

Original Research Article

Evaluation of serum lipid profile in children with nephrotic syndrome admitted in emergency ward of Government Tirunelveli Medical College and Hospital, India

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ABSTRACT

Background: Nephrotic syndrome is a collection of clinical findings due to kidney damage. This includes protein in the urine, low blood albumin levels, high blood lipids, and significant edema. The objective of this study was to study the correlation between lipid profile and different types of nephrotic syndrome

Methods: This cross-sectional study was done between March 2017 - October 2017 in the Department of Pediatrics, Tirunelveli Government Medical College. 40 cases of nephrotic syndrome between 1 to 12 years, which include all types of nephrotic syndrome. After history taking and clinical examination, blood samples were collected from the patients for lipid profile and analyzed with standard techniques.

Results: In the 40 cases included in the present study mean serum albumin was low (mean = 2.212 gm %), mean total cholesterol (mean = 344.300 mg/dl) mean triglycerides (mean = 304.025 mg/dl) mean LDL (mean = 234.650 mg/dl) and mean VLDL (mean = 61.625 mg/dl) were elevated. HDL (mean = 46.07 mg/dl) with in normal limits. No significant changes observed.

Conclusions: Serum cholesterol levels elevated significantly in relapse cases compared to the first episode. Serum cholesterol in SRNS cases shows statistically significant elevation compared to other types. LDL values were elevated in relapse cases compared to the first episode which were found out to be statistically insignificant. LDL values in SRNS cases show statistically significant elevation compared to first episodes and SDNS cases.

Keywords: Lipid profile, Nephrotic syndrome, Steroid-Resistant Nephrotic Syndrome (SRNS), Steroid-Dependent Nephrotic Syndrome (SDNS)

INTRODUCTION

Nephrotic syndrome is usually accompanied by retention of water and sodium. The degree to which this occurs can vary between slight edema in the eyelids that decrease during the day, to affecting the lower limbs, to generalized swelling, to full-blown anasarca.¹ Nephrotic syndrome is characterized by large proteinuria (>3.5 g per 1.73 m² body surface area per day, or >40 mg per square meter body surface area per hour in children), hypoalbuminemia (<2.5 g/dl), hyperlipidaemia, and

edema (which is generalized and also known as anasarca or dropsy) that begins in the face.² Lipiduria (lipids in urine) can also occur but is not essential for the diagnosis of nephrotic syndrome. Hyponatremia also occurs with a low fractional sodium excretion. 1-3 per 100000 children less than 16 years affected with nephrotic syndrome. Most of them affected with primary or idiopathic type. Minimal change disease is the most common idiopathic type.³ One of the characteristic features of nephrotic syndrome is 80% of them respond to corticosteroid therapy. In nephritic syndrome, there will be elevated

serum lipids and cholesterol level. During nephrosis there will be more loss of protein in urine this will lead to hypoalbuminemia.⁴ In addition to low serum albumin, more production of lipoproteins with impaired lipoprotein lipase activity will increase the lipoprotein level. Lipids are mainly transported by lipoproteins, so in nephrotic syndrome because of more lipoproteins there will be high serum cholesterol, LDL cholesterol, VLDL cholesterol and triglycerides.

In the present study lipid profile and thyroid function test was done in all cases of nephrotic syndrome during the study period of 9 months which includes the first episode, relapses, steroid-dependent nephrotic syndrome (SDNS), steroid-resistant nephrotic syndrome (SRNS) and in remission.⁵ The first being hypoalbuminemia which lowers the oncotic pressure within vessels resulting in hypovolemic and subsequent activation of the Renin-angiotensin system and thus retention of sodium and water.⁶

Additionally, it is thought that albumin causes a direct effect on the epithelial sodium channel (ENaC) on the principal cell that leads to the reabsorption of sodium and water. Nephrotic syndrome- edema initially appears in parts of the lower body (such as the legs) and in the eyelids. In the advanced stages, it also extends to the pleural cavity and peritoneum (ascites) and can even develop into a generalized anasarca.⁷ It has been recently seen that intrarenal sodium handling abnormality is related to atrial natriuretic peptide resistance is associated with decreased abundance and altered subcellular localization of dopamine receptor in renal tubules.⁸ Hyperlipidemia is caused by an increase in the synthesis of low and very low-density lipoproteins in the liver that are responsible for the transport of cholesterol and triglycerides.⁹

METHODS

This cross-sectional study was done between March 2017 to October 2017 in the Department of Pediatrics Tirunelveli Government Medical College. 40 cases of nephrotic syndrome between 1 to 12 years, which include all types of nephrotic syndrome.

Inclusion criteria

- All cases of nephrotic syndrome between 1 to 12 years.
- New and old cases which include relapses, SDNS, SRNS and on remission.

Exclusion criteria

- Children with a family history of hyperlipidemia
- Children with the previous history of thyroid dysfunction
- Children with other causes of hypoproteinemia like liver disease and malnutrition.

- Age less than 1yr and more than 12 years.

Pre-structured proforma was used to record the information from the individual. After getting the consent from the parents clinical data were collected and entered in the proforma, which include age, sex, presenting complaints, drug history and type of nephrotic syndrome (1 episode/relapse/SDNS/SRNS/remission).

After history taking and clinical examination, blood samples were collected from the patients for lipid profile and thyroid function. The enzymatic method used for measurement of serum cholesterol and VLDL, the enzymatic calorimetric method used for measurement of LDL and triglycerides, phosphotungstate method for HDL and photometric method used for measuring serum albumin. For categorical variable chi-square test was used. P value of <.05 considered as statistically significant.

RESULTS

Most common age group 6 to 10 years 24 cases followed by 1 to 5 years 12 cases and by 11 to 12 years 4 cases. Mean age of presentation is 6.9 years. Among 40 cases of nephrotic syndrome 32 children presented with facial puffiness (80%), 26 children presented with decreased urine output (65%) and 22 cases with abdominal distention (45%). In the present study, the most common presenting complaint is facial puffiness.

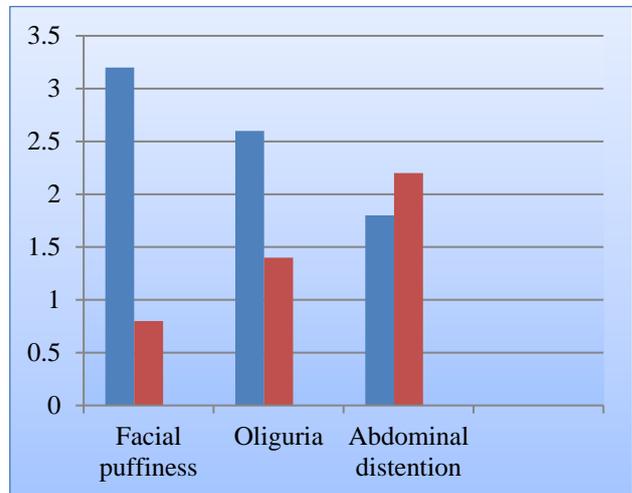


Figure 1: Common clinical presentation.

During relapse mean albumin (mean = 1.96 gm%) level less than that of the first episode (mean = 2.08 gm%) and SRNS (mean 2.03 gm%) but the mean difference is statistically insignificant. (p-value >0.05). In SRNS mean albumin level (mean = 2.03 gm%) lower than that of SDNS (mean = 2.23 mg%) and 1 episode (mean = 2.08 gm%). But the difference is statistically insignificant. In remission albumin level (mean = 3.65 gm%) was statistically significant from all other types (p-value less than <0.05).

Table 1: Serum albumin level in different types of nephrotic syndrome.

Serum albumin	Mean	SD
First episode	2.08	0.33
Relapse	1.96	0.29
SDNS	2.23	0.29
SRNS	2.03	0.21
Remission	3.65	0.25

In the present study compared to 1st episode (mean = 348.63 mg/dl) mean cholesterol level was elevated in relapse cases (mean 363.00 mg/dl) but the difference is statistically insignificant (p-value >0.05). Mean cholesterol level in SDNS (mean = 290 mg/dl) is less than that of 1 episode and relapse cases, but again statistically insignificant (P value >0.05).

Table 2: Mean cholesterol levels in different types of nephrotic syndrome.

Serum cholesterol	Mean	SD
First episode	348.63	83.88
Relapse	363.00	83.35
SDNS	290.00	67.56
SRNS	543.00	182.93
Remission	164.00	39.00

Mean Triglycerides level in 1-episode (mean = 329.95 mg/dl) higher than relapse (mean = 290.64 mg/dl) and SDNS (mean = 229.33 mg/dl) cases. In SRNS cases TG level (mean = 500.57 mg/dl) highly elevated compared to 1st Episode, relapse and SDNS cases but the mean difference was statistically insignificant.

Table 3: Mean serum triglyceride level in different types of nephrotic syndrome.

Triglycerides	Mean	SD
First episode	329.95	171.93
Relapse	290.64	98.63
SDNS	229.33	57.07
SRNS	500.67	227.01
Remission	126.25	17.02

Table 4: Mean serum HDL level in different types of nephrotic syndrome.

LDL	Mean	SD
First episode	233.58	65.51
Relapse	257.64	68.72
SDNS	205.00	54.56
SRNS	372.67	120.70
Remission	92.25	33.14

Mean serum LDL level in relapse cases (mean = 257.64 mg/dl) higher than 1st episode, (mean = 233.58 mg/dl) and SDNS (mean = 205.00 mg/dl) cases but statistically

insignificant (p value >0.05). In SRNS cases mean serum LDL (mean = 372.67 mg/dl) highly elevated compared to other types but statistically significant when compared to SDNS (P value 0.048) and 1st episode cases (p value 0.023).

Table 5: Mean serum VLDL level in different types of nephrotic syndrome.

Vldl	Mean	SD
First episode	66.00	34.31
Relapse	60.27	19.37
SDNS	49.00	8.89
SRNS	100.33	45.35
Remission	25.00	3.37

In the present study mean serum VLDL level in 1st episode (mean = 66 mg/dl) higher than relapse (mean 60.27 mg/dl) and SDNS (mean = 49.00 mg/dl) cases but statistically insignificant (P value >0.05). In SRNS cases VLDL level (mean = 100.33 mg/dl) higher than other types but insignificant statistically. Compared to remission (mean = 25 mg/dl) cases, VLDL in SRNS cases statistically significantly elevated (p value 0.016).

DISCUSSION

Lipoproteins are the major carriers of lipids in the blood and they participate in three major pathways that are responsible for the generation and transport of lipids within the name, the exogenous pathway, the endogenous pathway and the reverse cholesterol transport pathway. Lipid and lipoprotein metabolism is altered in nephrotic syndrome, with or without chronic kidney disease (CKD).¹⁰

The extent of altered lipid metabolism in nephrotic syndrome correlates with the magnitude of proteinuria. In particular, the plasma concentrations of cholesterol, triglycerides and apolipoprotein B (ApoB)-containing lipoproteins (including very low-density lipoprotein (VLDL), intermediate-density lipoprotein (IDL) and lipoprotein (a)) are all elevated in nephrotic syndrome.¹¹ The concentration of high-density lipoprotein (HDL), cholesterol and the content of ApoA-I and ApoA-II apolipoproteins are very similar in healthy individuals and in patients with nephrotic syndrome.¹²

White RH et al done a study on serum lipids in nephrotic syndrome in 30 cases and 10 children were taken as control. They showed that there was high cholesterol, LDL, VLDL and triglycerides and the HDL level was normal. According to their study serum cholesterol in relapse cases were significantly higher than the first episode.¹³ In steroid-resistant cases, serum cholesterol level highly elevated than steroid responsive cases. They also told the rise in serum cholesterol was less when compared to western studies. They noticed the positive relation between serum cholesterol and LDL and a

negative relation between albumin and cholesterol.¹⁴ Schussler GC et al in their study showed that serum cholesterol level continuously elevated in frequent relapse cases.

In the present study serum cholesterol in relapse cases higher than 1st episode but the value is insignificant. In steroid-resistant cases, serum cholesterol significantly elevated compared to other types. LDL level compared to the first episode and steroid-dependent nephrotic syndrome significantly elevated in steroid-resistant nephrotic syndrome.¹⁵ Children with frequently relapsing nephrotic syndrome had a high level of serum cholesterol even during remission. They also showed that negative correlation between albumin with LDL and VLDL.¹⁶

Yokoyama H, et al in their study told that there will be a positive correlation between albumin and HDL and a negative correlation between albumin and serum cholesterol.¹⁷ Niaudet P et al in their study showed a negative correlation between albumin and cholesterol. But the correlation is insignificant ($P > 0.01$).¹⁸ They also showed an inverse correlation between albumin and VLDL.

Shalhoub RJ et al told that no correlation between hyperlipidemia and hypoalbuminemia and the amount of hyperlipidemia is due to the amount of kidney tissue which was nephrotic.¹⁹ Sasdelli et al told that patients with nephrotic range proteinuria had a significantly higher carotid artery intimal thickness compared to those without nephrotic syndrome.²⁰

CONCLUSION

The study finding concludes that the serum lipid profile showed noticeable increase in the nephrotic syndrome. It also observed that nephrotic patients are having hyperlipidemia. This hyperlipidemia may progress into the cardiovascular diseases. Hence the lipid profile in the nephrotic syndrome must be monitored for better management of the diseases.

In nephrotic syndrome, elevation of VLDL and LDL is paralleled by a fall of HDL. HDL is important in the catabolism of both chylomicrons and VLDL. So, a deficiency of HDL may play a role in the accumulation of VLDL and LDL. HDL cholesterol in nephrotic syndrome may be normal or low. But the ratio of LDL cholesterol to HDL cholesterol is generally increased.

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