

Quantification of Proteinuria by Urine Protein/Creatinine Ratio

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Quantification of proteinuria by the collection of 24 hour urine sample is inconvenient and often unreliable due to the difficulty in accurately collecting a complete 24 hour sample in children. These problems suggest need for a more convenient and accurate method of urine protein estimation particularly in the outpatient setting(1). UP/UC ratio is a semiquantitative method for the estimation of proteinuria with only a few studies conducted in children(1,2). This study was done to evaluate the UP/UC ratio as a rapid and reliable test for the estimation of various ranges of proteinuria.

Material and Method

This study involved 79 subjects (46 male, 33 female, age range 1.5-12 yrs, mean 7.3 yrs) from the Pediatric ward and Nephrotic Clinic of Medical College, Baroda. Out of the 79 subjects, 54 children were hospital admissions which included 25 children with nephrotic syndrome, 18 with nephrotic syn-

drome in remission, 16 with proteinuria due to conditions other than nephrotic syndrome, *e.g.*, acute glomerulonephritis and 25 normal children.

The nephrotic syndrome patients were diagnosed as per McEnery and Strife(3). Each subject provided a timed 24 h urine sample (08.00-08.00 h) and 3 random single voided urine samples: (A) 08.00-12.00 h; (B) 12.00-18.00 h and (C) 18.00-24.00 h. No differentiation was made on the basis of posture. The first morning voided urine sample was excluded in all subjects(4). The urine protein (UP, mg/sqm/24 h) was estimated by Folin Lowry's method(5). The urine creatinine (UC, mg/kg/24 h) was estimated by Jaffe's method(6). The 79 subjects were then grouped based on their 24 h UP; Group I (n = 38): Physiologic range (upto 150 mg/sqm/24 h), Group II (n = 16): Pathologic range (150 mg/sqm/24 h to 1 g/sqm/24 h) and Group III (n = 25): Nephrotic range (above 1 g/sqm/24 h). UP/UC ratio (mg/mg; log converted) of <0.1, 0.1-1.0 and >1.0 were considered as the values corresponding to the physiologic, pathologic and the nephrotic ranges of proteinuria. UP/UC ratio and 24 h UP were correlated using logarithmic regression analysis. UP/UC ratio was used as a diagnostic test to assess the 24 h UP (gold standard). The validity indicators of using UP/UC ratio of random urine samples were calculated(7).

Results

The 24 h UP of 79 subjects ranged from 57.83 to 10,913.18 mg/sqm/24 hr (mean 1896.41 mg/sqm/24 h) and the daily creatinine excretion ranged from 3.2 to 40.0 mg/kg/24 h (mean 19.9 mg/sqm/24 hr). Regression analysis was done of UP/UC ratio of random urine samples (A, B or C)

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against 24 h UP over all the three ranges of proteinuria (Fig. 1). The linear regression analysis after log transformation yielded higher correlation coefficients. The validity indicators of random urine samples (A, B and C) for diagnosing each of the proteinuria ranges are shown in Table I.

Discussion

The estimation of proteinuria has considerable clinical and therapeutic implications in children with renal diseases. Though the 24 h timed urine collection remains the gold standard for the quantitation of proteinuria these are difficult to obtain and frequently unreliable. Qualitative assessment

by urinary dipsticks has no proven reliability with extremes of urinary flow rates and subject to observer error(8). As the glomerular filtration rate is fairly constant in a given patient, a simple ratio of protein to creatinine would cancel out the time factor and reflect the quantitative proteinuria(4). Preliminary studies on the use of UP/UC ratio involving adult subjects(4,8) and later studies in children(1,2) have concurred on a good correlation between UP/UC ratio and the daily protein excretion. The correlation coefficients of the random urine samples in our study were similarly high ($r = 0.95$ to 0.96). In our study, the validity indicators were higher for the morning and

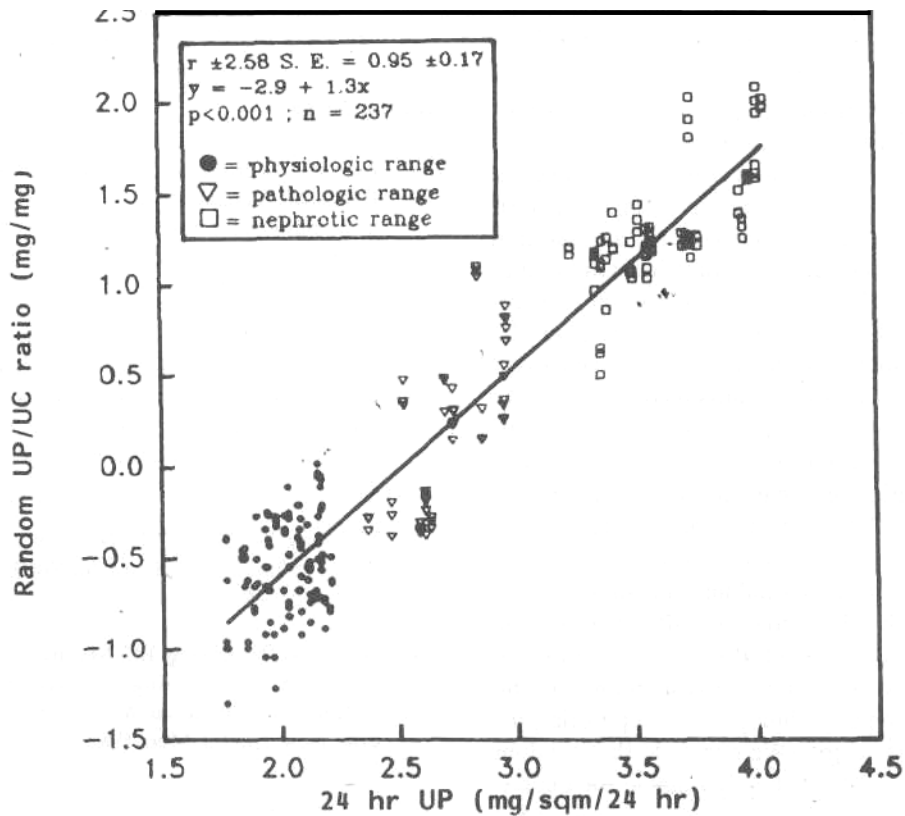


Fig. 1. Logarithmic regression analysis of random urine protein/creatinine (UP/UC) ratio against 24 hour urine protein (24 h/UP) over all the proteinuria ranges.

TABLE I—Validity Indicators (%) of UP/UC Ratio for the Diagnosis of Proteinuria Ranges (n=79)

Proteinuria range	Random urine sample*	Sensitivity	Specificity	Predictive value	
				Positive	Negative
Physiologic	A	100	85	86	100
	B	100	85	86	100
	C	100	85	86	100
Pathologic	A	69	98	92	93
	B	69	98	92	93
	C	63	95	77	91
Nephrotic	A	96	96	96	98
	B	96	96	96	98
	C	88	98	96	95

*A = Morning sample (08.00-12.00 h) excluding first morning voided sample.

B = Afternoon sample (12.00-18.00 h). C = Evening sample (18.00-24.00 h).

afternoon urine samples suggesting 08.00 - 18.00 h as the preferred time period for the collection of random urine sample needed for UP/UC estimation as a diagnostic test. Other studies by Iyer *et al.* (1) and Abitbol *et al.* (2) have found validity indicators ranging from 75 to 98% and 84 to 97%, respectively. The urinary protein levels in the physiological or the nephrotic range corresponds to a state of remission or attack (first/relapse) in a nephrotic syndrome patient. UP/UC ratio can prove very helpful in such a situation as it has high validity indicators (85 to 100%) for these proteinuria ranges. Our observations confirm the advantage of UP/UC ratio of random urine samples over the 24 h UP estimation. UP/UC ratio (log converted) of <0.1, 0.1 to 1.0 and >1.0 can be used as values corresponding to the physiologic, pathologic and nephrotic proteinuria ranges. We conclude that random UP/UC ratio is highly reliable for quantification of proteinuria in children and a wider application of this method is recommended.

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Congenital Nasolacrimal Duct Obstruction: The Proper Technique of Massage

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Congenital obstruction of the nasolacrimal duct (NLD) is a condition frequently encountered by pediatricians. Estimates of the incidence of the condition in newborns range between 1% and 6%(1,2). Management consists of massage of the nasolacrimal system, instillation of antibiotic drops in cases where a mucopurulent discharge is present, and probing if the obstruction persists beyond 6 months(3,4).

We observed that the technique of massage generally advised to parents did

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not result in opening up of the duct, with persistent epiphora and a high rate of probing subsequently. When asked to demonstrate the technique of massage being practiced, most parents were found to massage either at the wrong place (over the nasal bone), or too gently, or in the wrong direction (up and down). This prompted us to compare the results of different techniques of massage of the NLD.

Methods

Between January 1989 and December 1990, infants below the age of 5 months presenting with congenital NDL obstruction were prospectively randomized into 2 groups. Parents of infants in Group A were instructed to place the index finger over the inner canthus of the affected eye and exert gentle pressure inwards over the lacrimal sac in order to express secretions into the conjunctival sac. Parents in Group B were instructed to place the tip of the index finger over the nodule (medial palpebral ligament) at the inner canthus of the affected eye in such a way that the nail touched the eyeball through the upper lid (*Fig. 7*). They were asked to press the nodule, which lies over the common canaliculus, to block the reflux of secretions through the puncta into the conjunctival sac (*Fig. 2*). They were then