

Frequency of Dyslipidemia in Type 1 Diabetes Mellitus in Children

Shahid Iqbal¹, Iftikhar Ahmed¹ and Awais Tahir²

ABSTRACT

Objectives: To determine the frequency of dyslipidemia in type 1 diabetic children from 2 to 16 years of age.

Study Design: Descriptive / cross sectional study.

Place and Duration of Study: This study was conducted at the Diabetic Clinic Pediatric Department, Mayo Hospital Lahore for six months.

Materials and Methods: Total 200 diabetic children were included in the study. Children selection was done by using predefined inclusion criteria. Serum samples of patients fulfilling the inclusion criteria were taken for serum total cholesterol and LDL cholesterol under aseptic conditions according to laboratory instructions. Samples were sent to chemical pathology department of King Edward Medical University to which Mayo Hospital is affiliated. Data entry and analysis was done by using SPSS.

Results: Average age of all 200 children was 10.66 ± 3.32 years. Minimum age was 5 and maximum age was 16 years respectively. Gender distribution of children shows that there were 74 male and 126 female patients. There were 24 children whose duration of diabetes was <5 years and 176 of the children's had >5 years of duration of diabetes. Only 2% of the children were obese while the remaining 98% of the children were non obese. Dyslipidemia was labeled in the presence of anyone i.e. Total cholesterol > 170 mg/dl or LDL cholesterol > 110 mg/dl. There were 26 (13%) children who had dyslipidemia.

Conclusion: In young diabetic children frequency of Dyslipidemia was 13%. Although this frequency of dyslipidemia is quite less when compared with other studies reported in literature. Even then this frequency indicates that it is necessary to screen young diabetic children for dyslipidemia to avoid future complications.

Key Words: Type-1 Diabetes Mellitus (T1DM), Young Children, Dyslipidemia, LDL, Cholesterol, Obesity, Duration of Diabetes.

Citation of article: Iqbal S, Ahmed I, Tahir A. Frequency of Dyslipidemia in Type 1 Diabetes Mellitus in Children. *Med Forum* 2017;28(5):77-80.

INTRODUCTION

The prevalence of dyslipidemia (DLP) in the general population, including children, has recently increased^{1,2}. Changes in lifestyle that contribute to overweight and obesity, including sedentarism and high carbohydrate and fat diets, may have contributed to this increased DLP prevalence^{1,3,4}.

In patients with type 1 diabetes mellitus (T1D), the presence of DLP significantly increases cardiovascular risk. Patients with T1D have a 2–4 times greater risk of developing atherosclerosis compared to people without diabetes mellitus, and cardiovascular events account for up to 44% of the total mortality in these patients^{5,6,7}.

¹. Department of Pediatrics Sheikh Khalifa Bin Zayed Teaching Hospital Rawalakot

²Department of Pediatrics, Foundation university Medical College Rawalpindi

Correspondence: Dr. Iftikhar Ahmed Assistant Professor SKBZ teaching Hospital Rawalakot.

Contact No: 03125084789

Email: i_ahmed74@yahoo.com

Received: March 10, 2017;

Accepted: April 15, 2017

However, there are few studies that have investigated the relationship between DLP and T1D in young people; most of the information has been based on adult studies^{6,8,9}. The relationship between dyslipidemia and cardiovascular disease risk is well documented in adult diabetic population. It narrows sex gap for cardiovascular risk.⁶ Statins are given in adults in both type 1 and type 2 diabetes for prevention of primary and secondary cardiac events which work by lowering the low density lipoprotein cholesterol levels^{7,10}. In search study in which 2448 subjects (including both type 1 and type 2 diabetics) were included, The overall prevalence of high total cholesterol concentration (>240 mg/dL) was 5%; while prevalence for high LDL-C (>160 mg/dl) was 3% and 48% had LDL levels over the 100 mg/dL.

This study will help to highlight this aspect of DM in our population and guide in future for further studies regarding various treatment options of dyslipidemia found to be prevalent in type 1 DM in international studies. This data will also help us in making screening criteria for treatment of dyslipidemia in type 1 diabetic children and will also help us in future for implementation of treatment protocol of dyslipidemia in our country.

MATERIALS AND METHODS

This is a Descriptive cross sectional study conducted at Diabetic clinic Pediatric Department Mayo hospital Lahore. Study duration is 6 months.

Non probability purposive sampling technique was used for selection of patients. Sample size of 200 cases was calculated with 95% Confidence level, 5% margin of error and taking expected percentage of dyslipidemia (LDL-cholesterol>110 mg/dl) i.e. 15% in type1 diabetic children from 2 to 16 years of age.

Children aged up to 2-16 years, diagnosed as type 1 diabetes mellitus of >2 years duration on insulin therapy were enrolled in this study.

Children with associated conditions which can cause derangements in lipid levels like nephrotic syndrome (24 hour urinary proteinuria>40mg/m²/hour), chronic liver disease (coarse shrunken liver on USG), celiac disease and hypothyroidism (decreased serumT4) were excluded. Patients who did not consented to participate in the study.

After full informed and voluntary consent taken from patients (if mature enough) / attendants and Approval of study by ethical committee. Detailed review of history and clinical examination was carried out in all patients who were diagnosed as type 1 diabetes mellitus before inclusion in the study. Serum samples of patients fulfilling the inclusion criteria were taken for serum total cholesterol and LDL cholesterol under aseptic conditions according to laboratory instructions. Lipid levels were done by photometric test by the use of commercial kits. Serum total cholesterol and LDL cholesterol levels were recorded. Obesity a confounder was taken as BMI>95 percentile for age. All the data was recorded on a Proforma Annexure 1.

Data was entered and analyzed in SPSS version 17. Categorical variables like dyslipidemia, (present/absent) gender (M/F) were described in terms of frequencies and percentages. Continuous variables like serum cholesterol, LDL cholesterol, age were described in terms of means and standard deviations. Data was stratified for duration of diabetes i.e. (<5 years,>5 years) and presence or absence of obesity to address the effect modifiers.

RESULTS

Total 200 children who were diabetic included in this study with >2 years of duration of illness. Mean age of all 200 children was 10.66±3.32 years. Minimum age was 5 and maximum age was 16 years. Gender distribution of children shows that there were 74 male and 126 female patients. Whereas mean age of male and female patients was 9.02±3.58 and 11.63±2.74 years respectively. There were 24 children whose duration of diabetes was <5 years and 176 of the children's duration of diabetes was >5 years. (Table-1)

Only 4 (2%) of the children were obese while the remaining 196 (98%) of the children were non obese.

Cholesterol level of 26(13%) patients were >170 mg/dl and the remaining 174(87%) children's cholesterol level was <170 mg/dl (Table-2) LDL was >110 mg/dl in 14(7%) children while in remaining 186 (93%) LDL level was <110 mg/dl respectively. (Table-3)

Dyslipidemia was labeled in the presence of either Total cholesterol > 170 mg/dl or LDL cholesterol > 110 mg/dl. There were 26(13%) children who had dyslipidemia. (Table-4)

Table No.1: Distribution of frequency for duration of diabetes

	Frequency	Percent (%)
Duration of diabetes less than 5 years	24	12
Duration of Diabetes more than 5years	176	88
Total	200	100

Table No.2: Distribution of frequency for serum cholesterol level of patients

	Frequency	Percent(%)
Serum Cholesterol >170mg/dl	26	13
Serum Cholesterol <170mg/dl	174	87
Total	200	100

Table No.3: Distribution of frequency for ldl level of patients

	Frequency	Percent(%)
LDL Cholesterol > 110mg/dl	14	7
LDL Cholesterol < 110mg/dl	186	93
Total	200	100

Table No.4: Distribution of frequency of dyslipidemia in type 1 diabetic children

		Frequency	Percent
Dyslipidemia	Present	26	13.0
	Absent	174	87.0
Total		200	100.0

Table No.5: Dyslipidemia in type 1 diabetic children in relation to duration of diabetes

		Duration of Diabetes		Total
		<5 Years	>5 Years	
Dyslipidemia	Present	0(0%)	26(14.8%)	26(13%)
	Absent	24(100%)	150(85.2%)	174(87%)
Total		24	176	200

There were 26(13%) children who had dyslipidemia, all of these children's duration of diabetes was >5 years. Whereas in the remaining 174 children among them 150 children's duration of diabetes was >5 years and 24 children duration of diabetes was <5 years. (Table-5)

Dyslipidemia was also studied in relation to the obesity status of the children. Among 26 children who had dyslipidemia 4 patients were obese while the remaining 22 children were non obese. (Table-6).

Table No.6: Dyslipidemia in type 1 diabetic children in relation to obesity

		Obesity		Total
		Present	Absent	
Dyslipidemia	Present	4(100%)	22(11.2%)	26(13%)
	Absent	0(0%)	174(88.8%)	174(87%)
Total		4	196	200

DISCUSSION

The incidence of type 1 diabetes has increased globally over the past decades⁸. It has been estimated that on an annual basis some 65,000 children aged less than 15 years develop type 1 diabetes mellitus. Increased blood sugar levels also result in significant disturbance in lipid metabolism including both qualitative and quantitative change in the lipids. There are several studies that have evaluated dyslipidemia in type II diabetic patients, but dyslipidemia in type 1 diabetic patients especially in young age remains largely undiagnosed and undertreated.

Dyslipidemia is a preventable major risk factor for cardiovascular disease (CVD). The intensity of dyslipidemia predicts macro vascular complication such as a coronary artery disease in patients with type 1 diabetes mellitus. Total 200 diabetic children were included to see the frequency of dyslipidemia in them. In our study mean age of patients was 10.66 ± 3.32 . Mean age of male and female patients was 9.02 ± 3.58 and 11.63 ± 2.74 years respectively. Females were greater in number as compared to male children.

A cross sectional study from Pakistan evaluated the lipid profile of recently diagnosed uncomplicated young type 1 diabetic children. In This study age range of children was 9-16 years respectively.⁹ While in our study age range of children was 2-16 years. Another case control study in which lipid profiles and lipoprotein levels of 45 children aged 2-18 years with established diabetes were compared with those of 45 healthy controls.¹ Age range of this study was almost similar to our study but our study was cross sectional and lipid profile shows that in our study serum cholesterol level was <170 in 87% children and 13% children were having >170 cholesterol level.

Study from Iran evaluated 128 children with type I diabetes. In this study Patients' mean age was 12.6 ± 4.1 years.. Mean duration of diabetes was 6.9 ± 3.2 years. In our study frequency of Dyslipidemia in diabetic children was 13 % (26/200). Among these children all were having duration of diabetes >5 years and among these children only 2 % (4/200) children were obese. Faghieh in his case control study reported that Dyslipidemia was more prevalent in diabetic children

than in controls (52.9% vs. 47.1%, respectively) (¹). As compared to our study frequency of dyslipidemia in type1 diabetics was quite high in this study. Moayeri reported that type I diabetic patients with poor metabolic control are at higher risk of developing dyslipidemia. Moreover 21.4% had isolated hypertriglyceridemia, 11.6% isolated hypercholesterolemia and 15.5% mixed hyperlipidemia. Factors associated with dyslipidemia included longer duration of diabetes, higher mean age, higher mean HbA1C¹¹. In our study it was also found that all children who had dyslipidemia, their duration of diabetes was >5 years indicating strong association of increased duration of diabetes with dyslipidemias. However, we did not measure Hb1AC in our study.

Studies in children with diabetes demonstrate that the atherosclerotic process begins early in life and that high lipid levels during childhood are associated with coronary atherosclerosis in adulthood. Studies reported in the 1970s and 1980s found a high prevalence of dyslipidemia in youth with type 1 diabetes. However, a review published in 1992 concluded that lipid profiles were antiatherogenic in type 1 diabetes. A 1992 publication from the Diabetes Control and Complications Trial (DCCT) compared lipid concentrations among youth ages 13 to 17 years screened in 1983 to 1989 with published data on adolescents examined in 1972 to 1975 by the Lipid Research Clinics.¹²⁻¹³

SEARCH is a six-center study that began conducting population-based ascertainment of cases of non-gestational diabetes in patients younger than 20 years in 2001.^{11,14} Evidence of abnormal fasting lipid levels in youth with DM has come from the SEARCH study, in which 3% of subjects with T1D had an LDL-c level >160 mg/dL, 14% had an LDL-c level >130 mg/dL, and almost half (48%) had an LDL-c level over the recommended threshold of 100 mg/dL. Reported prevalence were higher in youth with T2D, at 9%, 24%, and 57% for these same cut points, suggesting that obesity has a negative impact on LDL-c (although much more research is needed on the mechanism of the increase in LDL-c sometimes seen in obesity). A recent review of complications in youth with T2D reported a wide ranging incidence of dyslipidemia (15% to 62.5%).¹⁴

Our data and the search data support the importance of optimizing glycemic control and lifestyle interventions aimed at reducing obesity as essential components of managing lipid abnormalities in this population.¹⁵

Future research needs include prospective longitudinal data on the natural history of dyslipidemia, safety and efficacy data from clinical trials of lipid-lowering medications, and ultimately the long-term relation of dyslipidemia and its treatment to future health outcomes in youth with T1D. Limitation of our study was that it included all the type 1 diabetic children

irrespective of their status of diabetic control and insulin requirement as HbA1c was not done.

CONCLUSION

In young diabetic children frequency of Dyslipidemia was 13%. Although this frequency of dyslipidemia is quite less when compared with other studies reported in literature. Even then this frequency indicates that it is necessary to screen young diabetic children for dyslipidemia to avoid future complications.

Conflict of Interest: The study has no conflict of interest to declare by any author.

REFERENCES

1. Faghih Imani S, Hashem pour M, Kelishadi R. Lipid Profile of Children with Type I Diabetes Compared to Controls. *ARYA Atherosclerosis* 2010;2(1).
2. Robert M, Kliegman RM, Schor NF, Behrman RE. Nelson textbook of pediatrics. The Endocrine system. In: Ali RAaO, editor. Nelson Textbook of Pediatrics. 19thed. Philadelphia: Saunders Elsevier Philadelphia; 2011.
3. Shera AS, Basit A, Fawwad A, Hakeem R, Ahmedani MY, Hydrie M, et al. Pakistan National Diabetes Survey: prevalence of glucose intolerance and associated factors in the Punjab Province of Pakistan. *Primary Care Diabetes*. 2010;4(2):79-83.
4. Marcovecchio ML, Dalton RN, Prevost AT, Acerini CL, Barrett TG, Cooper JD, et al. Prevalence of abnormal lipid profiles and the relationship with the development of microalbuminuria in adolescents with type 1 diabetes. *Diabetes Care* 2009;32(4):658-63.
5. Shaheed SM, Nawab SN, Shaikh R, Mahboob T. Glycemic control, dyslipidemia and endothelial dysfunction in coexisted diabetes, hypertension and nephropathy. *Pak J Pharm Sci* 2012;25(1):123-9.
6. Guy J, Ogden L, Wadwa RP, Hamman RF, Mayer-Davis EJ, Liese AD, et al. Lipid and Lipoprotein Profiles in Youth with and without Type 1 Diabetes The search for Diabetes in Youth Case-Control Study. *Diabetes Care* 2009;32(3):416-20.
7. Krishnan S, Short KR. Prevalence and significance of cardiometabolic risk factors in children with type 1 diabetes. *J Cardiometabolic Syndrome* 2009;4(1):50-6.
8. Porth CM. Essentials of pathophysiology: Concepts of altered health states: Lippincott Williams & Wilkins; 2010.
9. Hamad A, Qureshi HJ. Dyslipidaemia in recently diagnosed young subjects of type 1 diabetes mellitus with normal/favourable BMI: a risk factor of macrovascular disease. *Biomedica* 2008;24.
10. Petitti DB, Imperatore G, Palla SL, Daniels SR, Dolan LM, Kershner AK, et al. Serum lipids and glucose control: the SEARCH for Diabetes in Youth Study. *Archives of Pediatrics and Adolescent Medicine* 2007;161(2):159.
11. Oloomi Z. Prevalence of dyslipidemia in children and adolescents with diabetes mellitus type I. *Iranian J Pediatrics* 2006;16(2).
12. McGill HC, McMahan CA, Zieske AW, Sloop GD, Walcott JV, Troxclair DA, et al. Associations of coronary heart disease risk factors with the intermediate lesion of atherosclerosis in youth. *Arteriosclerosis, Thrombosis, and Vascular Biol* 2000;20(8):1998-2004.
13. Taskinen MR. Quantitative and qualitative lipoprotein abnormalities in diabetes mellitus. *Diabetes* 1992;41(Supplement 2):12-7.
14. Kershner AK, Daniels SR, Imperatore G, Palla SL, Petitti DB, Pettitt DJ, et al. Lipid abnormalities are prevalent in youth with type 1 and type 2 diabetes: the search for Diabetes in Youth Study. *J Pediatrics* 2006;149(3):314.
15. Petitti DB, Imperatore G, Palla SL, Daniels SR, Dolan LM, Kershner AK, et al. Serum lipids and glucose control: the search for Diabetes in Youth study. *Archives of Pediatrics & Adolescent Med* 2007;161(2):159.