



ORIGINAL ARTICLE

Metabolic syndrome in older adults of the nursing home " Carlos Castellano Blanco "

Síndrome metabólico en adultos mayores del hogar de ancianos" Carlos Castellano Blanco"

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ABSTRACT

Introduction: non-communicable diseases impede social and economic development worldwide, with a tendency to increase in incidence and mortality, a context in which the Metabolic Syndrome is inserted. Objective: To determine the incidence of metabolic syndrome in older adults of the "Carlos Castellano Blanco" nursing home in Pinar Del Rio.

Methods: a descriptive observational study was carried out in the Nursing Home already mentioned, in the period from January to September 2020. The universe consisted of 160 elderly adults, 54 of whom had a diagnosis of Metabolic Syndrome, leaving a sample of 40 elderly who met the inclusion criteria. The information was extracted from individual medical records, used to form a database in Microsoft Excel and processed by calculating absolute and relative frequencies and Chi-square test (X²) to establish the relationship between variables.

Results: metabolic syndrome was diagnosed in 34 % of the older adults, predominantly in the male sex (60 %) and in the 60 to 69 years age group (62,5 %). Arterial hypertension, elevated triglycerides and type 2 diabetes mellitus were the most frequent components of the metabolic syndrome. Non-alcoholic fatty liver disease represented 52 % of the patients and microalbuminuria 20 % of the sample; older adults without alterations in glycemic control predominated.

Conclusions: the degenerative changes in the elderly justify the high frequency, particularities of the Metabolic Syndrome and the high risk of complications and mortality.

Keywords: Metabolic Syndrome; Aged; Insulin Resistance.

RESUMEN

Introducción: las enfermedades no transmisibles impiden el desarrollo social y económico a nivel mundial, con tendencia al aumento en incidencia y mortalidad, contexto en el que se inserta el Síndrome Metabólico.

Objetivo: precisar la incidencia del síndrome metabólico en los adultos mayores del hogar de ancianos "Carlos Castellano Blanco" en Pinar Del Rio.

Métodos: se realizó un estudio observacional descriptivo, en el Hogar de Ancianos ya mencionado, en el período comprendido de enero a septiembre del 2020. El universo estuvo conformado por 160 adultos mayores, de los cuales 54 tenían diagnóstico de Síndrome Metabólico quedando una muestra de 40 ancianos que cumplieron con los criterios de inclusión. La información fue extraída de las historias clínicas individuales, utilizada para conformar una base de datos en Microsoft Excel y procesada calculando frecuencias absoluta, relativa y prueba de Ji cuadrado (X^2) para establecer relación entre las variables.

Resultados: el Síndrome Metabólico se diagnosticó en el 34 % de los adultos mayores, predominando el sexo masculino (60 %) y el grupo de 60 a 69 años de edad (62,5 %). La Hipertensión Arterial, triglicéridos elevados y la Diabetes Mellitus tipo 2 fueron los componentes del Síndrome Metabólico más frecuentes. El hígado graso no alcohólico representó el 52 % de los pacientes y la microalbuminuria el 20 % de la muestra, predominaron los adultos mayores sin alteraciones del control glucémico.

Conclusiones: los cambios degenerativos en los ancianos justifican la elevada frecuencia, particularidades del Síndrome Metabólico y el alto riesgo de complicaciones y mortalidad.

Palabras clave: Síndrome Metabólico; Adulto Mayor; Resistencia a la Insulina.

INTRODUCTION

The global burden and threat of non-communicable diseases impede social and economic development, a context in which the Metabolic Syndrome (MS) is inserted, as it is related to the diseases with the highest mortality and shows an increasing trend in its incidence.⁽¹⁾ The scientific community relates MS to the pandemic of obesity, diabetes and recognizes that its prevalence increases with age,⁽²⁾

The pathogenesis of MS is complex, with insulin resistance and the association with diabetes, obesity, hypertension, steatohepatitis and proinflammatory and prothrombotic factors playing a key role, which gives it clinical relevance and explains its importance as an entity associated with high vascular risk, factors that lead to an increase in morbidity and mortality of atherosclerotic origin.⁽³⁾

There is no pathognomonic diagnostic test for MS, so different societies and groups have developed a set of criteria for its diagnosis in clinical practice,⁽⁴⁾ since in its first definition the diagnosis focused on demonstrating insulin resistance (IR), which is a difficult parameter to measure in practice, but in 2001, the National Cholesterol Education Program (NCEP) Adult Treatment Panel III (ATP III), introduced criteria for the diagnosis of MS,⁽⁵⁾ which are among the most widely used at present and which we assume in this work.⁽⁶⁾

It has been found that the prevalence of this syndrome increases with aging, regardless of the concept applied, so, considering age as the main non-modifiable risk factor, it was considered of great importance to study the prevalence of MS in the population over 60 years old, since the combination of actions on several modifiable cardiovascular risk factors associated with MS could prevent atherosclerosis and reduce mortality significantly among older adults and the "Carlos Castellano Blanco" nursing home in the province of Pinar Del Rio, it was valued, because of the presence of older adults, which is a suitable scenario for this type of study, the main objective was to determine the incidence of metabolic syndrome in older adults in the nursing home "Carlos Castellano Blanco" of Pinar Del Rio province and then to determine the main causes of the appearance of metabolic syndrome in older adults belonging to the nursing home "Carlos Castellano Blanco" of Pinar Del Rio province.

METHODS

An observational, descriptive, cross-sectional study was carried out in the universe of 160 older adults of the Carlos Castellano Blanco Home for the Elderly in Pinar del Rio, in the period from January to September 2020, of which 54 have a diagnosis of Metabolic Syndrome in their clinical history, leaving a sample of 40 older adults who met the inclusion criteria established in the study, having a diagnosis of MS, age equal or older than 60 years and expressing informed consent and 14 patients with psychiatric diseases or mental disability and those who did not agree to participate were excluded.

The data were obtained by reviewing the medical records and the diagnosis of MS was made by the authors, according to the NCEP-ATP III,⁽⁷⁾ by the presence of at least three of the following criteria: Diabetes Mellitus, Arterial Hypertension, abdominal obesity, high triglycerides, low HDL. The diagnostic parameters were established according to the following criteria.

- **Diabetes Mellitus:** It was diagnosed according to the criteria of the American Diabetes Association (ADA),⁽⁸⁾ which are those applied in our health services.
- **Arterial hypertension:** Yes: BP \geq 130/85 mmHg for both sexes, or receiving antihypertensive treatment.
- **Abdominal obesity:** If waist circumference in men >102 cm and in women >88 cm.
- **Elevated triglycerides:** If: fasting blood values \geq 1.70 mmol/L, or receiving pharmacological treatment for hypertriglyceridemia.
- **Low HDL-cholesterol:** If: blood values <1.04 mmol/L in men and <1.29 mmol/L in women, or receiving drug treatment for hypercholesterolemia.

The laboratory techniques used for the determinations of the biochemical variables studied were carried out in the clinical laboratory of the Hospital Abel Santamaría, complying with quality control, the samples were processed by a certified laboratory technique in a Hitachi 192, after a 12-hour fasting period, the serum was obtained and the reagents used were produced by the Biologicals Production Company "Carlos J. Finlay. The kits and methods used for glycemia were the Rapigluco-Test kit, using the enzymatic colorimetric method of glucose oxidase; for cholesterol, the Colestestest kit was used, using the enzymatic method; triglycerides were determined with the Triglitest kit, using the enzymatic method, HDL-cholesterol was determined using the HDL-C Kit by colorimetric enzymatic method, end point and the determination of microalbuminuria was performed by the UMELISA MICROALBUMINA method, a heterogeneous sandwich enzyme-linked immunosorbent assay that uses ultramicroELISA strips as a solid phase.

Abdominal circumference was measured by the anthropometric method, using a 200 cm non-elastic tape measure. It was performed with the subject standing, at the midpoint between the lower costal ridge and the iliac crest, without compressing the skin with the tape, the feet were kept separated by a distance of 25 to 30 cm, in such a way that the weight was distributed over both lower limbs and the reading was taken at the end of a normal exhalation. To measure blood pressure, a KANGJU sphygmomanometer was used, with a previous rest of five minutes before measuring blood pressure.

The variable fatty liver was included in the study, using the abdominal ultrasound reports in the medical records of all patients, which confirmed its presence.

The patients were organized into three age groups: 60-69, 70-79 and 80-89 years.

The information was processed in Microsoft Excel, using descriptive statistics with absolute and relative frequencies and the Chi-square test (X²) to determine the relationship between variables. The principles of medical ethics were respected at all stages of the study.

RESULTS

that MS affected 34 % of the older adults belonging to the Carlos Castellanos Blanco Home for the Elderly.

The distribution of older adults with MS according to age and sex is shown in Table 1, with a higher proportion in the male sex (60 %) and in the 60-69 age group (62,5 %).

Table 1. Patients with MS according to age and sex.

Age group	Sex				Total n=40	
	Male		Female			
	No	%	No	%	No	%
60-69	16	40	9	22,50	25	62,50
70- 79	7	17,50	7	17,50	14	35
80-89	1	2,50	0	0	1	2,50
Total	24	60	16	40	40	100

Table 2 shows that AHT and elevated triglycerides were the most frequent components of MS, present in 62 and 60 % of the patients, respectively.

Table 2. Frequency of metabolic syndrome components.

Components	Sex				Total n=40	
	Female		Male		No.	%
	No.	%	No.	%		
Abdominal obesity	2	5	6	15	8	20,00
Elevated triglycerides	6	15	18	45	24	60,00
Low HDL cholesterol	1	2,50	0	0	1	2,50
High blood pressure	9	22,50	16	40	25	62,50
DM TIPE 2	4	10,00	10	25	14	35

Source: medical records.

Table 3 shows the combinations of the components of MS in the older adults studied, the most frequent being the association of DM, HT and high TAG, present in 35 % of the cases. It is significant that the diagnosis of MS was made in 75 % of the patients with at least three of the criteria required by ATP III; nine patients had four criteria and only one of the elderly presented all five diagnostic criteria. DM and AHT were present in all the patients and in the most frequent combinations of MS components in the study we found obesity and DM and in the sample studied in particular all the obese patients studied had DM, but not all the diabetics were obese.

Table 3. Combination of Metabolic Syndrome components.

Combination	Total n=40	
	No.	%
DM + HT + Obesity	8	20,00
DM + HTA + elevated TAG	14	35,00
DM + Obesity + elevated TAG	8	20,00
DM + HTA + Obesity + elevated TAG	8	20,00
DM + HTA + Obesity + HDL bajo	1	2,50
DM + HTA + Obesity + elevated TAG + low HDL	1	2,50
TOTAL	40	100

Source: Medical records.

The finding, from the abdominal ultrasound report, allowed establishing the presence of non-alcoholic fatty liver disease in 52 % of the elderly, as shown in graph 2.



Graph 2. Non-alcoholic fatty liver disease in older adults with MS.

Table 4 shows that there was a predominance of older adults with MS without alterations in glycemic control and of male sex, and that there was no statistical significance in the relationship between both variables when applying the Chi-square test (χ^2).

Table 4. Glycemic control in older adults with MS according to sex.

Age group	Sex n=40			
	Male		Female	
	No	%	No	%
With alterations in glycemic control	10	25,00	4	10,00
Without alterations of glycemic control	14	35,00	12	30,00

Source: medical records. Significance: $P > 0.05$

Table 5 shows that 20 % of the male older adults had microalbuminuria, a variable that showed no relationship with the sex of the older adults.

Table 5. Microalbuminuria, a variable that showed no relationship with the sex

Age group	Sex n=40			
	Male		Female	
	No	%	No	%
<30mg	4	10	2	5
30 to 300 mg	8	20	4	10
greater than 300mg	2	5	0	0
Clinical Proteinuria	3	7,50	2	5

Source: medical records. Significance: $P > 0.05$

DISCUSSION

The increase in the prevalence of metabolic syndrome (MS) worldwide is alarming, especially in older adults, in correspondence with the physiological changes typical of aging, the metabolism is much slower, free radicals increase, the functions of their organs decrease, such as the function of the pancreas, the arterial walls harden, factors that, together with inadequate lifestyles, increase the vulnerability to suffer from MS,⁽⁷⁾ Many studies in different countries, in Cuba and in the province of Pinar del Rio coincide with this statement.⁽⁶⁾

The prevalence by sex varies in the different stages of life, with many authors coinciding in the predominance of the female sex in post-climacteric ages;⁽⁹⁾ which does not correspond with the result obtained in the research, in which the male sex predominated, a result that may be due to the fact that most of the adults in this institution belong to this sex and perhaps related to the fact that there are risk factors that occur more frequently in men than in women, such as sedentary lifestyle, smoking, which contribute to the appearance of diseases such as arterial hypertension and hyperlipidemia, which are diagnostic criteria of this entity.⁽⁹⁾

although other research carried out in Cuba has found a predominance of the male sex over the female, at a ratio of 1.8: 1 men for each woman, results attributed to male hypogonadism or androgen deficiency and visceral obesity, which have a complex and bidirectional relationship, the decrease in testosterone levels, due to a decrease in gonadotropin-releasing hormone and luteinizing hormone, secondary to fat aromatization, causes an increase in visceral obesity, which in the context of insulin resistance leads to the diagnosis of MS.^(10,11)

It coincides with the study carried out in the province of Pinar del Rio by Perez Gonzalez and colls.,⁽⁶⁾ that the most significant component of MS found was HT, followed by hypertriglyceridemia, which was found in 60 % of the elderly with MS studied, These components of MS are interrelated in its pathogenesis, in which lipid deposition in the arteries, hypertrophy of the intimal layer of the vascular endothelium, vasoconstriction that appears as a consequence of the activation of the sympathetic nervous system, and renal sodium retention are involved.

Triglycerides transported by low density lipoproteins constitute the most useful lipid parameter when assessing coronary risk, they are transformed into LDL - oxidized, which is more immunogenic than native LDL, thus facilitating the deposition of cholesterol on arterial walls and the detection of immunocomplexes, which may be new diagnostic markers of coronary atherosclerosis and in turn of MS.⁽¹²⁾

Hypertriglyceridemia is an important alteration of lipid metabolism, with a wide range of clinical manifestations, which constitutes one of the most characteristic humoral alterations of MS and is an excellent marker of insulin resistance,⁽³⁾ which increases the synthesis of triglycerides and very low density lipoproteins (VLDL), which, together with deficient lipoprotein lipase activity, leads to hypertriglyceridemia This metabolic disorder impacts the lipoprotein pattern by favoring cholesteryl ester transfer protein activity, increasing the cholesterol ester content of VLDL and abnormally enriching HDL in triglycerides. HDL rich in triglycerides are more susceptible to degradation by hepatic lipase, which could explain the decrease in HDLc levels found in MS and small and dense LDL particles are formed, more atherogenic,⁽⁴⁾ alterations in plasma lipids that favor their deposition in the walls of the arteries, contributing to the development of atherosclerosis, which ends in a narrowing of the arteries, favoring the appearance of cardiovascular disease and arterial hypertension. Of the components of MS, low HDLc values were the least frequent in the sample studied, which coincides with Rivas et al.⁽¹³⁾

In the study only 20 % of the older adults with MS presented abdominal obesity, a result that could be related to the tendency to thinness of older adults and the lower presence in the combinations of low HDLc and abdominal obesity may be related to the reduction of adipose tissue that occurs with aging.

It is questioned whether the sum of the elements of MS increases the risk for the appearance of diseases, when compared with the effect of each one of them separately, in this respect it was considered that since the individual components of MS are clear risk factors, their simultaneous appearance increases the risk.

Insulin regulates a large part of the activities of adipose tissue and adipocytes constitute a cell type in which sensitivity to this hormone differs according to its levels, since the antilipolytic effect requires a notably lower concentration than that needed to stimulate glucose transport and even in states of IR in which glucose transport is altered, the antilipolytic effect is usually preserved, which maintains or even expands fat reserves.⁽¹⁴⁾

Insulin-stimulated glucose uptake is the key to the effectiveness of insulin in controlling blood glucose and therefore represents well what the level of insulin sensitivity is. Under physiological conditions there is a balance situation, which tends to be constant, between pancreatic insulin secretion and insulin sensitivity, and in healthy individuals there is great variability in both insulin effectiveness and insulin sensitivity and in the presence of insulin resistance the pancreatic beta cell, in an attempt to compensate for the product "insulin-stimulated glucose uptake" x "insulin secretion", will increase insulin secretion leading to hyperinsulinism, clinically ranging from normoglycemia through carbohydrate intolerance to non-insulin-dependent diabetes mellitus, when the islet beta cells do not respond with a sufficient increase in insulin secretion.⁽¹⁴⁾

Chronic liver disease can be caused by simple steatosis or with inflammation and damage to the hepatocyte or steatohepatitis, its most severe manifestations are liver cirrhosis, hepatocarcinoma or hepatic insufficiency, Therefore, we attach special importance to the finding of more than 50 % of elderly patients with MS in the investigation with a diagnosis of non-alcoholic fatty liver disease, which requires a special follow-up of these patients, since age, steatohepatitis activity and fibrosis predispose to cirrhosis that in 10 years' time could lead to death in 12 to 25 % of the affected subjects.⁽¹⁵⁾

In patients with steatosis, overproduction of VLDL represents a compensatory mechanism for hepatic lipid overload, which increases fasting dyslipidemia and the risk of atherosclerosis. This is accompanied by abnormal release of hormones and cytokines by adipose tissue, such as tumor necrosis factor alpha (tumour necrosis factor- α -TNF- α), IL-6, C-reactive protein, leptin, adiponectin and resistin, which is associated with dyslipidemia, oxidative stress, IR and hepatic inflammation.⁽¹⁵⁾

The lipotoxic hypothesis attempts to explain the mechanism by which fat infiltrates the liver through the unregulated influx of fatty acids.⁽¹⁶⁾ The massive, chronic, persistent and uncontrolled influx of free fatty acids into the hepatocyte overcomes the inhibitory effect of insulin on intracellular lipid oxidation and generates greater cellular resistance, fatty acids also interfere with insulin binding to its receptor and affect the intracellular propagation of the hormone signal by inducing serine phosphorylation of IRS-1.

Other mechanisms that favor IR facilitate the expression of proteins linked to the transcription and expression of genes related to the synthesis of triacylglycerides and to the production of an inflammatory response. New hypotheses state that in the context of IR, hepatic glucose production increases, because the ability of insulin to suppress gluconeogenic enzymes is altered, an anomaly that coexists with an increase in triglyceride synthesis and reduced fatty acid oxidation.⁽¹⁶⁾

Microalbuminuria is one such marker of abnormal urinary albumin excretion that has gained importance in the early recognition of at-risk individuals such as patients with type 2 diabetes mellitus (DM2) or hypertension (HT).⁽¹⁷⁾ In non-diabetic patients with essential hypertension, microalbuminuria is associated with higher blood pressures, elevated serum total cholesterol and reduced serum HDL-cholesterol, alterations related to a generalized dysfunction of the vascular wall, so that this association has allowed us to consider that "the kidney is the sentinel of the vasculature".⁽¹⁸⁾

Insulin resistance is the hallmark of MS, and is the underlying cause of the association with metabolic disturbances: hyperglycemia, dyslipidemias, and arterial hypertension, which would be fundamental factors in the development of atherosclerosis, and could also contribute directly to renal damage, due to alterations in normal hemodynamics and due to glomerular damage by multiple factors present in MS, such as Arterial Hypertension, hyperinsulinemia, hyperglycemia, hyperlipidemia and systemic inflammation, which would lead to renal damage,⁽¹⁸⁾ which justifies the need to provide follow-up to microalbuminuria and other parameters that allow a more precise evaluation of metabolic control, as well as the complications that may accompany MS and implement intervention strategies designed for the prevention and early detection of MS, in older adults attended at the Carlos Castellano Blanco home for the elderly and in all communities.

CONCLUSIONS

The degenerative changes in older adults justify the high frequency and particularities of Metabolic Syndrome in them and the high risk of complications and mortality as could be observed in this study. Among the main components, there is an increase in triacylglycerides, arterial hypertension, diabetes mellitus, obesity and cholesterol, which imposes the need to create a group of actions for its adequate control.

Conflict of interest

the authors declare that there are no conflicts of interest related to the study.

Authors' contribution:

LMRS, AMI: Conceptualization, Formal analysis, Research, Project Administration, Writing - original draft

YFR, MMPM: Data Curation, Resources, Supervision, Resources, Writing - proofreading and editing.

JCDC: Formal analysis, Project Administration, Supervision.

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