The Impact of Chronic Kidney Disease - Mineral and Bone Disorder on the Locomotor System and Quality of Life in Hemodialysis Patients

Kronik Böbrek Hastalığı - Mineral ve Kemik Bozukluğunun Hemodiyaliz Hastalarında Lokomotor Sistem ve Yaşam Kalitesi Üzerine Etkisi

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ABSTRACT

OBJECTIVE: Chronic kidney disease - mineral and bone disorder (CKD -BMD) is a worldwide challenge in hemodialysis patients (HD). Widespread use and improved methods of HD may have changed the spectrum of locomotor system disorders in this population. Locomotor system disorders have an impact on health-related quality of life (QOL). The objective of this study was to assess the effect of CKD-BMD on the locomotor system (bone, joint, muscle, tendon and bursa) and document the prevalence of locomotor system disorders in HD populations and its impact in QOL.

MATERIAL and METHODS: 550 HD patients were enrolled in this study. Each HD patient received complete locomotor system examination and specific diagnostic investigation. iPTH level classified study population into three groups. Group 1. (149 patients) iPTH level < 100 pg/ml, low- turnover renal osteopathy, Group 2. (126 patients) iPTH from 150-300 pg/mL, Group 3. (275 patients) iPTH > 300 pg/mL, high turnover bone disease. Patients were offered a self-administered QOL questionnaire, which assessed various QOL variables.

RESULTS: 75% of hemodialysis patients suffered from one or more locomotor system disorders and the commonest was bone pain 60%, followed by muscle cramps 36%, proximal muscle weakness 30%, osteoarthritis 25%, osteoporosis 16%, rotator cuff syndrome15%, gout pre-HD 12.5%, carpal tunnel syndrome 12%, bone fracture 7%, fibromyalgia 7%, tenosynovitis 6%, periarticular calcification 5%, Dupuytren's contracture 2%, septic arthritis 0.9% and osteomyelitis 0.9%. The three studied groups were represented by 27%, 23% and 50% respectively. The prevalence of osteoarthritis, muscle cramps, bone pain, spontaneous bone fracture and osteoporosis were higher in the third group. 30% of our HD patients completed the QOL questionnaire without assistance and their mean functional status, psychological status, pain scale, fatigue scale, global assessment and joint count were 3.24±2.24, 3.13 ±1.67, 4.07 ±1.7, 4.95 ±1. 8, 3.97 ±1.55 and 9.65±9.95 respectively. QOL variables pronouncedly worsen in HD patients, however the second group patients have a better quality of life than other groups (P<0.001).

CONCLUSION: Locomotor system involvement is still very common in our HD patients, especially in high turnover bone disease group and can compromise the QOL.

KEY WORDS: Chronic kidney disease, Mineral and bone disorder, Locomotor system disorders, Hemodialysis, Quality of life

ÖZ

AMAÇ: Kronik böbrek hastalığı – mineral ve kemik bozukluğu (KBH -MKB) hemodiyaliz (HD) hastalarında dünya çapında bir problemdir. HD'nin yaygın olarak kullanılması ve yöntemlerindeki gelişme bu popülasyonda lokomotor sistem bozuklukları spektrumu değiştirmiş olabilir. Lokomotor sistem bozukluklarının sağlıkla ilişkili yaşam kalitesi (QOL) üzerine bir etkisi olabilir. Bu çalışmanın amacı KBH – MKB'nin lokomotor sistem (kemik, eklem, kas, tendon ve bursalar) üzerine etkisini değerlendirmek ve HD popülasyonlarında lokomotor sistem bozukluklarının prevalansı ve yaşam kalitesi üzerine etkisini belgelendirmektir.

GEREÇ ve YÖNTEMLER: Çalışmaya 550 HD hastası kaydedildi. Her HD hastasında tam bir lokomotor sistem muayenesi ve spesifik diagnostik incelemeler yapıldı. iPTH seviyesine göre çalışma popülasyonu üç gruba ayrıldı: Grup 1 (149 hasta), iPTH < 100 pg/ml, düşük- dönüşümlü renal osteopati;

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Grup 2 (126 hasta), iPTH 150-300 pg/mL; Grup 3 (275 hasta), iPTH > 300 pg/mL, yüksek dönüşümlü kemik hastalığı. Hastalara çeşitli yaşam kalitesi değişkenlerini değerlendiren ve kendi kendine doldurulan bir yaşam kalitesi soru formu verildi.

BULGULAR: Hemodiyaliz hastalarının %75'inde bir veya birkaç lokomotor sistem bozukluğu vardı ve bunların en sık görüleni %60 ile kas ağrısı olup kas krampları %36, proksimal kas zayıflığı %30, osteoartrit %25, osteoporoz %16, rotator kaf sendromu %15, HD öncesi gut %12,5, karpal tünel sendromu %12, kemik kırığı %7, fibromiyalji %7, tenosinovit %6, periartiküler kalsifikasyon %5, Dupuytren kontraktürü %2, septik artrit %0,9 ve osteomiyelit %0.9 oranlarında saptandı. Çalışılan üç grup sırasıyla %27, %23 ve %50 oranlarında bulunmaktaydı. Osteoartrit, kas krampları, kemik ağrısı, spontan kemik kırığı ve osteoporoz prevalansı üçüncü grupta daha yüksekti. HD hastalarımızın %30'u yaşam kalitesi soru formunu yardımcısız doldurdu ve ortalama fonksiyonel durum, psikolojik durum, ağrı ölçeği, yorgunluk ölçeği, global değerlendirme ve eklem sayımı sırasıyla 3,24±2,24, 3,13±1,67, 4,07±1,7, 4,95±1,8, 3,97±1,55 ve 9,65±9,95 bulundu. Yaşam kalitesi değişkenleri HD hastalarında belirgin şekilde daha kötüydü. Ancak ikinci grup hastada yaşam kalitesi diğer gruplardan daha iyiydi (P<0,001).

SONUÇ: Lokomotor sistem tutulumu HD hastalarımızda halen çok yaygındır ve özellikle yüksek dönüşümlü kemik hastaları grubunda görülüp yaşam kalitesini olumsuz etkileyebilir.

ANAHTAR SÖZCÜKLER: Kronik böbrek hastalığı, Mineral ve kemik bozukluğu, Lokomotor sistem bozuklukları, Hemodiyaliz, Yaşam kalitesi

INTRODUCTION

Chronic kidney disease (CKD) is a worldwide public health problem, with increasing prevalence and adverse outcomes, including progressive loss of kidney function, cardiovascular disease, and premature death (1). Disturbances in mineral metabolism and bone disease are common complications of CKD and an important cause of morbidity and decreased quality of life and extra skeletal calcification that has been associated with increased cardiovascular mortality (2)

These disturbances have traditionally been termed renal osteodystrophy (3) The term renal osteodystrophy be used exclusively to define alterations in bone morphology associated with CKD (4) The term CKD-Mineral and Bone Disorder (CKD-MBD) be used to describe a broader clinical syndrome that develops as a systemic disorder of mineral and bone metabolism due to CKD, which is manifested by abnormalities in bone and mineral metabolism and/or extra-skeletal calcification. The initial evaluation of CKD-MBD should include PTH, calcium, phosphorus, alkaline phosphatase, bicarbonate, and imaging for soft tissue calcification. (5)

The US National Kidney Foundation Kidney Disease Outcomes Quality Initiative (NKF-KDOQI) published clinical practice guidelines provided recommended target ranges for various markers of MBD, such as iPTH 150-300 pg/mL, total serum calcium <10.2 mg/dl, serum phosphate< 5.5 and the Ca x P at <55 mg^2/dL^2 (6)

Rheumatic disorders are major complications of renal disease, and approximately two-thirds of HD patients develop musculoskeletal problems and that incidence rises with time on dialysis (7). These include renal osteodystrophy, avascular necrosis of bone, crystal induced arthritis, periarticular calcification, (8) and recurrent haemarthrosis of shoulders (9), carpal tunnel syndrome (CTS), (10) chronic large joint arthropathy (11) and bone cysts, and have also been recognized as a major complications of CKD. Recent studies have demonstrated the deposition of amyloid in the carpal tunnel, bone cysts, synovium, and tendons of such patients. (12)

The definition of quality of life (QOL) is difficult as it embraces many dimensions, ranging from physical well-being and cognitive competence to the establishment of satisfactory inter-relationships (13). In patients who have a chronic disease such as end-stage renal disease (ESRD) for which cure is not a realistic goal maximizing functioning and well-being should be the primary objectives of care. The importance of measuring the quality of life of ESRD patients in relation to health care lies in not only providing the absolute survival, but also the quality of that survival (14)

Locomotor system involvement has an impact on health-related quality of life and HD patients have been reported to have a compromised QOL. (15) Until today, a number of questionnaires which measure the disease-specific QOL in ESRD patients have been developed which assessed various QOL variables (functional status, psychological status, pain, fatigue, global assessment, and joint count. (16)

The epidemiological patterns of CKD-MBD among Egyptian hemodialysis patients are limited. The objective of this study is to determine the frequency of locomotor system diseases among HD populations and the impacts of CKD-BMD and hemodialysis process on locomotor system and hence quality of life.

MATERIAL and METHODS

Study Design and Population

Cross section study was carried out among hemodialysis populations of Sharkia governorate which locates in the east of the Egypt-delta, in between Feb 2014 to Mar 2015. All participants gave informed consent to participate in this study in compliance with the local Institutional Ethics Committee.

Demographic information was collected, the total number of the study was 550 hemodialysis patients among them 316

males and 234 females (1.35:1), their age ranged from 19 to 67 year (46.75±14.34 years), on maintenance hemodialysis three times weekly using 3.5 mEq/l dialysate calcium, duration of each dialysis was 4 hours, protocols were not changed during the study with adequate dialysis treatment (Kt/V>1.2) and their main causes of ESRD were chronic glomerulonephritis 209 (38%), interstitial nephropathy 126 (23%), diabetic nephropathy 88(16%), obstructive uropathy 77 (14%) and unknown 50 (9%).

Eligible participants included patients on regular hemodialysis, good verbal agreement to questionnaire and on maintenance hemodialysis therapy for at least 1 year. Participants were excluded from the study if the original cause of ESRD was a rheumatological disease or suffered from cerebral vascular disease, traumatic fractures, amputation or patients on steroids >3 months.

Kidney Disease: Improving Global Outcomes (KDIGO) clinical practice guideline for the biochemical diagnosis of the CKD-MBD, was categorized the spectrum of CKD-MBD of the study population into three groups (17);

(1) 149 patients with iPTH level < 100 pg/mL, low- turnover renal osteopathy (adynamic bone disease)

(2) 126 patients with iPTH from 150-300 pg/mL, Target of NKF-KDOQI

(3) 275 patients with iPTH > 300 pg/mL, high turnover bone disease (secondary hyperparathyroidism)

Physical Examination and Investigations

Medical records were reviewed for patient demographics, comorbidities, and prior rheumatic diseases. Each HD patient underwent locomotor system examination; locomotor system disease diagnoses fulfilled the American College of Rheumatology criteria. Proximal muscle weakness was defined as difficulty in getting up from a squatting position in the absence of hypokalemia, hypophosphatemia and steroid use for >3 months. Fragility fractures were defined as fractures secondary to trivial trauma.

At the time of commencing the serum intact PTH, corrected serum Ca, serum P, Ca x P product and serum alkaline phosphatase (ALP) were measured. Imaging studies, including plain X ray of symptomatic joints and DEXA were performed at the femoral neck and lumbar spine. T-score of –2. 5 or lower signifies osteoporosis.

QOL Questionnaire

Patients were offered a self-administered QOL questionnaire, a modification of the Multidimensional Health Assessment Questionnaire, which assessed various QOL variables (Functional status, psychological status, pain, fatigue, global assessment, and joint count) (16).

Functional status: Scale of 0 to 10, 10 being unable to do, for following activities: ability to dress, get in and out of bed, lift a full glass or cup to mouth, walk outdoors on flat ground, wash and dry self, bend to pick clothes from the floor, turn faucets on or off, get in and out of a bus, car, train or airplane, walk 2 miles if desired, and participate in recreational activities or sports.

Psychological status: Scale of 0 to 10, 10 being impossible, on ability to get a good night's sleep, deal with feelings of anxiety or nervousness, and deal with depression or feeling blue.

Pain, fatigue scale and global assessment: Scale of 0 to 10, 10 being the most severe, in the past week.

Joint count: Score of 0 to 48, for number of painful joints (fingers, wrists, elbows, shoulders, hips, knees, ankles, and toes) to a maximum of 48.

Statistical Methods

Results were expressed as mean ± standard deviation (SD), analysis of variance by ANOVA and post hoc analysis with LSD tests was applied for comparing differences among groups. Qualitative data were expressed in the form of numbers and percentages and comparison between data was performed by using the Chi-square test. Z test (test of proportion) was used for comparison of two proportions. The correlation between variables was calculated using the Pearson's and the Spearman correlation tests. The criterion for statistical significance was set at P< 0.05. All calculations were carried out using a standard statistical package (SPSS Inc., version 19, Chicago, USA)

RESULTS

Demographic Data and Characteristic of Study

The enrolled number of the study 550 participants, their mean age 46.75±14.3, male to female ratio 1.35:1 with a mean period of dialysis was 10.06±4.9 year; characteristic data of the study groups was available, with a non-significant difference in between the three groups regarding age and gender, while HD duration was higher in the third group than other two groups and the mean value of Ca, p and iPTH was intended higher in group 3 than other groups according to study design (Table I).

Frequency and Significant Difference of Locomotor System Disorders in HD Populations and Different Groups

75% of hemodialysis patients suffered from one or more locomotor system disorders and the commonest was bone pain 60%, followed by muscle cramps 36%, proximal muscle weakness 30%, osteoarthritis 29%, osteoporosis 16%, rotator cuff syndrome 15%, gout pre-HD 12.5%, carpal tunnel syndrome 12%, bone fragility fracture 7%, fibromyalgia 7%, tenosynovitis 6%, periarticular calcification 5%, Dupuytren's contracture 2%, septic arthritis, osteomyelitis 0.9% and without any attack of new onset post-HD gout.

The spectrum of CKD-BMD in the current study was 27% low-turnover renal osteopathy, 23% the target of the NKF-KDOQI and 50% high turnover bone disease.

Table I: Demographic data and characteristic of study.

Characteristic	No/Ratio (Mean±SD	According to iPTH level			p value
		Group 1 149 (27%)	Group 2 126(23%)	Group 3 275(50%)	
Age (Mean±SD)	46.75±14.3	45±17	44.4±12	47.5±14	0.06
Sex Males Females	 316 (57%) 234 (43%)	 81 (54%) 68 (46%)	 75 (60%) 51 (40%)	 160 (58%) 115 (42%)	0.65
HD duration (y)	10.06±4.9	9.2±5.1	9.7±4.2	11±6.6[ab]	<0.005*
Calcium (mg/dL)	9.8±2.66	9.5±1.7	9.7±0.5	10.1±1.5[ab]	<0.001*
Phosphate (mg/dL)	6.58±3. 7	3.7±1.09[b]	5.1 ±0.4	6.8±3.1[ab]	<0.001*
Ca x P product mg^2/dL^2	61.42±10.5	45.9±10.9	49.6±5.2	70.6±7.1[ab]	<0.001*
iPTH (pg/mL)	673.2±601.9	48±29	244±56[a]	1027±510[ab]	<0.001*
ALP (IU/L)	167±90.5	86 ±16	127±11	242±69	<0.001*

* Statistically Significant

Non significant difference in between the three groups regarding the prevalence of rotator cuff syndrome, gout, tenosynovitis, Dupuytren's contracture, septic arthritis, osteomyelitis, and fibromyalgia. While the prevalence of osteoarthritis, muscle cramps, proximal muscle weakness, bone pain, spontaneous bone fracture and osteoporosis were statistically significantly higher in the high turnover bone disease group. Lastly the prevalence of periarticular soft tissue calcification was frequent in low turnover renal osteopathy group (Table II).

Correlation Between QOL and Study Parameters

Although age, gender, duration of hemodialysis, Ca, P, ALP and iPTH levels were assessed for association with QOL variables. Only associations toward worsened QOL variables were found with increasing HD duration and iPTH level respectively; functional status (r=0.37; P=0.05) (r=0.36; P=0.05), psychological status (r=0.38; P=0.03) (r=0.35; P=0.05), pain scale (r=0.36; P=0.05), (r=0.35; P=0.05), Fatigue scale (r=0.37; P=0.05) (r=0.38; P=0.03), global assessment (r=0.36; P=0.05) (r=0.40; P=0.02) and joint count (r=0.40; P=0.02) (r= 0.51; P=0.01) respectively.

Summary of QOL Responses in in Different Study Groups

Only 165 patients were able to complete the self-administered questionnaire without assistance. QOL variables worsen in HD patients, however the second group (target of the NKF-KDOQI) patients have a better quality of life than other groups P<0.001 (Table III).

Most of our patients functional status were able to dress, get in and out of bed, lift a full glass or cup to mouth, walk outdoors on flat ground, wash and dry self, bend to pick clothes from the floor, turn faucets on or off but unable to get alone in and out of a bus, car, train or airplane, walk 2 miles, and participate in recreational activities or sports. Psychologically, our patients lacked serious psychiatric illness, dealt with feelings of anxiety or nervousness, and they were unable to get a good night's sleep. Our patients suffered from a moderate degree of fatigue and mild to moderate pain.

DISCUSSION

In hemodialysis patients, all parts of the locomotor system may be involved and most of the patients show evidence for more than one kind of bone involvement (18). In the past decade, numerous studies have shown that the disturbances in mineral metabolism, such as elevated plasma calcium, phosphorus and intact parathyroid hormone levels increase morbidity and mortality risk in hemodialysis patients (19,20). For that reason, the NKF-KDOQI published their guideline for bone metabolism and disease in CKD (6). Locomotor system disorders have an impact on health-related QOL as well HD patients have been reported to have a compromised QOL (21).

The results of this study recorded that 75% of hemodialysis patients suffered from one or more locomotor system disorders that appear agreeable with another study that found two-thirds of HD patients develop locomotor system disorders and that incidence goes up with the duration of dialysis (7).

The commonest locomotor system disorders in the current study were bone pain 60%, followed by muscle cramps 36%, proximal muscle weakness 30%, osteoarthritis 29%, osteoporosis 16%, rotator cuff syndrome 15%, gout pre-HD 12.5%, carpal tunnel syndrome 12%, bone fragility fracture 7%, fibromyalgia 7%, tenosynovitis 6%, periarticular

Table II: Frequency and significant difference of locomotor system disorders in HD populations.

Locomotor system disorders Total study (550)		Group 1 149 (27%)	Group 2 126 (23%)	Group 3 275 (50%)	p value
Osteoarthritis (OA)	160 (29%)	33 (22%)	11 (9%)	116 (42%)[b]	<0.002*
Rotator cuff syndrome (RCS)	82 (15%)	15 (10%)	11 (9%)	56 (20%)	0.06
Muscle cramps (MC)	198 (36%)	28 (19%)	15 (12%)	155 (56%)[ab]	<0.001*
Proximal muscle weakness	165 (30%)	32 (21%)	13 (10%)	120 (44%)[b]	<0.001*
Bone pain (BP)	330 (60%)	55 (36%)	49 (39%)	226 (82%)[b]	<0.000*
Gout pre-HD (G)	69 (12.5%)	17 (11.5%)	15 (12%)	37 (13.5%)	0.80
Carpal tunnel syndrome. (CTS)	66 (12%)	10 (7%)	15 (12%)	41 (15%)	0.06
Dupuytren's contracture	12 (2%)	3 (2%)	2 (1.5 %)	7 (2.5%)	0.82
Periarticular soft tissue calcification.	28 (5%)	16 (11%)[bc]	0 (0%)	12 (4%)	<0.001*
Tenosynovitis (TS). Trigger finger	33 (6%)	6 (4%)	12 (10 %)	15 (5.5%)	0.84
Fibromyalgia (FM)	39 (7%)	6 (4 %)	6 (5 %)	27 (10 %)	0.06
Osteomyelitis (OM)	5 (0.9%)	0 (0 %)	0 (0 %)	5 (2 %)	0.09
Fragility fracture (F)	40 (7%)	3 (2 %)	0 (0%)	37 (13.5%)[a]	<0.005*
Septic arthritis (SA)	5 (0.9%)	0 (%)	0 (0 %)	5 (2 %)	0.09
Osteoporosis (OM)	89 (16%)	21 (14%) [b]	4 (3%)	64 (23 %) [b]	<0.001*

[a] indicates a significant difference as compared to group 1
[b] indicates a significant difference as compared to group 2
[c] indicates a significant difference as compared to group 3
* Significant

Table III: QOL Responses in in HD populations.

Patient variable	Mean ±SD	Group1 149	Group 2 126	Group 3 275	p Value
Functional status	3.24 ± 2.54	2.4 ± 0.6	1.9 ± 0.5[ac]	5.4 ± 0.9	<0.001
Psychological status	3.13 ± 1.67	2.9 ± 0.7	1.8 ± 0.4[ac]	4.7 ± 0.8	<0.001
Pain scale	4.05 ± 2.1	3.8 ± 0.8	2.1 ± 0.6[ac]	6.1 ± 1.1	<0.001
Fatigue scale	4.95 ± 2.4	4.9 ± 1.1	2.7 ± 0.7[ac]	7.1 ± 1.3	<0.001
Global assessment	3.97 ± 1.95	4.1 ± 0.9	2.0 ± 0.5[ac]	5.7 ± 1.2	<0.001
Joint count	9.65 ± 9.95	10 ± 3.2	4.0 ± 1.5[ac]	15 ± 4.1	<0.001

[a] indicates a significant difference as compared to group 1
[c] indicates a significant difference as compared to group 3

calcification 5%, Dupuytren's contracture 2%, septic arthritis 0.9% and osteomyelitis 0.9%.

Bone pain was present in 60% of the patients, which appears comparable with other study results (22) that detected 52% of their patients complained of bone pain. The obstinate results less than 30% of patients complained of bone pain prevailed by another study (23). This difference could be justified by that most of our patients 50% had secondary hyperparathyroidism with high iPTH > 300 pg/mL.

Muscle cramps were present in 36% of the present study, which appeared to agree with other study reporting a rate of 31% (23). Nevertheless, a higher result, 52% was demonstrated

by other study (22). Disturbed mineral metabolism, according to the NKF-KDOQI guideline is associated with more muscle cramps in HD patients (22). Therefore the different mineral levels between these studies were rationalized the different results. Proximal muscle weakness represents 30% of the present study, comparable result obtained by other, 26% (24) which asses CKD-MBD in pre-dialysis stage 4 and 5 CKD patients, consequently the HD process may aggravate muscle weakness.

Osteoarthritis represents 29 % of our patient study, touching results, 32.6 % obtained by other study (25), while eminent results 59.4% proposed by other (22). Osteoarthritis a disease of wear and tear so years of patients is an important factor, the mean age of this study 46.7 years while the mean age of the previous study 62.4 y.

Osteoporosis represents 16% of our patient study, comparable results, 13% obtained by other study (22). The advanced age, low BW, low serum albumin level, and high ALP and iPTH levels were associated with a low bone mass in the hemodialysis patients, consequently the slight difference in results between the studies.

In the current study the prevalence of rotator cuff syndrome, carpal tunnel syndrome, tenosynovitis and dupuytren's contracture were 15%, 12%, 6% and 2% respectively. Matching results obtained by other studies, 17.9 %, 11.5%, 6.3% and 3%, respectively (23, 26), yet dissimilar results obtained in other studies (25, 27). These differences were ascribed to HD duration and amyloid deposition, older age and association with diabetes. (26), really all higher results were associated with higher prevalence of diabetic patients than this study as only 16% of our patient study was diabetics.

Fragility fracture represents 7% of the total student population and nearly all of them had markedly elevated iPTH levels. Other studies demonstrated a wide variation in the results of bone fracture among hemodialysis patients it varies from 3.1% to 26% (23, 28). Actually, this wide variant linked to different levels of iPTH.

Gout pre-HD represents 12.5% of the study population and it is not surprising that neither exacerbation nor new onset of gouty arthritis, through the period of the study, since it is uncommon to have a first attack of gout while on HD, as the HD process removes uric acid from the serum (29). Monocytes in ESRD patients have been shown to produce lower amounts of Interleukin-1β, Interleukin-6, and tumor necrosis- α factor when stimulated by monosodium urate crystals (30).

Fibromyalgia represents 7% of the study population, fibromyalgia, a disorder of widespread muscle aching with a female predominance, was no more prevalent in HD patients than in the general population, whoever equalizing results 7.4 % obtained by other study (31).

Periarticular soft tissue calcification symbolizes 5% of the study population, similar results, 4.9 % obtained by others (29). A dynamic bone disease, Ca xP product, vitamins D and K overload, aluminum intoxication, metabolic alkalosis, and tissue injury are implicated in pathogenesis of soft tissue calcification (32,33).

iPTH level, assorted our study population into three groups. The first group low- turnover renal osteopathy (adynamic bone disease), the second was the optimal group, target of the NKF-KDOQI and the third high turnover bone disease (2^{nd} hyperparathyroidism), the three groups represented by 27%, 23% and 50% respectively. Comparable results obtained by other studies, 30%, 25%, 45%, respectively (34), 13%, 22%, 55%, respectively (35), likewise 18%, 33% and 49% respectively (36). However, these results expressed need for more expensive medication to control secondary hyperparathyroidism to achieve the target of the NKF - KDOQI.

The prevalence of muscle cramps, bone pain, spontaneous bone fracture and osteoporosis were eminent in high turnover bone disease. These results supported by results by results obtained by other studies (22,24,28). Hence the importance to achievement of target of the NKF-KDOQI to minimize such complications.

30% of our HD patients completed the QOL questionnaire without assistance and their mean functional status, psychological status, pain scale, fatigue scale, global assessment and joint count were 3.24, 3.13, 4.07, 4.95, 3.97 and 9.65 respectively, hence the locomotor system involvement in our hemodialysis patients pronouncedly compromises the QOL.

In comparison to other studies, slightly better results obtained by other study as their mean functional status, psychological status; pain scale, fatigue scale, global assessment and joint count were 2.11, 1.43, 3.31, 4.48, 3.65 and 7.48 respectively (23). In the current study the higher duration of HD and iPTH level beside worsen QOL variables with increasing HD duration and iPTH level, may explicate such conflict. Precisely control secondary hyperparathyroidism and achievement the target level of iPTH is mandatory to accomplish good quality of life.

CONCLUSIONS

Locomotor system involvement is still very common in our hemodialysis population and can compromise the QOL, which necessitate more attention in its prevention and treatment by the physicians.

The prevalence of osteoarthritis, muscle cramps, bone pain, spontaneous bone fracture, osteoporosis were more eminent in high turnover bone disease, consequently the importance to achieve the target of the NKF-KDOQI to derogate such complications.

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