

LIPID SCREENING IN 100 PEDIATRIC PATIENTS WITH TYPE 1 DM IN TRIPOLI CHILDREN HOSPITAL (2008-2009)

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ABSTRACT

DM is a chronic metabolic disorder characterized by abnormalities in fuel metabolism including glucose, lipids and amino acids. Lipid disorders are common in diabetes mellitus, diabetic dyslipidemia is characterized by hypertriglyceridemia, increased levels of (VLDL), small dense LDL lipoprotein, and decreased levels of high density lipoproteins (HDL). Dyslipidemia will increase risk of cardiovascular disease in patients with diabetes mellitus. The study is designed to screen type1 diabetic patients for lipid abnormality and to know its relation to HbA1c, BMI and duration of DM. Case series study was done on 364 diabetic patients with type 1 DM of both sexes and aged between 1.5-18 yrs with different duration of DM, who attended endocrine clinic at Tripoli children hospital 2008-2009. Those patients were investigated for fasting TC, TG, LDL, HDL, and HbA1C, only 100 patients. (Convenient sample) was included in the study according to complete investigations results which were done at national accredited laboratory, data were analyzed according to weight, height, BMI, HbA1c and duration of diabetes mellitus. Lipid profiles of our patients showed abnormality in TC, TG, LDL, and HDL with significant positive correlation between triglycerides level and HbA1c level. The age of the patients ranged between 1.5 to 18 years, with mean age 10.7 ± 4.2 years. Female: Male ratio 1.4: 1, By using nonparametric chi-square; the difference between observed and expected count was insignificant ($p=0.072$). The duration of DM among our patients ranged between 1 month and 9.5 years, with mean 2.8 ± 2.5 yrs.; the majority of our patients (92%) had normal weight. 3 % of them were overweight (z score $>+2SD$ units). Only 1% were under weight. HbA1c was between 4.5% and 18.6 %, with mean HbA1c $9.3 \pm 2.6\%$, so about 52% of the patients had accepted HbA1c and 45% had non accepted HbA1c. Total cholesterol, LDL, TG, and HDL were the parameters determined in this study; the mean value of each of them is within normal range. We found that 5% of the patients have high cholesterol level, and about 9% have high LDL cholesterol and 13% have low HDL cholesterol, 6% had high TG level. So the commonest lipid abnormality is low HDL cholesterol by using T student test for independent samples: HbA1c was significantly greater in patients with high triglyceride levels (mean HbA1c 11.9%) than in those with normal TG level (mean HbA1c 9.2%) P value = 0.024. There is an abnormality in lipid profile among patients with type1DM especially who have poor diabetic control. Further longitudinal study with large sized sample is needed to get more informative results.

KEYWORDS: Lipid profile in Libyan children; Cholesterol in type 1 DM; HbA1c related to dyslipidemia.

INTRODUCTION

Diabetes Mellitus is a chronic metabolic disorder characterized by abnormalities in fuel metabolism including glucose, lipids and amino acid, hyperglycemia is the cardinal feature for diabetes mellitus. The major forms of diabetes are classified according to those caused by deficiency of insulin secretion due to pancreatic B-cell damage, type1DM and those that are a consequence of insulin resistance occurring at the level of skeletal muscle, liver and adipose tissue with various degree of B-cell impairment, type2 DM⁽¹⁾.

Incidence:

Incidence of type1 DM is rapidly increasing in specific regions, type1DM accounts for about 10% of all diabetes, affecting 1.4 million in the united states and about 15 million around the world. It is one of the most common severe chronic childhood diseases.

It is predicted that the overall incidence of type1DM will be about 40% higher in 2010 than in 1997⁽¹⁾.

There is a little argument that type2DM in children and adolescents has become an epidemic, reports from throughout the united states show that the percentage of patients with new onset diabetes diagnosed as having type 2DM increased from 2%-4% in 1994 to 20%-50% by 2000⁽²⁾.

Dyslipidemia in DM:

Lipid disorders are common in diabetes mellitus, diabetic dyslipidemia is characterized by hypertriglyceridemia, increased levels of (VLDL),small dense LDL lipoprotein, and decreased levels of high density lipoproteins(HDL)⁽³⁾.The major lipid abnormality are seen in patients with type 2DM⁽⁴⁾.

Diabetes Mellitus: is a strong risk factor for cardiovascular disease, which constitute the main cause of morbidity and mortality in both type1 and type2 diabetes in adulthood. Type1 diabetes is associated with 10-folds increase in CVD over that of people without diabetes⁽⁵⁾. Risk factors that independently increase cardiovascular risk in people with diabetes include hypertension, dyslipidemia, hyperglycemia and renal dysfunction⁽⁶⁾. A body of evidence now shows that elevated levels of plasma lipids especially low density lipoproteins (LDL-C) are associated

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with an increased probability of premature cardiovascular disease which constitute the main cause of morbidity and mortality in both type 1 and type 2 diabetes in adulthood⁽⁷⁾. Therefore preventive measures should be initiated as early as possible to prevent progression of the disease⁽⁸⁾.

American Diabetes Association (ADA) recommended in 2008 that fasting lipid profile in screening program of children and an adolescent with type1 DM. If there is a family history of a hypercholesterolemia or cardiovascular events before age 55 yrs or if family history is unknown, then fasting lipid profile should be performed on children > 2 yrs of age soon after diagnosis (after glucose control has been established). All children diagnosed with DM at or after puberty should have a fasting lipid profile performed soon after diagnosis. For both age groups, if lipids are abnormal annual monitoring is recommended⁽⁹⁾.

AIMS OF STUDY

To screen the patients with type 1 DM for lipid abnormality. To know the relations between the lipid levels and HbA1c, BMI and duration of DM.

PATIENTS AND METHODS

Case series study was done on 364 diabetic patients with type 1 DM of both sexes and aged between 1.5-18yrs (younger age group with unknown family history of dyslipidemia were included according to ADA recommendation) with different duration of DM, who attended endocrine clinic at Tripoli children hospital 2008-2009. Those patients were investigated for fasting (means consuming nothing orally after midnight) TC, TG, LDL, HDL, and HbA1C, only 100 patients (Convenient sample) were included in the study according to complete investigations results which were done at national accredited laboratory, data were analyzed according to, HbA1c, diabetes mellitus duration, weight, height, BMI; by using z score (standard deviation classification system) which is widely recognized as the best system for analysis and presentation of anthropometric data; normal weight (-2 to +2SD), under weight (-2SD), over weight (>+2SD) t), statistically by using SPSS program, results considered statistically significant when P. value <0.05.

RESULTS

Age distribution (figure1):- The age of the patients ranged between 1.5 to 18 years, with mean age 10.7±4.2 years.

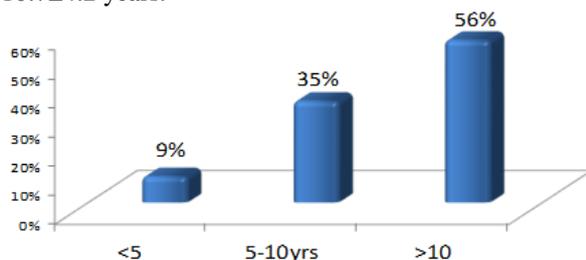


Figure (1) age distribution of children with type I DM (under study) attending endocrine clinic

in Tripoli children hospital (2008-2009) Sex distribution (figure 2):- Female: male ratio= 1.4: 1, by using nonparametric chi-square; the difference between observed and expected count was insignificant (p=0.072).

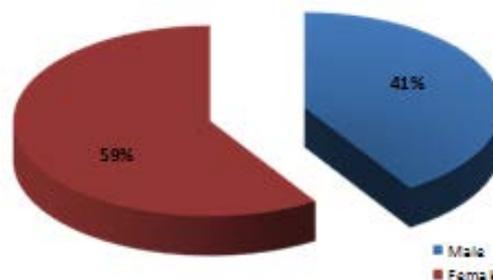


Figure (2) sex distributions of children with type I DM attending endocrine clinic in Tripoli children hospital (2008-2009)

The duration of DM among our patients (time between diagnosis and time of study) ranged between 1month and 9.5 years, with mean 2.8±2.5 years as showed in (figure3).

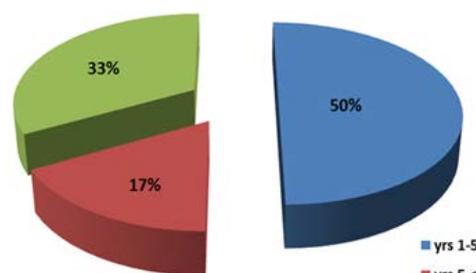


Figure (3) distributions of patients according to duration of DM

Body mass index in (figure 4):-the majority of our patients (92%) had normal weight, 3 % of them were overweight (z score >+2SD units) and only 1% were under weight(ZS <-2SD units).

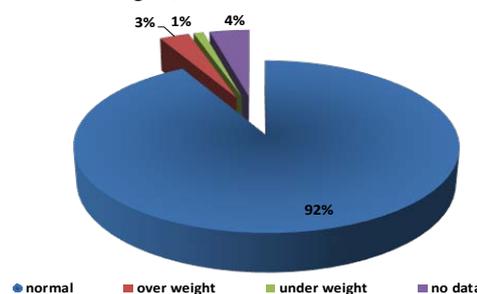


Figure (4) distribution of our patients according to BMI Z-score

HbA1c found to be ranged between 4.5% and 18.6 %, with mean HbA1c = 9.3± 2.6%, so about 52% of our patients had accepted HbA1c and 45% had non accepted HbA1c (figure 5).

Total cholesterol, LDL, TG, and HDL (Lipid profile) were the parameters determined in this study:

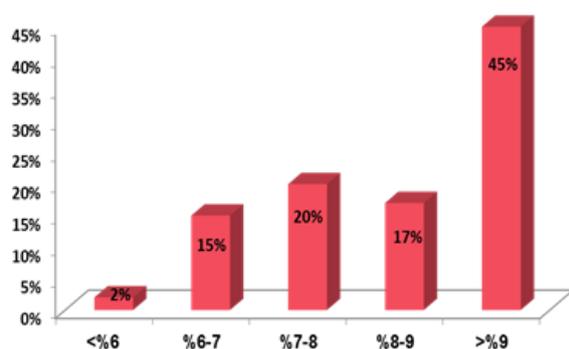


Figure (5) distribution of patients according to the level of HbA1c

We found that 5% of our patients have high cholesterol level, and about 9% have high LDL cholesterol and 13% have low HDL cholesterol, 6% had high TG level. So the commonest lipid abnormality is low HDL cholesterol (figure 6).

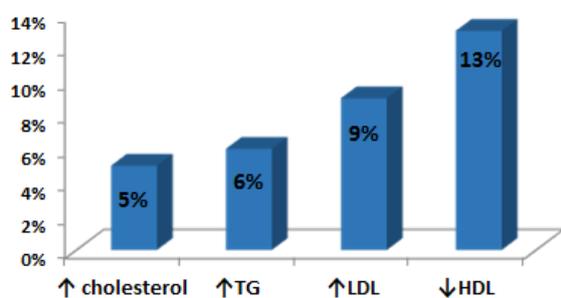


Figure (6) distribution of patients under study by abnormal lipid profile

The relation between lipid profile and HbA1c (table1). By using T student test for independent samples: HbA1c was significantly greater in patients with high triglyceride levels (mean HbA1c=11.9%) than in those with normal TG level (mean HbA1c=9.2%) P value=0.024. However HbA1c did not differ significantly with; LDL level (P value=0.222), HDL level (P value=0.144) nor cholesterol level (P value =0.738).

Table (1) the relation between lipid profile and HbA1c

Lipid profile	Mean HbA1c %	P-value
S cholesterol -High -normal	8.9 9.3	0.738
S. LDL - High - normal	10.3 9.2	0.222
TG - high - normal	11.9 9.2	<u>0.024</u>
HDL - high - normal	8.1 9.6	0.144

The relation between lipid profile and BMI z-score:- We compared the mean of BMI for normal and abnormal lipid profile. The difference between the

means for each parameter is statistically insignificant as showed in (table 2).

Table (2) Relation between BMI and lipid profile

Lipid profile	Mean of BMI z- score	P.value
S.Cholesterol - normal -high	0.46 1.21	0.114
HDL - normal -high	0.48 0.81	0.416
LDL - normal - high	0.462 0.87	0.283
TG - normal - high	0.49 0.48	0.980

The net table shows the relation between lipid profile and mean duration of DM: T student test for independent samples used to compare the mean duration by years for normal and abnormal lipid profile, as seen in (table 3).

Table (3) relation between lipid profile and duration of DM

Lipid profile	Mean duration of DM (years)	P.value
Cholesterol - normal - high	2.83 2.4	0.724
HDL - normal - high	2.9 3.7	0.412
LDL - normal - high	2.9 1.5	0.112
TG - normal - high	2.93 0.9	0.059

The mean duration was inversely related with cholesterol, LDL and TG level (i.e. high lipid level among patients with short duration of DM) but this difference is statistically insignificant except for triglyceride where it is nearly significant (p=0.059).

DISCUSSION

The incidence of type 1 DM is rapidly increasing, in USA annual incidence has risen from approximately 16 cases per 100,000 populations in 1990 to 24.3 per 100,000 populations (2008) and is probably still increasing⁽¹⁰⁾.

The frequency however is highly correlated with increasing age; it is one case in 1430 children at 5yrs of age to one case in 360 children at 16 years⁽¹⁾.

This study showed that the majority of our patient (56%) were between 10yrs and 18yrs, 35% of our patients in age group between 5-10yrs, only 9% aged less than 5yrs; this means that DM increases in frequency with age, also these results achieved by Kadiki et- al (1991– 2000)⁽¹¹⁾.

Diabetes is more common in females:

Our study showed female to male ratio =1.4 : 1 which agree with Kadiki et al (1998) study that shows the total of 73 females and 53 males (F:M=1.37:1) under 15yrs of age were diagnosed DM type1 in the period between 1991 to 1995 on Libyan children in Benghazi.⁽¹⁾

In 1998 national health survey (NHS) in Singapore showed the crude prevalence of diabetes was 8.5% in males and 9.6% in females.⁽¹⁾

In Finland during 1987 – 1989, the incidence of type1DM was higher in boys (38.4/100.000) than in girls (32.2/100.000) with M: F = 1.2:1.⁽¹⁴⁾

Other studies showed males and females are almost equally affected⁽¹⁾.

Body Mass Index:

The majority of our patients (92%) have normal weight, only 3% of them are overweight, it is well known that obesity is common among diabetes type2 patients because insulin resistance is a result of fat mass.

One study was done on African patients (1988 - 1995) comparing BMI between 50 patients with type 2DM and type 1DM, the mean BMI±SE at diagnosis of type 2DM patients was 35±1.1 KG/M² in contrast to 20± 0.8 KG/M² for type 1DM. 96% of type 2DM and only 24% of type 1DM youths had BMI > 85th percentile⁽¹⁵⁾.

HbA1c:

Measurement of Glycosylated HB (HbA1c) provide a reliable index of long term glycemic control, this measurements reflects the average blood glucose concentration of the preceding four months.

Our goal in the management of our patients to reach normal or near normal glycemic level.

The diabetes control and complication trial (DCCT) established conclusively the association between higher glucose levels and long term micro vascular complications and intensive management produced dramatic reductions of retinopathy, nephropathy and neuropathy by 47 – 76%⁽¹⁾.

Our study showed about 52% of our patients had accepted HbA1c, and 45% had HbA1c > 9% which is not acceptable. These results can be explained by; 31% from patients with high HbA1c were newly diagnosed according to age distribution among the same group; we found 32% of them were under 10yrs old, and 68% were more than 10yrs old, however it is more difficult to obtain a good HbA1c value during puberty since the secretion of growth hormone will raise blood glucose level.⁽¹⁶⁾

During puberty it is not uncommon to have an increased HbA1C of up to 1% even if the patient is as careful with his diabetes as he was before puberty.⁽¹⁾

Dyslipidemia in diabetes:

Our study showed some abnormality in the levels of TC, TG, LDL, HDL-C. The lipid alterations were expected in type 1DM.⁽¹⁸⁾

Studies on diabetic patients showed most significant lipid finding are high value triglyceride, LDL and total cholesterol, however HDL and total cholesterol were found low, normal or high in the literature.⁽¹⁹⁾

Results of one longitudinal study was done on 360 patients with type 1DM in Barbara Davis Center for childhood diabetes in Colorado between 1994–2004 showed sustained abnormalities existed for TC (16.9%), decrease HDL (3.3%) and high LDL (3.3%)⁽²⁰⁾.

Relation between lipid profile and HbA1C:

Those patients with high triglycerides had worse glycemic control (significant positive relation) than those with normal TG level but there is no statistical relation between TC, LDL-C, HDL-C and HbA1c.

In comparing with the results of a study was done in Morocco on 100 patients with type 1DM aged 3-17 years, where they had high HbA1c >8% (poorly diabetic control), showed that the level of triglyceride, LDL-cholesterol were higher (p<0.01, p <0.05 respectively) than those of the control group, HDL-cholesterol level was significantly lower (p<0.01) in these children.⁽²¹⁾

In various studies, HbA1C level was noted as showing positive correlation with triglycerides and total cholesterol and LDL cholesterol in diabetic patients⁽¹⁸⁾

Relation between lipid profile and BMI:

When we compare those patients with high lipid level to those patients who have normal lipid level, we found they were similar in BMI z score, which is the same result achieved by longitudinal study on 360 patients with type 1 DM in Barbara Davis Center for childhood diabetes⁽²⁰⁾.

Relation between lipid level and duration of DM:

We found those patients with higher TC, TG, LDL level had short duration of DM and this relation is nearly significant for triglyceride and this can be explained by that those patients with high TG were newly diagnosed patients and still need time to stabilized their blood sugar.

CONCLUSION

There is an abnormality in lipid profile among patients with type 1 diabetes mellitus.

Those patients with poor diabetic control (high HbA1c) showed high triglycerides level.

RECOMMENDATION

To screen our patients of DM type1 for dyslipidemia at diagnosis (after stabilizing blood sugar) and to be repeated yearly for those patients with poor control.

Further longitudinal study with large sized sample is needed to get more informative results.

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