


<b>Diabetes as a Risk Factor in Coronary Heart Diseases</b>			<b>Healthcare</b>
		<b>Keywords:</b> diabetic patients, non-diabetic patients, coronary heart disease, control grup, males and females, etc.	
<b>Luftime Bruka</b>		<b>Department of Endocrinology and Metabolic Diseases, Polyclinic No.3 Tirana, Albania.</b>	
<b>Aldi Shehu</b>		<b>Laboratory 'Intermedica', Tirana, Albania.</b>	
<b>Florian Toti</b>		<b>Department of Endocrinology and Metabolic Diseases, University Hospital Centre 'Mother Teresa', Tirana, Albania.</b>	

**Abstract**

**Purpose:** Diabetes type 2 is associated with a risk of at least 2 times higher for coronary heart disease. This study aims to determine the prevalence of coronary heart disease as well that of Risc Framingham Score to diabetic population and that of the control group (non-diabetic). **Methods:** The study is of retrospective type, data were gathered in the Endocrinology in specialty polyclinic service no. 3 in Tirana. Patients were classified in diabetic patients with and without coronary events, as well as the control group. Data were collected for all coronary risk factors and the results were compared. **Results:** 500 patients were analyzed as diabetics: 23.8% of them reported coronary events, while only 3.2% of the control group reported coronary events. FRS for diabetic population showed  $30 \pm 15\%$  vs.  $15 \pm 10\%$  of the control group. Without angina Acute Myocardial infarctions were more frequent among women, while IM among men **Conclusions:** The high prevalence of coronary heart disease to the diabetic population compared to the control group; and high risk according to the Framingham for coronaropathy in the next 10 years, proving that diabetes is a major risk factor in coronary artery disease.

**Introduction**

For diabetes, as well as for other chronic pathologies it is already spoken for a real pandemy. In fact, diabetes is now widely distributed throughout the world and its incidence and prevalence are destined to grow with the progressive aging of the population and the globalization of unhealthy food habits.<sup>1</sup>

Diabetes is presented in its two main forms: type 1 diabetes, also known as insulin dependents, that is characteristic of patients with early age and brings patients to the need for insulin treatment; and type 2 diabetes that in prevalent way occurs after age 40 and does not require obligatory treatment with insulin. This form represents more than 90% of cases with diabetes.

Diabetes is a particularly difficult disease, above all due to numerous micro and macrovascular complications in patients who experience it. Diabetic macroangiopathy complications constitute diabetic retinopathy which represents the biggest cause of blindness in adults, and diabetic nephropathy, which can lead to chronic renal failure and dialysis and diabetic neuropathies.

In North America type 2 diabetes is associated with almost twice the risk of occurrence of artero-coronary diseases. The prevalence of coronary disease in artero-adult diabetics is about 45% compared to 25% in individuals without diabetes. A recent survey has confirmed a prevalence of coronary artero-disease with 51%.

However, this figure appears to be lower in European countries. In 1985, a study conducted by the World Health Organization on vascular disease in diabetics reported a prevalence of coronary artery disease by about 30% in males and females. Recent studies from England and France estimate CES prevalence by 25% and 18% respectively.

In general, previous studies report dramatic changes in the prevalence of CES in diabetic patients compared with those non-diabetics (Ann Intern Med 1996, 124: 136-145).

The low prevalence of large vessel disease in Europe may be associated with a better control of diabetes as shown in the study UKPSD. In Italy, almost 70% of diabetic patients are followed at least once a year by specialized centers enabling them an ease for an extensive epidemiological studies.<sup>ii,iii</sup>.

This study reports data on the prevalence of coronary artery disease among diabetic patients in Albania.

### Aims of the study

Aims of the study are:

1. To determine the prevalence of diabetic patients who do coronary artery disease in relation to non-diabetic population
2. To compare the risk assessment of coronary heart disease (SCORE) in diabetic patients versus the control group.
3. Assess risk factors among diabetic patients with coronary episodes and those without coronary episodes.
4. To show the differences between the prevalence of coronary disease among male and female population received in the study.

### Materials and methods

The retrospective study was conducted on type of Endocrinology service in Tirana's central polyclinic and in patients with diabetes in the American Hospital 2 Tirana. In the study were included 500 diabetic patients of type 2 after the approval was taken for inclusion in the study.

These patients underwent questionnaire to assess risk factors of coronary disease and were observed changes in values of laboratory analysis throughout the study. SAK is diagnosed by specialist cardiologists based on the results of the ECG and coronarographies.

The control group consists of 500 random non-diabetic patients taken from daily visits to the health center no. 4 in Tirana.

All data presented in this study refer to the population of patients in the study received.

### Results

In the study, 500 patients participated. The average age of participants was  $64 \pm 11$  to  $\pm 11$  males and 67 for females. Ratio male / female is 243/257 respectively, or expressed in percentage 48.6% male and 51.4% female. Average age of diabetes is higher among women than men ( $10:49 \pm 9:19$  to  $8:57 \pm 7.78$  females and males).

	Diabetic patients (n=500)	Control group (n=500)	Value p
Coronary diseases	23.8 % (119)	3.2 % (16)	< 0.0001

*Prevalence of coronaropathies to diabetic and non-diabetic population*

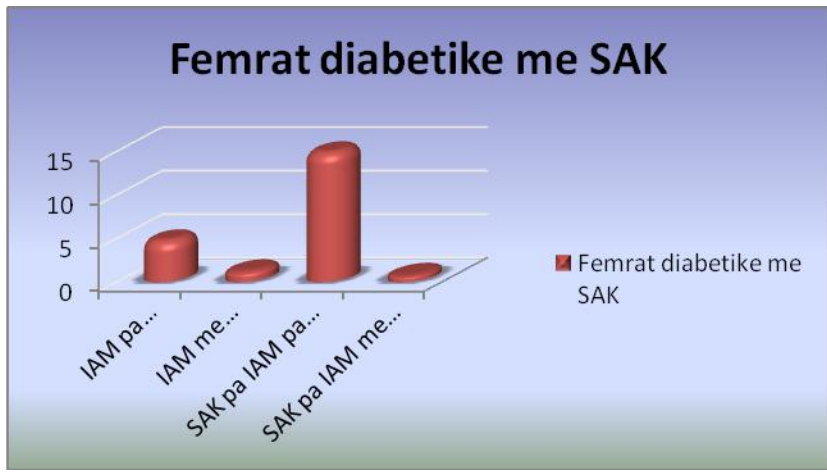
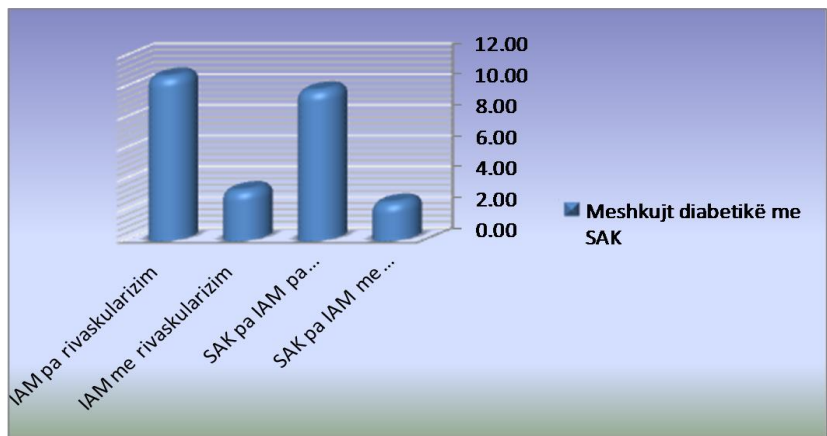
Graph 1



The prevalence of coronary disease in diabetic patients and control group

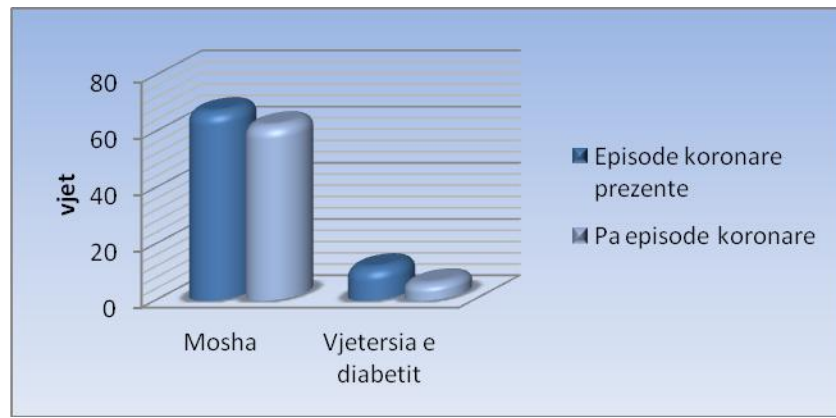
Graph 2 & 3

Graphic distribution of coronary events in males patients with diabetes (above) and females (below). Data on the axis ordinates are expressed in percentage.



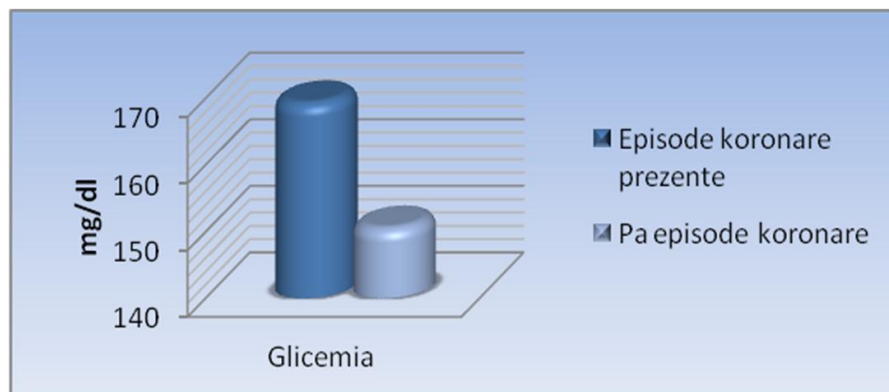
Graph 4

Characteristics of the diabetic males population who have developed diabetes and who have not developed episodes of coronary artery disease.



Graph 5

Changes in plasma glucose levels between diabetic patients with coronaropathy and those without coronaropathy.



Graph 6

*The percentage of diabetic patients with higher HbA1c than the maximum limit*

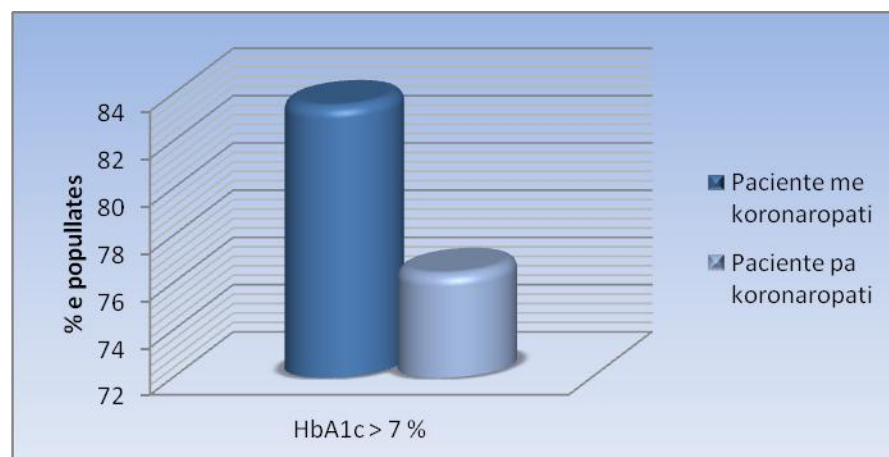


Table 1

Values of the risk to develop coronaropathy within the next 10 years.

The risk of coronary phenomena	Diabetic females (n=257)	Non-diabetic females (n=238)	Value p
Minimal risk (%)	14	8	< 0.001
Maximal risk (%)	>27	13	<0.001

Graph 7

Distribution of risk for coronaropathy to the diabetic females population and control group.

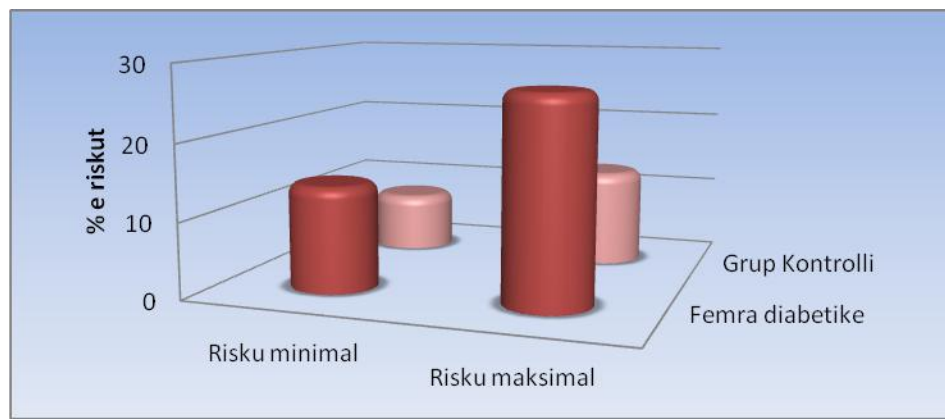
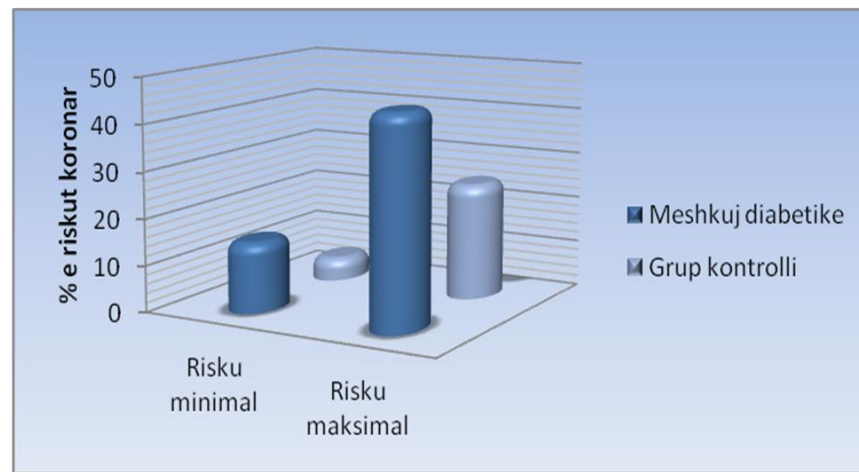


Table 2

Values of the risk in percentage to develop coronaropathy within the next 10 years (calculated according to the Framingham)

The risk of coronary phenomena	Diabetic males (n=257)	Males of control group. (n=238)	Value p
Minimal risk (%)	13	5	< 0.001
Maximal risk (%)	45	25	<0.001

Graph 8*Coronaropathy risk distribution of males diabetic population and control group.***Discussions**

This study was conducted with patients enrolled and followed in the Endocrinology Service at the central specialties polyclinic of Tirana, in collaboration with the health center no. 4 in Tirana, measured the prevalence of coronary disease in a group of 500 patients with diabetes. In addition, the prevalence was measured at 500 coronary patients of the control group, who did not suffer from Diabetes Mellitus.

Both these measured values were compared and it was observed that the prevalence of coronary disease in diabetics was significantly higher than the non-diabetic population. It appeared that this prevalence was 23.8% among diabetic population, compared with 3.2% of the control group. Value reported in studies conducted in Italy by DAI group shows a prevalence of about 16.7% (performed last year), a figure which is lower than in other European countries (Diabetes Med 2000; 17: 146 - 151)<sup>iv</sup>; ; this is explained by a better oversight, as well as a health education of better diabetics performed in Italy, as well as the lifestyle where the Mediterranean diet is combined with regular delivery of physical activity.<sup>v</sup>

Group of male diabetic patients who have developed coronaropathy has a higher average age ( $p < 0.0001$ ), has an average seniority of diabetes  $11.5 \pm 7.8$ , which is significantly higher than the group of diabetic patients who did not develop pathology of coronary artery (with an average seniority  $6:42 \pm 10$ ,  $p < 0:05$ ).

It is observed statistically significant difference in plasma glucose variable ( $p < 0.0001$ ), and percentage of population with  $HbA1c > 7$  mg, which is reported a high percentage of diabetic population compared with coronaropathy events compared with those that did not develop these events ( $p = 0.002$ ). Calculation of risk for coronary disease was carried by FRS (Framingham score Circulation 117 (6): 743-753.)<sup>vi,vii</sup>. Thus shown that for diabetic women, the risk for developing coronaropathy within the next 10 years ranges from 14% to over 27% (for those diabetic women with high levels of triglycerides and low HDL value-cholesterol). While the risk to the control group ranges from 8-13% for those with higher indices of risk variables ( $p < 0.001$ ).

This difference was deemed statistically significant, which confirms our hypothesis that diabetes is a risk factor for coronary disease.

It was observed that with diabetic males the risk for developing coronary events within the next 10 years ranged from 13 to 45% while with the males of control group the risk for developing coronary events ranged from 5% -25% ( $p < 0.001$ ).

As noted, the percentage of risk for coronaropathy in the control group reaches a maximum figure of 25% (which makes it to be considered as a high risk for coronaropathy), this is because a significant variable in predicting cardiovascular risk (mainly diseases of coronary arteries) according to Framingham is age, where it was highlighted that older women as a result of the development of menopause, dislipidemias and hypertension, had a higher prevalence of coronary artery disease. Because this control group results in an average age  $61 \pm 11$  years, the risk of developing coronaropathy in the next 10 years remains high for the age factor, although these patients are not diabetic.

Based on the graphs described in section 2.4.2 was concluded that diabetic population that has not yet developed coronaropathy, there is a risk that varies from 13 to 45% of the population of diabetic males, compared with 5-25% of group control, where the band calculation is made based on the minimum and maximum values of the data obtained from patients in the study.

Thus, 13% risk of diabetic patients corresponds to those who have a less altered lipidic profile, and better equilibrium of plasma glucose; while 45% of risk matches to those patients who have a poor monitoring of plasma glucose and glycated hemoglobin. We see also that for the population of diabetic males are compared with 5-25% of the control group.

However, the same is true for diabetic patients, and comparing the results of both groups it is evidenced a risk almost three times higher for diabetics to develop coronaropathy compared with the control group. P value indicates that the result is statistically significant, which confirms our hypothesis. So, it is evidenced a much expressed riskier for coronaropathy over a period of 10 years with diabetic population versus the control group.

## Conclusion

First, it was determined the prevalence of coronary diseases in patients with diabetes compared with non-diabetic population, and resulted that patients with diabetes mellitus have a prevalence of 23.8% for developed coronaropathy, compared with 3.2% of the normal population, which is about 7 times higher compared with the control group. Pathologies of coronary events were more frequent in males than diabetic females.

Another important conclusion of this study is the determination of the risk factors for coronary artery disease within the diabetic population. Thus, by the results presented, it was concluded that diabetic males and females who have developed coronaropathy, have a significant average seniority and higher diabetes compared with diabetics who did not develop coronaropathy. Likewise, they present an unbalanced condition of diabetes, with an average value of high plasma glucose as well as a higher level of glycosated hemoglobin than its maximum limit. It can be said that the age of diabetes, its state of equilibrium, as well as values of glycosated hemoglobin were statistically significant risk factors for coronary artery disease.

Because diabetes is a pathology which does not only alters carbohydrate metabolism but also of fat, it was observed that older diabetic patients with improper monitoring of plasma glucose reported altered values of lipidograma (diabetic dyslipidemia), which in itself constitute a major risk factor for coronary artery disease.

Thus, valuable conclusion of this study is that not good monitoring of diabetes results in an alteration of lipid profile by increasing the risk for coronary pathology. Another objective of this study was the prediction of risk for developing coronaropathy within the next 10 years, according to Framingham SCORE in the diabetic population and the control group. So, it is observed that the risk of FRS is about 2-3 times higher in diabetic patients compared with the control group which confirms our hypothesis that diabetes is a major risk factor in the development of macrovascular complications such as coronary artery disease, which has once been the main focus of this paper.

## References

1. Kannel WB, McGee DL. Diabetes and cardiovascular disease. *The Framingham study*. JAMA 1979; 241: 2035–38.
2. Stamler J, Vaccaro O, Neaton JD, Wentworth D. Diabetes, other risk factors, and 12-yr cardiovascular mortality for men screened in the Multiple Risk Factor Intervention Trial. *Diabetes Care* 1993; 16: 434–444.
3. Meigs JB, Singer DE, Sullivan LM, Dukes KA, D'Agostino RB, Nathan DM et al. Metabolic control and prevalent cardiovascular disease in non-insulin-dependent diabetes mellitus (NIDDM): The NIDDM Patient Outcome Research Team. *Am J Med* 1997; 102: 38–47.
4. Muggeo M, Verlato G, Bonora E, Bressan F, Girotto S, Corbellini M *et al*. The Verona diabetes study: a population-based survey on known diabetes mellitus prevalence and 5-year all-cause mortality. *Diabetologia* 1995; 38: 318–325.
5. Scott M, Grundy, Ivor J, Benjamin, Gregory L, Burke, Alan Chait, Robert H. Eckel, Barbara V. Howard, William Mitch, Sidney C. Smith, Jr and James R. Sowers *Diabetes and Cardiovascular Disease: A Statement for Healthcare Professionals From the American Heart Association Circulation*. 1999;100:1134-1146
6. Avogaro, C. Giorda, M. Maggini, E. Mannucci, R. Raschetti, E. Sarli, S. Spila-Alegiani, S. Turco, M. Velussi. The DAI prospective study on macrovascular complications in patients with Type 2 diabetes. Characteristics of the study population. *Ann Ist Super Sanità*, 372:289–296
7. Shehu A.; Toti F.; Resulaj B.; Minxuri D. The role of physical activity counseling, for improving metabolic control and weight reduction in people with type 2 diabetes'. *Journal of Diabetes* April 2013, Vol.5, Issue Supplement s1.
8. Sheridan S, Pignone M, Mulrow C. Framingham-based tools to calculate the global risk of coronary heart disease: a systematic review of tools for clinicians. *J Gen Intern Med*. 2003;18(12):1039–1052.
9. Validation of the Framingham coronary heart disease prediction scores: results of a multiple ethnic groups investigation. D'Agostino RB Sr, Grundy S, Sullivan LM, Ellison P. *JAMA*. 2001 Jul 11;286(2):180-7.
10. Sheridan S, Pignone M, Mulrow C. Framingham-based tools to calculate the global risk of coronary heart disease: a systematic review of tools for clinicians. *J Gen Intern Med*. 2003;18(12):1039–1052.
11. Angelo Avogaro, MD1, Carlo Giorda, MD2, Marina Maggini, PHD3, Edoardo Mannucci, MD4, Roberto Raschetti, PHD3, Flavia Lombardo, PHD3, Stefania Spila-Alegiani, PHD3, Salvatore Turco, MD5, Mario Velussi, MD6, Ele Ferrannini, MD7 *Incidence of Coronary Heart Disease in Type 2 Diabetic Men and Women Impact of microvascular complications, treatment, and geographic location* *Diabetes Care* May 2007 vol. 30 no. 5 pp.1241-1247.