Research Article [Araştırma Makalesi]

A Study on Lipid Profile Levels of Diabetics and Non-Diabetics Among Naini Region of Allahabad, India

[Hindistan'ın Allahabad Naini Bölgesinde Diyabetli ve Diyabetsizlerde Lipid Düzeyi Çalışması]

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ABSTRACT

Rationale: In India, diabetes is not an epidemic anymore but has turned into a pandemic, according to the International Journal of Diabetes in developing Countries which labeled India the diabetes capital of the world. Mainly because India now has the highest number of diabetic patients in the world The International Diabetes Federation estimates that the number of diabetic patients in India more than doubled from 19 million in 1995 to 40.9 million in 2007. It is projected to increase to 69.9 million by 2025. Currently, up to 11 per cent of India's urban population and 3 per cent of rural population above the age of 15 has diabetes. The most prevalent is Type II diabetes, which constitutes 95 per cent of the diabetic population in the country. Indian population faces higher risk for diabetes and its complications.

Objective: Evaluate the changes in lipid profile level in diabetes and effect of age and gender on alteration of lipid profile in diabetes.

Methodology: A prospective study was conducted for investigation of the serum lipid profile viz the level of total cholesterol, Triglycerides, LDL cholesterol and HDL cholesterol (group I) and compare them with level of non obese non diabetic and normotensive volunteers selected as control (group II).

Results: The result revealed that serum total cholesterol, LDL cholesterol and triglycerides were significantly raised (p<0.0001) where as the level of HDL cholesterol was significantly lower (p<0.0001) in diabetic subjects as compared to control. There is a significant change found between diabetic male and female serum lipid profile. Diabetic male has highly significant higher level of cholesterol, LDL cholesterol and triglycerides and significantly lower level of HDL cholesterol from the diabetic female.

Conclusion: It was concluded that Hypercholesterolemia, Hypertriglyceridaemia and lipoprotein are the main lipid abnormalities found in diabetes which is risk for coronary artery disease. In diabetes sex plays a significant effect on risk of coronary artery disease.

Key Words: Diabetes, cholesterol, triglycerides, HDL cholesterol and LDL cholesterol

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ÖZET

Gerekçe: Hindistan'ı dünyanın diyabet başkenti olarak niteleyen uluslar arası gelişen ülkelerde diyabet yayınına göre Hindistan için, diyabet artık bir epidemi olmaktan çıkmış bir pandemi haline gelmiştir. Bunun ana sebebi Hindistan'ın dünyadaki en yüksek diyabet hasta sayısını taşıyor olmasıdır. Uluslararası diyabet federasyonu Hindistan'daki diyabet hastası sayısının 1995 de 19 milyondan 2007 de ikiye katlanarak 40,9 milyona ulaşmış olduğunu hesap etmektedir. 2025 yılına kadar ise bu sayının 69,9 milyona çıkacağı tahmin edilmektedir. Su an, on beş yaş ve üzeri popülasyonda kentlerde yüzde onbir, kırsal alanda ise yüzde üç oranında diyabet hastalığı görülmektedir. yüzde 95 ile tip iki diyabet ülkede görülen en yaygın diyabet turudur. Hindistan popülasyonu diyabet ve buna bağlı komplikasyonlar açısından yüksek risk grubu oluşturmaktadır.

Amaç: Diyabet, yas ve cinsiyetin lipid düzeyi üzerine olan etkisinin değerlendirilmesi.

Metod: Bir prospektif çalışma ile serum lipid profili kapsamında total kolesterol, trigliserid, LDL kolesterol ve HDL kolesterol seviyeleri (grup I) ile obesite ve diyabeti olmayan normal tansiyonlu gönüllü grupta (grup II) karsılaştırma yapılmıştır. Sonuçlar- Diyabetli grupta total kolesterol, LDL kolesterol ve trigliserid seviyelerinin kontrol grubuna oranla belirgin olarak yüksek (p<0.0001), HDL kolesterol seviyesinin ise belirgin olarak alçak (p<0.0001) olduğu gösterilmiştir. Diyabetli erkek ve kadınların serum lipid profilinde anlamlı bir fark olduğu gözlenmiştir. Diyabetli erkeklerde kolesterol LDL kolesterol ve trigliserid seviyelerinde anlamlı bir yükseklik, HDL kolesterol sevilerinde ise anlamlı bir alçaklık vardır.

Sonuç: Hiperkolesterami, hipertrigliseridemi ve lipoproteinlerin diyabetle gözlenen ve koroner arter hastalığı için risk faktörü oluşturan ana lipid anomalileri olduğu sonucuna varılmıştır. diyabet hastalarında seks koroner arter hastalığı için bir etken olarak değerlendirilmiştir.

Anahtar Kelimeler: Diyabet, kolesterol, trigliseridler, HDL kolesterol, LDL kolesterol.

Introduction

Diabetes mellitus arises when insufficient insulin is produced, or when the available insulin does not function correctly. Without insulin, the amount of glucose in the bloodstream is abnormally high, causing unquenchable thirst and frequent urination. The body's inability to store or use glucose causes hunger and weight loss (1). There are two main types of diabetes. Insulin-dependent diabetes – type 1 diabetes – occurs when there is a severe lack of insulin due to the destruction of most or all of the beta cells in the islets of Langerhans. This type of diabetes develops rapidly, usually appearing before the age of 35, and most often between the ages of 10 and 16. Regular insulin injections are required to survive. Non-insulin-dependent diabetes – type 2 diabetes – occurs when the body does not produce enough insulin, and the insulin that is produced becomes less effective. This type of diabetes usually appears in people over the age of 40, and tends to have a more gradual onset. In most cases, glucose levels in the blood can be controlled by diet, or diet and tablets, although sometimes insulin injections may be needed. About 90 per cent of diabetics are non-insulin dependent (2). There are probably 100 million people in the world with diabetes mellitus and incidences of diabetes are on the rise. As diabetes progress patients are at increased risk of developing coronary disease (3). Insulin deficiency causes excessive metabolisation of free fatty acids, this may lead to a disorder in lipid metabolism. Insulin is a hypoglycemic hormone secreted from β-cell of the islet of pancreas. Insulin also has an effect on lipid metabolism. (4)

Materials and Methods

For this prospective present study, a total numbers of 60 human subjects of age ranging from 33-60 years were included in the study. Out of the 60 subjects, 30 volunteers (15 Males and 15 females) having normal blood sugar level were selected as control (group II). The remaining 30 subjects (15 males and 15 female) having high blood sugar levels were grouped as diabetic (group I). About 5 ml of fasting blood was obtained by venepuncture from each male and female diabetic patient between the ages of 33-60 attending the Hays Memorial Mission Hospital using sterilities disposable syringes and needle. Same amount of blood was collected from the non diabetic subjects. The blood was put into centrifuge tubes. This was allowed to clot and then centrifuged at 3000 rpm for 15 min at room temperature. The serum obtained was pipetted into a clean blood sample bottle and analyzed on the day of collection for serum sugar and lipid profile tests. Serum total cholesterol levels was determined by enzymatic (CHOD-PAP) colorimetric method (5) and triglycerides by enzymatic (GPO-PAP) method of (6). HDL-cholesterol was estimated using precipitant method (7) and LDL cholesterol by Friedewald formula (8). All above parameters under investigation were determined in the serum of patients and controls using commercially available reagent kits. All values were expressed as mean ± S.E. Statistical significance of differences between control and study groups were evaluated by student's t test

Results

All diabetic subjects have significantly higher cholesterol (t= df 58; p<0.0001) triglycerides (t=8.79, df58; p<0.0001) LDL (t=37.08, df 58; p<0.0001) and significantly lower HDL cholesterol (t=62.23, df58; p<0.0001) as compared to non diabetic subjects (Table 1). Diabetic males show a significant increase in serum cholesterol (t=25.70, df28; p<0.0001) triglycerides (t=12.74, df28; p<0.0001) LDL (t=18.67,df28;p<0.0001) and significantly lower HDL cholesterol (t=17.17,df28;p<0.0001) as compared to non diabetic males (Table 2). In the female category,

Table 1. Mean + SD of serum lipid profile of all diabetics and non diabetic subjects.

	N	Cholesterol (mg/dl)	Triglycerides (mg/dl)	LDL cholesterol (mg/dl)	HDL cholesterol (mg/dl)
Diabetic (group I)	30	299.361±13.461	178.32±10.12	164.15±5.98	31.12±1.10
Non diabetic (group II)	30	165.541±16.03	158.21±7.48	112.69±4.69	46.12±0.73
		P<0.0001	P<0.0001	P<0.0001	P<0.0001

Table 2. Mean + SD of serum lipid profile of diabetic male and non diabetic male.

	N	Cholesterol (mg/dl)	Triglycerides (mg/dl)	LDL cholesterol (mg/dl)	HDL cholesterol (mg/dl)
Diabetic male	15	250.28±6.56	173.88±8.23	140.13±4.96	42.28±0.63
Non diabetic male	15	191.32±5.99	140.96±5.56	109.88±3.84	46.83±0.81
		P<0.0001	P<0.0001	P<0.0001	P<0.0001

Table 3. Mean + SD of serum lipid profile of diabetic female and non diabetic female.

	N	Cholesterol (mg/dl)	Triglycerides (mg/dl)	LDL cholesterol (mg/dl)	HDL cholesterol (mg/dl)
Diabetic female	15	225.43+6.48	149.81+6.01	131.75+98.90	39.93+1.21
Non diabetic female	15	163.59+5.57	98.69+4.83	98.91+4.63	49.46+2.32
		P<0.0001	P<0.0001	P<0.0001	P<0.0001

Table 4. Mean + SD of serum lipid profile of diabetic male and diabetic female.

	N	Cholesterol (mg/dl)	Triglycerides (mg/dl)	LDL cholesterol (mg/dl)	HDL cholesterol (mg/dl)
Diabetic male	15	250.28+6.56	173.88+8.23	140.13+4.96	42.28+0.63
diabetic fe-male	15	225.43+6.48	149.81+6.01	131.75+4.10	39.93+1.21
		P<0.0001	P<0.0001	P<0.0001	P<0.0001

diabetic female shows a significant increase in the level of these lipid parameters compared to control subjects (Table 3). Among diabetic subjects, diabetic males have significantly higher level of cholesterol (t= 10.43, df 28; p<0.0001) triglycerides (t=9.14,df28;p<0.0001) LDL (t=5.04, df28; p<0.0001) and significantly lower level of HDL cholesterol (t=6.67,df 28;p<0.0001) as compared to that of female diabetics (Table 4)

Discussion

The present study comprised of a random sample of population, which has been selected on strict criteria based on including non obese non diabetic and normotensive volunteers as control. A strong clustering risk factor for coronary artery disease has been observed in diabetic subjects. These observed increases and decreases in serum lipid profile associated with Diabetes mellitus are in agreement with finding of Ononogbu (9), Uddin and Miah(10), Sccopla et al.(11), Adedeji and Onitiril (12) In diabetes many factors may affect blood lipid levels, this is because carbohydrates and lipid metabolism are interrelated to each other if there is any disorder in carbohydrate metabolism it also leads disorder in lipid metabolism so there is high concentration of cholesterol and triglycerides and due to this there is reduction in HDL cholesterol levels. In diabetic subjects sex plays a significant effect on risk of coronary artery disease. The males have marginally high serum lipid levels as compared to diabetic females. Similar results have been observed in other studies of Salonen et al (13), Kaare (14). Significant difference in lipid profile of male and

female diabetics is because sex hormones play unique role for lipid metabolism.

Acknowledgement

References

[1] Chatrejee C C (1992) Human physiology (vol I). Role of endocrine in lipid metabolism. (Editor- Medical allied agency) s. 546-550, Culcutta-INDIA

[2] Chatterjee M N and Shinde R (2005) Text book of medical laboratory technology. Metabolism of carbohydrates.(Jaypee Brothers Medical publisher)Sixth edition s. 266-330,Delhi-India

[3] World Health Organization (1994) Expert committee on prevention and treatment of diabetes mellitus. WHO technical series No 844.Geneva.Whorld Health Organization

[4] Godkar P and Godkar D (2003) Text book of medical laborarty technology.Ed.2 chemistry of carbohydrates (Bhalani publishing house) s.176-233,New Delhi-India

[5] Allain C C, Poon I S, Chan C H G and Richmond W (1974) Enzymatic determination of serum total cholesterol.Clin. Chem. 20: 470-471.

[6] Jacobs N J and VanDenmark P J (1960) Enzymatic determination of serum triglyceride.ch. Biochem. Biophys. 88: 250-255.

[7] Gordon T and Gordon M (1977) Enzymatic method to determine the serum HDL-cholesterol. Am. J. Med. 62: 707-708.

[8] Friedewald W T, Levy R I and Fredrickson D S (1972) Estimation of the concentration of LDL-cholesterol. Clin. Chem. 18 (6): 499-515.

[9] Ononogbu,I.C.(1988) Lipid and Lipoproteins.New Africa Publishing Co.Ltd.Owerri,Nigeria

[10] Uddin and Miah (1995) Resistence diabetes and risk of cardiovascular diasease.Bangladesh Med Res Counce Bull.Aug 21 vol(2)64-72

[11] Sccopola A, Stein A and Mayer GL (1995) Effect of insuline on cholesterol synthesis in type II diabetes mellitus pateins.Diabetes care:1995 oct;18 (10)1362

[12] Adedeji O O and Onitiri A C (1990) Lipids in Nigerian hypertensives. Afr. J. Med. Sci. 19:281-284.

[13] Salonen J T, Puska P and Kotke T E (1981) Coronary risk factor clustering patterns in Eastern Finland. Int. J. Epidemiol., 10: 203-210.

[14] Karee H and Banaa S (1991)The association between blood pressure and serum lipid in population.The tromso study.Circulation,83; 1305-1314