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An Evaluative Study Of Serum Adiponectin And Lipid Profile Level In Newly Diagnosed Diabetic Patients In Garhwal Region, Uttarakhand.

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Abstract:
Background: Numerous lipids and lipoprotein imbalances in the blood, such as low incidence of HDL cholesterol, a high incidence of small, dense LDL cholesterol, and high triglycerides are associated with type 2 diabetes. Many people have type 2 diabetes issue while having high LDL cholesterol levels. These modifications are also a component of the metabolic syndrome, often known as the insulin resistance syndrome, which is frequently associated with type 2 diabetes in adults
Aim and Objectives: To evaluate the level of serum adiponectin and lipid profile in newly diagnosed type 2 diabetes mellitus cases and find out the association of serum adiponectin with lipid profile in them.
Methods: The present study takes place in Garhwal region Uttarakhand. A total number of 384 subjects (including 192 diabetic subjects as cases and 192 subject as control group) have been selected. The cases were newly diagnosed type 2 Diabetes mellitus. Patients with chronic illness, pregnancy, alcoholism, Type 1 diabetes were excluded from the study. Both genders, male and female with age group 30 -70 years were selected. Lipid profile and adiponectin were estimated for both groups.
Result: In our study we have observed increased levels of serum cholesterol, triglycerides, LDL and VLDL cholesterol in Diabetic cases as compared to control group, which was statistically significant (p value <0.01). HDL level was lower in diabetic cases as compared to control group, which was also statistically significant (p value <0.01). The level of serum adiponectin was lower in newly diagnosed subjects as compared to control group, which was also statistically significant (p value <0.01).
Conclusion: Adiponectin can be used as an important clinical biomarker and can be used as cut off to predict the occurrence of type 2 diabetes mellitus.

Keywords: Type 2 Diabetes, Lipid Profile and serum adiponectin.

Introduction :

Diabetes mellitus (DM) is the name given to a collection of common metabolic conditions that all exhibit the hyperglycemia phenotype. A complicated interplay of genetic and environmental variables results in the development of several unique forms of DM. Reduced insulin secretion, impaired glucose utilisation, and increased glucose secretion, based on the etiology of the DM, are all variables that contribute to hyperglycemia. The secondary pathophysiological alterations in several organ systems brought on by the metabolic dysfunction associated with DM place a heavy strain on both the individual and the healthcare system. End-stage renal failure (ESRD), non-traumatic lower extremity amputation, and adult blindness are all mostly brought on by diabetes mellitus. It also puts them at risk for cardiovascular problems. DM will probably continue to be the primary cause of mortality and morbidity in the future due to its rising incidence around the globe (J. Larry Jameson, 2010; Jameson J. Larry et al., 2018).
Numerous lipids and lipoprotein imbalances in the blood, such as low incidence of high-density lipoprotein (HDL) cholesterol, a high incidence of low-density lipoprotein (LDL) cholesterol, and high triglycerides are associated with type 2 diabetes mellitus. These modifications are also a component of the metabolic syndrome, often known as the insulin resistance syndrome, which is frequently associated with type 2 diabetes in adults (Gagel et al., 2022; Prasad et al., 2022).
The most common cause of mortality for those with Type 2 diabetes mellitus (T2DM) is heart disease (CAD), which has a two- to four- fold greater risk in persons with T2DM. Lipid disorders and hypertension are two significant modifiable indicators of risk for T2DM and associated CAD, that are responsible for more than 87% of impairment in nations with low or middle incomes. Additionally, pre-diabetes (a metabolic condition intermediate between

normal glucose and T2DM) has been discovered to be linked with a higher risk for cardiovascular disease (Bhowmik et al., 2018).

Diabetes patients with lipid abnormalities—often referred to as "diabetic dyslipidemia"—typically exhibit a high level of total cholesterol (T-Chol), excessive triglycerides (TGs), low levels of high-density lipoprotein cholesterol (HDL-C), and elevated amounts of tiny dense LDL particles. Levels of cholesterol with a low density (LDL-C) might be slightly elevated or normal. Patients with T2DM and pre-diabetes frequently have lipid abnormalities (Arshag D Mooradian, 2009; Carlos G Santos-Gallego & Robert S Rosenson, 2014), although the distribution of the various lipids might change by ethnicity, socio-economic status, and access to medical treatment (Bhowmik et al., 2018).

According to a newly released meta-analysis, aberrant levels of the mentioned lipid markers partially represent the possibility of T2DM. Additionally, investigations in individuals with T2DM have discovered a stronger correlation between atherosclerosis and elevated TGs and low HDL-C when these two lipid markers are evaluated together (Carlos G Santos-Gallego & Robert S Rosenson, 2014; Joshi et al., 2014; Rana et al., 2015).

In addition to serving as an inert repository for lipids, adipose tissue also secretes several bioactive chemicals known as adipokines that have an impact on overall body homeostasis. The most prevalent of these adipocytokines, adiponectin is known to regulate the absorption and utilisation of glucose and lipids (Aleidi et al., 2015) and makes up to 0.01% of all plasma proteins (Gil-Campos et al., 2004; Heiker et al., 2010). Collagen and the complement 1q family are homologous to adiponectin (Simpson & Whitehead, 2010). It is made up of 244 amino acids, that organise themselves into four distinct domains (Sheng & Yang, 2008). Peroxisome proliferator activated receptor-a (PPAR-a) and 50-adenosine monophosphate-activated protein kinase (AMPK) are two metabolic pathways that adiponectin controls (Fagerberg et al., 2011). Furthermore, it is crucial in suppressing the metabolic disturbances that lead to resistance to insulin and diabetes type 2 mellitus (type 2 DM) (Sheng & Yang, 2008). So, the purpose of the study is to evaluate the level of serum adiponectin with lipid profile in the newly diagnosed type 2 diabetes mellitus cases and find out the association of both the parameters with type 2 diabetes mellitus in them and whether they can be used as an important clinical biomarker in type 2 diabetes mellitus.

Aim and Objective: To evaluate the level of serum adiponectin and lipid profile in newly diagnosed type 2 diabetes mellitus cases and find out the association of both the parameters with type 2 diabetes mellitus in them.

Material and Methods:

This study takes place in Garhwal region Uttarakhand. A total of 384 subjects, both male and female, aged 30-70 years were taken for this study. Out of these subjects 192 served as cases and 192 as controls. The research did not include any patients with acute and chronic diseases, infections, pregnancy, a history of alcoholism, or had Type 1 diabetes. Lipid profile and adiponectin were estimated for both groups.

Statistical Analysis:

The statistical software for social sciences was used for the statistical analysis (SPSS). As necessary, several statistical techniques were applied. For quantitative data and frequency for categorical variables, mean SD was calculated. On all continuous variables, the independent t-test was run. Prior to any t-test, the data were verified for normal distribution. At $p < 0.05$, differences were deemed significant.

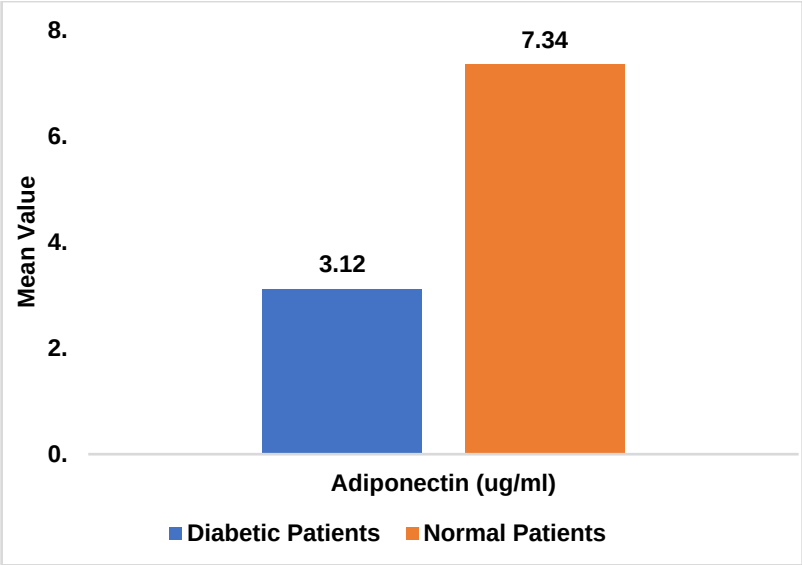
Result:

In our study we have observed higher level of serum cholesterol (225.71 ± 22.31 mg/dl), triglycerides (222.39 ± 39.51 mg/dl), LDL (144.54 ± 21.32 mg/dl) and VLDL (44.48 ± 7.90 mg/dl) in cases as compared to control group, which was statistically significant (p value <0.01). HDL level (36.40 ± 6.27 mg/dl) was low in cases as compared to control group, which was also statistically significant (p value <0.01). The level of serum adiponectin was low (3.12 ± 1.09 µg/ml) in newly diagnosed type 2 diabetes mellitus cases as compared to control group (7.34 ± 5.28 µg/ml), which was also statistically significant (p value <0.01).

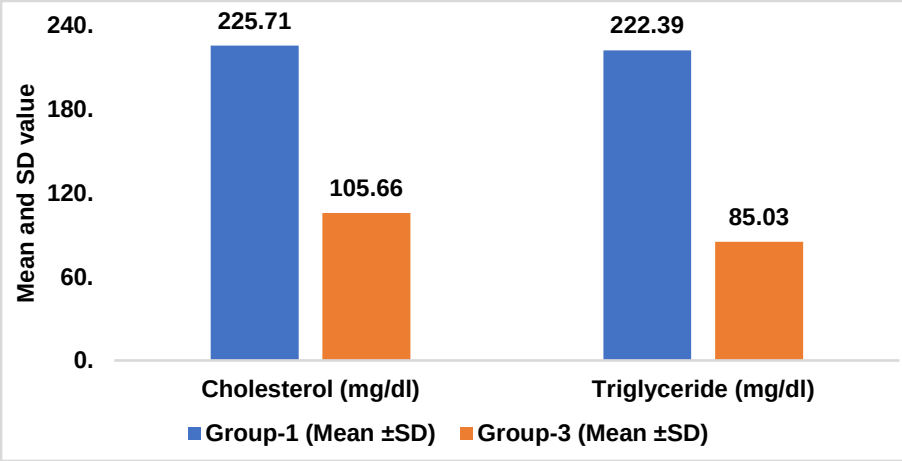
Biochemical Markers	Group-1 (T2DM) (Mean± SD)	Group-2 (Normal Subjects) (Mean± SD)	t-test (Mean difference)	p-value
Adiponectin (µg/ml)	3.12 ± 1.09	7.34 ± 5.28	13.027	<0.01*
Cholesterol (mg/dl)	225.71 ± 22.31	105.66 ± 26.01	6.15	<0.01*
Triglyceride (mg/dl)	222.39 ± 39.51	85.03 ± 15.34	13.36	<0.01*

HDL (mg/dl)	36.40 ± 6.27	42.23 ± 6.12	14.832	<0.01*
LDL (mg/dl)	144.54 ± 21.32	46.69 ± 24.71	4.436	<0.01*
VLDL (mg/dl)	44.48 ± 7.90	17.01 ± 3.06	13.383	<0.01*

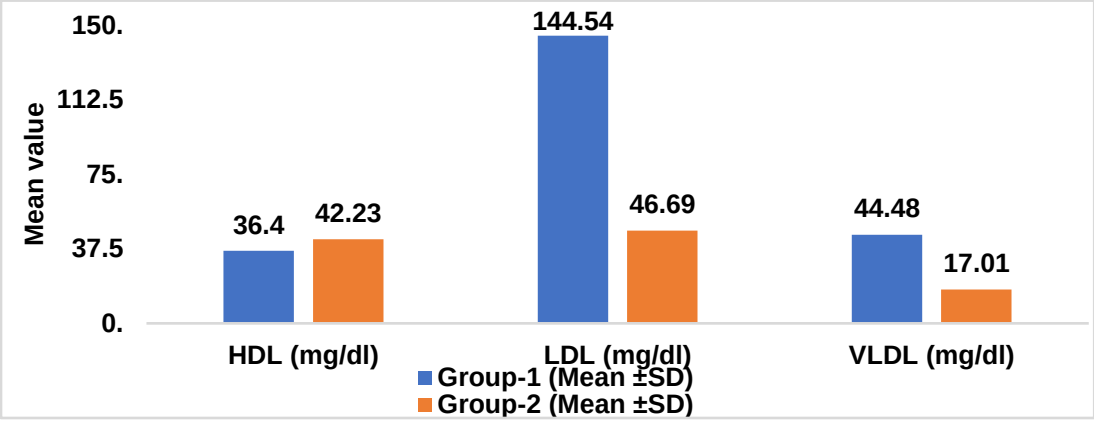
Table-1: Comparison of lipid profile between T2DM and normal subjects.



Graph Chart-1: Comparison of adiponectin between T2DM and normal subjects.



Graph chart-2: Comparison of serum cholesterol and triglycerides between T2DM and normal subjects.



Graph Chart-3: Comparison of serum HDL, LDL and VLDL between T2DM and normal subjects.

Discussion:

The value of total cholesterol and triglycerides were higher in T2DM subjects as compared to control group, which was statistically highly significant (p-value <0.01). The value of HDL was lower as compared to control group, the LDL and VLDL concentration were higher as compared to control group which was also statistically significant (p-value <0.01). Xiaosi Hong et. al; (2023) reported low levels of serum adiponectin in the subjects who were high risk on type 2 diabetes mellitus particularly among those who already had obesity and dyslipidemia, which was statistically significant (Hong et al., 2023). Gholamreza Bazmandegan et. al; (2023**)** reported in his study, that, diabetic subjects had high level of lipid profile except low HDL level. They observed high triacylglycerol, high cholesterol, high LDL and low HDL level, which was statistically significant (Bazmandegan et al., 2023). Ravi Kant and Meenakshi Khapre (2018) observed dyslipidemia in newly diagnosed diabetic subjects (Kant & Khapre, 2019). Surender Thakur et. al; (2013) found high level of Body Mass Index and abnormality in lipid profile (low HDL level, high serum cholesterol, high triacylglycerol, high low-density lipoproteins in the subjects with diabetes mellitus, which was statistically significant (Thakur et al., 2013). Anize Delfino von Frankenberg, André F. Reis and Fernando Gerchman observed reduced level of adiponectin and dyslipidemia in the patients who had type 2 diabetes mellitus (Von Frankenberg et al., 2014). Arshag D Mooradian found abnormal level of lipid profile in the patients of diabetes. In his study serum cholesterol and TGs level were higher as compared to normal healthy individuals, which was statistically significant (Arshag D Mooradian, 2009). The reason given for this abnormality was hepatic lipase activity is higher in people with T2DM, which makes it easier to remove TG from LDL and HDL, which creates small lipoprotein particles. It becomes less likely for Apo A-I to bind to small HDL particles. This causes Apo A-I to separate, which in turn causes the kidneys to get rid of and break down Apo A-I more quickly. Furthermore, people with diabetes may have less Apo A-I being made. Carbohydrate responsive element binding protein (ChREBP) can be activated by high glucose levels, and this transcription factor stops the production of Apo A-I. In addition, insulin raises Apo A-I expression, and if insulin function drops because of insulin resistance or low insulin levels, Apo A-I expression may also drop. Because of this, people with T2DM have lower amounts of Apo A-I and HDL-C (Arshag D Mooradian, 2009; Feingold, 2023).

Conclusion:

Adiponectin can be used as an important clinical biomarker and can be used as cut off to predict the occurrence of type 2 diabetes mellitus.

Conflict of Interest: Nil

Acknowledgement:

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