

COMPARATIVE STUDY IN MEN AND WOMEN OF VARIATION BIOCHEMICAL INDICATORS WITH DIAGNOSTIC VALUE IN HYPERTENSION

Maria Prisecaru, Ionuț Stoica, Alin Iosob, Tina Oana Cristea

Key words: hypertension, biochemical indicators, statistical calculation, cardiovascular risk

INTRODUCTION

One in five adults suffers from high blood pressure and cardiovascular disease is the leading cause of mortality in the world. Hypertension, chronic medical problem, is a major risk factor for cases of heart attack (myocardial infarction), heart failure, aneurysms of the arteries (for example aortic aneurysm), peripheral arterial disease and is the cause of chronic kidney disease. Even a moderate increase in blood pressure is associated with a reduced life expectancy.

Knowing the physiological and biochemical changes by determining the various indicators and their interpretation allows for accurate diagnosis and treatment strategy. Most studies on blood pressure that were made in different populations show a rise in blood pressure with age. This disease can have "roots" in childhood and adolescence as shown by some studies, but not sufficiently investigated and diagnosed. Also, there may be significant differences in the occurrence and progression of the disease by sex. After several series of tests, scientists have observed that 30-40% of women suffer more than men from cardiovascular problems, although both sexes these diseases are caused by increased blood pressure. In addition, researchers have found significant differences in the physiology in women cardiovascular related to the types and levels of hormones, and also how to regulate blood pressure.

In this work we aimed to determine and compare the values and development of organic biochemical parameters (triglycerides, total cholesterol, HDL, LDL, creatinine, troponin T) and the activity of enzymes with diagnostic value (lactate dehydrogenase, aminotransferases, creatine) in a group of 30 men and 30 women with untreated stage I hypertension (systolic 140-159 mmHg, diastolic 90-99 mmHg), of Bacau, Romania.

MATERIAL AND METHODS

The research was conducted in the clinical laboratory Bacau County Emergency Hospital. Studies were carried out on a total of 30 men diagnosed with hypertension. In these subjects we studied the biochemical response of the heart,

pursuing diagnostic value of biochemical indicators: triglycerides, cholesterol, HDL, LDL, creatinine, troponin T, lactate dehydrogenase, aminotransferases (SGOT, SGPT), and creatine which causes changes the circulatory system and blood pressure increase. Investigated subjects were grouped by sex and three age categories: 36-50 years, 51-65 years and above 65 years.

Determination of biochemical compounds organic: triglycerides, cholesterol, HDL, LDL, creatinine, was performed using the apparatus of medical tests Cobas Integra 400 Plus, determination of troponin T was performed using the analyzer Cardiac Reader and enzymes lactate dehydrogenase, aminotransferases (SGOT and TGP) and creatine were determined spectrophotometrically.

Applying **statistical methods mathematics** can calculate a value as close to the real one and can estimate the degree of certainty of these results, it is hard in practice to make a very large (infinite) determinations or even more determinations than usually denoted by **n**.

To characterize the value obtained for a biological sample (in this case the number of tests is quite small) was calculated from **measurements averaged** (\bar{x}), **standard deviation** (σ), **standard error** (SE) and **coefficient of variation** (CV). These values will give us an insight into the dispersion of results that will help us to discern which is the nearest to the real value.

The results of the measurements obtained were compared to each other and a lot considered as a control to ensure that the differences which are obtained are high. To appreciate the real nature or accidental changes in mean values of indices differences situated in experimental models, has become calculating, for each case, **the test of significance (Student test)**.

After calculating the value of "t" to determine the number of degrees of freedom and probability "p" setting the level of significance as follows:

$P < 0.001$ - very significant

$0.001 < p < 0.005$ - significantly distinct

$0.01 < p < 0.05$ - significantly

$p < 0.5$ - insignificant.

RESULTS AND DISCUSSIONS

The investigations were carried out on a sample of 60 subjects, 30 men and 30 women. By monitoring the extent of disease by gender, it appears that the disease is common in both men and women in equal proportions.

In both women and men, pathological changes, raising, there is only three biochemical parameters of the study - triglycerides, LDL-cholesterol, and LDH. In men appear in addition, elevated total cholesterol and aminotransferases (ALT and AST). The remaining investigated parameters are normal in all age groups

Following **triglyceride levels in women** (Table 1, Figure 1), the maximum recorded at 51-65 years, where the average is 158.3 mg/dL, which is above the normal value. Minimum values of the patients is > 65, where the average is 97.9 mg / dL, that is within normal limits, as the values recorded in the age group 36-50 years.

Triglycerides in men (Table 2, Figure 2). have maximal values in patients 36-50 years, where the average is 239.4 mg/dl value is high. The minimum values is patients > 65 years where the average is 103.8 mg/dl falling within normal limits. Triglyceride levels gradually decreased from the age 36-50 years, reaching normal levels in other age groups.

LDL in women (Table 3, Figure 3), ranks high in all age groups. The maximum values recorded in 36-50 years, where the average is 134.8 mg/dL, which is above the normal value. Minimum values of the patients is 51-65 years, where the average is 111.2 mg/dl, but also they exceed limits. At the age > 65 values are also pose above the normal.

In men recorded maximum values of LDL in patients 36-50 years, where the average is 129.82 mg / dl value is high. The minimum values is sick of 51-65 years where the average is 87.6 mg / dl falling within normal limits. LDL level gradually decreases

from the age 36-50 years, reaching normal levels in other age groups (Table 4, Figure 4).

LDH levels in women (Table 5, Figure 5), maximum values are > 65, where the average is 372.7U / L, which is above the normal value. Minimum values of the patients is 36-50 years, where the average is 208.9 U / L and therefore falls within the normal range. LDH level increases progressively with age, approaching the maximum values in the third age.

In men LDH maximum values recorded in patients > 65 years, where the average is 309.8 U / L value is high. The minimum values is sick of 36-50 years where the average is 209.5 U / L fits within limits. In men, LDH level increases progressively with age 36-50 years, reaching maximum values in other age groups (Table 6, Figure 6).

Total cholesterol and aminotransferases (TGO, TGP) values were changed only in men.

The maximum amounts of **cholesterol** are recorded in patients 36-50 years, where the average is 229.9 mg / dl value that is slightly elevated. The minimum values is patients > 65 years where the average is 145.9 mg / dl falling within normal limits. Cholesterol decreases gradually from age 36-50 years, reaching normal levels in other age groups (Table 7, Figure 7).

TGO maximum values recorded in patients 36-50 years, where the average is 39.8 U / L value that is slightly elevated. The minimum values is patients > 65 years, where the average is 35 U / L falling within the normal range (Table 7, Figure 7). TGO level gradually declines with age 36-50 years, reaching normal levels in other age groups.

TGP maximum values recorded in patients 36-50 years, where the average is 65.3 U / L value is high. The minimum values is sick of 51-65 years where the average is 39.9 U / L fits within limits. In men, the values are very high TGP 36-50 years, reaching normal levels in other age groups (Table 9, Figure 9).

Table 1. Triglyceride levels in women

| Biochemical indicator | Normal values | Statistical indices | Age group (years) | | |
|-----------------------|---------------|---------------------|-------------------|---------|---------|
| Triglyceride | ≤150mg/dl | n | 36-50 | 51-65 | > 65 |
| | | x | 105,2 | 158,3 | 97,9 |
| | | ES | 8,3211 | 49,4638 | 12,4877 |
| | | CV% | 25,0128 | 98,8113 | 40,3367 |
| | | t | - | 1,0586 | -0,4865 |
| | | p | - | - | - |
| | | % | - | 150,48 | 93,06 |
| | | ±Δx | - | 50,48 | -6,94 |

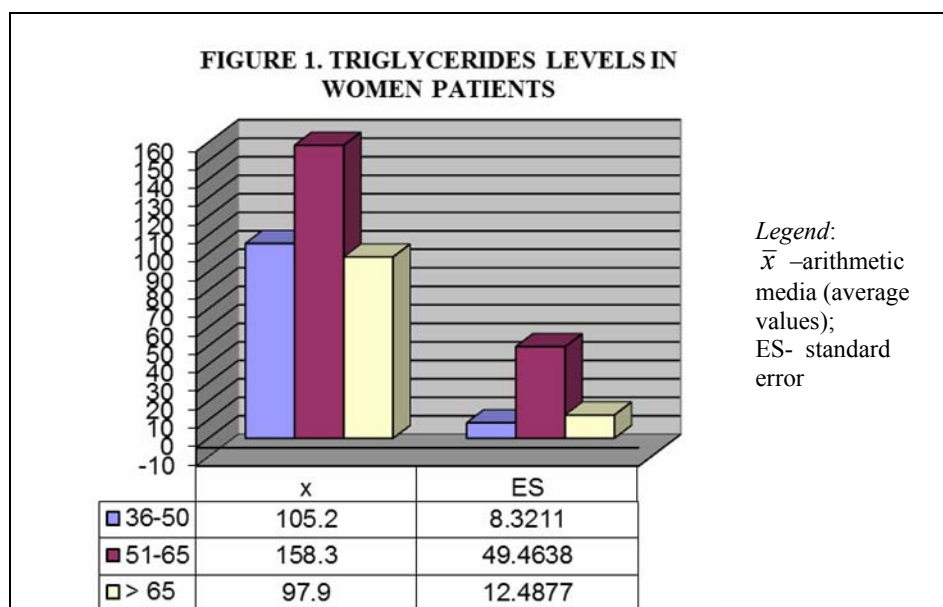


Fig. 1. Triglycerides levels in women patients

Table 2. Triglyceride levels in men

| Biochemical indicator | Normal values | Statistical indices | Age group (years) | | |
|-----------------------|------------------------|---------------------|-------------------|---------|---------|
| Triglyceride | $\leq 150\text{mg/dl}$ | n | 36-50 | 51-65 | > 65 |
| | | \bar{x} | 239,4 | 160,6 | 103,8 |
| | | ES | 53,8162 | 26,4177 | 14,2219 |
| | | CV% | 71,0868 | 52,0174 | 43,3271 |
| | | t | - | -1,3144 | -2,4361 |
| | | p | | | |
| | | % | - | 43,36 | 67,08 |
| | | $\pm\Delta x$ | - | -56,64 | -32,92 |

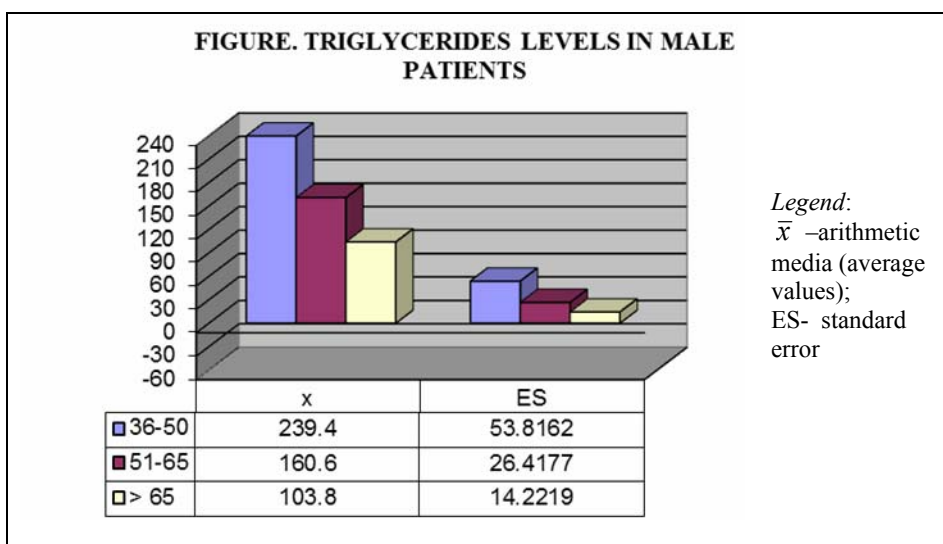


Fig.2. Fig. 1. Triglycerides levels in male patients

Table 3. The values of LDL-cholesterol in women

| Biochemical indicator | Normal values | Statistical indices | Age group (years) | | |
|-----------------------|---------------|---------------------|-------------------|---------|----------|
| LDL | <100 mg/dl | n | 36-50 | 51-65 | > 65 |
| | | x | 134,8 | 111,2 | 127,3 |
| | | ES | 11,4288 | 13,5177 | 14,3496 |
| | | CV% | 28,8109 | 38,4414 | 35,64615 |
| | | t | - | -1,3332 | -0,4088 |
| | | p | | | |
| | | % | - | 82,49 | 94,44 |
| | | ±Δx | - | -17,51 | -5,56 |

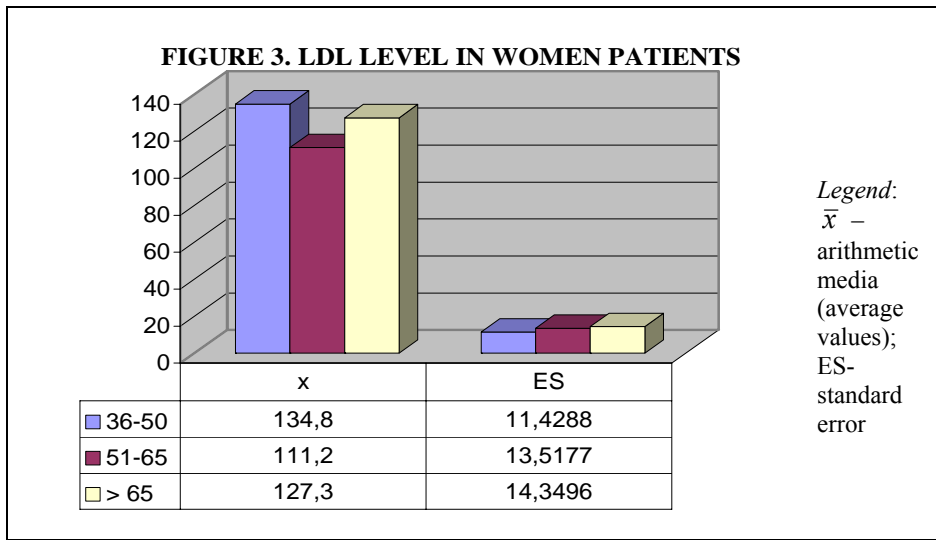


Table 4. The values of LDL-cholesterol in men

| Biochemical indicator | Normal values | Statistical indices | Age group (years) | | |
|-----------------------|---------------|---------------------|-------------------|---------|---------|
| LDL | <100 mg/dl | n | 36-50 | 51-65 | > 65 |
| | | x | 129,82 | 87,6 | 98,8 |
| | | ES | 17,6991 | 2,7006 | 6,6680 |
| | | CV% | 43,1132 | 9,7490 | 21,3422 |
| | | t | - | -2,3581 | -1,6401 |
| | | p | | | |
| | | % | - | 67,48 | 76,11 |
| | | ±Δx | | -32,52 | -23,89 |

Table 5. LDH levels in women

| Biochemical indicator | Normal values | Statistical indices | Age group (years) | | |
|-----------------------|---------------|---------------------|-------------------|---------|---------|
| LDH | 135-225 U/L | n | 36-50 | 51-65 | > 65 |
| | | x | 208,9 | 235,6 | 372,7 |
| | | ES | 19,3117 | 33,5229 | 68,3073 |
| | | CV% | 57,9573 | 44,9952 | 29,2337 |
| | | t | - | 0,6902 | 2,3075 |
| | | p | | | |
| | | % | - | 112,78 | 178,41 |
| | | ±Δx | - | 12,78 | 78,41 |

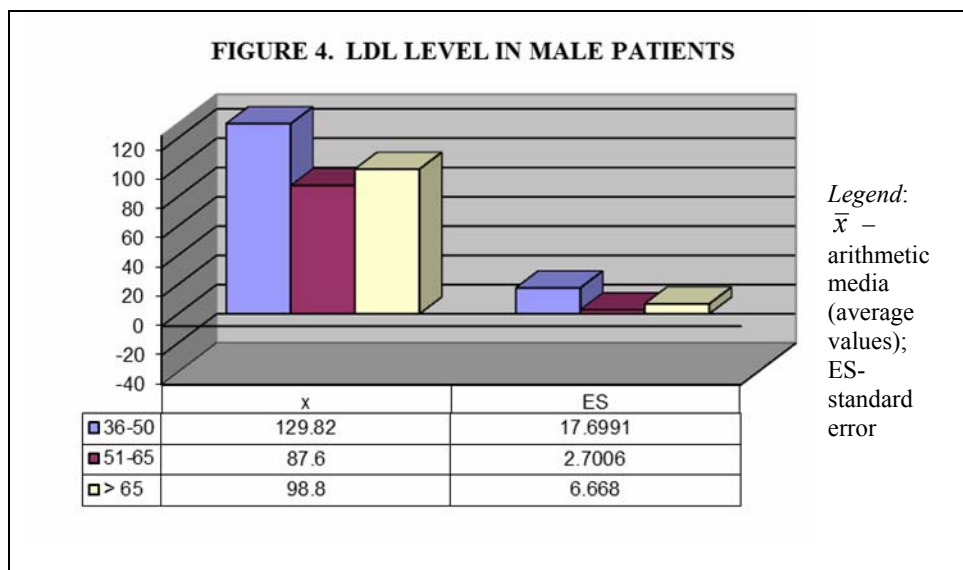


Fig. 4. LDL level in male patients

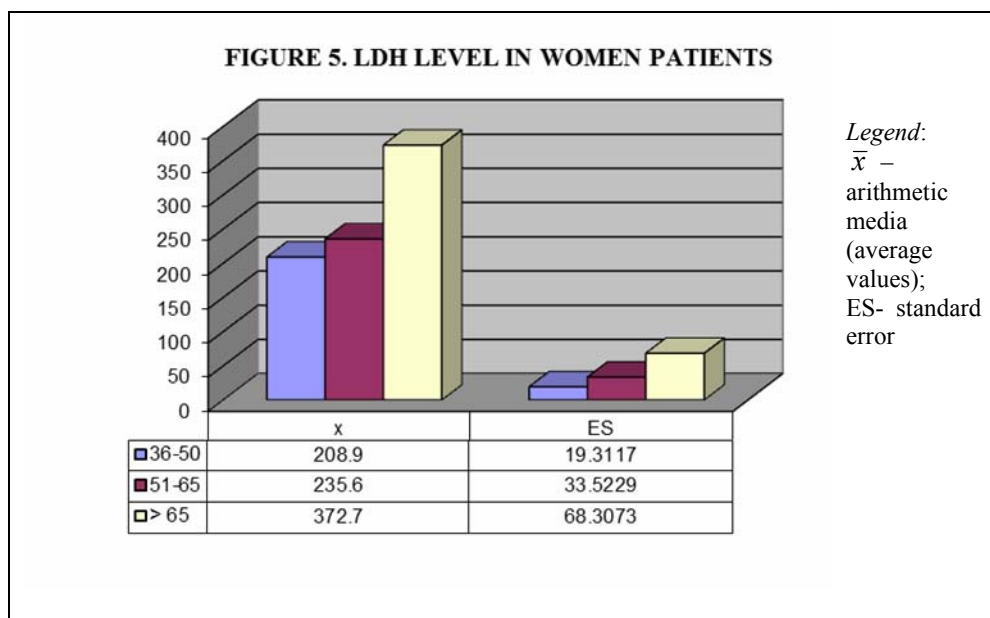


Fig. 5. LDH level in women patients

Table 6. LDH values in men

| Biochemical indicator | Normal values | Statistical indices | Age group (years) | | |
|-----------------------|---------------|---------------------|-------------------|---------|---------|
| LDH | 135-225 U/L | n | 36-50 | 51-65 | > 65 |
| | | x | 209,5 | 264,4 | 309,8 |
| | | ES | 26,7013 | 45,8716 | 38,4557 |
| | | CV% | 40,3041 | 54,8638 | 39,2536 |
| | | t | - | 1,0343 | 2,1424 |
| | | p | - | | |
| | | % | | 126,21 | 147,88 |
| | | ±Δx | | 26,21 | 47,88 |

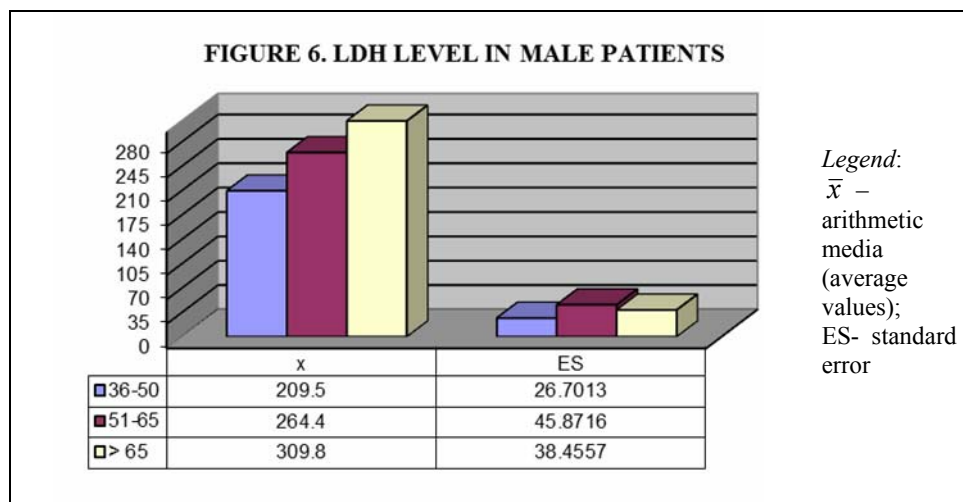


Fig. 6. LDH level in male patients

Table 7. Cholesterol levels in men

| Biochemical indicator | Normal values | Statistical indices | Age group (years) | | |
|-----------------------|---------------|---------------------|-------------------|---------|---------|
| Cholesterol | <220 mg/dl | n | 36-50 | 51-65 | > 65 |
| | | \bar{x} | 229,9 | 184,7 | 145,9 |
| | | ES | 22,9451 | 17,0444 | 9,6694 |
| | | CV% | 31,5610 | 29,1820 | 20,9579 |
| | | t | - | -1,5814 | -3,3740 |
| | | p | | | |
| | | % | - | 80,34 | 63,46 |
| | | $\pm\Delta x$ | | -19,66 | -36,54 |

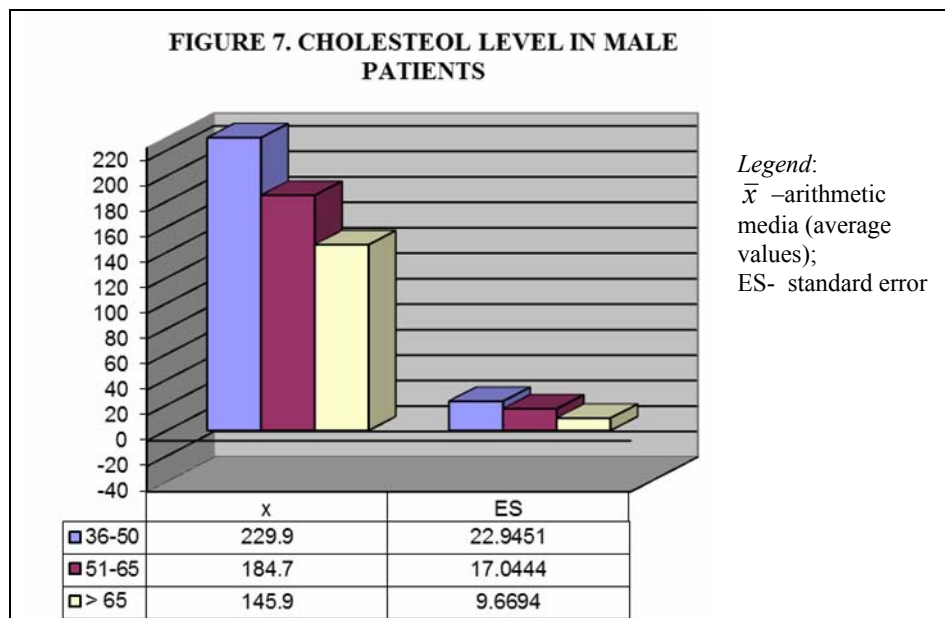


Fig. 7. Cholesterol levels in male patients

Table 8. TGO values in men

| Biochemical indicator | Normal values | Statistical indices | Age group (years) | | |
|-----------------------|---------------|---------------------|-------------------|---------|---------|
| TGO | 0-38 U/L | n | 36-50 | 51-65 | > 65 |
| | | x | 39,8 | 36 | 35 |
| | | ES | 6,3224 | 6,0608 | 5,8176 |
| | | CV% | 50,2345 | 53,2387 | 52,5625 |
| | | t | - | -0,4339 | 0,5587 |
| | | p | | | |
| | | % | - | 90,45 | 87,94 |
| | | $\pm\Delta x$ | - | -9,54 | -12,06 |

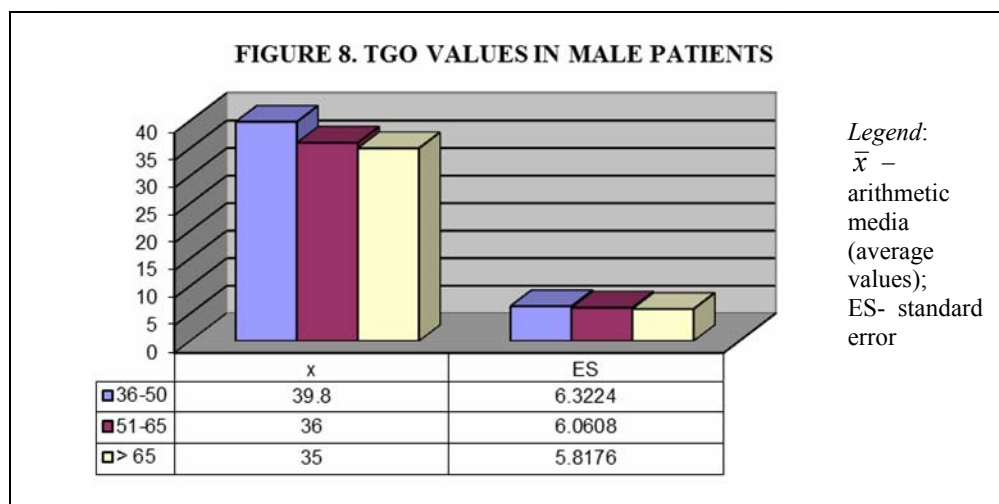


Fig 8. TGO values in male patients

Table 9. TGP values in men

| Biochemical indicator | Normal values | Statistical indices | Age group (years) | | |
|-----------------------|---------------|---------------------|-------------------|---------|---------|
| TGP | 0-41 U/L | n | 36-50 | 51-65 | > 65 |
| | | x | 65,3 | 39,9 | 41,1 |
| | | ES | 12,8574 | 5,8470 | 12,2197 |
| | | CV% | 62,2643 | 46,3407 | 94,0196 |
| | | t | - | -1,7983 | -1,3643 |
| | | p | | | |
| | | % | - | 61,10 | 62,94 |
| | | $\pm\Delta x$ | | -38,90 | -37,06 |

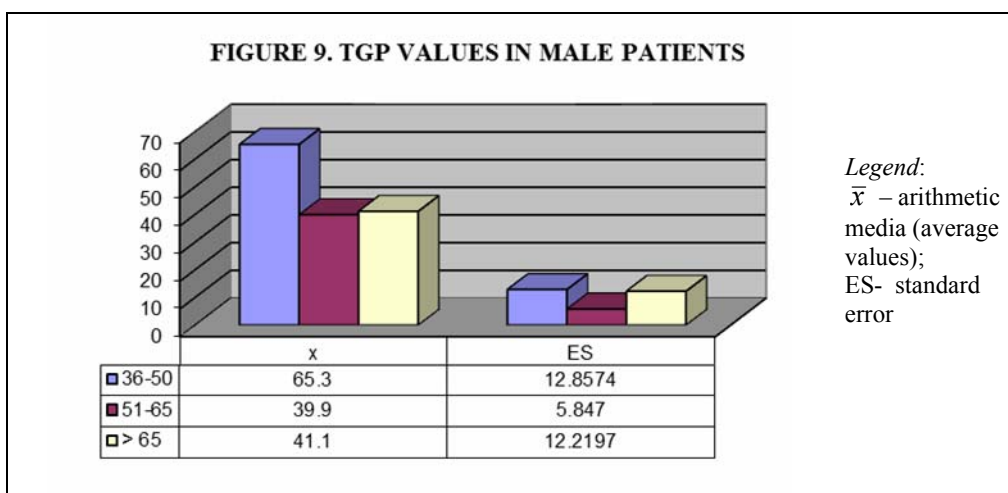


Fig. 9. TGP values in male patients

CONCLUSIONS

There are significant differences between men and women with hypertension. Women better tolerate high blood pressure than men.

In women, biochemical changes in the pathological sense are reduced in all age groups. In women, *the age group most affected* in our case, is over 50 years old and between 51-65 and over 65, confirming other studies that claim incidence and severity of hypertension is lower in women until menopause. With menopause, women no longer protected by their hormones estrogen. However, lifestyle change, hypertension association with physical inactivity, smoking, hyperlipidemia, obesity, stress, use of contraceptives, lower the age at which you can install and hypertension may increase the risk of coronary.

In men, *the age group most affected* in our case, was the one between 36-50 years, where significant changes occur specific indicators for cardiovascular disease: *LDL-cholesterol, triglycerides, LDH and TGO*. Higher risk age category of 36-50 years for cardiovascular disease due to the fact that at this age, men are afoot, exposed to heavy work, fatigue, alcohol, smoking, high consumption of salt, increased consumption of fat, sedentary lifestyle, obesity. Hypertension in men is more dangerous since some can live with it without being aware of it.

ABSTRACT

They were investigated 30 men and 30 women with a diagnosis of hypertension. These subjects were studied biochemical response of the heart, aiming biochemical indicators of diagnostic value: triglycerides, cholesterol, HDL, LDL, creatinine, troponin T, lactate dehydrogenase, aminotransferase (SGOT, SGPT) and creatine that cause changes to the circulatory system and increased blood pressure. Investigated subjects were grouped by gender and three age categories: 36-50 years, 51-65 years and over 65 years. In both women and men, pathological changes, raising, there is only three biochemical parameters of the study - triglycerides, LDL-cholesterol, and LDH. In men appear in addition, total cholesterol and elevated aminotransferase, SGOT and SGPT). The age group most affected is women over 50 years and between 51-65 and over 65, confirming other studies that claim incidence and severity of hypertension is lower in women before menopause. The age group most affected was the men between 36-50 years, where significant changes occur specific indicators for cardiovascular disease: *LDL-cholesterol, triglycerides, troponin T, LDH and TGO*.

REFERENCES

1. CORTI R., FUSTER V., BADIMON J.J., 2003 - „Pathogenetic concepts of acute coronary syndromes”, Journal American Coll Cardiology; 41(4):7S-14S;
2. FUSTER, V.; FAYAD, Z.A.; BADIMON, J.J.- 1999 - „Acute coronary syndromes: biology”, Lancet; 353 Suppl 2: SII5-9;
3. JOHNSON P. et al., 1999 - Cardiac TroponinT as marker for myocardial ischemia in patients seen at the Emergency Department for acute chest pain, American Heart Journal, 137(6): 1137- 1144;
4. KATUS H.A., LOOSER S., HALLERMAYER K. et al., 1992 - „Development and in vitro characterization of a new immunoassay of cardiac troponin T”, Cliniq. Chem.; 38: 386-93;
5. LAUER B., NIEDERAU C., KUHL U., SCHANNWELL M., PAUSCHINGER M., STRAUER B.E., SCHULTHEISS H.P., 1997 - „Cardiac troponin T in patients with clinically suspected myocarditis”, Journal American Coll Cardiology; 30: 1354-9;
6. LINDAHL, B., DIDERHOLM E., LAGERQVIST B., VENGE P., WALLENTIN L., 2001 - „Mechanisms behind the prognostic value of troponin T in unstable coronary artery disease: a FRISC II substudy”, Journal American Coll Cardiology; 38: 979-86;
7. LINDAHL B., VENGE P., WALLENTIN L., for the FRISC Study Group, 1996 - „Relation between troponin T and the risk of subsequent cardiac events in unstable coronary artery disease”, Circulation; 93:1651-1657;
8. NEWBY K.L., GOLDMANN B.U., OHMAN E.M., 2003 - „Troponin: an important prognostic marker and risk stratification tool in non-ST elevation acute coronary syndromes”, Journal American Coll Cardiology; 41:31S-36S;
9. SIMOIU M., 2012 – Importanța troponinei ca marker al leziunilor miocardice în sepsis, Practica Medicală. Vol.VII. Nr.3(27), p. 219-221;
10. WU A.H., APPLE F.S., GIBLER W.B., JESSE R.L., WARSHAW M.M., VALDES R. JR., 1999 - National Academy of Clinical Biochemistry Standards of Laboratory Practice: recommendations for the use of cardiac markers in coronary artery diseases”, Clinique Chemistry; 45: 1104-21.

AUTHORS' ADDRESS

PRISECARU MARIA, STOICA IONUȚ - Vasile Alecsandri University of Bacău, Faculty of Sciences, e-mail: prisecaru_maria@yahoo.com;

IOSOB ALIN - Vasile Alecsandri University of Bacău, Doctoral School;

CRISTEA TINA OANA - VRDS Bacău., Calea Barladului, Street no. 220, e-mail: tinaoana@yahoo.com.