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FREQUENCY OF MUSCULOSKELETAL DISORDERS AMONG DIALYSIS PATIENTS WITH CHRONIC KIDNEY DISEASES IN INSTITUTE OF KIDNEY DISEASES, HAYATABAD PESHAWAR, A CROSSCTIONAL STUDY

Hifsa Inam Durrani[1], Muhammad Rehman[2], Hafiz Yaseen Khan[3], Fanoos Hayat[4] , Dr Marish Memon[5], Hafiz Abdul Samad Mujeeb[6], Nawal Fazal[7], Sultan Shahabud Din Muhammad[8]

[1]Doctor of Physical Therapy Department, Jamil Medical Institute Nowshera
[2,4,7]Department of Allied Health Sciences, Kohat Univrsity of Science and Information Technology (KUST), Pakistan
[3]Department of Health Sciences, City Univrsity of Science and Information Technology (CUSIT), Pakistan
[5]Institute of Physiotherapy and Rehabilitation Sciences, Peoples University of Medical and Health Sciences for Women Shaheed Benazirabad, Sindh Pakistan
[6,8]MBBS Student, Kabir Medical College, Peshawar, Pakistan

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Corresponding Author:
Hafiz Yaseen Khan
Lecturer, Department of health sciences, City University of science and information technology (CUSIT), Pakistan
dryaseenkhan11@gmail.com

ABSTRACT

Background: Musculoskeletal (MSK) disorders are frequently observed in patients with chronic kidney disease (CKD), particularly those undergoing dialysis. Dialysis, which purifies blood when kidney function declines, can lead to electrolyte imbalances and increased protein and uric acid levels, resulting in muscle deterioration and regional MSK issues.
Objective: To assess the frequency of MSK disorders among dialysis patients with CKD at the Institute of Kidney Diseases, Hayatabad, Peshawar.
Methods: A descriptive cross-sectional study was conducted from March to October 2022, involving 100 dialysis patients (47 males, 53 females) selected through convenience sampling. Patients with rheumatic disorders, limb amputations, joint restrictions due to skin lesions or contractures, or those unwilling to participate were excluded. The Nordic Musculoskeletal Questionnaire was used for data collection.
Results: Pain in the last 12 months was most commonly reported in the knee (53%), followed by the shoulder and lower back (46%), ankle (36%), and neck (30%). Activity limitation

	was highest in the knee (48%) and shoulder/lower back (38%). Pain in the last 7 days was also most frequent in the knee (38%). **Conclusion:** MSK disorders are highly prevalent among dialysis patients, with the knee being the most commonly affected area. Female patients showed slightly higher prevalence.

INTRODUCTION

Backgraound:

Chronic kidney disease is an vast public health problem, worldwide that is related to high morbity and mortality(1).Skeletal muscle mass and muscle function are negatively affected by different conditions intrinsic to chronic kidney disease (CKD) and to dialysis treatment(2).

End-stage renal disease (ESRD) is related with chronic kidney disease-mineral and bone disorder (CKD-MBD); including renal osteodystrophy, and biochemical changes reflecting mineral and hormonal abnormalities. CKD-MBD can lead to serious musculoskeletal manifestations with an impact on the daily activities of patients(3).

Chronic kidney disease:

The kidneys are central to homeostasis, regulate blood pressure, water, sodium, potassium, acidity, bone minerals, and haemoglobin. But their main function is the excretion of the waste products of metabolism in urine. About 22 % of cardiac output goes to the kidneys and about 20 % of the plasma is filtered, producing about 170 L of glomerular filtrate per day. Ninety-nine percent of this is reabsorbed as it flows along the nephrons so only about 1.5 L of urine is produced per day(4). Chronic kidney disease (CKD) is a syndrome defined as persistent alterations in kidney structure, function or both with implications for the health of the individual Examples of structural abnormalities include cysts, tumours, malformations and atrophy, which are evident on imaging(5).

Current international guidelines define this condition as decreased kidney function shown by glomerular filtration rate (GFR) of less than 60 mL/min per 1·73 m^2, or markers of kidney damage, or both, of at least 3 months duration, regardless of the underlying cause. Diabetes and hypertension are the main causes of CKD in all high-income and middle-income countries, and also in many low-income countries(6).

The chronic kidney disease have five stages. Stage 1 is Kidney damage with a normal Glomerular filtration rate (GFR) or GFR ≥90, stage 2: Kidney damage with mild decrease in GFR or GFR 60–89, stage 3: Moderate decrease GFR or GFR 30–59, stage 4: Severe decrease in GFR or 15–29 and stage 5: Kidney failure (dialysis) or end stage renal failure <15 mL/min per 1.73 m2 respectively(7).

The causes of CKD include diabetes, hypertension, chronic glomerulonephritis, chronic pyelonephritis, chronic use of anti-inflammatory medication, autoimmune diseases, polycystic kidney disease, Alport disease, congenital malformations,and prolonged acute renal disease(8).

Kidney dysfunction can appear as hypertension, edema, changes in output or quality of urine and delayed growth children; the changes are recognized by increased serum levels of creatinine, cystatin C or blood nitrogen(5). Continous uraemia, anaemia, volume overload, electrolyte abnormalities, mineral and bone disorders, and acidaemia,are the signs and symptoms of kidney failure and automatically lead to death if left untreated(9).

The Kidney Disease Improving Global Outcomes Clinical Practice Guidelines recommend initiating dialysis when there are symptoms or signs that are indicative of kidney failure (e.g., serositis, acid-base or electrolyte abnormalities, or pruritus). Some of the symptoms include the inability to control the extracellular fluid volume status or blood pressure, progressive deterioration in nutritional status refractory to dietary intervention, or development of cognitive impairment(10).

Dialysis

Dialysis remains the prevailing treatment option for most people with kidney failure.Kidney failure requiring dialysis is often associated with substantially reduced quality of life and high mortality rates, especially in the first year after transition to dialysis(9).

Dialysis therapy is life-saving, but underlying systemic diseases and related painful syndromes such as ischaemic limb, musculoskeletal or neuropathic symptoms persist during **hemodialysis**, diffusion of solutes between the blood and a dialysis solution results in the removal of metabolic waste products and the replenishment of body buffers. Heparinized blood is pumped through a plastic dialyzer at flow rates of 300 to 500 ml per minute, while dialysate flows in the opposite direction at 500 to 800 ml per minute in order to remove waste products. Resulting urea clearance rates of 200 to 350 ml per minute effect a 65 to 70 percent reduction in the blood urea nitrogen concentration during a three-to-four-hour treatment session(11).

The modality of choice in newborns and infants who develop acute kidney injury (AKI) is acute peritoneal dialysis (PD) following surgery for congenital heart disease or from sepsis. Nowadays Acute PD is the best modality for managing uncomplicated or primary kidney disease causing acute kidney injury (AKI), such as glomerular diseases, acute tubular necrosis due to ischemia and/or drugs and hemolytic-uremic syndrome(12). Fatigue, limited exercise tolerance, proximal muscle weakness, and muscular atrophy frequently develop in uremic patients without specific pathologic changes. one of the factors leading to poorly understood uremic myopathy is Low-protein diet(13).

All records of physical function decreased according to the development of CKD. In CKD stage 4 or 5 patients the physical function index was notably lower as compared to CKD stage 2 or 3 patients(14). Musculoskeletal (MSK) symptoms are one of the most important health problems that affect patients on maintenance HD. Half of the patient of CKD is affected from MSK problems. Persisted symptoms may lead to disturbed sleep, memory, and even physical and social activities which badly affect QoL in HD patients(15).

Musculoskeletal disorder

Musculoskeletal disorders (MSDs) are injuries or dysfunctions of muscles, bones, nerves, tendons, ligaments, joints, cartilages, and spinal disc. Musculoskeletal disorders in patients with CKD are resulted from abnormal mineral metabolism and extraskeletal calcification(7).

One of very common symptom in patients with chronic kidney disease (CKD) is Chronic Musculoskeletal pain (CMP), and is related with a remarkable deterioration in quality of life(16).

The cause of uremic myopathy is complex including physical inactivity, reduced protein intake, vitamin D defificiency, hyperparathyroidism, metabolic acidosis, electrolyte disorder, low serum levels of testosterone, resistance to growth hormone and insulin, accumulation of uremic toxins, and carnitine defificiency, which can lead to mitochondrial dysfunction(17).

The joints, soft tissues, or both are involved in long term musculoskeletal problems with Chronic Kidney disease patients. Crystal induced arthropathy, most commonly caused by basic calcium phosphate crystals, is an important cause of acute joint inflammation in patients with kidney failure. A triad of shoulder periarthritis,carpal tunnel syndrome (CTS), and flexor tenosynovitis of the hands has been described in patients on long-term HD and PD and has been attributed to β2-

microglobulin amyloid deposition. Patients undergoing dialysis has increased risk of septic arthritis. Dialysis is also related with an erosive or a destructive arthropathy of the finger joints, which is not explained by local amyloid deposition(18). In patients with end-stage kidney disease undergoing haemodialysis Chronic pain due to musculoskeletal problems is common.most of the hemodialysis patients have one or more musculoskeletal problems, among which muscle cramps, myalgias and arthralgias are most common.

On report of the body regions, maximum number of patients reported pain in the last 1 year in the knee (51.5%) and the ankle (48%), followed by thigh (35%) and 1 upper back (32%), followed by neck (26%) and low back (25.5%), followed by left shoulder (13.5%) and both shoulders (13.5%), right shoulder (8.5%) and right elbow (8.5%) were the least common symptoms(19). This multicentric worlwide study involving 16 558 patients from 26 countries found the mean prevalence of chronic pain in hemodialysis patients to be 60.5%, and the mean prevalence of moderate or severe pain was 43.6%. Although limited, pain prevalence data for peritoneal dialysis patients (35.9%), those managed conservatively without dialysis (59.8%), those following withdrawal of dialysis (39.2%), and patients with earlier GFR category of CKD (61.2%) suggest similarly high prevalence rates(20).

1.2 RATIONALE

The aim of our study is to highlight the frequency of musculoskeletal disorders among dialysis patients with chronic kidney diseases in institute of kidney diseases, Hayatabad Peshawar, a cross-sectional study. According to the studies, the information about msk disorders in dialysis patients in Pakistan population is very little as compared to other countries. The lack of research leaves a profound gap in msk disorders in dialysis patients in chronic kidney disease epidemiology and knowledge in the Pakistan.

1.3 OBJECTIVE

To find the frequency of musculoskeletal disorders among dialysis patients with chronic kidney diseases in institute of kidney diseases, hayatabad peshawar, a crossctional study.

1.4 OPERATIONAL DEFINITIONS

- Arthralgia: Pain in the joint.
- Myalgia: Pain in a muscles and group of muscles.
- Septic arthritis: It is a painful infection in a joint due to microorganisms like virus, bacteria, and fungi, travel through blood stream from another part of body.
- Arthropathy: It is a joint disease that can be associated with hematologic disorders or an infections. Arthritis in its type.
- Renal osteodystrophy: It is a bone disease that occurs in adult and children's with chronic kidney disease.

METHODOLOGY

The present study employed an observational cross-sectional survey design conducted at the Institute of Kidney Diseases, Hayatabad, and Peshawar. The study population included both male and female participants diagnosed with chronic kidney disease (CKD). The study was carried out over a period of six months. A non-probability convenience sampling technique was used to select the participants. The inclusion criteria comprised patients undergoing dialysis for chronic kidney disease, aged between 26 and 60 years, and having received dialysis for a duration of six months to six years or more. Exclusion criteria included patients below 26 years or above 60 years of age, those on dialysis for less than six months, individuals with a history of chronic rheumatic disorders

such as rheumatoid arthritis, patients with upper or lower limb amputations, restricted joint motion due to skin lesions or contractures, and those with any medical condition other than chronic kidney disease. Ethical approval for the study was obtained from the Review Committee of Pakistan Educational Foundation (PEF) University, and formal permission was granted by the Director of PEF. Informed consent was also obtained from all participants. Data were collected using the standardized Nordic Musculoskeletal Questionnaire (NMQ), a validated tool designed to assess musculoskeletal (MSK) disorders, particularly in dialysis patients up to the age of 60. Participants were identified, briefed about the questionnaire, and guided regarding the types of questions included. The data collection was carried out after securing permission from the head of the selected department. The entire procedure included ethical approval, use of the Nordic Questionnaire, obtaining informed consent, and familiarizing participants with the study tool.

RESULT

Demographic Data: Shows total n= 100 dialysis patients, among them male n= 47 and female n=53 having dialysis in institute of kidney diseases Peshawar. In age 30 and below (33.0%), age 31-45 (34.0%), and 46-60 years (33.0%) of the participants. 13.0% patients were doing job and 87.0% were not doing job.

Table 1 Demographic Data

		Count	Column N %
Age of the participants	below-30	33	33.0%
	31-45	34	34.0%
	46-60	33	33.0%
Gender of the participants	Male	47	47.0%
	Female	53	53.0%
Job of the participants	Doing job	13	13.0%
	not doing job	87	87.0%

The frequency of 12-month period prevalence and restrictions in activities and 7-day point prevalence of MSK symptoms (ache, pain, discomfort, numbness) is shown in table 2. According to the body regions, maximum number of patients reported pain in the last 12 months in the knee (53.0%) followed by shoulder and lower back (46.0%) respectively, ankle (36.0%), neck (30.0%), upper back (25.0%) and hips/ thighs (19.0%), elbow (12.0%) and wrist (0.0%) was the least common symptoms. N=100 participants having restrictions in activity in last 12 months in the knee (48.0%) followed by shoulder and lower back (38.0%), ankle (32.0%), neck (21.0%), upper back (25.0%), hips/ thighs (11.0%), elbow (8.0%) and wrist (0.0%) was the least common in restrictions. In 100 participants pain during last 7 days is in the knee (38.0%) followed by shoulder (23.0%), lower back (22.0%), ankle (20.0%), neck (13.0%), upper back (10.0%), hips/ thighs (6.0%), elbow (3.0%) and wrist (0.0%) was the least common in symptoms.

Table 2: Number of MSK discomforts, pain and restrictions per individual in the last 12 months and 7 days using Nordic MSK Questionnaire among the studied group (*n* = 100)

	Pain during last 12 months	Restriction in activity in last 12 months	Pain during last 7 days
	YESS	YESS	YESS
	(frequency)	(frequency)	(frequency)
Neck	30	21	13
Shoulder	46	38	23
Elbow	12	8	3
Wrist	0	0	0
Upper back	25	18	10
Lower back	46	38	22
1Hips/Thighs	19	11	6
Knees	53	48	38
Ankles/knees	36	32	20

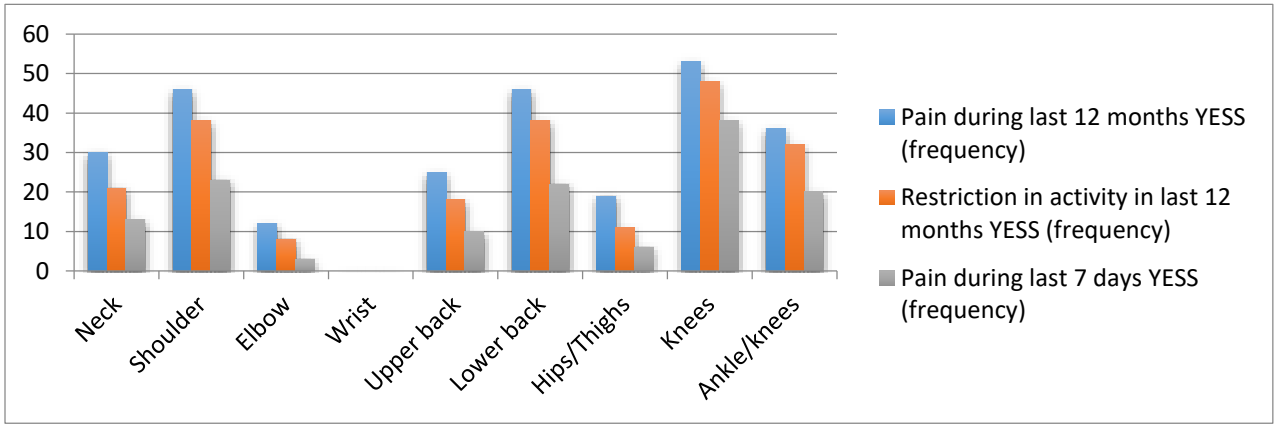

Figure 2:MSK symptoms as pain and restrictions present in the last 12 months and 7 days duration using Nordic MSK Questionnaire among the studied group (*n* = 100).

Table 3 shows the participants nor having pain in 12-month period and neither restrictions in activities and have no 7-day point prevalence of MSK symptoms (ache, pain, discomfort, numbness). According to the body regions, maximum number of patients reported no pain in the last 12 months in the wrist (100.0%) followed by elbow (88.0%), hip/thighs (81.0%), upper back (75.0%), neck (70.0%), ankles (64.0%), shoulder and lower back (54.0%), knees (47.0%) was the least common had no symptoms. N=100 participants having no restrictions in activity in last

12 months in the wrist (100.0%) followed by elbow (92.0%), hip/thghs (89.0%), upper back (82.0%), neck(79.0%), ankle (68.0%), shoulder and lower back (62.0%) and knees (52.0%) was the least common had no restrictions. In 100 participants having no pain during last 7 days is in the wrist (100.0%) followed by elbow (97.0%), hip/thighs (94.0%), upper back (90.0%), neck (87.0%), ankle (80.0%), lower back (78.0%), shoulder (77.0%) and knees (62.0%) was the least common had no symptoms.

Table 3: Number of MSK discomforts, pain and restrictions per individual in the last 12 months and 7 days using Nordic MSK Questionnaire among the studied group (*n* = 100)

	Pain during last 12 months	Restriction in activity in last 12 months	Pain during last 7 days
	NO	NO	NO
	(frequency)	(frequency)	(frequency)
Neck	70	79	87
Shoulder	54	62	77
Elbow	88	92	97
Wrist	100	100	100
Upper back	75	82	90
Lower back	54	62	78
Hips/Thighs	81	89	94
Knees	47	52	62
Ankles/knees	64	68	80

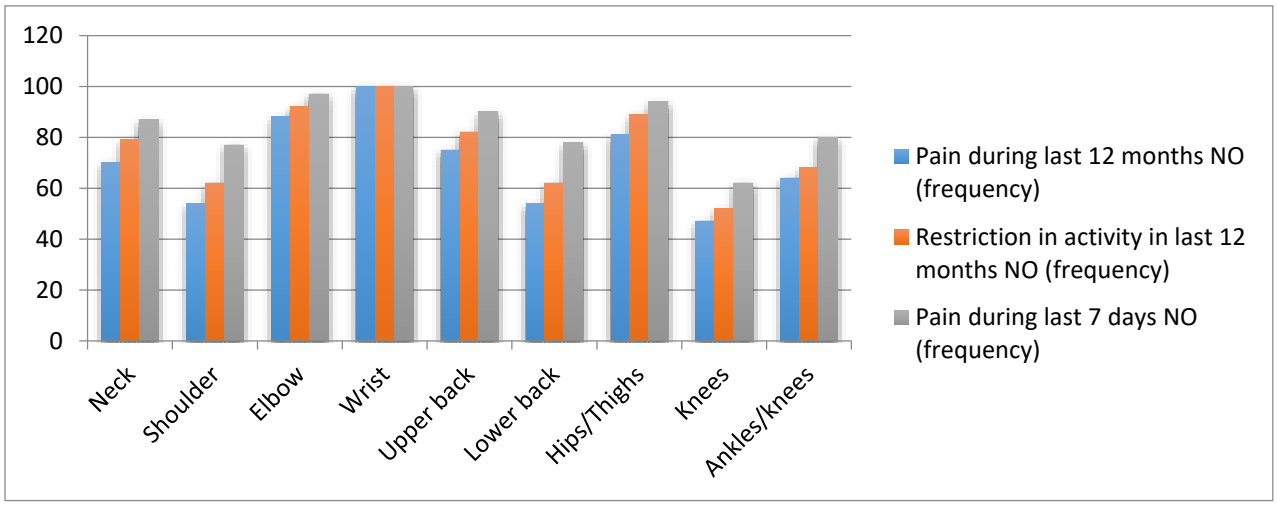

Figure 3:MSK symptoms as pain and restrictions not present in the last 12 months and 7 days duration using Nordic MSK Questionnaire among the studied group (*n* = 100).

The frequency of presence and absence of 12-month period prevalence and restrictions in activities in last 12-months and 7-day point prevalence of MSK symptoms (ache, pain, discomfort, numbness) is shown in table 4. According to the body regions, maximum number of patients reported pain in the last 12 months in the knee (53.0%) followed by shoulder and lower back (46.0%) respectively, ankle (36.0%), neck (30.0%), upper back (25.0%) and hips/ thighs (19.0%), elbow (12.0%) and wrist (0.0%) was the least common symptoms. According to the body regions, maximum number of patients reported no pain in the last 12 months in the wrist (100.0%) followed by elbow (88.0%), hip/thighs (81.0%), upper back (75.0%), neck (70.0%), ankles (64.0%), shoulder and lower back (54.0%), knees (47.0%) was the least common had no symptoms. N=100 participants having restrictions in activity in last 12 months in the knee (48.0%) followed by shoulder and lower back (38.0%), ankle (32.0%), neck (21.0%), upper back (25.0%), hips/ thighs (11.0%), elbow (8.0%) and wrist (0.0%) was the least common in restrictions. participants having no restrictions in activity in last 12 months in the wrist (100.0%) followed by elbow (92.0%), hip/thghs (89.0%), upper back (82.0%), neck(79.0%), ankle (68.0%), shoulder and lower back (62.0%) and knees (52.0%) was the least common had no restrictions. In 100 participants pain during last 7 days is in the knee (38.0%) followed by shoulder (23.0%), lower back (22.0%), ankle (20.0%), neck (13.0%), upper back (10.0%), hips/ thighs (6.0%), elbow (3.0%) and wrist (0.0%) was the least common in symptoms. Participants having no pain during last 7 days is in the wrist (100.0%) followed by elbow (97.0%), hip/thighs (94.0%), upper back (90.0%), neck (87.0%), ankle (80.0%), lower back (78.0%), shoulder (77.0%) and knees (62.0%) was the least common had no symptoms.

Table 4: Number of MSK discomforts, pain and restrictions per individual in the last 12 months and 7 days using Nordic MSK Questionnaire among the studied group (*n* = 100)

	Pain during last 12 months		**Restriction in activity in last 12 months**		**Pain during last 7 days**	
	YESS	NO	YESS	NO	YESS	NO
	(frequency)	(frequency)	(frequency)	(frequency)	(frequency)	(frequency)
Neck	30	70	21	79	13	87
Shoulder	46	54	38	62	23	77
Elbow	12	88	8	92	3	97
Wrist	0	100	0	100	0	100
Upper back	25	75	18	82	10	90
Lower back	46	54	38	62	22	78
Hips/Thighs	19	81	11	89	6	94
Knees	53	47	48	52	38	62

Ankle/knees	36	64	32	68	20	80

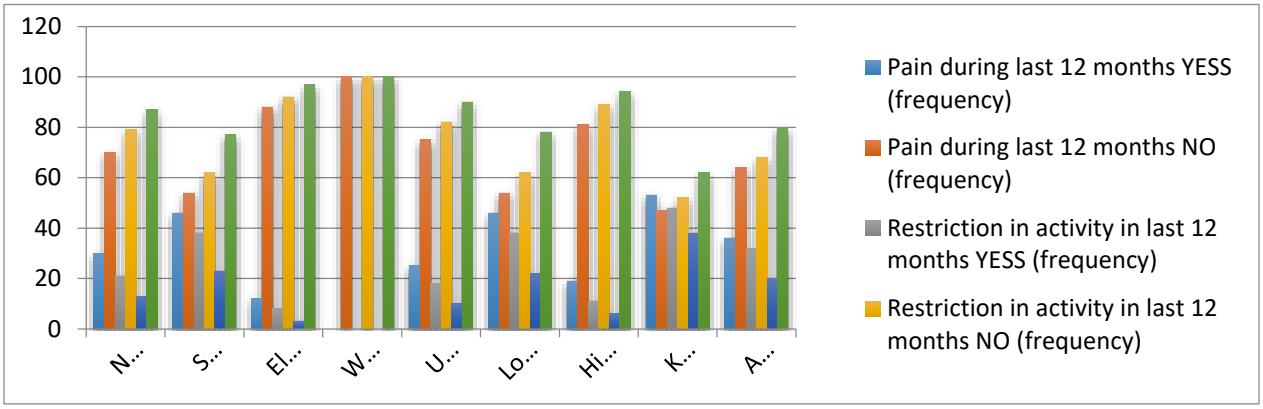

Figure 4: MSK symptoms as pain and restrictions in the last 12 months and 7 days duration using Nordic MSK Questionnaire among the studied group (n = 100)

DISCUSSION

Msk problem in CKD patients are mostly neglected to discuss. As far as our knowledge this is the first study conducted in Peshawar Pakistan which focuses on msk problem in CKD patients having dialysis. In current study we want to find out the frequency of msk problem in CKD patients we use Nordic questionnaire to find out which region of the body is mostly effected in CKD patients The main aim of our study is to find out how the quality of life is effected from dialysis we collect data from Institute of kidney disease patients in Hayatabad Peshawar. In addition the consent form and personal interviews were taken.

Out of n=100 participants, n=47 were **males,** among them n=37 participants presented msk disorders mostly in age 30 years and below. The remaining n= 10 participants were not having any msk disorders mostly in age 46-60 years. Out of n=100 participants, n=53 were **females**, out of which n=45 participants were having msk disorders mostly in age 31-45years and n=8 participants were not having any msk problems in age 30 years and below. In total out of 100 participants n=82 were having msk disorders except n=18 participants don't experienced any msk condition. According to the body regions, maximum number of patients reported pain in the last 12 months in the knee (53.0%) followed by shoulder and lower back (46.0%) respectively, ankle (36.0%), neck (30.0%), upper back (25.0%) and hips/ thighs (19.0%), elbow (12.0%) and wrist (0.0%) was the least common symptoms.

N=100 participants having restrictions in activity in last 12 months in the knee (48.0%) and the shoulder and lower back (38.0%), followed by ankle (32.0%) and neck (21.0%), followed by upper back (25.0%) and hips/ thighs (11.0%) and elbow (8.0%), and wrist (0.0%) were the least common in restrictions.(39)

In 100 participants pain during last 7 days is in the knee (38.0%) and the shoulder (23.0%) and lower back (22.0%), followed by ankle (20.0%) and neck (13.0%), followed by upper back (10.0%) and hips/ thighs (6.0%) and elbow (3.0%), and wrist (0.0%) is the least common region of symptoms.

A study was done by Ashby D et al in April 2008 and described data of 46 long term hemodialysis patients and concluded that musculoskeletal problems are present in 78% of patients that increases with dialysis vintage(35). In our study carried out in Peshawar hayatabad shows that pain is mostly prevalent in patients but do not depend on dialysis vintage.

A study carried out by Dr Rabiqa et al in 2018 stated that the frequency of pain and numbness in right shoulder is(16.0%) and on left shoulder (13.3%) patients felt pain and numbness, patients complain of pain in elbows are (2.7%), the patients complaining of pain in wrist is (3.3%) the patient complaining of upper back numbness and pain are (30.07%),the patient having pain and numbness in hip and thighs are (80.0%), the patient who have pain and numbness in knees are (18.7%), the patients having pain and numbness in ankles are (78.0%) (26)

Another research was carried by Tanvi Balvalkar n Mumbai concluded that in most of the CKD patients ankle is the region which have most msk problem that is 56% followed by lower back (52%) and knee (50%)(20), our study corresponds as patients reported pain in the last 12 months in the knee (53.0%) followed by shoulder and lower back (46.0%) respectively, ankle (36.0%), neck (30.0%), upper back (25.0%) and hips/ thighs (19.0%), elbow (12.0%) and wrist (0.0%).

A study conducted by Amany R EL Najjar in Egypt stated that joint pain (arthralgia) is the most common symptom of hemodialysis patients that is (25.3%)(18). On the other hand in our study n= 100 patients, n=47 males and n=53 were females. Participants with msk problem (82.0%) and without msk condition (18.0%). Pain is the major cause of restrictions of movements and activities in the knee, the shoulder and lower back, followed by ankle, neck, whereas elbow and wrist was the least common in restrictions. (38)

In contradiction a study done by Myasa M Haroon et al in Egypt in 2018 conclude that in n=49 participants, haemodialysis patients rheumatic and musculoskeletal disease are more prevalent especially in males and are related with chronic pain(27), as in our study more musculosketal issues are found in females (45.0%) as compared to males (37.0%).

A study carried out by Ryota Mutsuzawa in 2022 titled as Renal Rehabilitation as a management strategy for physical frailty in CKD stated that in hemodialysis patients poor physical activities especially leg muscle strength is common and it is associated with decrease walking ability and limiting their daily activities(36) (37) , As our study also concluded that most of the problem involve knee (53.0%)

CONCLUSION

This study showed that MSK disorders are common in CKD patients. Msk disorders are more prevalent in female population than in male. Males presented msk disorders mostly in age 26-30 years followed by age 46-60 years. Females were having msk disorders mostly in age 31-45years. The most effected region in body is knee (53.0%) followed by shoulder and lower back (46.0%) respectively ankle (36.0%) neck (30.0%) upper back (25.0%) hip and thigh (1.90%) elbow (12.0%) and wrist (0.0%) is the least common symptoms.

LIMITATIONS

- Only one study setting
- 6 months' time periods
- Patients repetition for dialysis 2-3 times per week

RECOMMENDTION

- More than one study settings

- Time period should be of 1 year
- Sample size should be large

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