Original Article

Hyperhomocysteinaemia and Cardiovascular Diseases In Diabetes

Association Between Hyperhomocysteinaemia and Cardiovascular Diseases In Type-II Diabetes

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ABSTRACT

Objective: To study the relationship between cardiovascular diseases and increased level of homocysteine in Type II diabetes. Our study was aimed to find out the Hyperhomocystenemia as a marker for early prediction of Cardiovascular (CVD) diseases in patients suffering from Type II diabetes mellitus.

Study Design: Prospective study.

Place and Duration of Study: This study was conducted at Baqai Institute of Diabetology & Endocrinology (BIDE) and Agha Khan University (AKU), Karachi, Pakistan from July 2016 to Oct. 2016.

Materials and Methods: The study included a total of eighty (80) Type II diabetes (40 Males and 40 Females) and forty (40) healthy subjects were selected as Control. All biophysical parameters and biochemical tests were done using standard procedures.

Results: Body weight, body mass index (BMI) and waist circumference were found to be significantly ($p<0.01$) increased when compared with control values. The triglyceride, total homocysteine and fasting plasma glucose (FPG) were markedly high in diabetes as compared to control. The Vitamin B12 and Folic acid levels were significantly ($p<0.05$) decreased in diabetes as compared to control values.

Conclusion: The outcome of this study reveals that high homocysteine level, high triglyceride level and decreased Vitamin B12 and Folic acid levels can be categorized as strong risk factor for early cardiovascular diseases.

Key Words: Homocystein, glucose, Type-II diabetes, triglycerides, vitamin B12, cardiovascular disease.

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INTRODUCTION

Diabetes Mellitus (DM) is a disease of long term duration due to deficiency of insulin or its function[1]. Common complications which usually occurs due to increase blood glucose level are microvascular and macrovascular complication of cardiovascular diseases, diabetic nephropathy, diabetic neuropathy and diabetic retinopathy[2,3]. It has been observed that even mild impairment of glucose tolerance causes atherosclerosis[4]. In diabetic patients homocysteine level is usually found to be high[5,6] and this elevated homocysteine level is considered as strong risk factor for cardiovascular events[7,8].

The aim or target of our study was to find out the relationship between Homocysteine, Vitamin B12 and Folic acid levels for predicting as risk factor for early cardiovascular diseases or whether there is any link between hyperhomocysteinemia and cardiovascular diseases in Type II diabetes.

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MATERIALS AND METHODS

We randomly selected eighty (80) patients (40 Males and 40 Females) Type II diabetes for this Prospective study. The patients were given a set of questionnaire to obtain information on demographic characteristics. We included strictly obese Type II diabetes with age >40 years. Exclusion criteria included those patients suffering from liver, kidney, cereberovascular diseases and patient suffering from Type I diabetes mellitus were excluded. Forty (40) volunteers consists of twenty (20) males and twenty (20) females, age ranges between 40-70years were randomly selected and included as Control.

The study was approved by Ethic Review Committee of Baqai Medical University.

Blood samples were collected and centrifuged. Plasma total cholesterol, triglyceride, high density lipoprotein cholesterol (HDLC) were estimated enzymatically. Plasma low density lipoprotein cholesterol (LDLC) was also calculated. Plasma glucose levels were determined by autochemical analyzer. HPLC was used for estimation of plasma Vitamin B12 and Folic acid.

Statistical Analysis: Statistical analysis was performed using SPSS (version 19) for all results. Biochemical parameters were calculated as mean ± SD. Student t-

test was performed to determine difference between means. In all statistical analyses performed, p-value <0.05 were considered statistically significant (S), while p>0.05 statistically insignificant. P value <0.01 was considered highly significant (HS).

RESULTS

Eighty (80) subjects were included in our study. The mean age of the study participants was 54±11.52 years. When compared to control significant increase in body weight and body mass index (BMI) (p<0.001) were found. There was also significant increase in waist circumference (WC) (p<0.012) in Type II diabetes. (Table 1).

Table No.1: Characteristics of cases and control

Characteristics	Diabetics	Control subjects	p-Value
	n = 80	n = 40	
Body Weight (kg)	69 ±10.4	59±8.3	p<0.01
Height (m)	1.18±5.0	1.49±3.90	p<0.02
BMI (kg/m2)	29±3.6	22±2.9	p<0.01
WC (cm)	80.2±7.5	71.5±3.5	p<0.05

BMI= Body Mass Index; Kg= kilogram; m= metre; Kg/m^2=kilogram/ $metre^2$;
WC= waist circumference; Cm= centimetre

Table No. 2: Biochemical Parameters of the Subjects

Parameters	Diabetic subjects	Control Subjects	p-Value
	n = 80	n = 40	
FPG (mmol/L)	6.98±3.9	3.98±0.7	p<0.01
tHcy (mmol/L)	9.92±2.4	7.01±1.98	P<0.02
TC (mmol/L)	4.58±1.19	4.11±1.68	p>0.05
TG (mmol/L)	1.70±0.5	1.20±0.25	p<0.03
HDLC(mmol/L)	0.96±0.13	1.06±0.20	p>0.05
LDLC (mmol/L)	3.10±1.06	2.80±0.01	p>0.05
HDLC/ TC	0.29±0.1	0.30±0.1	p>0.05
LDLC/ TC	0.45±0.12	0.54±1.09	p>0.05
Folic acid(µg/L)	51.23±1.78	58±1.08	P<0.001
Vitamin B12 (µg/L)	46.43±0.61	57±0.90	P<0.01

FPG = Fasting Plasma Glucose; tHcy= Total Homocysteine; TC= Total Cholesterol; TG= Triglyceride; HDLC= High Density Lipoprotein Cholesterol; LDLC= Low density Lipoprotein Cholesterol; mmol/L= millimol per litre; µmol/L= micromol per litre; µg/L= microgram per litre

Total homocysteine (p<0.01), fasting plasma glucose (p<0.002) and triglyceride (p<0.02) were significantly higher , while plasma folic acid and vitamin B12 (p<0.01) were significantly decreased in the Diabetes mellitus group as compared to control values (Table 2). Table 3 outlined total homocysteine, plasma glucose, lipids, lipoproteins, folic acid and vitamin B12 in male and female diabetes patients. In male the plasma total homocysteine (p<0.001) and folic acid (p<0.02) were high significantly when compared with female values. Plasma triglyceride (p<0.002) and Vitamin B12 (p<0.03) in male patients were significantly decreased when compared with female patients.

Table No. 3: Biochemical Parameters in Diabetic Patients With Gender

Parameters	Diabetics patients		p-Value
	Males	Females	
	n = 40	n = 40	
FPG (mmol/L)	7.98±3.6	6.9±2.3	p>0.05
tHcy (mmol/L)	12.01±1.6	8.9±1.2	P<0.01
TC(mmol/L)	5.48±0.07	5.98±0.2	p>0.05
TG (mmol/L)	2.08±0.9	2.98±0.1	P<0.02
HDLC (mmol/L)	3.01±0.12	2.98±0.1	P>0.05
LDLC (mmol/L)	3.47±0.1	3.94±0.2	p>0.05
BMI (kg/m2)	27.01±3.9	29.01±0.4	p>0.05
HDLC/ TC	0.29±0.02	0.21±0.07	p>0.05
LDLC/ TC	0.51±0.09	0.50±0.11	p>0.05
Folic acid (µg/L)	51.50±1.01	50.72±1.01	P<0.05
Vitamin B12 (µg/L)	45.62±1.11	47.09±0.84	P<0.05

FPG = Fasting Plasma Glucose; tHcy=Total Homocysteine; TC=Total Cholesterol; TG=Triglyceride; BMI=Body Mass Index; HDLC=High Density Lipoprotein Cholesterol; LDLC= Low density Lipoprotein Cholesterol; µg/L = microgram per litre

DISCUSSION

Most common cause of mortality in long term diabetes is cardiovascular disease[8,9]. The participant patients in this study was determined for plasma homocysteine, folic acid, lipids, Vitamin B12 and lipoproteins levels. In this study we included mainly obese diabetic patients. Literatures reviewed elaborated that both, atherogenic and thrombogenic effects are associated with high level of plasma homocysteine level[10,11] as well as hyperhomocystenemia causes endothelial dysfunction, decreases the release of nitric oxide and causes impaired casodilatation[11]. Our study also showed and support the hypothesis that impaired metabolism of homocysteine contributes to development of cardiovascular diseases.

There is no correlation between other measured parameters and plasma total homocysteine level supporting earlier studies[12.13], reporting that plasma total homocysteine level is an independent risk factor for early cardiovascular diseases mortality[14,15]. Our study also correlate that female patients have decreased level of total homocysteine level than men.

CONCLUSION

From our study we have come to the conclusion that increased total homocysteine, triglyceride level and

decreased Vitamin B12 and Folic acid levels along with increased waist circumference are strong risk factor for development of cardiovascular diseases in Type II diabetis mellitus subjects.

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Author's Contribution:

Concept & Design of Study:	Muhammad Ali Shakir
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Conflict of Interest: The study has no conflict of interest to declare by any author.

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