VERSITA

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Metabolic syndrome – a risky combination

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ABSTRACT.
The metabolic syndrome is characterized by a cluster of related clinical, anthropometric and biochemical features such as central obesity, dysglycaemia, dyslipidaemia and hypertension. It is highly prevalent in the general population (approximately 22%), with differences in relation to race, gender, and age. It carries an increased cardiovascular morbidity and mortality, which makes an early and correct assessment mandatory. The prevalence of the metabolic syndrome is very high in type 2 diabetes patients, in whom it influences the risk of chronic complications.
The aim of the present report is to explore the characteristics and the combination types of the metabolic syndrome and to assess the cardiovascular risk in patients presenting this clinical entity. 329 patients consecutively diagnosed with metabolic syndrome were included in the study, both men and women, no limit regarding age. Patient selection was made during the periodic medical visits in the outpatient clinics of Diabetes, Cardiology and Internal Medicine. Metabolic syndrome (MetS) was diagnosed according to 2005 International Diabetes Federation (IDF) Criteria.
Women were more frequent than men, mean age was 59.08±888 and they all had central obesity (it is the major criteria of 2005 IDF definition for MetS) .The diagnosis of the metabolic syndrome was fulfilled with only 3 criteria, most of the times. The complete metabolic syndrome was the rarest, less than 25% of the patients presenting all 5 definition criteria and it was more frequent among men (men 39.2% vs women 15.9%: $p < 0.0001$). Apart from central obesity, which is mandatory for diagnosing MetS and thus present in all patients, arterial hypertension is the most common finding in our study population, with impaired glycaemia and increased triglycerides occupying the second and third place, respectively. Central obesity, arterial hypertension and impaired glycaemia represent the most frequent combination, a real „hard core" of MetS.
As expected, the cardiovascular risk was high in the study population. The cardiovascular „score" of our patients increased significantly with the number of components used for the diagnosis of MetS (MetS with 3 elements vs MetS with 4 elements vs MetS with 5 elements: SCORE – 5.36 ± 7.07 vs 7.66 ± 8.63 vs 8.52 ± 8.34, $p < 0.01$).

Keywords: metabolic syndrome, International Diabetes Federation (IDF), central obesity, arterial hypertension, dysglycaemia, dyslipidemia.

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Background

Almost 250 years ago, the Italian anatomist Morgagni demonstrated the frequent association between central obesity, atherosclerosis and gout. In

1923, Kylin also emphasized the morbid association between arterial hypertension, diabetes mellitus and gout [1]. Later, in 1950, French doctor J. Vague observed that very often individuals with central obesity had in the same time type 2 diabetes mellitus and/or cardiovascular diseases [1]. Then, 15 years later, Avogaro and Crepaldi implemented the concept of „plurimetabolic syndrome" which included obesity, dyslipidemia, arterial hypertension and diabetes mellitus [1].

The true history of the metabolic syndrome (MetS) starts after 1988. That year, at the event called "Banting Lectures", Gerry Reaven had a conference about what he called at that time "X syndrome", a clinical entity composed of dysglycaemia, dyslipidemia, obesity and arterial hypertension [2,3].

Grouping all these diseases under a new larger concept was necessary considering the fact that X syndrome patients had a major cardiovascular risk, higher than that resulted by simply summation of composite risks. That is why, in 1989, Kaplan refers to this syndrome using the term "killer quartet" [4].

The most frequent term used nowadays is "metabolic syndrome". However, not only for semantic reasons, the proper term to use would be "dysmetabolic syndrome" [5].

The great number of definitions and diagnosis criteria along with the heterogeneity of studied populations make the metabolic syndrome (MetS) concept a difficult one from epidemiological point of view. Recent data show the pandemic character of the syndrome:

- 1 out of 4 adults has MetS and among old patients (age over> 60 years) the prevalence rises up to 40% [6];
- an increased prevalence (nearly 20%) observed among children and adolescents [7,8];

Aim of study

The aim of the present report is to explore the characteristics and the combination types of the metabolic syndrome and to assess the cardiovascular risk in patients presenting this clinical entity.

Materials and Methods

We conducted a clinical study over a five years period (2005 - 2010), which included 329 patients consecutively diagnosed with metabolic syndrome, both men and women, no limit regarding age. Patient selection was made during the periodical medical visits in the outpatient clinics of Diabetes, Cardiology and Internal Medicine. Metabolic syndrome (MetS) was diagnosed according to 2005 International Diabetes Federation (IDF) Criteria (see table below). All cases underwent a complete clinical, anthropometric, and laboratory investigation.

Table I. - 2005 IDF Diagnosis Criteria for Metabolic Syndrome

IDF CRITERIA [9,10]
Central obesity: AC ≥ 80 cm (women) and ≥ 94 cm (men)
Plus at least two of the following criteria:
* Triglyceride level ≥ 150 mg/dL
** HDL-C < 40 mg/dL(men) and < 50 mg/dL(women)
*** BP ≥ 130/85 mm Hg
A jeun glycaemia ≥ 100 mg/dL or known history of type2 DM

**or specific treatment for this lipid profile disturbance;*
*** or specific treatment for this lipid profile disturbance;*
**** or treatment for arterial hypertension.*

Statistical Analyses: All data collected were entered into an electronic patient registry, consisting of an SPSS database and were analyzed using SPSS version 19.0. T Test, $\chi 2$ Test, Mann-Withney Test were used whenever appropriate. P values were calculated and data in the text and in the tables are

reported either as frequencies or as means of different variables.

Results

The study population characteristics are presented in the table below. Women were more frequent than men, mean age was 59.08±8.88 and they all had central obesity (it is the major criteria of 2005 IDF definition for MetS).

Table II. - Characteristics of the study population

	YES	NO
Women/Men	209 (68.5%) / 96 (31.5%)	
Central obesity (AC ≥ 80 cm ♀; ≥ 94 cm ♂)	305 (100%)	0 (0%)
Arterial Hypertension (BP ≥ 130/85 mm Hg)	253 (83%)	52 (17%)
Hypertriglyceridemia (TG ≥ 150 mg/dL)	221 (72.5%)	84 (27.5%)
HipoHDL – cholesterolemia (HDL – C < 40 mg/dL ♀; < 50 mg/dL ♂)	166 (54.5%)	139 (45.5%)
Dysglycaemia(fasting blood glucose ≥ 100 mg/dL or history of type 2 DM)	228 (74.75%)	77 (25.25%)

Most of the times, the diagnosis of the metabolic syndrome was fulfilled with only 3 criteria. The complete metabolic syndrome was the rarest, less than 25% of the patients presenting all 5 definition criteria.

Table III - Distribution according to the number of MetS elements

MetS	N (%)
3 COMPONENTS	130 (39.5)
4 COMPONENTS	123 (37.4)
5 COMPONENTS	76 (23.1)

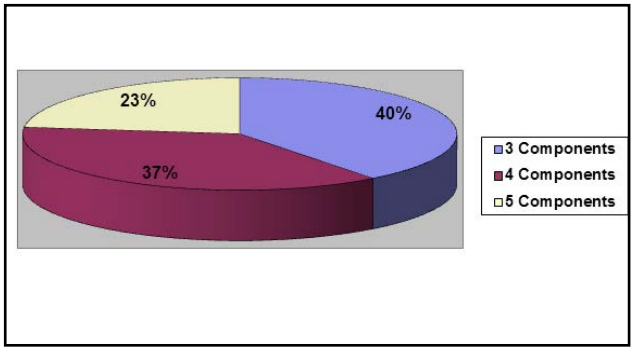

Figure 1 - Distribution according to the number of MetS elements

Analyzing the whole study population, we observed that most of the men already have the complete metabolic syndrome before they reached 60 ; in contrast, in women, the complete syndrome was the rarest configuration and it seems that age doesn't play a decisive part in the number of components.

Table IV - Distribution according to the number of components of MetS stratified by sex and age

		MEN		WOMEN	
3 COMP(%)	< 60	27.5	18.7	44.9	25.1
	≥ 60		8.8		19.8
4 COMP(%)	< 60	33.3	18.6	39.2	22
	≥ 60		14.7		17.2
5 COMP(%)	< 60	39.2	29.4	15.9	7.9
	≥ 60		9.8		8

The three types of MetS may result, through permutations of definition elements, into 11 possible variants. In our study population, the most frequent one was that in which all the 5 criteria were met, followed by the combinations of arterial hypertension with impaired glycaemia and/or increased triglycerides.

The rarest combination was the association between low HDL-cholesterol and impaired glycaemia.

The so called complete MetS was more frequent among men (men 39.2% vs women 15.9%: $p < 0.0001$). The most frequent combinations with 3 and 4 components, respectively, were especially seen in women (arterial hypertension + impaired glycaemia: women 20.7% vs men 8.8%; $p < 0.0001$ and arterial hypertension + impaired glycaemia + increased triglycerides: women 20.3% vs men 7.8%; $p < 0.0001$).

Table V - Distribution of the 11 possible "definitions"

	MetS DEFINITION	**N (%)**
3 CRITERIA	HBP+HDL	11 (3.3)
	HBP+TG	25 (7.6)
	HBP+DSG	56 (17)
	HDL+TG	17 (5.2)
	HDL+DSG	5 (1.5)
	TG+DSG	16 (4.9)
4 CRITERIA	HBP+HDL+TG	31 (9.4)
	HBP+HDL+DSG	20 (6.1)
	HBP+TG+DSG	54 (16.4)
	HDL+TG+DSG	18 (5.5)
5 CRITERIA	HBP+HDL+TG+DSG	76 (23.1)

The cardiovascular risk was calculated using Conroy's modified SCORE diagram (the risk is two fold in the presence of diabetes mellitus). As expected, the cardiovascular risk was high in the study population.

Table VI - Distribution of the cardiovascular risk class assessed according to SCORE diagram

	LOW RISK	**MOEDRATE RISK**	**HIGH RISK**
N (%)	26 (7.9)	131 (39.8)	172 (52.3)

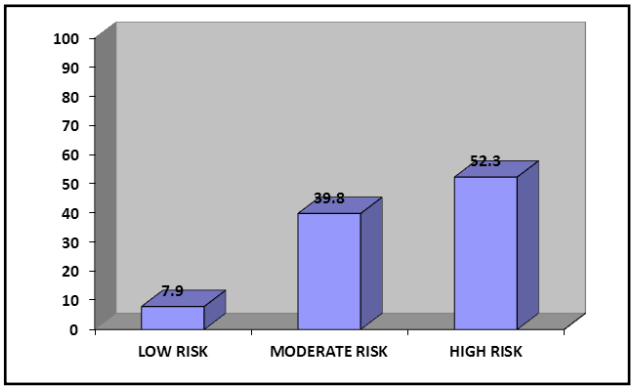

Figure 2.Distribution according to cardiovascular risk class

Analyzing the study population by gender, we observed that men dominated the group with high cardiovascular risk, the difference from women reaching the statistical significance (SCORE > 5: women 43.2% vs men 71.6%, $p < 0.0001$; medium SCORE - women 5.62 ± 6.20 vs men 9.90 ± 10.60, $p < 0.0001$). These results were not so predictable because in our study population, although more men were affected by diabetes and were smoking, the female patients were older and more frequently had arterial hypertension and/or high cholesterol levels.

Table VII - Patient distribution stratified by cardiovascular risk and sex

	MEN	**WOMEN**	**p**
SCORE (MEAN)	9.90 ± 10.60	5.62 ± 6.20	< 0.0001
HIGH CVS RISK (%)	71.6	43.2	< 0.0001

The cardiovascular „score" of our patients increased significantly with the number of components used for the diagnosis of MetS (MetS with 3 elements vs MetS with 4 elements vs MetS with 5 elements: SCORE – 5.36 ± 7.07 vs 7.66 ± 8.63 vs 8.52 ± 8.34, $p < 0.01$). These data emphasize that the number of the patients with important cardiovascular risk increases with 50% with every new added component (MetS with 3 elements vs 4 elements vs 5 elements: 37.7% vs 54.5% vs 72.4%, $p < 0.0001$).

Table VIII - Distribution stratified by cardiovascular risk and the number of elements of the MetS

	SCORE (MEAN)	HIGH CVS RISK (%)
3 COMPONENTS	5.36 ± 7.07	37.7
4 COMPONENTS	7.66 ± 8.63	54.5
5 COMPONENTS	8.52 ± 8.34	72.4
p	< 0.01	< 0.0001

Conclusions

Apart from central obesity, which is mandatory for diagnosing MetS and thus present in all patients, arterial hypertension is the most common finding in our study population, with impaired glycaemia and increased triglycerides occupying the second and third place, respectively. Finally, the rarest finding in this group was the low HDL-cholesterol level.

Most of the times, only three criteria were sufficient for diagnosing MetS, while the „complete" MetS was the rarest.

Central obesity, arterial hypertension and impaired glycaemia represent the most frequent combination, a real „hard core" of MetS.

The cardiovascular risk associated with MetS increases significantly with the number of components used/fulfilled/met for diagnosis.

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