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Research Article

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Unveiling Hyperparathyroidism: Insights from Najaf's Dialysis Patients

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Abstract: The study analysed 110 patients undergoing dialysis and a control group between 2023 and 2024, representing 5% of all patients in Iraq. The data set included participants of both sexes and no age limit. The mean age of the patient cohort was 37.2 ± 3.2 years, while that of the control group was 36.9 ± 2.9 years. The objective of this study was to analyse the demographic data and information of Iraqi patients suffering from hyperparathyroidism among dialysis patients in different hospitals in Iraq. The statistical analysis program IBM SOFT SPSS 22 was employed to ascertain the true values and arithmetic means for all samples and laboratory results for patients. The findings of this study indicate that the patient cohort had a mean age of 37.2 ± 3.2 years, while that of the control group was 36.9 ± 2.9 years. The mean calcium level was 8.87±0.23 mg/dl in the patient group, while in the control group, 7.12±0.33 patients exhibited adequate calcium levels. The mean PO4 mg/dl in the blood of the patient group was 10.2±0.345 mg/dl, with a maximum. There were significant but non-significant differences in dialysis type and serum calcium. Statistically significant differences in compliance with target recommendations were found in the patient group, in addition to the occurrence of hypophosphatemia.

Keywords: Hyperparathyroidism, Dialysis, CA, PO4, Parathyroid hormone (PTH), Hyperphosphatemia.

INTRODUCTION

It is a disorder where the parathyroid glands overproduce, leading to elevated blood levels of parathyroid hormone (PTH). This results in hypercalcemia, a condition when the blood contains higher amounts of calcium.

Hyperparathyroidism has a direct impact on the population of people with renal failure, in addition to being a secondary disorder that may arise as chronic kidney disease (CKD) worsens. Certain aspects of hyperparathyroidism, like cardiovascular calcifications or hyperphosphatemia, are even linked to mortality. [Walker, M. D. *et al*., 2017 - Grey, A. *et al*., 2005] The aetiology of chronic kidney disease (CKD), the age of dialysis or kidney transplant patients, and—most importantly—the variety of treatment choices that have emerged throughout time for these conditions have all contributed to changes in the pathophysiology of bone and mineral metabolism (BOM) disorders [Sun, B. *et al*., 2018 – Block, G. A. *et al*., 2004].

The evolution of the last four decades shows the predominance of low remodeling forms associated with aluminum overload (in the 1970s and 1980s), mixed forms, and high remodeling due to secondary hyperparathyroidism (in the 1990s) until the last decade from 2000 to the present, where low remodeling with dynamic bone disease predominates, possibly connected to the usage of various treatments for hyperparathyroidism and the rise in the prevalence of diabetes as a cause of CKD. [Battistella, M. *et al*., 2011 - Aucella, F]

The parathyroid glands play a pivotal role in maintaining optimal calcium levels within the body. In order to fulfil this function, the glands produce parathyroid hormone (PTH). In the event of an excess of parathyroid hormones, the surplus is simply retained. Consequently, an excess of calcium is released from the bones, which is not fully excreted by the kidneys. Consequently, the concentration of calcium in the bloodstream is elevated. Concurrently, an elevated quantity of phosphate is excreted in the urine, resulting in a reduction in the serum phosphate concentration. Approximately half of individuals with hyperparathyroidism are unaware of their condition. In other instances, the disease presents with a range of symptoms, some of which are severe, including bone pain, nephrolithiasis, fatigue, anxiety, and depression [www.hcup-us.ahrq.gov, 2015 - Tentori, F. *et al*., 2015].

Hyperparathyroidism (PTH) represents one of the most prevalent complications associated with non-dialysis chronic kidney disease (CKD) stages 3-5. SPTH is typified by augmented synthesis and secretion of PTH, parathyroid gland hyperplasia, and an imbalance in divalent ions (1, 2). This is the result of a number of factors, including hypocalcaemia, phosphate retention, and reduced calcitriol synthesis. In these intricate mechanisms, additional factors are involved in regulating the altered synthesis and secretion of PTH, including aluminium load, diabetes, oestrogens, and catecholamines (3). Furthermore, elevated serum PTH levels are associated with a range of long-term clinical consequences, with the primary target

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being the skeleton. Furthermore, IPTS has been demonstrated to have systemic toxicity effects on the cardiovascular system, which can explain the elevated risk of cardiovascular morbidity and mortality observed in patients with CKD. [National Kidney Foundation]

PATIENTS AND METHODS

Patients, defined as adults aged at least 30 years, were enrolled from a number of different centres in Iraq. These dialysis centres were distributed throughout Iraq. The following data were collected: personal and medical history, comorbidities (Charlson index), blood chemistry tests, and data on treatment and dialysis.

After conducting the study on 110 patients, the study was completed with the following selection criteria: • Inclusion criteria (Patients who were vaccinated with chronic kidney disease during dialysis treatment, Blood analysis period February 2024, Blood biochemistry information: Ca, P, PTH; found in the results of the patient's treatment clinic laboratory, Exclusion criteria, Patients who do not get their full clinical history, Patients who do not accept to be part of the studio, based on informed consent.

Inclusion criteria: adult Iraqi patients with CKD of both sexes and receiving conventional intermittent haemodialysis without any considerations of their disease nor haemodialysis duration. Patients were excluded if they met any of the following criteria: hyperparathyroidism, any existing parathyroid disorders, cancer, skeletal disorders, prior kidney transplant, or a history of having undergone parathyroid surgery.

The diagnosis is made by measuring the levels of calcium, phosphorus, alkaline phosphatase, and parathyroid hormone in the blood. In the event of elevated parathyroid hormone levels, supplementary instrumental tests may be conducted, such as an ultrasound, to assess the location and volume of the parathyroid glands. It is of the utmost importance to consider not only the absolute value of parathyroid hormone levels but also their variation over time. It is to be expected that parathyroid hormone levels will be elevated to a certain degree in patients with renal insufficiency. It is not cause for concern if parathyroid hormone values are below 300 pg/mL. A progressive increase in values necessitates prompt pharmacological intervention, as failure to respond to therapy may necessitate surgical treatment for the removal of the parathyroid glands.

RESULTS

Table 1: Description of the general characteristics of Iraqi patients with hyperparathyroidism

	Patients	**Control**	**P value**
Age			
Mean and sd	37.2±3.2	36.9±2.9	
Sex			
Male	70	30	
Female	40	20	
BMI			
Mean and sd	35.5±3.2	34.4±2.77	
CKD			
Obesity	34	---	0.00
Blood pressure	28	---	
Diabetes	32	---	
Glomerulonephritis	8	---	
Interstitial nephritis	5	---	
Prolonged urinary tract obstruction	3	---	
Education			
Primary	20	5	
Secondary	20	15	0.074
College	60	20	
High	10	10	
Comorbidities			
Arterial hypertension	34	15	0.001
Diabetes	38	15	0.003

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Heart disease	20	11	0.083
Joints	18	9	0.09
Smoking			
Yes	30	7	<0.001
No	80	43	<0.001
Dialysis duration (months)			
Mean sd	40.4±5.9		

Table 2: Distribution of patients with hyperparathyroidism according to the stages of chronic kidney disease

Variable	f	P%
S 1	5	4.5
S 2	20	18.1
S 3A	40	36.3
S 3B	30	27.2
SEVERE	15	13.6

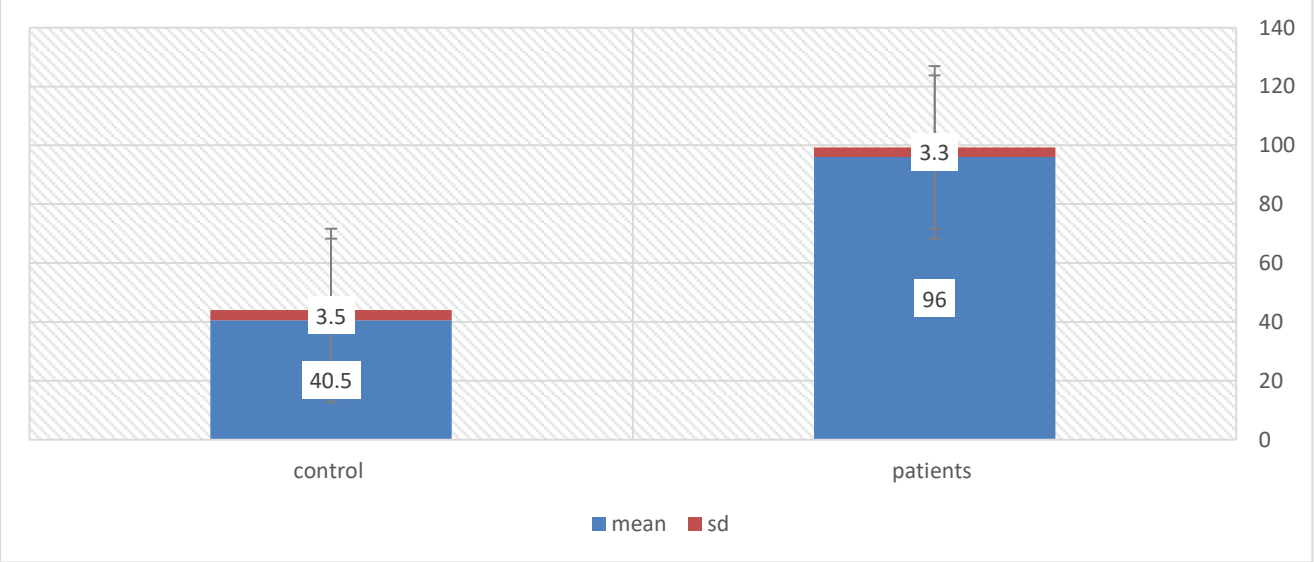

Fig 1: A mean and standard division of groups' patients and control according to GFR

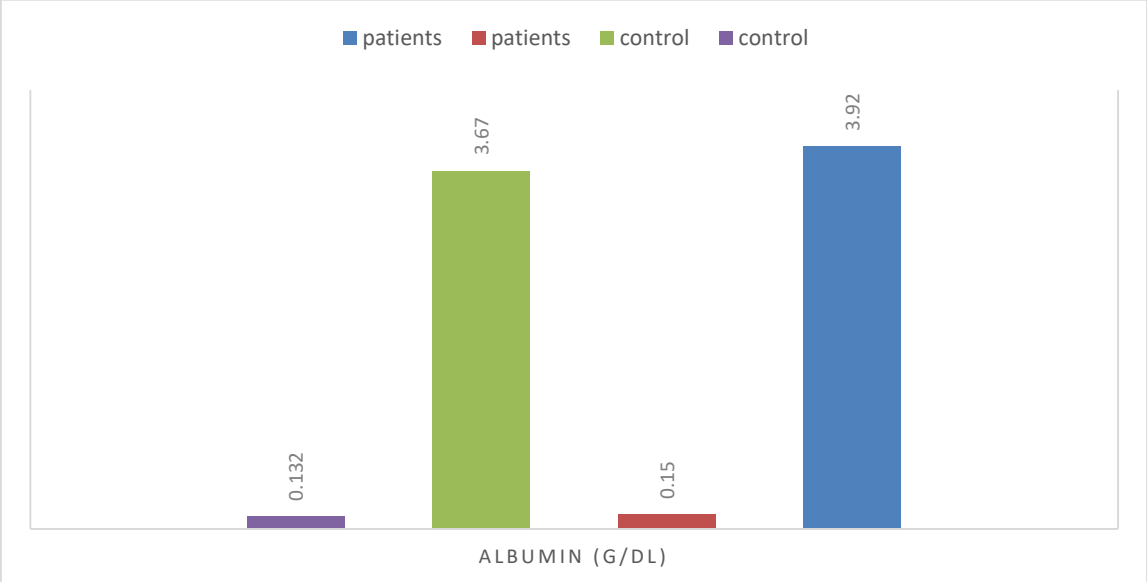

Fig 2: Comparison of differences in parameters between groups according to Albumin (g/dL)

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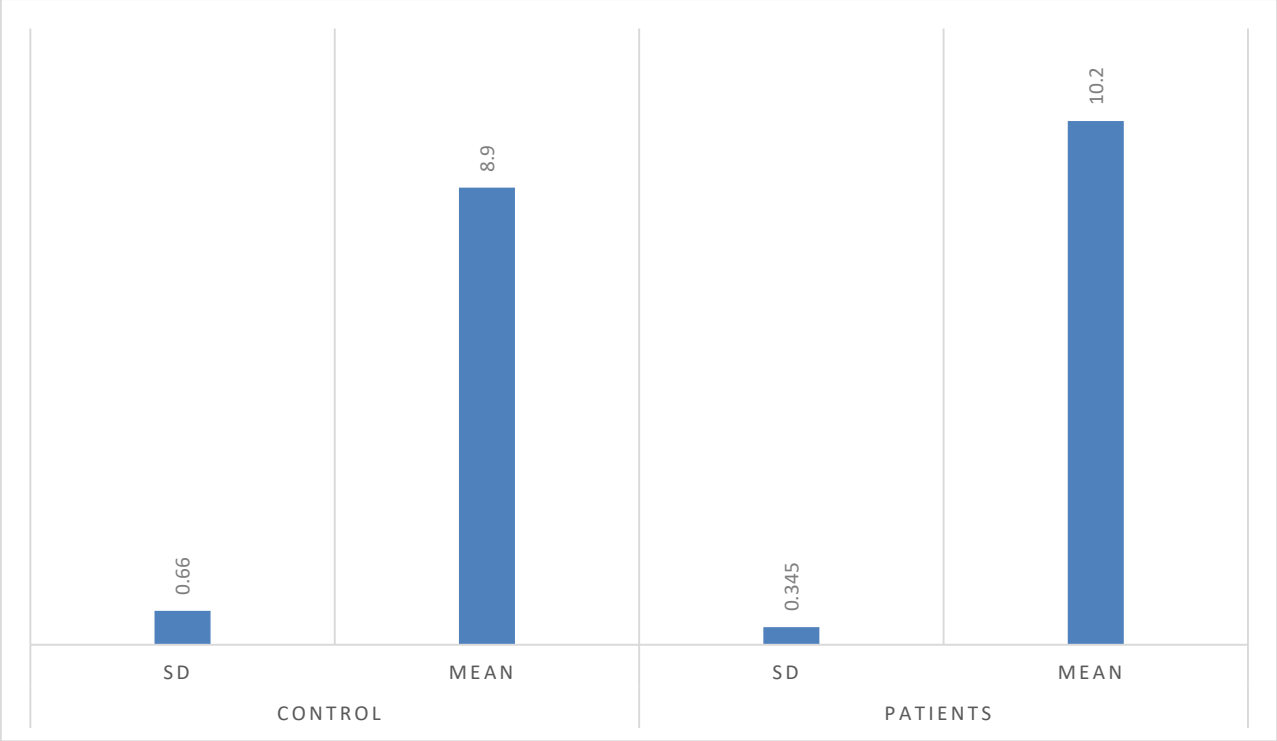

Fig 3: Comparison of differences in parameters between groups according to Creatinine

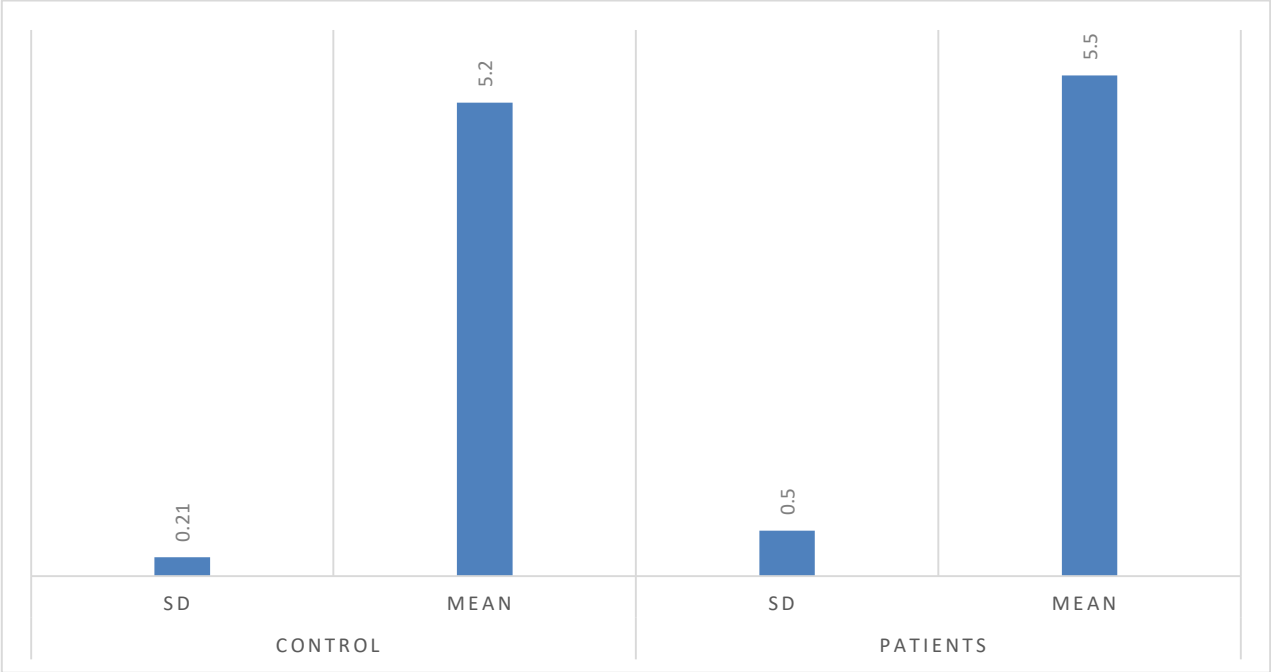

Fig 4: Comparison of differences in parameters between groups according to PO4 mg/dl

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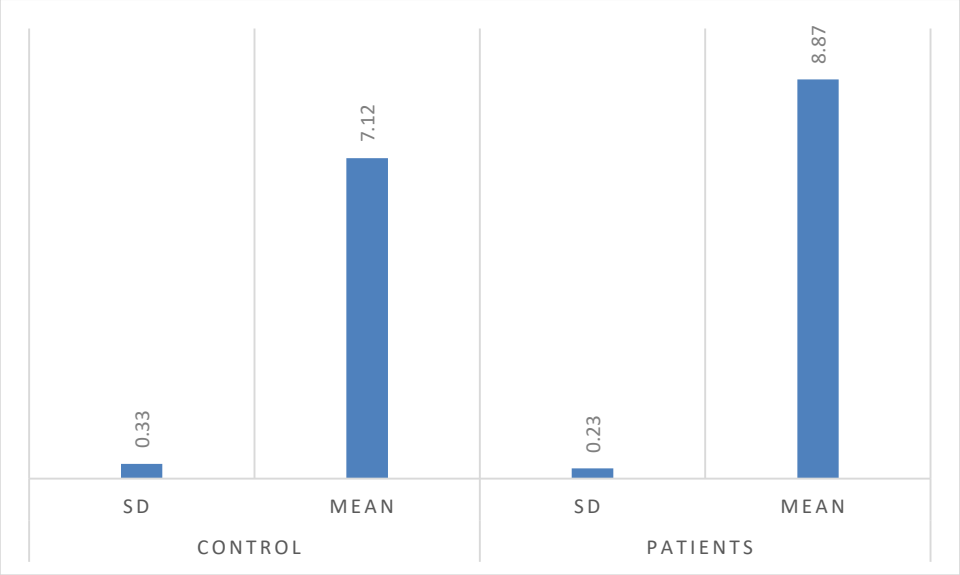

Fig 5: Comparison of differences in parameters between groups according to Calcium

DISCUSSION

The data set comprised 110 dialysis patients and a control group of 50 individuals, collected in 2023. The prevalence of dialysis patients in Iraq has reached a high rate in recent times; therefore, the data presented represent approximately 5% of all patients in the country. The study included patients of both sexes, and no age limit was imposed. Patients who had undergone dialysis for a period of less than three months or who lacked the requisite data were excluded from the study. Table 1 presents patient characteristics as reported by the 25 dialysis centers. The mean age of the patient cohort was 37.2 ± 3.2 years, while that of the control group was 36.9 ± 2.9 years.

The data were subjected to basic statistical analysis. In order to compare two continuous variables with a normal distribution between two different groups of patients, the student's t-test for unpaired data was employed, where two nominal variables were subjected to a comparative analysis.

The mean calcium level was 8.87±0.23 mg/dl in the patient group, while in the control group, 7.12±0.33 patients exhibited adequate calcium levels. The mean PO4 mg/dl in the blood of the patient group was 10.2±0.345 mg/dl with a maximum. This study provides important information about the prevalence of hyperparathyroidism among dialysis patients in different hospitals in Iraq and its management in a large and representative haemodialysis population in Iraq. The data presented in this study indicate that patients with hyperparathyroidism are prevalent in this population, which differs from the findings of other large studies conducted on haemodialysis populations in Iraq, where an opposite effect was observed. The relationship was observed in the proportion of patients with hyperparathyroidism [KDIGO, 2009 - Ureña, P. *et al*., 2009].

The parathyroid glands play a pivotal role in maintaining optimal calcium levels within the body. In order to fulfil this function, the glands produce parathyroid hormone (PTH).

The gradual increase in values necessitates prompt pharmacological intervention, as failure to respond to treatment may necessitate surgical removal of the parathyroid glands.

The existence of hyperparathyroidism plays a pivotal role as far as the mortality rate of dialysis patients is concerned and especially with the levels of PTH. In another study, severe secondary hyperparathyroidism (SHPT) patients at risk of end-stage kidney disease (ESKD) were also associated with an increased risk of mortality. For example, patients having PTH levels above 600 pg/mL present a greater chance of mortality than those with PTH levels of 301-600 pg/mL. Moreover, parathyroid surgery increases survival rates, and therefore the detrimental effects of SHPT are reduced after the spike of the hormone.

We observed no meaningful relationship between the occurrence of hyperparathyroidism and the various etiologies of CKD and comorbid conditions (P>0.05). It was found that calcium supplementation, as well as vitamin D and Cinacalcit therapy, were notably correlated with increased incidence of hyperparathyroidism. Earlier studies reported various interventions and

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drugs for the treatment of mineral metabolism disorders in these patients, and though there exist different pathophysiological explanations on the interaction of calcium, vitamin D, phosphate, and PTH, it is expected that calcium supplementation should lower PTH levels whereas this was not reflected in our findings; this could stem from the lack of clarity on when calcium supplementation was introduced or the time frame over which hyperparathyroidism was diagnosed so the causative vector could not be ascertained which is one of the drawbacks of cross-sectional studies. Additional clarification is that most of our patients were on calcium therapy [Martin, K. J. *et al*., 2014].

CONCLUSION

This investigation has shown a high prevalence of hyperparathyroidism; however, new medications developed for hyperphosphatemia and secondary hyperparathyroidism treatment are not yet in practice in Iraq, and older agents are still in use. The outlines of metabolic bone diseases, when bone mineral homeostasis is disturbed, were too changed recently because of the population studied and the better understanding and recognization of such conditions. The calcium and phosphorous levels of a significant portion of the studied population did not meet the present standards, and correlation was found with age, gender, presence of diabetes, duration of dialysis, serum phosphorous level, and plasma PTH level. It is quite impossible for the normal level of this hormone to be maintained in patients who are on dialysis.

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