



# Prevalence of Secondary Hyperparathyroidism in Hemo-Dialysis Patients

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## ABSTRACT

**Introduction:** One persistent complication of chronic kidney disease is secondary hyperparathyroidism. Early diagnosis of this disease will reduce morbidity in patients undergoing hemodialysis.

**Aims & Objectives:** To determine the prevalence of secondary hyperparathyroidism in chronic kidney disease patients at National Institute of Kidney Diseases, SZH Lahore.

**Place and Duration of Study:** A cross sectional study was conducted at Nephrology Department of Shaikh Zayed Hospital (SZH) Lahore after getting approval from Institutional Review Board of National Health Research Complex (NHRC). It was conducted from September 2023 to November 2023 & 140 hemo-dialysis patients were selected.

**Material & Methods:** We measured serum parathyroid hormone, hemoglobin and other variables, at Biochemistry laboratory of Sheikh Zayed Hospital, in 140 hemodialysis patients. Serum samples were measured for PTH levels using ELISA method. The data was analyzed using SPSS version 20. P value  $\leq 0.05$  was considered significant.

**Results:** Fifteen patients had secondary hyperparathyroidism out of 140 hemodialysis patients. Hyperparathyroidism was observed in 10.71 % of the patients. Hyperparathyroidism patients had significantly low calcium, hemoglobin levels & higher phosphate levels.

**Conclusion:** The prevalence of secondary hyperparathyroidism is low at 10.71% of patients undergoing hemodialysis at National Institute of Kidney Disease, SZH Lahore.

**Keywords:** Chronic kidney disease, hemo-dialysis, parathyroid hormone, Secondary hyperparathyroidism

## INTRODUCTION

Common complications of chronic kidney disease (CKD) patients are anemia<sup>1</sup>, body edema, gouty bone disease, cardiovascular disease and secondary hyperparathyroidism<sup>2</sup>. Normal kidneys convert inactive Vitamin D to active Vitamin D in proximal tubules. The damaged kidneys are unable to form active Vitamin D. Lack of Vitamin D causes hypocalcemia. This triggers the release of excessive parathyroid hormone (PTH) by parathyroid glands<sup>3</sup>. This excessive PTH hormone causes secondary hyperparathyroidism, further side effects and disease progression. The combination of increased PTH levels and decreased Vitamin D produces renal osteodystrophy<sup>4</sup>. Renal osteodystrophy causes

increased bone resorption and osteomalacia<sup>5</sup>. The incidence of secondary hyperparathyroidism increases with worsening renal function. As renal stages advances to stage 4, 10-50% of hemo-dialysis patients suffer from secondary hyperparathyroidism (SHPT)<sup>6</sup>. SHPT causes metabolic bone problems. It causes bone pains, arthralgia, muscle weakness & increased fracture risk. To make matter worse SHPT causes more renal anemia by erythropoietin resistance. Hyperparathyroidism down regulates erythropoietin receptors contributing to anemia. This anemia, due to hyperparathyroidism in hemo-dialysis patients, cannot be treated by expensive erythropoietin & intravenous iron. Instead, it is treated by Vitamin D<sup>7</sup>. Measurement of PTH is used for the diagnosis of hyperparathyroidism in patients. SHPT occurred in 29% of CKD patients in Philippines, 44 % in Iranian CKD patients, 31.9% in American patients & 17% in Libyan renal patients<sup>8</sup>. Therefore, there is a need for research to check the burden of secondary hyperparathyroidism in hemo-dialysis patients in different tertiary hospitals in Pakistan.

## MATERIAL AND METHODS

A cross sectional study was conducted at Nephrology department of Shaikh Zayed Hospital (SZH) Lahore after getting approval from

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Institutional Review Board of National Health Research Complex (NHRC) vide letter: SZMC/TERC/External/984/2023. It was a cross-sectional study conducted from September 2023 to November 2023. 140 hemo-dialysis patients were selected. The sample size was calculated using WHO calculator. Following were the exclusion criterion: primary hyperparathyroidism patients, any history of tumor of parathyroid gland. Written consent was taken from patients. Centrifugation was used to separate serum from plasma. Serum was frozen at -20°C. 1ml venous blood was used to measure Parathyroid hormone (PTH) via ELISA Kit (Diagnostic Automation, USA). Serum calcium, serum phosphate & hemoglobin were measured at Biochemistry Laboratory Sheikh Zayed Hospital by standard methods. The definition of secondary hyperparathyroidism is agreed to be PTH hormone levels >300pg/ml in many studies. KDOQI practice clinical guidelines defined Secondary hyperparathyroidism as PTH levels >300 pg/ml<sup>8</sup>. The data was analyzed using IBM-SPSS version 20. Mean ± SD was given for age, duration on dialysis, hemoglobin, Parathyroid hormone levels, calcium and phosphate concentration. Student's t-test was used to compare the mean between groups. Chi-square test was to determine the gender difference between groups. It was not significant. p-value of less than or equal to 0.05 was considered significant.

### RESULTS

Out of 140 patients, fifteen had hyperparathyroidism (10.71%). 78 patients were male and 62 were female. Out of 78 males, eight had hyperparathyroidism (10.3%). Out of 62 females, seven had hyperparathyroidism (11.2%). Hyperparathyroidism patients had significantly low calcium, hemoglobin levels. Hyperparathyroid patients had significantly higher phosphate levels. There was no significant difference in gender and age between hyperparathyroid patients and all hemo-dialysis patients' group.

Category	All Patients	Hyperparathyroidism Patients	P-Value
Age (Mean±SD)	51 ±13.8	52 ± 11.6	0.455
Gender	M	8 (10.3%)	0.569
	F	7 (11.2%)	
Duration on hemodialysis in Years (Mean±SD)	4.0 ±3.93	3.0 ±3.66	0.892
Hemoglobin (g/dl) (Mean±SD)	11.9 ±0.89	7.0±1.03	<0.001
Calcium levels (mmol/l) (Mean±SD)	2.7±0.29	1.9±0.25	<0.001

Phosphate levels (mmol/l)	1.7±0.25	2.0±0.23	<0.001
Parathyroid Hormone levels (pg/ml)	100±14.5	350±50	0.001

Table-1: Characteristics of all patients and patients with hyperparathyroidism.

### DISCUSSION

The prevalence of SHPT was found to be low and occurred in 10.71% of patients presented at SZH & NIKD. Prevalence of SHPT ranges between 30-50% in different studies and countries. Figures from Arbor Research Collaborative for Health showed prevalence of 43% in France, 29% in Italy, 34% in Denmark, 47% in Russia, 32 % in Germany, 33% in Spain and 42% in UK. The prevalence of SHPT in North America; USA & Canada was at around 31.9% and 57.6% respectively<sup>9</sup>. However, the prevalence in Brazil & Japan was same as that of our study at around 10.5%.<sup>10</sup> Three studies were done in Nigeria. Study done by Gimba et al showed a prevalence of 55%. Another study done in Southwest Nigeria using only X-ray features of renal osteodystrophy showed a prevalence of 3.3% only<sup>8</sup>. Study in India showed a frequency of 27.9%<sup>11</sup>. Prevalence of hyperparathyroidism in developed countries seems to be more than in developing countries. It can be due to more CKD disease in developed countries due to lifestyle and dietary intake<sup>12</sup>.

A study in Nigeria found that secondary hyperparathyroidism is independently associated with hypocalcemia, hyperphosphatemia and elevated alkaline phosphate levels<sup>8</sup>. Our study did not study these variables.

Hyperparathyroidism causes anemia by blocking action of erythropoietin receptors. Renal anemia due to hyperparathyroidism can be treated by supplying Vitamin D and reducing phosphate intake in diet. The Vitamin D injections would reverse the Vitamin D shortage in the body and this in turn would reduce the parathyroid hormone levels<sup>13</sup>.

This study was a single center study. More research is needed to determine the relationship between parathyroidectomy & SHPT. This data is not within the scope of this research. These figures present only the prevalence of secondary hyperparathyroidism in adults. Estimates of SHPT in children undergoing hemo-dialysis may vary.

### CONCLUSION

Secondary hyperparathyroidism in the hemodialysis

patients presented at Sheikh Zayed Hospital is 10.7%. It not as prevalent as in other developed countries of the world. Proper clinical guidelines should be established to treat this less common condition.

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