



Original Research Article

A comparative study of pre and post dialysis biochemical parameters in chronic renal failure patients

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ABSTRACT

Chronic renal failure is a disease characterised by progressive loss of function of kidney over a period of months and years, and it may lead to one of its recognised complications such as anaemia, cardiovascular diseases and end stage renal disease. Hemodialysis is a method that is used to achieve the extracorporeal removal of waste products such as creatinine, urea, free water from blood by an artificial kidney machine, when the kidneys are in a state of renal failure. The aim of this study was to evaluate and compare serum urea, creatinine, sodium, potassium chloride levels in chronic renal failure patients before and after dialysis. The levels of serum urea, creatinine, were found significantly lower in patients after receiving hemodialysis, while electrolytes came to normal. This study confirms the role of dialysis in prognosis of patients of chronic renal failure.

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1. Introduction

Chronic renal disease (CRD) is a pathophysiologic process with multiple etiologies, resulting in irreversible loss of nephron number and function and frequently leading to end stage renal disease (ESRD).¹

In turn ESRD represents a clinical state or condition in which there is irreversible loss of endogenous renal function of a degree sufficient to render patient permanently dependent upon renal replacement therapy. (Dialysis or transplantation) in order to avoid life threatening uraemia.

Uremia is the clinical and laboratory syndrome, reflecting dysfunction of all organ systems as a result of untreated or undertreated chronic renal failure.

By the time plasma creatinine concentration is even mildly elevated, substantial chronic nephron injury has already occurred.

The uremic syndrome pathophysiology can be divided into two sets of abnormalities:

1. Those consequent to the accumulation of products of protein metabolism.

2. Those consequent to the loss of other renal functions such as fluid and electrolyte homeostasis and hormonal abnormalities.²

As the kidneys play a central role in regulation of body fluids, electrolytes and acid base balance.

CKD and ESRD result in multiple derangements including hyperkalemia, metabolic acidosis and hyperphosphatemia.³

Which in turn leads to serious complications like muscle wasting, bone mineral disorders, vascular calcifications and mortality.

Unlike acute renal failure, which happens quickly and suddenly, chronic renal failure happens gradually - over a period of weeks, months, or years as the kidneys slowly stop working, leading to end-stage renal disease (ESRD).⁴

With the widespread availability of dialysis, the lives of hundreds of thousands of patients with end stage renal disease have been prolonged.

Commonly accepted criteria for placing patients on dialysis include the presence of uremia, hyperkalemia unresponsive to conservative measures, acidosis refractory to medical treatment, creatinine clearance of 10 ml/min/1.73

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The procedure of haemodialysis is performed two to three times in a week and the time of dialysis is from two to four hours.

The time of dialysis depends on various factors, including kidney function, amount of waste in body, level of salts and body weight.

Hemodialysis plays a vital role in the process of extracorporeal removal of waste products –creatinine, urea, free water from blood, when kidneys are impaired.

The principle behind hemodialysis is diffusion of solutes through a semipermeable membrane.

Movement of metabolic waste products takes place down a concentration gradient from the circulation into the dialysate. A small molecule such as urea, (60 Da) undergoes substantial clearance, whereas a larger molecule such as creatinine (113Da) is cleared less efficiently.⁶

One of the fundamental goals of the hemodialysis prescription is to maintain serum potassium levels within a narrow normal range. Hence; we evaluated the pre-dialysis and post-dialysis mean values of serum renal biochemical markers in CRF patients undergoing dialysis to elucidate the effect of dialysis on CRF patients.

The analytical part of this study included samples of 25 patients with chronic renal failure before and after hemodialysis for urea, creatinine and electrolytes.

2. Materials and Methods

The present study was conducted in renal failure patients who were on dialysis in the age group of 18 to 65 years consisting of males and females

For pre and post dialysis analysis of CKD, blood of 25 patients was collected from dialysis centre of SKNMC & GH, Pune. Blood was obtained from each patient before and after dialysis.

All the estimations were done on VITROS 5600 system which uses microslide technology. Assessment of the results were done with SPSS software. Chi square test and one way ANOVA were used for the assessment of level of significance.

A total of 25 patients were analysed. These patients were randomly selected and their serum urea level, serum creatinine level, serum sodium, potassium, chloride were estimated pre and post hemodialysis.

Renal failure is a gradual, progressive and irreversible loss of normal kidney functioning.

A total of 25 patients who were diagnosed for renal failure at SKNMC, Pune were included in this study.

Creatinine is a resultant of muscle metabolism and its elevated level indicate kidney disease.

Hemodialysis portrayed an effective impact on serum creatinine levels which reduced to near normal levels.

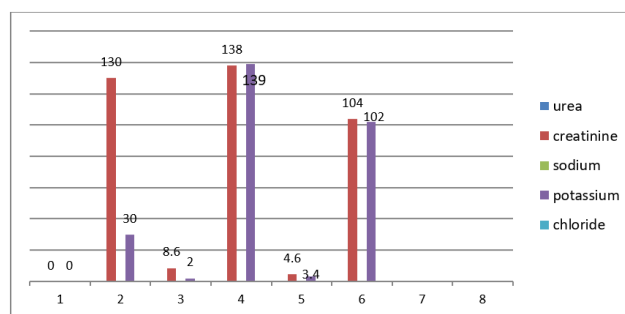


Fig. 1: Pre and post dialysis biochemical parameters

3. Discussion

One of the progressive diseases causing irreversible fall in the glomerular filtration rate further resulting in elevation in values of serum creatinine and blood urea nitrogen values is the chronic renal failure.⁴

Hypertension, diabetes mellitus, autoimmune cause etc forms the most common cause of chronic renal failure. Since it is irreversible in nature and progresses to further severe form with time, with a decline of glomerular filtration rate to 5 to 10 percent with high levels of uremia.⁵

These biochemical changes of the blood reflect the sign and symptoms of the disease.

Chronic dialysis reduces the incidence and severity of these disturbances, so that overt manifestations of uremia get disappeared.

In this study we investigated if serum electrolyte profile (sodium, potassium, chloride) are different pre and post dialysis.

Serum potassium: Serum potassium values in pre-dialysis group were lower in comparison with the post-dialysis group (P-value 0.00005 highly significant).

Serum sodium: Serum sodium levels in post-haemodialysis patients were lower in comparison with the pre hemodialysis.

(P Value: 0.573 Not significant).

Serum chloride levels in pre and post hemodialysis: in pre dialysis group serum chloride was higher than post dialysis group. (P value : 0.2 Highly significant).

A study by Nauman Tarif et al. observed that mean serum sodium in post HD patients were higher compared to pre HD patients.⁷

4. Conclusion

A firm relationship is observed between serum creatinine and serum urea levels among renal failure patients. Hemodialysis forms an effective process as an efficient and indispensable process for the filtration of undesired metabolites such as creatinine and urea and electrolytes at a considerable range, hence decreasing burden over kidneys.

Table 1: Pre and post dialysis biochemical parameters

Parameter	Pre- dialysis group	Post –dialysis group	P value	T value
1] urea	130.45±56 mg/dl	30.81±25.4 mg/dl	< 0.00001 Highly significant	8.029
2] creatinine	8.65±2.6 mg/dl	2.06 ±1.31 mg/dl	< 0.00001 Highly significant	8.64
3] sodium	138.06±7.5	139.13.7	0.573 Not significant	0.57
4] potassium	4.6±0.83	3.4±0.64	0.00005 Highly significant	5.59
5] chloride	104.81±10.82	102±8.88	0.2 Highly significant	

Serum sodium and serum chloride does not have significant post dialysis change, but serum potassium, serum creatinine and blood urea having significant post dialysis change.

5. Source of Funding

None.

6. Conflict of Interest

None.

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