Original Article

Comparison of Lipid Profile Among the Different Stages of Chronic Kidney Disease in Children

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Abstract

Background: *Chronic Kidney Disease (CKD) is associated with significantly increased morbidity and mortality. Children with (CKD)/End stage renal disease (ESRD) exhibit various co-morbidities, including dyslipidemia. Hypertriglyceridemia is inversely correlated with renal function. Children with advanced chronic kidney disease or end stage renal disease developed atherosclerosis and cardiovascular disease.* ***Objectives:*** *To measure the lipid profile in kidney disease and comparison of lipid profile among the different stages of CKD.* ***Materials and Methods:*** *A cross sectional analytic study to measure and compare lipid profile in fifty children with different stages of chronic kidney disease during January 2016 to June 2016 by purposive sampling technique and divided into two groups, Children with CKD stage iii and iv included in Group I and CKD stage V and V(D) included in Group II.* ***Results:*** *Out of Fifty children with CKD, 28(56%) were male and 22 (44%) male, 30(60%) were of 11-15 year age group and 32(64%) were from rural area and 18(36%) from urban area. The etiology of CKD in two groups glomerulonephritis were 14(28%),obstructive uropathy 15 (30%), hypoplasia/dysplasia 9(18%), polycystic kidney disease 9(18%) and acute kidney injury 3(6%). All the cases were anemic, 26(52%) were hypertensive and 20(40%) had osteodystrophy.* ***Conclusion:*** *Dyslipidemia specially hypertriglyceridemia is common in children with CKD. Hypertriglyceridemia is inversely related to severity of CKD stages.*

Keywords: *CKD, Dyslipidemia, Hypertrigl Yceridemia, ESRD.*

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Introduction

Chronic kidney disease (CKD) is a permanent and significant reduction in glomerular filtration rate or chronic irreversible destruction of the kidney tissue.[1] Chronic kidney disease is defined as abnormalities of kidney structure or function, present for more than 3 months, with implication for health.[2] Lipids are essential components of cell membranes, contributing to cell fuel, myelin formation, subcellular organelle function and steroid hormone synthesis.[3] Children with chronic kidney disease (CKD)/End stage renal disease (ESRD) exhibit various co-morbidities, including dyslipidemia. The prevalence of dyslipidemia in children with CKD and end stage renal disease (ESRD) is high (39-65 %).[4] Insulin resistance, increased Apo lipoprotein C-III and impaired lipolysis are involved in the inappropriate clearance of lipoproteins, contributing to lipid abnormalities in children with chronic kidney disease.[5] Dyslipidemia is prevalent in young child on peritoneal dialysis. The high glucose load from the dialysis fluid might contribute to this high dyslipidemia.[6] Many studies document that prevalence of dyslipidemia is an important risk factor for the development of cardiovascular and cerebrovascular disease in general population as well as in children with CKD.[7]

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Materials and Methods

It was a cross sectional analytic study, conducted in department of Pediatric Nephrology, Bangabandhu Sheikh Mujib Medical University, Dhaka, over a period of 01st January 2016 to 30th June 2016. Fifty Children with CKD who were admitted in inpatient and attended in the outpatient department were included and divided into two groups, Group I and Group II. Children with CKD stage III and IV were included in Group I and stage V and VD in Group II.

Data analysis and Statistical Analysis

After collection, all the data were checked and edited. Then data were entered into computer with the help of SPSS software for windows programmed version 16. Chi-square and independent samples t-test and other appropriate statistical tests were done based on.

Results

This cross sectional study was conducted to see the comparison of Lipid Profile among the different Stages of Chronic kidney disease in Children. (P value <0.001)

Table I: Age distribution of the patients in groups (n=50)

Age (years)	Group P Value		P Value
	Group I (n=20) (Mean ± SD)	Group II (n=30) (Mean ± SD)	
0-5	2 (10.0)	3 (10.0)	
6-10	6 (30.0)	9 (30.0)	
11-15	12 (60.0)	18 (60.0)	0.381
Total	20 (100.0)	30 (100.0)	
Mean ± SD	10.10 ± 2.82	10.90 ± 3.32	
Range (min-max)	4 - 15	2 - 15	

Unpaired t test was done to measure the level of significance.

Table- I Distribution of patients according to age. Maximum patients were of 11-15 years. Sixty(60%) percent patients were in 6-10 years of age group and 10% patients were under 5 years age group.

Table II: Sex distribution the patients in groups (n=50)

Gender	Group		P Value
	Group I (Mean ± SD)	Group II (Mean ± SD)	
Male	12 (60.0)	16 (53.3)	0.88
Female	8 (40.0)	14 (46.7)	
Total	**20 (100.0)**	**30 (100.0)**	

Chi-square test was done to measure the level of significance.

Table-II Distribution of patients according to gender. Among 50 patients male were 28 (56%) and female were 22(44%). Male female ratio was 1.27'

Table III: Residential area in groups (n=50)

Residential area	Group		p value*
	Group I	Group II	
Urban	8 (40.0)	10 (33.3)	0.630 ns
Rural	12 (60.0)	20 (66.7)	
Total	**20 (100.0)**	**30 (100.0)**	

Chi-square test was done to measure the level of significance. Table-III showed that 32(64%) patient live in rural area and 18(36%) live in urban area.

Table IV : Monthly family income in groups (n=50)

Monthly family income	Group		p value*
	Group I	Group II	
50000 - 10000	5 (25.0)	8 (26.7)	
10000 - 20000	9 (45.0)	17 (56.6)	0.523 ns
>20000	6 (30.0)	5 (16.7)	
Total	**20 (100.0)**	**30 (100.0)**	

*Chi-square test was done to measure the level of significance.

Table IV: showed that majority of study patients in Group-I (45%) and Group-II (56%) were from average income group social status.

Table V: Etiology of different stages of CKD in groups (n=50)

Etiology	Group		p value*
	Group I	Group II	
Glomerulonephritis	5 (25.0)	9 (30.0)	
Obstructive Uropathy	6 (30.0)	9 (30.0)	
Renal Hypoplasia/dysplasia	5 (25.0)	4 (13.3)	0.872 ns
Polycystic Kidney disease	3 (15.0)	6 (20.0)	
HUS	1 (5.0)	2 (6.7)	
Total	**20 (100.0)**	**30 (100.0)**	

*Chi-square test was done to measure the level of significance. Table-V: showed different etiology of CKD in both groups, there is no statistical significant between two groups.

Table VI: Lipid profile in different stages of CKD

Lipid Profile	Stage 3 (Mean ± SD)	Stage 4 (Mean ± SD)	Stage 5 (Mean ± SD)	Stage 5 (D) (Mean ± SD)	P value
Total Cholesterol (gm/dl)	157.90± 34.20	178.50 ± 15.48	168.87 ± 43.71	146.00 ± 65.96	0.386
Triglyceride (gm/dl)	201.40 ± 53.05	198.80 ± 53.84	284.60 ± 77.57	295.13 ± 143.24	0.022*
High Density Lipoprotein (gm/dl)	31.20 ± 7.21	33.40 ± 7.41	29.47 ± 7.11	27.87 ± 10.58	0.423
Low Density Lipoprotein (gm/dl)	96.00± 19.74	111.56 ± 12.26	107.60 ± 42.08	98.40 ± 50.12	0.725

ANOVA test was done to measure the level of significance

Table VII: Value of lipid profile in different stages of CKD. Among the value of lipid profile only triglyceride is statistically significant.

Lipid Profile	Group		P Value
	Group I (Mean ± SD)	Group II (Mean ± SD)	
Total Cholesterol (gm/dl)	168.2±27.9 (124.0 - 204.0)	157.8± 57.5 (99 - 288.0)	0.455^{ns}
Triglyceride (gm/dl)	200.1±52.0 (83.0 - 289.0)	289.9±113.3 (122.0 - 653.0)	0.002**
High Density Lipoprotein (gm/dl)	32.3±7.2 (23.0 - 45.0)	28.7±8.9 (5.0 - 46.0)	0.138^{ns}
Low Density Lipoprotein (gm/dl)	103.8±17.9 (55.0 - 128.0)	103.2±45.5 (6.0 - 216.0)	0.954^{ns}

Unpaired t test was done to measure the level of significance.

Table VII: showed that comparison of lipid profile between two groups. Only triglyceride is statistically significant between two groups.

Table VIII: Correlations of lipid profile with GFR (n=50)

GFR vs □ □ □	r value □ □	p value*
Total Cholesterol (gm/dl)	0.072	0.621
Triglyceride (gm/dl)	-0.387	0.006**
High Density Lipoprotein (gm/dl)	0.155	0.282
Low Density Lipoprotein (gm/dl)	0.045	0.757

*Pearson Correlation test was done to measure the level of significance.

Table VIII: Pearson's correlation test done between GFR and lipid profile to measure the level of significance. Only triglyceride is statistically significant among the lipid profile.

Figure 1: Linear regression plot for Correlation of total cholesterol with GFR

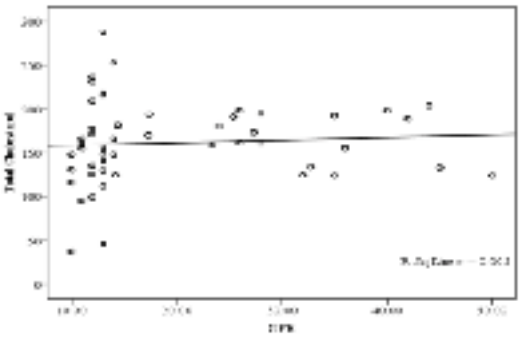

Figure I: Show the relationship between total cholesterol level and GFR. Here log (TC) and GFR displayed a linear relationship and shows positive correlation.

Figure II: Linear regression plot for Correlation of serum triglyceride with GFR

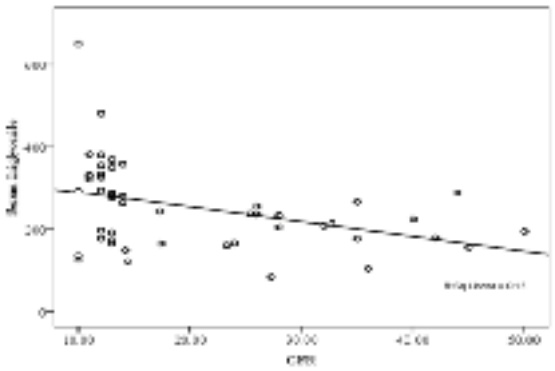

Figure II: show the relationship between triglyceride and GFR. Here log triglyceride and GFR displayed a linear relationship and shows negative correlation.

Figure III: Linear regression plot for Correlation of high density lipoprotein with GFR

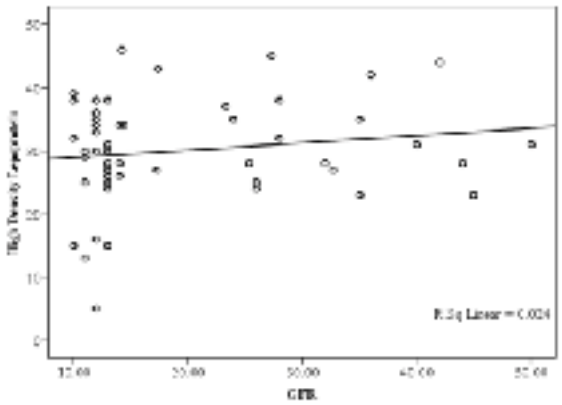

Figure III: show the relationship between high density lipoprotein and GFR. Here log (HDL) and GFR displayed a linear relationship and shows positive correlation

Figure IV: Linear regression plot for Correlation of low density lipoprotein with GFR

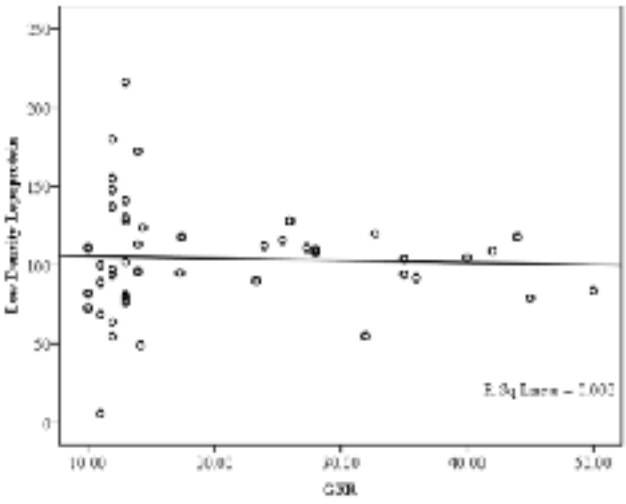

Figure IV: show the relationship between low density lipoprotein and GFR. Here log (LDL) and GFR displayed a linear relationship and shows positive correlation

Discussion

The present study was conducted in the department of pediatric nephrology, BSMMU, Dhaka, to see the status of Lipid Profile among the different stages of chronic kidney disease in Children. This study analyzed fasting lipid profile of 50 children with CKD. The current study has shown male is predominance with a male to female ratio of 1.27:1.This finding is almost similar to Bonthus et al[5] and Dvorakova et al.[8] The cause of male predominance might be the etiology as obstructive uropathy and glomerulo-nephropathy are more common in male gender. It has been also observed that, most of the patients were of 11-15 year (60%) age group. Bonthus et al5 also found similar type of findings.[5] This similarity may be due to both studies were performed in tertiary level hospital where patients usually attained hospital lately. In our study, it was observed that majority (64%) patient came from rural area and 36% came from urban area as Bangladesh is a developing country most of the people live in rural area. It is also consistent with report of Bangladesh bureau of statistics.[9] It had been observed that, majority 26 (52%) had monthly income between 10000-20000 taka, only 13 (26%) had between 5000-10000 taka, few 11 (22%) had >20000 taka. This reflects the socioeconomic status of patients in our hospital. It is also consistent with report of Bangladesh bureau of statistics.[9] The present study showed that the etiology of CKD included glomerulonephritis 14 (28%), obstructive uropathy 15 (30%), hypoplasia/dysplasia 9 (18%), polycystic kidney disease 9 (18%) and acute kidney injury 3 (6%). Roy RR et al[10] also found similar type of findings in their study, and both of the study done in the same hospital. Kanitar 11 also found same type of findings as both countries have similar economic and social back ground.

Present study showed, raised level of serum triglyceride in both groups but more marked in group II. Bonthus et al[5] demonstrated that prevalence of dyslipidemias was highest among PD patients and among dyslipidemias and hypertriglyceridemia were common. Saland et al[12], Barika et al[13] also showed same type of result. Mean value of triglyceride in group I and Group II were 200.1±52.0 mg/dl and 289.9±113.3 mg/dl respectively and it was statistically significant (p value<0.05). Youssef et al[14] studied dyslipidemia in children with chronic kidney disease. They had three groups, group I (ESRD) patients, group II (CKD stage 3and 4), group III (healthy control) and mean triglyceride value was 186±84.5, 241.6±78.6,117.7±28.9 respectively and it was statistically significant (p value<0.05). Reduced level of high density lipoprotein had been observed in both groups but more reduced in group II and was not statistically significant group. Khurana, Silverstein et al[4], Saland et al[13] and Tsimihodimos et al[16] demonstrated same result in their study. Ahamed et al[17] demonstrated majority of the patients had normal level and few patient had border line of HDL level Asyama[18] reported that HDL level was correlated inversely with serum triglyceride level and positively with glomerular filtration rate. In our study mean value of high density lipoprotein in group I and group II were 32.3±7.2 and 28.7±8.9 respectively. Rao et al[19] showed in their study HDL level in different groups and they had normal level of HDL. In group I (CKD stage 1,2), group II (CKD stage 3,4), group III (ESRD patient) and mean value of HDL level were 50.40±4.04,50.20±4.25, 48.33±5.06 respectively and which was not statistically significant. In the present study serum cholesterol was within normal limit in both groups. Olusey et al20 also reported normal serum cholesterol level in CKD patients. Tsumura et al[21] observed hypercholesterolemia in their study of patients with CKD. In our study, mean cholesterol level in group I was 168.2 ± 27.9 and Group II was 157.8 ± 57.5 respectively. Youssef et al[14] showed their study mean cholesterol level in different groups in children with chronic kidney disease. They had three groups, group I (ESRD) patients, group II (CKD stage 3and 4), group III (healthy control) and mean cholesterol was 197.3±38.4, 156.6±26.5, 143.4±31.76 respectively. Our study analyzed that serum low density lipoprotein was not altered in children with CKD. Barika et al[13] also showed same type of result. In our study mean LDL level was 103.8± 17.9 and 103.2±45.5 in group I and group II respectively. Noor et al[22] showed in adult study increased serum LDL level in CKD patients. It was also found positive correlation between GFR and cholesterol, HDL, LDL Only triglyceride showed significant negative correlation. Ragba et al[23] showed their study significant positive correlation between GFR and cholesterol, HDL, LDL, and Triglyceride showed insignificant negative correlation.

Conclusion

It can be concluded from present study that dyslipidemia was common in CKD. Hypertriglyceridemia was being the commonest. It is inversely related to GFR. Children with chronic kidney disease should routinely be checked up with lipid profiles and should be addressed or treated. Larger caliber multicenter studies are recommended for validating the finding of the present study.

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