Research Paper

Correlation of Serum Lipids and Glycosylated Haemoglobin with Diabetic Retinopathy
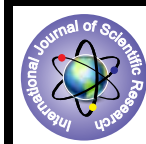
Medical Science

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ABSTRACT

Background- Diabetic retinopathy(DR) is a microangiopathy which primarily affects the precapillary arterioles, capillaries and post capillary venules. .
Aim:- To estimate serum lipids and glcosylated haemoglobins levels in patient with and without diabetic retinopathy.To determine the correlation between serum lipids and glycosylates hemoglobin level with the severity of diabetic retinopathy in India.
Material and methods:-200 diagnosed cases of diabetes mellitus were divided into two groups. I study group (with diabetic retinopathy) and II control group (without diabetic retinopathy) . Both group of patients underwent lipid profile and glycosylated hemoglobin test and results were compared.
Result : - Serum lipid levels are significantly raised in patient with diabetic retinopathy . Glycosylated hemoglobin level are significantly raised in patient with diabetic retinopathy(p<0.01), and higher levels are associated with progression from moderate to severe diabetic retinopathy (p<0.05) .

Introduction

The retinovascular complications of diabetes are collectively called diabetic retinopathy (DR). It is the fourth major cause of blindness worldwide (Thylefors, 1995). It is a microangiopathy which primarily affects the precapillary arterioles, capillaries and post-capillary venules (Kanski, 2003). Depending on the severity and clinical appearance, diabetic retinopathy is divided into two distinct types - non-proliferative and prolfierative diabetic retinopathy. Maculopathy is the most common cause of visual impairment in diabetic patients.The best predictor of diabetic retinopathy is the duration of the disease (Klein & Klein, 1992).

Yanko et al (1983) found that the prevalence of diabetic retinopathy, 11-13 years after the onset of non-insulin dependent diabetes mellitus (NIDDM) was 23% and after 16 years or more was 60%.

Klein et al in 1994 showed that amongst the patients who had insulin dependent diabetes mellitus (IDDM), 27% of those who have had diabetes for 5-10 years and 71-90% of those who have had diabetic for longer than 10 years had diabetic retinopathy.

Glycosylated haemoglobin (HbA_1C) level at baseline has been found to be strongly related to the incidence, progression, or both of Diabetic Retinopathy (Klein et al 1996).

Plasma lipids and lipoprotein pattern have been found to be deranged in patient with diabetic mellitus (Weismelier et al 1987).

Reports regarding association between elevated lipids, glycosylated haemoglobin with the development and progression of diabetic retinopathy are variable. Thus, the present study is being conducted to evaluate serum lipids and glycosylated haemoglobin levels in patients with diabetic retinopathy in our geographical population.

Material and Methods

This was a one year prospective study which was conducted on 200 patients who were diagnosed to have diabetes mellitus and attended the outpatient clinic of Department of Ophthalmology, or Department of Medicine, or were admitted in wards of J.A.H., Gwalior (M.P.). The study included 100 patients with diabetic retinopathy and 100 patients without diabetic retinopathy.

Patients included in this study had been diagnosed to have diabetes mellitus as per Criteria of American Diabetes Association (2000).

Exclusion criteria

The following patients were excluded from the study:

1. Patients in whom dilatation of pupils was contraindicated e.g. angle closure glaucoma.
2. Patients with hazy media, thus impairing visualization of the fundus e.g.
   a.   macular/Leucomatous corneal opacities
   b.   Healed or active anterior uveitis
   c.   Cataract
   d.   Vitreous opacities
3. Familial hyperlipidemia

A detailed history was elicited from the patients as per protocol. A comprehensive ophthalmological examination including visual acuity, anterior segment examination and slit lamp biomicroscope was carried out. Intraocular pressure was recorded. A detailed fundus examination of both eyes was done. Retinopathy was classified according to Modified Airlie House Classification of Diabetic Retinopathy.5-7 ml of fasting venous samples was drawn from patients for estimation of total lipid profile and glycosylated hemoglobin.

RESULT

There were 53 males and 47 females in the study group, whereas the control group included 54 males and 46 females. Mild NPDR was found in 49 patients and the mean HbA1C level in this group was 8.43±2.13%, moderate NPDR was found in 26 patients and the mean HbA1C was 8.53±2.16, while severe NPDR was found in 10 patients in whom the mean HbA1C was 10.45 ± 2.97.Proliferative diabetic retinopathy (PDR) was found in 15 of the 100 cases and the mean HbA1C level in this group was 8.93 ± 3.20%.

Table 1:- HBA1C AND SEVERITY OF DIABETIC RETINOPATHY

Grade of DR	HbA_{1C} (%) (Mean±SD)	p value
Mild NPDR vs Moderate NPDR	8.43 ± 2.13 / 8.53 ± 2.16	> 0.10
Moderate NPDR vs Severe NPDR	8.53 ± 2.16 / 10.45 ± 2.97	< 0.05
Severe NPDR vs PDR	10.45 ± 2.97 / 8.93 ± 3.20	> 0.10
Mild NPDR vs PDR	8.43 ± 2.13 / 8.93 ± 3.20	> 0.10
Mild NPDR vs Severe NPDR	8.43 ± 2.13 / 10.45 ±2.97	< 0.05

The average HbA1C levels in patients with moderate NPDR vs severe NPDR were 8.53 ± 2.16% and 10..45±2.97 respectively and the difference was statistically significant (p<0.05) and in patients with mild NPDR vs severe NPDR were 8.43 ± 2.13% and 10.45 ± 2.97% respectively and the difference was statistically significant (p<0.05). The average HbA1C levels in patients with severe NPDR vs PDR, mild NPDR vs PDR the difference was not statistically significant (p>0.10).

In present study the average duration of diabetes was compared among the patients in both groups. The average duration of diabetes in the two groups was 6.53 ± 6.62 yrs and 11.91 ± 6.91 yrs respectively. This difference was found to be statistically significant (p<0.01).

The increase in the duration of diabetes was not found to be associated with a corresponding increase in the HbA1C levels in either group (p>0.10 in both cases).

Table 2: Total cholesterol, triglycerides, HDL and LDL levels in study and control groups

Group	n	Cholesterol(mg/dL)[mean +/- SD]	Triglycerides(mg/dL)[mean +/- SD]	HDL (mg/dL)[mean +/- SD]	LDL(mg/dL)[mean +/- SD]
Control group	100	179.20+/-57.13	149.40+/-81.59	41.23+/-11.95	104.28+/-34.76
NPDR	85	201.27+/-65.34	182.40+/-94.51	40.15+/-13.34	119.46+/-46.38
Mild NPDR	49	196.24+/-62.13	181.12+/-100.63	40.37+/-12.66	113.08+/-44.16
Moderate NPDR	26	198.85+/-65.53	179.65+/-73.34	38.15+/-14.86	123.15+/-46.67
Severe NPDR	10	232.20+/-78.20	195.80+/-119.13	44.30+/-12.72	141.10+/-53.33
PDR	15	203.20+/-61.91	150.67+/-48.11	47.73+/-15.68	116.27+/-40.02
Study group	100	201.56+/-64.54	177.64+/-89.65	41.29+/-13.90	118.98+/-45.31

The average cholesterol level in the control group and study group was 179.20 ± 57.13 mg/dL , 201.56±65.54 mg/dL respectively. The average cholesterol level in patients with NPDR was 201.27±65.34 mg/dL and in those with PDR was 203.20±61.91 mg/dL.

The average triglyceride level in the control group and study group was 149.40±81.59 mg/dL, 177.64±89.65 mg/dL respectively. In the study group, the average triglyceride levels in those with NPDR and PDR were 182.40±94.51 mg/dL and 150.67±48.11 mg/dL respectively.

The difference between averages of cholesterol level and triglyceride levels in patients with NPDR and PDR , mild NPDR and moderate NPDR , moderate NPDR and severe NPDR , severe NPDR and PDR , mild NPDR and PDR , mild NPDR and severe NPDR was not statistically significant (p>0.10).

The average HDL level in the control group and study group was 41.23±11.95 mg/dL. 41.29±13.90 ml/dL respectively. In the study group, the average HDL level in patients with NPDR was 40.15±13.34 mg/dL and in those with PDR was 47.73±15.68 mg/dl.

A statistically significant difference was found on comparing

the HDL levels in patients with NPDR and in those with PDR (p<0.05).

The average LDL level in the control group was 104.28±34.76mg /dL. In the study group, the average LDL levels in patients with NPDR and PDR were 199.46±46.38mg /dL and 116.27±40.02mg /dL, respectively.

The difference between averages of HDL and LDL levels in patients with mild NPDR and moderate NPDR , moderate NPDR and severe NPDR, severe NPDR and PDR ,mild NPDR and PDR, mild NPDR and sever NPDR was not statistically significant (p>0.10).

DISCUSSION

The average total cholesterol levels in our study group was 201.56±64.54 mg/dL, which was significantly higher than that in the control group (179.20±57.13 mg/dL), and this is similar to the studies reported by Dhir et al (1984) and Chew et al (1996).

The average serum triglyceride levels in our study group was again significantly higher than the average level in the control group .A similar result was derived after assessing the average serum LDL levels in the study group and control group .However, there was no statistically significant difference in the serum levels of HDL in the study and control groups.

Our study is also in agreement with Dhir et al (1984), Chew et al (1996), Larsson et al (1999) and supports the assumption that higher levels of serum total cholesterol and higher levels of serum lipoproteins are associated with more severe retinopathy.

In present study 85 patients with PDR. Further, there was 49 patients with mild NPDR, 26 with moderate NPDR and 10 with severe NPDR.

The difference between serum cholesterol , triglyceride , LDL, HDL levels in patients with NPDR and PDR was not significant with mild, moderate and severe NPDR.

This data was found to be in agreement with some other studies described below:

Haffner et al (1995) could not derive a link between higher levels of serum lipids and severe retinopathy in either younger or older onset subjects.

The average glycosylated haemoglobin level in our study group was 8.73±2.45% which was significantly higher than in the control group (7.07±1.93%).No significant difference was found in the glycosylated haemoglobin levels in patients with mild and moderate NPDR and severe NPDR and PDR. However, a statistically significant difference was established between patients with moderate NPDR and severe NPDR, their glycosylated hemoglobin levels being 8.53±2.16% and 10.45±2.97% respectively.

The data in this study is in agreement with the studies done by: Klein et al (1996) found that glycosylated hemoglobin level at baseline was strongly related to the incidence, progression, or both of diabetic retinopathy in persons with either IDDM or NIDDM.

Morisaki et al (1994) supports our results that HbA1C is an independent risk factor for diabetic retinopathy in the all cases.

Thus present study observed that serum lipids and glycosylated hemoglobin levels are elevated in patients with diabetic retinopathy. The levels of glycosylated hemoglobin correlate to a certain extent with the increasing severity of diabetic retinopathy, whereas, serum lipid levels do not correlate with the increasing severity of diabetic retinopathy.

Figure 1: HbA1c level in various grades of diabetic retinopathy
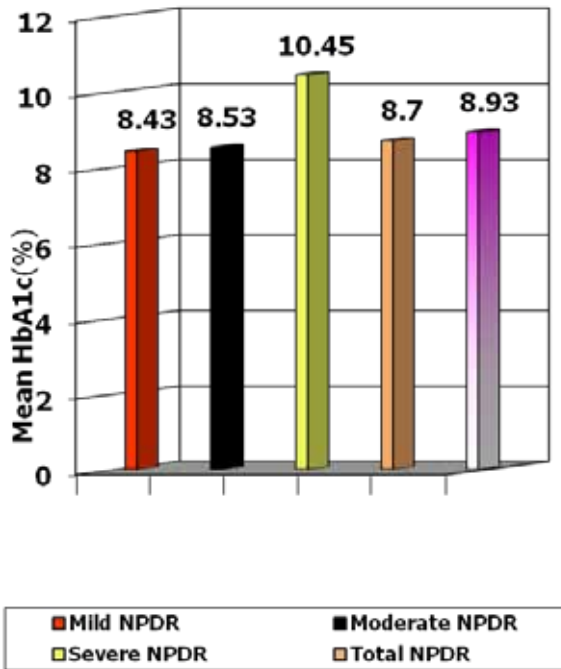
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