



ORIGINALES

Metabolic alterations in street traders in the city of Cuenca, Ecuador

Alteraciones metabólicas en comerciantes ambulantes de la ciudad de Cuenca, Ecuador

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ABSTRACT:

Introduction: The metabolic syndrome is conceptualized as a set of metabolic abnormalities whose etiopathogenic expression includes a prothrombotic and pro-inflammatory state that increases the risk of morbidity and mortality in affected patients.

Objective: The objective of the study was to analyze the behavior of the main clinical and laboratory elements that are part of the diagnostic criteria for metabolic syndrome.

Methodology: A basic, non-experimental, cross-sectional cohort research was carried out, supported by the results of the occupational health inquiry of the street vendors of the January 9 Association of the city of Cuenca. The universe was made up of 150 merchants and the sample was made up of 109 workers. A questionnaire was applied to each participant to identify general characteristics and blood pressure values, nutritional status, blood glucose and lipid profile were analyzed.

Results: Among the results, overweight merchants predominated (43.12%). 27.52% had high blood pressure figures, as well as hyperglycemia in 15.60%; 39.45% presented hypertriglyceridemia and 36.40% hypercholesterolemia. Likewise, 34.86% of merchants with high LDL cholesterol and 29.36% presented low HDL cholesterol values.

Conclusions: It is concluded that, in the group of street vendors investigated, there is a high presence of alterations in the clinical and laboratory components of the metabolic syndrome. Interventions are needed in this group and in the general population to achieve greater metabolic control and thus reduce the risk of complications related to these disorders.

Keywords: Dyslipidemias; Nutritional condition; Metabolic syndrome

RESUMEN:

Introducción: El síndrome metabólico es conceptualizado como un conjunto de anomalías metabólicas cuya expresión etiopatogénica incluye un estado protrombótico y proinflamatorio que eleva el riesgo de morbilidad y mortalidad en los pacientes afectados.

Objetivo: El objetivo de estudio fue analizar el comportamiento de los principales elementos clínicos y de laboratorio que forman parte de los criterios diagnósticos del síndrome metabólico.

Metodología: Se realizó una investigación básica, no experimental, de cohorte transversal, apoyado en los resultados de la indagación de salud ocupacional de los comerciantes ambulantes de la Asociación 9 de Enero de la ciudad de Cuenca. El universo estuvo constituido por 150 comerciantes y la muestra quedó conformada por 109 trabajadores. A cada participante se le aplicó un cuestionario para identificar características generales y se analizaron los valores de presión arterial, estado nutricional, glucemia y perfil lipídico.

Resultados: Entre los resultados, predominaron los comerciantes con sobrepeso (43,12%). El 27,52% presentaba cifras de presión arterial elevadas, así como hiperglucemia en el 15,60%; el 39,45% presentó hipertrigliceridemia y el 36,40% hipercolesterolemia. Se observa igualmente un 34,86% de comerciantes con LDL colesterol elevado y el 29,36% presentó valores bajos de HDL colesterol.

Conclusiones: Se concluye que en el grupo de comerciantes ambulantes investigados existe elevada presencia de alteraciones de los componentes clínicos y de laboratorio del síndrome metabólico. Se necesita realizar intervenciones en este grupo y en la población en general para lograr un mayor control metabólico y disminuir de esa forma el riesgo de aparición de complicaciones relacionadas a estos trastornos.

Palabras claves: Dislipidemias; Estado nutricional; Síndrome metabólico.

INTRODUCTION

Chronic noncommunicable diseases (NCDs) are one of the world's leading health problems. Health professionals focus their struggle on achieving control of NCDs to minimize morbidity and mortality in this group of diseases ^(1,2).

NCDs include high blood pressure (hypertension), diabetes mellitus (DM), bronchial asthma and metabolic syndrome (MS) among others. This last disease is considered one of the conditions that presents the greatest number of clinical manifestations and complications, being described not only as a disease, but also as a risk factor for other conditions such as hypertension and DM ^(3,4).

MS is conceptualized as a set of metabolic abnormalities including obesity, elevated blood pressure figures, dyslipidemias and alterations of serum glucose levels as an expression of insulin resistance syndrome. A prothrombotic and pro-inflammatory state secondary to MS is described that increases the risk of morbidity and mortality in affected patients ⁽⁵⁻⁷⁾.

However, in order to reach the diagnosis of the disease it is necessary to have 3 of the 5 components of it ⁽⁵⁻⁷⁾; each of them, although they are not part of the MS, they are a determining factor for the appearance of different disorders; among all of them there is a certain degree of dependence, since each one exerts a certain influence on the rest ⁽⁴⁻⁶⁾. That is why it is of paramount importance the early identification of alterations in these components to avoid the progression of metabolic alterations that could condition the diagnosis of MS.

That is why, taking into account the importance of each of the components of the SM individually or collectively and the influence they can have on people's state of health; it is decided to carry out this research with the aim of analyzing the behavior of the main clinical and laboratory elements that are part of the diagnostic criteria of MS.

METHODS

A basic, non-experimental, documentary and cross-sectional cohort research was carried out, supported by the results of the occupational health inquiry of the street vendors of the 9 of January Association of the city of Cuenca in Ecuador. The research had a mixed approach by using both qualitative and quantitative elements. Logical history, synthetic analytical and deductive inductive were used as research methods.

The universe was made up of 150 people who work as street traders and who are members of the 9 of January Association of Merchants. To calculate the sample size, the mathematical formula for known populations was used: ⁽⁸⁾

$$n = \frac{PQN}{(N - 1) \frac{e^2}{K^2} + PQ}$$

The nomenclature used was as follows:

- n= Sample size
- PQ= Population variance constant (0,25)
- N= Population size (52.126 people)
- e= Error (al 2%)
- Z= Trust level (1,96)

Mathematical calculations determined that the sample size should include 109 workers. To form it, the simple random method was used so that each person had the same possibility of being part of the study sample. All street traders included in the investigation met the inclusion criteria and did not meet the exclusion criteria defined for the study.

Inclusion criterio

- Street vendors belonging to the Association of Merchants January 9 of the city of Cuenca.
- Street vendors who complied with the realization of the occupational health check.
- Street vendors who agreed to participate in the research and expressed this by signing the informed consent.

Exclusion criterio

- Street vendors not affiliated to the Association of Merchants January 9 of the city of Cuenca.
- Street vendors who had not complied at the time of the investigation with the realization of the occupational health check.
- Street vendors who showed no interest in participating in the research so they did not sign the informed consent.

To carry out this research, the following research variables were identified:

- General characteristics: included the subvariants age, sex, presence of comorbidities and type of comorbidities.
- Components of MS: this variable included the analysis of blood pressure values, serum cholesterol, HDL cholesterol, LDL cholesterol, glycemia and the nutritional status of the workers investigated.

During the development of the research, two research techniques were used, the documentary review and the interview. The documentary review allowed to obtain, from the clinical history of each worker, the data related to the two research variables. The interview allowed to inform the workers about the objectives and methods of the research as well as the final report of the results of the same.

It is important to mention that the research team was based on the results of periodic health check-up of the workers which is a requirement as part of occupational health monitoring. During the development of the study, no direct action was taken with the people who were part of the research.

For the classification of blood pressure figures, the diagnostic criteria of the World Health Organization were taken into account which establish as normal values figures below 140/90 mmHg; higher values can be considered as confirmatory of HTN ^(9,10).

To identify nutritional status, the determination of body mass index (BMI) was used as an anthropometric measure. The formula for calculating BMI is based on the division of body weight expressed in kilograms, over the height of the person expressed in square centimeters.

The reference values defined by the WHO, and that were used in this research were:

- Low weight: BMI less than 18.5 points
- Normal weight: BMI between 18.5 and 24.9 points
- Overweight: BMI between 25.0 and 29.9 points
- Obesity: BMI equal to or greater than 30.0 points

The analysis of the laboratory tests was based on the reference values established by the clinical laboratory of the Diagnostic Center and Biomedical Research of the Faculty of Medical Sciences of the University of Cuenca and that defines the following parameters of normality.

- Fasting blood glucose: between 75 and 115 mg/dl
- Total cholesterol: up to 200 mg/dl
- HDL cholesterol: greater than 40 mg/dl
- LDL cholesterol: less than 100 mg/dl
- Triglycerides: up to 150 mg/dl

The research instrument used was an eight-question questionnaire, created specifically for the study and that it was submitted to expert criteria and a pilot test prior to its final application. The questionnaire was oriented towards the identification of the general characteristics of the workers included in the study.

The information processing was carried out automatically using the statistical program *Statistical Package for Social Sciences (SPSS)* in its version 26 for Windows. Absolute frequencies and percentages were determined for the processing of qualitative variables and measures of central tendency and dispersion for quantitative variables.

The confidence level was defined at 95% with a margin of error of 5% and statistical significance was defined at a $p \leq 0.05$. The results were expressed in the form of tables and statistical graphs to facilitate their understanding.

The research complied with the standards set out in the Declaration of Helsinki 2 for conducting research on human beings. Each participant was informed, prior to the start of the study, about the objectives and methods used. The incorporation of the people was voluntary and each of them expressed, through the signature, the informed consent your desire to participate in the study and the authorization for your medical history data to be used. No personal identity data or other elements that could reveal the identity of the participants were used; only alpha numeric codes were used in strictly necessary cases. The database with the information collected was definitively deleted after the final report of the study was made.

RESULTS

The main results of this study are shown below:

Table 1. Distribution of people according to general characteristics

General characteristics	Total sample n=109 workers Frequency (percent)
Average age (years)	53,62 *SD 21,38
Sex	
Masculine	38 (34,90)
Feminine	71 (65,10)
Presence of comorbidities	
Presence	35 (32,11)
Absence	74 (67,89)
Type of comorbidities n=35 people	
Arterial hypertension	15 (42,86)
Mellitus Diabetes	4 (11,43)
Rheumatoid arthritis	2 (5,71)
Hypothyroidism	12 (34,28)
Heart failure	3 (8,57)
Chronic obstructive pulmonary disease	2 (5,71)
Fibromyalgia	5 (14,28)

Source: research questionnaire *SD: standard deviation

Table 1 shows the distribution of people according to the general characteristics identified. An average age of 53.62 years with SD of 21.38 is observed. There was a predominance of females (65.10%) and 32.11% reported at least one associated comorbidity. Among the comorbidities that were most frequently referred are hypertension (42.86%), hypothyroidism (34.28%) and fibromyalgia (14.28%).

Table 2. Distribution of people according to clinical components of the metabolic syndrome.

Clinical Components	Total sample 109 people n=109		*p
	Frequency	Percent	
Blood pressure numbers			
Normal blood pressure	79	72,48	----
High blood pressure	30	27,52	----
Nutritional condition			
Low weight	5	4,59	0,095
Normal weight	39	35,78	0,064
Overweight	47	43,12	0,057
Obesity	18	16,51	0,083

Source: clinical history *p≤ 0.05

In Table 2, the analysis of the clinical components of MS showed that 27.52% of the people investigated had elevated blood pressure figures. In relation to nutritional status, it stands out that 59.63% of people had nutritional alterations due to excess; of these, 43.12% were overweight and 16.51% were considered obese (Table 1).

Quantitative analysis of nutritional status showed a mean BMI of 27.86 points with ED of 4.43, the lowest value was 17.17 points and the highest was 40.90 points.

Table 3. Distribution of people according to results of laboratory components of the MS

Laboratory components	Total sample 109 people n=109	
	Frequency	Percent
Blood glucose figures		
Normal	92	84,40
Elevated	17	15,60
Triglyceride figures		
Normal	66	60,55
Elevated	43	39,45
Cholesterol Figures		
Normal	69	63,30
Elevated	40	36,70
HDL cholesterol		
Normal	77	70,64
Low	32	29,36
LDL cholesterol		
Normal	71	65,14
Elevated	38	34,86

Source: research questionnaire

The results of Table 3 are directly related to the components of metabolic syndrome; in this sense, 15.60% of the people investigated with high blood glucose values stand out; 39.45% presented hypertriglyceridemia and 36.40% hypercholesterolemia. There were also 34.86% of traders with high LDL cholesterol and 29.36% had low HDL cholesterol values.

DISCUSSION

The components of MS constitute, individually, risk factors for the appearance of different NCDs such as hypertension and DM among others ^(3,6). Health professionals working at the first level of health care have a responsibility to monitor behavior, clinical and laboratory components, mainly in patients at risk, to identify initial alterations of each of them.

The results of the present research show a high percentage of street vendors with associated comorbidities. Different investigations carried out in Ecuador report in high parameters to hundreds of people with different diseases. A similar result is reported by Solis Cartas and Calvopiña Bejarano ⁽¹¹⁾ who report about 40% of people with different comorbidities.

Hypertension, hypothyroidism and fibromyalgia were the comorbidities that had the highest frequency of presentation. The prevalence of HBP in Ecuador at the end of 2019, according to data offered by the National Institute of Statistics and Census (INEC), it is around 18.7 percent of the population over 15 years of age; this figure exceeds the 14.3% prevalence of hypertension in the Americas ⁽¹²⁾.

One element to take into account is the high percentage of street vendors diagnosed with hypothyroidism; this disease has a high presence in the Ecuadorian epidemiological context, is a disease that is among the first 10 reasons for consultations according to INEC; an unreported popular theory relates the increased prevalence of hypothyroidism to the consumption, for many years, of non-iodized salt in the country.

Fibromyalgia is a rheumatic disorder that has increased its incidence and prevalence in recent years, is considered a predominant condition in female patients between 15 and 45 years of age and that it is directly related to stressful situations; in Ecuador, there are few reports of fibromyalgia ⁽¹³⁾.

The analysis of the components of the MS showed some important elements related to the alterations of the values of each one. The determination of the blood pressure taking showed a very high percentage of street vendors with high figures, it is even a result higher than the prevalence of hypertension in the country according to INEC ⁽¹²⁾.

Many factors may be related to this outcome, nutritional disorders, inadequate diets, and inadequate habits and lifestyles are some of them. Research such as that of Larrea Fabra et al. ⁽¹⁴⁾ reports a direct relationship between the quality of feeding and the risk of the occurrence of hypertension.

For their part, Petermann and collaborators and Conesa Gonzalez and collaborators agree that nutritional disorders are not only a risk factor for HBP but also for other cardiovascular conditions. Other authors such as Miranda Pérez et al. ⁽¹⁷⁾ describe in their research a relationship between nutritional habits and the risk of cardiovascular disease, including hypertension.

The analysis of nutritional status, according to BMI results, both qualitatively and quantitatively shows a high percentage of street vendors with nutritional alterations

due to excess. There are other investigations that also report high percentages of different population groups with overweight and obesity⁽¹⁸⁻¹⁹⁾. Obesity and overweight, despite being an important component of MS, are risk factors for diseases as HBP, MD and dyslipidemias⁽²⁰⁻²²⁾.

Lipid alterations were also identified in percentages higher than those desired to maintain an adequate state of health. Other research carried out in Ecuador also reports high percentages of dyslipidemias, even reaching 50% of people investigated⁽²¹⁻²³⁾.

In consideration of the limitations of the present study, first, the cross-sectional study design excluded casual conclusions and further longitudinal investigations were needed to determine the causal relationship. Secondly, some street vendors were constantly mobilized and could not be included in this study. Finally, clinical components and comorbidities need to be more detailed to explain the exact mechanisms and associations with metabolic syndrome, and these factors should be analyzed as covariates in future research.

CONCLUSION

In the group of street vendors investigated, there is a high presence of alterations in the clinical and laboratory components of the MS. Interventions are needed in this group and in the general population to achieve greater metabolic control and thus reduce the risk of complications related to these disorders.

The monitoring of the components of the SM will not only allow early identification of alterations and correct them to minimize the incidence and prevalence of the syndrome; it will also facilitate the control of some NCDs and the reduction of the risk of complications, for this reason, it is suggested that this study from another point of view of health professionals to analyze how the variables are seen from their perspective.

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