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Association of HbA1c Level with Lipid Ratio in Diabetic Patients

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Abstract: Introduction: Diabetes mellitus is a common disease in the world and the number of diabetes patients is rapidly increasing. Dyslipidemia is one of the most risk factors for cardiovascular disease which is more prevalent among adults with diabetes than in the general population. Aim: To study the correlation of diabetes patients glycated hemoglobin (HbA1c) with lipid ratios. Materials and methods: Samples were collected from 101 diabetic patients (aged 19-86 years; male 51, female 50). Retrospective study included data such as age, gender, type of diabetes, HbA1c, total cholesterol, LDL cholesterol and triglyceride from two family medicine doctor's practices. According to the HbA1c level, the patients were divided into three groups, group A (HbA1c < 7%, n = 58), group B (7% ≤ HbA1c < 10%, n = 37) and group C (HbA1c ≥ 10%, n = 6). The correlations of HbA1c with lipid ratios were analyzed. Results: In the group A the mean HbA1c was 6.1 ± 0.5%, mean age—60.6 years, total cholesterol—4.7 mmol/L, LDL—2.8 mmol/L, triglycerides—1.6 mmol/L. In the group B the mean HbA1c was 7.7 ± 0.6%, mean age—64.0 years, total cholesterol—5.7 mmol/L, LDL—3.1 mmol/L, triglycerides—2.2 mmol/L and in the group C the mean HbA1c was 11.2 ± 1.0%, mean age—48.7 years, total cholesterol—4.9 mmol/L, LDL—2.7 mmol/L, triglycerides—1.7 mmol/L. Conclusions: From all groups highest total cholesterol, LDL cholesterol, triglycerides were patients in the group B. In others two groups lipid profile changes were without any significant differences and there was no association with HbA1c.

Key words: Diabetes, HbA1c, total cholesterol, LDL cholesterol, triglycerides.

1. Introduction

Diabetes is a global issue. Diabetes kills and disables, striking people at their most productive age impoverishing families or reducing the life-expectancy of older people. Diabetes is a common threat that does not respect borders or social class. No country is immune from diabetes and the epidemic is expected to continue. The burden of diabetes drains national healthcare budgets, reduces productivity, slows economic growth, causes catastrophic expenditure for vulnerable households and overwhelms healthcare systems.

Diabetes is one of the largest global health emergencies of the 21st century. Diabetes is among the top 10 causes of death globally and together with the other three major noncommunicable diseases (NCDs) (cardiovascular disease, cancer and respiratory disease) account for over 80% of all premature NCD deaths. In 2015, 39.5 million of the 56.4 million deaths globally were due to NCDs [1]. A major contributor to the challenge of diabetes is that 30-80% of people with diabetes are undiagnosed [2].

According to the Latvian Diabetes Registry in 2016, 88,945 CD patients were registered in Latvia [3] (SPKC, 2016). In Latvia, according to age-related prevalence with CD 4.9% of the population of Latvia were affected [4] (IDF, 2017).

Population-wide lifestyle change, along with early detection, diagnosis and cost-effective treatment of diabetes are required to save lives and prevent or significantly delay devastating diabetes—related complications. Only multi-sectoral and coordinated responses with public policies and market interventions within and beyond the health sector can address this issue.

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2. Materials and Methods

2.1 Materials

Retrospective quantitative study included data from January till December of 2017 of patients with diabetes. During this period, 127 patients with diabetes mellitus were analyzed. Patients were selected through a specialized informational tracking program for doctors "Medius", which selected patients with diabetes who were prescribed prescriptions for antidiabetic medicines during the period from January 2017 to December 2017. The study included those patients who, according to the ICD-10 classification, were diagnosed with E10-E14 diagnostic codes.

For a further analysis of the data, a group of patients (101 patients) who had a triglyceride assay for glycosylated hemoglobin and lipid profiles—total cholesterol, LDL (low density cholesterol)—were isolated separately from the total number of patients (127 patients).

The following parameters were also taken into account for data analysis: patient's age, gender, type of diabetes mellitus and prescribed antidiabetic medication.

2.2 Statistic Analysis

Descriptive and analytical statistical methods were used to analyze the obtained and selected patient data using the "IBM SPSS Statistics" version 20.0 software and the Microsoft Excel 2016 application.

3. Results

Average age of patients with diabetes which were included in the study was 57.3 ± 13.8 years. Patient gender distribution: 51 (50.5%) male, 50 (49.5%) women.

In the study, 97 (96%) patients with an average age of 62.5 ± 13.3 years were ill with type 2 diabetes mellitus, and 4 patients with an average age of 28 years were suffering from type 1 diabetes mellitus

The average glycated hemoglobin (HbA1c) between all patients was 7.01 ± 1.4%. Type 1 diabetes mellitus patients average HbA1c was 10.1 ± 2.2% and in patients with type 2 diabetes mellitus, HbA1c was 6.9 ± 1.3%.

Patients were also analyzed by grouping according to HbA1c levels. Fifty-eight (57%) patients had HbA1c < 7% (group A), for 37 (37%) patients, the glycated hemoglobin was between 7% and 10% (group B) and for 6 (6%) patients HbA1c was ≥ 10% (group C) (Fig.1).

In the group of patients with HbA1c level < 7%, average glycated hemoglobin was 6.13%. In the group where the HbA1c level was 7-10%, average HbA1c was 7.71% and in the group with the highest HbA1c ≥ 10%, it was average 11.19% (Fig. 2).

The average age in group A was 61 ± 10.5 years. The highest age was in group B—64 ± 14.3 years, but

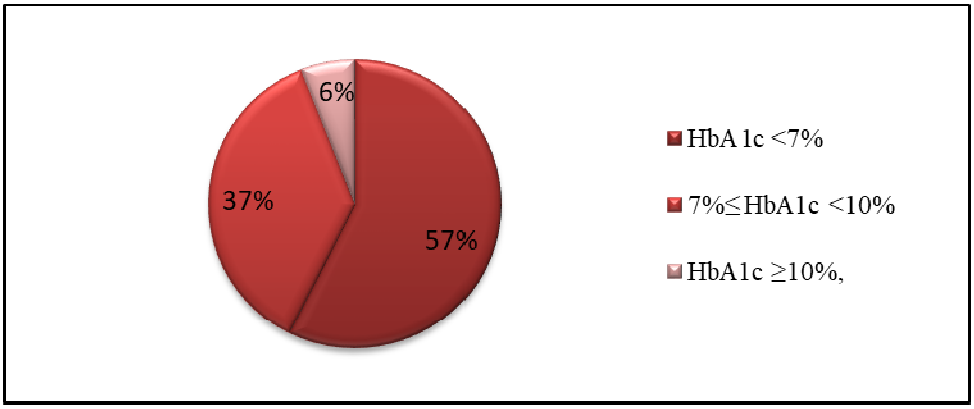

Fig. 1 Proportions of patient groups according to HbA1c levels.

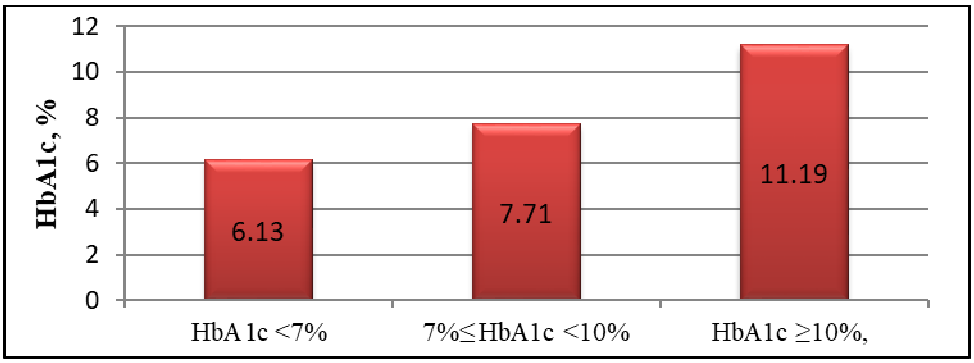

Fig. 2 Average HbA1c by groups.

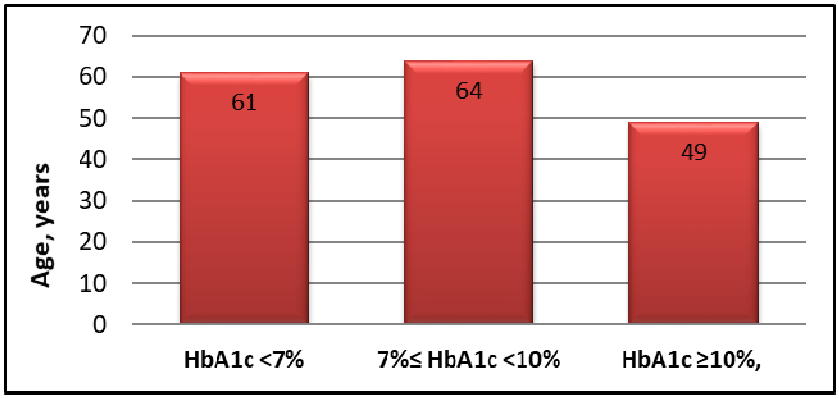

Fig. 3 Average age by groups.

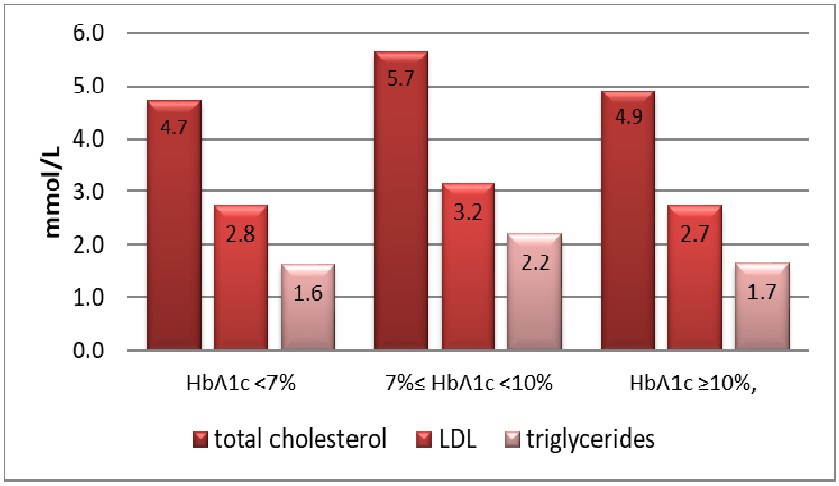

Fig. 4 Average correlation of total cholesterol, LDL, triglyceride levels with HbA1c by groups.

the youngest was group C—their average age was 49 ± 23.2 years (Fig. 3).

In the group of patients with HbA1c levels < 7%, total cholesterol was 4.7 mmol/L, LDL—2.8 mmol/L, triglycerides—1.6 mmol/L. In the group where the HbA1c level was between 7-10%, total cholesterol was 5.7 mmol/L, LDL—3.2 mmol/L, triglycerides—2.2 mmol/L, and in the group with the highest HbA1c ≥ 10%, total cholesterol was 4.9 mmol/L, LDL—2.7 mmol/L, triglycerides—1.7 mmol/L (Fig. 4).

4. Discussion

Research data show that diabetes mellitus peak prevalence is from 50 to 80 years of age, and it affects men and women equally often. First type diabetes is

more common in younger population that corresponds with international statistics [4] (IDF, 2017).

Dyslipidemia was observed only in group B (elevated total cholesterol, low density lipoprotein cholesterol and triglycerides). This consequently puts these patients in higher risk for diabetes complications such as coronary heart disease, arterial hypertension, cerebrovascular disease, peripheral atherosclerotic vascular disease, kidney damage [5] (ADA, 2013).

In other two groups lipid profile changes were without any significant differences and there was no association with HbA1c levels, therefore no correlation was found. Such results could be explained by the fact that 4 out of 6 patients in group C had type 1 diabetes mellitus that is less commonly associated with metabolic syndrome and dyslipidemia than type 2 diabetes (groups A and B). Another factor that could affect results is age: patients in the group C were the youngest and their lipid levels were within normal ranges—it can be attributed to consideration that dyslipidemia increases with age in general population. Comparatively lower lipid levels in the group A could be associated with compensation of diabetes mellitus.

5. Conclusions

HbA1c level, total cholesterol, LDL cholesterol and triglycerides were measured in one-year period for most of patients (80%). Results show no correlation between HbA1c levels and lipid profile.

Dyslipidemia (elevated total cholesterol, low density lipoprotein cholesterol and triglycerides) was observed only in group B with HbA1c 7%-10%. We presume that type 1 diabetes patients (4 out of 6 patients in group C distorted the correlation, because they are less commonly associated with metabolic syndrome. Mean age difference between the groups could also affect results knowing that dyslipidemia in general population increases with age.

Our suggestions for further studies are to exclude all the patients with type 1 diabetes mellitus and to determine the percentage of type 2 diabetes mellitus patients with metabolic syndrome. Research group should be increased for statistically more reliable results. Another suggestion is to include patients with similar ages.

It is important to control lipid and glycated hemoglobin levels to minimize risk for diabetes complications and to improve quality of life.

References

[1] DeFronzo, R. A., Ferrannini, E., Zimmet, P., et al. 2015. *International Textbook of Diabetes Mellitus* (4th ed.), Vol. 2, Wiley-Blackwell.

[2] Fendler, W., Borowiec, M., Baranowska-Jazwiecka, A., et al. 2012. "Prevalence of Monogenic Diabetes amongst Polish Children after a Nationwide Genetic Screening Campaign." *Diabetologia* 55: 2631-35. doi: http://dx.doi.org/10.1007/s00125-012-2621-2.

[3] Slimību profilakses un kontroles centrs. Statistikas dati 2016. gads, cukura diabēts [09.03.2018]. Available at: https://www.spkc.gov.lv/lv/statistika-un-petijumi/statistika/veselibas-aprupes-statistika1/get/nid/14.

[4] International Diabetes Federation. 2017. *IDF Diabetes Atlas* (8th ed.). Brussels, Belgium: International Diabetes Federation,. Available at: http://www.diabetesatlas.org.

[5] American Diabetes Association (ADA). 2013. "Standards of Medical Care in Diabetes-2013." *Diabetes Care* 36 (suppl. 1): S11-66.