Lipid Profile and Serum Magnesium levels in Patients with Type-2 Diabetes

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ABSTRACT

Hyperlipidemia is relatively common problem in patients with poorly controlled Diabetes Mellitus. Fifty (50) subjects of either sex were included in the present study; the age of the subjects was ranging from 30-80 years. A statistically highly significantly decrease ($T=4.26$; $p<0.001$) in serum HDL-C level was observed in diabetic subjects as compared to the healthy control subjects. A statistically very significant decrease ($t=3.42$; $p<0.01$), serum Mg^{++} level was observed in diabetic subjects as compared to the healthy control subjects. This study supports the dietary recommendations to increase consumption of major food sources of magnesium, such as whole grains, nuts and green leafy vegetables. JMS 2014; 17 (1): 11-15

Keywords: Hyperlipidemia, Dyslipidemia, Magnesium, Dietary Recommendations

INTRODUCTION

Diabetes is a disease in which the body does not produce or properly use insulin. The cause of diabetes continues to be a mystery, although both genetic and environmental factors such as obesity and lack of exercise play major roles. NIDDM or type -2 Diabetes is the most common type of Diabetes. It occurs when glucose binds up in the blood due to the body's inability to use insulin effectively and it is characterized by peripheral insulin resistance, β cells failure and increased hepatic glucose production. These abnormalities interact in a complex fashion to cause and sustain hyperglycemia but there is a continuing controversy over which of these abnormalities may be primary.

Lipoproteins main function is to transport lipids and lipid soluble materials throughout the body. Dyslipidemia is a disorder of lipoprotein metabolism, including lipoprotein overproduction and deficiency. They may manifest as one of the following elevation of total cholesterol, low density lipoprotein (LDL), cholesterol and triglyceride levels or as decreased high density lipoprotein (HDL) cholesterol levels. Dyslipidemia comes under consideration in many situations including Diabetes and common cause of

lipidemia.

Magnesium is an essential nutrient for all organisms, and its importance in normal function in cells and enzyme is well established. It acts as biocatalyst for phosphorylation of glucose. Magnesium has a role in insulin sensitivity. Insulin dependent uptake of glucose is reduced in magnesium deficiency. In view of wide spread biochemical disturbance, it is logical to suspect variation in magnesium metabolism in Diabetes.

METHODS

Fifty (50) subjects of either sex were included in the present study, the age of the subjects was ranging from 30-80 years. The selected Type- 2 Diabetic patient(25) were regularly attending the Diabetic clinic/Out Patient Department (OPD) or admitted in the wards of the Department of Medicine, HI Tech Hospital attached to High Tech Medical College, Bhubaneswar. The result was compared with age matched 25 healthy control subject of either sex.

The selected subjects were further grouped as:

Group 1:- Healthy control subjects ($n=25$) was ensured by routine examination that all the subjects were in good health and there were no signs and symptoms or no positive history of Diabetes.

Group 2:- This group comprised of 25 patients of either sex of varying age who were clinically diagnosed case of Non Insulin dependent Diabetes Mellitus.

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1. **Total Cholesterol** done by Enzymatic CHOD-PAP, end point method [Allian CC; 1974].
2. **Triglyceride** done by Enzymatic method GPO-PAP method (Fossati P, 1982).
3. **High Density Lipoprotein Cholesterol (HDL-C)** done by Phosphotungstic acid, end point [Finley PR, 1978]
4. **Very Low Density Lipoprotein [VLDL-C], and Low Density Lipoprotein Cholesterol [LDL-C]** was also calculated from the Friedewald's formula+.
5. **Magnesium [MG⁺⁺]** Colorimetric endpoint method, Xylidine blue method [Bohounc, 1962].

RESULTS

Fifty (50) subjects of either sex and 25 controls were included in the present study. A Statistically highly

significant increase ($t= 4.95$; $p<0.001$) in serum total cholesterol was observed in diabetic subjects as compared to the control. Diabetic males (147.62 ± 47.92) have statistically increased ($t= 1.99$; $p<0.05$) serum triglyceride level, Whereas in diabetic female (186.0 ± 47.68) statistically very significant elevated ($t= 3.05$; $p<0.01$) serum triglyceride value observed as compared to the healthy control females. A statistically highly significantly decreases ($T= 4.26$; $p<0.001$) in serum HDL-C level and statistically highly significant increases ($t= 4.82$; $p<0.001$) serum LDL level was observed in diabetic subjects as compared to the healthy control subjects. A statistically significant decrease ($t= 3.42$; $p<0.01$) in serum Mg⁺⁺ level was observed in diabetic subjects as compared to the healthy control subjects. (Table 1 -6)

Table 1: Mean Total Cholesterol Level (mg/dl) In Healthy Control Subjects & Diabetic Subjects

Groups Studied	Mean Total Cholesterol (mg/dl) (Mean±S.D) Range			Statistical Significance Male v/s Female
	Male	Female	Total	
Healthy Control (25)	178.35±30.45 (135.0-220.0) (14)	175.45±27.94 (121.0-209.0) (11)	177.08±28.81 (121.0-220.0) (25)	$t=0.41$ $p>0.05$ [NS]
Diabetic Subjects (25)	213.93±30.25 (166.0-264.0) (16)	221.77±28.25 (160.0-250.0) (9)	216.76±27.92 (160.0-264.0) (25)	$t=0.66$ $p>0.05$ [NS]

Table 2: Mean Triglyceride Level (mg/dl) In Healthy Control Subjects and Diabetic Subjects

Groups Studied	Mean Triglyceride Level (mg/dl) (Mean±S.D) Range			Statistical Significance Male v/s Female
	Male	Female	Total	
Healthy Control (25)	115.42±40.67 (74.0-162.0) (14)	131.36±27.40 (74.0-168.0) (11)	118.44±33.95 (74.0-168.0) (25)	$t=1.16$ $p>0.05$ [NS]
Diabetic Subjects (25)	147.62±47.92 (85.0-257.0) (16)	186.0±47.68 (97.0-265.0) (9)	161.44±50.46 (85.0-265.0) (25)	$t=1.92$ $p>0.05$ [NS]

Table 3: Mean Very Low Density Lipoprotein (VLDL) Level (mg/dl) Healthy Control Subjects and Diabetic Subjects

Groups Studied	Mean VLDL Level (mg/dl) (Mean±S.D) Range			Statistical Significance Male v/s Female
	Male	Female	Total	
Healthy Control (25)	21.65±7.20 (14.8-32.4) (14)	26.27±5.40 (18.8-33.6) (11)	23.68±6.79 (14.8-33.6) (25)	t=1.83 p>0.05 [NS]
Diabetic Subjects (25)	29.52±9.58 (17.0-51.4) (16)	37.2±9.53 (19.4-53.0) (9)	32.28±10.09 (17.0-53.0) (25)	t=1.93 p>0.05 [NS]

Table 4: Mean High Density Lipoprotein (HDL) Level (mg/dl) In Healthy Control Subjects and Diabetic Subjects

Groups Studied	Mean HDL Level (mg/dl) (Mean±S.D) Range			Statistical Significance Male v/s Female
	Male	Female	Total	
Healthy Control (25)	44.78±8.63 (31.0-58.0) (14)	42.36±8.57 (30.0-58.0) (11)	43.72±8.51 (30.0-58.0) (25)	t=0.70 p>0.05 [NS]
Diabetic Subjects (25)	33.81±9.25 (21.0-52.0) (16)	32.77±7.67 (27.0-43.0) (9)	33.44±8.56 (21.0-52.0) (25)	t=0.30 p>0.05 [NS]

Table 5: Mean Low Density Lipoprotein (LDL) Level (mg/dl) In Healthy Control Subjects and Diabetic Subjects

Groups Studied	Mean LDL Level (mg/dl) (Mean±S.D) Range			Statistical Significance Male v/s Female
	Male	Female	Total	
Healthy Control (25)	106.81±27.31 (63.0-161.0) (14)	111.91±36.66 (65.0-142.2) (11)	109.67±31.72 (63.0-161.6) (25)	t=0.40 p>0.05 [NS]
Diabetic Subjects (25)	150.6±28.93 (108.0-206.2) (16)	151.8±30.49 (86.8-193.8) (9)	151.03±28.86 (86.8-206.2) (25)	t=0.09 p>0.05 [NS]

Table 6 : Mean Serum Magnesium level (mg/dl) In Healthy Control Subjects & Diabetic Subjects

Groups Studied	Mean Magnesium Level (mg/dl)(Mean±S.D) Range			Statistical Significance Male v/s Female
	Male	Female	Total	
Healthy Control (25)	1.71±0.30 (1.6-2.2) (14)	1.76±0.33 (1.6-2.3) (11)	1.73±0.31 (1.6-2.3) (25)	t=0.41 p>0.05 [NS]
Diabetic Subjects (25)	1.48±0.30 (0.8-1.6) (16)	1.50±0.30 (0.9-1.9) (9)	1.49±0.29 (0.8-1.9) (25)	t=0.16 p>0.05 [NS]

Serum Glucose and Serum Lipid Profile in Healthy Control & Diabetic Subjects

Serum Magnesium in Healthy Control & Diabetic Subjects.

DISCUSSION

Hyperlipidemia is relatively common problem in patients with poorly controlled Diabetes Mellitus. It has been estimated that the frequency of elevated serum cholesterol is found more in obese patients in comparison to lean thin patients. The raised level of cholesterol has been reported by Albrink (1963) and Knewles (1965). Similar type of observation has been reported by Sharma (1970) and Gylling H (1996). These finding are in accordance with those of Abraham (1982), Dunn (1984), Howard (1987), Cappack SW (1997) and Laakso M (2002) as they have reported in their study an increase level of VLDL in Diabetic patients.

A statistically highly significantly decrease ($T=4.26$; $p<0.001$) in serum HDL-C level was observed in diabetic subjects as compared to the healthy control subjects. This finding is in accordance with the study of Gott (1992), Byrne (1994), Duell (1991) as they have reported the decrease level of HDL-C in Diabetic patients. In Diabetes, there is low HDL cholesterol, especially HDL and apolipoprotein A1 due to increased catabolism but with its production in normal range [Garg, 1988]. Elevated hepatic lipase activity also may contribute to the decrease in HDL-C concentration in Diabetes Mellitus, since this also play a key role in the metabolism of HDL. The changes in lipoprotein and hepatic lipase may act in concert to decrease HDL-C levels in Diabetes Mellitus [Harno, 1980].

A statistically highly significant increases ($t=4.82$; $p<0.001$) serum LDL level was observed in diabetic subjects as compared to the healthy control subjects. These findings are in accordance with the studies of Chase (1976), Sosenko (1980) and Harris (1991), as they has reported in their study an increased level of LDL cholesterol in diabetic patients.

A statistically very significant decrease ($t=3.42$; $p<0.01$), serum Mg^{++} level was observed in diabetic subjects as compared to the healthy control subjects. Willet et al (2004) has reported a significant inverse association between magnesium intake and diabetic risk. This study supports the dietary recommendations to increase consumption of major food sources of magnesium, such as whole grains, nuts and green leafy vegetables.

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