

**Short communication:**

**Markers of cardiovascular complications in patients with type 2 diabetes mellitus and arterial hypertension**

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**Abstract**

**Background:** Hypertensive patients with type 2 diabetes mellitus are also at increased risk for diabetes mellitus-specific complications, including nephropathy. Even the smallest degree of albuminuria increases risk for cardiovascular diseases and all-cause death. The common conditions coexisting with type 2 diabetes (e.g., hypertension and dyslipidemia) are clear risk factors for cardiovascular diseases. **Methods and materials:** The first (I) group consists of 99 obtained patients with type 2 and AH, the second (II) includes 49 practically healthy people. We evaluated such markers of cardiovascular complications as glycated hemoglobin, lipid profile components by biochemical method and albumin excretion rate with the help of enzyme immunoassay. **Result:** The positive correlation between the level of albumin excretion rate and glycated hemoglobin ( $r = 0,23$ ,  $p < 0,001$ ) is confirmed that albuminuria is a main marker of diabetic nephropathy. The positive correlation between albuminuria and low density lipoproteins ( $r = 0,34$ ,  $p < 0,001$ ), triglycerides ( $r = 0,04$ ,  $p < 0,001$ ) is the definition of the important role of dyslipidemia in diabetic nephropathy. **Conclusion:** Determination of albumin excretion rate, glycated hemoglobin as markers of nephropathy, lipid profile components is necessary for patients with type 2 diabetes mellitus and arterial hypertension for prevention cardiovascular complications.

**Keywords:** type 2 diabetes mellitus; arterial hypertension; albumin excretion rate; dyslipidemia; glycated hemoglobin.

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**Introduction**

Diabetes mellitus (DM) presents a growing health and socioeconomic problem nowadays. The latest International Diabetes Federation estimates indicate that 415 million (1 in 11 persons) have diabetes, and this will increase to 642 million or almost 10% of the general population by 2040. The coexistent of arterial

hypertension (AH) and type 2 DM connected with increase of the risk of heart failure and stroke in 5-6 times compared with patients with AH. Moreover, the coexistence of both diseases is also associated with increased micro vascular complications like nephropathy. In high-risk patients with type 2 DM with low density lipoproteins (LDL) levels less than

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2.0 mmol/L is unexpectedly related to a higher risk for cardiovascular events and all-cause mortality. Each one percentage increase of glycated hemoglobin (HbA1c) was associated with a greater increase in cardiovascular risk in white versus African American diabetic patients<sup>1-10</sup>.

**Materials and Methods**

Our participants treated in Sumy City Clinical Hospital №1 during 2015-2017 years. The first (I) group consists of 99 obtained patients with type 2 DM and AH, the second (II) includes 49 practically healthy people.

The duration of type 2 DM was (9,94±0,73) years, AH – (4,89±0,36) years.

The patients were more than 55 years old. The mean systolic blood pressure were (155,0±0,3) mm, (126,7±0,12) mm, t = 87,5, p < 0,001, diastolic – (105,2±0,3) mm, (83,4±0,13) mm, t = 66,06, p <

0,001.

We evaluated HbA1c, lipid profile components such as general cholesterol (GCH), LDL, triglycerides (TG) by biochemical method and albumin excretion rate with the help of enzyme immunoassay.

All data were analyzed with the help of statistical methods (Microsoft Excel 2013). In addition, we evaluated the Student criteria (t), Pearson ratio (r) and the veracity of differences (p) for assessment results. The study was approved by ethic committee before submission.

**Results and Discussion**

We analyzed such markers of cardiovascular complications as albumin excretion rate, HbA1c, GCH, LDL, TG (table 1).

Table 1 - Markers of cardiovascular complications for patients with type 2 Diabetes mellitus and arterial hypertension

	I (n = 99)	II (n = 49)	t	p
albumin excretion rate, mg/l	36,6±5,86	4,6±0,3	5,45	< 0,001
HbA1c, %	8,49±0,14	1,47±0,1	40,8	< 0,001
GCH, mmol/l	5,2±0,02	4,6±0,3	1,9	< 0,05
LDL, mmol/l	2,81±0,01	2,61±0,1	1,99	< 0,05
TG, mmol/l	2,45±0,19	1,7±0,3	2,11	< 0,05

Notes: n – number of patients;

t - Student criteria;

p - veracity of differences.

We decided to analyze the correlation between albumin excretion rate and another markers of cardiovascular complications in patients with type 2 DM and AH (figure 1, 2, 3, 4).

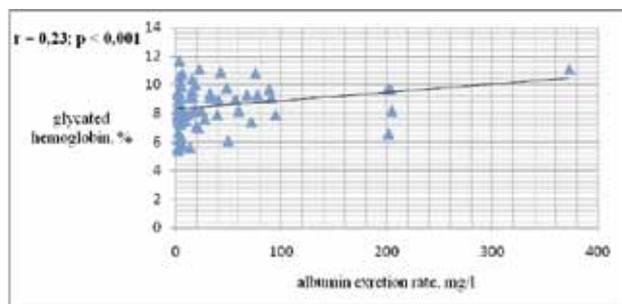


Figure 1 - The correlation between albumin excretion rate and glycated hemoglobin

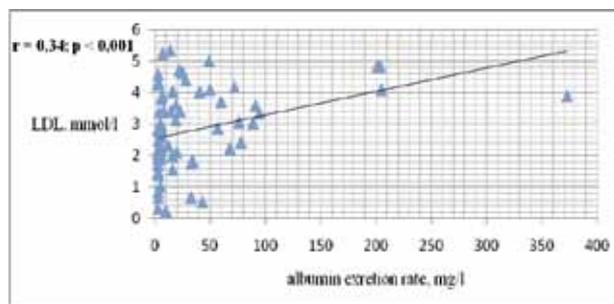


Figure 2 - The correlation between albumin excretion rate and low density lipoproteins

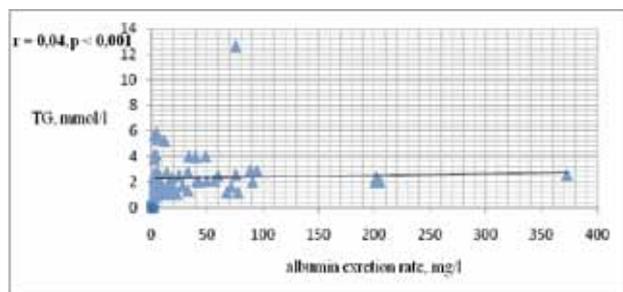


Figure 3 - The correlation between albumin excretion rate and triglycerides

The positive correlation between the level of albumin excretion rate and HbA1c ( $r = 0,23, p < 0,001$ ) is confirmed that albuminuria is a main marker of diabetic nephropathy (DN), end-stage or which is one of the cause of death. The positive correlation between albuminuria and LDL ( $r = 0,34, p < 0,001$ ), TG ( $r = 0,04, p < 0,001$ ) is the definition of the important role of dyslipidemia in DN.

Some obtained patients (5%) had the normal level of albumin excretion rate. Also levels of urinary albumin excretion, even within the “normal” range, are associated with increasing risk for cardiovascular end points among individuals with DM<sup>3</sup>.

Other researches also confirmed that only LDL

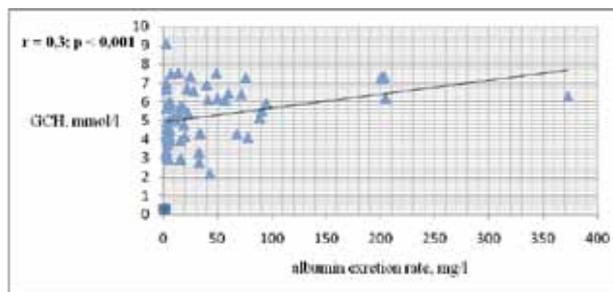


Figure 4 - The correlation between albumin excretion rate and triglycerides

discordance within the DM was positively associated with cardiovascular events<sup>8</sup>. But some people say, that dyslipidemia in type 2 DM is, in general, characterized by elevated TG, reduced HDL cholesterol, and predominant presence of small density LDL particles<sup>4,5</sup>. As a result the quantity of LDL is not so important as quality. We determined the strongest correlation was confirmed between albumin excretion rate and LDL ( $r = 0,34, p < 0,001$ ).

**Conclusion.** In addition, determination of albumin excretion rate, HbA1c as markers of nephropathy, LDL, TG, GCH is necessary for patients with type 2 DM and AH for prevention cardiovascular complications.

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