Research Article

Dyslipidemia in diabetes mellitus: a hospital based study

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Abstract

Introduction: Metabolic syndrome has become increasingly common all over the world. It is characterized by a constellation of metabolic risk factors in one individual. The root causes of the metabolic syndrome are overweight/obesity, physical inactivity, and genetic factors. The metabolic syndrome is closely associated with a generalized metabolic disorder called insulin resistance, in which tissue responsiveness to the normal action of insulin is impaired. Some individuals are genetically predisposed to insulin resistance; in these persons, acquired factors (excess body fat and physical inactivity) elicit insulin resistance and the metabolic syndrome. **Aims and Objectives:** To assess the Dyslipidemia in Diabetic patients using ATP-3 guidelines. **Material and Method:** In the present study two groups were formed (diabetic and control group). Lipid profile of all the selected patients was done and compared. **Results:** Borderline high to high Serum Cholesterol was found in 60 % diabetics' patients. Borderline and high Serum Triglycerides were observed in 36% diabetic patients and in only 6% in control group. Only 16% diabetics had optimal LDL Cholesterol level. High HDL cholesterol was observed that 68% diabetic patients. **Conclusion:** Dyslipidemia and diabetes are strongly associated with each other.

Keywords: Dyslipidemia, diabetes mellitus.

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INTRODUCTION

Metabolic syndrome has become increasingly common all over the world. It is characterized by a constellation of metabolic risk factors in one individual. The root causes of the metabolic syndrome are overweight/obesity, physical inactivity, and genetic factors. The metabolic syndrome is closely associated with a generalized metabolic disorder called insulin resistance, in which tissue responsiveness to the normal action of insulin is impaired. Some individuals are genetically predisposed to insulin resistance; in these persons, acquired factors (excess body fat and physical inactivity) elicit insulin resistance and the metabolic syndrome. Most persons with insulin resistance have abdominal obesity. The mechanistic connections between insulin resistance and metabolic risk factors are not fully understood and appear to be complex. [1-5] Various risk factors have been included in the metabolic syndrome. As per **ATP3** guidelines[1-5] abdominal obesity, atherogenic dyslipidemia, raised blood pressure, insulin resistance with or without glucose intolerance etc are generally accepted as being characteristic of metabolic syndrome. Lots of studies have been conducted and reported in literature about correlation of metabolic syndromes and dyslipidemia. This study has been conducted to compare individual components of the metabolic syndromes (Diabetes Mellitus, Hypertension, Obesity, Hyperlipidemia) in Indian population using ATP3 guidelines. Cholesterol is a fat-like substance (lipid) that is present in cell membranes and is a precursor of bile acids and steroid hormones. Cholesterol travels in the blood in distinct particles containing both lipid and proteins (lipoproteins). Three

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major classes of lipoproteins are found in the serum of a fasting individual: low density lipoproteins (LDL), high density lipoproteins (HDL), and very low density lipoproteins (VLDL). Another lipoprotein class, intermediate density lipoprotein (IDL), resides between VLDL and LDL; in clinical practice, IDL is included in the LDL measurement. LDL cholesterol typically makes up 60–70 percent of the total serum cholesterol. LDL is the major atherogenic lipoprotein[1,2,3,4,6,7] and has long been identified by NCEP[1-4] as the primary target of cholesterol- lowering therapy. This focus on LDL has been strongly validated by recent clinical trials, which show the efficacy of LDL-lowering therapy for reducing risk for CHD. The diabetes leads to dyslipidemia and which indirectly increases the risk of CHD.

AIMS AND OBJECTIVES

To assess the Dyslipidemia in Diabetic patients using ATP-3 guidelines.

MATERIAL AND METHODS

The present study was conducted at Tertiary care teaching medical College and Hospital for the duration of 2 years. Randomly selected diabetic patients attending O.P.D. and I.P.D were selected for the study and were compared to control group (i.e. not suffering from diabetes mellitus). Thus two groups were formed.

Group A: Consist of Control group. Patients whose history, examination and blood investigations were negative for Hypertension (50 subjects).

Group B: Consist of patients diagnosed Diabetes mellitus New or Old (25 subjects).

Following criteria was used to select hypertensive patients.

As per American Diabetic Association (ADA) Guidelines the revised (current) criteria include

1. symptoms of diabetes and casual (i.e., regardless of the time of the preceding meal) plasma glucose ≥ 11.1 mmol/L (200 mg/dL);
2. Fasting plasma glucose (FPG) ≥7.0 mmol/L (126 mg/dL); or 2-h postload glucose ≥11.1 mmol/L (200 mg/dL) during an oral glucose tolerance test (OGTT)[1].

If any one of these three criteria is met, repeat testing on a subsequent day was done to confirm the diagnosis. Repeat testing was not necessary in patients who have unequivocal Hyperglycemia with acute metabolic decompensation. All the subjects were selected between Age Group of 20 -70years. Informed consent was taken from all the participants. Details of all the subjects were noted on a prestructured proforma. Details about name, age, sex, finding of general and systemic examination were noted. Lipid profile was done in all the subjects (i.e. group A and B). Lipid profile was estimated using CHOP – PAP Method for Serum Cholesterol and GPO – PAP Method for Serum Triglycerides. HDL cholesterol was estimated by using corning express plus auto analyzer. LDL cholesterol levels can be measured in either serum or plasma but usually are determined indirectly by using the Friedewald formula.

Friedewald Formula

LDL cholesterol = total cholesterol - (HDL cholesterol - [Triglycerides/5]). The findings of lipid profile in hypertensive and control group were noted and were compared as per the **ATP-3 guidelines.** The obtained results were compared by using chi-square test.

Table 1: Distribution of study population according to Age, sex and BMI

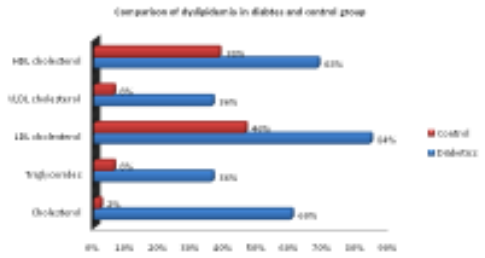
Variable		DM		Control		Significance
		No.	%	No.	%	
Age	20-30	2	8	2	4	χ^2=2.20, df=4, p>0.05
	31-40	1	4	6	12	
	41-50	6	24	9	18	
	51-60	8	32	19	38	
	61-70	8	32	14	28	
Sex	Male	18	72	39	78	χ^2=0.33, df=2, p>0.05
	Female	7	28	11	22	
BMI	< 18.5	5	20	31	62	χ^2=11.79, df=2, p<0.005
	18.5-24.9	16	64	15	30	
	25 - 29.9	4	16	4	8	
	30-34.9	0	0	0	0	

It was observed that majority of the study population was above 50 years of age in both the groups (hypertensive and control group). Whereas sexwise distribution showed that majority of the population was male. The difference in age and sexwise distribution between both the groups was statistically insignificant and thus the both the groups are comparable. It was observed that BMI of hypertensive group was more as competed to the control group. And the difference was statistically significant.

Table 2: Distribution of subjects according to lipid profile

Parameter	Levels		DM		CONTROL		Significance
			No.	%	No.	%	
Cholesterol	<200	Normal	10	40	49	98	χ^2=33.69, df=2, p<0.000
	200 – 239	borderline high	8	32	00	0	
	≥ 240	high	7	28	01	2	
Sr. Triglycerides	< 150	Normal	16	64	47	94	χ^2=11.47, df=2, p<0.001
	150 – 199	Borderline	8	32	3	6	
	200 –499	High	1	4	0	0	

	> 500	Very high	0	0	0	0	
	<100	Optimal	4	16	27	54	
	100-129	above optimal	6	24	20	40	
LDL cholesterol	130-159	Borderline high	8	32	2	4	χ^2=28.35, df=4, p<0.000
	160-189	High	5	20	0	0	
	≥ 190	Very High	2	8	1	2	
VLDL cholesterol	≤ 30	Normal	16	64	47	94	χ^2=11.16, df=1, p<0.000
	>30	High	9	36	3	6	
HDL cholesterol	<40	Normal	8	32	31	62	χ^2=6.01, df=1, p<0.05
	≥40	High	17	68	19	38	
	< 18.5 kg/mts²	Underweight	5	20	31	62	
BMI	18.5-24.9	Normal	16	64	15	30	χ^2=11.79, df=2, p<0.005
	25 - 29.9	Overweight	4	16	4	8	
	30-34.9	Obese	0	0	0	0	



Borderline high to high Serum Cholesterol was found in 60 % diabetics' patients. While, 98% belonging to the control group had Normal Serum Cholesterol level. Thus Hypercholesterolemia was more commonly observed in hypertensive patients with statistically significant difference. Borderline and high Serum Triglycerides were observed in 36% diabetic patients and in only 6% in control group. The observed difference in these two groups was also statically significant. In this study 54% of patients belonging to control group had optimal LDL Cholesterol level. While 16% diabetics had optimal LDL Cholesterol level. The difference in the LDL levels in hypertensive and control group was also statically significant. VLDL levels more than 30 was observed in 36% hypertensive group whereas 6% in control group. While measuring HDL cholesterol it was observed that 68% diabetics had levels more than 40 whereas in control group 38% had levels more than 40. The difference HDL cholesterol level in hypertensive and control group was statistically significant.

DISCUSSION

In the present study we studied the association of dyslipidemia in diabetic patients and compare the results with the control group. The majority of the subjects in the study were male and more than 50 years of age. The body mass index was more in diabetic groups and the difference was statistically significant. As per ATP3 guidelines[1-5] Dyslipidemia (hypertriglyceridemia and low levels of high-density lipoprotein cholesterol), elevated blood pressure, impaired glucose tolerance, and central obesity is identified now as METABOLIC SYNDROME. The predominant underlying risk factors for the syndrome appear to be abdominal obesity [8,9,10] and insulin resistance; other associated conditions can be physical inactivity, aging, and hormonal imbalance. An atherogenic diet (eg, a diet rich in saturated fat and cholesterol) can enhance risk for developing cardiovascular disease in people with the syndrome. Although this diet is not listed specifically as an underlying risk factor for the condition. An interesting feature of upper-body obesity is an unusually high release of nonesterified fatty acids from adipose tissue; this contributes to accumulation of lipid in sites other than adipose tissue. Ectopic lipid accumulation in muscle and liver seemingly predisposes to insulin resistance and dyslipidemia. When serum cholesterol levels were compared, it was observed that it was elevated in diabetic group as compared to control group with statistically significant difference. SB Hulley, JM Walsh and TB Newman *et al*[11] reported had Similar results I their study. Serum triglyceride was also observed to be increased in diabetic patients. Cecil M. Burchfiel *et al*[12] also stated similar findings in their study. Zhiyan Li, Ruifeng Yang, Guobing Xu and Tiean Xia[13] studied Serum Lipid Concentrations and Prevalence of Dyslipidemia in a Large Professional Population in Beijing. They found out that Hypercholesterolemia, hypertriglyceridemia, and abnormally low HDL-C have increased considerably over the past 20 years in professional populations in Beijing. Dietary changes and less physical activity resulting from rapid improvements in living conditions may be the

causes for the increase in dyslipidemia. Hypercholesterolemia and Hypertension are important risk factors for the development of micro- and macrovascular complications in people with diabetes. It was observed that in majority of diabetic patients, LDL and VLDL levels were above the normal levels (84% and 36% respectively). Robert Boizel *et al*[14] observed the similar finding in their study. While measuring HDL cholesterol it was observed that 68% diabetics had levels more than 40 whereas in control group 38% had levels more than 40mg/dl. The difference HDL cholesterol level in hypertensive and control group was statistically significant. Ettinger WH *et al*[15] also observed similar findings in their study. Dyslipidemia has long been associated with the metabolic syndrome and is present in at least 50% of subjects. Elevation of serum triglycerides and lowering of HDL-cholesterol are included in the NCEP-ATP III criteria[1-5], and together with preponderance of small dense LDL particles constitute the so-called "lipid triad". Excessive postprandial lipemia[6,7], accumulation of remnant particles, and elevation of free fatty acids are also important features of the dyslipidemia associated with the metabolic syndrome In addition, studies have shown that dyslipidemias an early and consistent component of insulin-resistance, and significant correlations have been established between insulin-resistance and components of the lipid triad[6,7].

CONCLUSION

Thus from the above discussion we could conclude that dyslipidemia and diabetes are strongly associated with each other.

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