, which invite society to risk lifestyles (smoking, alcohol consumption, unhealthy diets and sedentary lifestyle) and predisposes the population with several internal and external risk factors that can cause metabolic abnormalities such as cardiovascular diseases. (CVD), diabetes mellitus, metabolic syndrome (MS), cerebrovascular diseases [1].

The statistical analysis of the present study can use unsupervised data mining techniques, such as simple and multiple corre-

spondence analysis, as well as canonical correspondence analysis (Comparison between simple correspondence analysis and canonical correspondence analysis: application in health public) to characterize the risk of a disease in terms of sociodemographic, physiological and lifestyle variables [2].

Metabolic syndrome (MS) is considered as a grouping of risk factors of metabolic origin, such as abdominal obesity, high blood pressure, high blood glucose and dyslipidemia [3]. The causes of mortality of MS are headed by CVD, which correspond to 28.7% of all deaths [4]. Coronary heart disease and ischemic heart disease predominate in men; and in women, diseases related to high blood pressure, such as cerebrovascular disease and heart failure [5]. It is estimated that approximately 20-25% of the adult world population has metabolic syndrome, so, some diseases they are twice as likely to die and three times more likely to suffer some disease or a heart attack, compared to the population that does not suffer from it, about 17.9 million people died of CVD in 2016, accounting for 31% of all global deaths. Of these deaths, 85% are due to heart attacks and strokes [6].

In Latin America, the prevalence of metabolic syndrome (MS), associated with high blood pressure, has been increasing. López-Jaramillo., *et al.* [7] found that the prevalence of MS in adults ranges from 25 to 45%. On the other hand, another study conducted in capital cities of Latin America, found that metabolic syndrome was more frequent in Mexico (27%), followed by Santiago (21%) and Bogotá (20%); lower prevalence was found in Lima (18%), Buenos Aires (17%) and Quito. In addition, metabolic syndrome was more frequent in women than men, with a higher prevalence in women with increasing age (range 25% to 49%) than in men (range 13% to 38%) [8].

Colombia, among the Chronic non-communicable disease (CNCD), cardiovascular have remained in recent years as the main cause of death, does not respond to distinctions of sex, age, ethnicity or geographical location, reports few studies on MS. In 2003, a group of researchers from the University of Antioquia conducted the first study on the prevalence of metabolic syndrome applying the criteria of the National Cholesterol Education Program (NCEP) and the Treatment Panel for Adults III (ATP III) in an urban population, taking as its center the municipality of El Retiro (Antioquia). The results showed a prevalence by age of 23.64%. Subsequently, in the city of Popayán (Cauca) a study was prepared on risk factors for cardiovascular diseases that lead to the presence of metabolic syndrome, finding that arterial hypertension (hypertension) was 11.5%, Overweight 45.8%, and 12.5% for Dyslipidemia and Smoking [9]. In Bogotá, another study of workers at a level III hospital showed that MS was more frequent in people over 50 years of age (46.4%) and in the secondary (42.9%) and technical (32.5%) educational levels [10].

In the Caribbean region, studies were carried out at the departmental level, highlighting that of Díaz-Navarro., *et al*. [11], where they analyzed the population of workers of the Barranquilla Sectional Free University, finding that the prevalence of metabolic syndrome, in men between 50 and 60 years, was higher (52.94%); than in women (50%), in ages of 40 to 50 years. The cardiovascular risk factors found in the population with the highest prevalence were: Central obesity (93.1%), Alcohol consumption (82.76%), followed by the least prevalent as Smoking, 31.03%. For their part, Manzur., *et al*. [12], in the community of Arjona (Bolívar) they found that the prevalence of metabolic syndrome was 22%, the distribution by gender did not show a statistically significant difference and the component of the most prevalent metabolic syndrome was abdominal obesity (70%, of the respondents). Itis necessary to carry out studies to know the current state of this syndrome in the department of Sucre, in order to determine the incidence of metabolic syndrome.

Methodology

This is a descriptive observational cross-sectional and population-based study to establish the prevalence of cardiovascular risk factors, where 3200 volunteer patients, aged 60 years or older (71.9 ± 7.8 years) were evaluated in the period 2013-2015 and attended in health care providers (EPS) in the department of Sucre (Colombia).

The selected sample was 86 workers in an age range of 60-63 years, considering formal, informal and independent workers from the department of Sucre. Two criteria were considered, one of inclusion, that is, any person who is active in the workplace and is among the selected age range and exclusion, that is, people who are not active at work and have an age range lower or higher than the established, who do not belong to the urban area and pregnant women.

Data collection protocol

- **Body Mass Index (BMI):** Height and body weight were measured, with which BMI was calculated by dividing the weight (in kilogram) by the square of the height (in meters). BMI was classified according to the cut-off criteria proposed by the WHO, Malnourished (BMI < 18.5), Normal (BMI 18.5 to 24.9), Overweight (BMI, 25.0 to 29.9), Obesity (BMI ≥ 30.0).
- **Blood Pressure**: Blood pressure measurement was done with a mercury sphygmomanometer, using a cuff with a 12 x 40 cm camera in obese people with an arm perimeter > 35 cm. Blood pressure was measured in the outpatient clinic during the clinical interview after the individual sat for 5 minutes. An individual was defined as hypertensive if they have a previous medical diagnosis and if the measurement shows systolic blood pressures (SBP) ≥ 140 mm Hg or diastolic blood pressures (DBP) ≥ 90 mm Hg.
- **Questionnaire:** A self-report was applied to the patient (older adult) to note: age, drug addiction (coffee, alcohol, smoking), sedentary lifestyle (physical activity) and socio-demographic data.

Structured survey

The socio-demographic, physiological and lifestyle variables were organized as qualitative variables for a better understanding of the study, recorded in table 1.

Variables	Guy	Class	Variable encoding
Socio-demographic variables			
Level of studies	Qualitative	Ordinal	Illiterate (Analf), Basic Primary (Bprim), Basic Secondary (Bsec), Superior (Sup).
Sex	Qualitative	Nominal	Male (M); Female (F)
Physiological Variables			
Metabolic Syndrome (SindMet)	Qualitative	Ordinal	No, risk, yes
Chronic non-communicable disease (CNCD), high hypertension, obesity, diabetes, cardiovascular diseases, triglycerides, cholesterol.	Qualitative	Nominal	Otherwise.
Body mass index (BMI) BMI (WHO 2000) = weight (Kg)/Height (m)	Qualitative	Ordinal	Normal (N), Overweight (S), Obese (O).
Hypertension (HTA)	Qualitative	Nominal	Otherwise.
Lifestyles			
Caffeine	Qualitative	Nominal	Otherwise.
Smokes	Qualitative	Nominal	Otherwise.
Alcohol	Qualitative	Nominal	Otherwise.
Physical activity	Qualitative	Nominal	Otherwise.

Table 1: Coding of socio-demographic, physiological and lifestyle variables.

Information processing

The information collected was coded and tabulated in a spreadsheet, 86 of3,200 registered volunteer patients were evaluated, (94%) met the inclusion criteria (they completed a complete self-report and were attended by outpatient consultation). For the control of the quality of the fingering, double entry of the data was carried out by two independent digitators. This investigation was considered to be of minimum risk under resolution 8430 of 1993.

The data and study variables were exported to the statistical program R for description and analysis. For multivariate analysis, two packages developed in Rare used: ade4 [13] and FactoClass [14].

The presence of MS was classified according to diagnostic criteria, established by the Adult Treatment Panel (ATP III) (Table 2), which diagnoses a person with MS by presenting three factors of those established. When creating the database and collecting the information, the variable chronic noncommunicable diseases (NCDs) was taken to include data on diseases (high triglyceride, diabetes, low HDL cholesterol), BMI and hypertension; useful information to be able to diagnose according to the criteria to be considered.

Diagnostic criteria	Values
Abdominal obesity + 2 criteria	♂ ≥ 102cm; ♀ ≥ 88cm
Triglycerides	>150mg/dL
C-HDL: High-density lipoprotein cholesterol (HDL)	♂ < 40 mg/dL; ♀ < 50 mg/dL
Blood pressure	> 130/85 mmHg, with treatment.
Fasting glucose	≥ 100 mg/dL, with treatment

Table 2: Diagnostic criteria for incidence of metabolic syndrome (MS) according to the Adult Treatment Panel III (ATP III) [15].

Statistical analysis

To understand the relationship between several aspects that lead to the presence of MS, an analysis was carried out that sought to generate the possibilities of interpretation through numerical descriptive analysis, graphic and biological analysis corresponding to the subject of study.

First, bivariate analysis, crossing of SM variables with lifestyle, physiological and sociodemographic variables and their respective independence test by means of a chi-square test, a general hypothesis was considered for all variables, with confidence intervals of 95% (95% CI).

- **Ho:** There is no relationship between the variables, so they are independent.
- **H1:** If there is a relationship between the variables, therefore, they are not independent.

Second, multivariate analysis. Researchers know that information on epidemiological phenomena is essentially multivariate in nature.

Multiple Correspondence Analysis was used as Analysis in Main Components to relate socio-demographic, physiological and lifestyle variables of the elderly population of the department of Sucre, since it is suitable for reading tables of "individuals" by qualitative variables (nominal or ordinal). Through logistic regression models, socio-demographic, physiological and lifestyle variables associated with MS were identified in older adults, where the variable to be predicted is the presence of metabolic syndrome with respect to the other variables [16].

To execute the statistical techniques, free statistical software R was used, with a wide variety of statistical techniques (linear and non-linear models, statistical tests, time series analysis, classification, grouping and graphs.

Results

We currently live in a world in demographic transition, both in developed and developing countries. This translates into a demographic aging or increase in the group of older adults (also called the elderly or the elderly), to which Colombia does not escape, 10% of its inhabitants are equal to or greater than 60 years old. Currently, the population pyramid has a barrel profile, a reduction in mortality does not seem to translate into morbidity, since the fact of living longer means living with a better quality of life? or does it mean living longer living with chronic noncommunicable diseases (NCDs) such as metabolic syndrome?

Characteristics of the 3200 study participants. Of the total of 3200 older adults, 43.2% were 60 to 69 years old, 40.65% were 70 to 79 years old, and 16.2% were 80 years of age or older. 63% were women; the predominant marital status was married with 59%. Schooling was low: more than half (52.3%) of older adults had no education (36.3% women and 16.0% men); 34 per cent had completed primary school alone, and only 6 per cent of women and 7.1 per cent of men had completed secondary education or more.

Of the 100 per cent of the total, 54.0 per cent of women and 33 per cent of men are pensioners, i.e., they receive a financial contribution from a social security institution. 29% of women have wid-

owed marital status and men only have the same civil status for 2%. In the study 60% are married, the proportion for men and women is the same in this condition (30%). Among the characteristics of the lifestyle of older adults, 30% have at least once smoked cigarettes and 46.3% have at least once ingested alcoholic beverages. 54.5% report physical activity. Women have BMI: 29.4 ± 5.1, while men have BMI: 28.2 ± 3.9. Women have a higher prevalence of overweight and obesity than men, 26% of women and 12% of men are overweight, while 26% of women and 18% of men are obese.

Lifestyle variables and their risk relationship and presence of MS

Of the 86 people included in the MS study, 46% were at risk of MS and 22% were at risk. tables 3 and 4 show the relationship between the lifestyle variables and the SM variable, taking into account when there is risk and presence of the syndrome. The lifestyle variables, table 3, did not present dependence on the risk of MS.

Variable	Number of people observed	N° of people with MS risk	Prevalence (%)	CI95%	X2 (P-value)
Smoking					0.496
No	45	23	51.1	(35.9-66.0)	
Yes	41	17	41.4	(26.7-57.8)	
Alcohol					0.761
No	34	17	50	(13.5-44.6)	
Yes	52	23	44.2	(34.0-65.9)	
Caffeine					0.241
No	32	18	56.2	(37.8-73.1)	
Yes	54	22	40.7	(27.8-54.9)	
ActFisica					0.705
No	33	14	42.4	(25.9-60.6)	
Yes	53	26	49.0	(35.2-62.9)	

Table 3: Risk ratio of Metabolic Syndrome (MS) and lifestyle variables.

Unlike the information in table 4, this showed that the presence of MS was increased by the practice of bad lifestyle habits, such as smoking (29.2%), drinking alcohol (25.0%) and consuming coffee (27.7%), with the smoking factor being the most influential in this presence. A sedentary lifestyle is a direct factor for the presence of MS, because the number of people with MS is higher in those who are not physically active (33.3%) than in those who do physical activity (15.0%).

Sociodemographic variables and their relationship with the risk and presence of MS

Table 5 shows that the p-value does not show dependence between the variables and the null hypothesis is met. When looking at the prevalence of study levels, it is evident that the lower the academic training, the greater the number of people at risk of MS. The highest prevalence was that of illiteracy, that is, 51.5% of people at risk of MS, while the lowest prevalence of risk was for people with higher education (33.3%). For the sex variable, women had a higher risk of MS (58.8%) compared to men (38.4%).

Compared to table 6, it could be observed that the relationship found previously is maintained, that is, the presence of MS increases when having a higher education (33.3%), followed by primary basic (23.3%) and illiteracy (21.2%), the average level showed the lowest presence of MS with 17.6%. With respect to sex, it occurred mostly in men with a prevalence of 25.0%. Women had a lower prevalence (17.6%).

Physiological variables and their relationship with the risk and presence of MS

Considering the *p-value* values, it is necessary that the physiological variables influence that a person has a risk of MS and the

Variable	Number of people observed	N° people with MS risk	Prevalence (%)	CI95%	X2 (P-value)
Smoking					0.203
No	45	7	15.5	(6.9-30.0)	
Yes	41	12	29.2	(16.6-45.7)	
Alcohol					0.590
No	34	6	17.6	(7.3-3.51)	
Yes	52	13	25.0	(14.4-39.2)	
Caffeine					0.167
No	32	4	12.5	(4.0-29.9)	
Yes	54	15	27.7	(16.8-41.8)	
ActFisica					0.086
No	33	11	33.3	(18.5-51.8)	
Yes	53	8	15.0	(7.1-28.1)	

Table 4: Relationship of presence of Metabolic Syndrome (MS) and lifestyle variables.

Variable	Number of people observed	N° of people with MS risk	Prevalence (%)	CI95%	X2 (P-value)
Studios					0.814
illiterate	33	17	51.5	(33.8-68.8)	
Basic primary	30	14	46.6	(28.7-65.3)	
Basic high school	17	7	41.1	(19.4-66.5)	
University	6	2	33.3	(59.0-75.8)	
Sex					0.103
Female	34	20	58.8	(40.8-74.8)	
Male	52	20	38.4	(25.6-52.9)	

Table 5: Risk relationship of Metabolic Syndrome (MS) and sociodemographic variables.

Variable	Number of people observed	N° of people with MS risk	Prevalence (%)	CI95%	X2 (P-value)
Studies			0.878		
illiterate	33	7	21.2	(9.6-39.3)	
basic primary	30	7	23.3	(10.6-42.7)	
Basic high school	17	3	17.6	(4.6-44.1)	
University	6	2	33.3	(59.0-75.8)	
Sex			0.590		
Female	34	6	17.6	(7.3-35.1)	
Male	52	13	25.0	(14.4-39.2)	

Table 6: Relationship of Metabolic Syndrome (MS) and sociodemographic variables.

presence of MS, all the variables presented a value less than 0.05 indicating dependence between the variables, fulfilling the alternative hypothesis. The values obtained when there was a risk of MS indicated that BMI was the most influential with a p-value of 0.007 followed by hypertension (0.022) significantly increase the risk of suffering from MS, the CNCD (triglycerides, diabetes, high cholesterol, dyslipidemia) was the one that had a lower value, but still had dependence. When a person has metabolic syndrome, they will undoubtedly have hypertension (0.0000), high BMI (0.014) and some CNCD (0.012), since the p-value values were much more significant.

Logistic regression

The relationship of the variables (sociodemographic, lifestyle and physiological) with the presence of MS does not present a significant value, since all values are higher than 0.05%, indicating that no variable helps to classify the presence of MS.

Coefficients:	Estimate Std.	Error	z value	Pr (> |z|)
Intercept	-1.238e + 02	1,382e + 05	-0.001	0.999
Smoking Yes	-1.875e - 01	5,604e + 04	5,604e + 04	1.000
Alcohol Yes	-5.086e - 02	6,497e + 04	0.000	1.000
Caffeine Yes	3.193e - 01	6,079e + 04	0.000	1.000
ActPhysics Yes	-4.128e - 01	6,813e + 04	0.000	1.000
Study. basic primary	2,167e - 01	5,065e + 04	0.000	1.000
Study. Basic high school	1,008e + 00	8,386e + 04	0.000	1.000
Study. University	1,350and + 00	1,304e + 05	0.000	1.000
Sex Male	4.723e - 01	5,550e + 04	0.000	1.000
CNCD Yes	4,908e + 01	7,366e + 04	0.001	0.999

Table 7: Logistic Regression: Physiological, Lifestyle and Sociodemographic vs. SM.

Weighted principal component analysis - multiple correspondence analysis

In the multivariate analysis, using the technique of multiple correspondences, a simultaneous reading of the first two axes was made that allowed to group the variables in the following typologies (Figure 1): having that the red color indicated high risk level, the brick color bad habits, the green normal state and good habits, mustard and blue educational level, and the purple genus.

People who have a secondary level of education have a normal BMI and are physically active. The men who presented a primary basic level of study had obesity, high blood pressure, CNCD and MS. There is no CNCD when the person had healthy habits, such as, not smoking, not consuming alcohol and coffee. Individuals who smoked also consumed alcohol and coffee.

Figure 1: Plan 1-2 MCA. Distribution of variables according to the presence in individuals.

Discussion

According to the results obtained, 46% of the workers presented a risk of MS and 22% have it, indicating a high prevalence of exposure to the syndrome and revealing a problem that has been growing rapidly in society, throughout history, and is based on the existence of different risk factors, being the fundamental, high hypertension, high cholesterol, increased BMI, Diabetes, triglycerides, dyslipidemia; all this set of diseases result in a high cardiovascular risk in those who present it [17].

Regarding the variables lifestyle of risk and presence of MS, dependence was not significant, even takinginto account risk factors that according to the literature are related to MS (high alcohol consumption, smoking and sedentary lifestyle), and the effect these cause on the functioning of organs such as the liver and pancreas [3] for this sample do not agree.

For the case of presence of MS with lifestyle, a more significant relationship between variables was observed when observing the prevalences with the practice of bad lifestyle habits (Table 4) such: smoking habit the most influential in said presence with 29.2%. Tobacco smoke is a mixture of active substances, with neurotransmitters such as dopamine or epinephrine, which causes greater vascular effect, increased blood pressure levels, and induces the development of other cardiovascular diseases (CVD) [18]. The sedentary lifestyle is another factor that influences the presence of MS, because people who did not perform physical activity were older (33.3%), with those who do physical activity (15.0%). Excessive calorie intake accompanied by a sedentary life are factors that promote the growth of adipose tissue and obesity. Under normal physiological conditions, adipose tissue releases various bioactive molecules, such as: leptin, adiponectin, interleukin-6 (IL-6) and tumor necrosis factor-α (TNF-α).

In pathological conditions of obesity, the balance of these molecules is altered, the release of leptin, IL-6 and TNF-α increases and adiponectin decreases; situation that contributes significantly to the development of metabolic syndrome, and related diseases. However, it can be minimized due to physical exercise since very small increases in activity produce significant changes in the reduction of risks [3].

The prevalence of risk to MS increases in parallel with the level of study, given that the lower the academic training, the greater the number of people at risk of MS (Table 5); with the difference in the presence of MS, that the highest prevalence occurred in people with higher level of education (33.3%), followed by basic primary (23.3%) and illiteracy (21.2%) (Table 6).

Therefore, academic training plays a fundamental role in terms of quality of life, such as comfort, good physical and mental health, economic stability etc., however, work excesses and misuses of comforts as technological means (own transport, electronic devices and appliances), increase sedentary lifestyle in people, in most cases cardiovascular risk and therefore the presence of MS. Due to a strong family influence, mainly on the part of paternal grandparents, to value traditional foods and the link with the land, it is of the utmost importance for all of us to dedicate ourselves to working with and for older adults in Colombia, the rescue of culinary traditions to lead a balanced diet and maintain a life full of health and well-being, with nutritional contents appropriate to our age.

Regarding sex, it was found that the risk of suffering from MS is more frequent in women with a prevalence of 58.8% (men, 38.4%). The risk of the syndrome increases in women, due to the transition of menopause, due to a deterioration that is related to age, metabolic and hormonal changes, physical inactivity and the increase in the deposit of visceral adipose tissue [19]. In men (Table 6) there was a higher prevalence associated with a decrease in testosterone and an increase in cortisol mediated by stress. Testosterone, intervenes in glucose homeostasis and lipid metabolism, its decrease can affect the production of neurotransmitters (dopamine, acetylcholine) inducing cardiovascular risk; cortisol, promotes synthesis of liver glucose and lipids, inhibits glycogen synthesis and insulin secretion under stress.

The positive association of these two hormones testosterone/cortisol (T/C) could be an early indicator of the development of insulin resistance and metabolic syndrome, due to the causative alteration in the components of MS [20].

The MS is characterized by the presence of a set of diseases that alter the metabolic functioning, this could be verified, by relating the physiological variables with risk to MS and presence of MS where, a high statistical significance was observed, because there was dependence between the variables. BMI was of great relevance in people at risk of MS, this being a fundamental trait.

It represents the accumulation of visceral and peripheral fat in most cases; adipose tissue is very active, synthesizes hormones such as adipokines, peptides and proteins that modulate vascular function, and adipocytes metabolism, as well as mediate glucose, lipid and inflammatory response metabolism. Therefore, they play a role in the pathogenesis of MS and its clinical characteristics: obesity, high arterial hypertension and dyslipidemia [3].

The results of the logistic regression (Table 7) did not present significance, because none of the selected variables allowed to characterize the MS. The results found show basic education as a consequence, low income reflected in a bad socio-economic condition of the general population, which potentiates negative effects on eating habits, adapted to the consumption of foods with low nutritional or energy value such as carbohydrates (tubers) and saturated fats (unginned dairy products) that abound by this area and is within reach of your pockets. One of the main limitations is the difficulty in modifying habits followed for many years, which cause them satisfaction, but threaten their health. For socio-cultural, geographical and violence reasons experienced in the 90s, women heads of families or partners in any civil relationship are responsible for eating and nutrition habits. Most continue with a strong activity within the kitchen, responsibility acquired to feel useful or because they like it and are regularly visited by their close relatives. Others, on the contrary, the replacement of social roles in terms of the preparation of meals is negatively affected (malnutrition or malnutrition), they feel displaced by their daughters or daughters-in-law, which causes frustration and feeling of uselessness, which leads to depression or physiological deterioration that can happen in old age.

The distribution of the variables when applying PCA (Figure 1) was related to certain previous results, taking that the lifestyle and sociodemographic variables have an important effect on the presence of the syndrome, since having bad lifestyle habits presented physiological variables such as hypertension, increased BMI, presence of MS, CNCD.

Academic studies, in most cases, determine economic stability, and well-being. Therefore, a low training may influence cultivating bad habits such as a diet high in flours and fats, a product of low economic income. So, it can potentiate the syndrome, progressively damage organs such as the liver and pancreas and other metabolic pathways [8]. A curious fact that could be appreciated was the little relationship of the higher-level categorization with the rest of the variables, given that only a minimum part of respondents has this characteristic.

Of the articles published in the area of "metabolic syndrome in adults" and "physiological, socioeconomic and lifestyle variables" of the *Pubmed* online database, 112 of the last 5 years and complete articles with a bibliometric analysis were analyzed in an exhaustive [21] and objective way as a contribution to our study (Own elaboration). Thesmall number of publications in languages other than English limits the collection of scientific data from less developed countries such as Colombia.

The analysis of citations (Figure 2) shows us the structure of a specific field through links between nodes (authors, articles, journals). Co-word networks show the conceptual structure, which discovers links between concepts through co-occurrences of terms (Figure 3). Conceptual structure is often used to identify the most important and recent issues.

Metabolic syndrome is more related to the healthy habits and nutrition of older adults. If there is a culture focused on the use of flour, saturated fat and high salt consumption it will be closer to the presence of triglycerides, cholesterol or high blood pressure, if we also add alcohol consumption and smoking, with a lot of sedentary lifestyle we will be avocados at a high cost in geriatric health.

However, few epidemiological studies have evaluated the associations of dietary fiber and its source with metabolic diseases, such as obesity, hypertension, and type 2 diabetes, in the adult population, whose diets typically include a high carbohydrate content due to carbohydrate-rich staple foods [22].

Figure 2: Plan 1-2 ACM - Conceptual structure articles with high contributions.

Figure 3: Plan 1-2 ACM - Conceptual structure descriptors most current topics.

Conclusion

According to this study, the prevalence or presence of MS among the population under study, evidenced an unhealthy lifestyle, prevention and control measures should be taken in smoking, sedentary lifestyle, unhealthy diets and alcohol consumption, so as not to increase the risk of the presence of chronic non-communicable diseases. The PCA allowed to know which variables are related, having that a disordered lifestyle alters the metabolism, and therefore develops cardiovascular diseases and chronic non-communicable diseases that lead to the appearance of MS, likewise a low academic training predisposes to have an unhealthy diet, rich in flours and fats that lead to the increase in BMI.

Bibliography

1. Álvarez Álvarez AM., *et al.* "Role of testosterone and cortisol in metabolic syndrome and type 2 diabetes mellitus". *Revista Cubana de Endocrinología* 21.1 (2010): 80-90.

2. Barrera MDP., *et al.* "Metabolic syndrome: an interdisciplinary look". *Colombian Journal of Cardiology* (2008).

3. Bernal García JJ., *et al.* "Modelling of the most important factors that characterize a website". *Spain: ASEPUMA* (2004).

4. Chessel D and Dufour AB. "The ade4-package: implementing the duality diagram for ecologists". *Journal of Statistical Software*. *Paris* 22.4 (2007): 1-20.

5. De Salazar DIM and Munoz-Gómez D. "Metabolic syndrome in women". *Revista Colombiana de Cardiología* 25 (2018): 21-29.

6. Díaz granados IL., *et al.* "Metabolic syndrome in workers of the Universidad Libre Seccional Barranquilla, 2009". *Uninorte Health* 26.1 (2010): 41-53.

7. Díaz-Realpe JE., *et al.* "Risk factors for cardiovascular disease in workers of a health service provider institution, Colombia". *Journal of Public Health* 9 (2007): 64-75.

8. Escobedo J., *et al.* "Prevalence of the metabolic syndrome in Latin America and its association with sub-clinical carotid atherosclerosis: the CARMELA cross sectional study". *Cardiovascular Diabetology* 8.1 (2009): 52.

9. Galán Morillo M., *et al.* "Effects of smoking on blood pressure of 24 h-evaluation by ambulatory blood pressure monitoring (MAP)". *Revista Cubana de Medicina* 43.5-6 (2004): 0-0.

10. Giraldo-Giraldo NA., *et al.* "Metabolic syndrome in a group of older adults not institutionalized according to criteria of international organizations". *Perspectives on Human Nutrition* 18.1 (2016): 25-35.

11. Gomez LA. "Cardiovascular diseases: a public health problem and a global challenge". *Biomedical* 31.4 (2011).

12. López-Jaramillo P., *et al.* "Latin American consensus of hypertension in patients with type 2 diabetes and metabolic syndrome". *Arteriosclerosis Clinical and Research* 26.2 (2014): 85-103.

13. Manzur F., *et al.* "Metabolic syndrome prevalence in the town of Arjona, Colombia". *Revista Colombiana de Cardiología* 15.5 (2008): 215-222.

14. Pardo C-E and Del Campo PC. "Combination -of factorial methods and cluster analysis in R: the FactoClass package". *Revista Colombiana de Estadística* 30.2 (2007): 231-245.

15. Pedrozo W., *et al.* "Metabolic syndrome and risk factors associated with the lifestyle of adolescents in a city in Argentina, 2005". *Pan American Journal of Public Health* 24 (2008): 149-160.

16. Pinzón A., *et al.* "Metabolic syndrome in workers of a level III care hospital SIMETRA study". *Acta Medica Colombiana* 39.4 (2014): 327-335.

17. R Development Core Team. "R: A language and environment for statistical computing, R Foundation for Statistical Computing, Vienna, Austria (2012).

18. Song S and Song Y. "Dietary Fiber and Its Source Are Associated with Cardiovascular Risk Factors in Korean Adults". *Nutrients* 13.1 (2021): 160.

19. Uriel E and Manzano JA. "Applied multivariate analysis". *Auditorium* 76 (2002): 270-271.

20. Worachartcheewan A., *et al.* "Data mining for the identification of metabolic syndrome status". *EXCLI Journal* 17 (2018): 72.