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A Study Of Calcium, Vitamin-D And Phosphorus In Chronic Kidney Disease On Dialysis.

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ABSTRACT

One of the slowly progressive diseases of kidney functions is chronic renal failure (CRF) which is characterized by low glomerular filtration rates (GFR). Special replacement therapy of the renal system is required for its treatment. One such line of treatment is dialysis which involves the removal of excessive toxic fluids and metabolic end products from the body. Hence; we evaluated the pre-dialysis and post-dialysis mean values of a Few biochemical markers in CRF patients undergoing dialysis to elucidate the effect of dialysis on CRF patients. This cross-sectional study was done on 50 CRF patients who are undergoing hemodialysis at Government Thiruvavur Medical College, Thiruvavur in the year 2023. After taking written informed consent from subjects enrolled in the study, 5 ml of blood will be collected. The test will be analyzed by a full autoanalyzer. The Statistical analysis was performed by Paired t-test. The Mean Serum phosphorus showed a statistically significant decrease in Pre-HD patients (4.057 ± 12) mg/dl when compared to that of the Post HD (4.02 ± 0.791) mg/dl. which is statically significant (P-value < 0.05) Mean Serum Calcium showed a statistically significant decrease in Pre-HD patients (6.98 ± 3.14) mg/dl when compared to that of the Post HD (7.97 ± 2.60) mg/dl. which is statically significant (P-value < 0.05) The Mean vitamin -D showed a statistically significant decrease in Pre-HD patients (2.21 ± 2.58) ug/dl when compared to that of the Post HD (26.55 ± 0.21) ug/dl. which is statically significant (P-value < 0.05) The new methodology or sophisticated membrane to be invented for hemodialysis and further, it will develop for removing ROS without disturbing any antioxidants; it will help improve the life of CRF patients. It has been reported that the passage of blood through dialyzers leads to a decrease in vitamin D levels. Also, The abrupt change in hemodynamic and metabolic balance caused by dialysis may add to the development of Oxidative stress.

Keywords: calcium, Vitamin-D, phosphorous, CKD, dialysis.

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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). 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 the patient permanently dependent upon renal replacement therapy. (Dialysis or transplantation) to avoid life-threatening uremia [1]. Uremia is a clinical and laboratory syndrome, reflecting the 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 [2]. The physiologic function of the kidney involves the removal of waste products and fluids from the bloodstream and disposing of them through the urine route. In patients who have suddenly lost their renal function or who have reached end-stage renal stage, one line of treatment involves dialysis which involves the removal of excessive toxic fluids and metabolism’s end products from the body [3]. Severe illness is characterized by CRF and special replacement therapy of the renal system such as dialysis is required for its treatment. The incidence rate of CRF is 1 in every 5000 and affects mostly middle-aged and older people. Mostly irreversible, it might eventually lead to total kidney failure [4,5].

METHODS

This cross-sectional study was done on 50 CRF patients who are undergoing hemodialysis at Government Thiruvapur Medical College, Thiruvapur in the year 2023. After taking written informed consent from subjects enrolled in the study, 5 ml of blood will be collected. The test will be analyzed by a full autoanalyzer. Serum calcium is estimated by the Colorimetric method Arsenazo III. At a neutral pH, the Ca²⁺ form with Arsenazo III a complex, the color intensity of which is directly proportional to the concentration of calcium in the sample. Serum phosphorus is estimated by Molybdate U.V Phosphate ions in an acidic medium react with ammonium molybdate to form a phosphomolybdate complex. This complex has an absorbance in the ultraviolet range and is measured at 340 nm. The intensity of the complex formed is directly proportional to the amount of inorganic phosphorus present in the sample. Vitamin -d is estimated by Diasorin (formerly Incstar) 25-OH-D assay. Hemolysis is avoided, and blood is allowed to clot. The serum after separation was centrifuged and transferred into sterile, clean, and dry polypropylene tubes. The tubes were labeled and stored in the refrigerator at - 20 degrees centigrade. The Statistical analysis would be performed by Paired t-test, Analysis of variance (ANOVA), Linear regression analysis, and Bland Altman plot.

Table 1: Age Group Distribution

AGE_GROUP	FREQUENCY	PERCENT
<30 Years	4	7.0
31- 40 Years	11	22.0
41-50 years	12	23.0
51-60 Years	12	25.0
Above 60 Years	11	23.0
Total	50	100.0

Table 2: Serum Phosphorus Level

Serum Phosphorus Level Changes In Pre-And Post-Hemodialysis					95 % Confidence interval		
	Mean	N	Std. Deviation	Std. Error Mean	Lower	Upper	p-value
Phosphorus Pre HD	4.057	100	1.219	0.122	3.818	4.295	p>0.05
Phosphorus Post HD	4.020	100	0.791	0.079	3.865	4.175	

Graph 1: Phosphorus Level In Pre & Post Hemodialysis

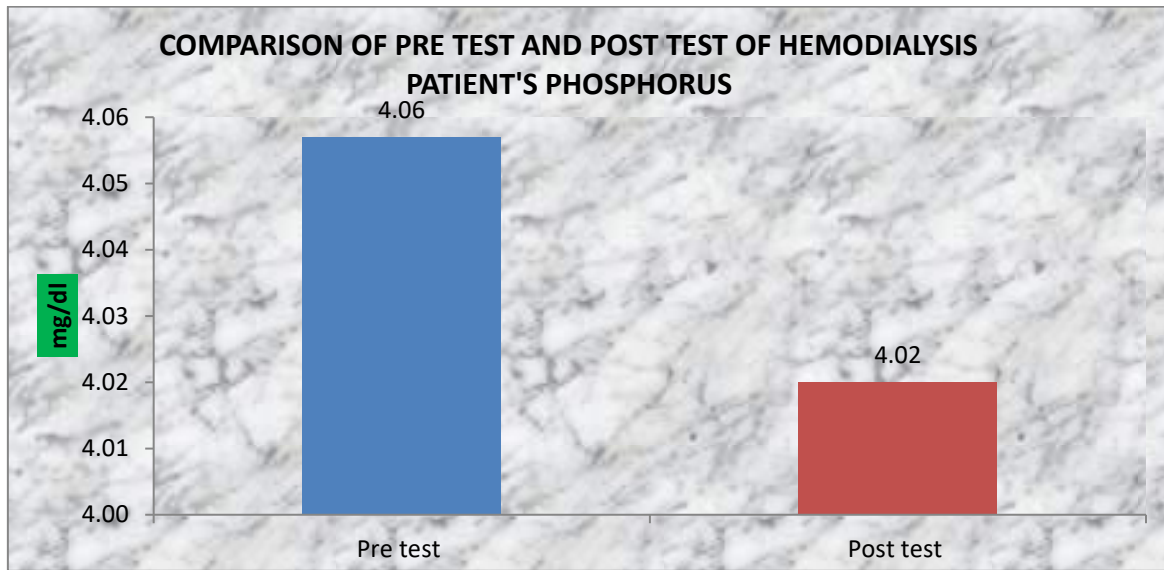
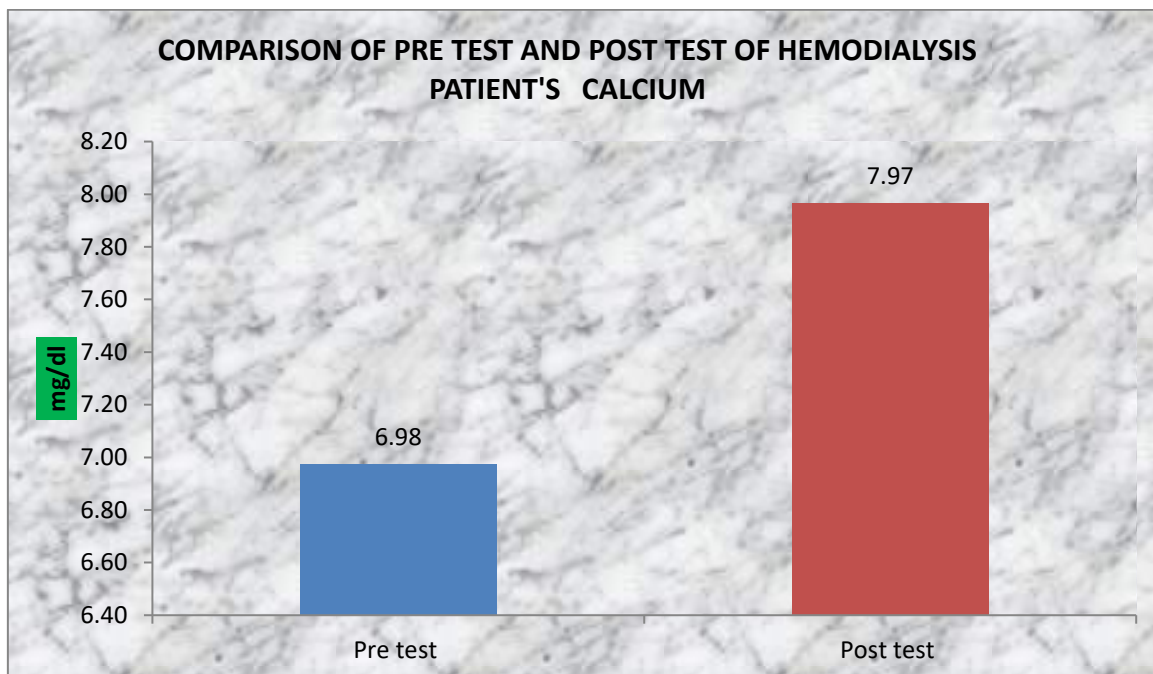


TABLE 3: SERUM CALCIUM LEVEL

Serum Calcium Level Changes In Pre-And Post Hemodialysis					95 % Confidence interval		
	Mean	N	Std. Deviation	Std. Error Mean	Lower	Upper	p-value
Calcium Pre HD	6.975	100	3.143	0.314	6.5360	7.7594	P<0.05
Calcium Post HD	7.966	100	2.602	0.263	7.070	8.102	

Graph 2: Calcium Level In Pre & Post Hemodialysis

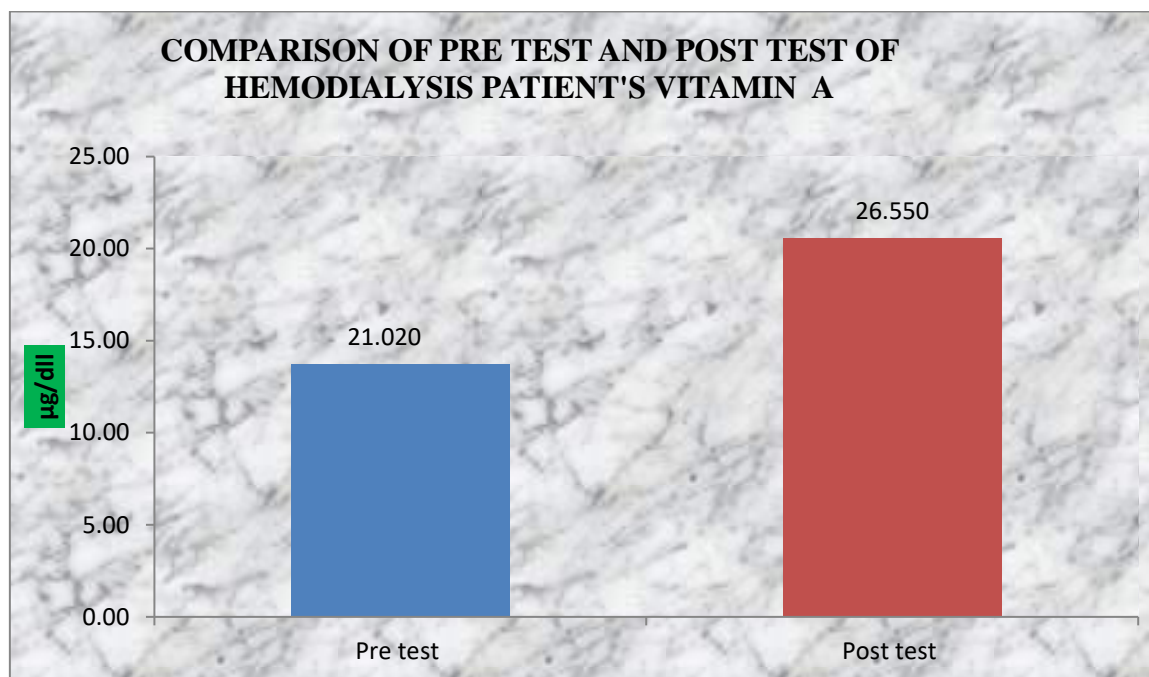


Significance fixed at * p<0.05, Highly significant at **p<0.001

Table 4: Vitamin -D

Vitamin- D Level Changes In Pre And Post-Hemodialysis					95 % Confidence interval		
	Mean	N	Std. Deviation	Std. Error Mean	Lower	Upper	p-value
Vitamin D Pre-HD	21.020	100	2.185	0.219	26.122	26.978	P<0.05
Vitamin D Post HD	26.550	100	2.586	0.259	20.513	21.527	

Graph 3: Vitamin -D Level In Pre and Post Hemodialysis



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 chronic renal failure. Hypertension, diabetes mellitus, autoimmune cause, etc forms the most common cause of chronic renal failure. Since it is irreversible 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. [6] These biochemical changes in the blood reflect the signs and symptoms of the disease. By measuring the serum level of the compounds excreted by the kidneys, assessment of the renal excretory functions can be done and therefore serum levels of electrolytes in the body fluids such as sodium, potassium, etc can also be used as a diagnostic tool in the assessment of renal diseases [7]. Chronic dialysis reduces the incidence and severity of these disturbances so that overt manifestations of uremia disappear. In this study, we investigated if serum electrolyte profiles (sodium, potassium, chloride) are different pre and post-dialysis [8]. The Differences between the mean serum calcium level in renal failure patients before HD sessions and after HD Sessions were calculated as shown in the above graph (n=50). Mean Serum Calcium showed a statistically significant decrease in Pre-HD patients (6.98±3.14). mg/dl when compared to that of the Post HD (7.97± 2.60) mg/dl. which is statically significant (P-value < 0.05) [9]. The Differences between the mean serum phosphorous level in renal failure patients before HD sessions and after HD Sessions were calculated as shown in the above graph (n=50). The Mean Serum phosphorus showed a statistically significant decrease in Pre-HD patients (4.057± 12)mg/dl when compared to that of the Post HD (4.02± 0.791) mg/dl. which is statically significant (P-value < 0.05) [10]. The Differences between the mean vitamin - D level in renal failure patients before HD sessions and after HD Sessions were calculated as shown in the above graph (n=50). The Mean vitamin -D showed a statistically significant decrease in Pre-HD patients (21.020) ug/dl when compared to that of the Post HD (26.550) ug/dl. which is statically significant (P-value < 0.05)

Present study concludes that hypovitaminosis D, hypocalcemia and hyperphosphatemia is common in our pre-dialysis CKD patients and serum phosphorus raises more with reduction of GFR [11,12].

CONCLUSION

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 new methodology or sophisticated membrane to be invented for haemodialysis and further, it will develop for removing ROS without disturbing any antioxidants; it will help improve the life of CRF patients. It has been reported that the passage of blood through dialyzers leads to a decrease in vitamin D levels. Also, The abrupt change in hemodynamic and metabolic balance caused by dialysis may add to the development of Oxidative stress. Enhanced production of proinflammatory cytokines by dialysate pyrogens, by complement activation, or both, as well as inhibition of anti-inflammatory cytokine secretion, may contribute to the cell-mediated immunosuppression seen in patients with ESRD.

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