

EVALUATION OF INCIDENCE OF ADYNAMIC BONE DISEASE IN PATIENTS WITH END STAGE RENAL DISEASE

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Abstract: *To assess frequency of adynamic bone disease in subjects with ESRD a Prospective study was carried out at Department of Medicine, Services Hospital Lahore from 6 months from January 2022 to July 2022. Demographic data of the subjects including gender, age, BMI, smoking history, socioeconomic status and duration of dialysis and end stage renal disease was recorded. Blood samples of all patients were drawn and sent to the laboratory for evaluation of phosphate, calcium, alkaline phosphatase and iPTH levels. Findings of the laboratory tests were analyzed and adynamic bone diseases were diagnosed according to operational definition. The study was conducted on 135 patients whose mean age was 50.31 ± 12.56 years. According to this study, adynamic bone disease was found in 34(25.19%) patients. Association between adynamic bone disease and duration of ESRD, duration of dialysis was statistically insignificant ($p > 0.05$). Adynamic bone disease was reported in 25.2% of patients having ESRD.*

Keywords: Adynamic bone disease, End stage renal disease, Bone metabolism

Introduction

Though there have been significant developments in renal replacement therapy, yet mortality rate in patients with end stage renal disease (ESRD) is unacceptably high (Dai et al., 2017). Prevalence of ESRD is constantly increasing. In 2018, 2.618 million people worldwide received renal replacement therapy, in 2030 this number will expectedly increase to 3.439 million (Liyana et al., 2015; Park et al., 2018). Chronic kidney disease is commonly associated with disorders of bone and mineral metabolism. Collective term of renal osteodystrophy is used for these disorders. Such disorders frequently result in structural and functional abnormalities of the cardiovascular system. Based on latest research bone is considered an endocrine organ with significant role in cardiovascular complications and metabolic abnormalities associated with chronic kidney disease (Milovanova et al., 2022). Metabolic bone disease begins during the early stage of kidney disease, worsens as the disease progresses, and has high morbidity and mortality rate. However, factors causing metabolic bone disorders in patients with chronic kidney disease are not well known (Mungulluh et al., 2020). Among chronic kidney disease –mineral and bone disorders most prevalent is adynamic bone disease and thus requires most attention. In stage 3-5 of chronic kidney disease its prevalence is 18% (Abdalbary et al., 2022). A study reported frequency of adynamic bone disease in

ESRD to be 23% (Jat et al., 2016). Literature strongly supports the development of bone disease during renal dysfunction; however, there is lack of local studies. Therefore, the aim of this study is to assess frequency of adynamic bone disease in subjects with ESRD.

Methodology

This retrospective study was conducted in Department of Medicine, Services Hospital Lahore from January 2022 to July 2022. The study was conducted on 135 subjects. Those included in the study were aged between 18 to 75 years and had end stage renal disease. Those with history of diabetes, autoimmune disease, long term steroid use, osteoporosis, parathyroidectomy, recent fracture and acute renal failure were excluded. Informed consent of the patients was recorded. The Ethical Board of the hospital approved the study. Demographic data of the subjects including gender, age, BMI, smoking history, socioeconomic status and duration of dialysis and end stage renal disease was recorded. Blood samples of all patients were drawn and sent to the laboratory for evaluation of phosphate, calcium, alkaline phosphatase and iPTH levels. Findings of the laboratory tests were analyzed and adynamic bone diseases were diagnosed according to operational

definition. Standard protocol was followed for the management of adynamic bone disease. SPSS version 21 was used for data analysis. Quantitative variables such as age, duration of dialysis and end stage renal disease, BMI and eGFR level were presented in the form of mean and standard deviation. Qualitative variables such as gender, socioeconomic status, smoking, adynamic bone disease and number of dialysis/weeks were presented in form of percentage and frequency. Data stratification was done to study variables. The sequence test was used for comparison of post stratification frequency. P -value ≤ 0.05 was considered statistically significant.

Results

Table I: Comparison of adynamic bone disease between duration ESRD

		Adynamic bone Disease		Total	p-value
		Yes	No		
Duration of ESRD	≤24	31 25.0%	93 75.0%	124 100.0%	>0.999
	>24	3 27.3%	8 72.7%	11 100.0%	

Table II: Comparison of adynamic bone disease between duration of dialysis

		Adynamic bone Disease		Total	p-value
		Yes	No		
Duration of dialysis	≤24	34 27.2%	91 72.8%	125 100.0%	0.065
	>24	0 0.0%	10 100.0%	10 100.0%	

Table III: Comparison of adynamic bone disease between the number of dialyses

		Adynamic bone Disease		Total	p-value
		Yes	No		
No. of dialysis	≤2	30 29.7%	71 70.3%	101 100.0%	0.057
	>2	4 11.8%	30 88.2%	34 100.0%	

The study was conducted on 135 patients whose mean age was 50.31±12.56 years. 64(47.41%) subjects were female while 71(52.59%) were male. The mean BMI was 28.74±5.26 kg/m² and the mean eGFR level of the patients was 6.83±3.45. According to this study 39(28.89%), patients were smokers. In

our study 94(69.63%) patients belonged to low and 41(30.37%) patients belonged to middle socioeconomic status. The mean duration of ESRD was 10.57±9.91 months, the mean duration of dialysis was 10.02±10.42 months and the mean amount of dialysis per week was 2.25±0.43. The mean serum iPTH of the patients was 348.48±95.49, the mean alkaline phosphatase of the patients was 249.59±103.24, the mean serum calcium level of the patients was 9.25±7.76 and the mean phosphate level of the patients was 4.48±1.29.

According to this study, adynamic bone disease was found in 34(25.19%) patients. The Association between adynamic bone disease and duration of ESRD, and duration of dialysis was statistically insignificant ($p > 0.05$) (Table I, II, and III). Of patients aged below 50 years, 18 (24.7%) had the adynamic bone disease and in those aged above 50 years, 16 (25.8%) had it ($p = 0.878$). In male patients the adynamic bone disease was found in 22 (31%) patients and in female patients the adynamic bone disease was noted in 12 (18.8%) patients ($p = 0.102$). In patients having BMI ≤ 25 kg/m² adynamic bone disease was found in 10 (27%) patients and patients having BMI > 25 kg/m² adynamic bone disease was noted in 24 (24.5%) patients ($p = 0.762$).

In patients having eGFR ≤ 6 level adynamic bone disease was found in 15 (23.4%) patients and in patients having eGFR > 6 level adynamic bone disease was noted in 19 (26.8%) patients (p value=0.657). Among smokers, adynamic bone disease was found in 15 (38.5%) patients and in non-smokers, adynamic bone disease was noted in 19 (19.8%) patients ($p = 0.024$). Among patients with low socioeconomic status, adynamic bone disease was found in 20(21.3%) patients and among patients from middle socioeconomic status, adynamic bone disease was noted in 14 (34.1%) patients ($p = 0.113$).

Discussion

Bone and mineral disorders are frequent occurrences in chronic kidney disease (CKD). Bone lesions associated with CKD were traditionally termed renal osteodystrophy, recently these are referred to as 'chronic kidney disease—mineral and bone disorder' (CKD-MBD). These have different types that have different etiologies and require different management (Pereira et al., 2022; Seyedzadeh et al., 2022). In our study, adynamic bone disease occurred in 25.19% patients. Bone biopsies of the patients with advanced CKD or those who recently started dialysis showed the prevalence of adynamic bone disease to be 23% (Fusaro et al., 2021). Another study reported that in stage 5 CKD patients prevalence of adynamic bone disease was 49% (Bover et al., 2021). In subjects with creatinine clearance of 20 ± 13 ml/ min

prevalence of disease was 13% (Sharma and Gupta, 2021). Another study conducted on the patients with CKD stage 3-5, prevalence of the disease was 18% (Ketteler et al., 2018). In CKD-MBD patients receiving peritoneal dialysis and hemodialysis low-turn-over disease had 50% and 18% prevalence respectively (Mazzaferro et al., 2021). Another study confirms that prevalence of adynamic bone disease is constantly increasing in dialysis patients, it is more prevalent in patients undergoing peritoneal dialysis as compared to hemodialysis (Mazzaferro et al., 2020). Improving Global Outcomes (KDIGO) Work Group did meta analysis of bone histology studies and reported that in CKD stage 3-5, hemodialysis and peritoneal dialysis prevalence of adynamic bone disease was 18%, 19% and 50% (Moe et al., 2006).

Conclusion

Adynamic bone disease was reported in 25.2% of patients having ESRD.

Conflict of interest

Authors declared no conflict of interest

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