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# Metabolic Syndrome and Pharmacological Treatment Measures

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**Abstract:** Metabolic syndrome is a set of several different pathological conditions and risk factors that are often the cause of many unwanted cardiac and cerebrovascular occurrences. It is highly represented around the world, especially in countries with excessive and inadequate nutrition, insufficient physical activity of the population and obesity, with a constant growth trend. The work included 1052 patients with HTA of which DM was 309 (29.4%). Out of the total number of 1052 patients with metabolic syndrome there were 675 (64.2%) patients. Observing certain determinants of the metabolic syndrome HTA was present in all observed patients. Low HDL cholesterol values were found in 503 (74.5%) patients and the lowest incidence was hyperglycaemia (252 mg / 37.3%). Implemented pharmacological treatment measures have led, in most patients, the blood pressure to optimal or normal. The effect of pharmacological therapy on glycaemic value in patients with metabolic syndrome led to the normalization of glycaemia in majority of patients. The results achieved have improved the quality of life of patients and motivated them for further treatment.

**Key words:** metabolic syndrome, arterial hypertension, diabetes mellitus.

## INTRODUCTION

Metabolic syndrome (MS) is a simultaneous association of various pathological conditions and risk factors of some persons who, by their existence, increases the risk of developing atherosclerotic cardiovascular disease, insulin resistance and diabetes mellitus as well as vascular and neurological complications.

The above mentioned risk factors are: increased blood pressure (HTA), abdominal, i.e. central type of obesity, increased serum triglyceride values, reduced serum HDL cholesterol, and insulin resistance. Their existence and interaction with the influence of genetic and risk factors from the environment increase the risk of unwanted cardiovascular occurrences. The mutual relations of these components are often very complex in nature and insufficiently known, but they need to be sought and followed and thus delay or reduce the intensity of pathological processes (*1)*. The frequency of metabolic syndrome in modern world is high but it is difficult to determine because of the different criteria used to define it and which depend on various associations dealing with this issue (World Health Organization-WHO, the European Group for the Study of Insulin Resistance- EGIR, National Cholesterol Education Program, Adult Treatment Panel III, NCEP-ATP III, International Diabetes Federation-IDF, American Heart Association / National Heart, Lung and Blood Institute -AHA / NHLBI). According to most authors, the metabolic disorder is characterized as a syndrome when at least 3 of the following criteria are present:

1. Waist size: depending on ethnicity and used recommendations: National Cholesterol Education Program Adult Treatment Panel III NCEP-ATP III:> 101 cm for male and> 89 cm for female, respectively according to International Diabetes Federation-IDF:> 94 cm for male> 80 cm for female.
2. Serum triglyceride values> / = 1.71 mmol/l
3. Serum HDL Cholesterol <1.04 mmol/l
4. Glucose supplements> / = 5.6 mmol/l
5. Blood pressure </ = 130/85 mmHg (*2*).

The goal of the work was to indicate on frequency of metabolic syndrome and its particular determinants at patients with HTA and the possibility of achieving target values of arterial blood pressure and

glycaemia at patients with metabolic syndrome by conducting pharmacological treatment measures in accordance with existing guidelines.

## MATERIAL AND METHODS

The study was performed at Health Institution Specialist medical centre "Poliklinika Semiz" in Prijedor during five-year long period of time and included 1,052 patients with arterial hypertension. Patients who met the criteria for metabolic syndrome in which the available therapeutic procedures were already actively implemented through non-pharmacological treatment measures were isolated from observed group.

The diagnosis of the metabolic syndrome and its determinants was based on a detailed anamnesis, clinical examination with repeated measurement of arterial blood pressure and anthropometric measurements, retinal scan, electrocardiogram, cardiac echosonography, carotids, femoral and renal arteries and abdomen and complete laboratory treatment with emphasis on glycaemic and lipidogram.

An assessment was made on existence of changes in the target organs due to introduction of adequate pharmacological treatment measures according to valid recommendations of European Society of Cardiology and European Society of Hypertension (ESC / ESH) and IDF which were the logical choice in patients with comorbidity within the metabolic syndrome(*4*).

## RESULTS AND DISCUSSION

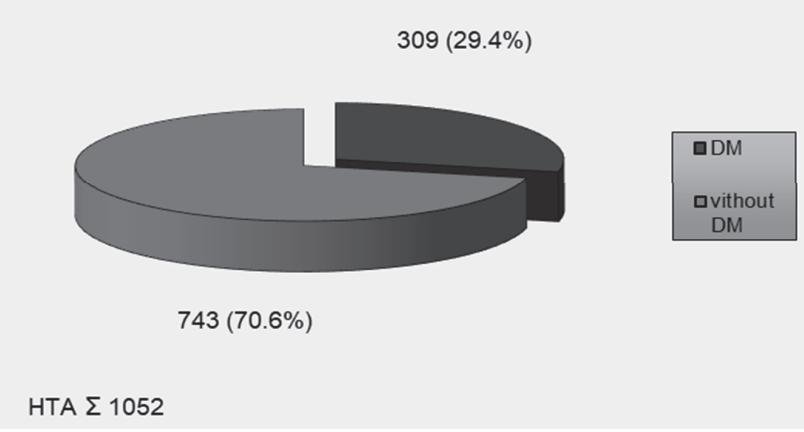


**Figure 1.** Comorbidity of arterial hypertension (HTA) and diabetes mellitus (DM)

Out of a total of 1052 patients with HTA, 309 (29.4%) have had DM (figure 1). These two diseases are mass non-communicable diseases which often appear jointly affect to each other as risk factors whose effects are added and multiplied. People with metabolic syndrome have three times higher risk of having a heart attack or a stroke and twice as high risk of this unwanted occurrence goes to death outcome. Arterial hypertension (HTA) and diabetes mellitus (DM) are mass non-communicable diseases and significant components of MS syndrome with a constant growth trend diseased. They bear the greatest responsibility for high incidence of cardiovascular and cerebrovascular disease, chronic renal failure as well as numerous microvascular and macrovascular complications. They are prone to prevention and correction using non-pharmacological and pharmacological treatment measures (*1-3*).

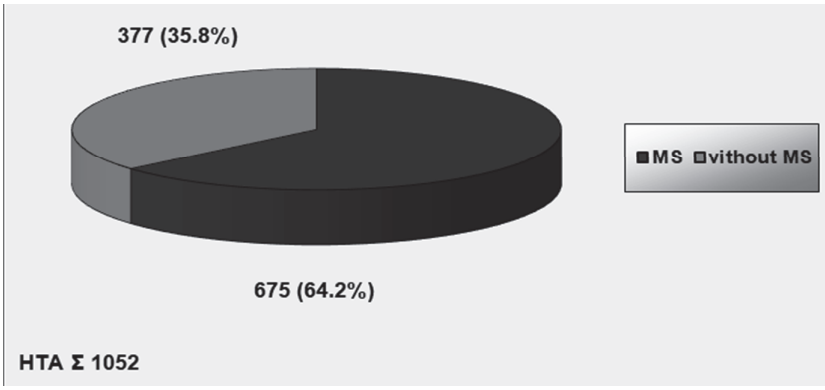


**Figure 2.** Frequency of metabolic syndrome patients with HTA

From the group of patients with HTA, patients who met the criteria for MS and who have already undergone active measures of non-pharmacological treatment have been selected for further monitoring. Criteria for MS were 675 (64.2%) of patients out of a total of 1052 patients (figure 2). Metabolic syndrome with its determinants: hypertension and diabetes show high frequency and significant implications for individual health and a constant increase in medical care costs. According to the definition of NCEP ATP III, the incidence of MS in Europe, Asia, Australia, North and South America is 9.6-55.7%. According to WHO 13.4-70% and according to IDF 7.4-50% (*3*) . Study in the Republic of Srpska showed that more than a third of the subjects had metabolic syndrome: 38.4% according to IDF and 36.0%, according to NCEP ATP III and that hyperglycaemia was the rarest component (*5)*. The data from numerous studies point to the high incidence of MS in different regions of the world as well as the multiple association of all its determinants (*6-8*).

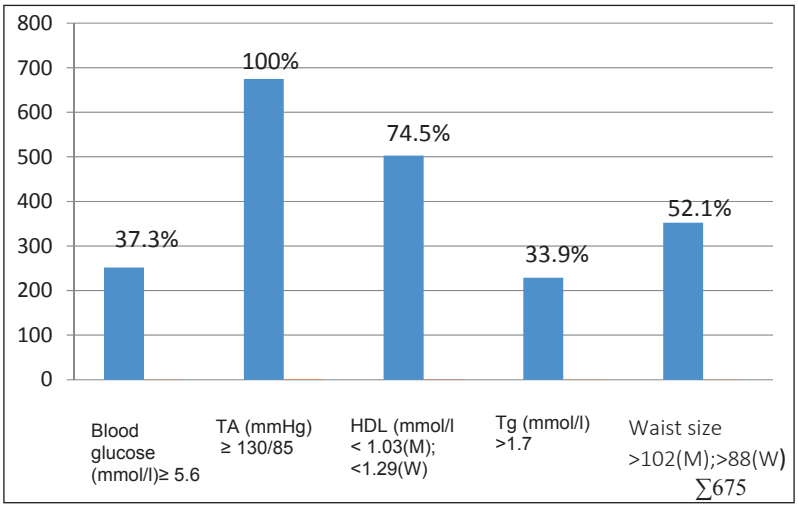


**Figure 3.** Frequency of certain determinants of metabolic syndrome

The analysis of individual determinants frequency (Figure 3) showed that all patients with metabolic syndrome, 675 of whom had HTA too. Low HDL cholesterol levels were high on 503 (74.5%), visceral obesity on 352 (52.1%) and the lowest represented hyperglycemia was on 252 (37.3%) patients. The high incidence and significance of lipoprotein metabolism disorders and their individual fractions, obesity as well (especially visceral due to their metabolic activity) have been confirmed in Framingham and other numerous studies (*5*). An examination in the Republic of Srpska showed that hyperglycemia was the rarest component of the metabolic syndrome *(6*). Pharmacological measures of blood pressure correction included usage of drugs according to the ESC / ESH recommendations for MS comorbidity where the significance of blood pressure reduction is “per se” more conspicuous than in general population (*9-12*).

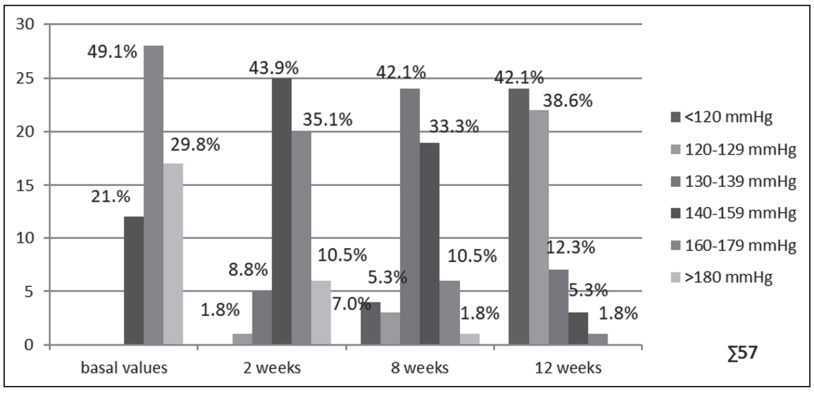


**Figure 4.** Effect of pharmacological treatment measures on systolic blood pressure values

The effect of pharmacological treatment measures on systolic blood pressure values showed that the most common basal values were 160-179 mmHg on 28 (49.1%) patients. After two weeks the largest number, 25 of them (43.9%) had a blood pressure of 140-159 mmHg. Eight weeks later, 24 of them (42.1%) had blood pressure of 130-139 mmHg and after twelve weeks most of them, 24 (42.1%) achieved the target values of systolic blood pressure below 120 mmHg (figure 4).

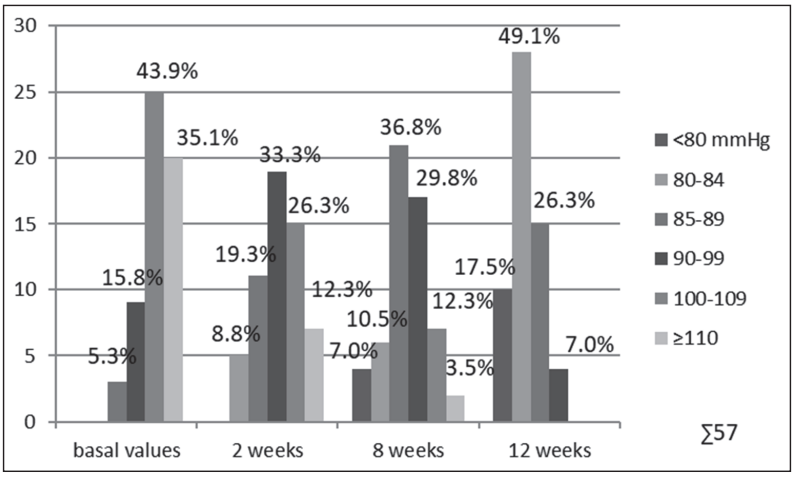


**Figure 5.** Influence of pharmacological treatment measures on the value of diastolic blood pressure

At the same time, the effect of pharmacological treatment measures on the value of diastolic blood pressure is controlled (figure 5). The most common basal values of diastolic blood pressure were 100-109 mmHg on 25 (43.9%) patients. After two weeks, the largest number of patients, 19 (33.3%) of them had diastolic blood pressure of 90-99 mmHg, and eight weeks later the most commonly recorded values were 85-89 mmHg on 21 (36.8%) patients. At the end of monitoring, 28 (49.1%) had diastolic blood pressure values of 80-84 mmHg. There were 10 (17.5%) patients with target values below 80 mmHg. The effective implementation of non-pharmacological measures, and then the introduction of adequate pharmacological therapy, resulted in a significant reduction of blood pressure value. These results are in line with the current guidelines for diagnosis and treatment of HTA (*3*).

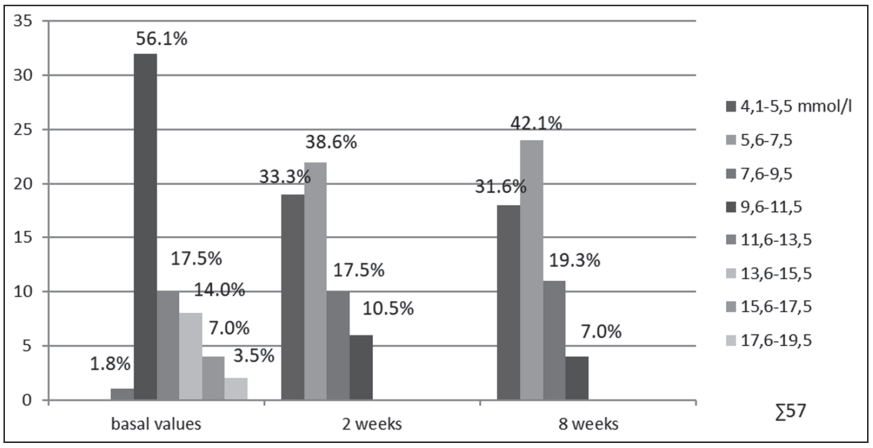


**Figure 6.** Effect of pharmacological therapy on glycemic value on patients with MS

An analysis of the drug therapy effect on glycemic value in patients with metabolic syndrome, after previously introduced non-pharmacological treatment measures (Figure 6), was performed. The results showed that glycaemia at the beginning on most patients 32 (56.1%) ranged from 9.6-11.5 mmol/l. After two weeks, only 6 (10.5%) of patients had this value and the largest number, 22 (38.6%) of them had glycaemia 5.6 to 7.5 mmol/l. After eighth week these values were reported on 4 (7.0%) patients. Glycaemia 11.6 -13.5 mmol/l was observed alone in basal measurements on 10 (17.5%) patients. Proactive treatment of hyperglycemia has yielded expected results in accordance with current recommendations (9, 13). Based on the monitoring of demographic trends, trends in mortality and morbidity as well as economic models, the World Health Organization estimates a further increase in the number of HTA and DM diseased, especially in developing countries where 2/3 people live with DM. It is estimated that in 2025 the number of DM patients will be 380 million. There is an intense tendency of the incidence of frequency and other particular determinants including metabolic syndrome in general, especially in the younger population (*14,15*).

Considering high cardiovascular risk which directly carries development of atherosclerosis and its consequences, there is a need for constant and persistent conduction of non-pharmacological and modern, intensive pharmacological treatment measures (*16*).

## CONCLUSION

In our study, we recorded a high incidence of metabolic syndrome and its individual components on HTA patients. The highest incidence of individual components of the metabolic syndrome in the HTA group was related to low HDL cholesterol and visceral obesity. Pharmacological treatment measures statistically significantly corrected the values of systolic and diastolic blood pressure and the state of glucoregulation.

The results achieved have improved the quality of life of patients and motivated them for further treatment. The results are encouraging because they indicate the effectiveness of the treatment measures applied and the possibility of reducing morbidity and mortality on these patients.

The significance is also reflected in the further motivation of the patients to remain persistent, not only in regular therapy, but also in maintaining healthy lifestyle habits.

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