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Research Article

Role of urine sediment cytology in the diagnosis of renal disorders in comparison with biochemical and histopathological findings

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ABSTRACT

Background: The functional reserve of the kidney being large, serum biochemical parameters do not show abnormality until late. The need to recognize minimal damage in the kidneys is hence valuable. Urine sediment examination is cost effective, time saving and is called "liquid renal biopsy". The present study was aimed to evaluate the role of urine sediment examination in predicting the severity of renal damage and compare the results with serum biochemical parameters, 24 hour urine protein values and renal biopsy findings.
Methods: A total of 149 patients presenting with symptoms pertaining to renal disease were included in the study. Clinical information and serum biochemical parameters were obtained. Urine examination was done and renal biopsy performed in all the cases. 2 scoring systems were adopted to grade the urine sediment findings and renal biopsy grading devised by A. Z. Gyory et al. was used to grade the renal injury. 24 hour urine protein was estimated by Esbach's method. Urine sediment scores, serum biochemical parameters, 24 hour urine protein values were compared with the grades of renal injury on renal biopsies and statistical significance calculated.
Results: 32.8% of patients with renal disease were in the age group of 31-40 years. Nephrotic syndrome was the most common clinical presentation (33.5%) followed by nephritic syndrome (21.4%). The most common histopathological diagnosis was post infectious glomerulonephritis (n = 26) followed by acute interstitial nephritis (n = 17). 14 cases of lupus nephritis were diagnosed all of which were confirmed by "full house" pattern of immunofluorescence. Both the urine sediment scores had high specificity and positive predictive values in predicting the severity of renal injury. 24 hour urine protein had high positive predictive value in predicting the severity of renal injury. Serum biochemical parameters were insignificant in predicting the severity of renal injury.
Conclusion: Urine sediment examination can be used as an effective diagnostic test for predicting the severity of renal injury. The decision of further investigations and follow-up can be certainly decided by taking urine microscopy findings and 24 hour urine protein values into consideration.

Keywords: Kidney, Urine, Cytology

INTRODUCTION

There is an epidemiological transition taking place in India with a decline in communicable diseases and a growing burden of chronic disease. According to the first annual report published by the chronic kidney disease registry of India, diabetes and hypertension were major causes of chronic kidney disease in urban India with a prevalence of 28.5% and 16.2% respectively.[9] In rural India, although its prevalence is declining compared to previous years, chronic glomerulonephritis remains a common cause of chronic kidney disease and accounts

for 16.4%. The aim of present management strategies in renal diseases mainly pertains to the arrest of progression to end stage renal disease.

As serum biochemical parameters do not show abnormality until late, renal diseases are seldom diagnosed in the early stages.[13] Tests which detect early stages of renal disease are of hence immense importance. Urine examination is called "liquid renal biopsy" as when properly performed, it yields a lot of valuable information regarding the functional status of the kidney.[6,12] Subtle changes in the renal function can be indicated by a properly conducted urine examination. Hence an extent of damage to the kidney can be predicted. Urine examination is cost effective and simple.[11] Kidney is prone to damage by several systemic diseases like diabetes, S. L. E. where serial monitoring is necessary for detection of kidney damage. Renal biopsy is an invasive procedure and is not patient acceptable repeatedly. In such conditions, where repeated monitoring is necessary, it can be done by urine sediment examination.

In this study, an attempt was made to evaluate the role of urine sediment in predicting the severity of renal injury prior to more invasive procedures in comparison with 24 hour urine protein values and serum biochemical parameters taking histopathological findings as gold standard.

METHODS

This is a prospective study in the department of pathology, at a tertiary care centre for a period of 2 years from June 2010 to July 2012. Patients with azotemia and/or clinical features pertaining to renal disease presenting to the clinician for the first time were included in the study. Patients less than 10 years of age, terminally ill, debilitated patients, patients with a previous biopsy report and patients with contraindications to the biopsy procedure were excluded from the study. A detailed clinical history and serum biochemical parameters were obtained. 25-30ml of urine was collected from each patient. 10ml of urine was centrifuged for 5 minutes at 1500-2000rpm and sediment was taken on 2 slides. One was stained with toluidine blue and the other left unstained. (Figure 1a, b, c, d, e, f) The sediment findings were scored based on 2 separate scoring systems:

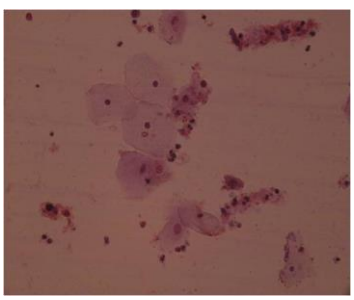

Figure 1a: Urine sediment: squamous epithelial cells (Toluidine blue; 100X).

Figure 1b: Urine sediment: hyaline cast (Toluidine blue; 100X).

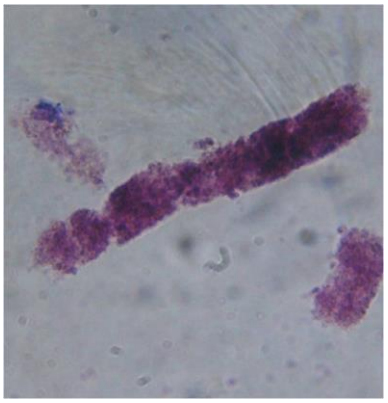

Figure 1c: Urine sediment: coarse granular cast (Toluidine blue; 400X).

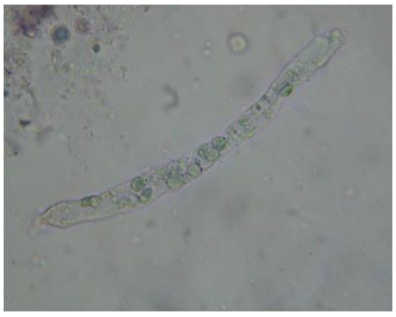

Figure 1d: Urine sediment: red blood cell cast (Toluidine blue; 400X).

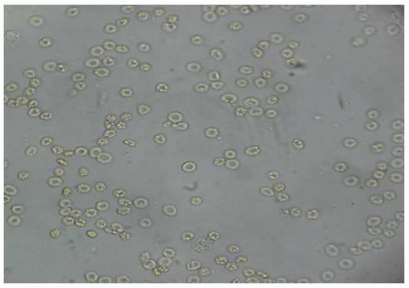

Figure 1e: Urine sediment: red blood cells in urine (Toluidine blue; 100X).

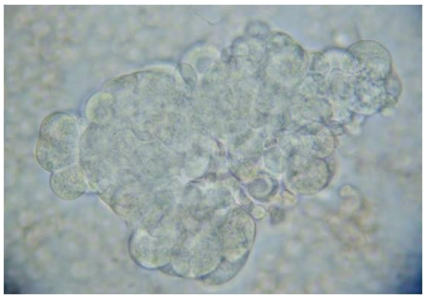

Figure 1f: Urine sediment: pus cells in urine (Unstained; 400X).

Mark et al. scoring system:[7]

Score 1: Granular casts - 0, renal tubular cells - 0 (per HPF)
Score 2: Granular casts - 1-5, renal tubular cells - 0 (per HPF)
or
Granular casts - 0, renal tubular cells - 1-5 (per HPF)
Score 3: Granular casts - 1-5, renal tubular cells - 1-5 (per HPF)
or
Granular casts - 6-10, renal tubular cells - 0 (per HPF)
or
Granular casts - 0, renal tubular cells - 6-10 (per HPF)

Lakhmir S. Chawla et al. scoring:[4]

Score 1 - No evidence of granular casts or epithelial cell casts (Figure 2a).

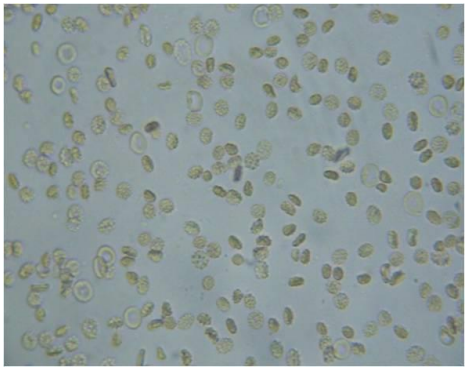

Figure 2a: Urine sediment (Lakhmir S. Chawla et al. score 1): 40-45 RBC/HPF and 3-4WBC/HPF; No casts seen in the sediment: (Toluidine blue; 400X).

Score 2 - Rare granular casts/epithelial cell casts – at least 1 cast seen on entire slide but less than 10% of low power fields (Figure 2b).

Score 3 - Many granular casts or epithelial cell casts but not seen on every low power field, seen on greater than 10% but less than 90% of low power fields (Figure 2c).

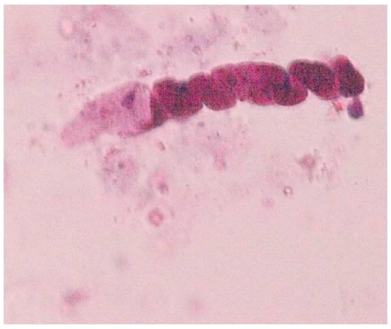

Figure 2b: Urine sediment (Lakhmir S. Chawla et al. score 2): 1 granular cast seen in entire slide: (Toluidine blue; 100X).

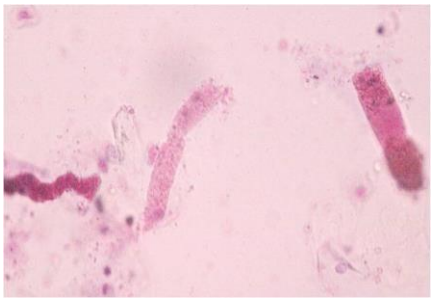

Figure 2c: Urine sediment (Lakhmir S. Chawla et al. score 3): Many granular casts seen in one low power field: (Toluidine blue; 100X).

Score 4 - Sheets of muddy brown casts, granular casts or epithelial cell casts seen on greater than 90% of low power fields.

24 hour urine was collected for estimation of protein levels and graded as:[10]

Mild: <1gm/24 hour urine
Moderate: 1-4gm/24 hour urine
Severe: >4gm/24 hour urine

Biochemical parameters obtained in all cases were:

1. Serum creatinine
2. Blood urea
3. Serum calcium
4. Serum phosphorus
5. Serum albumin
6. Random blood sugar levels were estimated to exclude diabetes.

Renal biopsy core for histopathological examination was formalin fixed, paraffin embedded and H&E, PAS, masson trichrome and silver methenamine stains were done on all cores. Extent of renal injury was graded using the grading system deviced by A. Z. Gyory et al.[1]

- Normal by Light microscopy (Grade 0).
- Minimal (Grade 1):

Mesangium inapparent
Tubules arranged back to back
No interstitial widening
Occassional mononuclear cell seen

- Mild (Grade 2):

Mesangium seen as thick pink threads
Mild interstitial widening
No segmental inflammatory lesions
Focal mononuclear aggregates

- Moderate (Grade 3): (Figure 3a)

Focal segmental inflammatory lesions
Minimal crescents
Patchy dense mononuclear collections
Interstitial fibrosis of less than half of cortex

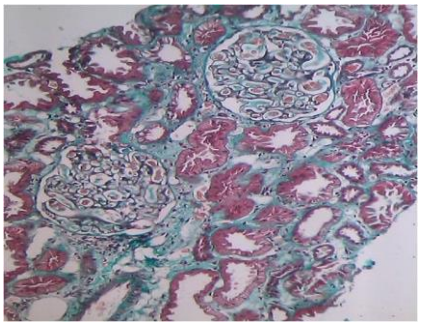

Figure 3a: Grade 3 renal injury on renal biopsy (AZ Gyory et al.): interstitial fibrosis and mesangial expansion (Massons trichrome; 100X).

- Severe (Grade 4): (Figure 3b)

Florid segmental inflammatory lesions
Florid crescents
Interstitial fibrosis involving more than half of cortex
Dense mononuclear cells with marked interstitial widening

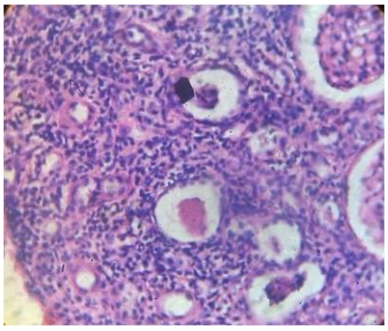

Figure 3b: Grade 4 renal injury on renal biopsy (AZ Gyory et al): interstitium showing dense mononuclear cells with interstitial widening (H&E; 400X).

Core for immunofluorescence was snap frozen in liquid nitrogen immediately and tested for IgG, IgM, IgA, C3c, anti Gbm antibodies.

Sensitivity, specificity, positive & negative predictive values of urine sediment cytology in predicting the severity of renal injury was calculated. Statistical significance was calculated by the chi-square test.

RESULTS

A total of 149 patients were included in the study. There was a slight male predominance with 33% of cases in the age group of 30-40 years. Out of 149 cases, 50 cases (33.55%) presented with nephrotic syndrome followed by nephritic syndrome with 32 cases (21.47%). (Table 1).

Table 1: Clinical presentation of patients with renal disorders (n=149).

Clinical presentation	No. of cases	%
Nephrotic syndrome	50	33.59%
Nephritic syndrome	32	21.47%
Nephrotic-nephritic syndrome	7	4.69%
Rapidly progressive renal failure	28	18.79%
Acute kidney injury/Acute renal failure	15	10.06%
Others	17	11.40%
Total	149	

Urine sediment scoring by adopting Lakhmir S. chawla et al. urine sediment score and Mark et al showed majority of cases with grade 2 and grade 3 score: 103/149 (69.1) and 131/149 (87.9%) respectively (Table 2).

Table 2: Scoring of urinary sediment by adopting Lakhmir S. Chawla et al. and Mark et al. score in patients presenting with renal disease (n=149).

	Number of cases with renal diseases	%
Lakhmir S. Chawla et al. score (n=149)		
1	46	30.89%
2	61	40.93%
3	42	28.18%
4	0	0%
Total	149	
Mark et al. score (n=149)		
1	18	12.08%
2	70	46.97%
3	61	40.93%
Total	149	

Out of 149 cases, thirteen cases (9.55%) had inadequate biopsies and hence were excluded from analysis. In all 136 cases which had adequate biopsies, immunofluorescence was performed for confirmation of the diagnosis. In the present study, the commonest

diagnosis on renal biopsy was post infectious glomerulonephritis (Figure 4) with 26 cases (19.11%) followed by acute tubulo-interstitial nephritis with 17 cases (12.5%). Other cases were minimal change disease (10 cases, Figure 7) mesangioproliferative glomerulonephritis (14 cases, Figure 5) and diabetic nodular glomerulosclerosis (3 cases, Figure 8 a, b). In 5 cases the histology on renal biopsy was unremarkable who presented clinically as nephrotic syndrome.

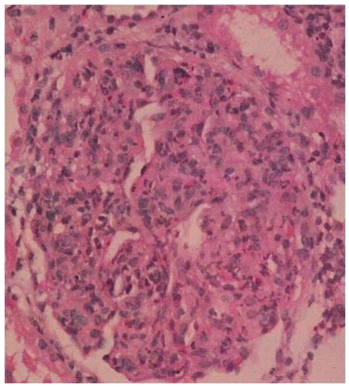

Figure 4: Post infectious glomerulonephritis showing hypercellular glomerulus with neutrophilic infiltration (H&E; 400X).

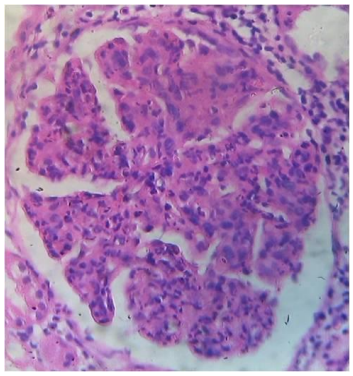

Figure 5: Mesangioproliferative glomerulonephritis showing lobular accentuation of the glomerular tuft (H&E; 400X).

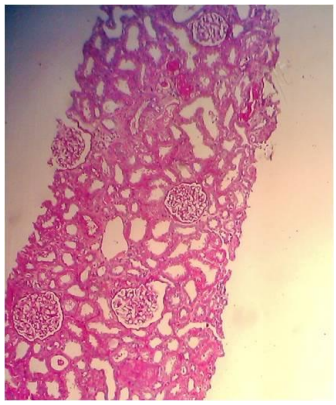

Figure 7: Minimal change disease showing normal glomeruli (PAS; 40X).

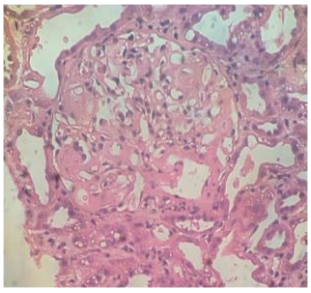

Figure 8a: Diabetic nodular glomerulosclerosis showing acellular eosinophilic nodules within the mesangium (H&E; 400X).

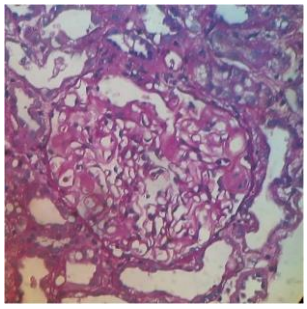

Figure 8b: Diabetic nodular glomerulosclerosis showing PAS positive acellular nodules (PAS; 400X).

Out of 14 cases of lupus nephritis, the pattern of lupus nephritis on renal biopsy based on WHO was : 4 cases were classified as class I, 2 cases as class II, 2 cases as class III, 4 cases as class IV and 2 cases as class V (Figure 6 a, b). All the cases of lupus nephritis showed full house pattern of positivity on immunofluorescence (Table 3).

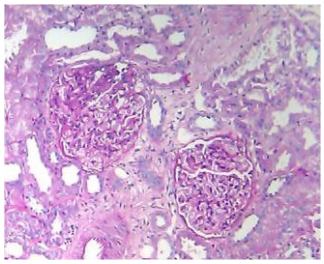

Figure 6a: Class V lupus nephritis showing thickening of the basement membrane (PAS; 100X).

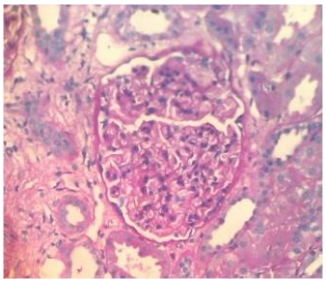

Figure 6b: Class V Lupus nephritis showing diffuse thickening of the basement membrane (PAS; 400X).

Table 3: Histopathological variants in various renal disorders on renal biopsies (n=136).

Histopathological diagnosis	No. of cases	%
Post infectious glomerulonephritis	26	19.17%
Acute interstitial nephritis	17	12.5%
Focal segmental glomerulosclerosis	14	10.29%
Lupus nephritis	14	10.29%
Mesangioproliferative glomerulonephritis	14	10.29%
Membranous glomerulonephritis	13	9.55%
Minimal change disease	10	7.35%
IgA nephropathy	9	6.61%
Normal histology	5	3.67%
Crescentic glomerulonephritis	3	2.20%
Diabetic kidney disease	3	2.20%
Benign nephrosclerosis	2	1.47%
Cortical necrosis	2	1.47%
Chronic glomerulonephritis	2	1.47%
Chronic interstitial nephritis	2	1.47%
Total	136	

In the present study, majority of the cases showed grade 2 and grade 3 renal injury on renal biopsy. 3/26 cases of Post infectious glomerulonephritis, 2/14 cases of focal segmental glomerulosclerosis, 2/14 cases of lupus nephritis, 1/3 cases of crescentic glomerulonephritis and 1/2 cases of chronic interstitial nephritis presented with grade 4 injury. When renal biopsy grades were compared with Lakhmir S. Chawla et al. urinary sediment score, out of 61 patients presenting with moderate (grade 3) and severe renal injury (grade 4) on renal biopsy, 53 (86.88%) patients had a urine sediment score of 2 (24 cases) and 3 (29 cases). When compared with Mark et al. urinary sediment score, out of 58 patients presenting with moderate and severe renal injury on renal biopsy, 56 (96.55%) patients had urine sediment score of 2 (23 cases) and 3 (33cases) (Table 4).

When 24 hour urine protein values were compared with severity of renal injury on renal biopsies, out of 55 patients presenting with moderate and severe grades of renal injury, 42 cases had moderate and severe 24 hour urine protein values. 24 hour urine protein estimation was not possible in 15 cases (Table 5). The mean serum creatinine levels were higher for chronic interstitial nephritis (11.5mg/dl), crescentic glomerulonephritis (9.96mg/dl), diabetic kidney disease (9.4mg/dl), and chronic glomerulonephritis (8.1mg/dl) (Table 6). Biochemical parameters were compared with grades of renal injury on biopsy: Serum creatinine levels when compared with grades of renal injury on biopsy, showed that 20 cases (31.7%) out of 63 cases presenting with moderate and severe grades of renal injury had serum creatinine values greater than 5mg/dl. 38 cases out of 59 cases presenting with moderate and severe grades of renal injury had blood urea values greater than 50mg/dl. Comparison of serum calcium, serum phosphorus and serum albumin with grades of renal injury also showed that less than 50% of cases had values <8mg/dl, >5mg/dl and <2 gm/dl respectively (Table 7).

Table 4: Comparison of grades of renal injury on renal biopsies with both urine sediment scores (n=136).

Urine sediment score	Normal, minimal and mild injury on renal biopsy	Moderate and severe injury on renal biopsy
Lakhmir S. Chawla et al. score	**(n=75)**	**(n=61)**
1	31	8
2	30	24
3	14	29
Total	75	61
Mark et al. urine sediment score	**(n=78)**	**(n=58)**
1	17	2
2	38	23
3	23	33
Total	78	58

Table 5: Comparison of 24 hour urine protein values with grades of renal injury on renal biopsy (n=122).

24 hour urine protein	Normal, minimal and mild injury on renal biopsy (n=67)	Moderate and severe injury on renal biopsy (n=55)
Mild	14	13
Moderate	19	23
Severe	34	19
Total	67	55

Table 6: Mean serum creatinine and blood urea values in various renal diseases (n=136).

Renal diseases	Serum creatinine	Blood urea
Chronic interstitial nephritis	11.55mg/dl	65mg/dl
Crescentic GN	9.96mg/dl	189mg/dl
Diabetic kidney disease	9.4mg/dl	123mg/dl
Chronic glomerulonephritis	8.1mg/dl	126.6mg/dl
ATIN	6.847mg/dl	121mg/dl
IgA nephropathy	6.26mg/dl	108mg/dl
Benign nephrosclerosis	4.8mg/dl	90mg/dl
Cortical necrosis	4.8mg/dl	82mg/dl
PIGN	4.134mg/dl	86mg/dl
Lupus nephritis	2.128mg/dl	46mg/dl
FSGS	1.95mg/dl	53mg/dl
MPGN	1.714mg/dl	38mg/dl
Normal histology	1.44mg/dl	38.8mg/dl
Minimal change	1.44mg/dl	33mg/dl
Membranous GN	1.1mg/dl	31mg/dl

Table 7: Comparison of biochemical parameters with grades of renal injury on renal biopsy (n=136).

Serum biochemical parameters	Number of cases	
	Normal, minimal & mild injury	Moderate and severe injury
Serum creatinine		
<5mg/dl	51	43
>5mg/dl	22	20
Total	73	63
Blood urea		
<50mg/dl	49	21
>50mg/dl	28	38
	77	59
Serum calcium		
>8mg/dl	50	33
<8mg/dl	27	26
Total	77	59
S.Phosphorus		
<5mg/dl	66	53
>5mg/dl	5	12
Total	71	65
Serum albumin		
>2gm/dl	53	48
<2gm/dl	20	15
Total	73	63

The specificity and positive predictive value of Lakhmir S. Chawla et al. and Mark et al. urine sediment scores in assessing the extent of renal damage were 79.5%, 86.88% and 89.4%, 96.55% respectively. The P value was statistically significant for Lakhmir S. Chawla et al. urine sediment score (P value = 0.00082) and Mark et al. urine sediment score (P value = 0.0038).

The positive predictive value of 24 hour urine protein value in estimating the severity of renal damage was 76.36%. Biochemical parameters had low sensitivities, specificities, positive and negative predictive values (Table 8).

DISCUSSION

India is experiencing a rapid health transition with large and rising burdens of chronic diseases, which are estimated to account for 53% of all deaths and 44% of disability adjusted life years lost.[9] Some data are available on the pattern of end stage renal disease in India. Glomerulonephritis and interstitial nephritis were reported to be the predominant causes previously; however recent data highlight the emergence of diabetic nephropathy as the major cause of end stage renal disease in India. Although its prevalence is declining compared to previous years, chronic glomerulonephritis remains the second common cause of chronic kidney disease. To tackle the problem of limited access to renal replacement therapy, an important method would be to try and reduce the incidence of end stage renal disease and the need of renal replacement therapy by preventive measures, which can be primary, secondary and tertiary.[9] Medical renal diseases always present late as the functional reserve of the kidney is large, thus making them difficult to manage. The need for detecting renal damage when it is minimal is hence valuable. Urine examination serves as a simple test for the assessment of extent of renal damage. There are only a few studies which emphasize the need for a properly conducted urine examination prior to more expensive and laborious investigations.

Table 8: Statistical significance of various tests predicting the severity of renal injury (n=136).

Tests	Sensitivity	specificity	Positive predictive value	Negative predictive value	P value
L. S. Chawla et al. urine sediment score	54.63%	79.58%	86.88%	41.33%	0.00082
Mark et al. urine sediment score	52.33%	89.47%	96.55%	25%	0.0038
24 hour urine protein	49.52%	51.85%	76.36%	20.8%	0.170
Serum creatinine	47.26%	54.25%	31.74%	30.13%	0.846
Blood urea	58.46%	69.5%	64.4%	64%	0.16
S. calcium	49.05%	60.2%	44.06%	64.93%	0.285
S. phosphorus	71.4%	55.65%	16.39%	63.1%	0.056
S. albumin	47.42%	56.2%	23.8%	73.9%	0.718

In the present study, 149 cases presenting with renal disease were investigated systematically starting with analysis of clinically relevant data, estimation of serum biochemical parameters, urine examination and a renal biopsy. The role of urine microscopy, 24 hour urine protein values and serum biochemical parameters in the prediction of severity of renal injury was assessed taking histopathology as gold standard.

In the present study, the mean age at presentation was 36.2 years with 61% of cases presenting above the age of 31 years and less than 39% presenting below 30 years of age. There was a male predominance with a male to female ratio of 1.36:1. The commonest clinical presentation was nephrotic syndrome with 33.55% cases, 21.47% cases presented with nephritic syndrome, 18.79% cases presented with rapidly progressive renal failure, 10.06% presented with acute kidney injury, 4.69% cases presented with nephrotic-nephritic syndrome and 11.40% cases presented with various other manifestations. In the study by U. Das et al.[14] the male: female ratio was 1.4:1. The most common indications of renal biopsy in their study were nephrotic syndrome (49%), followed by chronic renal failure (13.6%) and rapidly progressive renal failure (12%).

In the present study, the commonest diagnosis was that of Post infectious glomerulonephritis (19.11%) followed by acute tubulo interstitial nephritis (12.5%).In five cases the histology was normal on renal biopsy out of them two presented with nephrotic syndrome, one case was on therapy for systemic lupus nephritis and two cases presented with chronic renal failure. The mean age of presentation of post infectious glomerulonephritis was 32.4 years and that of acute tubule-interstitial nephritis was 39.6 years. In the study by U. Das et al.,[14] primary glomerulonephritis (PGN) comprised 69.1% of the total patients. Among the primary glomerulonephritis cases, the most common one was minimal change disease (21.8%), followed by focal segmental glomerulosclerosis (15.3%). In the study by Muhammed Mubarak et al.,[8] 61.9% were males and 38.1% females, with male-to-female ratio of 1.6:1. The histopathological lesions seen on renal biopsies comprised of focal segmental glomerulosclerosis (FSGS) (38.5%), followed by minimal change disease (MCD) (23.2%). In the study by A. S. Gyory et al.,[1] the commonest diagnosis was IgA nephropathy.

In the present study, observed urine sediment findings were graded by 2 scoring systems: Lakhmir S. Chawla et al.[4] scoring system and Mark et al.[7] scoring system. Of the 149 cases, 69.11% cases presented with score 2 and 3 on Lakhmir S. Chawla et al. scoring system and 87.9% cases presented with score 2 and 3 on Mark et al. scoring system. When urine sediment findings in various renal disorders were observed, minimal change disease cases had no casts or if present, only occasional hyaline casts were seen in the sediment. Focal segmental glomerulosclerosis and mesangioproliferative glomerulonephritis cases invariably had microscopic hematuria as well as few RBC casts in the sediment. RBC and WBC casts were commonly noted in Post infectious glomerulonephritis.

In the present study, renal injury was graded on renal biopsies adopting the grading devised by A. S. Gyory et al.[1] When Lakhmir S. Chawla et al. urine sediment score was compared with grades of renal injury on biopsy, out of 61 patients with moderate and severe grades of renal injury on biopsy, 53 (86.88%) cases had a urine sediment score of 2 & 3. The test had a specificity of 79.58% and a positive predictive value of 86.88% in predicting the severity of renal injury. The P value obtained was also statistically significant with a p value of 0.00082. Comparison of Mark et al. urine sediment scoring system with grades of renal injury on biopsy showed that out of 58 patients with moderate and severe injury on biopsy, 56 cases (96.55%) had a urine sediment score of 2 & 3. This test had a specificity of 89.47% and a positive predictive value of 96.55% in predicting the severity of renal injury. The P value obtained was statistically significant with a value of 0.0038. Hence both the urinary sediment scoring system was significant in predicting the extent of renal injury and can be used as a screening test.

In the study by Mark A. Perazella et al.,[7] the sensitivity and specificity of urine microscopy in predicting the severity of renal damage were 76% and 86% respectively. The urinary scoring system was significantly associated with increased risk of worsening acute kidney injury. In the study by Fogazzi GB et al.,[3] the sensitivity and specificity of urine microscopy in predicting histological alterations were 80.8% and 79.2% respectively.

In the literature, 24 hour urine protein estimation though time taking is considered as the gold standard in quantitation of proteinuria.[5] When 24 hour urine protein values were compared with severity of renal injury on biopsy, out of 55 cases presenting with moderate and severe renal injury, 42 (76.36%) patients had moderate and severe 24 hour proteinuria. 24 hour urine protein had a positive predictive value of 76.36% in predicting the severity of renal injury on histology. In the study by Y Kawasaki et al.,[15] 79.26% of patients who had higher chances of progression to renal failure had higher 24 hours urine protein values. When serum creatinine was compared with grade of renal injury on biopsy, out of 63 cases presenting with moderate and severe renal injury, only 20 (31.77%) cases had serum creatinine values greater than 5mg/dl. When blood urea levels were compared with grade of renal injury on biopsy, out of 59 cases presenting with moderate and severe renal injury, 38 (64.40%) cases had blood urea values of greater than 50mg/dl. Similar results were obtained with the other serum biochemical parameters. In the study by Bagshaw et al.,[2] it was observed that the scientific basis for the use of biochemistry indices in patients with severe renal failure is weak and the results are variable and inconsistent when biochemical parameters were correlated with severity of the disease.

In view of the results obtained in the present study, both the urine sediment scoring systems adopted in our study had a significant role in predicting the severity of renal injury. 24 hour urine protein value has a high predictive value in assessing the severity of renal damage. Serum biochemical parameters were insignificant in predicting

the severity of renal injury in early stages of the renal diseases.

CONCLUSION

Urine sediment scoring was highly significant in predicting the extent of renal injury which is a simple bedside cost effective investigation. 24 hours urine protein values were also predictive of the severity of renal injury. When biochemical parameters were compared with the severity of renal injury on histopathology, in majority of the cases the values were normal or mildly deranged indicating that biochemical parameters do not reflect the severity of renal damage. The decision of further investigations and follow-up can be certainly decided by taking urine microscopy findings and 24 hours urine protein values into consideration.

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REFERENCES

1. Akos Z. Gyory, Hadfield, C. S. Lauer. Value of urine microscopy in predicting histological changes in the kidney: a double blind comparison. Br Med J. 1984;288:819-22.
2. Bagshaw SM, Langenberg C, Bellomo R. Urinary biochemistry and microscopy in septic acute renal failure: a systematic review. Am J Kidney Dis. 2006;48:695-705.
3. Fogazzi GB, Saglimbeni L, Banfi G, Cantu M, Moroni G, Garigali G, Cesana BM. Urinary sediment features in proliferative and non-proliferative glomerular disorders. J Nephrol. 2005 Nov-Dec;18:703-10.
4. Lakhmir S. Chawla, Aaron Dommu, Alexandra Berger, Shirley Shih, Samir S. Patel. Urinary sediment cast scoring index for acute kidney injury: a pilot study. Nephron Clin Pract. 2008;110:c145-50.
5. Lee A. Herbert, Daniel J. Birmingham, Ganesh Shidham, Brad Rovin, H. N. Nagaraja, Chack Yung Yu. Random spot urine protein/creatinine ratio is unreliable for estimating 24 hour proteinuria in individual SLE nephritis patients. Nephron Clin Pract. 2009;113:c177-82.
6. Marcussen N, Schumann J, Campbell R, Kjellstrand C. Cytodiagnostic urinalysis is very useful in the differential diagnosis of acute renal failure and can predict the severity. Ren Fail. 1995;17:721-9.
7. Mark A. Perazella, Steven G. Coca, Mehmet Kankay, Ursulac Brewster, Chirag Parikh. Diagnostic value of urine microscopy for differential diagnosis of acute kidney injury in hospitalized patients. Clin J Am Soc Nephrol. 2008;3:1615-19.
8. Muhammed Mubarak, Javed I. Kazi, Shaheera Shakeel, Ali Lanewala, Seema Hashmi. The spectrum of histopathological lesions in children presenting with steroid-resistant nephrotic syndrome at a single center in Pakistan. Sci World J. 2012;2012:1-5.
9. Murugesan Ram Prabahar, Venkatraman Chandrasekaran, Periasamy Soundararajan. Epidemic of chronic kidney disease in India - what can be done? Saudi J Kid Dis Transplant. 2008;19:847-53.
10. The Washington Manual. Nephrology. In: Steven Cheng, Anitha Vijayan, Katherine E. Henderson, Thomas M De Fer, eds. Nephrology Subspecialty Consult. 3rd ed. Philadelphia: Lippincott Williams and Wilkins; 2011: 408.
11. Ottiger C, Huber AR. Improved sensitivity in detecting renal diseases by combined urinalysis (proteins and cellular components). Ther Umsch. 2008 Sep;65:503-11.
12. Obroniecka I, Rojewska J, Wancowicz Z. The value of urine sediment cytomorphology in the ambulatory differential diagnosis of hematuria. Pol Merkur Lekarski. 1998 Nov;5(29):285-7.
13. Prigent A. Monitoring renal function and limitations of renal function tests. Semin Nucl Med. 2008 Jan;38(1):32-46.
14. U. Das, K. V. Dakshinamurty, A. Prayaga. Pattern of biopsy-proven renal disease in a single center of south India: 19 years experience. Indian J Nephrol. 2011 Oct-Dec;21:250-7.
15. Y Kawasaki, J Suzuki, R Nozawa, H Suzuki. Efficacy of school urinary screening for membranoproliferative glomerulonephritis type 1. Arch Dis Child. 2002;86:21-5.

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