



**A STUDY OF RANDOM URINE PROTEIN TO CREATININE RATIO IN THE
DIAGNOSIS OF NEPHROTIC SYNDROME IN CHILDREN.**

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ABSTRACT

Background: The objective of the study was to evaluate the accuracy of urine protein creatinine ratio (UP/UC) in a random sample for quantitative measurement of proteinuria in comparison with 24 hours urinary protein excretion in children of nephrotic syndrome. **Methods:** 20 patients of nephrotic syndrome were enrolled in study and were advised regarding 24 hours urine collection. They were asked to collect 24 hours urine sample for total protein excretion rate. A random urine sample was obtained and urine protein/creatinine ratio was calculated. The data was analyzed by linear regression and by calculating the correlation coefficient between urinary protein/creatinine ratio and 24 hour urinary protein. **Results:** Urine total protein in a timed 24 hour sample of nephrotic syndrome patients was in the range of 40.26-126.56 mg/m²/hour with the mean value of 69.68 mg/m²/hour. While as UP/UC ratio ranged from 2.32-5.6 with the mean value of 3.38. A significant correlation ($r = 0.776$) was found between timed 24 hour urinary protein and UP/UC ratio. **Conclusions:** Thus we conclude that random urine protein-creatinine ratio is highly reliable and rapid test for quantification of proteinuria in children. It reflects the amount of protein in a 24 hour collection. Thus it avoids all the drawbacks which are associated with time collection method.

KEYWORDS: UP/UC ratio, 24 hour urinary protein, Nephrotic syndrome.

INTRODUCTION

Nephrotic syndrome is a common type of kidney disease seen in children. Nephrotic syndrome may be caused by a variety of glomerular and systemic diseases, but by far the most common type in childhood is idiopathic nephrotic syndrome. Before the introduction of antibiotics, corticosteroids, and other immunosuppressive therapies, nephrotic syndrome was associated with mortality as high as 67%, usually following infections. The introduction of adrenocorticotrophic hormone and cortisone in the 1950s contributed to an greater decrease in mortality (to 9%), which was noted to occur in association with dramatic resolution of proteinuria.^[1]

Diagnosis of nephrotic syndrome requires the presence of edema, massive proteinuria (>40 mg/m²/hour) or a urine protein/creatinine ratio (>2.0 mg/mg) and hypoalbuminemia (<2.5 gm/dl).^[2,3] The annual incidence is 2-3 cases per 100000 children per year and higher in underdeveloped countries resulting predominantly from malaria.^[4]

Assessment of urinary protein excretion is not only diagnostic but also has prognostic value in monitoring of

nephrotic syndrome.^[5] Traditionally urinary protein assessments has been done in 24 hours urine collection specimens but this approach is time consuming, cumbersome, and imprecise.^[6] An alternative approach has been advocated by some researchers avoiding 24 hours collection. This is the measurement of protein/creatinine ratio in a random urine sample.^[7] This approach is based on the fact that in the presence of a stable glomerular filtration rate, urinary creatinine excretion has been reported to be fairly constant in a given individual.^[8]

The objective of the study was to evaluate the accuracy of urine protein creatinine ratio (UP/UC) in a random sample for quantitative measurement of proteinuria in comparison with 24 hours urinary protein excretion in children of nephrotic syndrome having normal Glomerular Filtration Rate (GFR).

MATERIAL AND METHODS

A total of 20 patients between 2-12 years of age of nephrotic syndrome (fresh case or case in relapse) with Nephrotic range proteinuria >40 mg/m²/hour, Hypoalbuminemia <2.5 gm/dl, Edema were enrolled. Children in renal failure were excluded.

Cases were noted down into the proforma with respect to history, examination and investigation. All the patients were advised regarding 24 hours urine collection. They were asked to give a 24 hours urine sample starting at 9.00 am for total protein excretion rate. A random urine sample was obtained and urine protein/creatinine ratio was calculated. Urine protein was estimated by improved Pyrogallol Red-Molybdate method and creatinine is measured by Jaffe's reaction. The random urine, protein-creatinine ratio was calculated mg/mg. Data was analyzed by linear regression and by calculating the correlation coefficient between urinary protein/creatinine ratio and 24 hour urinary protein. Also chi-square test was applied for non-parametric data.

RESULTS

Out of 20 cases, 12 cases were in the age group of 2-5 years, 6 cases in 6-10 years and 2 cases were above 10 years of age. Among 20 cases, 12 cases were male and remaining 8 were females. So, Male: female ratio found was found to be 1.5:1. Among these cases, 15 patients presented for the first time while remaining 5 cases were of relapse.

Various symptoms with which these patients presented are given in [Table 1]. The most common symptom was puffiness of face (96 %), followed by swelling of the limbs (82 %), abdominal distension (60 %) and fever (36 %) burning micturition(4%).

All patients had their serum albumin level below 2.5 gm/dl. Range is 1.5-2.4 gm/dl, Mean serum level of 2.02 gm/dl, SD is 0.25 and SE is 0.043. Serum cholesterol: Among these patients, 90% of cases showed serum cholesterol level more than 250 mg/dl. Range is 151-530 gm/dl, mean serum level of 300 gm/dl, SD is 95.89 and SE is 17.95. Urine protein by: All cases showed urine protein to be >3+ sulphosalicylic acid method (random sample). In present study, the range of timed 24 hours urine total protein was found to be 40.26-126.56 mg/m²/hour with the mean value of 69.68 mg/m²/hour. SD is 18.39 and SE is 3.26. Urine protein/creatinine ratio (UP/UC) (mg/mg): In present study, the range of urine protein/creatinine ratio (UP/UC) was found to be 2.32-5.6 with the mean value of 3.38. 2DS is 0.9 and SE is 0.126.

Linear regression of random urine protein creatinine ratio against 24 hour urine protein was done. The correlation coefficient between these values was 0.776 and this was highly significant (P <0.01), that means as the 24 hours urinary protein excretion value increased, the spot UP/UC value also increased linearly.

TABLE 1: Clinical features of patients with Nephrotic syndrome.

CLINICAL FEATURES	PERCENTAGE %
Puffiness of face (96
Swelling of the limbs	82
Abdominal distension	60
Fever	36
Burning micturition	4

TABLE 2: Correlation coefficient (r) between values of 24 hour urine protein and random UP/UC ratio.

Study	Correlation coefficient (r)
Iyer RS et al.	0.81
Wahbeh AM et al.	0.83
Siwach SB et al.	0.88
Lane C et al.	0.92
Shastri NJ et al.	0.95
Morales JV et.al.	0.91
Parag KB et al	0.90

DISCUSSION

This study was done to evaluate the UP/UC ratio as a rapid and reliable test for the estimation of various ranges of proteinuria and thus its usefulness in the diagnosis of nephrotic syndrome in children. In the present study the age distribution of cases ranged from 2 year to 12 years. The mean age in the present study was 5.28 years. Similar observations were made by Chahar OP et al.^[9] and Shastri NG et al.^[10] In the present study (n = 20) male: female ratio was noted to be 1.5:1. In study by Seigel NJ et al.^[11] the male female ratio was found less. The disparity may be due to smaller sample size.

All patients had their serum albumin level below 2.5 gm/dl. Range is 1.5-2.4 gm/dl, Mean serum level of 2.02 gm/dl, SD is 0.25 and SE is 0.043. Similar observations were made by Hiraoka et al.^[12] Among these patients, 90% of cases showed serum cholesterol level more than 250 mg/dl. Range is 151-530 gm/dl, mean serum level of 300 gm/dl. Similar observations were made by Appeal GB et al.^[13] Urine protein/creatinine ratio (UP/UC) (mg/mg): In present study, the range of urine protein/creatinine ratio (UP/UC) was found to be 2.32-5.6 with the mean value of 3.38. Chahar OP et al.^[9] and Iyer RS et al.^[14] found similar results.

In the present study, correlation coefficient obtained was 0.776 and value obtained was statistically significant (P <0.01). The correlation coefficient obtained in the other studies and in their studies also values obtained were highly significant [TABLE 2].

CONCLUSION

Thus we conclude that random urine protein-creatinine ratio is highly reliable and rapid test for quantification of proteinuria in children. It reflects the amount of protein in a 24 hour collection. Thus it avoids all the drawbacks which are associated with time collection method.

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REFERENCES

1. Arneil GC, Lam CN. Long-term assessment of steroid therapy in childhood nephrosis. *Lancet*. 1966; 2(7468): 819-21.
2. ISKDC. The primary nephrotic syndrome in children. Identification of patients with minimal change nephrotic syndrome from initial response to prednisone. *J Pediatr*. 1981; 98(4): 561-4.
3. Niaudet P. Steroid-resistant idiopathic nephrotic syndrome in children. In: Avner ED, Harmon WE, Niaudet P, eds. *Pediatric Nephrology*. 5th ed. Philadelphia: Lippincott Williams & Wilkins; 2004.
4. Priya Pais, Ellis D. Avner. Nephrotic syndrome. In: Kleigman, Stanton, St. Geme, Schor, Behrman, eds. *Nelson Textbook of Paediatrics*. 19th ed. USA: Elsevier Saunders; 2011; 1801.
5. Kassirer JP, Harrington JT. Laboratory evaluation of renal function. In: Scurrier RW, Gottschalk CW, eds. *Diseases of the Kidney*. 4th ed. Boston: Little, Brown; 1988; 393.
6. Ruggenentic P, Gaspari F, Perna A, Remuzzi G. Cross sectional longitudinal study of spot morning urine proteins: creatinine ratio 24 hours urine proteins excretion rate, glomerular filtration rate and end stage renal failure in chronic renal disease in patients without diabetes. *BMJ*. 1998; 316: 504-9.
7. Ginsberg JM, Chang BS, Matarese RA, Garella S. Use of single voided urine samples to estimate quantitative proteinuria. *N Engl J Med*. 1983; 309: 1543-6.
8. Vestergaard P, Leverett R. Constancy of urinary creatinine excretion. *J Lab Clin Med*. 1958; 51: 211-8.
9. Chahar OP, Bundella B, Chahar CK, Purohit M. Quantitation of proteinuria by use of single random spot urine collection. *J Indian Med Assoc*. 1993; 91(4): 86-7.
10. Shastri NJ, Shendurnikar N, Nayak U, Kotecha PV. Quantitation of proteinuria by urine protein/creatinine ratio. *Indian Pediatrics*. 1994; 31: 334-7.
11. Siegal NJ, Golberg B, Krassner CS. Long term follow-up of children with steroid responsive nephrotic syndrome. *J Pediatr*. 1972; 81: 251-8.
12. Hiraoka M, Takeda N, Tsukahara H, Kimura K, Takagi K, Havashi S, et al. Favourable course of steroid responsive nephrotic children with mild initial attack. *Kidney Int*. 1995; 47(5): 1392-3.
13. Appel GB, Blum CB, Chien S. The hyperlipidemia of the nephrotic syndrome - relation to plasma albumin concentration, oncotic pressure, viscosity. *N Eng J Med*. 1985; 312: 1544-8.
14. Iyer RS, Shailaja SN, Bhaskaranand N, Baliga M, Venkatesh A. Quantitation of proteinuria using protein-creatinine ratio in random urine samples. *Indian Pediatr*. 1991; 28(5): 463-7.