Prevalence of Secondary Hyperparathyroidism among Hemodialysis Patients in Three Royal Medical Services Centers

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ABSTRACT

Objective: To determine the prevalence of secondary hyperparathyroidism among hemodialysis patients treated in three different centers.

Methods: This is a descriptive study conducted by reviewing patient's medical records, Patients receiving hemodialysis therapy in three different centers: King Hussein Medical Center in Amman, Prince Hashem Hospital in Zarka, and Prince Ali Hospital in Karak, representing various governorate of Jordan. Patients included in the study were treated by hemodialysis for more than 6 months and have not had parathyroidectomy. We screened our patients for the purpose of the study during January 2014. Their laboratory values including serum creatinine, BUN, calcium, phosphorous, alkaline phosphatase and intact parathyroid hormone were recorded. Depending on the iPTH level, patients were divivded into three groups, adynamic bone disease group with iPTH levels less than 130pg/ml, euparathyroid group with iPTH within the target range for hemodialysis patients (130-210pg/ml), and secondary hyperparathyroidism group with iPTH more than 210pg/ml.

Results: A total of 276 patients were included in this study. Males were 56.5% and females 43.5%, their age ranged from 23 to 87 years with duration of hemodialysis ranged from 6 to 300 months. Majority of patients (77.5%) found to have secondary hyperparathyroidism with an average intact parathyroid hormone level of 887.1pg/ml. The remaining patients showed either acceptable average intact parathyroid hormone level for the hemodialysis patients 127.7pg/ml (13.4%) or showed low average intact parathyroid level of 32.9pg/ml indicating the presence of the more serious adynamic bone disease (9.1%).

Conclusion: Despite advancing hemodialysis treatment facilities and the use of calcium containing phosphorous binders and vitamin D analogue the incidence of secondary hyperparathyroidism remains high. This may represent late referral to nephrology care or may indicate poor patient compliance to the prescribed medications. Additional efforts should be implemented to enhance early referral of patients with chronic kidney disease to nephrology care.

Key words: Chronic kidney disease, Hemodialysis, Secondary hyperparathyroidism, Renal osteodystrophy.

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Introduction

Chronic kidney disease (CKD) is a growing health problem worldwide with its complications leading to high incidence of co morbidities and even mortality.[1-3]

Failing and failed kidneys have decreased ability to convert circulating 25-hydroxycholecalciferol to the more active form 1,25 - hydroxycholecalciferol, leading to the development of vitamin D deficiency resulting in hypocalcaemia that triggers parathyroid gland to increase its synthesis of parathyroid hormone (PTH) resulting in secondary hyperparathyroidism (SHPT).[3-5]

Elevate parathyroid hormone (PTH) results from both increased amount of PTH-secretory tissue (glandular hyperplasia)[6] as well as increased cellular PTH biosynthesis and secretion.[7,8] Diminished functional renal parenchyma results in decreased vitamin D levels, which is temporarily corrected by increased PTH levels.[9]

Secondary hyperparathyroidism in chronic kidney disease starts as an adaptive process, but later becomes redirected to a maladaptive process leading to the development of mineral bone disease (MBD).[10]

PTH levels are reported to increase during early stages of CKD, and as CKD deteriorates and progresses, serum PTH levels continue to rise leading to the development of SHPT,[11] this explains why almost all CKD patients who start to receive dialysis therapy are already having SHPT.[11]

Most of survey studies demonstrate high prevalence of SHPT among dialysis patients regardless of ethnic origin or geographical distribution,[12-16] Salem[13] from the States, Chua *et al*[14] from Philippines and Mugera[18] from Kenya all described high rates of SHPT prevalence among hemodialysis patients. Similar data of high prevalence of SHPT was also described among CKD patients treated by peritoneal dialysis[15] we performed this retrospective study to determine the prevalence of SHPT among our hemodialysis patients.

Methods

CKD patents treated by hemodialysis in three main Royal Medical Services hospitals representing mid Jordan (King Hussein Medical Center - Amman), north eastern of Jordan (Prince Hashim Hospital - Zarka) and the south of Jordan (Prince Ali Hospital – Karak) were included in the study and the screening for this study was done during January 2014.

Patients who included in this study were adult patients with stage V CKD treated by conventional intermittent hemodialysis for at least 6 months and had not parathyroidectomy. A total of 276 were identified and included. Their medical records were looked for demographic and biochemical data. Laboratory data collected were the most recent prior to enrolment in the study (during January 2014)

As part of treatment regimen for advanced CKD, including stage V dialysis, all of our patients were receiving regular calcium carbonate (as calcium supplementation and as phosphorous binder) and vitamin D analogue, those patients with elevated phosphorous level and elevated calcium phosphorous product were treated by sevelamer and withholding vitamin D analogue.

Our treatment targets in the Royal Medical Services of acceptable clinical care for renal osteodystrophy in hemodialysis patients includes but not limited to the followings:

Corrected serum calcium level	8.4–10.3mg/dl
Serum phosphorous level	2.5 – 4.5mg/dl
iPTH	130-210pg/ml (2-3 folds the normal value)
Calcium, Phosphorous product	< 55

Laboratory data were obtained on monthly bases except for iPTH which is evaluated every 3-6 months.

Records of the patients included in the study were reviewed and their laboratory data collected aiming at BUN, creatinine, calcium, phosphorous, alkaline phosphatase and iPTH done at the same period. Depending on iPTH levels, the patients were divided into three groups: Adynamic bone disease, euparathyroid and secondary hyperparathyroidism.

Treatment provided in the three selected centers is comparable; in the Royal Medical Services we have similar dialysis facilities (dialysis machines and consumables) and similar dialysis therapy criteria regarding frequency and duration of sessions in each hemodialysis unit. Basically treatment provided to all patients is hemodialysis

session of (3.5 – 4) hours three times per week. We don't routinely measure Kt/V, instead mostly we depend on urea reduction ratio (URR) looking for URR of at least 65% per session. Our hemodialysis programme is bicarbonate based with dialysate calcium concentration of 9.9 mg/dl (2.5 Meq/L).

Each dialysis unit has a dedicated renal dietician who evaluates the nutritional status of our patients on monthly bases.

Results

Two hundred seventy six patients with CKD stage V treated by hemodialysis for a minimum of 6 months were included in this study. There were 156 males (56.5%) and 120 females (43.5%) their age ranged from 23 to 87 years with average of 57.9 years reflecting aging of hemodialysis patients, their duration of hemodialysis ranged from 6 to 300 months with an average of 64.9 months probably reflecting an increased survival rate among hemodialysis patients Table I. All of them started their renal replacement therapy by hemodialysis and none were treated by peritoneal dialysis.

Table I: Study population Demographic data

Gender:	
Male	156
Female	120
Age	Range: 23-87 year Average: 57.5 year
Duration of Dialysis (Months)	Range: 6-300 Average: 62.3

According to iPTH levels, we divided the study patients into three groups:

1. Adynamic bone disease group with iPTH levels less than 130pg/ml.
2. Euparathyroid group with iPTH within the target range for hemodialysis patients (130-210pg/ml).
3. Secondary hyperparathyroidism group with iPTH more than 210pg/ml.

There were 37 patients (13.4%) in euparathyroid group with an average age of 56.7 years average duration of dialysis of 55.9 months and average iPTH of 127.7pg/ml (Table II).

Table II: Secondary hyperparathyroidism

Gender:	
Male	119
Female	95
Age	Range: 23-87 year Average: 57.9 year
Duration of Dialysis (Months)	Range: 6-300 Average: 64.9
iPTH*	Range: 248 -2765 pg/ml Average: 887.1 pg/ml

*iPTH: intact parathyroid hormone

In the adynamic bone disease group, there were 25 patients (9.1%), with an average age of 56.6 years and average duration of hemodialysis of 44.6 months and average iPTH of 32.9pg/ml (Table III).

Table III: Euparathyroid

Gender:	
Male	24
Female	13
Age	Range: 27 - 82 year Average: 55.8 year
Duration of Dialysis (Months)	Range: 6 – 276 Average: 58.4
iPTH	Range: 73.2 – 205pg/ml Average:127.7pg/ml

iPTH: intact parathyroid hormone

The majority of our patients fell in the secondary hyperparathyroidism group, as there were 214 patients (77.5%) with an average age of 58 years, average duration of hemodialysis of 59.9 months and average iPTH of 887.1pg/ml (Table IV).

Table IV: Adynamic bone disease

Gender:	
Male	13
Female	12
Age	Range: 24 - 82 year Average: 56.6 year
Duration of Dialysis (Months)	Range: 6 – 186 Average: 44.36
iPTH	Range: 3.2 – 70.9pg/ml Average: 32.9 pg/ml

iPTH: intact parathyroid hormone

These results demonstrate that SHPT is common and prevalent among hemodialysis patients.

Table V demonstrates the average laboratory data in the three groups showing that all of our patients have an acceptable average of calcium,

Table V: Laboratory data of the three groups

	iPTH	Calcium	Phosphorous	ALP
Euparathyroid	127.74	9.48	4.58	150.03
A dynamic bone disease	32.94	9.85	4.92	189.32
SHPT	887.1	9.27	4.78	308.23

iPTH: intact parathyroid hormone, ALP: alkaline phosphatase
SHPT: secondary hyperparathyroidism

and all of them have elevated phosphorous levels which was the least in the euparathyroid group and highest in the adynamic bone disease group, while levels of ALP were much higher in the SHPT group.

Discussion

Our patient's demographic data showed males (56.5%) are more than females (43.5%), is consistent with similar studies described before.[3,13,14,18] The age of our patients showed extension beyond the 80s as age alone is no more contraindication to start hemodialysis in Jordan.

Although treatment provided for hemodialysis patients in our centers is as near to the clinical guideline as possible:[12] (As part of treatment regimen for advanced CKD, including stage V dialysis, all of our patients were receiving regular calcium carbonate (as calcium supplementation and as phosphorous binder) and vitamin D analogue, those patients with elevated phosphorous level and elevated calcium phosphorous product were treated by sevelamer and withholding vitamin D analogue), these results obviously show high prevalence (77.6%) of SHPT among our hemodialysis population. This may reflect late referral of CKD patients to nephrology care or to patients' poor compliance to medications (mainly calcium containing phosphorous binders and vitamin D analogous), as some patients do think that once dialysis initiated then no need to keep on taking medicines previously prescribed, or due to the development of side effects of calcium containing phosphorous binders mainly gastrointestinal ones.

Reviewing the data of each group showed similarities among these groups regarding age, calcium and phosphorous, with obvious higher duration of hemodialysis and ALP level among SHPT group, reflecting that the longer duration of hemodialysis the more likely complications to develop despite various clinical interventions.[13,17-19]

Our patients are like any other CKD patients treated by hemodialysis, they consume calcium containing phosphorous binders as preventive and therapeutic measure against hyperphosphatemia, from which about half the elemental calcium is absorbed.[20,22]

Calcium containing phosphorous binders are prescribed to all of our hemodialysis patients (unless contraindicated) as a preventive therapeutic action against hyperposphatemia and as a source of calcium, as about half of its elemental calcium is absorbed.[20-22]

This explains why the average laboratory data of our patients showed control of calcium, this observation also has been described in advancing CKD.[23]

All of our patient groups regardless of their iPTH levels showed hyperphosphatemia which was more prominent in the adynamic bone disease group, reflecting progressive and advanced renal bone disease, this observation was also described pointing towards difficulty in controlling bone related disorders in CKD patients,[19] which may explain why adynamic bone disease is an emerging entity with increasing incidence among dialysis patients.[20,24]

Conclusion

SHPT and MBD is prevalent among hemodialysis population which may increase the burden on the patients, patients' families and health care providers. Every effort must be taken to decrease this complication including early referral to nephrology care, adherence to dialysis guidelines, encouraging patients to be committed to their prescribed medicines, frequent and regular laboratory evaluation and early management of the anticipated complications.

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