

# Gender influence on Musculoskeletal Ultrasound (MSUS) finding among patients on maintenance haemodialysis. An Egyptian single centre study.

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## Research Article

**Keywords:** Musculoskeletal ultrasound, Gender, haemodialysis, Greater Trochanteric Pain Syndrome, Knee effusion, Carpel tunnel syndrome, Tendinopathy.

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# **Gender influence on Musculoskeletal Ultrasound (MSUS) finding among patients on maintenance haemodialysis.**

*(An Egyptian single centre study).*

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## **Acknowledgement including working group.**

**Background:** Musculoskeletal disorders remain a major problem in long term hemodialysis patients.

**Objectives:** Assessment the difference of MSUS finding among male and female haemodialysis patients.

**Methods:** Musculoskeletal ultrasound assessment of articular and extraarticular tissues.

**Result:** Fifty patients, mean age  $52 \pm 16$  years, 31 (62%) male and 19 (38%) female, maintained on regular hemodialysis (three times/ week) for  $4.4 \pm 3.8$  years.

Knee osteophytes with prepatellar effusion was the most common MSUS finding in 15/31 (48.4%) male patients while Subacromial subdeltoid bursa (SASD)bursa and planter fasciitis were evident in 2/19 (10.5%) female patients, successfully ultrasound guided corticosteroid injection.

## **Conclusion:**

Soft tissue affection (SASD bursa, planter fasciitis and prepatellar effusion) more MSUS manifestation in female than male where knee osteophytes with prepatellar effusion is evident.

**Keywords:** Musculoskeletal ultrasound, Gender, haemodialysis, Greater Trochanteric Pain Syndrome, Knee effusion, Carpel tunnel syndrome, Tendinopathy.

### **Background:**

Skeletal and joint disorders are the most common medical problem in patient undergoing on chronic haemodialysis (CHD)<sup>(1)</sup>. These include Renal osteodystrophy, periarticular calcifications, tendon rupture, microcrystalline arthropathies, and infectious arthritis<sup>(9)</sup>.

These disorders vary between male and female maintained on CHD. Ultrasonography (US) has been suggested as the modality of choice in evaluating these skeletal and joint disorder<sup>(2)</sup>.

Assessment of musculoskeletal finding by US in both male and female and bone mineral assessment in the studied groups.

### **Methods:**

Cross sectional observational study on all patients (50 patients) maintained on regular hemodialysis three times/ week for more than 6 months in Mansoura Nephrology and Dialysis Unit (MNDU) over a period of 6 months.

Were subjected to

- Complete history and physical assessment focusing on musculoskeletal system (joint, tendon, bursa).
- Musculoskeletal ultrasound assessment using conventional grey-scale ultrasound machine with a 6-12 MHz linear transducer.
- All joints (hip, knee, ankle, shoulder, elbow, wrist and small joints of hand and feet) are going to be examined for erosion, osteophyte, effusion, synovial thickness, tendon for defect, echogenicity, muscles for tears and median nerve for entrapment.
- Laboratory assessment:
  - Basic laboratory (CBC, liver function test, serum creatinine).
  - Bone mineral assessment (serum calcium, phosphorus, PTH).

### **Result:**

Fifty patients of them 31 (62%) male, median of age 58 (36-63)years, and 19 (38%) female, median of age 42 (38-66)years, maintained on regular hemodialysis (three times/ week) for median of duration in male 3 (1-6)years, Female 4 (2-8)years.

According to finding in table (1):-

#### Male predominant

- Knee osteophytes with prepatellar effusion was the most common MSUS finding in 15/31 (48.4%) patients, but 8/31 (25.8%) patients had only osteophytes and 2/31 (6.5%) patients had Jumper's knee (Proximal patellar tendinopathy).

- Greater Trochanteric Pain Syndrome was chief complain in 2/31 (6.5%) patients, successfully ultrasound guided corticosteroid injection.
- Impingement syndrome with supraspinatus tendon abnormalities as photo (2) and Biceps tendinopathy in 2/31 (6.5%) patients. Tendinopathy of the tibialis anterior tendon in 2/31 (6.5%) patients.
- Only one patient (3.2%) had Carpel tunnel syndrome that conservatively managed.

Female predominant:-

- Synovial hypertrophy in parapatellar recess was the most common MSUS finding 10/19 (52.6%) patients.
- Effusion was very common in knee and ankle joints 5/19 (26.3%) and 4/19 (21.1%) patients respectively.
- Subacromial subdeltoid bursa (SASD)bursa as photo (1) and planter fasciitis were evident in 2/19 (10.5%) patients, successfully ultrasound guided corticosteroid injection.
- Tenosynovitis in supraspinatus and biceps tendon was evident in 1/19 (5.3%) patients.

According to finding in table (2):-

Regard bone mineral assessment;

No statistically significant difference in Bone mineral disorder;

- Median of serum Ca 8.65 (8.05-8.98) mmol in male while in female 8.60 (7.50-8.80) mmol.
- Mean of serum PO<sub>4</sub> 5.78±2.23 in male, 5.13± 1.49mmol.
- Serum PTH was slightly higher in female, median 483.5 (345.50-778.75) pg/l than in male 387.50 (202.50-914.75) pg/l.
- HB level was lower in female median 10.35 (9.50-12.33) g/l and Transferrin saturation (Tsat) median19.50 (16-35.75) than male 11.15 (10.13-12.05), 21 (17.50-32) respectively.
- Ferritin level 304.30 (191.30-573.20) ng/ml in female higher than in male 191 (93.28-467.63)ng/ml.

Discussion:

Ultrasonography (US) has been suggested as the modality of choice in assessment of skeletal disorder in chronic kidney disease maintained on CHD. Gender may affect skeletal involvement in dialysis dependent patients.

In our study soft tissue predominantly affected female;

Synovial hypertrophy in parapatellar recess was the most common MSUS finding 10/19 (52.6%) patients, also knee and ankle effusion was very common 5/19 (26.3%) and 4/19 (21.1%) patients respectively, the cause of underlying effusion is still incompletely explained haemodialysis patients as "A J Ferrari et al 1997" stated that Some highly

inflammatory joint effusions in patients undergoing chronic haemodialysis are not due to pyogenic infections and may be attributable to other factors.

Subacromial subdeltoid bursa (SASD)bursa in the shoulder and planter fasciitis were evident in 2/19 (10.5%) patients that successfully ultrasound guided corticosteroid injection, in agreement of study " *Ferdinando D.etal;2015*; stated that the effusion in the SASD bursa is frequently associated with shoulder pain often independently from the underlying pathology . Tenosynovitis in supraspinatus and biceps tendon was evident in 1/19 (5.3%) patients.

While in male, mechanical pain predominate in most of them;

Knee osteophytes with prepatellar effusion was the most common MSUS finding in 15/31 (48.4%) patients, but 8/31 (25.8%) patients had only osteophytes and 2/31 (6.5%) patients had Jumper's knee (Proximal patellar tendinopathy), followed by Greater Trochanteric Pain Syndrome in 2/31 (6.5%) patients that successfully ultrasound guided corticosteroid injection.

shoulder involvement is very common among our patients; impingement syndrome with supraspinatus tendon abnormalities and Biceps tendinopathy in 2/31 (6.5%) patients, may be related to amyloid deposition, "*T Konishiike etal;1996*"concluded that one type of shoulder pain in patients on long-term haemodialysis is caused by the subacromial impingement of amyloid deposits.

Regard bone mineral assessment in both gender; no statistically significant in serum calcium and phosphorus level, but serum PTH was higher in female 483.5(345.50-778.75) pg/l,with lower level in male 387.50 (202.50-914.75) pg/l. This value are accepted in CKD maintained on CHD may due to efficient dialysis and good control of secondary hyperparathyroidism in studied patients, that in agreement with "*Zhan et al.2019*' Extended hours haemodialysis independently reduced serum phosphate levels with minimal change in serum calcium and PTH levels.

Hemoglobin level (HB) was lower in female median 10.35 (9.50-12.33) g/l and Transferrin saturation (Tsat) median 19.50 (16-35.75) than male 11.15 (10.13-12.05), 21 (17.50-32) respectively, but to some extant with normal range because most of studied patients maintained on regular haemodialysis (Three time weekly) "*Lankhorst CEetal2010*"that suggests dialysis therapy may modulate and affect key processes of anaemia and its therapy.

Ferritin level 304.30 (191.30-573.20) ng/ml in female higher than in male 191 (93.28-467.63)ng/ml, may due associated with inflammation occur in patients maintained on CHD.

## **Conclusion:**

Soft tissue affection (SASD bursa, planter fasciitis and prepatellar effusion) more MSUS manifestation in female than male where knee osteophytes with prepatellar effusion is evident; that are highly related with dialysis duration and easily management.

Bone mineral assessment are highly associated with both gender with no difference, related more to dialysis duration and efficacy that must regularly follow up.

Anemia is common complication in dialysis patients, uremia is the main cause the easily controlled by efficient dialysis.

**One of limitation in this study;** assessment of Beta2 microglobulin (b2M) and serum amyloid level and its correlation to joint manifestation.

## **List of abbreviations**

CKD= Chronic kidney dialysis, CHD= Chronic hemodialysis, PTH= parathormone hormone, HB= Hemoglobin level, s.Ca =serum calcium, S.PO4= serum phosphorus, SASD (Subacromial Subdeltoid bursa), Musculoskeletal Ultrasound (MSUS).

**DOI (Declaration of conflict of interest): no** declaration of conflict of interest).

**Ethics approval and consent to participate:** was taken by **IRB Mansoura.**

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**Table: -**

**Table (1)**

		Gender				p	
		Male		Female			
		n	%	n	%		
<i>Hand</i>	<i>Normal</i>	26	83.9%	12	63.2%	0.276	
	<i>Tenosynovitis</i>	2	6.5%	4	21.1%		
	<i>Joint effusion</i>	1	3.2%	1	5.3%		
	<i>Wasted muscle</i>	1	3.2%	2	10.5%		
	<i>Tenosynovitis+ bone erosion</i>	1	3.2%	0	0.0%		
<i>Shoulder</i>	<i>Normal</i>	28	90.3%	16	84.2%	0.276	
	<i>Tenosynovitis</i>	1	3.2%	0	0.0%		
	<i>Bursitis, biceps</i>	0	0.0%	1	5.3%		
	<i>tenosynovitis biceps and supraspinatus</i>	2	6.5%	1	5.3%		
	<i>Bursitis, biceps+ tenosynovitis biceps and supraspinatus</i>	0	0.0%	1	5.3%		
<i>Ankle</i>	<i>Normal</i>	29	93.5%	14	73.7%	0.022	
	<i>Tenosynovitis</i>	2	6.5%	1	5.3%		
	<i>Effusion</i>	0	0.0%	4	21.1%		
<i>Knee</i>	<i>Normal</i>	5	16.1%	1	5.3%	0.071	
	<i>Effusion</i>	1	3.2%	5	26.3%		
	<i>Osteophytes</i>	8	25.8%	2	10.5%		
	<i>Enthesitis, origin and insertion</i>	1	3.2%	0	0.0%		
	<i>Osteophyte with prepatellar effusion</i>	15	48.4%	10	52.6%		
	<i>baker cyst</i>	1	3.2%	0	0.0%		
	<i>Knee effusion +enthesitis in patellar tendon</i>	0	0.0%	1	5.3%		
<i>Hip</i>	<i>Normal</i>	29	93.5%	19	100.0%	0.519	
	<i>Bursitis</i>	2	6.5%	0	0.0%		
<i>Softtissue</i>	<i>Normal</i>	20	64.5%	12	63.2%	0.47	
	<i>planter fascia</i>	1	3.2%	2	10.5%		

	<i>carpel tunnel syndrome</i>	1	3.2%	0	0.0%	
	<i>trochantric bursitis</i>	2	6.5%	0	0.0%	
	<i>SASD bursa</i>	0	0.0%	2	10.5%	
	<i>Coccygitis</i>	1	3.2%	0	0.0%	
	<i>Enthesitis at patellar tendon</i>	2	6.5%	1	5.3%	
	<i>planter fascia+ Enthesitis at patellar tendon</i>	0	0.0%	1	5.3%	
	<i>supraspinatus tendinopathy</i>	2	6.5%	0	0.0%	
	<i>Biceps bursitis+ supraspinatus tendinopathy</i>	1	3.2%	1	5.3%	
	<i>ganglion + planter fascia</i>	1	3.2%	0	0.0%	
<i>mediannerve</i>	<i>Normal</i>	30	96.8%	19	100.0%	1
	<i>enlarged nerve</i>	1	3.2%	0	0.0%	
<i>planterfascia</i>	<i>Normal</i>	29	93.5%	16	84.2%	0.284
	<i>thickness more than 4.5</i>	1	3.2%	3	15.8%	
	<i>calcaneal spure</i>	1	3.2%	0	0.0%	
<i>Intervention</i>	<i>no intervention</i>	21	67.7%	14	73.7%	0.744
	<i>injection and aspiration of knee effusion</i>	2	6.5%	2	10.5%	
	<i>injection of trochnatric bursitis</i>	2	6.5%	0	0.0%	
	<i>surgical release of median nerve</i>	1	3.2%	0	0.0%	
	<i>injection and aspiration of biceps bursa</i>	0	0.0%	1	5.3%	
	<i>Injection and aspiration of knee effusion+ injection and aspiration of biceps bursa</i>	0	0.0%	1	5.3%	
	<i>surgical decompression of knee</i>	1	3.2%	1	5.3%	
	<i>injection of supraspinatus tendon</i>	2	6.5%	0	0.0%	
	<i>injection of patellar bursa</i>	1	3.2%	0	0.0%	
	<i>aspiration of baker cyst</i>	1	3.2%	0	0.0%	
<i>otherinvestigation</i>	<i>No</i>	28	90.3%	16	84.2%	0.763

	<i>DEXA, osteoporosis &gt;-2.5</i>	1	3.2%	1	5.3%	
	<i>MRI knee degenerated tendon with fracture patella</i>	1	3.2%	2	10.5%	
	<i>bone biopsy show aluminum toxicity</i>	1	3.2%	0	0.0%	
<i>complication</i>	<i>No</i>	29	93.5%	18	94.7%	1
	<i>Fracture</i>	2	6.5%	1	5.3%	

P value was compute using Fisher-Exact

Table (1); - Difference MSUS finding between female and male maintained on CHD.

Table (2)

	<b>Male</b>		<b>Female</b>		<b>P*</b>
<b>Age Median(Q1-Q3)</b>	31	58.00 (36.00-63.00)	19	42.00 (38.00-66.00)	0.944
<b>HD Duration Median(Q1-Q3)</b>	31	3.00 (1.00-6.00)	19	4.00 (2.00-8.00)	0.188
<b>Ca Median(Q1-Q3)</b>	28	8.65 (8.05-8.98)	15	8.60 (7.50-8.80)	0.313
<b>Po4 Mean±SD</b>	28	5.78±2.23	15	5.13±1.49	0.319
<b>PTH Median(Q1-Q3)</b>	28	387.50 (202.50-914.75)	16	483.50 (345.50-778.75)	0.661
<b>Albumin Mean±SD</b>	28	3.89±0.30	15	3.84±4.20	0.654
<b>HB Median(Q1-Q3)</b>	28	11.15 (10.13-12.05)	18	10.35 (9.50-12.33)	0.386
<b>Ferritin Median(Q1-Q3)</b>	30	191.00 (93.28-467.63)	19	304.30 (191.30-573.20)	0.169
<b>TSat Median(Q1-Q3)</b>	30	21.50 (17.50-32.00)	18	19.50 (16.00-35.75)	0.773

\*p value was computed by T test or Mann-Whitney.

Table (2) Difference between Bone mineral assessment between male and female maintained on CHD.

**Photo from cases:**



Figure (1) 38 years old female with SASD bursa in right shoulder



Figure (2) 40 years old male patient presented with supraspinatus tendinopathy.

Permission was taken from patients for publication.