

A STUDY OF DYSLIPIDAEMIA AMONG PATIENTS WITH TYPE 2 DIABETES IN THE NORTHERN PROVINCE OF SRI LANKA

Suganthan N¹, Sivansuthan S¹

¹Teaching hospital, Jaffna

ABSTRACT

Background & Objectives: Quantitative and qualitative abnormalities in lipids in patients with diabetes are numerous. However, data related to the prevalence and pattern of dyslipidemia among the Sri Lankan population is limited. This study was conducted to find out the prevalence and pattern of dyslipidemia among patients with type 2 diabetes.

Methods: This is a descriptive institutional based study where we studied a total 51 newly diagnosed type 2 diabetes patients registered at FHC (Family Health Centre) in Jaffna for their quantitative lipid abnormalities.

Results: The mean age of the study population was 56.5 years and there were 13 males (25.5%) and 38 females (74.5). Most common lipid abnormality demonstrated was low HDL (High-density lipoprotein) cholesterol, which was seen in 81.6% (n=31) of females and 69.2% (n=9) of males. In addition, 64.7% (n=33) patients had high LDL (Low density lipoprotein) cholesterol and 27.5% (n=14) of patients had high TG (Triglyceride) levels. 84.3% (n=43) of patients did fall into the high-risk group according to atherogenic index. Further, this study demonstrated a negative correlation between HDL and LDL cholesterol levels among the subjects.

Conclusion: This study clearly shows that the prevalence of low HDL is a common lipid abnormality among the newly diagnosed patients with Type 2 diabetes.

Keywords: Diabetes mellitus, dyslipidaemia, low HDL cholesterol, hypertriglyceridaemia

INTRODUCTION

Type 2 Diabetes Mellitus is a heterogeneous condition characterized by the presence of both impaired insulin secretion and insulin resistance. It is the commonest metabolic disorder affecting the people throughout the world. In 2010, approximately 285 million people had diabetes mellitus and more than 438 million people worldwide are expected to have diabetes by 2030. South Asians represent one-fifth of the world population, concentrated in a large geographic area of the Indian subcontinent where highest burden of diabetes is expected (1). Multiple studies done on this South Asian

population have demonstrated a 3- to 5-fold increase in the risk of cardiovascular disease (2, 3, 4, 5, 6) and they tend to develop it at a younger age when compared to other ethnic origins (7).

Diabetes, hypertension and dyslipidaemia are considered as the main traditional risk factors for cardiovascular disease and the co-existence these metabolic risk factors are well known. Dyslipidaemia plays a bigger role in the pathogenesis of cardiovascular disease in patients with diabetes and higher prevalence of dyslipidaemia among patients in South Indian origin may be the reason for higher prevalence of cardio-vascular disease among these patients.

There is reasonable amount of data in related to the prevalence and pattern of lipid dyslipidemia among patients with diabetes in neighbouring countries of Indian subcontinent (8, 9, 10, 11, 12, 13). However, there is very limited data available in Sri Lanka in this regard (14). The main objective of this study was to study the lipid abnormalities among patients with Type 2 Diabetes Mellitus, registered at Family Health Centre, Kondavil, Jaffna.

METHODS

It is a descriptive institutional based study among the newly diagnosed Type 2 diabetes patients registered at

Family Health Centre, Kondavil, Jaffna.

Selection of patients: After obtaining written informed consent, a total of 51 patients with Type 2 diabetes mellitus were recruited for the study. Patients with other diseases such as hypothyroidism, nephrotic syndrome, recent trauma or surgery that could alter lipid levels and the patients who were on lipid-lowering drugs within last 6 weeks were excluded from this study.

The study protocol and data collection: The study protocol was reviewed and approved by ethical review committee, Faculty of Medicine, University of Jaffna. Data needed for this study (Age and sex) were collected according to the general and specific objectives.

Laboratory analysis: Blood was collected and then centrifuged immediately to separate the plasma needed for lipid analysis. Plasma was kept at (-20) degree. Analysis of lipids was performed on the same day or the following day. Total cholesterol, triglyceride and HDL-cholesterol were measured and LDL-cholesterol was calculated according to the Friedewald formula (LDL-cholesterol = Total cholesterol – HDL – triglyceride/5, in mg/dl)

Statistical analysis: Statistical analysis was performed with a help of SPSS statistical software.

RESULTS

volume (3 burette readings) of sodium thiosulfate using the following formula.

Mean total cholesterol, triglyceride, LDL-cholesterol and HL-cholesterol were 183.99mg/dl, 123.14mg/dl, 116.83mg/dl and 42.63mg/dl respectively (Table 1). 68.4% (26) of females and 53.8% (7) of males had high LDL-cholesterol (\geq 100 mg/dl). However, this gender difference in LDL levels was not statistically significant. Only 27.5% (10 males and 4 females) participants had hypertriglyceridemia (\geq 150 mg/dl).

Considering the gender differences in cut-off values, HDL cholesterol levels of males and females were analysed separately. The study showed that 69.2% (9) of males and 81.6% (31) of females had low HDL-cholesterol (Low HDL-cholesterol is defined as \leq 40mg/dl in males and \leq 50 mg/dl in females).

The atherogenic index was calculated using the triglyceride and the HDL-Cholesterol levels and it was classified as low risk, intermediate risk and high risk, when it falls below 0.1, between 0.1 and 0.24 and above 0.24 respectively. The majority (84.3%) of the study population was in the high-risk group.

There was a significant negative correlation between the HDL and the LDL cholesterol levels (Figure 1). However, the sample size was too small to interpret the statistical significance and to draw conclusions regarding the relationship of these parameters.

DISCUSSION

Cardiovascular disease accounts for more than 65% of the deaths in diabetes (15). The increased cardiovascular risk appears to be multifactorial. However, diabetes dyslipidaemia seems to play a

Table 1: Quantitative and Qualitative analysis of lipid profile

	Mean (mg/dl) N-51	SD
Total Cholesterol	183.99	38.36
Triglyceride	123.14	50
LDL-Cholesterol	116.83	38.20
HDL-Cholesterol	42.63	13.74

Table 2: Pattern of atherogenic index (Log10 TG/HDL)

			Low risk	Intermediate risk	High risk	Total
Sex	Male	Count %	2	1	10	13
		within sex	15.4%	7.7%	76.9%	100.0%
	Female	Count %	3	2	33	38
		within sex	7.9%	5.3%	86.8%	100.0%
Total		Count %	5	3	43	51
			9.8%	5.9%	84.3%	100.0%

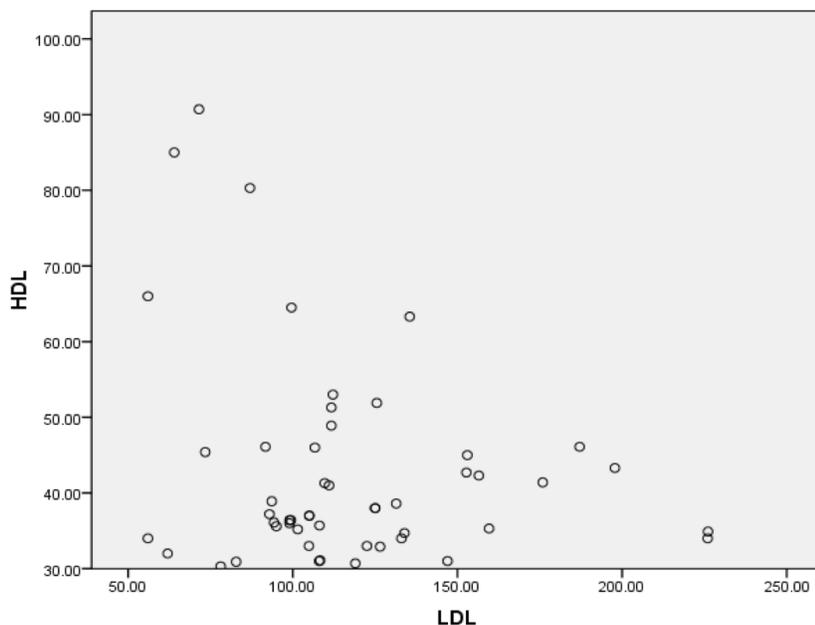


Figure 1: Figure shows the correlation between LDL-Cholesterol and HDL-Cholesterol.

significant role in the pathogenesis. The studies have shown that the prevalence of dyslipidaemia in the diabetes population is almost twice the figure compared to the general population (16). High plasma triglyceride concentrations, low HDL concentrations and elevation of small LDL cholesterol particle concentrations are characteristic of diabetes dyslipidaemia (9, 17). The complex metabolic abnormalities related to obesity, insulin resistance, hyperinsulinism and poor glycaemic control are thought to be responsible for the lipid abnormalities seen in patients with diabetes (10, 11). Hypertriglyceridaemia and low HDL are the commonest lipid abnormalities seen in patients with diabetes (8, 9, 10, 18), which was demonstrated even in our study population.

Hypertriglyceridemia and high LDL cholesterol levels are common lipid abnormalities seen among the patients with type 2 diabetes (9, 17). Our study demonstrated that 64.7% (68.4%, n=26 of females and 53.8%, n=7 of males) of study population had a LDL-Cholesterol of more than or equal to 100mg/dl. However,

only 26.3% (n=10) of females and 30.8% (n=4) of males had high triglyceride level, which needs further evaluation with a bigger patient sample.

South Asians are well known to have more atherogenic lipid abnormalities (the ratio of total cholesterol (TC) to HDL, TG/HDL, and apo B/apo A1) compared to other ethnic groups (11, 12) and these levels are highly correlated with the higher incidence of premature cardiovascular disease (13, 14). The atherogenic index calculated from TG and HDL by using formula $\text{Log}_{10} \text{TG}/\text{HDL}$ showed that thirty-three (86.8%) females and ten males (76.9%) did fall into the high-risk group and accounting for 84.3% of our study population with high risk for atherosclerosis. Previous studies also have demonstrated almost similar trend among the Sri Lankan patients with type 2 diabetes mellitus (14).

According to the statistical calculations, the study required a sample of 339 patients and the smaller sample size was a major limitation of this

study. Although we were unable to draw firm conclusions, it appeared to be a reasonable preliminary study and an area that needs to be further studied.

LIMITATIONS

According to the statistical calculation, the study required 339 patients and the smaller sample size was a major limitation of this study. Although we were unable to draw firm conclusions, it appeared to be a reasonable preliminary study and an area that needs to be further studied.

CONCLUSIONS

Low HDL cholesterol followed by hypertriglyceridaemia is the commonest lipid abnormality found in Sri Lankan patients with Type 2 diabetes. These patients also have a high atherogenic index with a higher susceptibility cardiovascular disease. This preliminary study highlights the importance of further research on this area to explore the lipid pattern among the Sri Lankan type 2 diabetes mellitus population.

ACKNOWLEDGEMENT

I express my sincere thanks to the staff at family Health Centre, Kondavil, Dr.Dinesh Coonghe, Lecturer in Community medicine for the statistical analysis and all the patients participated this study.

REFERENCES

1. Milan Gupta, Narendra Singh, Subodh Verma. *South Asians and Cardiovascular Risk. Circulation.* 2006; **113**: e924-e929.
2. Tuomilehto J, Ram P, Ese-roma R, Taylor R, Zimmet P. Cardiovascular diseases and diabetes mellitus in Fiji: analysis of mortality, morbidity and

- risk factors. *Bull World Health Organization*. 1984; **62**: 133-143.
3. McKeigue PM, Miller GJ, Maromot MG. Coronary heart disease in South Asians overseas: a review. *Journal of Clinical Epidemiology*. 1989; **42**: 597-609.
 4. Harding S. Mortality of migrants from the Indian subcontinent to England and Wales: effect of duration of residence. *Epidemiology*. 2003; **14**: 287-292.
 5. Forouhi NG, Sattar N, Tillin T, McKeigue PM, Chat-urvedi N. Do known risk factors explain the higher coronary heart disease mortality in South Asian compared with European men? Prospective follow-up of the Southall and Brent studies, UK. *Diabetologia*. 2006; **49**: 2580-2588.
 6. Miller GJ, Beckles GL, Maude GH, Carson DC, Alexis SD, Price SGL et al. Ethnicity and other characteristics predictive of coronary heart disease in a developing community: principal results of the St James Survey, Trinidad. *International Journal of Epidemiology*. 1989; **18**: 808-817.
 7. Enas EA, Garg A, Davidson MA, Nair VM, Huet BA, Yusuf S. Coronary heart disease and its risk factors in first-generation immigrant Asian Indians to the United States of America. *Indian Heart Journal*. 1996; **48**: 343-353.
 8. Agrawal P, Reddy VS, Madaan, Patra SK, Garg R. Urban-rural differences in atherogenic dyslipidaemia (URDAD Study): a retrospective report on diabetic and non-diabetic subjects of Northern India. *Journal of Health, Population and Nutrition*. 2014; **32**(3): 494-502.
 9. Subburam R, Manohar CR, Subramaniyam P, Sachithranatham S, Sankaraandian M. Dyslipidaemia among type 2 diabetes mellitus patients in a rural hospital in Erode district, Tamilnadu. *Journal of the Indian Medical Association*. 2013; **111**(1): 10-13.
 10. Smith J, Cianflone K, Al-Amri M, Sniderman A. Body composition and the apoB/apoA-I ratio in migrant Asian Indians and white Caucasians in Canada. *Clinical Science (Lond)*. 2006; **111**: 201-207.
 11. Sierra-Johnson J, Somers VK, Kuniyoshi FH, Walldius G, Hamsten A, Fisher RM et al. Comparison of apolipoprotein-B/apolipoprotein-AI in subjects with versus without the metabolic syndrome. *American Journal of Cardiology*. 2006; **98**: 1369-1373.
 12. Joshi P, Islam S, Pais P, Reddy S, Kazmi K, Panday MR et al. Risk factors for early myocardial infarction in South Asians compared with individuals in other countries. *Journal of American Medical Association*. 2007; **297**: 286-294.
 13. Enas EA. Dyslipidemia in the South Asian patient. *Current Atherosclerosis Reports*. 2007.
 14. Lukshmy M.H, Gunasekara SW, Jayasinghe SS, Wee-rarathna TP, Palangasinghe S, Kotapola I. Lipid abnormalities in Type 2 diabetes mellitus patients in Sri Lanka. *Galle medical journal* 2007; **12**(1): 1-4.
 15. Geiss LS, Herman WH, Smith PJ, National Diabetes Data Group. Diabetes in America. Bethesda, Md: National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases; 1995:233-257.
 16. Vakkilainen J, Steiner G, Ansquer JC (2003). Relationships between low-density lipoprotein particle size, plasma lipoproteins, and progression of coronary artery disease. *The Diabetes Atherosclerosis Intervention Study (DAIS)*. *Circulation* 107: 1733-1737.
 17. Bhalodkar NC, Blum S, Rana T, Bhalodcar A. Comparison of levels of large and small high-density lipoprotein cholesterol in Asian Indian men compared with Caucasian men in the Framingham Offspring Study. *American Journal of Cardiology*. 2004; **94**: 1561-1563.
 18. Chandalia HB et al. Lipid Abnormalities in Diabetes Mellitus. *International Journal of Diabetes in Developing Countries*. 1999; **19**: 1-6.