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TO STUDY ATHEROGENIC LIPID PROFILE IN FEMALES WITH INSULIN RESISTANCE

Biochemistry

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ABSTRACT

Introduction: Atherogenic lipid profile is defined as an increase in serum total Cholesterol (TC), low density lipoprotein cholesterol (LDL-c), Triglycerides (TG), decrease in high-density lipoprotein and Insulin Resistance. **Aim:** The present study was conducted with an aim to evaluate prevalence of Insulin resistance in young females and to find a correlation of cardiovascular risk profile with insulin resistance in these females. **Method:** This was a cross sectional study comprising of total 200 female students from Government Medical College Amritsar, above the age of 18 years. In this study 146 subjects were in the age between 18-24 years and 54 subjects were in the age of 25-30 years. The various parameters were estimated such as Fasting blood sugar, Glycosylated hemoglobin (HbA1c), lipid profile, HOMA-IR was calculated. **Results:** Insulin resistance is common in females of age group >25-30 years. HOMA-IR values correlated positively ($p<0.001$) with the atherogenic lipid profile in these individuals. **Conclusions:** From the present study, it is concluded that as the age increases the tendency of Insulin Resistance increases resulting in increased atherogenic lipid profile which may lead to different complications in the later life.

KEYWORDS

Insulin Resistance, Atherosclerosis, females.

INTRODUCTION:

Atherogenic dyslipidemia (AD) is a lipid abnormality defined as the presence of elevated triglycerides (TG) and low high-density lipoprotein cholesterol (HDL-C). It is known to increase the risk of coronary events in patients with or without CAD [1,2] as well as silent myocardial infarction and silent CAD in high-risk patients with type 2 diabetes[3]. AD is a common lipid profile in patients with obesity, metabolic syndrome, insulin resistance, type 2 diabetes mellitus and coronary artery disease (CAD)[4-7].

Clinically, insulin resistance is defined as the inability of glucose uptake and utilization by insulin-dependent tissues and reduced insulin sensitivity, being the basis of type 2 diabetes mellitus (DM2)[1-3]. Almost 415 million people around the world are suffering from Type 2 Diabetes mellitus, and recent data estimated that 318 million adults have impaired glucose tolerance and insulin resistance (IR) is prevalent in 20 to 30% of general population and in 90% of patients with type 2 Diabetes Mellitus[8]. The studies have shown that IR, without established DM2, is already a predictor of more atherogenic lipid profile, contributing for a worse cardiovascular risk of Brazilian individuals.IR is a key factor for the development of atherosclerosis and DM2, and the most common associated metabolic abnormality is high TAG and low HDL-C levels, whereas TC and LDL-C are not consistently altered[9].Thus keeping in view, the changes in lipid profile in individuals with Insulin Resistance, the present study was planned to find the prevalence of atherogenic lipid profile in young females with insulin resistance.

MATERIAL AND METHODS:

The present cross-sectional study was conducted in the Department of Biochemistry in collaboration with department of Medicine, Guru Nanak Dev Hospital, Amritsar. The study group included 200 female students from Government Medical College Amritsar, above the age of 18 years. All the females were subjected to analysis of following parameters.

1. Fasting Blood glucose Levels by GOD-POD Method[10].
2. HbA1c Levels by Ion exchange chromatography[11].
3. S. Insulin by sandwich ELISA[12]
4. Triglycerides were estimated based on GPO method, as described by Trinder[13].
5. Total Cholesterol was estimated by Roeschlau's Method as described by Allian C.C[14]
6. HDL Cholesterol was estimated by direct method as described by Barr, D. P[15].
7. LDL and VLDL were calculated using Friedwald's Formula[16]
8. HOMA -IR was calculated using online software.

Written informed consent was taken from all the individuals and the study was performed after taking approval from the institutional ethical committee. Data was analyzed statically. Student t test was used to compare means. Pearson's correlation was used to find a correlation between the different biochemical parameters. All the values are expressed as mean ± SD, $p< 0.05$ was taken to be statistically significant.

RESULTS:

In the present study 200 females belonging to various departments of GMC Amritsar were enrolled. The age group of these females was >18 years. 146 females were in the age group of 18-24 years and 54 females were in the age group of >24-30 years. All the females were analyzed for fasting plasma glucose, glycosylated Hb, Insulin, lipid profile complete and HOMA -IR was calculated.

It was observed that mean fasting blood glucose increased significantly in the age group of >25-30 years ($p<0.05$) as compared to age group of 18-25 years. There is an increasing pattern of blood glucose with increasing age. The glycated Hb in both the age group was within the normal limits. Similar pattern was observed in the levels of S. Insulin though in the normal range had an increasing trend with increasing age. Thus, indicating that as the age increases the tendency to insulin resistance increases (Table 1).

Table1: Comparison of glucose, glycated Hemoglobin and Insulin in individuals according to their age group

Age group (years)	Fasting blood glucose (mg/dl) Mean±SD	Glycated Hemoglobin (%) Mean±SD	Insulin mlU/L Mean±SD
18-24 years	88.079 ± 16.028	4.958±0.836	13.85±9.44
>24-30 years	101.333 ± 16.328*	5.072±0.753*	15.65±7.56*

*$p<0.05$ when two groups were compared with each other

It was observed that Total cholesterol, triglycerides, LDL-C and VLDL-C was high in females of age group>24-30 years as compared to females of age group of 18-24 years. There is an increasing pattern of lipid profile with increasing age. On the contrary HDL-C levels decreased in females belonging to the age group of >24-30 years of age (Fig 1). Thus, re-enforcing the fact that as age increases tendency for Insulin resistance increases along with atherogenic lipid profile.

HOMA-IR was calculated in all the individuals and the females were divided according to the levels of IR into two groups i.e., females without IR and females with IR (Table 2). It was observed that 67 females were normal and 33 had increased HOMA-IR values i.e. %β, %S and IR. The cut off values for IR was taken as ≥ 2. When the lipid profile was compared in these two groups it was observed that Total Cholesterol, Triglycerides, VLDL, LDL and non-HDL increased significantly ($p<0.001$) in females with IR as compared to females without IR. levels of HDL-C were significantly lower ($p<0.001$) in

females with IR as compared to females without IR.

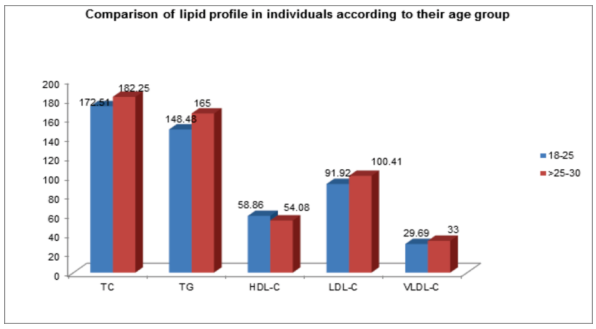

Fig 1 Comparison of lipid profile in females according to their age group

Table 2 Comparison of females based on values of HOMA-IR

Group	%β	%S	IR	Total Cholesterol (mg/dl)	Triglycerides (mg/dl)	HDL (mg/dl)	LDL (mg/dl)	VLDL (mg/dl)
Normal females	160.07	105.6	1.15	112.4±12.5	104.27±32.1	57.7±4.2	76.74±23.6	23.42±2.3
Insulin resistant females	234.01	38.66	2.6	174.4±31.42*	149.57±45.3*	40.64±3.8*	92.44±38.2*	28.89±3.2*

*p<0.001 when normal and insulin resistant females were compared with each other.

DISCUSSION:

Insulin resistance without established Diabetes mellitus is a predictor of atherogenic lipid profile which is common in patients with obesity, metabolic syndrome, Insulin resistance, Type2 Diabetes Mellitus and CAD[17]. It is the key factor for the development of atherosclerosis, particularly low HDL-C is strongly and independently associated with CVD. Small HDL-C particles have greater antioxidant and anti-inflammatory properties thus preventing LDL oxidation whereas large HDL-C particles are more competent in reverse cholesterol transport. Low HDL-C concentration is an independent risk factor of CHD irrespective of sex, race, and ethnicity[18].

Lipid profile was estimated in both the age groups, and it was observed that TC, TG, LDL, VLDL increased with the increasing age (Fig 1). This observation is in accordance with the study done by Anthonia O Ogbera et al[19]. In his study he found that the pattern of lipid abnormalities was most common in subjects with the MetS. He noticed that the occurrence of elevated LDL-C in people with MetS had been noticed to increase the magnitude of the risk for developing coronary artery disease. In our study, there were low levels of HDL in increased age group which is in accordance with the study of Anthonia O Ogbera

Low HDL-C and high TG are associated with decreased physical activity[20]. Its association with obesity is due to increased intake of calories which leads to increased triglycerides. It has been reported that 5-10% weight loss can lower LDL-C by approximately 15% and triglycerides by approximately 20-30% and increase HDL-C by approximately 8-10%[21]. As all were students enrolled in the present study. All were having a sedentary lifestyle with an increased intake of saturated foods i.e. fast foods and empty calories, which is trend of the day. Hence changes in the lipid profile of these individuals.

Comparison of fasting blood glucose and glycated Hemoglobin in individuals according to their age group revealed that mean fasting blood glucose increased significantly in the age group of >25-30 years as compared to age group of 18-25 years as shown in table-1. There is an increasing pattern of blood glucose with increasing age with a simultaneous increase in Glycated hemoglobin levels. The levels though increased were within normal limits thus indicating that individuals have a tendency for insulin resistance.

Insulin resistance is linked with triglycerides and high-density lipoproteins (HDL-C). this is due to compensatory hyperinsulinemia due to IR which induces FFA efflux from adipose tissue, thus raising VLDL production in the liver consequently triglycerides and reduces HDL-C by activation of cholesterol ester transfer protein and increased clearance by the kidneys. As described[22] there is a complex bi-directional relationship of lipoprotein homeostasis and IR. HDL acts both in IR and β cell function, it improves insulin sensitivity in the target tissues i.e. adipose and muscle cells promoting positive effects on β-cell survival[23].

As calculated using HOMA-IR it was observed that 33 females had IR ≥ 2 which was taken as cut off value. IR is a key factor for development of Atherosclerosis and Type 2 Diabetes Mellitus. Hyper triglyceridemia is considered the principal lipid abnormality in IR and plays a key role in development of diabetic dyslipidemia, hence putting these females at a risk of developing Type 2 Diabetes Mellitus.

CONCLUSION:

It is concluded from the present study that Insulin Resistance is prevalent in young age of 25years, which may lead to Type 2 Diabetes Mellitus and Atherosclerosis in later stages of life. Thus it should be taken care of at an early stage of development of IR.

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