

# Correlation between Serum Cholesterol and Serum Albumin Levels in Idiopathic Nephrotic Syndrome in Children.

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## ABSTRACT

**Background:** The aim of the study is to find correlation between serum levels of cholesterol and albumin in idiopathic nephrotic syndrome in children. **Methods:** Serum levels of cholesterol and albumin were compared in fifty cases of idiopathic nephrotic syndrome. **Results:** Negative correlation was found between serum albumin concentration and serum cholesterol levels. **Conclusion:** Serum cholesterol is high when serum albumin is very low in idiopathic nephrotic syndrome.

**Keywords:** Nephrotic syndrome, cholesterol, albumin.

## INTRODUCTION

Nephrotic syndrome (NS) is a chronic glomerular disease, characterized by massive proteinuria, hypoalbuminemia (serum albumin <2.5 g/dL), hyperlipidemia (serum cholesterol >200 mg/dL) and edema.<sup>[1,2]</sup> Nephrotic range proteinuria is early morning urine protein 3+/4+ (by heat test or dipstick), spot protein/creatinine ratio >2 mg/mg or urine albumin excretion >40 mg/m2/hr (on a timed-sample). Annual incidence of NS is 2-7 per 100,000 children and prevalence is 12-16 per 100,000.<sup>3</sup> In 95% cases NS is primary or idiopathic, while in less than 5 % there is underlying collagen vascular disease or infections like parvovirus B19, HIV, Hepatitis B and C.<sup>[3-5]</sup> More than 80 % cases of NS are minimal change disease (MCD) and the remaining are focal segmental glomerulosclerosis (FSGS) and mesangiproliferative glomerulonephritis.<sup>[6-8]</sup>

There is hyperlipidemia in NS which results from increased synthesis of lipoproteins that accompany increased hepatic albumin synthesis due to hypoalbuminemia. Other possible explanations are decreased plasma oncotic pressure causing increased hepatic lipoprotein synthesis, abnormalities in regulatory enzymes like lecithin-cholesterol

acyltransferase, lipoprotein lipase and cholesterol ester transfer protein.<sup>[9,10]</sup>

Hyperlipidemia is prevalent during the active phase of NS and disappears with the recovery of proteinuria. Several studies have found a negative correlation between serum albumin concentration and serum cholesterol levels.<sup>[11,12]</sup> However, high lipid levels may continue to persist even after the edema has disappeared.<sup>[13,14]</sup> So, this study was conducted to know whether any correlation exists between serum lipid and serum albumin levels in NS.

## MATERIALS AND METHODS

An observational prospective study was conducted over 50 children aged 2-12 years, admitted with Idiopathic NS in Department of Paediatrics, R.G. Kar Medical College and Hospital, a tertiary care centre of West Bengal. They were subsequently followed up at Paediatric Nephrology OPD in the same institution. The study period was of 1 year from October 2015 to September 2016. Inclusion criteria for subjects were: 1) Children presenting with typical features of minimal change NS. Any of the following was excluded: 1) Non minimal change NS, 2) Patients with prior history of diabetes mellitus, hypothyroidism and familial hypercholesterolemia, 3) NS secondary to systemic disease such as systemic lupus erythematosus, Henoch-Schonlein purpura, malignancy (lymphoma and leukaemia) and infections (hepatitis, HIV and

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malaria), 4) History of transfusion with albumin or fresh frozen plasma. Diagnostic criteria for NS were edema, massive proteinuria, hypoalbuminemia and hypercholesterolemia. Massive proteinuria was diagnosed by early morning urine heat test  $\geq 3+$  and spot urinary protein creatinine ratio more than 2. Hypoalbuminemia was diagnosed by serum albumin level less than  $<2.5$  gm/dl and hypercholesterolemia was considered where serum cholesterol was  $\geq 200$  mg/dl. Data were recorded in pre-tested proforma meeting the objectives of the study and were analysed with help of SPSS statistical software.

## RESULTS

Altogether, 50 children aged 2-12 years, were recruited in the study. Fifty seven percent were females and 2-6 years aged children were predominantly affected. Mean serum albumin level was  $1.87 \pm 0.30$  g/dl and mean serum cholesterol level was  $463.92 \pm 155.05$  mg/dl. A negative Pearson correlation ( $r = -0.34$ ) was found between serum levels of albumin and cholesterol. The Z-score was -8.61383. P-value was  $< 0.00001$ . Hence, the Pearson correlation is negative as well as statistically significant ( $p < 0.05$ ). [Figure 1]

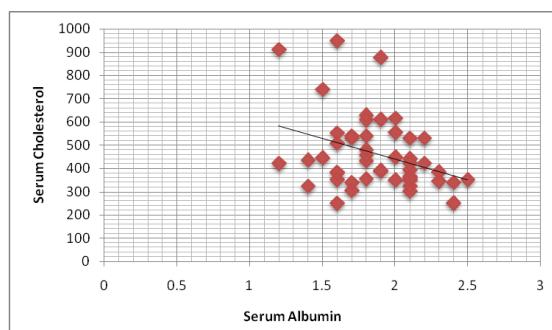


Figure 1: Correlation between serum albumin and cholesterol

## DISCUSSION

The main hypothesis behind NS pathophysiology is destruction of foot process of podocytes. Destruction of podocytes  $>20\%$  leads to irreversible glomerular damage, development of glomerulosclerosis and progressive loss of kidney function.<sup>[15,16]</sup> Mutations of genes encoding podocyte slit diaphragm proteins nephrin (NPHS1) and podocin (NPHS2) most often presents as either congenital or steroid resistant NS.<sup>[17]</sup> Immune dysregulation also plays a pathogenic role in disease development as evident by NS occurring after exposure to allergens and response to corticosteroids in treatment.<sup>[18]</sup>

Among 50 subjects, there was female predominance with female: male ratio of 1:0.8 (approx). Similar study in Canada showed female:<sup>[19]</sup> male ratio to be 1: 0.9, though Srivastava et al showed male predominance in India.<sup>[8]</sup> Fifty eight percent of

children were between 2-6 years of age. Kumar J et al,<sup>[20]</sup> found mean age of idiopathic NS to be  $7.9 \pm 5.1$  years. They also showed that MCD is most common under whereas FSGS is prevalent above 8 years. MCD is differentiated from non MCD subtypes by younger age, absence of hypertension and absence of hematuria.<sup>[20]</sup>

In our study, we have found a negative correlation ( $r = -0.34$ ) between serum levels of albumin and cholesterol and that is statistically significant ( $p$ -value  $<0.00001$ ). So, this indicates that when the serum albumin is very low (Mean  $1.87 \pm 0.30$  g/dl), serum cholesterol levels will be very high (Mean  $463.92 \pm 155.05$  mg/dl) in NS. Similar finding were recorded by Sah et al in Nepal,<sup>[11]</sup> Kaysen et al in USA and Hossain et al in Bangladesh. However,<sup>[12,21]</sup>

Heymann et al,<sup>[22]</sup> concluded that there was no correlation between the developmental of hyperlipidemia and hypoalbuminemia. He also found that severity of hyperlipidemia is related to the amount of nephrotic kidney tissue present. Thomas et al,<sup>[23]</sup> found correlation between serum cholesterol and albumin but found no correlation between serum cholesterol and globulin or total protein. Friedman and Byers showed that hypoalbuminemia causes hyperlipidemia.<sup>[24]</sup>

## CONCLUSION

There is a statistically significant negative correlation between serum cholesterol level and serum albumin level in childhood nephrotic syndrome and this study showed that lower the serum albumin level, higher will be the serum cholesterol level.

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