



## Hematological Fluctuations in parathyroid hormone in chronic kidney disease patients undergoing hemodialysis

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### Abstract:

Different causes of significant useful and structural kidney disabilities are also called CRF. The main ones are blood with low calcium level and high phosphorus level. It is responsible for several health problems, including osteoporosis, atherosclerosis as well as nervous system issues. The aim of the present study was to evaluate calcium and phosphor variability in hemodialysis patients with CKD and anticipated health effects. Total number of samples = 100, which includes 100 patients ( clinically and biochemically diagnosed to have renal failure and subjected to dialysis \_) along with the bio- data collection of 50 adult healthy volunteers. Regarding sex distribution, the study of our patient group included 60 males (60%) and 40 females (40%). The study's results showed that the mean of parathyroid hormone concentrations was (376.166pg/ml) in 94% of the sample after dialysis session and it is demonstrated a very significant increase in blood phosphorus levels for CKD patients compared to reference values (>4.5 mg/dL). Approximately 80% of Patients with chronic renal failure have increased phosphorus levels versus 20 percentile fall within normal reference interval. In contrast, 60% of patients present with hypocalcemia (<8.5 mg/dL). It is known that in prior studies a significant association between calcium and phosphor with parathyroid hormones has been shown, there is strong positive correlation of high phosphorus level (hyperphosphatemia) with highly increased activity of PTH in hemodialysis patients, retention of phosphorus and lack of active vitamin D promotes the glands to secrete more hormone causing bone and cardiovascular complications. Dietary and therapeutic control of phosphorus is essential

**Keyword:** Chronic renal failure, parathyroid hormone (PTH), hemodialysis

## Introduction

Introduction Chronic renal failure (CRF) is a persistent progressive disorder defined by functional and structural changes in the kidneys resulting from varying causes. Therefore, an  $\uparrow$  in eGFR represents a worsening of kidney function (Abdel & Shawky., 2023). Such changes can cause a number of health problems like osteoporosis, arteriosclerosis and nervous system disorders.

in renal function lasted for three months and manifested itself with an assessment of GFR declared less than 60 mL/min peristape li1. 73m2", "or a marker of kidney apoptosis (Atif., 2016). Beyond its direct role in global diseases and death, chronic kidney disease raise the risks of at least five other major killers. DM, malaria, human immunodeficiency virus (HIV), hypertensio. it is estimated that per 1,2 million deaths/year approximately 19 million DALYs and around the same number of disability-adjusted life years will be singularly attributable to reduced glomerular filtration rates

. At the same time, renal failure accounted for 1.2 million deaths in 2015, a 32 percent increase since 2005. In 2010 were estimated to be between 2.3 and 7.1 million people with ESRD who died from inadequate access to chronic dialysis (Badiu., 2018) In addition, an estimated 1.7 million people die each year due to the complications of acute renal impairment (Bichari et al., 2020). Approximately five to ten million people are estimated to die each year due to renal disease (Dhillon-Jhattu et al., 2023). End-Stage renal disease (Disease., 2023), and people undergoing renal hemodialysis have the complication of protein-energy wasting.

The present study was conducted to assess the changes in calcium and phosphor levels among patients with CKD during hemodialysis and health consequences of those changes.

## Materials and Methods

Research methodology and participants

Chronic kidney disease is related to many diseases that have similar clinical pictures; therefore, infectious diseases (such as syndrome double immune infected by sepsis-which is a condition in critical). Both males and females included in the study were aged between 20 – 63 years. They were houses in the city of Al-Kut (Wasit province, Iraq) during July to November (2024). Also selected was a control group of 50 healthy subjects

Laboratory investigation: Ionized calcium (reference range: 1.11–1.40 mmol/l) and serum phosphorus (reference range: 2.3–4.5 mg/dl), were determined by automated methods [10]. Serum iPTH (normal range: 10–65 pg/ml) was determined by chemiluminescence assay (DPC; Medlab, San Antonio, TX, USA).

### *Statistical analysis*

GraphPad Prism Software was served to identify significant differences between the findings of study groups at  $p < 0.05$  throughout the one-way ANOVA and 95% confidence interval (95% CI).

## Results and Discussion

The total number of study population is 100. Regarding the gender distribution, the group of patients included 60 males (60%) and 40 females (40%), distributed as shown in the figure in figure (1)

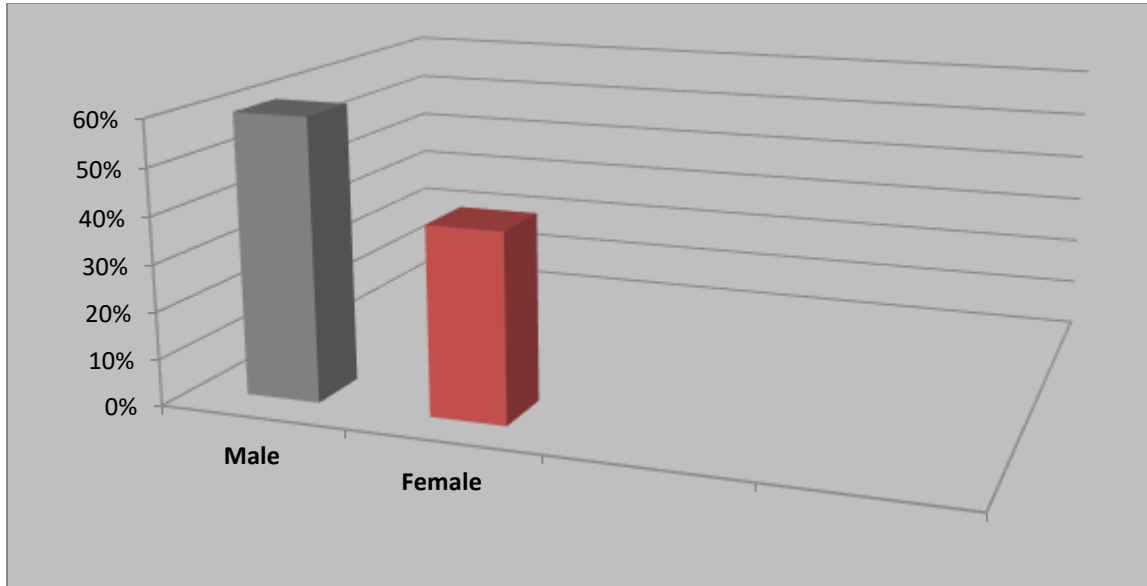


Figure : Sex distribution of the study groups.

Furthermore, the distribution of patients included in the study according to disease severity .

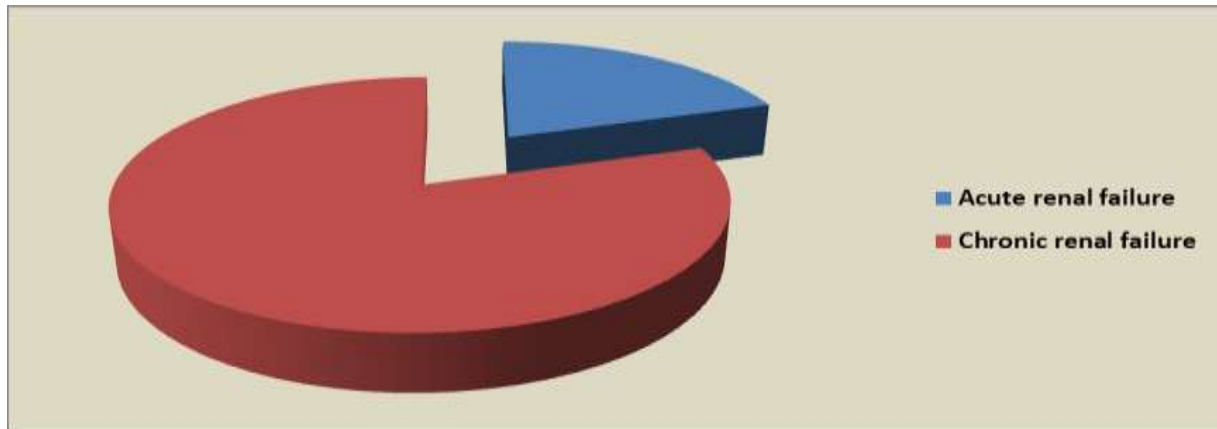


Figure 2 : Distribution according to the disease severity.

Subsequently, the findings were recorded a significant elevation in PTH hormones (376.166pg/ml ) after the dialysis session in approximately 94% of the studied group in comparison with those as explained in figure (3).

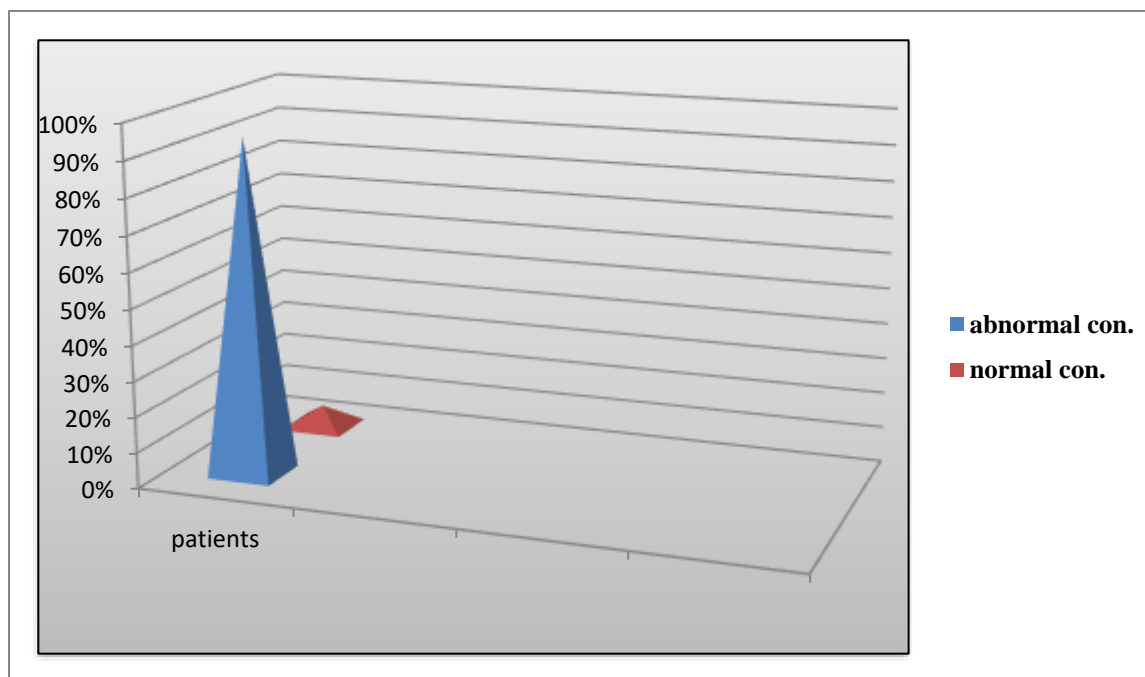


Figure 3: levels of Parathyroid hormone among the groups of study population.

This result was in accordance with several of earlier studies (Ephraim & Jewel., 2021; Jacquillet & Unwin., 2019). Low serum Ca levels, increased serum phosphorus levels or decreased serum vitamin D levels stimulate an increase in PTH secretion. High calcium moreover, calcitriol in the blood inhibits synthesis of PTH. This results in a fall in serum calcium level that stimulates the secretion of PTH and causes secondary hyperparathyroidism. One of the contributing factors towards decreased responsiveness in target organs for PTH is downregulation (Mohamed et al., 2023).

In addition, a rise in levels of blood phosphorus values the CKD patients was shown significantly ( $p < 0.0096$ , 95% CI: 53.25 to 176.5  $\mu\text{g/ml}$ ). According to ( figure ) 80% of patients with chronic renal failure have hyperphosphatemia and 20 % of them in normal reference interval.

(4)

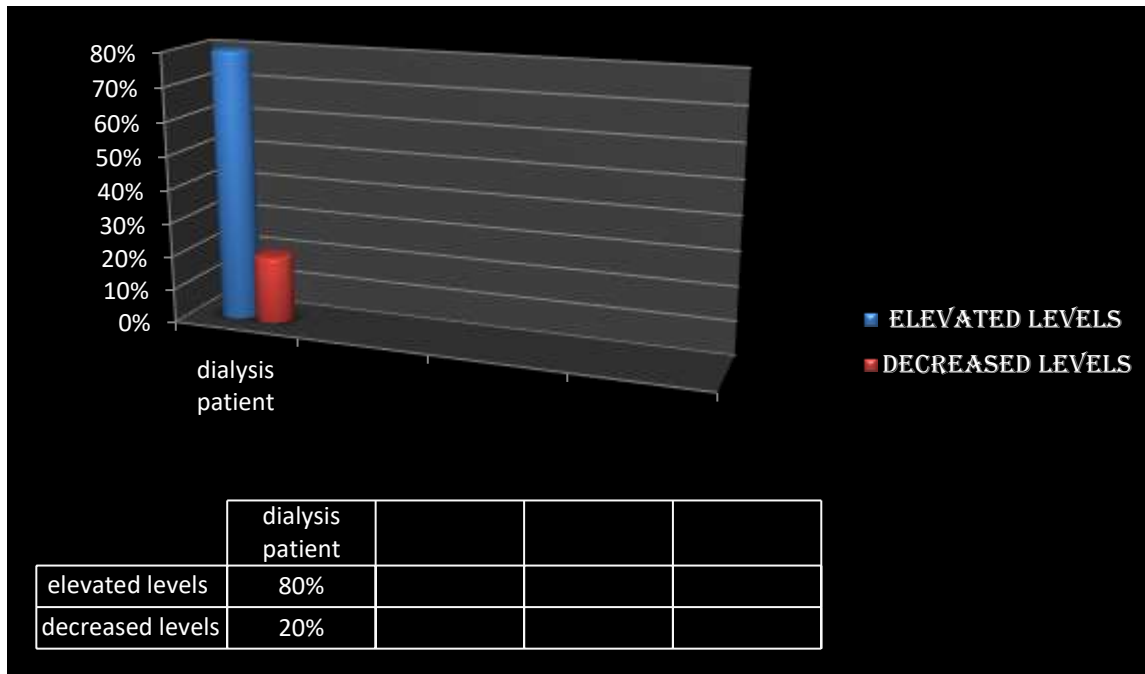
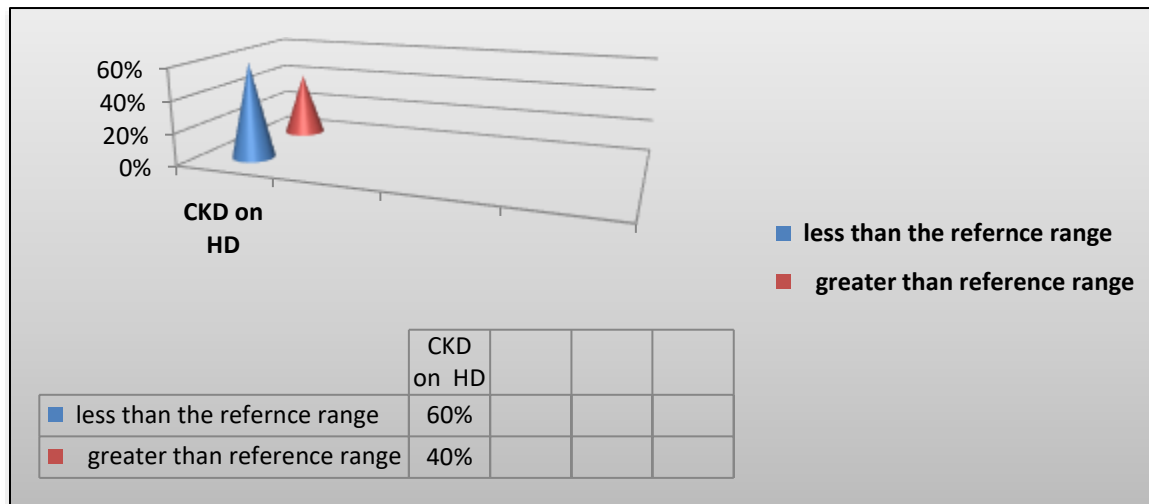


Figure 4: Percentages of the phosphorus among CKD patients on dialysis.

This agreed with the study of (Raikou., 2021) He mentioned many valid causes for chronic hyperphosphatemia in patients undergoing dialysis, such as the elimination of phosphate during a single session of hemodialysis only reaching between 800 -1000 mg. Consequently, phosphorus (1,000 mg/d) which is the mandatory daily requirement for dialysis patients cannot be cleared effectively by undergoing thrice weekly of dialysis. In contrast, 60% of patients had hypocalcemia (<8.5 mg/dL). As detailed in the figure 5.



Figure(5): Percentages of the phosphorus among CKD patients on dialysis.

These results were similar to those (Wan et al., 2019) for patients with renal failure is also lower and they entitled this to the increase of serum Pi resulting from a negative correlation between serum Ca and Pi concentrations, in which an increase in one upon causes decrease to another (Yamada & Nakano., 2023). Impaired vitamin D production is another mechanism of bone damage as the kidney fails to produce its active form (1,25-dihydroxycholecalciferol). (Yu et al., 2021).

## Conclusion

This study shows the importance of calcium and phosphorus in PTH, there is a direct correlation between high serum phosphorus (hyperphosphatemia) levels and increased activity of parathyroid hormone gland (PTH) in patients undergoing hemodialysis since they tend to retain a lot of phosphorus along with Vitamin D deficiency which will stimulate the gland to secrete large amount of hormone that tends to cause bone and cardiovascular complications. Phosphorus is regulated by dietary and therapeutic means .

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