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PREVALENCE OF METABOLIC SYNDROME AND RISK FACTORS KARIÑA ETHNICITY, BOLIVAR STATE, VENEZUELA

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ABSTRACT

Metabolic Syndrome includes the association of risk factors: hypertension, obesity, dyslipidemia and insulin resistance, which increases the possibility of developing cerebrovascular, cardiovascular and diabetes diseases.

General objective: To determine the prevalence of the Metabolic Syndrome and its risk factors in individuals of the Kariña ethnic group. May 2013 - May 2014.

Methods: An observational, descriptive study and cross section study was conducted; with a universe of 203 individuals, and a sample of 120 individuals (18-85 years) of the Kariña ethnic group of the Community of Mayagua, Bolívar State, Venezuela.

In all participants, the lipid profile was analyzed with the colorimetric method. The glycemia was quantified with a glucometer prior to fasting for 12 hours. The diagnostic criteria of the International Diabetes Federation, the Latin American Diabetes Association and the Adult Treatment Panel III were used.

Results: the prevalence of the metabolic syndrome was 46,67% according to the International Diabetes Federation, 39,17% Latin American Diabetes Association, and 38.33% Adult Treatment Panel II, the Kappa (k) concordance between Adult Treatment Panel III and International Diabetes Federation indicates a considerable concordance force, said Index between Adult Treatment Panel III and Latin American Diabetes Association denotes an almost perfect match strength as does the index between Latin American Diabetes Association and International Diabetes Federation.

Conclusion: A high prevalence of metabolic syndrome was found by both the Latin American Diabetes Association, International Diabetes Federation and Adult Treatment Panel III criteria, with predominance in the female gender and individuals over 50 years old.

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Abreviatures used in this scientific paper:

*IDF: International Diabetes Federation
**ATP III: Adults Treatment Panel III
***ALAD: Associacion Latin-American Diabetes
+BP: Blood Pressure
++PAS: Blood Pressure Systolic
+++PAD: Blood Pressure Dyastolic
°cHDL: cholesterol high density lypoproteins
°°DM2: Diabetes Mellitus type 2

INTRODUCTION

Metabolic Syndrome associates a group of risk factors: arterial hypertension, obesity, dyslipidemia and Insulin Resistance (related to increased body fat and lack of physical activity), which increase the probability of developing cerebrovascular and cardiovascular diseases, and diabetes[1-3].

In 1998, The World Health Organization (WHO) describes this syndrome by the presence of Diabetes type 2, alterations of glucose tolerance, insulin resistance, or fasting hyperglycemia, coinciding with at least two of the following criteria such as blood pressure ≥140/90mmHg; triglycerides ≥150mg/dl or High Density Lipoprotein-cholesterol (HDL) <35mg/dl for men and <39mg/dl for women; waist-hip ratio >0,90 for men and >0,85 for women; Body Mass Index (BMI) >30kg/m2; microalbuminuria ≥20µg/min or albumin-creatinine ratio ≥30mg/g4,5. The Asociación Latinoamericana de Diabetes (ALAD) established that abdominal girth >94 cm for men and >88 cm for women, makes Metabolic Syndrome diagnosis. In addition, life style, ethnicity and urbanization influenced in the high incidence of this syndrome.

In Latin America, it´s expected to rich 14% in the next 10 years[8]. In Zulia-Venezuela State, one study determined that one-fourth of above 20 year-old population have obesity, and one-third Metabolic syndrome[9]. Health, Education and production conventional system have been modified by oilfield exploitation and urbanization[10]. Due to indigenous groups, health has changed over time, which has been associated to lifestyle changes given their proximity to large cities, moreover exist few researchers that document about this syndrome in Venezuelan indigenous ethnic groups; The principal motivation to do research about this topic was to determine the prevalence of Metabolic syndrome in this group of people.

MATERIALS AND METHODS

It was performed a cross-transversal and descriptive study in Mayagua community, Orinoco Parish church, Heres borough, Bolívar-Venezuela

State. The universe is formed by 203 Kariñas between 18-85 years old with direct ancestry, from which was decided to sample 120 (59,1% of Kariña population)individuals using the following formula:

$$n = \frac{N\sigma^2Z^2}{(N-1)e^2+\sigma^2Z^2};$$

Where: n=sample size; N=population size; σ=Population Standard Deviation, it was used a constant value of 0,5; Z=-confidence levels, it was employed 95% of confidence that is equal to 1,96; e=Margin of error with a value of 6% (0,06).

The inclusion criteria involves: Kariña ethnic group individuals, male and female sex of direct ancestry between 18-85 years old. The exclusion criteria includes, indigenous from a different ethnic group ancestry, pregnant women, diagnosis of endocrine-metabolic diseases, Metabolic syndrome, Diabetes Mellitus and Cushing´s syndrome.

The materials used were: an aneroid sphygmomanometer (Lane Aneroide CEO123), stethoscope, (Littmann Brand Classic II S.E.), tape measure (1,50cm), sterile gloves, cotton, syringe of 5cc, scalpel n°21, tubes with red end caps, Blood-Glucose Monitoring System (SUMASENSOR SXT CE0123), Blood-Glucose Biosensor (SUMASENSOR SXT) and sterile lancets for single use only (LIANFA 28G).

To the recollection data was necessary an informed consent form, in which identification data, genre, ethnicity, waist circumference, systolic blood pressure (SBP) and diastolic blood pressure (DBP) were registered.

The lipid profile which includes total cholesterol, high density lipoprotein (HDL), low density lipoprotein (LDL), very low density lipoprotein (VLDL) and tryglicerids were obtained through a blood sample analyzed with the colorimetric method. Blood sugar levels were quantified with a glucometer, a 12-hour fast was required. The criteria of ATP III, IDF and ALAD (see Table 1) were applied to determine the prevalence of Metabolic syndrome[11].

The Statistical analysis was made by SPSS® 23 program (versión 23; Statistical Packageforthe Social Sciences, SPSS Inc, Chicago, IL). Tables and figures were made in Microsoft Excel® 2010 program. Data were analyzed throughout descriptive statistics as the mean, standard deviation, minimum and maximum value, absolute and relative frecuencies.

The normality of variables were assessed by the Kolmogorov-Smirnov test. Due to, evaluated variables did not follow the normal distribution, were assessed with the Chi-squared test. The confidence interval was 95% and the differences are statistically significant with a p≤0,05. To assess the concordance between ALAD, International Diabetes Federation (IDF), Adult Treatment Panel III (ATP III) criteria, the Cohen´s kappa coefficient was applied and a scale that express the force of concordance qualitatively was used to interpret it. According to Landis and Koch, it is considered: no agreement, a Kappa coefficient (k) of 0,00; slight, a Kappa coefficient (k) between 0,01-0,2; fair 0,21-0,40; moderate 0,41-0,60; 0,61-0,80 as substantial; 0,81-1,0 as almost perfect agreement[12].

RESULTS

It was obtained the average age 42,07±16,81 years old, waist circumference 93,88±14,96 cm, HDL 43,05±9,66 mg/dl, triglycerides 130,98±116,55 mg/dl, fast blood sugar 102,45±19,03 mg/dl, SBP 120,75±14,68 mmHg y DBP 81,17±13,36 mmHg.

According to IDF, the abdominal obesity frecuency is 77% (n=92), (male sex 39%[n=47] y female 38%[n=45]), ALAD indicates 58%(n=70) (female sex 31%[n=37] y male 28%[n=33]), ATP III mentions 47%(n=56) (female sex 31%[n=37] y male 16%[n=19]); There was not significant difference between IDF and ALAD in gender, while ATP III presents significant differences.

As stated by IDF, abdominal obesity was predominant in the 30-39 years old group with 21,7%(n=26) and ATPIII with 11,7%(n=14); without significant differences at a rate of p=0,106 y p=0,068 respectively. In respect of ALAD ruled over the age group with a 15,8%(n=19) and a significant difference of (p=0,025).

Low levels of HDL in female was 35,8%(n=43) and 25,8%(n=31) in male, which make a significant difference. Hypertriglyceridemia was higher in men with 15,8%,(n=19) compared to women with 9,2%[n=11]; Fast blood glucose ≥100 mg/dL more in women 24,2%(n=29) than men 23,3%(n=28), blood pressure (DBP ≥85 mmHg y/o SBP ≥130 mmHg), 23%(n=28) in men and 16%(n=19) in women. There weren´t significant differences about gender for this criteria (Figure 1).

The 61,6% (n=74) of population presented low levels of HDL, it´s predominant with 16,7%(n=20) in 18-29 years old age group, without significant difference (p=0,653); high triglycerides prevail in 30-39 (7,5%[n=9]) and 40-49 years old (7,5%[n=9]) with significant differences (p=0,018). Fast blood glucose ≥100 mg/dL is predominant 47,5%(n=57), 18-29 years old group was the most affected with 10,8%(n=13) no significant difference (p=0,115). The 39,1%(n=47) show DBP≥85 mmHg and SBP≥130 mmHg, 50-59 years group are disproportionately affected with 12,5%(n=15) and significant difference (p=0,000).

The prevalence of metabolic syndrome was major according to IDF 46,67%(n=56), followed by ALAD 39,17%(n=47), and finally ATPIII 38,33%(n=46). In the one hand, the Kappa (k) concordance between ATP III and IDF was 0,797, which indicates a significant force of concordance; On the other hand, the Kappa (k) concordance between ATP III and ALAD was 0,912 showed an almost prefect agreement; Last, the Kappa (k) concordance between ALAD and IDF was 0,848 almost prefect agreement too (Figure 2).

In terms of prevalence of metabolic syndrome, female gender is disproportionately affected based on ALAD information 20,83%(n=25), ATPIII 20,83%(n=25), while based on IDF both female and male gender are predominant

23,33%(n=28), no significantly statistics differences were found.

According to the age group we found significant differences, 50-59 years (9,2%[n=11]) are the most affected among 60 years onwards (9,2%[n=11]), reported by ALAD (p=0,045) and ATP III (p=0,016), IDF (p=0,02) is predominant in 30-39 years (10,8%[n=13]), 60 years onwards (10,8%[n=13]) for each group (Table 2).

Table 1 Clinical Diagnosis Criteria of Metabolic Syndrome[11]

Parameters	Abdominal obesity	High tryglicerides	Low cHDL *	High PA*	Glucose metabolism alterations	Diagnosis
IDF*	Waist circumference ≥90cm in men y ≥80cm in women (Asian and Latin American)	> 150 mg/dl (or in specific lipid lowering treatment)	< 40mg/dl in men or < 50 mg/dl in women (effect treatment in cHDL cHDL°)	PAS++ ≥130 mm Hg y/o PAD+++ ≥ 85 mm Hg or antihypertensive treatment	fasting glycemia ≥100 mg/dL or DM2 previously diagnosed	Abdominal Obesity +2 of 4
ATP III**	Waist circumfere>102cm in men (for hispanics >94cm) y > 88cm in women	≥ 150 mg/dl (or in specific lipid lowering treatment)		> 130/85 mm/Hg	fasting glycemia ≥ 100 mg/dL or high glycemia treatment	3 of 5
ALAD***	Perimetro de cintura ≥94cm in men and ≥88cm in women	> 150 mg/dl (or in specific lipid lowering treatment)		PAS++ ≥130 mm Hg y/o PAD+++ ≥ 85 mm Hg or antihypertensive treatment	Anormal Fasting glycemia, glucose intolerance or Diabetes	Abdominal Obesity +2 of 4

Fuente: Data obtained from Latin-American Cosensus of Asociación Latinoamericana de Diabetes (ALAD) 2010.

DISCUSSION

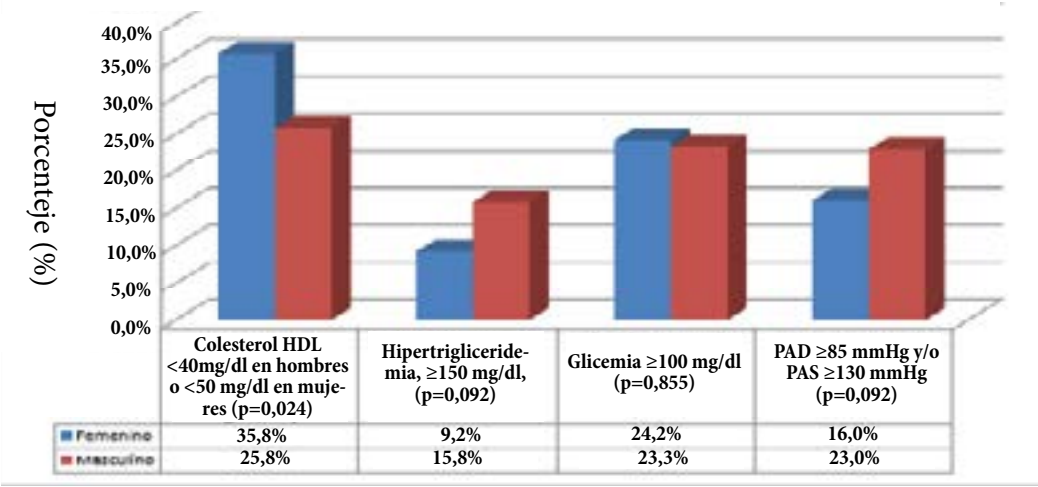
Age, various population ethnicity, lifestyle, environment, and nutritional status between countries, may have effects in prevalence of metabolic syndrome[13,14]. In respect to waist circumference average value was 93,88±14,96 cm, higher than Waraos indigenous ethnicity (91,02±11,50 cm) mentioned by Brito et al 2013[8] and Añu indigenous Age, various population ethnicity, lifestyle, environment, and nutritional status between countries, may have effects in prevalence of metabolic syndrome[13,14]. In respect to waist circumference average value was 93,88±14,96 cm, higher than Waraos indigenous ethnicity (91,02±11,50 cm) mentioned by Brito et al 2013[8] and Añu indigenous (89,74±15,43 cm) by Bermúdez et al 2009[15], considered a criterion of abdominal obesity according to IDF, ATP III y ALAD[11]. The relative high visceral adipose tissue amount compared with subcutaneous cellular tissue, plus high abdominal circumference in Asian and Hindu people, may explain a greater prevalence of this syndrome unlike African-American men who tend to subcutaneous fat[16].

According to HDL concentration, it was obtained an arithmetic mean of 43,05±9,66 mg/dl, compared to Brito et al 2013[8] (41±12,21 mg/dl) y Bermúdez et al 2009[15] (39,1±10,6 mg/dl) in which results were higher, low levels of HDL represented a diagnostic criterion used for metabolic syndrome. In the one hand, triglycerides had an arithmetic average of 130,98±116,55 mg/dl, less than Brito et al 2013 study (135,05±65,70 mg/dl)[8]; on the other hand, fast blood glucose was 102,45±19,03 mg/dl, also representing a diagnostic criterion to metabolic syndrome[11], but was higher in Brito et al 2013 study[8] (82,89±26,24 mg/dL).

There is a mean for SBP 120,75±14,68 mmHg and DBP 81,17±13,36 mmHg, similar to the reported by Brito et al 2013 (SBP 123,28±15,27 mmHg; DBP 78,11±9,67 mmHg)[8].

Abdominal obesity is more frequent in female gender 31% than male 28% according to ALAD. ATP III show female 31% and male 16% similar to Brito et al[8] (ALAD: female 55,9% and male 51,9%; ATP III female 61,8% and male 22,2%, in contrast IDF shows male gender as the more affected 39% compared to female 38%, which differ from Brito et al[8] female 91,2% and male 55,6%. The Strong Heart study stablished indigenous community Pima presents higher risk of becoming obese due to 50% of adult population is obese[17]. In Chile, previous studies described a gradual increase prevalence of Mapuche ethnicity individuals in urban area different from rural area, it may result from an adaptation process of behaviors from their way of life to modern habits[13]. In the Cardiovascular Risk Factor Multiple Evaluation Latin America (CARMELA) scientific study, in 2008, was reported an obesity abdominal prevalence increased with age, finding similar to this study[18].

Figure 1
Frequency of Metabolic syndrome components according to IDF, ALAD, and ATPIII, in function of gender indigenous of Kariña ethnicity. Mayagua, Municipality of Heres, Estado Bolívar – Venezuela, Mayo 2013 – Mayo 2014.



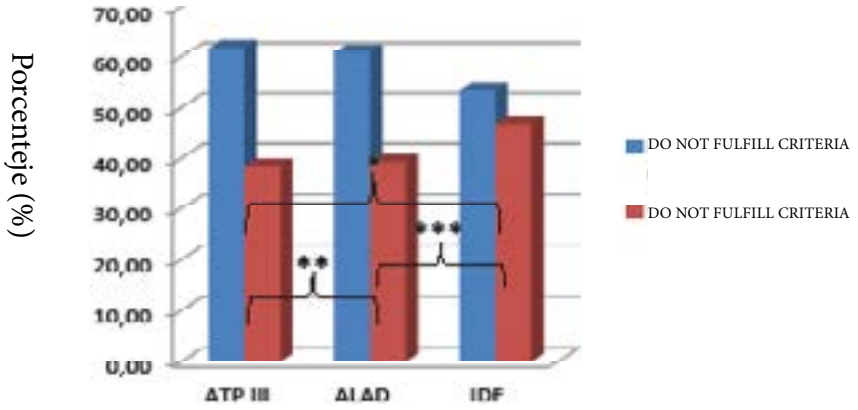
Source: Data obtained of clinical history made to the sample research in the Mayagua community

Table 2 Frequency of Metabolic Syndrome according to IDF, ALAD and ATIII criteria, in function of age. Indigenous of Kariña ethnicity Municipio Heres, Estado Bolívar – Venezuela, May,2013-May,2014

IDF		Does not fullfill criteria for Metabolic Syndrome		Metabolic syndrome		Total		p
		N	%	N	%	N	%	
Age	18 - 29	24	20,0	8	6,7	32	26,7	0,02
	30 - 39	18	15,0	13	10,8	31	25,8	
	40 - 49	8	6,7	10	8,3	18	15,0	
	50 - 59	7	5,8	12	10,0	19	15,8	
	60 y más	7	5,8	13	10,8	20	16,7	
	Total	64	53,3	56	46,7	120	100,0	
ALAD		Does not fullfill criteria for Metabolic Syndrome		Metabolic syndrome		Total		p
		N	%	N	%	N	%	
Age	18 - 29	25	20,8	7	5,8	32	26,7	0,045
	30 - 39	21	17,5	10	8,3	31	25,8	
	40 - 49	10	8,3	8	6,7	18	15,0	
	50 - 59	8	6,7	11	9,2	19	15,8	
	60 y más	9	7,5	11	9,2	20	16,7	
	Total	73	60,8	47	39,2	120	100,0	
ATP III		Does not fullfill criteria for Metabolic Syndrome		Metabolic syndrome		Total		p
		N	%	N	%	N	%	
Age	18 - 29	25	20,8	7	5,8	32	26,7	0,016
	30 - 39	23	19,2	8	6,7	31	25,8	
	40 - 49	9	7,5	9	7,5	18	15,0	
	50 - 59	8	6,7	11	9,2	19	15,8	
	60 y más	9	7,5	11	9,2	20	16,7	
	Total	74	61,7	46	38,3	120	100,0	

Source: Data obtained of clinical history made to the sample research in the Mayagua community

Figure 2
Prevalence of Metabolic syndrome according to ALAD, IDF and ATPIII criteria. Indigenous of Kariña Ethnicity. Mayagua, Municipality of Heres, Bolívar State – Venezuela, May 2013–May 2014.



** Cohen´s Kappa: between ATPIII and IDF = 0,797*
*** Cohen´s Kappa: between ATP III and ALAD = 0,912*
**** Cohen´s Kappa: between ALAD and IDF = 0,848*

Source: Data obtained of clinical history made to the sample research in the Mayagua community

Obesity could be one of the principal reasons of high metabolic syndrome prevalence due to, it increases with the rise in obesity, smultaneously[14]. Visceral or abdominal adipose tissue is active by lypolisis, tumor necrosis factor α (TNF-α), leptin, resistin, inteleukin-6 (IL-6) and other substances that can develop proinflammatory state, endothelial damage or insulin resistance, because it produces an insulin sensitivity change of muscle tissue because of higher free fatty acids that cause metabolism glucose inhibition, moreover an increased lipogenesis, gluconeogenesis, VLDL, LDL and lower HDL[19,20]. The release of free fatty acids is due to the action of catecholamines on β3 receptor, have lypolitic activity in visceral adipose tissue[21].

Furthermore, the release of TNF-α is able to maintain a high concentration of free fatty acids, due to stimulates fat breakdown (lipolysis) and suppress lipogenesis resulting in impaired insulin sensitivity[22].

In the hyperglycemia was found a frequency of 47,50% higher than Bermudez et al 2009 (14%)[15] and Brito et al 2013 (9,8%)[8]. Some indigenous population studies of Mexico reported a prevalence of diabetes mellitus 4,4% in Otomies indigenous of Querétaro; in tribes including Pima of Sonora, male 6,3% y female 10,5%; Mazatecas of Oaxaca 2,1%, and other types of metabolic disorders in tepehuana, huichol y mexicanera de Durango; mayas de Yucatán and triquis de Oaxaca[23, 24].

Prevalence of Metabolic syndrome in Kariña indigenous group is higher than Waraos[8] and Añú[15], more frequent in female gender in Añu[15] and Waraos[8] areas, CARMELA study[18] and a systematic review performed by De Carvalho et al in Brazilian adults, an indigenous group of Río Grande do Sul, it was determined metabolic syndrome prevalence 65,3% used NCEP-ATP III (2001)[25] as a diagnostic criteria. Gyakobo et al performed in Ghana, a rural population study, in which metabolic syndrome was more frequent in women, taking into account IDF y NCEP ATP III criteria for diagnosis, is in line with this research paper[26]. According to Misra, et al metabolic syndrome prevalence in Sri Lanka is higher, corresponding to men 35% and 51% are women, what this again highlights an increased frequency in women[27]. In China, the prevalence is low between young women, but increase at middle and old age[14]. Metabolic syndrome is prevalent in the Andean of Peru, especially old women as reported by Medina-Lezama et al[28].

Metabolic syndrome was frequent in old ages similar to CARMELA[18], Bermúdez et al[15], Brito et al[8] and De Carvalho et al[25] have mentioned. It has been shown that in most part of the world have increased the prevalence, and it´s estimated about 20%-25% adult people is affected, resulting in a high rate of obesity and sedentary lifestyle[25].

Overall prevalence of metabolic syndrome is about 24% in white people, which increase in proportion to age, >30% people older than 50 years and 40% over the age of 60[15].

The presence of Insuline resistance in patients with metabolic syndrome increase cardiovascular risk, due to VLDL becomes more atherogenic due to a rise of cholesterol esters and LDL also get this quality through oxidative modification, capacity to accumulate on intima thickness and be picked up by macrophage receptors, making easier atherosclerosis[29,30].

In conclusion, it was found a high prevalence of metabolic syndrome according to ALAD, IDF y ATPIII criteria, female gender predominant, >50 year-old individuals, who have

high cardiovascular risk and diabetes. For this reason, we recommend to perform indigenous group ethnic research in order to document risk factors, lifestyle changes, eating habits that cause Metabolic Syndrome, cardiovascular diseases and Diabetes mellitus. So, we can foster health-promotion and disease prevention and prompt treatment to improve quality of life of indigenous population.

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