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Association between Haemoglobin A1c and Uric Acid Levels among Patients with Diabetes Mellitus Type 2 at a Primary Health Care Clinic in North Sumatera, Indonesia

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Abstract

BACKGROUND: Haemoglobin A1c (Hba1c) levels and uric acid levels may be associated.

AIM: This study aimed to determine Hba1c, and uric acid levels are associated among patients with diabetes mellitus type 2 who attend a primary health care clinic in North Sumatera, Indonesia.

METHODS: We conducted a cross-sectional study among patients was conducted on 70 type 2 Diabetes Mellitus patients who attended Primary Health Care in Binjai. Patients with age > 40 years old attend a primary health care clinic in Binjai city, North Sumatera with diabetes mellitus type 2. In each subject demographics, age, sex, body mass index, blood pressure, post health history, fasting blood sugar, Hba1c and uric acid levels were checked and recorded. A student's t-test was used to determine if there was an association between Hba1 and uric acid levels. A total of 70 were included in this study.

RESULTS: The mean age of study subjects was 58.33. The mean Hba1c level was 8.743, and standard deviation (SD) was 1.80. The mean of uric acid was 6.31, and standard deviation (SD) was 1.58. The statistical analysis using T-test found that there was no significant association between Hba1c and uric acid levels among study subjects ($p > 0.05$).

CONCLUSION: We found no significant association between Hba1c and uric acid levels among the study subjects.

Introduction

Diabetes mellitus (DM) type 2 is increasing incidence and prevalence [1]. DM is a leading cause of morbidity and mortality worldwide [2]. About 2-3 % of the world's population is estimated to have DM [3]. People with DM are at higher risk for cardiovascular disease, nephropathy and retinopathy [3] [4].

Haemoglobin A1C (Hba1c) is a measure of glycosylated haemoglobin over the period 3 months due to the usual lifespan of erythrocytes of 120 days and is used to monitor control of blood glucose levels in patients with DM [5].

Serum Uric acid is the final oxidation product of purine metabolism in the circulation. Elevated serum uric acids levels are associated with increased risk for cardiovascular disease and so the metabolic diseases such as metabolic syndrome and diabetes mellitus [6]. Patients with hyperuricemia are significantly more likely to DM [7]. Some study suggests uric acid may be associated with glycometabolic disorders, because of this association between uric acid and glucose metabolic [8]. However, there is not a linear association between uric acid and blood glucose levels. Hyperuricemia in patients with diabetes mellitus type 2 associated with increased risk for diabetic nephropathy [9]. Serum uric acid level among patients with diabetes mellitus type 2

may are with the development of macroalbuminuria and microvascular disease [10]. Uric acid levels rise with increasing blood glucose concentrations in the normal and prediabetes population [11].

However, among patient with diabetes mellitus type 2, uric acid levels tend to decline with increasing blood glucose concentration [12]. The reason for the inverse relationship is unclear. However, insulin levels are also closely related to uric acid levels [13]. Serum uric acid levels are directly associated with serum insulin levels in diabetic, but the mechanism for this is not clear [14]. We aimed to determine if there is an association between HbA1c and uric acid among patients with diabetes mellitus type 2 who attend a public health care clinic in Binjai city, North Sumatera Indonesia. This place is many Diabetes Mellitus type 2 patients.

Material and Methods

This study is a cross-sectional evaluation of consecutive sampled subjects who attend a primary health care clinic in Binjai city, North Sumatera, Indonesia. Inclusion criteria the subjects of sex aged > 40 years old and a history of confirmed on who were willing to participate in the study. Exclusion criteria were those who were undergoing treatment for cancer therapy or who were taking a diuretic. This study was approved by the Health Research Ethics Committee, Faculty of Medicine, Sumatera Utara Universitas/H. Adam Malik General Hospital number 591/TGL/KEPK FK USU-RSUP HAM/2016.

In each subject, demographic, age, sex, body mass index, abdominal circumstance, blood pressure, and laboratory tests such as fasting blood glucose, HbA1c and uric acid levels were obtained and recorded. The student's T-Test was used to determine an association between HbA1c and uric acid levels. A p-value < 0.05 was considered statistically significant.

Results

A total of 70 subjects were included in the study, 69 % female and 31% male.

Table 1: Age and laboratory result among study (n = 70)

	Min	Max	Mean	SD
Age	40	76	58	9
Uric Acid	3.8	10.9	6.3	1.6
HbA1c	5.7	12.5	8.7	1.8

The mean (range) Uric acid level among study the subjects was 6.3 (3.8-10.9 mg/dl). The mean (range) HbA1c level was 8.7 (5.7-12.5 %). We found no significant association between Hba1c and uric acid levels among the study subjects. We used the statistical analysis with chi-square test and found that there was no correlation at type 2 diabetes mellitus patients in Binjai city of North Sumatera in Indonesia ($n = 70$, $p > 0.05$).

Discussion

Over the years, the association between uric acid levels and glucose metabolism has been a hot research topic. A growing number of studies have indicated that there is a bell fit between uric acids and glucose concentrations. Many previous studies have linked uric acid to type 2 diabetes mellitus, but studies linking uric acids to HbA1c are scarce. Some studies have observed an increase in Uric acid levels in type 2 diabetes mellitus and our study found that there was no association between HbA1c and uric acid level in the subjects.

In the research by Yuliang Cui et al. that is an inverse correlation between uric acid and HbA1c, which is dependent on hyperinsulinemia in patients with newly, diagnosed with type 2 diabetes. Some studies have found that serum uric acid levels are inversely correlated with blood glucose concentration in type 2 diabetes mellitus patients. However, until now, it has been unclear as to why this relationship exists and what factors influence this relationship.

High insulin levels may be important factor affecting the correlation between the uric acid and HbA1c, the same with Fengjiang Wei et al., they found that serum uric acid level is inversely associated with HbA1c in Type 2 Diabetes Mellitus patients and according to the research by Walid G Babkir et al show that patients with type 2 diabetes mellitus serum uric acid level has an adverse effect on glycemic control, but the research by V. Pavithra etc. has strongly established an association between uric acid and Hba1c thereby linking uric acid, the end product of purine metabolism to DM.

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