Original Article

Clinical scenario of primary dyslipidaemia in the paediatric age group; an Egyptian experience

Rania Hosny Tomerak,[1] Nermeen Moftah Galal,[2] Sawsan Hassan Abdelhady,[3] Khaled A. Naem[4]

Department of Pediatrics, Cairo University,[1-3] Department of Pediatrics, Ministry of Health,[4] Cairo, Egypt.

Abstract

Objectives: To study the frequency of occurrence of the different forms of primary dyslipidaemia, to display their various clinical presentations and their lipid profile before and six months after therapy.

Methods: Prospective study was conducted in the Cairo University Childrens' Hospital- Twenty primary dyslipidaemic cases were included with history taking, clinical examination, electrocardiography and echocardiography. Investigations included: Total cholesterol, total triglycerides, LDL-C and HDL-C using enzymatic colorimetric methods, ApoA1, Apo B100 were evaluated using a Behring nephelometer. Different therapeutic modalities were offered and reassessment of laboratory tests was done every three months.

Results: Parents were consanguineous in 75%. Eleven cases had hypercholesterolaemia; eight had xanthoma, one had xanthelasma, two had hypo pigmentation, three had corneal arcus, one had lipaemia retinalis and six had cardiac manifestations among which one case had myocardial infarction and one case died. Three cases had hypertriglyceridaemia; three had milky plasma, two had xanthoma, two had lipaemia retinalis, one case had pancreatitis and none had cardiac manifestations. Six cases had mixed hyperlipidaemia; five had xanthoma, three had lipaemia retinalis and two had cardiac manifestations. After six months of multi-drug use, the laboratory lipid profile was unsatisfactory in majority of the cases.

Conclusion: Primary dyslipidaemia may present early and paediatricians should have high index of suspicion. These children should be put on early strict lipid reduction protocols to prevent complications.

Keywords: Paediatric cardiovascular disease, Xanthoma, Pancreatitis, Myocardial infarction (JPMA 62: 321; 2012).

Introduction

Coronary heart disease (CHD) is the major cause of morbidity and mortality, with a worldwide epidemic potential, according to WHO reports.[1] Dyslipidaemia is a modifiable highly prevalent disorder closely linked to cardiovascular diseases.[2,3] Dyslipidaemia can be primary or secondary to diseases or medications. The original classifcation of dyslipidaemia was based on the bio-chemical phenotype of lipoprotein excess. A more simplifed classifcation is based on whether plasma levels of cholesterol, triglycerides, or both are elevated.[4]

Most cases of dyslipidaemia are multifactorial in origin with genetic predisposition. The conditions mostly encountered are primary moderate hypercholesterolaemia (prevalence l/30), familial combined hyperlipidaemia (1/100), familial hypertriglyceridaemia (l/200 to 300), and heterozygous familial hypercholesterolaemia (l/500). Primary dyslipidaemia can be detected before the age of 20.[5]

Familial combined hyperlipidaemia (FCH) is autosomal-dominant occurring in adults and children and characterized by high cholesterol and triglycerides.[6] It accounts for 30-50% of familial causes of CHD and 10% of premature CHD.[7] Familial hypercholesterolaemia (FH) is autosomal-dominant, characterized by cutaneous and tendenous xanthomas, arcus corneae, CHD due to premature atherosclerosis and elevated LDL[8] noted as early as at birth.[9] Familial hypertriglyceridaemia (FHTG) is autosomal-dominant and is often accompanied by insulin resistance, obesity, hyperglycaemia, hypertension and hyperuricaemia.[10] Patients with marked hypertriglycaeridemia (>1000mg/dl) may develop memory loss, abdominal pain and /or pancreatitis, dyspnoea, eruptive xanthoma, and lipaemia retinalis.[11]

The aim of this work was to study the frequency of occurrence of different forms of hyperlipidaemia in cases presenting to our metabolic clinic, to display their various clinical presentations and to assess their lipid profile before and after six months of therapy.

Patients and Methods

This is a descriptive prospective study, conducted in the metabolic clinic in the Cairo University Children's Hospital, in the period from June 2008 through May 2010. This is a specialized clinic receiving cases suspected clinically or proven by laboratory tests to have a metabolic disease. The clinic receives referrals of suspected cases from all over the country; after being re-assessed in the general paediatric clinics. In the metabolic clinic, patients are thoroughly examined; the relevant investigations are done together with proper documentation of the patient's data. Cases with clinico-laboratory evidence of primary dyslipidaemia were recruited in this study. Their clinical and laboratory findings together with the treatment modalities applied and the response to this treatment were displayed in this study. Screening of their relatives was done whenever possible. The hospital's ethical review board approved the study and the parents provided an informed consent.

Patients were subjected to history taking and proper examination. Body mass indices (BMI) were assessed according to the Egyptian growth curves. Fundus examination, echocardiography and electrocardiography (ECG) were done. Echocardiography was done using Hp 4500 machine with 8 MHZ probe. Dimensional echocardiogram and Color flow Doppler were performed to detect: The evidence of cardiac dilatation and estimation of the coronary artery dimensions, checking any stenosis of the coronary ostia, assess cardiac function, assess valves regurgitations mitral or aortic and exclusion of structural heart disease

Total cholesterol (TC), total triglycerides (TG), low-density lipoprotein cholesterol (LDL-C) and high-density lipoprotein cholesterol (HDL-C) were obtained after a 12-hour fast. All were measured using enzymatic colorimetric methods on Roche Integra Biochemical analyzer with commercially available kits (Roche Diagnostics GmbH, Mannheim, Germany). Low-density lipoprotein cholesterol concentrations were calculated by means of the Friedewald formula if the triglycerides were less than 400 mg/dl. LDL concentrations were calculated by means of the Friedewald formula if the TG was less than 400mg/dl. LDL-C =TC - [HDL + (TG/5)].[12]

Values were considered high if cholesterol was >200 mg/dl, LDL-c > 130 mg/dl, triglycerides > 100 mg/dl in age ?10 years and > 130 mg/dl in age10-19 years and HDL was considered low if < 35 mg/dl.[13] ApoA1, Apo B100 were evaluated using a Behring nephelometer. The accepted Apo A1 level (SD) was 133 (27) mg/dl in age ≤ two years and 143 (18) mg/dl in age >two years. The accepted Apo B100 level (SD) was 73 (16) mg/dl in age ≤ two years and 78 (17) mg/dl in age > two years.[14]

Cases presenting with secondary dyslipidaemia were excluded e.g. nephrotic syndrome, chronic kidney disease, diabetes, hypothyroidism and drug induced (Corticosteroids, thiazides, β-Blockers, retinoid and antiretroviral drugs).

According to the laboratory results, cases were subdivided into three groups:

Familial Hypercholesterolaemia (FH): having elevated cholesterol and LDL-c. They received dietary restrictions, cholestyramine (16gm/d), statin (20mg/day) and /or plasmapharesis.

Familial hypertriglyceridaemia (FHTG): having elevated triglycerides. They received dietary restrictions, omega3 fatty acid (4g/day) and/or fibrate (300 mg/bid).

Mixed hyperlipidaemia: having elevated triglycerides, cholesterol and LDL-c. They received dietary restrictions, omega3 fatty acid, statin, and/or fibrate.

The choice of treatment in the 3 groups depended upon their initial cholesterol and triglycerides level, age of the patient and laboratory reassessment after three months.

Statistical Package for social science program version 9.0 was used for analysis of data. Data was summarized as mean and standard division. Non-parametric test (Mann Whitney U) was used for the analysis of two quantitative data. Kruskal -Wallis H test was done for the analysis of more than two variables. Chi square test was used for the analysis of qualitative data. P-value is considered significant if < 0.05.

Results

The study included twenty cases; 17 cases presented to the clinic and three cases were diagnosed among their screened relatives. Eleven cases had FH, three males and eight females, had ages between 4 years 8 months and 13

Table-1: Clinical findings in hypercholesterolaemic, hypertriglyceridaemic and mixed hyperlipidaemic patients.

Hypercholesterolemic group

	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7	Case 8	Case 9	Case 10	Case 11	Total Number =11	Percentage
Sex	F	M	F	F	F	F	F	M	F	F	M		
Xanthoma	+	+	+	+	-	+	+	-	-	+	+	8	72.7
Xanthelasma	-	-	+	-	-	-	-	-	-	-	-	1	9.1
Hypopigementation	-	-	-	-	-	+	-	+	-	-	-	2	18.2
Hepatomegaly	-	-	-	-	+	-	+	+	+	+	+	6	54.6
Splenomegaly	-	-	-	-	-	-	-	+	-	-	-	1	9.1
Corneal arcus	-	-	-	-	-	-	+	+	-	+	-	3	27.3
Lipaemia retinalis	+	-	-	-	-	-	-	-	-	-	-	1	9.1
Chest pain	+	-	+	-	-	-	-	-	-	+	-	3	27.3
Electrocardiogram	-	-	-	-	-	-	-	ST	-	MI	-	2	18.2
Echocardiography	AR & MR	-	AS, MR&PFO	-	AR	-	AR	-	-	AR & MR	-	5	45.5

Hypertriglyceridaemic group

	Case 12	Case 13	Case 14	Total Number=3	Percentage
Sex	F	F	M		
Milky plasma	+	+	+	3	100
Xanthoma	-	+	+	2	66.7
Abdominal pain	-	+	-	1	33.3
Hepatomegaly	+	-	+	2	66.7
Xanthelasma	-	-	-	0	0
Corneal arcus	-	-	-	0	0
Lipaemia retinalis	+	+	-	2	66.7
Chest pain	-	-	-	0	0
Electrocardiogram	-	-	-	0	0
Echocardiography	-	-	-	0	0

Mixed hyperlipidaemia group

	Case 15	Case 16	Case 17	Case 18	Case 19	Case 20		
Sex	M	M	F	M	M	F		
Milky plasma	-	-	+	+	+	+	4	66.7
Xanthoma	+	+	+	+	+	-	5	83.3
Xanthelasma	-	-	-	-	-	-	0	0
Hepatomegaly	-	-	+	+	+	-	3	50
Splenomegaly	-	-	+	-	-	-	1	16.7
Corneal arcus	-	-	-	-	-	-	0	0
Lipaemia retinalis	-	-	+	+	+	-	3	50
Chest pain	-	-	+	-	-	-	1	16.7
Electrocardiogram	-	-	ST	-	-	-	1	16.7
Echocardiography	-	-	-	-	-	AR	1	16.7

AR=aortic regurge. AS=aortic stenosis. PFO=patent foramen ovale
MR=mitral regurge. F=female. M=male. ST=sinus tachycardia
(-) =Absent. (+) = present.

years. Two females were accidentally discovered during family screening. Three cases had FHTG, one male and 2 females, aged between 9 months and 5 years.

Six cases had mixed Hyperlipidaemia, two males and four females, aged between 10 months and 10 years. One male was accidentally discovered during family screening.

FHTG group symptomatized earlier at a mean age of 8.7±9.9 months than FH, 54.2±22 and the mixed hyperlipidemia group 54.0±29 months (p=0.03). History of positive consanguinity was detected in 15 (75%) cases, eight having hypercholesterolaemia, two having hypertriglyceridaemia and five having mixed hyperlipidaemia. Family history of similar condition, sudden death and/or premature CHD was detected in ten cases, eight having hypercholesterolaemia, one having hypertriglyceridaemia and one having mixed hyperlipidaemia.

The mean systolic blood pressure values (mmHg) were 95.5±12.9, 66.7±20.8 and 78.3±21.4 for the FH, FHTG and mixed hyperlipidemic groups respectively whereas the mean diastolic values were 61.8±7.5, 44.3±15.3 and

Table-2: Comparison between laboratory data of patients on recruitment and after six months of treatment.

Variables	Basal lab data Mean (SD)	Follow up lab data Mean (SD)	P-value
	Hypercholesterolaemia		
Cholesterol (mg/dl)	605.3 (212.6)	371.6±158.3	0.005*
Low-density lipoprotein cholesterol.(mg/dl)	587.0 (225.4)	270.4±131.1	0.02*
High density lipoprotein cholesterol (mg/dl)	45.0 (17.4)	43.9±13.0	0.2
Triglyceride (mg/dl)	104.1 (68.1)	106.5±51.0	0.7
	Hypertriglyceridaemia		
Triglyceride (mg/dl)	1834.3 (1046.4)	1250.0±608.3	0.1
Cholesterol (mg/dl)	149.3 (43.7)	126.0±48.0	0.1
Low-density lipoprotein cholesterol. (mg/dl)	97.7 (23.1)	85.0±27.8	0.3
High density lipoprotein cholesterol (mg/dl)	26.7 (6.4)	33.0±3.5	0.3
	Mixed hyperlipidaemia		
Cholesterol (mg/dl)	850.0 (674.6)	254.5±66.3	0.03*
Triglyceride (mg/dl)	3822.0 (4390.3)	1129.3±748.8	0.04*
Low-density lipoprotein cholesterol. (mg/dl)	501.2 (364.5)	172.0±55.8	0.05*
High density lipoprotein cholesterol (mg/dl)	69.1 (57.9)	45.5±12.9	0.3

*Significant.

Table-3: Lipid Profiles before and after treatment in hypercholesterolaemic, hypertriglyceridaemic and mixed hyperlipidaemic patients.

Hypercholesterolaemic group

Number	Age (years)	Lipid Profile Before treatment (mg/dl)			Line of Treatment	Lipid Profile after 6 months of therapy (mg/dl)		
		TC	LDL	HDL		TC	LDL	HDL
1	9	662	608	38	Diet,Statin,Choestyramine	425	322	40
2	9	676	603	68	Diet,Statin,Choestyramine	552	422	68
3	13	640	571	55	Diet,Statin,Choestyramine	Died		
4	7	226	150	48	Diet,Statin,Choestyramine	170.	105	45
5	8	421	355	38	Diet,Statin,Choestyramine	345	243	40
6	7	750	625	50	Diet,Statin,Choestyramine Plasmapharesis	250	147	30
7	10	606	564	30	Diet,Statin,Choestyramine	231	170	35
8	4	625	595	44	Diet,Statin,Choestyramine	422	315	45
9	11	296	230	56	Diet,Statin,Choestyramine	186	120	56
10	6	865	760	65	Diet,Statin,Choestyramine Plasmapharesis	550	425	45
11	12	888	802	68	Diet,Statin,Choestyramine Plasmapharesis	585	435	25

Hypertriglyceridaemic group

Number	Age	TG Before treatment (mg/dl)	LDL	Line of Treatment	TG After 6 months(mg/dl)	LDL
12	10 months	2250	112	Diet & omega3	1550	80
13	6 years	2609	115	Diret, omega3, fibrate &plasmapherasis	1650	115
14	9 months	644	71	Diet & omega3	550	60

Mixed hyperlipidaemic group

Number	Age	Lipid Profile Before treatment (mg/dl)				Line of Treatment	Lipid Profile after 6 months of therapy (mg/dl)			
		TC	TG	LDL	HDL		TC	TG	LDL	HDL
15	10 years	325	1023	250	35	Diet,omega3,statin&fibrate	195	1023	110	35
16	9 years	316	1617	121	52	Diet,omega3, statin &fibrate	182	53	71	50
17	7 years	1495	2189	1055	68.5	Diet,omega3,statin&fibrate	325	1125	225	65
18	18 months	640	4888	526	45	Diet&omega3	210	2150	135	50
19	10 months	1890	12280	780	30	Diet&omega3	290	1750	231	28
20	6 years	434	935	325	48	Diet,omega3,statin&fibrate	325	675	210	45

TC=total cholesterol. TG=total triglycerides.

LD=Low density lipoprotein cholesterol HDL= high density lipoprotein cholesterol.

53.3±16.3 respectively; all readings were within the normal ranges for age.

The BMI of the whole group ranged between 20 and 31, with a mean of 28±2 in the FHTG group, 27±3.8 in the mixed hyperlipidaemia group and 27±3.6 in the FH group (p=0.4)

The clinical manifestations of the three groups are presented in Table-1.

Hypercholesterolaemia group: Eight cases presented with xanthomas; the lesions appeared as small, multiple, orange-yellow superficial papules with an erythematous base (eruptive xanthomata). Case 3 had xanthelasma in the form of a yellowish, soft macule on the medial portion of the upper eyelid. Hypopigmentation was observed in two cases before therapy; truncal in case 6 and facial in case 8. Corneal arcus was found in three cases; case 7, 8 and 10; detected at the age of 4 1/2, 6 and 10 years respectively.

Abdominal ultrasound done on the six cases having hepatomegaly revealed mild hepatomegly with homogenous pattern, intact hepatic vein and portal vein, no dilated intrahepatic biliary radicals, no focal lesions in the liver. Case 8 had mild splenomegaly with homogenous pattern and no focal lesions. Cases having organomegaly in the other two groups of dyslipidaemia displayed the same ultrasonographic findings.

ECG revealed sinus tachycardia in case 8. Old myocardial infarction was observed in case 10 (female) with raised ST segment and flat T wave in v4, v5 and v6. She was admitted at the age of five years because of chest pain and elevated cardiac enzymes. Her twin sister died, by the same presentation, at the age of four years. The five cases having cardiac lesions by echocardiography had aortic valve involvement and three had mitral valve defects. Case 3 died suddenly at home at the age of 13 years. Stenotic changes of the coronary ostium were not detected in any case.

Hypertriglyceridaemia group: Milky plasma was the alarming symptom for all. Case 13 had tendinous xanthoma, appearing as slowly enlarging, smooth, and firm subcutaneous nodules on the extensor surface of the forearm and case 14 had eruptive xanthoma. Case 13 presented with recurrent abdominal pain diagnosed as pancreatitis at the age of four years by the elevated serum amylase and lipase. The two cases presenting with lipaemia retinalis had much higher levels of triglycerides than the third case. None of the cases had cardiac manifestations.

Mixed hyperlipidaemia group: Eruptive xanthomas were found in the five cases. ECG revealed sinus tachycardia in case number 17 and echocardiography revealed aortic regurgitation in case 20.

All the patients received treatment for six months according to the established protocol of the clinic; their basal and the follow up lipid profile -after six months- are shown in Table-2. Detailed treatment, basal and follow up lipid profile of each patient are shown in Table-3.

The mean Apolipoprotein A values were 36.6±17.6, 34.0±23.4 and 108.0±90.5 mg/dl whereas the mean Apolipoprotein B levels were 184.2±60.9, 25.7±14.0, 43.8±11.9 mg/dl for the hypercholesterolemic, hypertriglyceridemic and mixed dyslipidaemia groups respectively, significantly higher (p=0.001*) in the hypercholesterolaemic group.

The four cases that performed plasmapheresis developed low HDL; (LDL-aphaeresis was not available). Case number 15 (mixed hyperlipidaemia) presented with ecchymotic patches, bleeding tendency and arthritis, with normal anti nuclear antibody to exclude systemic lupus. Case number 17 (mixed hyperlipidaemia) suddenly complained of inability to walk and muscular pain with elevated CPK, relieved by statins stoppage.

Discussion

In our work, assessment of cases having primary dyslipidaemia revealed that hypercholesterolaemia was the most prevalent presentation. Six cases had organic cardiac lesions; one of them had frank myocardial infarction at five years of age and another patient died at 13 years. After six months of multi-drug use, the laboratory lipid profile was unsatisfactory in the majority of the cases.

In our study, the majority had FH, in agreement with Harrabi et al[15] and Jie et al.[16] However, previous studies done on FHTG revealed that it is often silent, and may not have clinical features.[17]

Seventy five percent of our patients had consanguineous parents. This is a major problem in the whole Middle East[18] and probably contributes to the severity of these hereditary disorders. Female predominance was observed (60%), similar to the study done in Canadian primary care.[19] Positive family history of primary dyslipidaemia, sudden death and/or premature CHD was observed in 50% in our study in concordance with other studies.[19] Similar family condition is one of the diagnostic features of familial hypercholesterolaemia[17] and premature CHD has been reported in the relatives of up to 89% of heterozygote familial hypercholesterolaemia.[20] However, combined lipid disorders showed more prevalent positive family history than other lipid disorders in one study.[21]

Regarding cutaneous manifestations, multiple types of xanthomas can occur in familial hypercholesterolaemia, such as tendinous, tuberous, subperiosteal, and xanthelasma. Intertriginous xanthomas are rare, but pathognomonic of this disorder.[22] Patients with hypertriglyceridaemia may also

develop eruptive xanthoma.[11] In our study, 14 cases presented with eruptive xanthomata and one who had tendinous xanthomas in the hypertriglyceridaemia group. Hypopigementation was observed in two cases and this is the first study reporting hypopigmentation in FH patients.

Hepatomegaly with or without splenomegaly was observed in all groups, which could be explained by lipid deposition. Acute pancreatitis was diagnosed in a six years old female having FHTG with triglyceride level of 2609 mg/dl as reported in similar studies.[23]

Lipaemia retinalis was observed in the three groups. It is an important and reliable parameter of high levels of chylomicrons and triglycerides.[24] It was also reported in one case having mixed hyperlipidaemia.[25] We discovered lipaemia retinalis in a nine years old- female having isolated hypercholesterolaemia; this was previously reported in one hypercholesterolaemic patient following bone marrow transplantation that was reversible after cholesterol normalization.[26] Corneal arcus is age related,[27] however it was observed in our patients having FH as early as four and a half years. Its presence suggests increased atherosclerosis risk in these hypercholesterolaemic patients.[28] It was not detected in any of the other two groups though cases of hypertriglyceridaemia can develop it in addition to decreased retinal blood flow and lipid emboli affecting vision.[29]

The present study observed that blood pressure was within normal ranges among our cases, while other studies mentioned that hypertension is one of the diagnostic features of FHTG[10] This could be explained by the fact that, the prevalence of fibrous plaques and atherosclerotic lesion increases with age,[30] and our patients were still young.

A definite relationship between total cholesterol and cardiovascular complication has been documented.[31] Acute anterior-lateral myocardial infarction has been reported in a 16-year-old patient with familial hypercholesterolemia.[32] In our study, we report the occurrence of myocardial infarction in a five years old hypercholesterolaemic female patient.

Premature atherosclerosis can affect the aortic root in a so-called "Hypercholesterolaemic valvulopathy" which denotes malignant atherosclerosis.[33] Among our young age group, aortic valvulopathy was present in thirty percent of the patients mostly in the hypercholesterolaemic group. All had aortic regurgitation and the only case that had a stenotic valve died suddenly at 13 years. This early cardiac lesion might reflect the homozygous nature of the disease in a population with a high incidence of positive consanguinity. It is also noticeable that this hypercholesterolaemic group had higher Apo B than the other two groups ($p=0.001$). A high plasma level of Apo B is a risk factor for atherosclerosis, whereas low levels provide protection.[34]

This high Apo B is better than low density lipoproteins in the prediction of ischaemic cardiac events.[35] We also report the occurrence of sinus tachycardia in two cases; one having hypercholesterolaemia and one having mixed hyperlipidaemia. Heart rate, an important risk factor of coronary mortality, is highly correlated with numerous variables including hyperlipidaemia.[36]

Regarding haematological presentation, ecchymotic patches were observed in mixed hyperlipidaemiac patients. There may be a link between hyperlipidaemia, endothelial dysfunction and abnormalities in thrombosis and fibrinolysis in children.[37] Statins therapy may reduce plasma levels of prothrombin fragment and von Willebrand factor antigen.[38]

Diet has been the main therapy in hypercholesterolaemic children. Restriction of dietary saturated and trans-fat and cholesterol, along with increased intake of soluble fiber, can achieve substantial low density lipoproteins lowering.[39] Anion exchange resins, as cholestyramine and colestipol, were found to be effective but unpalatable and poorly tolerated. Statin trials in children seems to be safe in the short term but the long-term safety is unknown.[40] the American Academy of Pediatrics encourage the use of drugs to treat hypercholesterolaemia at younger age than previous ones (8 versus10 years) and promotes statins as first line therapy in both children with low density lipoprotein-cholesterol persistently above 160 mg/dl despite diet therapy, with other risk factors for cardiovascular disease (overweight, hypertension, smoking, familial hypercholesterolaemia) and in children with low density lipoprotein-cholesterol >190 mg/dl, despite diet therapy, without other risk factors.[41]

In our study, patients having familial hypercholesterolaemia were treated with diet, cholestyramine and statins. Plasmapharesis was done in three patients having cholesterol $\geq$ 750 mg/dl. After six months of therapy, the cholesterol and low-density lipoproteins were normalized in a single case and six cases respectively, though the patients confirmed their compliance to therapy. None of the patients reported any side effects to the drugs taken, however, decreased level of high density lipoproteins was observed in all patients subjected to plasmapharesis, which could be explained by the lack of selective filters.

As for hypertriglyceridaemia, diet remains the primary therapeutic avenue where triglyceride levels were found to decrease over time with the use of fibrates, to increase with the use of bile acid-binding resins, and not to change with the use of statins.[42]

In the present study, the three patients having hypertriglyceridaemia received dietary restrictions and omega 3 but showed minimal changes in serum triglycerides. Fibrate was used in one patient having acute pancreatitis. Fibrate therapy should be reserved for children with

markedly elevated triglycerides to decrease the risk of pancreatitis and not optimization of triglycerides.[43]

One case having mixed hyperlipidaemia developed myopathy with elevated CPK that improved by discontinuation of statin and fibrate. Intensive statin therapy can increase the risk of myopathy and it is important to consider its risk-benefit ratio in individual patients.[39] Fibrates increase the risk of rhabdomyolysis.[44] Thus, the safety and efficacy of combined therapy of fibrates and statins needs to be established.

Conclusion

Primary dyslipidaemia disorders may present in various forms, which should be known to paediatricians. It might have a strong impact on cardiovascular status that starts at a younger age than previously thought. The presence of asymptomatic cases with silent cardiac manifestations highlights the importance of screening for those at risk.

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