Association of radiological osteoarthritis of the knee joint with locomotor disability

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ABSTRACT

Background: Knee osteoarthritis (KOA) is a common joint disorder leading to considerable pain and locomotor disability in lower limb function. Locomotor disability, which is difficulty in activities of daily living related to lower limb function, can be the consequence of KOA, so early diagnosis and management may improve quality of life.

Objective: To assess the contribution of radiological osteoarthritis of the knees to disability in the activities of daily living related to lower limb function.

Methods: One hundred twenty Iraqi KOA patients (104 females and 16 males) who were attending to Rheumatology Unit, Full history was taken and complete clinical examination was done for all patients. Wight-bearing X-rays of both knees (anteroposterior and lateral view) were taken for patients and were graded according to Kellgren and Lawrence scale.

Results: The frequency of locomotor disability, was 62.50% for men and 72.11% for women (p=0.431). The frequency of radiological osteoarthritis of the knee was 50% for men and 40.37% for women (p=0.651). There was significant statistical differences between; locomotor disability, and increased age, morning stiffness, muscle wasting & BMI (p=0.000, p=0.003, p=0.002 and p=0.028 respectively). There was no statistical significant association between; KOA radiological grading, and gender, morning stiffness, BMI & lower limb locomotor functions disability (p=0.651, p=0.357 and p=0.972 respectively).

Conclusion: Radiological osteoarthritis of the knee is only weak independent predictors of locomotor disability. Patient's age, pain of the knees, muscle wasting, morning stiffness and obesity seem to be the most important independent determinants of locomotor disability.

Keywords: Kellgren and Lawrence, Knee joint, Locomotor disability, Osteoarthritis, IRAQ, Baghdad.

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INTRODUCTION

Osteoarthritis (OA):

Is the most common form of chronic joint disease in humans [1]. The most commonly affected are apophyseal joints of the cervical and lumbar spine, interphalangeal joints of the hand, 1st carpometacarpal joint, acromioclavicular joint of shoulder, the first metatarsophalangeal joint, the hips, and the knees [2].

Clinically, osteoarthritis is diagnosed by the presence of joint pain, stiffness and disability [3], in addition to (ACR) criteria for classification of knee OA [4]. Radiological osteoarthritis was assessed by means of the grading system proposed by Kellgren and Lawrence [5].

Osteoarthritis is second to cardiovascular disease as a cause of disability [6].

EPIDEMIOLOGY:

Osteoarthritis is a strongly age-related disorder. It is uncommon before the age of 40, but its prevalence rises rapidly with age thereafter, such that most people over the age of 70 have the pathological changes of OA in some of their joints (although they may remain asymptomatic) [7]. Knee OA principally targets the Patello-femoral (PF) and medial tibio-femoral (TF) compartments of the knee with a higher frequency of radiographic osteophytes in the patello-femoral compared with the tibio-femoral compartment [8]. Patello- femoral pain is usually worse going up and down stairs. Posterior knee pain suggests a complicating popliteal cyst [9].

Locomotor disability:

Locomotor disability, defined by difficulties in activities of daily living related to lower limb function, can be the consequence of diseases [10]. Osteoarthritis of the knee is a major cause of impaired mobility, particularly among women [11]

and the most common cause of chronic disability in the elderly [12-14].

AIM OF STUDY

To assess the contribution of radiological osteoarthritis of the knees to disabilities in the activities of daily living related to lower limb function.

METHODS

Patients:

A cross-sectional study was conducted on 120 patients with KOA aged 50 years and over were collected from Dec. 2010 to May 2011 at the Rheumatology Unit, Department of Medicine in Baghdad Teaching Hospital. Knee osteoarthritis (KOA) was diagnosed according to American College of Rheumatology (ACR) criteria [4]. A signed consent was taken from participants to be included in the study.

Method:

Full history was taken from all individuals including: name, age, sex, occupation, clinical features, family history of KOA, use of NSAIDs were reported. Complete clinical examination was done for all of them. BMI was used as a measure of obesity. Patient is obese if BMI > 30 Kg/m^2 [15]. The Stanford Health Assessment Questionnaire (HAQ) was used to assess disability [16]. ***Locomotor disability*** was defined as the mean of the scores on the six questions related to lower limb functions. The cut off for disability was 0.50, which means that the participants have at least some difficulty with three or more out of six functions. Weight-bearing X-rays of both knees (AP and lateral view) was obtained and KOA was graded according to Kellgren and Lawrence scale [5].

Statistical Analysis:

Statistical Package for Social Sciences version 18 (SPSS v.18) was used for data input and analysis. Chi square test for goodness of fit used to test the significance of observed distributions. Chi square test for independence used to test the significance of association between two variables. P value used for all tests was asymptotic and two sided. Findings with P value equal or less than 0.05 was considered significant.

RESULTS

The demographic distribution of knee OA patient is shown in (**Table 1**). There were 120 patients with KOA, 104 females (86. 7%), and 16 males (13.3%) their mean age (54.8 ± 5.4) years were included in this study.

Sixty females (57.69%) had positive family history regarding to KOA, so there is statistical difference between family history and gender (p-value = 0.048) and patient's ages and gender (p-value = 0.001) which is highly significant.

We have noticed that patients with abnormal BMI who are classified overweight or obese are 98 females (94.3%) and 12 males (75%); which showed significant statistical differences (p-value = 0.015), as shown in **Table 1**.

There were significant statistical differences in the distribution of clinical features (morning stiffness, muscle wasting, BMI) and the disability of the six lower limb functions (p-value=0.003, p-value =0.002, p-value = 0.028 respectively) , as shown in **Table 2**.

In **Table 3,** there was no significant statistical differences between the radiological changes and gender, morning stiffness & BMI (p-value = 0.651, p-value = 0.357, p-value = 0.972 respectively).

In men, pain and radiological osteoarthritis of the knee have impact on in/out bed (56.25%) and climbing stairs (62.5%). Isolated knee pain in men has their strongest effect on getting in or out of car, rising from chair and climbing stairs. In women both pain and radiological osteoarthritis of the knees have an effect on climbing stairs (89.42%) and getting in and out of a car (84.62%), as shown in **Table 4**.

Although there were increasing number of patients who have locomotor disability with increasing severity of radiological findings but this increase was not enough to be of significant value. Radiological osteoarthritis and locomotor functions were poorly associated and the results are not significant statistically, as shown in **Table 5**

Table 1: Demographic characteristics of 120 knee osteoarthritis patients

Variables	GENDER				P value
	Males N0.	(%)	Females N0.	(%)	
Age groups					
50-59	7	(43.75)	76	(73.08)	
60-69	6	(37.50)	27	(25.96)	0.001*
70-79	3	(18.75)	1	(0.96)	
Family history					
positive	5	(31.25)	60	(57.69)	0. 048*
negative	11	(68.75)	44	(42.31)	
BMI (Kg/m$^{2)}$					
18.5-24.9	4	(25.00)	6	(5.77)	0. 015*
25-29.9	8	(50.00)	44	(42.31)	
≥30	4	25.00	54	(51.92)	

* p-value is significant, NO; number, %; percentile, BMI; body mass index.
The table above shows a statistical difference between patient's ages and gender (p-value = 0.001), family history and gender (p-value = 0.048), and between high BMI and gender (p-value = 0.015).

Table 2: Distribution of clinical features according to disability in the six separate locomotor functions of the lower limb in 120 knee osteoarthritis patients.

Functions		Clinical features									
		Morning stiffness			Muscle wasting			BMI (Kg/m$^{2)}$			
		+	-	P value	+	-	P value	18.5-24.9	25-29.9	≥30	P value
Climb stair	-	9	6	0.038*	3	12	0.444	2	8	5	0.381
	+	87	18		31	74		11	39	55	
Rising from chair	-	45	14	0.315	9	50	0.002*	7	29	23	0.053
	+	51	10		25	36		6	18	37	
bending	-	56	21	0.008*	17	60	0.042*	10	31	36	0.487
	+	40	3		17	26		3	16	24	
walking	-	65	22	0.019*	21	66	0.098	12	34	41	0.214
	+	31	2		13	20		1	13	19	
In/out car	-	15	7	0.125	2	20	0.027*	3	9	10	0.849
	+	81	17		32	66		10	38	50	
In/out bed	-	50	18	0.043*	16	52	0.182	8	26	34	0.923
	+	46	6		18	34		5	21	26	
Locomotor disability	-	22	13	0.003*	3	32	0.002*	6	18	11	0.028*
	+	74	11		31	54		7	29	49	

* p-value is significant, BMI; body mass index, += present; - = not present or normal.
There were significant statistical differences in the distribution of clinical features (morning stiffness, muscle wasting, BMI) and the disability of the six lower limb functions (p-value = 0.003, p-value = 0.002, p-value = 0.028 respectively).

Table 3: Distribution of radiological findings in 120 knee osteoarthritis patients with their clinical features.

	XRAY						
GENDER	**mild**	**%**	**moderate**	**%**	**severe**	**%**	**P values**
Males	4	(25)	8	(50)	4	(25)	0.651
females	38	(36.53)	42	(40.37)	24	(23.1)	
Morning stiffness							
None	9	(21.43)	12	24.00	3	(10.71)	
<30min	33	(78.57)	38	(76.00)	25	(89.29)	0.357
>30 min	0	(.00)	0	(.00)	0	(.00)	
BMI (Kg/m$^{2)}$							
18.5-24.9	4	(9.52)	4	(8.00)	2	(7.14)	
25-29.9	19	(45.24)	22	(44.00)	11	(39.29)	0.972
≥30	19	(45.24)	24	(48.00)	15	(53.57)	

Significant difference when P value was equal or less than 0.05 level, BMI; body mass index. There were no significant statistical differences between the radiological changes and gender, morning stiffness & BMI (p-value = 0.651, p-value = 0.357, p-value = 0.972 respectively).

Table 4: Prevalence (%) of disability in the six separate functions, which constitute the locomotor disability index, in men and women according to joint status.

MEN	Climbing stair	Rising from chair	bending	walking	In/out car	In/out bed
Pain	75	56.25	25	18.75	62.5	56.25
Morning stiffness +ve	56.25	34.75	18.7	12.5	34.7	34.75
Morning stiffness – ve	18.7	12.5	6.25	6.25	18.7	12.5
Muscle wasting	37.5	31.25	18.7	12.5	31.25	31.2
ROA	62.5	34.75	25	18.75	34.7	50
WOMEN						
Pain	89.42	45.19	35.19	26.92	84.62	36.54
Morning stiffness +ve	75	39.42	34.62	25.96	71.15	34.62
Morning stiffness – ve	14.42	5.77	1.92	0.96	13.46	1.92
Muscle wasting	24.04	18.27	13.46	9.62	25.96	16.35
ROA	55.77	29.81	25.96	18.27	53.85	25

ROA; radiological knee osteoarthritis. In men, pain and radiological osteoarthritis of the knee have impact on in/out bed (56.25%) and climbing stairs (62.5%). Isolated knee pain in men has their strongest effect on getting in or out of car, rising from chair and climbing stairs. In women both pain and radiological osteoarthritis of the knees have an effect on climbing stairs (89.42%) and getting in and out of a car (84.62%).

Table 5: Distribution of radiological findings with disability in the six separate functions, which constitute the locomotor disability index, within knee osteoarthritis patients.

		X-RAY						
		mild		moderate		severe		
Functions		N0	%	N0	%	N0	%	P value
Climb stair	negative	5	(11.90)	6	(12.00)	4	(14.29)	
	positive	37	(88.10)	44	(88.00)	24	(85.71)	0.948
Raising chair	negative	24	(57.14)	28	(56.00)	12	(42.86)	
	positive	18	(42.86)	22	(44.00)	16	(57.14)	0.444
bending	negative	31	(73.81)	32	(64.00)	15	(53.57)	
	positive	11	(26.19)	18	(36.00)	13	(46.43)	0.216
walking	negative	33	(78.57)	38	(76.00)	18	(64.29)	
	positive	9	(21.43)	12	(24.00)	10	(35.71)	0.379
In/out car	negative	10	(23.81)	8	(16.00)	4	(14.29)	
	positive	32	(76.19)	42	(84.00)	24	(85.71)	0.514
In/out bed	negative	29	(69.05)	29	(58.00)	15	(53.57)	
	positive	13	(30.95)	21	(42.00)	13	(46.43)	0.372
Locomotor disability	negative	20	(47.62)	20	(40.00)	7	(25.00)	
	positive	22	(52.38)	30	(60.00)	21	(75.00)	0.163

Significant difference when P value was equal or less than 0.05 levels, NO; number, %; percentage, += present; - = not present or normal. Radiological osteoarthritis and locomotor functions were poorly associated and the results are not significant statistically.

DISCUSSION

This study among people aged 50 years and over. Disability as evaluated by the Stanford Health Assessment Questionnaire was present in (62.50%) of the men and (72.11%) of the women.

Up to the best of our knowledge, this is the first cross-sectional study investigating disability in the activities of daily living related to lower limb function in Iraqi patients with influence of pain and radiological osteoarthritis of the knee joint.

In the presence of joint pain or radiological osteoarthritis both in men and women difficulties in walking, climbing stairs and getting in or out of a car or bed were the most prevalent disabilities of the lower limb functions. This could correspond with weakness of the quadriceps muscles (p-value = 0.001). In women difficulties in climbing stairs and getting in and out of a car were the most prevalent disabilities irrespective of having pain or radiological osteoarthritis, which most likely due to presence of morning stiffness (75%, 71%) respectively (**Table 4**).

The American College of Rheumatology published criteria for osteoarthritis of the knee in 1986, often referred to as the Altman criteria [(4)]. These clinical criteria all start with the presence of pain and require the equivalent of grade 2 in the Kellgren grading system and for the knee one of three additional criteria: age over 50 years, stiffness less than 30 minutes, or crepitus. The age criterion is fulfilled by all our respondents.

In the present study, we didn't find a significant association between locomotor disability and radiological findings of KOA. Possible explanation is that most of the association between radiological osteoarthritis and locomotor disability could however be explained by the existence of musculoskeletal complaints and obesity also that pain and morning stiffness had a much greater independent impact on the activities of daily living related to lower limb function in women than in men.

The explanation could be that in men other disabling conditions such as intermittent claudication, heart failure, angina, and chronic respiratory disease as well as weakness of the lower limb muscles, especially the quadriceps, play a dominant part [17]. Psychosocial status could play a part in the explanation of disability as well. The most important predictors of psychosocial disability were chronicity of pain, male sex, current other mobility problems, and radiological osteoarthritis [18].

It is not clear why clinical osteoarthritis variables associate stronger with locomotor disability in women than in men. The apparent lack of an independent association between radiological osteoarthritis and locomotor disability could in part be explained by the presence of radiological osteoarthritis of the patellofemoral joint, which was not studied by us.

In this study, we observed an increased BMI, ages and family history considerably increased the risk of subsequent symptomatic KOA in women, these findings agreed with previous studies [19,20].

In this study, we noticed decreased quadriceps strength and wasting is strongly associated with knee pain and disability. There is a strong and independent association between locomotor disability and age, joint pain, and generalized morning stiffness in people aged 50 years and over. While the presence of generalized morning stiffness is of greater influence than the presence of joint pain. These findings agreed with other authors [21]. In our study, there is no statistical difference and poor association between radiological findings of KOA with locomotor disability, which is similar to Dawson J *et al* [22] findings.

The suggestion that although locomotor disability is a prevailing problem in an aging population, signs and symptoms of the musculoskeletal system can only partly explain its presence. Of the people with locomotor disability only one third has radiological osteoarthritis of the knees. On the other hand, people who do suffer from pain whether or not combined with radiological osteoarthritis are three to sevenfold as often disabled. Obesity in women increases this risk even more [22].

The main limitations of our findings are the small size of the studied sample, and being a cross sectional study has limited the conclusions regarding cause and effect relationship between radiological findings of KOA and locomotor disability.

CONCLUION

1) Radiological osteoarthritis of the knee is only weak independent predictors of locomotor disability.
2) Patient's age, pain, morning stiffness, muscle wasting and obesity are significant predictors of increased locomotor disability.

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