

## THE CORRELATION BETWEEN LIPID PROFILE AND PROTEINURIA IN ADULT NEPHROTIC SYNDROME PATIENTS IN BANGLADESHI POPULATION

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### ABSTRACT

The nephrotic syndrome is a constellation of abnormalities that includes massive proteinuria, hypoalbuminemia and edema. Dyslipidemia is an important secondary biochemical abnormalities in nephrotic syndrome due to proteinuria and hypoalbuminemia. Dyslipidemia in nephrotic syndrome involved in the cardiovascular risk and also accelerates the progression of glomerular dysfunction. This study was conducted to evaluate the relationship between dyslipidemia and proteinuria in adult nephrotic syndrome patients. A total of 50 (fifty) diagnosed adult nephrotic syndrome patients from the Dept of Nephrology, Dhaka Medical College, Dhaka with age range from 20-50 years of both sexes were enrolled as study subjects. To evaluate the correlation between serum TC, TAG, HDL-C and LDL-C with 24 hour urinary total protein. This case control study was carried out in the Department of Biochemistry, Dhaka Medical College, Dhaka, during the period of July 2013 to June 2014. With baseline information, lipid profile and 24 hour urinary total protein of study subjects were estimated. Mean values of the variables were determined. Correlation between variables were determined by Pearson's correlation test by using SPSS for windows version 20.0. For all the statistical analysis  $p < 0.05$  was considered as significant. Mean ( $\pm$ SD) values of serum total cholesterol (Tchol), TAG, HDL-C and LDL-C in adult nephrotic syndrome patients were  $288.23 \pm 35.67$  mg/dl,  $174.53 \pm 18.86$  mg/dl,  $23.71 \pm 4.58$  mg/dl and  $231.16 \pm 34.28$  mg/dl respectively. Mean value of 24 hour urinary total protein in study subjects was  $5.65 \pm 0.54$  gm/d. Positive correlation was found between 24 hour urinary total protein and Tchol ( $r=0.476$ ,  $p < 0.05$ ), TAG ( $r=0.354$ ,  $p < 0.05$ ), LDL-C ( $r=0.444$ ,  $p < 0.05$ ) and positive correlation was found between 24 hour urinary total protein and HDL-C ( $r=0.028$   $p > 0.05$ ). Dyslipidemia in adult nephrotic syndrome possesses a significant relationship with proteinuria which could predispose them to develop coronary artery disease.

**Key Words:** Nephrotic Syndrome, Dyslipidemia, Proteinuria

### Introduction

-Nephrotic syndrome is a clinical entity with multiple causes characterized by increased glomerular permeability and manifested by

massive proteinuria<sup>1</sup>. Nephrotic syndrome is represented as urinary total protein excretion more than 3.5 gm/day, low serum albumin level

(<2.5 gm/dl) and peripheral edema<sup>2</sup>. Nephrotic syndrome can affect any age, although it is found with a ratio of adults to children of 26:1<sup>3</sup>. The incidence of nephrotic syndrome is 90-100/million in the Indian subcontinent including Bangladesh<sup>4</sup>. Nephrotic syndrome is a chronic relapsing disease. Relapse is also higher in children of Bangladesh which is 36.4%. This frequent or infrequent relapse in the nephrotic syndrome may continue even in adult age<sup>5</sup>. Lipid abnormalities have an important biochemical basis in nephrotic syndrome. Although pathophysiological aspects of abnormal lipid metabolism have not been completely identified, Urinary protein loss as well as hypoalbuminemia, stimulates hepatic over production of lipoproteins and decreases lipoprotein lipase activity which are described as the important causal factors<sup>6</sup>.

Proteinuria in nephrotic syndrome leading to hypoproteinemia may lead to a coordinated increase in the synthesis of albumin and other proteins mainly apoprotein B containing lipoprotein by the liver<sup>7</sup>.

Dyslipidemia in nephrotic syndrome, not only involved in the cardiovascular risk but also accelerates the progression of glomerular dysfunction<sup>8</sup>. Elevation of serum lipid concentrations is an independent risk factor for coronary artery disease and cerebrovascular disease. Concurrent elevation of lipid profile increase these risks<sup>9</sup>.

Abnormalities in serum lipid profile has been paralleled by an increase in the incidence of the disease. Glomerular disease is a common cause of ESRD (End stage renal disease) and comprises 25-45% cases of ESRD in developing nation including Bangladesh.<sup>10</sup> These formidable enemies of health are joining forces to impose a double burden of disease. Limited published data has yet been found regarding this content, though several studies have been done in abroad

to establish the relationship but present study was designed in a small group of Bangladeshi population to evaluate the correlation between proteinuria and serum lipid profile in adult nephrotic syndrome.

### Materials and Methods

This cross sectional study of one year duration from July 2013 to June 2014 was designed to evaluate the correlation of dyslipidemia with proteinuria among the adult patients with nephrotic syndrome. The study protocol was approved by the Institutional Ethical Committee. Informed written consent was obtained from all the study subjects. Study sample consists of fifty (50) adult diagnosed nephrotic syndrome patients admitted in Department of Nephrology, Dhaka Medical College Hospital. Subjects with age group 20-50 years were included.

Along with the baseline information, 3 ml of fasting (at least 12 hours devoid of meal) blood sample were collected and analyzed for Tchol, TAG, LDL-C, HDL-C and the 24 hour urine collected samples were analyzed for protein of all participants of the study. Total cholesterol (Tchol), triacylglycerol (TAG), high density lipoprotein (HDL-C) were assayed by semi automated biochemical analyzer. Low density lipoprotein (LDL-C) was calculated by Friedewald's equation<sup>11</sup>.

Statistical analysis was performed by using the SPSS version 20.0 for windows. All data were processed to compute mean and standard deviation and expressed as mean±SD. Pearson's correlation coefficients were used to analyze linear correlation between variables. For all the statistical analysis p<0.05 was considered as significant.

**Results**

The mean±SD age of study subjects was 34.62±6.45 years. Among them, 21 (42%) were male and 29 (58%) were female. The mean±SD of systolic and diastolic blood pressure of nephrotic syndrome patients were 133.52±7.56 and 85.16±7.36 mm of Hg respectively. Mean±SD of serum albumin of study subjects was 1.87±0.54 gm/dl. Mean±SD of 24 hour urinary total protein of nephrotic syndrome patients was 5.65±0.54 gm/d.

**Table-I:** Base line informations of study subjects (n=50)

Base line informations	Adult patients with nephrotic syndrome (Mean±SD)
Age (yrs)	34.62±6.45
Sex: Male, n=21 (42%)	
Female, n=29 (48%)	
Systolic blood pressure (mm of Hg)	133.52±7.56
Diastolic blood pressure (mm of Hg)	85.16±7.36
Serum albumin (gm/dl)	1.87±0.54
24 hour urinary total protein (gm/day)	5.65±0.54

n = Number of study subjects

The mean±SD of serum Tchol, TAG, HDL-C and LDL-C of the study subjects were (288.23±35.67 mg/dl), (174.53±18.86 mg/dl), (23.71±4.58 mg/dl) and (231.16±34.28 mg/dl) respectively.

**Table-II:** Serum lipid profile and UTP in adult nephrotic syndrome (NS) patients

Parameters (mg/dl)	Adult NS patients (Mean±SD)
S. Tchol	288.23±35.67
S. TAG	174.53±18.86
S. HDL-C	23.71±4.58
S. LDL-C	231.16±34.28
UTP (gm/day)	5.65±.54

UTP maintained positive correlation with serum Tchol (r=0.476, p=.0005) TAG (r=0.354, p=.0117) & LDL-C (r=0.444, p<0.05). UTP was not correlated with serum HDL-C (r=0.028, p>0.05).

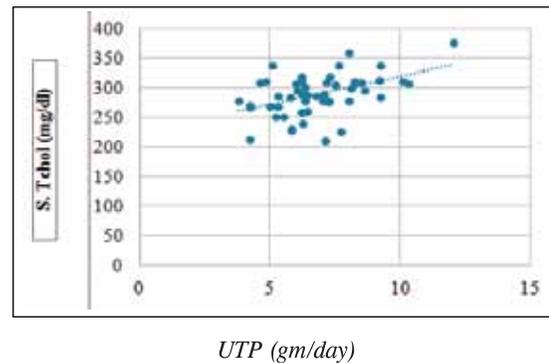
**Table-III:** Correlation between UTP and lipid profile in adult nephrotic syndrome (NS) patients.

Variables (gm/day)	(mg/dl)	r values	p values
UTP	Tchol	0.476	0.0005*
	TAG	0.354	0.0117*
	HDL-C	0.028	0.8469 <sup>ns</sup>
	LDL-C	0.444	0.0012*

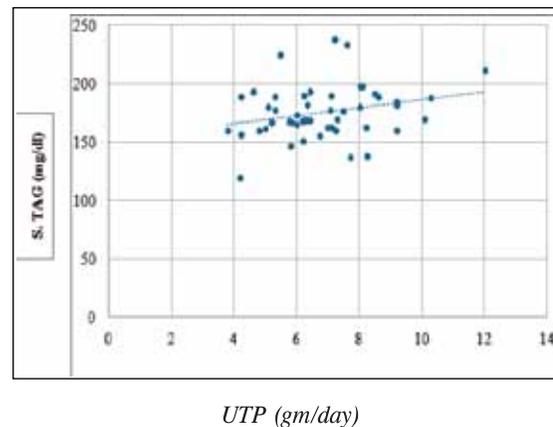
Level of significance, p < 0.05

\*significant.

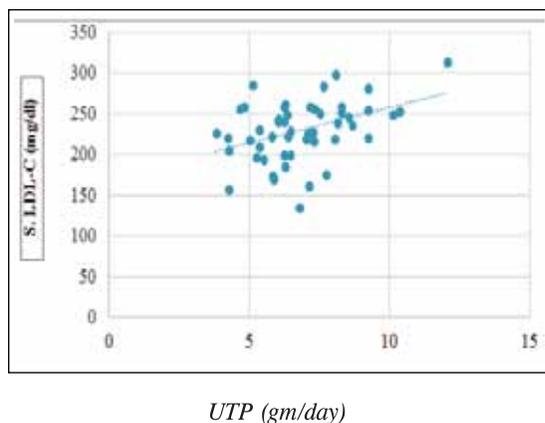
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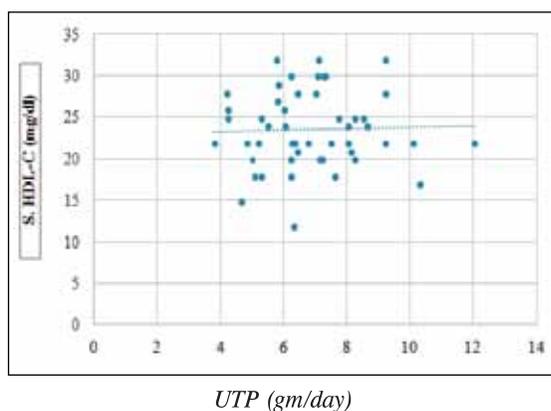
**Fig. 1:** Correlation between UTP and S. Tchol in study subjects



**Fig. 2:** Correlation between UTP and S. TAG in study subjects



**Fig. 3:** Correlation between UTP and S. LDL-C in study subjects.



**Fig. 4:** Correlation between UTP and S. HDL-C in study subjects

### Discussion

The present study was designed to observe the correlation between proteinuria and lipid abnormalities in adult nephrotic syndrome patients. In nephrotic syndrome, protein loss through urine results hypoproteinemia that stimulates protein synthesis in the liver, resulting in the overproduction of lipoproteins. This pathophysiological phenomenon is involved for dyslipidemia in adult patients with nephrotic syndrome<sup>6</sup>. Present study also reveals increased serum levels of lipid profile in adult patients with nephrotic syndrome.

Moreover, hypoalbuminemia leading to reduced oncotic pressure, and loss of regulatory protein in the urine of nephrotic syndrome patients all have been suggested as driving stimulus for synthesis of proteins and of LDL and VLDL cholesterol by the liver. Moreover, hepatic tissue expression and activity of diacylglycerol acyltransferase, an enzyme that catalyzes the final step in TAG biosynthesis, is increased<sup>13</sup>.

Passage of plasma proteins larger than 70 KDa across the glomerular basement membrane is believed to be normally restricted by a charge selectivity barrier<sup>14</sup>. It is thought to be mainly the result of polyanionic glycosaminoglycans in the glomerular basement membrane, which restrict the passage of small polyanionic plasma proteins (70 to 150 KDa). Investigations have revealed that the defect in minimal-change glomerulopathy results mainly from a loss of charge selectivity, whereas the defect in membranous glomerulonephritis results mainly from a loss of size selectivity. Both these phenomenon in nephrotic syndrome causes massive protein loss through urine<sup>15</sup>.

This present study found that urinary total protein (UTP) maintained significant ( $p < 0.05$ ) positive correlation with serum Tchol ( $r = 0.476$ ), TAG ( $r = 0.354$ ) & LDL-C ( $r = 0.444$ ) in adult nephrotic syndrome patients. This result is consistent with the other studies performed by Bulucu *et al.*<sup>16</sup> and Viswanathan *et al.*<sup>17</sup>. In this study the correlation between UTP and HDL-C among cases showed insignificant ( $p > 0.05$ ) positive correlation ( $r = 0.028$ ). Nandedkar *et al.*<sup>7</sup> found negative correlation between UTP and serum HDL-C in adult nephrotic syndrome patients ( $r = -0.03$ ) which was insignificant ( $p > 0.05$ ). Ohta and Matsuda<sup>18</sup> found high level of HDL-C while Alexander *et al.*<sup>19</sup> reported low level of HDL-C in nephrotic syndrome patients but no correlation test between HDL-C and urinary total protein was carried out by them.

Due to presence of significant correlation between proteinuria and dyslipidemia, patients with nephrotic syndrome are at higher risk of developing cardiovascular and cerebrovascular complications. So, regular screening of lipid profile should be performed for early detection of dyslipidemia in patient with nephrotic syndrome to prevent further complications arising out of dyslipidemia.

### References

1. Adu EM. Serum lipid profile abnormalities among patients with nephrotic syndrome. **Int J Med Biomed Res** 2013; **2**: 13-17.
2. Hull RP and Goldsmith DJ. Nephrotic syndrome in adults. **BMJ** 2008; **336**: 1185-1189.
3. Borrego R, Jaime Montero C and Orlando (eds.) Nefrologia: Fundamentos de Medicina. Spain: Corporacion para investigaciones biologicas 2003; p.340.
4. Shrivastava RN and Bagga A. Nephrotic syndrome: 'Paediatric Nephrology'. 4<sup>th</sup> edn., New Delhi: Jaypee Brothers. 2005; 161-200.
5. Rahman H, Hossain A, Hossain SZ, Haque AK, Hossain MM and Islam MN. Clinical profile and therapeutic outcome of nephrotic syndrome. **J of Teacher's Assoc** 1996; **7**: 13.
6. Chan CM. 'Hyperlipidaemia in chronic kidney disease with nephrotic syndrome. **Ann Acad Med Singapore** 2005; **35**: 31-35.
7. Prerna ND, Kamble, Meahendra T and Suryabhan L. Analysis of lipid profile and 24 hour urinary protein excretion as a predictor of cardiovascular risk in CKD with nephrotic syndrome. **J Pharm Biomed Sci** 2012; **21**(2): 63-71.
8. Vaziri ND. Dyslipidemia of chronic renal failure: the nature, mechanism and potential consequences. **Am J physiol Renal physiol** 2006; **290**: 262-272.
9. Marsh JB. Lipoprotein metabolism in experimental nephrosis. **Proc Soc Exp Biol Med** 1996; **213**: 178-186.
10. Rashid HU. Nephrotic syndrome-Evidence based management. **Bangladesh Renal J** 2003; **22**: 1-4.
11. Friedwald WT, Levy RI and Frederickson DS. Estimation of the concentration of low-density lipoprotein cholesterol in plasma, without use of preparation ultracentrifuge. **Clin Chem** 1972; **18**: 499-502.
12. Clinlab navigator.Lipid Profile 2012 [Online] [Accessed on 7<sup>th</sup> May 2012] [http:// www.clinlabnavigator.com/ lipid- panel.html](http://www.clinlabnavigator.com/lipid-panel.html).
13. Appel G. Lipid abnormalities in renal disease. **Kidney int** 1991; **39**: 169-183.
14. Goode NP, Shires M and Davidson AM. The glomerular basement membrane charge selectivity barrier: an over simplified concept. **Nephrol Dial Transplant** 1996; **11**: 1714-1716.
15. Shemesh O, Ross JC, Deen WM, Grant GW and Myers BD. Nature of the glomerular capillary injury in human membranous glomerulopathy. **J Clin Invest** 1986; **77**: 868-877.
16. Bulucu F, Vural A, Aydin A and Sayal A. Oxidative stress status in adult with nephrotic syndrome. **Clin Nephrol** 2005; **53**: 169-173.
17. Viswanathan V, Snehalatha C, Kumutha R, Jayaraman M and Ramachandran A. Serum albumin levels in patients with nephropathy. **Indian J Nephrol** 2004; **14**: 89-92.
18. Ohta T and Matsuda I. Lipid and apolipoprotein levels in patients with nephrotic syndrome. **Clin Chim Acta** 1981; **117**: 133-143.
19. Alexander JH, Schapel GJ and Edwards KD. Increased incidence of coronary heart disease associated with combined elevation of serum triglycerides and cholesterol concentrations in the nephrotic syndrome in man. **Med J Aus** 1974; **2**: 119-122.

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