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Original Article

Association of fasting blood glucose with non alcoholic fatty liver in type 2 diabetes mellitus patients

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Abstract:

Type 2 diabetes mellitus (T_2DM) and metabolic syndrome are the risk factors for non-alcoholic fatty liver disease (NAFLD). Insulin resistance might have a role in disease progression. The present study was under taken to find out any association between fasting blood glucose and NAFLD in Bangladeshi population. 256 T_2DM subjects were included in this study. Out of them 127 subjects of NAFLD were taken as case and rest 129 without fatty liver were taken as control. Anthropometric measurements, fasting blood glucose, SGPT, lipid profile were estimated. Data was analyzed by appropriate univariate and multivariate statistical tools. Mean (±SD) of age of case and control were 43.33±6.36 and 42.89±5.85 years, mean (±SD) of BMI of case and control were 26.19±3.69 and 25.32±3.47, mean (±SD) of waist hip (WH) ratio between case and control were 0.923±0.06 and 0.918±0.074 respectively and statistically no significant difference was found between the two groups. Median (range) value of fasting blood glucose between case and control were 6.70 (3.60-23.0) and 5.10 (4.0-5.9) mmol/L respectively and statistically no significant difference was also found. Median (range) value of SGPT of case and control were 36 (10-150) and 23(10-324) U/L respectively. This result only showed statistically significant difference. Multiple regression analysis taking the fatty liver as dependent variables and age, WH ratio, BMI, SGPT, FBG as independent variables, a positive significant association was found with SGPT but FBG did not show any significant association with NAFLD. From this study it is suggested that there is no association between hyperglycemia and NAFLD in Bangladeshi T_2DM subjects.

Key words: T2DM, NAFLD

Introduction :

Non-alcoholic fatty liver disease is a chronic liver condition characterized by insulin resistance and hepatic fat accumulation, in the absence of other identifiable causes of fat accumulation, such as alcohol abuse, viral hepatitis, autoimmune hepatitis, alpha-1 antitrypsin deficiency, medications like corticosteroids and estrogens, and other conditions[1]. It is estimated that 75% of type 2 diabetic patients (T_2DM) present with some form of NAFLD of different degrees. It is ranging

from simple fatty liver (steatosis) to nonalcoholic steatohepatitis (NASH) to cirrhosis[2]. Patients who develop liver steatosis are likely to be obese have type 2 diabetes and or meet the criteria for the metabolic syndrome[3,4]. Patients who are most likely to progress from simple steatosis to steatohepatitis are those who are obese and have type 2 diabetes[5]. Type 2 diabetes is also a prominent risk factor for developing fibrosis and cirrhosis. Type 2 diabetes and the metabolic syndrome are risk factors for more serious forms of NAFLD may suggest that insulin resistance itself also has a role in promoting disease progression. Diabetes, dyslipidemia, hypertension, and cardiovascular disease (CVD) occur more frequently in individuals with NAFLD[6]. As type 2 diabetes is an important risk factor for NAFLD; the present study has been undertaken to find any association of NAFLD with hyperglycemia in Bangladeshi people suffering from type 2 diabetes mellitus

Subjects and Methods:

The study was conducted in the Department of Radiology and Imaging in Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorders (BIRDEM) during the period of July 2008 to June 2009. A group of 256 T_2DM subjects were included in this study and they were recruited from the out patient and in-patient departments of the BIRDEM Hospital. There was no specific predilection for race, religion and socioeconomic status. The study subjects were grouped into T_2DM with fatty liver (n=127) as case and T_2DM without Fatty Liver (n=129) as control. Then the history was collected and clinical examination was done by using a predesigned questionnaire. Anthropometric measurement, fasting blood glucose and lipid profile were measured by standard biochemical methods, SGPT by UV method kinetic method. Fatty liver was diagnosed by 4D ultrasound. Data were analyzed by appropriate univariate as well as multivariate tools.

Results:

Mean (±SD) of age of case and control were 43.33±6.36 and 42.89±5.85 years (p=0.559), mean (±SD) of BMI of case and control were 26.19±3.69 and 25.32±3.47 (p=0.053), mean (±SD) of waist hip (WH) ratio between case and control were 0.923±0.006 and 0.918±0.074 (p=0.589) respectively. Statistically no significant difference was found between the two groups for age, BMI and waist hip (WH) ratio shown in Table-1. Median (range) value of fasting blood glucose between case and control were 6.70 (3.60-23.0) and 5.10 (4.0-5.9) mmol/L respectively. Statistically no significant difference was also not found. Median (range) value of SGPT of case and control were 36 (10-150) and 23(10-324) U/L respectively. This results showed statistically significant difference (p=0.001) (Table-2).In multiple regression analysis taking fatty liver as a dependent variable and the age, Waist-Hip Ratio, Body Mass Index, SGPT and FBG as independent variables a positive significant association was found only with SGPT (p=0.000) but FBG did not show any significant association with NAFLD.(Table-3)

Table 1: Anthropometric measurement of study subjects

Variables	Case (n=127)	Control (n=129)	t/p values
Age (yrs)	43.33±6.36	42.89±5.85	0.585/0.559
BMI (kg/m²)	26.19±3.69	25.32±3.47	1.945/0.053
W/H	0.923±.060	0.918±.074	0.540/0.589

*Results are expressed as mean±SD. Unpaired t test is performed as test of significance

Table- 2: Biochemical parameters of study subjects.

Variables	Case	Control	z/p
FBS mmol/L	6.7 (3.60-23)	5.1 (4-5.9)	1.12/0.26
SGPT U/L	36 (10-150)	23(10-324)	5.05/0.0

Results are expressed as median (range). Mann-Whitney U test is performed as test of significance

Table-3: Multiple regression analysis taking NAFLD as a dependent variable and other parameters as independent variables

Independent variables / Dependent variable	Regression coefficient	P value
Age/ fatty liver	0.98	0.33
WH/ fatty liver	0.53	0.75
BMI/fatty liver	0.94	0.15
SGPT/ fatty liver	0.97	0.001
FBS/ fatty liver	0.99	0.958

Discussion :

Nonalcoholic fatty liver disease (NAFLD) has become a global epidemic, affecting 20-40% of the general adult population. Type 2 diabetes mellitus is associated with dyslipdemia, insulin resistance and non alcoholic fatty liver disease. During the past 20 to 30 years, the frequency of patients presenting with NAFLD has increased gradually in proportion to the increase in the population with life-style related diseases. It is estimated that 75% of type 2 diabetic patients (T_2DM) present some form of NAFLD of different degrees[7,8]. The purpose of the present study is to assess whether type 2 diabetes mellitus-induced hyperglycemia is associated with NAFLD. Age is major determinant of NAFLD and in a study on T_2DM population it was found that the prevalence of NAFLD was found to be 65.4% in 40-59 years age group and 74.6% in more than 60 years age group[9]. The matching of age between the two groups in the present study leads to nullify the effects of age on the outcome variable. Analyzing the BMI (a measure of generalized obesity) and WHR (an indicator of central obesity) it was found that NAFLD groups has significantly but marginally higher BMI but not to WHR compared to the non-NAFLD group. This indicates that general obesity rather than central adiposity have stronger link in the NAFLD. The fasting glucose did not show any significant difference among NAFLD and non NAFLD group and in multiple regression analysis FBG did not show any significant association with the presence of NAFLD. Park et al. (2005) also found that fasting blood glucose was not significantly different between pediatric NAFLD and a normal control group[10]. Kunihiko et al (2009) also found that FPG was not statistically significant between the three groups of NAFLD[11]. In another study Shobha et al. (2009) showed significantly higher serum HbA1c levels in NAFLD patients than controls (P <0.001) The prevalence of NAFLD was significantly higher in subjects with increased HbA1c level (HbA1c ≥6.5%) than in those with normal HbA1c leve[12]. In our study the present data recommended that there is no strong association between fasting blood glucose with NAFLD in T2DM. However, the question of whether hyperinsulinemia or insulin resistance is the primary disorder of NAFLD remains unanswered.

Conclusion:

The present study recommended that there is no strong association between fasting blood glucose with NAFLD in type 2 diabetes mellitus. However the question of whether insulin resistance is the primary disorder of NAFLD not cleared. Further studies are needed to elucidate the interrelationship between NAFALD, metabolic syndrome and insulin resistance.

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