CORRELATION OF HbA1c AND BODY MASS INDEX IN TYPE-2 DIABETES MELLITUS PATIENTS WITH AND WITHOUT ISCHEMIC HEART DISEASE

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ABSTRACT

INTRODUCTION: Man may be the captain of his fate, but he is also the victim of his blood sugar. A recent estimate suggested that diabetes was the fifth leading cause of death worldwide and was responsible for almost 4.6 million deaths annually. The cardiovascular diseases accounted for an estimated 1.4 million deaths in 2004 and it is likely to be 2.1 million in 2021.. It has been estimated that 75% of the deaths in diabetic patients may be attributed to coronary artery disease. HbA1C and body mass index (BMI) is a significant predictor for type 2 DM. Our study mainly aims to find the correlation of HbA1C and BMI in type 2 DM patients with and without ischemic heart disease.

MATERIAL AND METHOD: A case-control study was done on 100 type2 DM patients attending Guru Nanak Dev Hospital, Amritsar, Punjab, India and divided into 2 groups each consist of 50 patients based on the presence or absence of ischemic heart disease.

RESULT: BMI (p=.002) and HbA1C (p=.001) was significantly high in Type 2 DM patients with ischemic heart disease as compared to non-ischemic heart disease.

CONCLUSION: From the study it was concluded that body mass index and HbA1C was significantly high in Type 2 DM patients with ischemic heart disease as compared to non-ischemic heart disease. Both BMI and HbA1C was important predictor for the development of ischemic heart disease in type 2 DM patients.

KEYWORDS : body mass index; HbA1c; type 2 diabetes mellitus; coronary artery disease

INTRODUCTION:

A recent estimate suggested that diabetes was the fifth leading cause of death worldwide and was responsible for almost 4.6 million deaths annually (8.2% of deaths worldwide).(1) Cardiovascular diseases (CVD), comprising coronary heart (CHD) and cerebro-vascular diseases, are currently the leading cause of death globally, accounting for 21.9% of total deaths and are projected to increase to 26.3% by 2030.(2) According to the National Commission on Macro-economics and Health, there would be around 62 million patients with CAD by 2016 in India.(3) Diabetes is an important risk factor for the development of CAD. It has been estimated that 75% of the deaths in diabetic patients may be attributed to CAD.(4) Most of the patients with uncontrolled DM and high HbA1c have a high level of serum cholesterol, triglyceride, LDL, VLDL and low level of HDL. HbA1can be used as a predictor for hyperlipidaemia and hence as a risk factor for atherosclerosis.(5) HbA1c is therefore not only a key indicator of glycemic control for patients with diabetes, but also an important marker for cardiovascular disease. (6) Obesity is not only a predisposing risk factor for the development of dyslipidemia, hypertension and diabetes mellitus, but also a significant predictor for IHD. Lower BMI is associated with lower IHD risk among people in the normal range of BMI values (20-25 kg/m).(7) Various studies had confirmed that HbA1c is more in type 2 DM patients with ischemic heart disease as compared to non-ischemic.(8) (9) (10) whereas few studies could not confirm this association.(11) (12) Similarly various studies shows BMI is high in type 2 DM patients with ischemic heart disease compared to non-ischemic. (13) (14)

MATERIALS AND METHODS:

Ethics: The approval of institutional thesis and ethical committee was granted before initiating the present cross-sectional study. The study subjects were informed about the study procedure and written informed consent was taken.

Study Design: A case-control study was conducted on 100 type 2 DM patients which further divided into 2 groups on the basis of presence or absence of ischemic heart disease, attending Guru Nanak Dev Hospital, Amritsar, Punjab India. Out of 100 Type 2 DM patients, 50 were having Ischemic heart disease (Group A) and 50 were non-ischemic (Group B).

Inclusion criteria: Patients who are known cases of type 2 diabetes mellitus above 35 years of age.

Exclusion criteria: Type 1 diabetes mellitus, Gestational diabetes mellitus, Maturity-onset diabetes of the young.

A standard questionnaire was used which included a detailed history and examinations. All the study subjects were then subjected to RBS, FBS, two-hour plasma sugar, HbA1C and BMI. T2DM were diagnosed based on standard ADA criteria.(15) Diagnosis of ischemic heart disease was made on clinical history/examination and ECG showing characteristics changes in QRS complex, ST-T segments and T- wave and echocardiography was done wherever necessary

Statistics: For the purpose of making comparisons the study population was divided into 2 groups, Group A consists of Type 2 Diabetes mellitus with Ischemic heart disease and Group B consists type 2 DM without ischemic heart disease. Systematically collected and compiled data was statistically analyzed using IBM SPSS 22.0 software to draw cross-tabs and make relevant conclusions. The data was expressed as means, standard deviation, number and percentages. One way x2-test (Chi-square test) was applied to calculate p values. The p value of <0.05 was considered as significant, p-value of <0.001 as highly significant and p-value of >0.05 was considered as non-significant.

RESULT:

Group A consisting of 50 patients of type 2 DM with ischemic heart disease, 19 (38%) were male and 31 (62%) were female where as in group B consisting of 50 patients of type 2 DM alone, 22 (44%) were male and 28 (56%) were female. The mean age of group A was 59.78 ± 9.78 years and group B was 54.78 ± 12.42 years. Mean Body mass index (BMI) in group A was 30.65 ± 2.26 and in group B was 27.86 ± 5.83 which reflects that BMI was important risk factor for ischemic heart disease in type 2 DM patients. (p=0.002).The mean HbA1C in group A and group B was 9.57 ± 1.37 and 8.50 ± 1.74 respectively, which concludes that HbA1C was significant predictor for development of ischemic heart disease in type 2 DM patients.(p=.001)
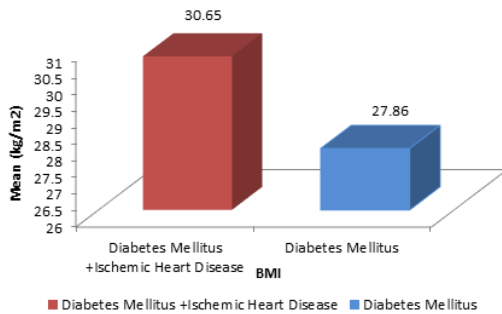
Graph shows the mean BMI of the patients of Group A was 30.65 ± 2.26 and Group B was 27.86 ± 5.83. Significant difference was found in the BMI of these 2 groups. (p=0.002)
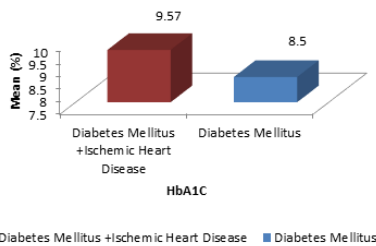
Graph shows the mean HbA1C of the patients was 9.57 ± 1.37 in Group A and was 8.50 ± 1.74 in Group B. Significant difference was found in the HbA1C in these 2 groups. (p=0.001)

DISCUSSION:

The cardiovascular diseases accounted for an estimated 1.4 million deaths in 2004 and it is likely to be 2.1 million in 2021. An estimated 6.7 million people were hospitalised for cardiovascular diseases in 2004, and projected to be 10.9 million by 2021.(16) Diabetes is an important risk factor for the development of CAD. It has been estimated that 75% of the deaths in diabetic patients may be attributed to CAD. (4) Patients with diabetes develop CAD at an accelerated rate and have a higher incidence of heart failure, myocardial infarction and cardiac death than their non-diabetic counterparts.(13) Advancing age, uncontrolled DM, increased BMI, dyslipidemia, smoking and sedentary habits are associated with increased evidence of CAD in diabetes.

Present study conducted on 100 Type 2 DM patients, 50 were having Ischemic heart disease (Group A) and 50 were non- ischemic (Group B). In group A out of 50 patients 19 (38%) were male and 31 (62%) were female. In group B out of 50 patients 22 (44%) were male and 28 (56%) were female. However study done by Peters SA et al the excess risk of IHD observed in men compared with women. (17)

Mean age of group A was 59.78 ± 9.78 years and group B was 54.78 ± 12.42 years. Study shows, as the age progress, there was a significant increase in the incidence of ischemic heart disease in the patients having type 2 DM. Similar results were found by Jousilahti P et al on 14 786 Finnish men and women 25 to 64 years old at baseline. An increase in risk factor levels was associated with the age-related increase in CHD incidence and mortality in both sexes. (18) Another study done by Kuwabara K et al on 19,874 patients and divide into 3 groups (under 65 years, 65-74 years,75 years or older) and found that proportion of angina was significantly different among three age categories (angina 72%, 75%, 71.4% respectively). Age had a modest impact on IHD.(19)

The mean HbA1c of study group A (type 2 DM with IHD) was 9.57± 1.37 and group B (type 2 DM without IHD) was 8.57± 1.74 with significant difference (p= 0.001) concluded that HbA1c was a significant predictor for development of IHD in type 2 DM patients. Study conducted by Ma X et al on 272 subjects found that HbA1c level were significantly higher in CAD group than those in non CAD group (p=0.01).(10) Similarly study conducted by Liu XJ et al found

that the Global Registry of Acute Coronary Events was positively associated with HbA1c level and there is increased risk of major adverse cardiac events with increasing HbA1c. (8) However Study by Ertem AG et al found no significant relationship could be determined between HbA1C and patients with non-diabetic acute coronary syndrome. (11) Di AE et al found that additional assessment of HbA1c values in the context of cardiovascular disease risk assessment provided little benefit in predicting the cardiovascular disease risks. (12)

Body mass index relates to the dyslipidemia and indirectly associated with increased risk of coronary artery disease. The BMI cut point for screening overweight or obese Asian Americans for pre-diabetes and type 2 diabetes was changed to 23 kg/m2 (vs. 25 kg/m2) to reflect the evidence that this population is at an increased risk for diabetes at lower BMI levels relative to the general population. (13) Mean Body mass index (BMI) in group A was 30.65 ± 2.26 and in group B was 27.86 ± 5.83 which reflects that BMI was important risk factor for ischemic heart disease in type 2 DM patients. (p=0.002). In a study conducted by Crump C et al on 38142 men diagnosed with IHD in 39.7 million person-years of follow-up. High BMI was associated with higher risk of IHD, adjusting for family history and socioeconomic factors. The combination of high BMI (overweight/obese vs normal) was associated with highest IHD risk (incidence rate ratio, 3.11; 95% CI, 2.91-3.31; P<0.001). (14) Study done by Appiah D et al on 1691 participants, who were enrolled in the coronary artery risk development in young adults study, aged 40 years or more, who had follow-up examinations 5 and 10 years later on. BMI trends were positively associated with 10-year change in American Heart Association atherosclerotic cardiovascular disease (ASCVD) risk scores (0.07% per 1 kg/m2 increase. (20) Alkhawam H et al on found that BMI ≥30 appears to be a risk factor for early development of CAD. (21) Similarly Lu Y et al concluded that both overweight (BMI ≥25 to <30 kg/m2) and obesity (BMI ≥30 kg/m2) were associated with a significantly increased risk of coronary heart disease (with 50% of the excess risk of overweight and 44% of the excess risk of obesity for coronary heart disease).(22)

This study was done on a small number of patients for relatively short duration of time, so further larger studies are needed with a longer duration in order to exactly determine the correlation of BMI and HbA1C in type 2 DM patients with and without ischemic heart disease.

CONCLUSION:

From the study it was concluded that body mass index and HbA1C was significantly high in Type 2 DM patients with ischemic heart disease as compared to non-ischemic heart disease. Both BMI and HbA1C were important predictors for the development of ischemic heart disease in type 2 DM patients. By reducing BMI and HbA1C level, the incidence of coronary artery disease in type 2 DM patients can be decreased.

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