

VARIABILITY STUDY OF BIOCHEMICAL INDICATORS WITH DIAGNOSTIC VALUE IN MEN WITH HYPERTENSION

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INTRODUCTION

One in five adults suffers from high blood pressure and cardiovascular disease is the leading cause of mortality in the world. High blood pressure (hypertension) is a major public health problem in developed and developing countries and affects about one billion people around the world with a growing incidence being one of the most common cardiovascular disease, affecting crucial developments the most dangerous diseases of modern civilization, greatly increases the risks to them.

Hypertension is a major risk factor for cases of heart attack (myocardial infarction), heart failure, arterial aneurysms (eg aortic aneurysm), peripheral arterial disease, cerebrovascular disease and chronic kidney disease is the cause. Even a moderate increase in blood pressure is associated with a reduced life expectancy. Determination of various physiological and biochemical indicators in patients with hypertension allows for accurate diagnosis and treatment strategy. Latest research shows significant differences between genders in the occurrence of hypertension and its evolution. Hypertension is frequent in men than in women. Some research shows that the risk of developing hypertension before the age of 55 years is higher in men than women. The explanation is that until menopause, women's bodies are secreted in a series of "defenders" natural cardiovascular system. Also, researchers found that if both parents suffer from hypertension developing the disease by age 55, men show up to 20 times more likely to develop the disease until the age of 35 years.

The present work aimed to study the biochemical indicators of organic (triglycerides, total cholesterol, creatinine, troponin T) and activity of enzymes of diagnostic value (lactate dehydrogenase, aminotransferases, creatine) in male patients with untreated stage I hypertension (systolic 140-159 mmHg / diastolic 90-99 mmHg), in Bacău County, Romania.

MATERIAL AND METHODS

The research was conducted in the clinical laboratory Bacău 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 investigation results and their statistical processing is shown below.

- **The level of cholesterol in blood serum**

The reference values are less than 220 mg cholesterol / dL.

In men (Table 1, Figure 1) the maximum values recorded in patients 36-50 years, where the average is 229.9 mg / dL value that is slightly elevated. Minimum values are found in patients of >

65 years old, where the average is 145.9 mg / dL falling within the normal range.

Cholesterol decreases progressively from age 36-50 years, reaching normal values in other age groups.

- **The level of triglycerides in blood serum**

Reference values of triglycerides are \leq 150mg/dL.

Following triglyceride levels in men (Table 2, Figure 2) maximum values recorded in patients 36-50 years, where the average is 239.4 mg / dL value is high. Minimum values are found in patients of > 65 years which is the average of 103, 8 mg / dL falling within the normal range.

Triglyceride levels gradually decreased from age 36-50 years, reaching normal values in other age groups.

Table1. Cholesterol levels in male patients

| Biochemical indicator | Normal values | Statistical indices | Age group (years) | | |
|-----------------------|---------------|---------------------|-------------------|---------|---------|
| Cholesterol | <220 mg/dl | n | 36-50 | 51-65 | > 65 |
| | | 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 |

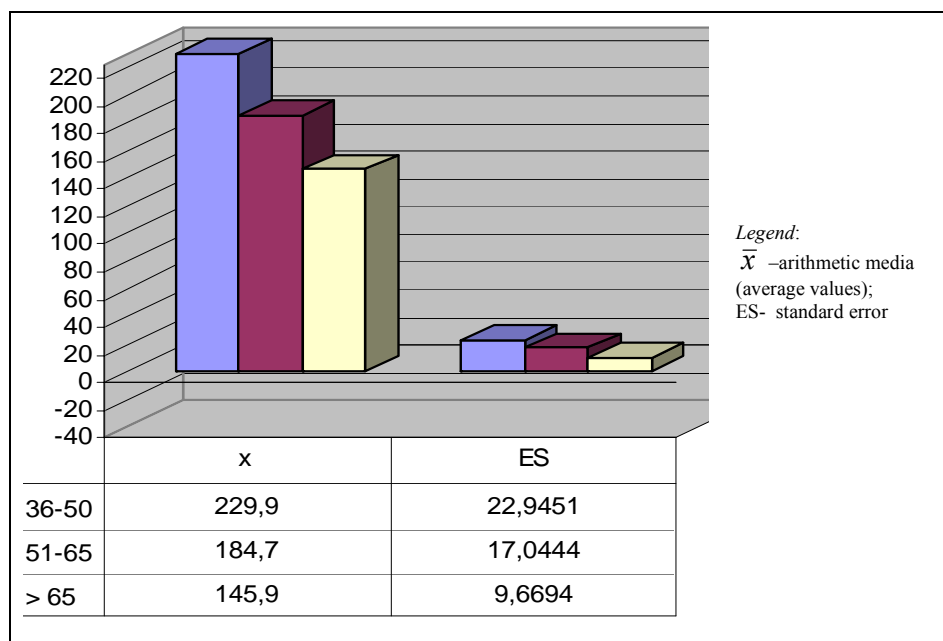


Fig. 1. Cholesterol levels in male patients

Table 2. Triglycerides values in male patients

| Biochemical indicator | Normal values | Statistical indices | Age group (years) | | |
|-----------------------|---------------|---------------------|-------------------|---------|---------|
| Triglycerides | ≤150mg/dl | n | 36-50 | 51-65 | > 65 |
| | | 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 |
| | | ±Δx | - | -56,64 | -32,92 |

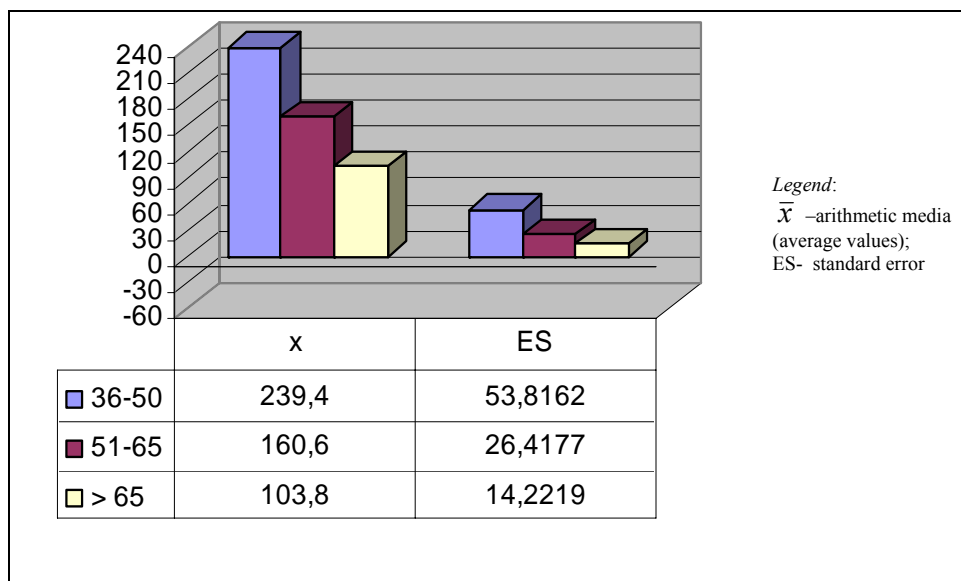


Fig. 2. Triglycerides in male patients

- The level of HDL in the blood serum**

HDL reference values are 35-75 mg / dl.

The maximum values are recorded in the patients 36-50 years old, where the average is 53.1 mg / dl value does not fall within the normal range (Table 3, Figure 3). Minimum values are found in patients of 51-65 years of age where the average is 35 mg / dl falling within the normal range.

HDL levels are within the normal values in all age groups.

- The level of LDL in serum**

The reference values are LDL <100 mg / dl.

Following the LDL (Table 4, Figure 4) the maximum recorded in patients 36-50 years, where the average is 129.82 mg / dl value is high. Minimum values are found in patients of 51-65 years of age where the average is 87.6 mg / dl falling within the normal range.

LDL decreases progressively from age 36-50 years, reaching normal values in other age groups.

Table 3. HDL values in male patients

| Biochemical indicator | Normal values | Statistical indices | Age group (years) | | |
|-----------------------|---------------|---------------------|-------------------|---------|---------|
| HDL | 35-75 mg/dl | n | 36-50 | 51-65 | > 65 |
| | | x | 53,1 | 35 | 39,3 |
| | | ES | 6,0193 | 2,4129 | 5,1554 |
| | | CV% | 35,8470 | 21,8010 | 41,4835 |
| | | t | - | -2,7911 | -1,7413 |
| | | p | | | |
| | | % | - | 65,91 | 74,01 |
| | | ±Δx | - | -34,09 | -25,99 |

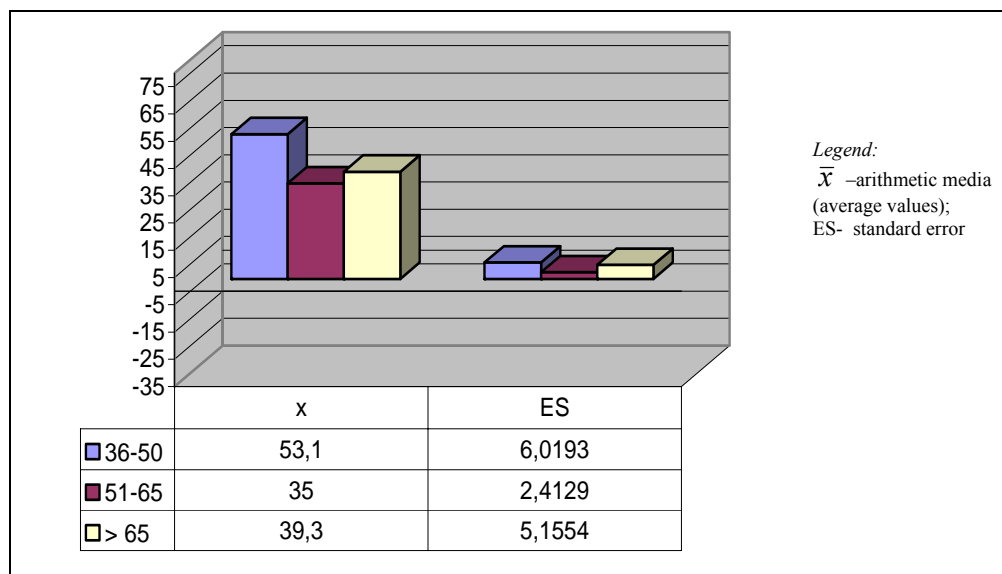


Fig. 3. HDL in male patients

Table 4. LDL values in male patients

| 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 | |
| | | $\pm\Delta x$ | | -32,52 | -23,89 | |

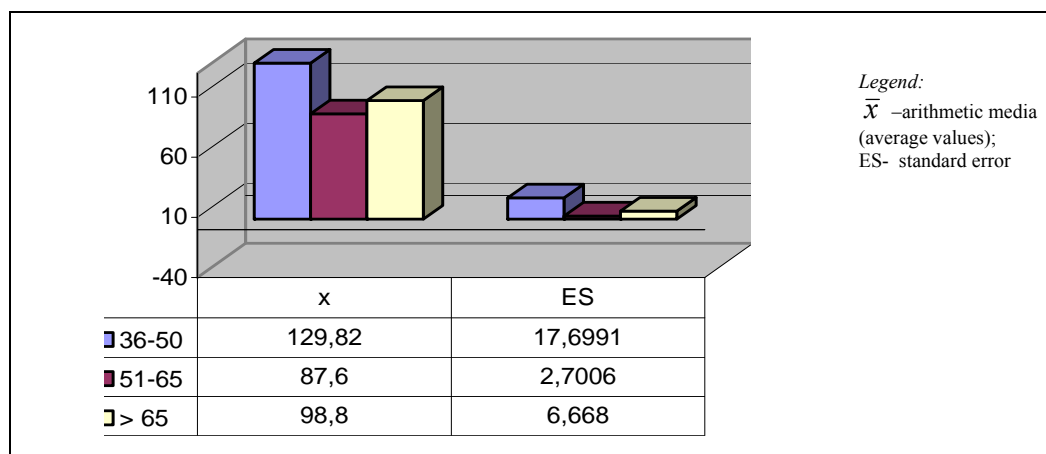


Fig. 4. LDL male patients

- The level of creatinine in blood serum**

Creatinine reference values 0.50-1.30 mg / dl.

The maximum values recorded creatinine in patients > 65 years, where the average is 1,248 mg / dl value is within normal limits. Minimum values are found in patients of 51-65 years of age where the

average is 0.94 mg / dl fits also within the normal range (Table 5, Figure 5).

In men, creatinine level increases progressively with age 36-50 years, reaching maximum values in the third age group, but fits in normal limits.

Table 5. Creatinine values in male patients

| Biochemical indicator | Normal values | Statistical indices | Age group (years) | | |
|-----------------------|-----------------|---------------------|-------------------|---------|---------|
| Creatinina | 0.50-1.30 mg/dl | n | 36-50 | 51-65 | > 65 |
| | | x | 0,983 | 0,94 | 1,248 |
| | | ES | 0,0410 | 0,04 | 0,1143 |
| | | CV% | 13,2035 | 13,4565 | 28,9494 |
| | | t | - | -0,7503 | 2,1829 |
| | | p | | | |
| | | % | - | 95,63 | 126,96 |
| | | $\pm\Delta x$ | - | -4,37 | 26,96 |

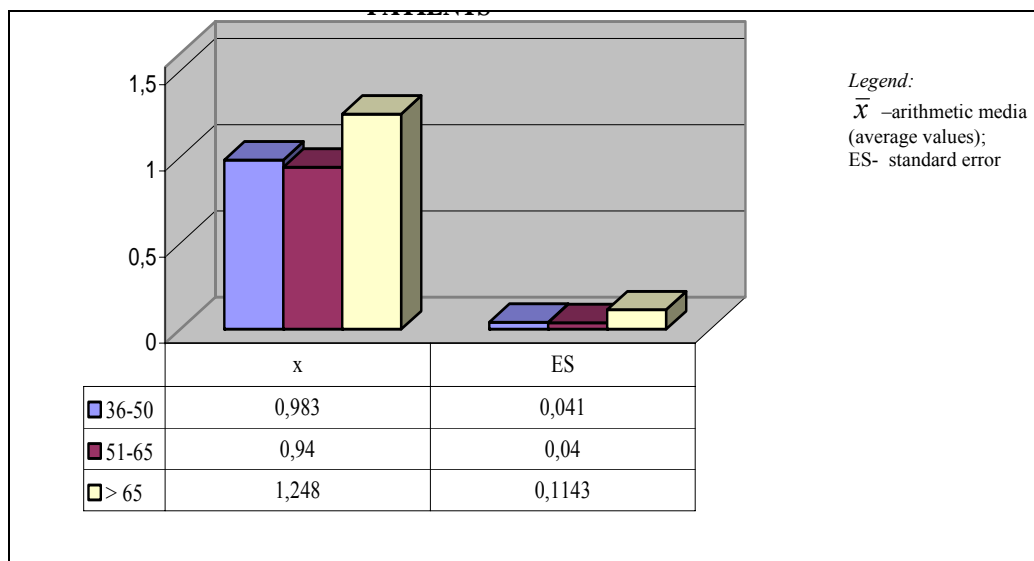


Fig. 5. Creatinine values in male patients

- The level of the serum troponin T**

Reference values of troponin T are 0-0.1 mg / l

In men (Table 6 Figure 6) The maximum value recorded in the patients 36-50 years old, where the average is 0.14 mg / L value is slightly elevated. Minimum values are found in patients of 51-65 years and > 65 years, where the average is 0 mg / l being in the normal range. Troponin T levels gradually decreased with age 36-50 years, reaching minimum values in other age groups.

- The level of LDH in blood serum**

LDH reference values are 135-225 U / L

In men (Table 7, Figure 7) the maximum values recorded in patients > 65 years, where the average is 309.8 U / L value is high. Minimum

values is 36-50 years old patients where the average is 209.5 U / L falling within normal limits. In men, the LDH increases progressively with age 36-50 years, reaching maximum values in other age groups.

- The level of SGOT in the blood serum**

Reference values SGOT / AST is 0-38 U / L.

In men (Table 7, Figure 7) glutamic oxalic maximum values recorded in patients 36-50 years, where the average is 39.8 U / L value that is slightly elevated. Minimum values are found in patients of > 65 years of age where the average is 35 U / L falling within the normal range.

SGOT level gradually declines with age 36-50 years, reaching normal values in other age groups.

Table 6. Troponin T values in male patients

| Biochemical indicator | Normal values | Statistical indices | Age group (years) | | |
|-----------------------|-----------------------|---------------------|-------------------|--------|--------|
| Troponina T | Negativă sau 0,1 µg/l | n | 36-50 | 51-65 | > 65 |
| | | x | 0,14 | 0 | 0 |
| | | ES | 0,1026 | 0 | 0 |
| | | CV% | 231,7423 | 0 | 0 |
| | | t | 0 | 1,3648 | 1,3648 |
| | | p | | | |
| | | % | - | 0 | 0 |
| | | $\pm\Delta x$ | - | 100 | 100 |

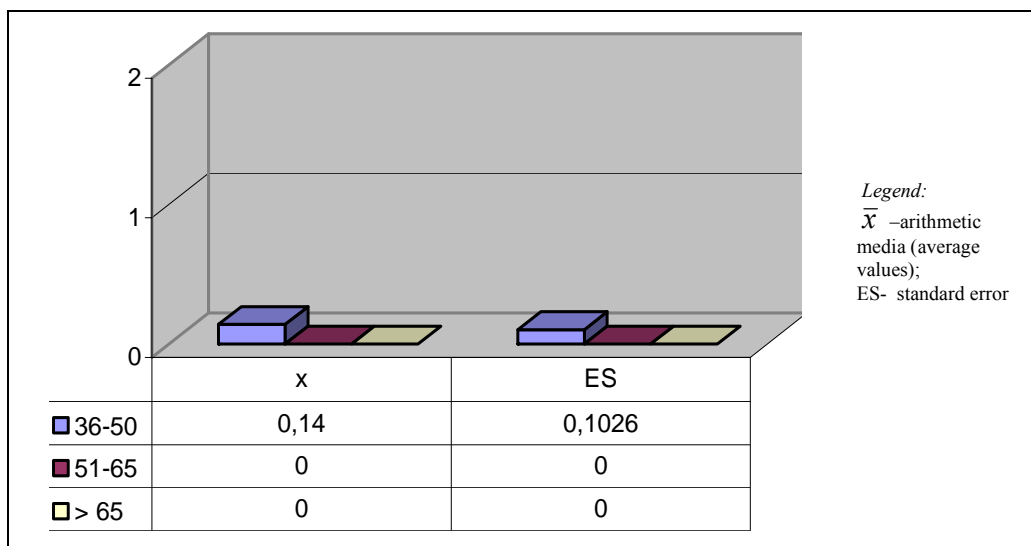


Fig. 6. Troponine T values in male patients

Table 7. LDH values in male patients

| 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 |

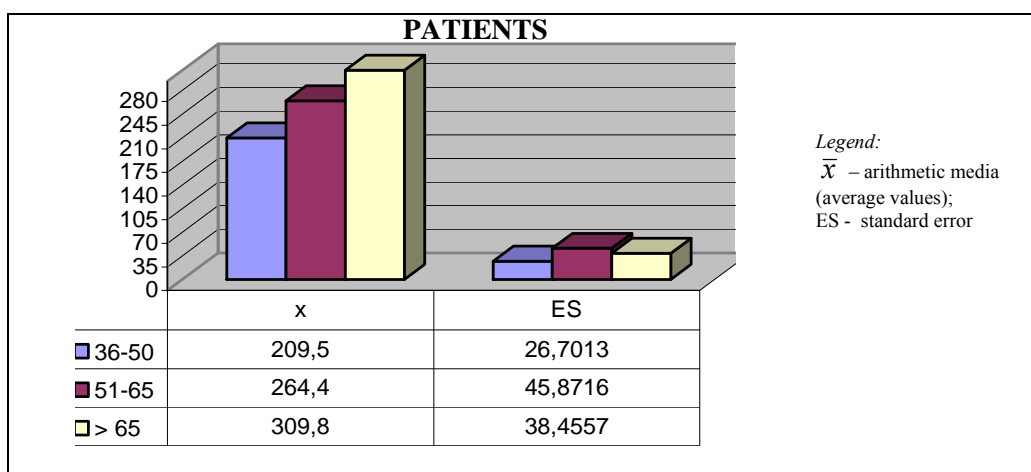


Fig.6. LDH values in male patients

Table 8. SGOT in male patients

| Biochemical indicator | Normal values | Statistical indices | Age group (years) | | |
|-----------------------|---------------|---------------------|-------------------|---------|---------|
| SGOT | 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 |

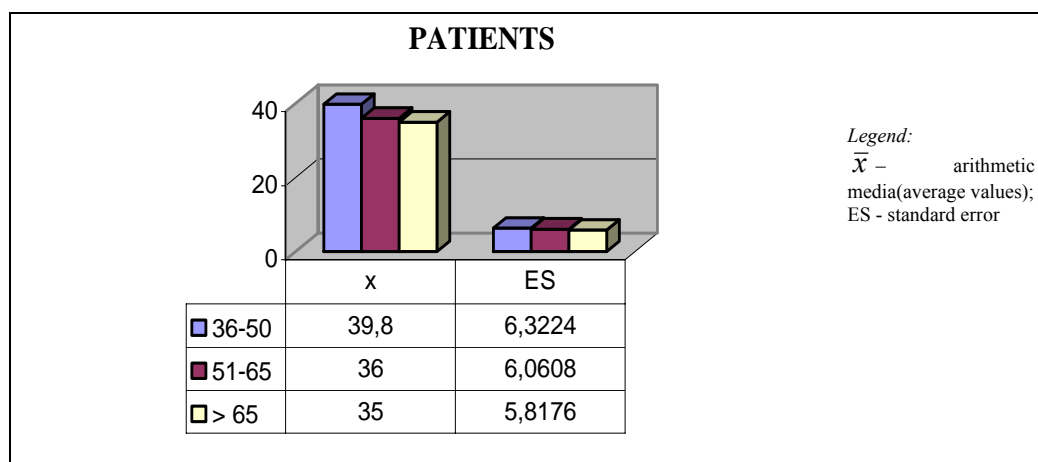


Fig. 8. SGOT value in male patients

- SGPT level in blood serum**

Reference values SGPT / ALT 0-41 U / L.

In men (Table 9, Figure 9) glutamic pyruvic maximum values recorded in patients 36-50 years, where the average is 65.3 U / L value is high. Minimum values is 51-65 years old patients where the average is 39.9 U / L falling within normal limits.

In men, the values are very high TGP 36-50 years, reaching normal values in other age groups.

- The level of creatinekinase in the blood serum**

CK reference values are 0-190 U / L.

In men (Table 10, Figure 10) the maximum values recorded in patients 36-50 years, where the average is 158.1 U / L value is within normal limits. Minimum values is 51-65 years old patients where the average is 90.3 U / L, falling within

CK level high values at 36-50 years, reaching lower values in other age groups, all but falling within the normal range.

Table 9. SGPT values in male patients

| Biochemical indicator | Normal values | Statistical indices | Age group (years) | | |
|-----------------------|---------------|---------------------|-------------------|---------|---------|
| SGPT | 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 |

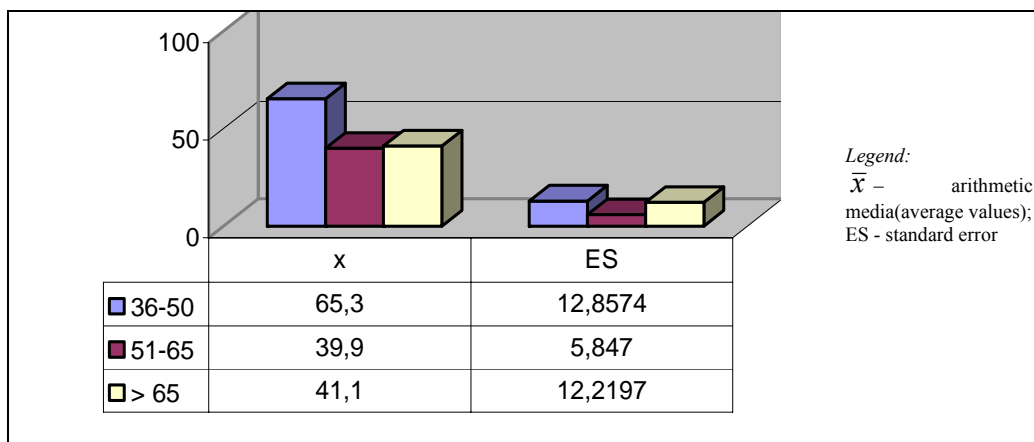


Fig. 9. SGPT value in male patients

Table 10. Creatinekinase levels in male patients.

| Biochemical indicator | Normal values | Statistical indices | Age group (years) | | |
|-----------------------|---------------|---------------------|-------------------|---------|---------|
| Creatinkinase | 0-190 U/L | n | 36-50 | 51-65 | > 65 |
| | | x | 158,1 | 90,3 | 115,4 |
| | | ES | 26,5064 | 15,6234 | 19,1121 |
| | | CV% | 53,0174 | 54,7126 | 52,3723 |
| | | t | - | -2,2036 | -1,3067 |
| | | p | | | |
| | | % | - | 57,12 | 73,99 |
| | | ±Δx | | -42,88 | -27,01 |

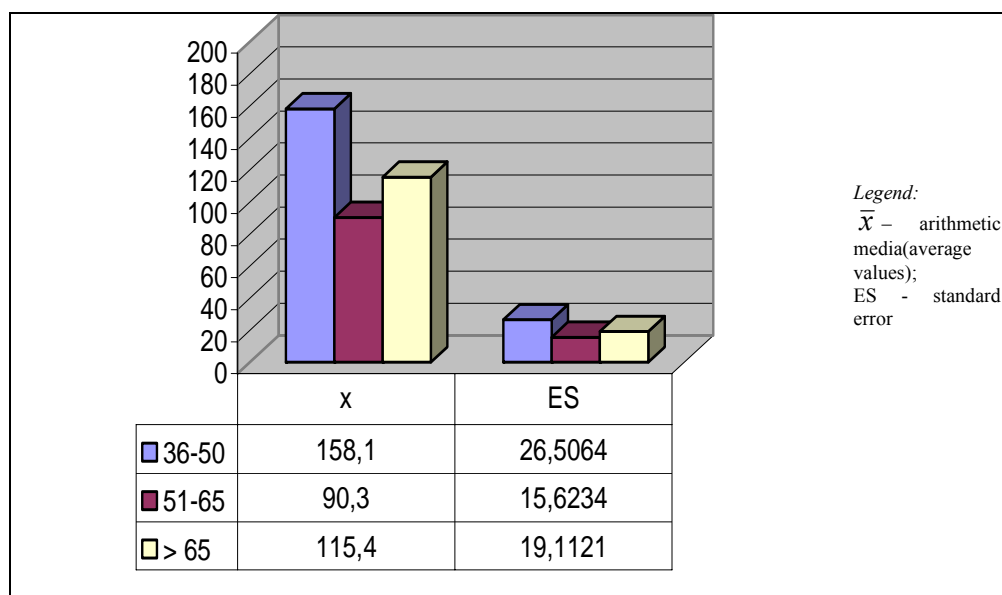


Fig. 10 Creatinkinase values in male patients

By following the biochemical parameters in the case of males there were elevated in the age of 36-50 years and > 65 years and lower values in the 51-65 years of age (Figure 11).

Except increased LDH value significantly altered only in the age group > 60 years, most other

indicators have changed to Increase over the normal range in the age group 36-50 years.

Elevated LDL, triglycerides, troponin T, LDH and SGOT in the age group 36-50 years, showing increased cardiac risk of this age.

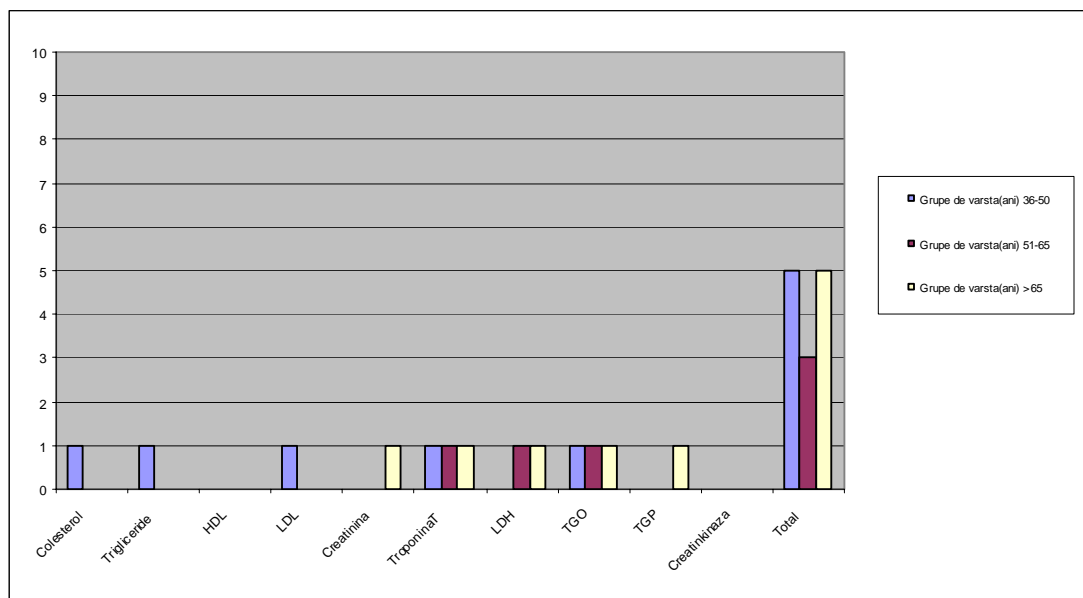


Fig. 11 Biochemical parameters in male by age

CONCLUSIONS

Using our data summarized in the previous tables, the data representing the analysis performed on a number of 30 patients, we list below the main conclusions drawn from the analysis of recorded data interpretation.

- Values of biochemical parameters studied exhibits a distinct change (total cholesterol, triglycerides, LDL-cholesterol, LDH, SGOT and SGPT).
- While total cholesterol levels are within normal limits in all age groups, with very slight increases in the age category 36-50 years, triglyceride values are much above normal in the same age group, 36-50 years. Values increase with the age of patients and remain elevated and următor age group of 51-65 years.
- The separation of the fractions, HDL-cholesterol has been normal in all age groups, but LDL-cholesterol has been elevated to ages 36-50 years and > 65 years which express atherogenic.
- Troponin T, highly sensitive and specific indicator signifying cardiac muscle cell damage at high risk of cardiac disease, elevated obtained in the age group 36-50 years. The exact mechanism of troponin increase is not known, but elevated levels of troponin T and cardiac lesion suggests a poor prognosis.
- Lactate dehydrogenase (LDH) has been increased in the age group 51-65 years and > 65 years. Although increases in LDH are nonspecific enzyme with a wide distribution in the body, this test is useful to confirm the diagnosis retrospectively heart attack or lung. The

persistence of myocardial infarction increased LDH level is longer than the other enzymes.

- SGOT / AST, an enzyme present mainly in the heart and liver, has been elevated in the age group 36-50 years, signifying a possible modification pathological cardiac risk.
- SGPT / ALT high values obtained in the age group 36-50 years and slight increases to > 65 years. Although the enzyme is significant liver pathology, elevations meet and myocardial infarction, the most common indicator of cytolysis explored.
- Age group most affected, in our case the range was 36-50 years, where significant changes occur specific indicators for cardiovascular disease: LDL-cholesterol, triglycerides, troponin T, LDH and SGOT.
- Higher risk age category 36-50 years for cardiovascular disease is due to the fact that at this age, men are in full activity, are exposed to hard work, exhaustion, alcohol, smoking, increased consumption of salt increased consumption of fats, inactivity, obesity.
- High blood pressure in men is more dangerous as some can live with it without being aware of it.

ABSTRACT

Were investigated 30 men with a diagnosis of 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, lactad 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. Age group most affected, in our case the range was 36-50 years, where significant changes occur specific indicators for cardiovascular disease: LDL-cholesterol, triglycerides, troponin T, LDH and SGOT.

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