The prevalence of depression and its relevance to clinical and radiological characteristics among older adults with knee osteoarthritis

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Abstract: In this study we assessed the prevalence of depression and its relevance to pain intensity, functional status (health related disability) and radiographic severity in older adults with knee osteoarthritis (OA).One hundred and thirty-eight elderly (sixty-five years or older) patients with knee OA and 82 age and sex matched healthy controls were included into the study. Beck depression scale was used to assess depressive disorders in all participants. The pain intensity, functional status and radiographic severity in patients were assessed with a Visual Analogue Scale (VAS), the Western Ontario and Mc-Master Universities Osteoarthritis Index (WOMAC), and the Kellgren-Lawrence grading system,respectively. Depression was detected in 49.3% of patients and 12.3% of controls. In patients group whose BDI scores were ≥17, the scores of VAS, WOMAC, and radiographic severity were found to be statistically significantly higher, compared to the group whose BDI scores were <17. A positive correlation was detected between BDI score and VAS, WOMAC and radiological classification scores in patients with knee OA. In linear regression analysis, the most significant determinant for the level of depression was WOMAC score. The present study shows that depression is a commonly encountered comorbidity in older adults with knee OA. The level of depression was correlated with the severity of the disorder, especially in patients whose WOMAC score was high. Therefore, coexisting depression should be taken into account in the assessment and management of older patients with knee OA.

Keywords: Knee Osteoarthritis, Disability, Depression, Pain

1. Introduction

Knee osteoarthritis is a common, debilitating chronic disease characterized by degenerative changes in all the joint tissues, including hyaline cartilage, synovial membrane, menisci, and subchondral bone[1]. It affects more than half of persons over the age of 65 years and 80% of those older than 75 years old[2,3]. The advancements in medical science and increased life expectancy indicate that the prevalence of knee OA will increase in the following years.

Knee OA is among the major causes of disability in the elderly[4,5]. These patients have impaired ability to perform daily activities such as walking, ascending or descending stairs, sitting and standing. Apart from the pain and disability, OA can significantly affect psychosocial well-being and social behavior.

Numerous studies show that pain and functional disability are closely correlated with emotional disturbance, particularly depression, across the lifespan[6,7]. On the other hand, it is also reported that concurrent depression is strongly associated with more severe pain, greater disability, and poorer HRQL[8,9].

Depression is a common comorbid condition in patients with knee OA and effects the degree of pain and disability

experienced by the patients[10,11].

Despite the well documented reciprocal relationship between pain and depressed mood, there are conflicting findings in the literature as to whether pain intensity, functional status [health related disability] or radiographic severity contribute to the depressed mood among the older patients with OA. While Parmelee et al[12] found that pain and functional disability were independently correlated with depression among elderly institution residents, Williamson and Schulz[13] discovered that activity restriction wholly mediated the relationship of pain to depressive symptomatology in a sample of geriatric outpatients[14].

Since a definitive cure for osteoarthritis is not yet available, management is focused on pain control, and reducing accompanying functional limitations, but less attention is given to the effects of concomitant depression on patients. However, it is known that depression is already one of the most common problems in the elderly[15,16]. Further, the concomitant depression is associated with greater health care use and place a substantial economic burden on patients and health care system[17,18]. It has been also found that comorbid depression is clearly linked to reduced adherence to pain interventions[19,20]. So, recognition of and attention to the potential comorbidity of depression is essential especially in the elderly. In this study, therefore, we sought to assess the association of depression comorbidity and its relevance to pain intensity, functional status (health related disability) and radiologic scores among older adults with knee OA. We hypothesized that severe knee OA patients with respect to pain, disability and radiography would have coexisting depression compared with less severe knee OA subjects.

2. Material and Method

The study was carried out between March 2012 and August 2013 in the Department of Physical Medicine and Rehabilitation, Faculty of Medicine, N. Erbakan University, Turkey. The study was approved by the Ethical Committee of Selçuk University Medical Faculty, and written informed consent was obtained from each participants.

One hundred and thirty-eight elderly (sixty-five years or older) patients with knee OA and 82 age and sex matched healthy controls were included into the study. The diagnosis of knee OA was made based on the American College of Rheumatology guidelines[21], which include knee pain with radiographic changes of osteophyte formation and at least one of the following: patient age >50 years, morning stiffness lasting <30 minutes, or crepitus on motion.

2.1. Exclusion Criteria

Patients were excluded from the study if they had a systemic, neurological, or another musculo-skeletal problem leading to chronic pain; had a psychiatric disorder; taken ananxiolytic orantidepressantagent within 6 months; treated with physical therapy or given corticosteroid injections to knees during the last six months; or had a

history of knee surgery.

In the control group, those who complain of knee pain, chronic rheumatic or major psychiatric disorders, a musculo-skeletal problem leading to chronic pain, anxiolytics or antidepressants drug users, and those with heavy alcohol consumption were excluded from the study.

Socio-demographic data and clinical history of all subjects were recordedand all patients were physically examined. Beck Depression Inventory (BDI) scale was conducted for the purpose of assessing depressive disorders for all participants. The pain intensity, functional status and radiographic severity in patients were assessed with a 0-10 cm. Visual Analogue Scale (VAS), the Western Ontario and Mc-Master Universities Osteoarthritis Index (WOMAC), and the Kellgren-Lawrence grading system, respectively.

2.2. Beck Depression Inventory

Beck Depression Inventory (BDI)[22,23] is a standard self-report questionnaire consisting of 21 multiple-choice items designed to assess the presence and severity of depressive symptomatology such as hopelessness, irritability, cognitive problems, feelings of guilt or being punished, and the physical symptoms, including fatigue, weight loss, and lack of sexual desire. Each item is scored from 0 to 3, and the sum of these scores indicates the total score of depression. The score range is 0–63 and the cut-off point is accepted as 17.

2.3. Western Ontario and Mcmaster Universities Osteoarthritis(WOMAC) Index

The WOMAC Index[24] is a self-administered questionnaire that assesses the three dimensions of pain, disability and joint stiffness in knee and hip OA using a battery of 24 questions, five related to pain, two related to stiffness and 17 related to physical function. The total score of WOMAC-OA ranges from 0 (no disability) to 96 (severest disability).

2.4. Radiographic Evaluations

Radiographic evaluations were performed with use of weight-bearing anteroposterior radiograph. Radiographs were evaluated by one of the authors with use of the Kellgren-Lawrence grading scale[25] for OA severity. The radiographs of each knee were graded according to the presence of osteophytes, joint-space narrowing, sclerosis, and cysts (Grade 0, no features of OA; Grade 1, small osteophyte of doubtful importance; Grade 2, definite osteophyte but an unimpaired joint space; Grade 3, definite osteophyte with moderate diminution of joint space; and Grade 4, definite osteophyte with substantial joint-space reduction and sclerosis of subchondral bone).

2.5. Statistical Analysis

Statistical analysis of data was performed by using SPSS 20.0 (SPSS Inc., Chicago, IL, USA) software. Descriptive statistical findings were presented as mean±standard

deviation, numbers and percentages. To compare the clinical features of both groups, student's *t* test was used for normally distributed variables, and Mann Whitney U test was used for the non-normally distributed variables. To compare the frequencies, we used chi-square test. Analyses of correlations between independent variables and the BDI scores were conducted using Spearman's rho correlation test. Multiple regression analyses were performed to determine the relative contributions by VAS score, WOMAC score and radiographic severity to BDI scores. The level of significance was 0.05 and the confidence interval was 95%. Correlation coefficients were interpreted as follows: 0-0.25, no correlation; 0.25-0.50, mild-

moderate correlation; 0.50-0.75, strong correlation; and, 0.75-1.00, extremely strong correlation.

3. Results

Socio-demographic and clinical features of both groups are presented in Table-1. Age, gender, BMI, occupational and educational status of both groups were similar ($p>0.05$). Mean WOMAC score of patients was 54.57 ± 18.91. According to Kellgren-Lawrence grading system, 2.2% of patients were grade I, 35.0% were grade II, 48.2% were grade III, and 14.6% were grade IV.

Table 1. Socio-demographic and clinical characteristics of patients and control groups.

	Knee OA (n=138)	Controls (n=81)	χ2	p
Age (year)	69.17±4.27	69.02±4.68		0,589
Gender			1,877	0.185
Women	96 (69.6 %)	49 (60,5 %)		
Men	42 (% 30,4)	32 (% 39,5)		
BMI (kg/m²)	28.62±3.70	29,00±4,07		0,510
Occupation			2,608	0,271
Housewife	98 (% 71,0)	49 (% 60,5)		
Employed	7 (% 5,1)	5 (% 6,2)		
Retired	33 (% 23,9)	27 (% 33,3)		
Educational level			5,793	0,122
Illiterate	34 (% 24,6)	32 (% 39,5)		
Primary school (8 years)	83 (% 60,1)	40 (% 49,4)		
High school (11 years)	20 (% 14,5)	8 (% 9,9)		
College (12 years and over)	1 (% 0,7)	1 (% 1,2)		
BDI scores	17,74±9,63	10,05±5,11		<0,001
Morning stiffness (min)	13,78±13,06	……….		
VAS scores	66,46±20,32	……….		
WOMAC scores	54,57±18.91	……….		
Kellgren-Lawrence radiological classification score	2.75±0.73	……….		

BMI: Body Mass Index, BDI:Beck Depression Inventory, VAS: Visual Analogue Scale, WOMAC: The Western Ontario and Mc-Master Universities Arthritis Index

Mean BDI score of patients was found to be higher, compared to controls ($17,74\pm9,63$ vs $10,05\pm5,11$, $p<0.05$) (Table-1). Considering the cut-off value of BDI≥17, depression was detected in 49.3% patients and in 12.3% of controls. In the patient group, no difference was observed in the frequency of depression between the genders (52.1% in women and 42.9% in men, $p>0.05$).

The patients whose BDI score ≥17 had significantly higher mean age, BMI, VAS score, WOMAC score and Kellgren-Lawrence grading scale than patients whose BDI scores <17 had ($p<0.001$) (Table-2).

There were strong positive correlations between the BDI score and WOMAC ($r=0.603$, $p<0.001$), WOMAC pain subscale ($r=0.521$, $p<0.001$), VAS score ($r=0.465$, $p<0.001$), radiological grading scale ($r=0.386$, $p<0.001$), and the duration of morning stiffness ($r=0.261$, $p<0.001$). However, there was no statistically significant correlation between the BDI score and age, BMI, occupational, and educational status ($p>0.05$).

To evaluate the variables affecting the BDI score, a linear regression analysis was performed and it was found out that whereas the WOMAC score was found to be the most

significant determinant for the BDI score ($R^2=0.488$, $p=0.001$); age, BMI, VAS score, WOMAC pain score and the radiological grading scale were not significant for the BDI score ($R^2=-0.133$, $p=0.071$; $R^2=0.098$, $p=0.185$; $R^2=0.121$, $p=0.249$; $R^2=-0.053$, $p=0.698$; and, $R^2=-0.006$, $p=0.952$, respectively). In other words, the more higher the WOMAC score was, the more likely the depression associated.

Table 2. Characteristics of patients with and without depression.

Knee OA (n=139)	BDI<17 (n=70)	BDI≥17 (n=68)	p
Age (year)	69,1±4,36	68,92±5,01	0,828
BMI (kg/m²)	28,95±4,12	29,02±4,37	0,922
Morning stiffness (min)	11,10±9,09	16,54±15,76	0,014
VAS scores	56,21±20,13	77,02±14,27	<0,001
WOMAC scores	44,34±17,50	65,09±13,93	<0,001
Kellgren-Lawrence radiological classification score	2,47±0,68	3,05±0,66	<0.001

BMI: Body Mass Index, BDI: Beck Depression Inventory, VAS: Visual Analogue Scale, WOMAC: The Western Ontario and Mc-Master Universities Arthritis Index

4. Discussion

With the increase of the mean age of the populations, the knee OA is becoming an important social and health problem. Apart from the pain, restricted joint mobility, and muscle weakness developing with the course of knee OA impair the locomotor functions such as walking, ascending or descending stairs, sitting and standing and cause substantial impairment in the quality of life and social interaction. Such a condition may result in social isolation and depression[26,27].

In this study we found that the prevalence of depression was significantly higher (49.3%) in older adults with knee OA. The level of depression was correlated with VAS, WOMAC and radiological classification scores. In linear regression analysis, the most significant determinant for the level of depression was WOMAC score. The data in literature and our findings indicate that depression accompanies with knee OA frequently. In literature, depression is reported to be seen at the rate of 11-45 % in patients with knee OA[28-30]. The reason why different findings were obtained in such studies is that different scales for depression were used, and different cut-off values for depression were taken into account in these scales. In our study, the rate of depression was found as 49.3% in patients with knee OA, and such a rate was a bit higher than that reported in the literature. We consider that the higher rate in our study arised from the increased average age and higher radiological scores of our participants. Indeed, some studies have shown that elderly patients are more predisposed to depression[31,32].

Myriad studies[33-36] have shown that chronic pain and depression usually accompany each other's and, this accompaniment leads impairment in quality of life. Miller[37] declared that approximately 35 % of the people with chronic pain also had a probable diagnosis of depression. This rate is somewhat higher than the prevalence of depression in other community studies of chronic pain (11–20 %). Whether depression precedes or follows pain onset is unclear, but reciprocal effects are likely. Three different possibilities have been asserted for the correlation between pain and depression: depression may lead to pain, pain may lead to depression or as a result of a synergetic effect from depression and pain, both may develop and progress together[38].

Studies investigating the association between pain and depression in patients with knee OA report different findings. While some studies[39-42] reported a strong correlation between the severity of pain and depressive symptoms, the others[43-44] reported no correlation. In our study, it was detected that the pain scores of the VAS and WOMAC were higher in knee OA patients with depression, compared to those without, and a strong correlation was present between the BDI score and the pain scores of the VAS and WOMAC. However, the pain scores of the VAS and WOMAC were determined not to be effective on depression in our linear regression analysis. We consider that the severity of pain is not directly associated with depression, but functional disabilities caused by the disease are related to depression. As a matter of fact, according to cognitive model, impairment in functional status and quality of life has a much greater impact on depression than either pain severity or radiological grading[45,46].

Association between depression and disability has also been demonstrated in previous studies. While the prevalence of depression in disabled persons is increased compared with controls, the same is also true for disability in depressive subjects. In literature, studies report different data as to the association between disability and depression in patients with knee OA. Whereas some studies[36,47,48] report a strong association between disability and depression due to OA, other studies[10,43] report no association. In our study, it was determined that the WOMAC scores, radiological grading score and morning stiffness were at a higher rate in knee OA patients with depression, compared to those without depression, and a positive correlation was present between the BDI score, and WOMAC score, radiological classification score and the duration of morning stiffness. However, we found that the most significant factor for depression was the WOMAC score in linear regression analysis. Our findings indicate that additional depression to physical disability causes the effect of the disorder to be felt more severely and further increases the disability caused by the condition.

4.1. Study Limitations

Our study has some limitations despite high number of participants. Firstly, our participants could not be evaluated via structured interviews. Secondly, our study was composed of only patients with knee OA admitted to a single center, so our findings cannot be generalized to the whole population. Thirdly, we failed to obtain certain data related to the depressive symptoms declared by our patients, and thus we could not clearly determine the association between duration of depression and the duration of OA. Finally, those with controlled disorders such as hypertension and diabetes mellitus, and with systemic problems not leading to functional disorders were also included into the study. Although they were under control and did not lead to functional disorders, how much such diseases influenced our findings remains unclear.

5. Conclusion

Our findings demonstrate that depression is a commonly encountered finding in older patients with knee OA and the level of depression is associated with the severity of the disability. Since a definitive cure for OA is not yet available, management should target to control the pain, improve the functions and increase the quality of life. On the other hand, the psychological health and its reflection on social life should not be neglected and multidisciplinary approaches including the diagnosis and treatment of depression must be encouraged in these patients.

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