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Original Research Article

FREQUENCY OF HYPERPARATHYROIDISM IN ADULT CHRONIC HEMODIALYSIS PATIENTS

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ABSTRACT

Background: *Secondary hyperparathyroidism (SHPT) is a frequent and significant complication in patients undergoing long-term hemodialysis. It arises due to chronic disturbances in mineral metabolism and is associated with adverse outcomes including bone disease and cardiovascular complications.* ***Objective:*** *This study aimed to determine the frequency of secondary hyperparathyroidism among adult patients receiving chronic hemodialysis.* ***Study Design:*** *This was a cross-sectional study.* ***Setting:*** *The study was conducted in the Nephrology Department of Rehman Medical Institute, Peshawar, Pakistan.* ***Duration of Study:*** *The data collection occurred over a defined study period (*18-September-2024 to 18-March-2025*).* ***Methods:*** *A total of 136 adult patients on maintenance hemodialysis for at least 12 months were enrolled. Secondary hyperparathyroidism was defined by parathyroid hormone (PTH) levels exceeding 70 pg/mL, in conjunction with hypocalcemia (serum calcium <8.5 mg/dL) and vitamin D deficiency (25(OH)-vitamin D <30 ng/mL). Relevant demographic and clinical information including comorbidities such as hypertension and diabetes was recorded. Data were analyzed using SPSS, with descriptive statistics used for frequency and mean calculations.* ***Results:*** *The mean age of participants was 51.71 ± 15.84 years. Of the total patients, 73 (53.7%) were male and 63 (46.3%) were female. Hypertension was observed in 56 patients (41.2%), and diabetes in 59 patients (43.4%). Secondary hyperparathyroidism was present in 85 patients, representing a frequency of 62.5%.* ***Conclusion:*** *A high prevalence of secondary hyperparathyroidism was observed among adult chronic hemodialysis patients. These findings emphasize the need for routine screening and timely intervention to manage mineral and bone disorders in this population.*

Keywords: Secondary Hyperparathyroidism, Chronic Hemodialysis, Parathyroid Hormone, Calcium, Phosphate

INTRODUCTION

Hemodialysis has undergone ongoing improvements to enhance patient outcomes. Traditionally, the term “renal replacement therapy” was commonly used; however, this terminology may be overly general. The primary purposes of dialysis include removal of uremic toxins, preserving electrolyte balance as well as restoration of fluid balance, while neglecting other essential metabolic and immune functions. Furthermore, the drawbacks of existing haemodialysis membranes encompass propensity to occlude over time due to protein accumulation as well as the lack of convenience associated with both the device as well as the procedure (1-3).

Haemodialysis serves as a critical chronic treatment option for a growing number of patients who suffer from end-stage renal disease (ESRD). Research suggests that an estimated 2 million individuals worldwide undergo chronic haemodialysis (4, 5). The utilisation of haemodialysis has been on rise as well as is projected to continue increasing in coming decades. This trend is mainly due to ageing population and growing prevalence of related conditions. This is anticipated to substantially elevate financial strain on healthcare system, particularly in nations that are developing. The incidence of ESRD have shown a consistent upward trend in recent decades. The total number of patients going through haemodialysis rose from roughly 4,000 in 1995 to almost 18,000 by 2017 (5-8).

Epidemiologic studies that involve dialysis patients reveal an important connection between elevated parathyroid hormone (PTH) levels as well as increased mortality rates (9, 10). Therapies that focus on addressing abnormal CKD-MBD parameters are demonstrating improvements in biochemical endpoints; however, they have not convincingly demonstrated reductions within critical endpoints, including all-cause as well as cardiovascular mortality (11, 12). Currently, Secondary hyperparathyroidism (SHPT) administration focusses primarily on therapies aimed at decreasing serum phosphate levels by means of dietary phosphate restriction as well as use of oral phosphate binders, controlling PTH with vitamin D analogues along with calcimimetics (13). According to a study reported frequency of SHPT was 65.6% among chronic hemodialysis cases (14).

Although uncontrolled SHPT can impair patient outcomes, several national and international clinical practice regulations recommend keeping parathyroid hormone levels within defined ranges. Due to the paucity of literature on this subject locally, the goal of this study is to determine the frequency of secondary hyperparathyroidism in adult chronic hemodialysis patients at our health setup. The results of this study will be helpful for our medical professionals in understanding of secondary hyperparathyroidism in this population, and develop targeted strategies to mitigate its impact, ultimately leading to better clinical outcomes for patients with chronic kidney disease on hemodialysis.

METHODOLOGY

We conducted this cross-sectional study at the Nephrology Department of Rehman Medical Institute, Peshawar with the ethical approval of the hospital. The study duration was 6 months which dated from 18-September-2024 to 18-March-2025. We selected one hundred and thirty-six patients for this study, their sample was calculated based on the previous frequency of hyperparathyroidism 65.6% (14), margin of error 8% and confidence level 95%. Non-probability consecutive sampling was used for the recruitment of patients. The included patients were male and female aged 20 to 75 years, who had been on routine hemodialysis for at least 12 months, we defined chronic hemodialysis as a procedure performed to filter and remove waste materials and excess fluids from the blood of patients with advanced kidney failure. This treatment involved circulating the patient's blood through a dialysis machine which helped to restore electrolyte balance and eliminate toxins.

Hemodialysis sessions were conducted three times a week with each session lasting approximately four hours. Patients who had undergone parathyroidectomy, using steroids or were pregnant were excluded from the study.

Data collection commenced after obtaining consent from the patients. Demographic information such as age, gender, body mass index (BMI), socioeconomic status, employment status, residence and education level was recorded. A thorough medical history was also taken, and each patient underwent a physical examination. Secondary hyperparathyroidism was diagnosed based on PTH levels exceeding 70 pg/mL with accompanying hypocalcemia (plasma calcium < 8.5 mg/dL) and vitamin D deficiency (25(OH)-vitamin D < 30 ng/mL).

The data was analyzed with SPSS 23. Age, BMI were calculated using mean and standard deviation. Gender, hypertension, socioeconomic status, education, employment status, residence, obstructive nephropathy and diabetes were evaluated using frequency and percentage. The relationship of secondary hyperparathyroidism with demographic and clinical variables was assessed using Chi-square test. P value was set significant at ≤ 0.05.

RESULTS

We included 136 adult patients on hemodialysis, their mean age was 51.71±15.836 years and their mean BMI of 23.0119±2.76286 kg/m². Gender distribution showed that 73 (53.7%) patients were male while 63 (46.3%) were female. The presence of comorbidities revealed that hypertension was present in 56 (41.2%) patients while 80 (58.8%) patients did not have hypertension. Diabetes mellitus was observed in 59 (43.4%) patients while 77 (56.6%) did not have this condition. Obstructive nephropathy was found in 40 (29.4%) patients with 96 (70.6%) patients not having this condition (Table 1).

Secondary hyperparathyroidism was found in 85 (62.5%) of the patients while 51 (37.5%) did not have this condition (Table 2). Stratification of secondary hyperparathyroidism with various demographic and clinical factors can be seen at table no 3.

Table 1: Demographics and clinical factors

Demographics and clinical factors		n	%
Gender	Male	73	53.7%
	Female	63	46.3%
Socioeconomic status	Low (< 20K Rs/Month)	24	17.6%
	Middle (20 to 50K Rs/Month)	76	55.9%
	High (> 50K Rs/Month)	36	26.5%
Education status	Educated	60	44.1%
	Uneducated	76	55.9%
Employment status	Employed	58	42.6%
	Unemployed	78	57.4%
Residence	Rural	72	52.9%
	Urban	64	47.1%
Hypertension	Yes	56	41.2%
	No	80	58.8%
Diabetes	Yes	59	43.4%
	No	77	56.6%
Obstructive nephropathy	Yes	40	29.4%
	No	96	70.6%

Table 2: Frequency of Secondary hyperparathyroidism

Secondary hyperparathyroidism	n	%
Yes	85	62.5%
No	51	37.5%

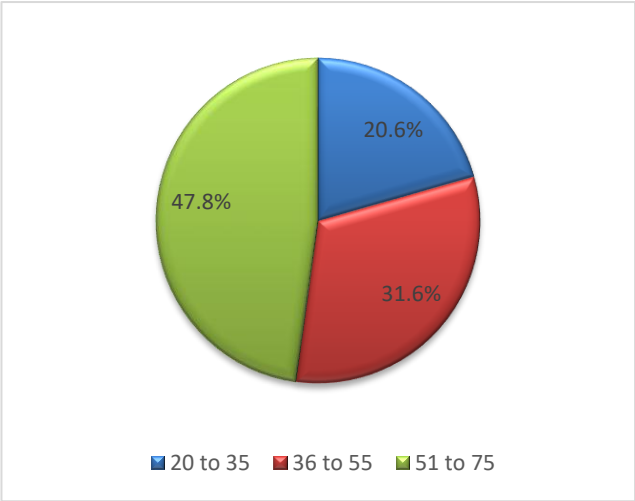

Figure 1: Age distribution

Table 3: Association of Secondary hyperparathyroidism with various demographic and clinical factors

Demographic and clinical factors		Secondary hyperparathyroidism				P value
		Yes		No		
		n	%	n	%	
Age distribution (Years)	20 to 35	19	22.4%	9	17.6%	P > 0.05
	36 to 55	28	32.9%	15	29.4%	
	56 to 75	38	44.7%	27	52.9%	
BMI (Kg/m2)	18 to 24.9	61	71.8%	36	70.6%	P > 0.05
	> 24.9	24	28.2%	15	29.4%	
Gender	Male	41	48.2%	32	62.7%	P > 0.05
	Female	44	51.8%	19	37.3%	
Socioeconomic status	Low (< 20K Rs/Month)	16	18.8%	8	15.7%	P > 0.05
	Middle (20 to 50K Rs/Month)	44	51.8%	32	62.7%	
	High (> 50K Rs/Month)	25	29.4%	11	21.6%	
Education status	Educated	37	43.5%	23	45.1%	P > 0.05
	Uneducated	48	56.5%	28	54.9%	
Employment status	Employed	34	40.0%	24	47.1%	P > 0.05
	Unemployed	51	60.0%	27	52.9%	
Residence	Rural	44	51.8%	28	54.9%	P > 0.05
	Urban	41	48.2%	23	45.1%	
Hypertension	Yes	33	38.8%	23	45.1%	P > 0.05
	No	52	61.2%	28	54.9%	

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Diabetes	Yes	37	43.5%	22	43.1%	P > 0.05
	No	48	56.5%	29	56.9%	
Obstructive nephropathy	Yes	28	32.9%	12	23.5%	P > 0.05
	No	57	67.1%	39	76.5%	

DISCUSSION

In our study we evaluated the frequency of secondary hyperparathyroidism (SHPT) in adult chronic hemodialysis patients. We included 136 participants in our study with mean age 51.71±15.836 years. The demographic data reveals that a slightly higher percentage of males (53.7%) were enrolled as compared to females (46.3%). The study also investigated various sociodemographic factors.

The most significant findings from our study relate to the high prevalence of secondary hyperparathyroidism in hemodialysis patients. Among the 136 participants 62.5% were diagnosed with SHPT indicating a notably high frequency of this condition. The pathophysiology behind SHPT involves complex mechanisms including impaired kidney function leading to altered calcium and phosphate metabolism which directly stimulates parathyroid hormone (PTH) secretion.

When comparing our findings with other research, it was evident that the prevalence rates of SHPT can vary. Owda et al found that 78% of patients undergoing hemodialysis had elevated PTH levels greater than 200 pg/Ml (15). Our finding of 62.5% prevalence of SHPT in hemodialysis patients suggests that while the prevalence in our cohort is slightly lower than the reported 78% by the aforementioned study, it still reflects a substantial burden of the disease in dialysis patients. Similar to our findings, Bashir et al. reported a high prevalence of SHPT in a cohort of hemodialysis patients with 65.6% demonstrating abnormal PTH levels (14).

Our study also analyzed the various clinical and demographic factors in patients of hemodialysis. Among the comorbid condition's hypertension was prevalent in 41.2% of patients and diabetes was present in 43.4% of patients. These results highlight hypertension and diabetes as major risk factors in CKD patients. The relationship between kidney dysfunction abnormal mineral metabolism is well-established and both hypertension and diabetes contribute to the progressive decline in kidney function (16).

In our study the association between SHPT with hypertension and diabetes could not reach the point the of statistical importance, this has been validated by Owda et al in their study, they found that 53 patients in their cohort of 122 patients presenting for hemodialysis had diabetes, they could not find notable association of SHPT with diabetes (15).

One critical aspect observed in our study was the relationship between SHPT and the socioeconomic status of patients. A substantial portion of participants (51.8%) fell within the middle-income group and 18.8% had low-income status. Patients from lower socioeconomic backgrounds may often experience delayed diagnoses, poorer access to medical care and greater disease severity which could explain the higher incidence of SHPT in this group.

Secondary hyperparathyroidism remains an important complication in patients undergoing hemodialysis and this emphasizes the need for vigilant monitoring and early intervention to manage calcium, phosphate and PTH levels along with vitamin D deficiency.

CONCLUSION

In conclusion, our study found a higher frequency of secondary hyperparathyroidism in adult chronic hemodialysis patients (62.5%). We recommend regular screening of parathyroid hormone levels along with early interventions to prevent progression of SHPT.

DECLARATIONS

Data Availability Statement
All data generated or analysed during the study are included in the manuscript.

Ethics approval and consent to participate
Approved by the department Concerned. (RMI-REC/51)

Consent for publication
Approved

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Not applicable

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTION

ALINA KHAN (Postgraduate Resident)
Data Entry, Review of manuscript, Data Collection, and Manuscript drafting.
NISAR ANWAR (Professor & HOD)
Conception of Study Design and Methadology and Critical input,and Final approval of manuscript
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Review of Literature

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