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Research Article

**THE IMPORTANCE OF PROTEINURIA AND ITS  
RELATIONS AMONG PATIENTS WITH ACUTE RENAL  
FAILURE**Dr Asma Nawaz<sup>1</sup>, Dr Farsa Kanwal<sup>2</sup>, Dr Saira Fiaz<sup>3</sup><sup>1</sup> Rawal Institute of Health Sciences, Islamabad<sup>2,3</sup> District Headquarter Hospital, Jhelum**Article Received:** July 2020**Accepted:** August 2020**Published:** September 2020**Abstract:****Aim:** To determine the importance of proteinuria and its relationships in patients with acute renal failure.**Method:** This study is a prospective observational study conducted over a six-months duration from January 2020 to June 2020 in the Nephrology department of PIMS Hospital Islamabad. The study included a total of n = 40 patients who presented to our department with acute renal failure or acute chronic renal failure. Proteinuria was analyzed by gel electrophoresis in patients and its predictive value was reported for the need for renal replacement therapy.**Results:** A total of n = 40 patients with a mean age of 58.6 ± 27 years and a male to female ratio of 24:16 were included in the study. Patient mortality was 15 (37.5%), the surviving population was critically ill at referral with an APACHE II score of 29 +/- 5, also had a lower baseline creatinine and a higher tubular-to-glomerular ratio, as indicated by for acute tubular necrosis. Among those who had survived 25(62.5%) a total of 7(17.5%) patients were those who did not recover and 19(47.5%) were those who recovered and returned towards normal renal functioning. Those who did not recover had elevated levels of tubular proteinuria and progressed to end-stage renal disease.**Conclusion:** According to our research, gel electrophoresis analysis for proteinuria is a cost effective and reliable method of determining tubular or glomerular proteinuria in patients with acute renal failure requiring renal replacement therapy in the intensive care unit. The presence of tubular proteinuria correlates with the duration of dialysis treatment and mortality, and the presence of glomerular proteinuria indicates glomerular damage and its severity.**Key words:** Acute renal injury, dialysis, proteinuria, tubular proteinuria, glomerular proteinuria.**Corresponding author:****Dr. Asma Nawaz,**

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**INTRODUCTION:**

20-50% of acute kidney injury or chronic kidney injury occurs in the intensive care unit, the cause of this injury is usually acute tubular necrosis, with adverse sequelae and increased mortality<sup>1-2</sup>. Serum creatinine levels are poor indicators and have poor specificity and sensitivity, according to a series of clinical trials, urine protein levels are a better marker of acute kidney injury and determine the course of end-stage renal disease<sup>3-4</sup>. But this association is less certain. Some specific indicators are being given more attention in the scientific community because of their association with adverse outcomes, as reflected in the requirement for renal replacement therapy, such indicators as neutrophil gelatinase-associated lipocalin, kidney injury molecule. But quantification of these markers is very limited and not available in all media, unlike SDS PAGE technique, as quantitative analysis of proteinuria is promising as it is inexpensive and convenient, separates molecules according to their size, and the staining properties determine the number and presence of bands of low molecular weight reveal tubular protein loss, while high molecular weight bands reveal more larger protein molecules such as albumin and globulin, indicative of glomerular damage<sup>5-6</sup>. The aim of this study is to determine the importance of both tubular and glomerular proteinuria, determined by gel electrophoresis in patients with acute / chronic kidney injury.

**MATERIALS AND METHODS:**

This study is a prospective observational study conducted over a six-months duration from January 2020 to June 2020 in the Nephrology department PIMS Hospital Islamabad. A total of 40 patients who came to our department with acute or chronic renal failure participated in the study. All patients were referred from the intensive care unit because they did not respond to treatment, patients were referred to our unit for renal replacement therapy, which included hemodialysis and veno-venous hemofiltration. The choice to use a particular

method depended on the patient's condition, hemodynamics, nutrition, and metabolism. All patients were in the FAILURE stage of the rifle criteria. A fresh urine specimen was collected through an indwelling catheter and then sent for gel electrophoresis as recommended by the manufacturer of the instrument used for analysis. Two scales were used to analyze proteinuria, using the tubular and glomerular scale. One trained laboratory scientist analyzed the samples with a visual scale score which was 0,0.5,1,2,3 and 4, respectively. Where applicable, the dilution factor was properly applied. Tubular damage, and hence the use of tubular scoring, was determined by the presence of low molecular weight bands above albumin, and higher molecular weight bands below albumin were used to determine glomerular damage and thus to evaluate the glomerular score. This study had no effect on the intervention. Patient survival was defined as the patient's survival time at discharge, and renal recovery was defined as recovery of renal function to baseline after discharge from hospital. Failure to regenerate the kidneys is defined as declining renal function with an estimated glomerular filtration rate of less than 15 ml per minute. Statistical analysis was performed using SPSS version 20, means and standard deviations are used for descriptive data, while categorical data was analyzed as frequency and percentages, student t-test and Pearson chi-square test were used to compare the data.

**RESULTS:**

A total of n = 40 patients with a mean age of 58.6 +/- 27 years and a male to female ratio of 24:16 with acute renal failure or acute chronic renal failure of 22:18 enrolled in the study, the mortality of patients was 15, respectively (37.5%), the non-survivor population was critically ill at referral with an APACHE II score of 29 +/- 5, they also had lower baseline creatinine and a higher tubular-to-glomerular ratio, which indicates acute tubular necrosis, see table 1.

**Table 1: Summary of demographic data in different groups of patients.**

| Variables                            | Survivor                | Non survivor                | P value         |
|--------------------------------------|-------------------------|-----------------------------|-----------------|
| Number                               | 25 (62.5%)              | 15 (37.5%)                  |                 |
| Age in years                         | 64 +/- 15               | 64 +/- 10                   | Not Significant |
| APACHE II Score                      | 20 +/- 4                | 29 +/- 5                    | <0.001          |
| Creatinine (baseline) in umol/L      | 335 +/- 300             | 120 +/- 48                  | <0.02           |
| Creatinine (Intradialytic) in umol/L | 403 +/- 208             | 354 +/- 127                 | Not Significant |
| Dipstick score                       | 1.4 +/- 0.8             | 1.3 +/- 0.9                 | Not Significant |
| Glomerular score                     | 2.3 +/- 2               | 1.5 +/- 1                   | Not Significant |
| Tubular score                        | 1.4 +/- 1.3             | 1.5 +/- 1.1                 | Not Significant |
| Tub/Glom ration                      | 75 +/- 36               | 114 +/- 59                  | <0.05           |
| Tub + Glom total score               | 3.8 +/- 2.5             | 3.1 +/- 1.8                 | Not Significant |
|                                      | <b>Renal Recoveries</b> | <b>Renal Non Recoveries</b> |                 |
| Number                               | 19 (47.5%)              | 7 (17.5%)                   |                 |
| Age in years                         | 60 +/- 7                | 65 +/- 9                    | Not Significant |
| APACHE II Score                      | 19 +/- 4                | 21 +/- 6                    | Not Significant |
| Creatinine (baseline) in umol/L      | 125 +/- 18              | 414 +/- 327                 | <0.01           |
| Creatinine (Intradialytic) in umol/L | 331 +/- 89              | 429 +/- 237                 | Not Significant |
| Dipstick score                       | 0.5 +/- 0.0             | 1.8 +/- 0.9                 | <0.001          |
| Glomerular score                     | 0.6 +/- 0.1             | 3.0 +/- 1.9                 | <0.002          |
| Tubular score                        | 0.6 +/- 0.2             | 1.7 +/- 1.0                 | <0.02           |
| Tub/Glom ration                      | 100 +/- 0.5             | 65 +/- 40                   | <0.01           |
| Tub + Glom total score               | 1.2 +/- 0.5             | 4.6 +/- 2.4                 | <0.005          |

Of those who survived, 25 (62.5%) in total, 7 (17.5%) patients were not recovered and 19 (47.5%) were those who recovered and Normal kidney function. Those who did not recover had end-stage renal disease. Both in the groups of people who recovered and those who did not have low APACHE II scores at the time of presentation, those who did not heal, also those who did not recover, had higher baseline creatinine values of 414 +/- 327 compared with 125 +/- 18 for those who recovered. The group that showed no signs of recovery also had higher tubular / glomerular scores and higher total tubular and glomerular protein total scores, reflecting severe and irreversible damage to the glomeruli. See Table 1. There were 8 patients who required dialysis less than two days, while 10 patients required dialysis for more than 2 days before returning to normal renal function.

**Table 2: Duration of dialysis and comparison of various variables. Excluding patients who underwent end stage renal disease or those who died.**

| Variables                       | Dialysis for less than 2 days | Dialysis for more than 2 days | P value         |
|---------------------------------|-------------------------------|-------------------------------|-----------------|
| Number                          | 8                             | 10                            |                 |
| Days dialyzed                   | 1.5 +/- 0.4                   | 10 +/- 9                      | <0.05           |
| Apache II score                 | 19 +/- 4                      | 22 +/- 6                      | Not Significant |
| Creatinine (baseline) in umol/L | 159 +/- 80                    | 163 +/- 74                    | Not Significant |
| Gender M:F                      | 5:1                           | 4:4                           | Not Significant |
| Age in years                    | 64 +/- 9                      | 64 +/- 10                     | Not Significant |
| Dipstick                        | 0.8 +/- 0.5                   | 1.7 +/- 1.1                   | 0.059           |
| Tubular score                   | 0.7 +/- 0.2                   | 2.0 +/- 1.2                   | <0.02           |
| Glomerular score                | 1.0 +/- 1.0                   | 3.1 +/- 2.1                   | 0.059           |
| Tub/Glom ratio                  | 89 +/- 26                     | 73 +/- 44                     | Not Significant |
| Tub + Glom Total score          | 1.7 +/- 1.1                   | 5.0 +/- 2.9                   | <0.02           |

The group that required more days of dialysis also had higher tubular and glomerular scores, suggesting more damage.

**DISCUSSION:**

Scientists have developed a number of markers to evaluate kidney function, including NGAL, KIM-1 and Cystatin-C. However, these markers are not widely available, hence the need for a more manageable and manageable method of assessing renal function in the treatment of acute renal failure<sup>9-10</sup>. Many nephrologists use serum creatinine levels as the gold standard, which also hampers the use of these new biomarkers<sup>11-12</sup>. Combined assessment with biomarkers and urine protein levels showed higher accuracy. Acute tubular necrosis is characterized by the secretion of protein in the urine and enzymes, the most sensitive sites of the nephron are the proximal tubules and the thick ascending limb of the hen loop, these sites are most susceptible to ischemic damage due to low blood supply and high energy requirements. The routine stripe method is not effective in detecting tubular proteinuria, and gel electrophoresis is one method that detects, is inexpensive and reliable<sup>13-14</sup>. Tubular proteinuria consists of low molecular weight proteins such as microglobulin beta 2, KIM-1, cystatin C, NGAL and microglobulin alpha 1, which are filtered by the renal glomeruli and are normally reabsorbed by proximal tubular cells. cells cause pathological secretion of these proteins into the urine. This proteinuria can also help determine which patients required renal replacement therapy, according to our study, those who required longer dialysis times had elevated levels of tubular proteinuria. Tubular proteinuria often precedes glomerular proteinuria as evidenced by this study. Tubular proteinuria is a more reliable test than glomerular proteinuria in predicting the duration of renal replacement therapy required by patients with acute renal failure. Tubular proteinuria is also associated with increased mortality due to the fact that severely ill patients have ruptured acute tubular necrosis<sup>15</sup>. In our study, we found lower baseline creatinine levels in those patients who did not survive, indicating a pre-existing health predisposition, and were unable to survive due to multiple organ failure. Increased mortality has always been associated with medium and high molecular weight proteins in the urine, such as albumin, but has not been reported to predict acute renal failure. In our study, we found that those who did not regain kidney function had higher baseline creatinine levels as well as higher rates of glomerular proteinuria, which is associated with a low incidence of renal dysfunction, also found in a study by Matthew et al who also demonstrated glomerular proteinuria. as an indicator of severe kidney damage.

**CONCLUSION:**

Our research shows that gel electrophoresis analysis for proteinuria is a cost-effective and reliable method of determining tubular or

glomerular proteinuria in patients with acute renal failure requiring renal replacement therapy in the intensive care unit. The presence of tubular proteinuria correlates with the duration of dialysis treatment and mortality, and the presence of glomerular proteinuria indicates glomerular damage and its severity.

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