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A Clinical Study of Nephrotic Syndrome with Special Reference to Serum Lipid Profile

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Abstract: ***Background and Objective**: Nephrotic syndrome is an important chronic renal disease in children characterized by minimal change disease in the majority. The objectives of present study were: (1) To study the clinical features of nephrotic syndrome. (2) To study the levels of serum cholesterol, serum triglycerides, HDL, LDL and VLDL in nephritic syndrome. **Methodology**: A prospective study which included 50 children with nephrotic syndrome, aged between 2-12 years. They were clinically examined and lipid profile was done at the onset and during remission. Thirty children without liver and kidney disorders were taken as controls. **Results**: Among 50 cases studied, maximum number of cases (60%) were in the age group of 2-6 years. 29 (58%) were male and 21 (42%) were female with male: female ratio of 1.38:1. Generalised edema was present in all cases (100%), abdominal distension in 40 (80%) cases and decreased urine output in 23 (46%) cases. Ascites was present in 40 (80%) cases. Hypoproteinemia and hypoalbuminemia was present in all patients (100%). Serum globulins were normal in all patients. Mean serum total proteins and serum albumin were significantly (.000) lower in study group compared to control group. There was highly significant (p = .000) increase in mean serum cholesterol (420.32 ± 122.69 mg/dL), Triglycerides (297.90 ± 93.09 mg/dL), LDL (323.75 ± 100.98 mg/dL) and VLDL (61.79 ± 19.78 mg/dL). However, there was no significant (p = .234) change in HDL cholesterol. In relapse cases of nephrotic syndrome there was significantly higher serum cholesterol (p = .000), Triglycerides (p = .003), LDL (p = 0.000) and VLDL (p = .011) when compared to first episode. **Interpretation and Conclusion**: The present study shows that in nephrotic syndrome, there is generalised hyperlipidemia. There was significantly higher hyperlipidemia in relapse cases compared to first episode nephrotic syndrome.***

Keywords: Serum cholesterol; Serum triglycerides; Serum albumin; Serum globulin; Serum LDL; Serum VLDL; Nephrotic syndrome

1. Introduction

Nephrotic syndrome is an important chronic renal disease in children, characterized by minimal change disease in the majority.[1] Hyperlipidemia is an important characteristic of idiopathic nephrotic syndrome in children and is usually observed during the active phase of the disease and disappears with the resolution of the proteinuria.[2] The persistence and severity of lipid changes in serum correlate well with the duration and frequency of the relapses, even during the remission in patients of the nephrotic syndrome. The intensity of hyperlipidemia is usually related to the severity of proteinuria and hypoalbuminemia.[3] Hyperlipidemia increases the risk of atherosclerosis and may also be important in the development of glomerulosclerosis and progressive renal injury. It may be possible to control it by using lipid lowering drugs.[3]

2. Aims & Objectives

1) To study the clinical features of nephrotic syndrome.
2) To study the levels of serum cholesterol, serum triglycerides, HDL, VLDL in nephrotic syndrome.

3. Methodology

Study design: Prospective, Hospital based, descriptive study .

Source of Data: Patients with nephrotic syndrome admitted to Paediatrics department, King George Hospital, Visakhapatnam during the period between January 2017 to June 2018.

Inclusion Criteria

1) Children in the age group of 2-12 years with typical features of nephrotic syndrome.
2) Patients were studied at onset of nephrotic syndrome, during remission and relapses.

Exclusion Criteria

1) Children with features that make minimal change disease less likely (hematuria, hypertension, renal insufficiency).
2) Patients with prior history of diabetes mellitus, hypothyroidism and familial hypercholesterolemia.

Methods of Collection of Data

Data was collected by using pre-tested proforma meeting the objectives of the study. Fifty patients were taken into study who were clinically diagnosed as nephrotic syndrome. Thirty cases who were age-matched and without liver and kidney disorders were taken as control group. Detailed history was taken.

Thorough clinical examination was done.

Laboratory Procedures

1) Urine Examination

(a) Presence of proteinuria[4]

This was done by sulfosalicylic acid test.

Amount of turbidity Rough estimation of proteins
No turbidity: Negative
Slight turbidity: Trace (20 mg/dL)
Turbidity without granule formation : 1 + (50 mg/dL)
Turbidity with granule formation : 2 + (200 mg/dL)
Turbidity with flocculation and granule formation: 3 + (500 mg/dL)
Precipitated protein or more : 4 + (1000 mg/dL)

(b) 24 hours urine protein estimation
24 hours urine was collected for total protein estimation by Esbach's Albuminometer.

(c) Urine was also collected for microscopy and culture sensitivity.

2) Blood Sampling for Biochemical Analysis
12 hours fasting blood was collected for biochemical analysis of lipid profile, total protein, serum albumin, serum globulin estimation.

3) Apart from the above investigations, other investigations like routine hemogram, blood urea, serum creatinine, chest X-ray, Mantoux test was done.

Lipid Profile Assay
Serum total cholesterol[5] was measured by cholesterol oxidase phenol amino antipyrine method (CHOD-PAP) method.
Serum HDL Cholesterol[6]: HDL was measured by antibody method.
Serum LDL Cholesterol[7]: This was measured by detergent technology.
Serum Triglycerides[8]: This was measured by Glycerol-3-phosphate oxidase phenol amino antipyrine method (GPO-PAP).
Method: Enzymatic triglyceride assay was done by enzymatic hydrolysis.

Serum VLDL[9]
This was measured by enzymatic method.
Normal value – 2-38 mg/dL

Total proteins[9]
This was measured by Biuret Method.
Normal value – 6-8 g/dL

Serum Albumin[9]
This was measured by Bromcresol green method.
Normal value: 3.5 – 5.0 g/dL

Serum globulins[9]
Serum globulin = Total proteins – Serum albumin
Normal value – 2.3-3.5 g/dL

Data Analysis
Data analysis was done by Descriptive Statistics using One sample t-test Contingency table analysis (cross tabs) and Chi-square test.

Treatment protocol: IAP regimen.
Prednisolone 2 mg/kg in 2-3 divided doses daily for six weeks, followed by 1.5 mg/kg as a single morning dose on alternate days for the next six weeks.[10]

4. Results

Fifty children in the age group of 2-12 years with nephrotic syndrome were included in the study. They were studied during the onset and remission. Patients were considered in remission when urine albumin nil or trace or proteinuria < 4 mg/m^2/hr for three consecutive days.

Table 1: Age wise distribution of study and control groups

Age (in years)	Study group		Control group		Total	
	No.	%	No.	%	No.	%
2-6	30	60	18	60	48	60
7-12	20	40	12	40	32	40
Total	50	100	30	100	80	100

CC=0.000; p=1.0 (NS); CC=Contingency Coefficient; NS = Not significant

A non-significant association was observed between age groups in study and control groups. Maximum number of cases 60% was found in age group of 2-6 years.

Table 2: Distribution of sex in study and control groups

	Study group		Control group		Total	
	No.	%	No.	%	No.	%
Male	29	58	19	63.3	48	60
Female	21	42	11	36.7	32	40
Total	50	100	30	100	80	100

C=0.053; p=0.637; CC=Contingency Coefficient; NS = Not significant

In the present study there were 29 male and 21 female children with a male to female ratio of 1.38:1.

Table 3: Distribution of symptoms in study group (n=50)

Symptoms	Number	Percentage	Chi-square	p-value
Generalised edema	50	100	-	-
Abdominal distension	40	80	18.00	.000
Decreased urine output	23	46	15.68	.000
Fever	15	30	9.68	.002
Cough	8	16	23.12	.000
Scrotal swelling	2	4	46.08	.000
Diarrhea	2	4	42.32	.000
Breathlessness	1	2	42.32	.000

Degree of freedom (df) = 1
In the present study, generalised edema was present in all cases (100%).
Abdominal distension in 80% of cases.

Table 4: Urinary Protein in Study group n = 50, (based on Sulfo salicylic acid test)

Proteinuria	Number of patients	Percentage
Moderate (+++)	24	48
Severe (++++)	26	52

Table 5: Mean values of Various Laboratory Parameters among Study and Control Groups

	Study group	Control group	t-value	p-value
Mean Serum Total Protein (g/dl)	Mean=4.6	Mean=6.86	-18.60	0.000(HS)
	Standard deviation=0.51	Standard deviation=0.53		
Mean Serum Total Albumin(g/dl)	Mean=2.00	Mean=4.19	-31.96	0.000(HS)
	Standard deviation=0.31	Standard deviation=0.25		
Mean Serum Total Cholesterol (mg/dl)	Mean=42.32	Mean=175.37	10.82	0.000(HS)
	Standard deviation=122.69	Standard deviation=18.32		
Mean Serum total Triglycerides(mg/dl)	Mean=297.90	Mean=94.10	11.81	0.000(HS)
	Standard deviation=93.09	Standard deviation=19.39		
Mean serum total low density lipoprotein (mg/dl)	Mean=323.75	Mean=107.33	11.62	0.000(HS)
	Standard deviation=100.98	Standard deviation=16.10		
Mean serum total very low density lipoprotein(mg/dl)	Mean=61.79	Mean=24.00	9.79	0.000(HS)
	Standard deviation=19.78	Standard deviation=9.52		
Mean serum total High density lipoprotein(mg/dl)	Mean= 49.48	Mean= 54.16		0 .234

The mean value of serum total proteins in study group was 4.61 g/dL, while in control group it was 6.86 g/dL. The p-value (.000) was highly significant. The mean value of serum albumin in study group was 2.00 g/dL, while in control group it was 4.19 g/dL. The p-value (.000) was highly significant. The mean value of serum cholesterol in study group was 420.32 mg/dL, while in control group it was 175.37 mg/dL. The p-value (.000) was highly significant. The mean value of serum triglycerides in study group was 297.90 mg/dL, while in control group it was 94.10 mg/dL. The p-value (.000) was highly significant. The mean value of serum low density lipoprotein in study group was 323.75 mg/dL, while in control group it was 107.33 mg/dL. The p-value (.000) was highly significant.

The mean value of serum very low density lipoprotein in study group was 61.79 mg/dL, while in control group it was 24.00 mg/dL. The p-value (.000) was highly significant. The Mean Serum HDL in study group was 49.48 ± 20.00 mg/dL, while in control group it was 54.16 ± 9.61 mg/dL. The p-value (.234) was not statistically significant.

Table 6: Comparison of lipid profile at the onset and during remission in first episode nephrotic syndrome (n=35)

	Number	Mean (mg/dL)		Standard Deviation		p-value
		At the onset	During remission	At the onset	During remission	
Cholesterol	35	372.82	282.74	106.20	47.50	.000(HS)
Triglycerides	35	273.37	178.15	84.20	49.43	.000(HS)
Low density lipoprotein	35	289.72	191.46	90.18	52.96	.000(HS)
Very low density lipoprotein	35	57.24	47.19	18.86	17.24	.002(S)
HDL	35	49.33	54.75	20.20	17.17	.426(NS)

Degree of freedom=48; HS=Highly significant; S=Significant; NS=Not significant Mean values at the onset in first episode nephrotic syndrome for cholesterol

(372.82 mg/dL), triglycerides (273.37 mg/dL), LDL (289.72 mg/dL) and VLDL (57.24 mg/dL) were significantly elevated compared to the mean values during remission for cholesterol (282.74 mg/dL), triglycerides (178.15 mg/dL), LDL (191.46 mg/dL) and VLDL (47.19 mg/dL). Mean value of HDL at the onset in first episode was 57.24 mg/dL, while in remission was 54.75 mg/dL. The p-value was not significant (.426).

Table 7: Comparison of lipid profile at the onset and during remission in relapse (n=15)

	Number	Mean (mg/dL)		Standard Deviation		p-value
		At the onset	During remission	At the onset	During remission	
Cholesterol	15	531.17	407.98	80.58	96.25	.000(HS)
Triglycerides	15	355.14	262.44	89.97	74.09	.000(HS)
Low density lipoprotein	15	403.17	305.66	79.29	79.89	.000(HS)
Very low density lipoprotein	15	72.40	64.85	18.26	17.24	.003(S)
HDL	15	49.82	55.06	20.23	15.15	.566(NS)

Degree of freedom = 48; HS= Highly significant; S=Significant; NS=Not significant

Table 8: Complications in study group

Complications	Number of cases	Percentage	Chi-square	p-value
Respiratory tract infection	10 (URTI-7; Pneumonia-3)	20	18.00	.000
Pulmonary tuberculosis	1	2	46.08	.000
UTI	9	18	20.48	.000
Cellulitis	2	4	42.32	.000

Degree of freedom = 1; URTI = Upper respiratory tract infection

In the present study, respiratory infection was the commonest complication seen in 20%, out of which 14% were upper respiratory tract infection and 6% were pneumonia. UTI was the next common complication seen in 18% of cases

5. Discussion

After studying 50 cases of nephrotic syndrome along with 30 age matched controls, the observations revealed the following results. The maximum incidence was in the age group between 2-6 years (60%). The male to female ratio was 1.38:1.Generalised edema (100%), abdominal distension (80%) and decreased urine output (46%) were commonest clinical presentation. Generalised edema (100%), ascites (80%), hepatomegaly (22%) and anemia (8%) were commonest clinical findings. Respiratory infection (20%) was the commonest complication. Other complications were UTI (18%), cellulites (4%) and pulmonary tuberculosis (2%). Severe proteinuria was present in 52%, moderate proteinuria in 48% of cases. Pus cells were present in 22% of cases and granular casts in 4% of cases. Urinary culture was positive in 18% of cases. Hypoproteinemia and hypoalbuminemia was present in all patients (100%). Serum globulin values were normal in all patients. Mean serum total proteins and serum albumin were significantly (.000) lower in study group compared to control group. Hypercholesterolemia, hypertriglyceridemia, elevated LDL, elevated VLDL seen in all cases (100%). The p-value was 0.000 (HS). HDL was normal in 52% of cases, increased in 26% of cases and decreased in 22% of cases. Hypoalbuminemia was inversely proportional to hypercholesterolemia. The p- value (.000) was significant. The mean serum cholesterol, triglycerides, LDL and VLDL was significantly higher in relapse cases compared to first episode nephrotic syndrome. Serum cholesterol, triglycerides, LDL and VLDL were raised even during remission, more so in relapse cases.

6. Conclusion

The present study shows that in nephrotic syndrome, there are elevated levels of hyperlipidemia even during remission. There was significantly higher hyperlipidemia in relapse cases compared to first episode of nephrotic syndrome.

In the present study, there is generalised hyperlipidemia which may lead to the risk of atherosclerosis and the progression for chronic renal failure, which calls for modalities to reduce the lipoprotein levels in the management of nephrotic syndrome

References

[1] Arvind Bagga, Mukta Mantan. (2005). Nephrotic syndrome in children. Indian J Med Res ; 122:13-28.
[2] Merouani A, Levy E, Mongeall JG, Robitaille P, Lambert M, Delvin EE. (2003)Hyperlipidemic profiles during remission in childhood idiopathic nephrotic syndrome. Clin ; 36(7):571-4.
[3] Srivastava RN, Arvind Bagga. Pediatric Nephrology(2016). 6th ed. New Delhi,
[4] India:Jaypee Brothers, Medical Publishers (P) Ltd;. p. 191-233
[5] Vijayakumar M, Prahlad N, Nammalwar BR. Evaluation of renal disorder with urine examination. In: Nammalwar BR, Vijayakumar M, editors.(2004) Principles and practice of pediatrics nephrology. 1st ed. New Delhi: Jaypee Brothers MedicalPublishers. p. 73.
[6] Alain CA. Estimation of cholesterol by enzymatic method. Clin Chem(1974); 20:470.
[7] Rifai N, Warnick GR Ed.(1994) Laboratory measurement of lipids, lipoproteins and apolipoproteins. Washington (USA):AACC Press;
[8] Bachorik PS, Ross JW.(1995) National cholesterol education program recommendations for measurement of low-density lipoprotein cholesterol: Executive summary. Clin Chem ; 41(10):1414-20.
[9] Werner M, Estaman G.(1981) Estimation of serum triglycerides. Clin Chem ; 21:268.
[10] Rafai N, Bachorik PS, Albers JJ. (1999) Lipids, lipoproteins and apolipoproteins. In: Burtis CA, Ashwood ER, editors. Tietz textbook of clinical chemistry. 3rd ed. Philadelphia: WB Saunders Company;p. 840-6.
[11] Arvind Bagga. (2001) Consensus statement on management of steroid sensitive nephrotic syndrome. Indian Academy of Pediatrics; 38:975-85.
[12] Balgopal R, Krishnan S, Vijaya. Nephrotic syndrome in children. Antiseptic 1974; 71:1-7.
[13] Katiyar GP Singh, Agarwal. Study of serum lipid pattern in nephrotic syndrome in children. Indian Paediatrics 1976; 13:83-7.
[14] Malhotra ML, Andurkkar GP. Clinical biochemical histological correlation in nephrotic syndrome in children. Indian J Paediatr 1976; 43:153.
[15] Mateer, Weiganand, Greeman. Am J Dis Child 1957; 93:591.
[16] Basu AK. Indian J Child Health 1960; 9:300.
[17] Sarala Vaishnava, Chowdhary Panna. Tuberculosis in children with nephrotic syndrome. Indian Paediatrics 1983; 20:499.
[18] Kumar K, Vaishnava S. Study of bacteriuria in nephrotic syndrome in children. Indian Paediatrics 1977; 14:999.
[19] Chowdhary VP, Ghai OP. Peritonitis in nephrotic syndrome. Indian Paediatrics 1977; 14(5):406.
[20] Bhandari, Mandowara. Lipoprotein profile in nephrotic syndrome. Indian Paediatrics 1980; 17:416-9.
[21] Mehta K, Ali UD. Recent advances in minimal change nephrotic syndrome. Indian J Paediatr 1985; 52:579.
[22] Herluf J. Plasma protein and lipid pattern in nephrotic syndrome. Acta Sca Med 1967; 182:465.
[23] Gerald BA, Conrad BB, Shuchein. Hyperlipidemia of nephrotic syndrome. The N Engl J Med 1985; 312:1544.
[24] Gaston Zilleruelo, Sungh LH, Michael. Persistence of serum lipid abnormalities in children with idiopathic nephrotic syndrome. J Paediatr 1984; 61:104.
[25] Tsukahara H, Harukis, Hiroka M, Horic, Sudo M. Persistent hypercholesterolemia in frequently relapsing steroid responsive nephrotic syndrome. J Paediatr Child Health 1997; 33(3):253-5.
[26] Querfeld U. Should hyperlipidemia in children with nephrotic syndrome be treated ? Pediatr Nephrol 1999; 13(1):77-84.
[27] Buyukcelik M, Anarat A, Noyas A, Ozcl A, Anarat R, Dikmen M et al. The effects of gemfibrozil on hyperlipidemia in children with persistent nephrotic syndrome. Turk J Pediatr 2002; 44(1):40-4.