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Original Research Article

Frequency of comorbidities in patients with osteoarthritis and their impact on pain and physical function

Mohammed Taherul Islam[1]*, Mohammad Imtiaz Sultan[2], Aparna Deb[3], Protyay Dey[4], M. Saiful Arif[5], Anupam Barua[1], Muhammad Habib Hassan[1], Shamshed Nesreen Romana[6], Tousif Bin Mamun[7], Simanto[1]

[1]Department of Medicine, Chittagong Medical College Hospital, Chittagong, Bangladesh
[2]Department of Rheumatology, Kurmitola General Hospital, Dhaka, Bangladesh
[3]Department of Medicine, Upazila Health Complex, Fatikchari, Chittagong, Bangladesh
[4]Department of Nephrology, Chittagong Medical College, Chittagong, Bangladesh
[5]Department of Rheumatology, Chittagong Medical College, Chittagong, Bangladesh
[6]Department of Radiology and Imaging, Chittagong Medical College Hospital, Chittagong, Bangladesh
[7]Department of ENT, Chittagong General Hospital, Chittagong, Bangladesh

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***Correspondence:**
Dr. Mohammed Taherul Islam,
E-mail: drtaher.cmc11@gmail.com

ABSTRACT

Background: Osteoarthritis (OA) is one of the commonest morbidities in older age population and the most common reason for restricted activity in their daily life. The prevalence of other disabling condition also rises with age and some common chronic condition can be found along with OA. The aim of this study was to identify frequency of comorbidities in patients with OA and impact of comorbidities on pain and physical function of the patients.
Methods: Self-reported comorbidities, clinical examinations and relevant investigations findings were recorded in a case record form. Depression and anxiety were measured by PHQ-9 and GAD-7 scale respectively. Pain of joint and physical function was measured by WOMAC questionnaire.
Results: The mean of the age, BMI (body mass index) and duration of pain was respectively 56.83 (±8.28) years, 26.01 (±4.1) kg/m^2 and 4.1 (±2.9) years. Male female ratio was 1:2.23. About one fifth of the patients (19.1%) reported no associated comorbid conditions and approximately three fourth of patients (70%) reported one or two comorbid conditions and another 11% reported three or more comorbid conditions. Of the comorbid conditions the most frequent was HTN (45.5%), followed by DM (20.9%), depression (20.9%) and anxiety (13.6%). The mean pain and physical function scores were 17.8±7.1 and 63.6±21.7 respectively.
Conclusions: In summary, the OA patients showed a high frequency of comorbid conditions including depression, which can impact the pain and physical function of those patients. Such results show the need for investigating and treating those comorbidities in OA patients.

Keywords: Osteoarthritis, Knee osteoarthritis, Comorbidity, Hypertension, Diabetes mellitus

INTRODUCTION

Osteoarthritis (OA) is characterized by synovial inflammation, degradation of articular cartilage, and changes to subchondral bone, as well as pain and functional disability that represent patients' experience of the condition.[1] The most prevalent musculoskeletal condition is OA. According to the Johnston County Osteoarthritis Project, the lifetime risk of developing symptomatic knee OA is projected to be 45 percent (40% in men and 47% in women), with chances increasing to 60.5 percent among obese people, which is nearly double

the risk of those who are normal weight or underweight.[2] The prevalence of OA is projected to climb as the population ages and obesity levels rise. Indeed, the Framingham cohort has shown an increase in the frequency of symptomatic knee OA, with rates rising by 4.1% and 6% among women and men, respectively, but without a concurrent rise in the frequency of radiographic OA.[3] The impact of OA on morbidity is well documented. In the 2010 WHO global burden of disease study, OA was ranked 11th in the world in terms of years lived with disability, up from 15th in 1990.[4] The burden was 6th in East Asia and high-income East Pacific countries, 10th in North America, 7th in Eastern Europe but 13th in Western Europe.[4] Although smaller scale studies in Bangladesh revealed similar data to that seen elsewhere in the world, there has been little research on the disease burden of OA.[5,6] To better comprehend the impact of OA, it is vital to put it in perspective with other health problems that individuals may have. Comorbid diseases can intensify the symptoms of OA (pain and physical limitations), making management more difficult or even impossible. Given the high frequency of several comorbid health disorders among people with OA, this is especially significant.[7,8] Perruccio and colleagues discovered that 68% of Medicare members with OA who underwent elective joint replacement surgery had at least one additional comorbid health condition, and almost 10% of patients had three or more additional comorbid health disorders.[9] The average number of other self-reported comorbid health disorders was 1.73 in a community-based cohort of patients with symptomatic knee OA.[10] Cardiovascular disease, stroke, diabetes mellitus, obesity, cognitive impairment, anxiety, and depression are all commonly linked to OA, and the link between OA and disability is thought to be attributable to coexisting comorbidity rather than the illness itself.[11,12] Metabolic syndrome, which is characterized as the presence of SAH, central obesity, glucose intolerance, hypertriglyceridemia, or low HDL values in the same person (at least three of the five criteria), is also common in OA patients.[13] Since OA is the most common cause of pain in the elderly, a group with a high prevalence of depression, coexistence of the two disorders is common. Depression has a profound impact on OA because it affects three vital joint symptoms: pain and physical impairment. Depressed people are more prone to experience chronic or severe pain, and more than half of chronic pain sufferers are depressed.[14] Even though it is widely acknowledged that comorbid disorders are widespread among OA patients, little is known regarding the particular influence of comorbidities on patients' experiences, such as pain perception, functional status, insomnia, depression, and fatigue. It's unclear whether a significant number of chronic health disorders or a few particular health problems have a more detrimental impact on OA-related patient- reported outcomes. Identifying these links might help clinicians focus on the components of comorbidity that have the highest influence on OA-related patient-reported outcomes and, as a result, should be prioritized in treatment and care plans. Comorbidity load, particularly activity-limiting diseases, is linked to poor OA-related patient-reported outcomes, according to new research.[15]

In light of this, the purpose of this study was to assess the presence of comorbidities in patients with OA, as well as the influence of comorbidities on pain and physical function in OA patients.

METHODS

A hospital based cross-sectional study. Department of medicine and physical medicine, CMCH, Chattogram, Bangladesh. It is a 1313 bedded tertiary Government hospital in Bangladesh 110 patients in the study. OA patients attend different outpatient and inpatients ward of medicine and physical medicine department of this hospital for management. Study period 6 months from January 2019 to June 2019. Patients with a diagnosis of OA attending in OPD or admitted in the department of medicine of CMCH during the study period.

Inclusion criteria

Patients diagnosed as primary OA of knee on the basis of ACR 1991 OA classification criteria were included in the study.

Exclusion criteria

Patients with other rheumatologic disease like SLE, RA soft tissue rheumatism and other connective tissue disease, subjects who did not provide written consent to participate in this study, pregnancy and critically ill patients and patient with Lumber OA and cervical OA were excluded from the study.

Data collection tool

A pre designed semi-structured case record form. Semi-structured questionnaire containing: sociodemographic variables, clinical variables like disease duration, drug history and extra articular features, comorbidities, WOMAC questionnaire. PHQ-9 and GAD-7.

Data processing and analysis

After collection data were compiled in a Microsoft Office Excel Worksheet. Then they were fed into SPSS (Statistical package for social science) for Windows version 23 software to process and analyze the data. The mean±standard deviation (SD) of the continuous variables was calculated. Categorical response variables were presented in frequency and proportion. Different statistical method like t test and Chi squared test were applied for data analysis. P value considered as statistically significant when it is less than 0.05.

Ethical implication

Study was conducted after getting approvals from the ethical and review committee of CMC. As per the ethical issue: Participation was voluntary. Consent was obtained after a brief explanation about the study. It was made clear

to them that they were free to take part or refuse any part of the study. All answers were kept confidential. Every attempt was taken to conduct the interview privately. Refusal to take part or withdrawal from the study not hampered his/her treatment.

RESULTS

This study 110 patients of knee OA were included. The socio-demographic characteristics of them are shown in Table 1. Mean±SD age was 56.83±8.28 years. There were 77 (70%) women and majority of them were married (98%).

Table 1: Socio-demographic characteristics of the study patients (n=110).

Characteristics		N (%)
Age (in years)	Mean±SD	56.83±8.28
	Range	39-84
Sex	Male	33 (30.0)
	Female	77 (70.0)
Residence	Urban	46 (41.8)
	Semi-urban	51 (46.4)
	Rural	13 (11.8)
Education	Primary or below	55 (50.0)
	SSC	37 (33.6)
	HSC	11 (10.0)
	Graduate	7 (6.4)
Marital status	Married	109 (99.0)
	Unmarried	1 (1.0)
Religion	Islam	81 (73.4)
	Hindu	29 (26.6)
Ethnicity	Bangali	105 (95.5)
	Chakma	5 (4.5)
Monthly income	<20000 BDT	11 (10.0)
	20000-50000 BDT	57 (51.8)
	>50000 BDT	42 (38.2)

Table 2: Smoking and alcohol habit of the study patients (n=110).

Characteristics		N (%)
Smoker	Yes	28 (25.5)
	No	82 (74.5)
Alcohol drinking	Yes	5 (4.5)
	No	105 (95.5)

Twenty-eight out of 110 patients were current smoker and all were male. Regarding alcohol drinking 5 (4.5%) patients hailing from halftracks reported to drink the alcohol (Table 2).

Mean pain duration was 4.1±2.9 years. Half of the included patients had BMI 25-29.99 kg/m^2 and only 2 (1.8%) patients had BMI >30 kg/m2 (Table 3).

Table 3: Duration of pain and BMI of the study patients (n=110).

Characteristics		N (%)
Pain duration (in years)	Mean±SD	4.1±2.9
	Range	1.0-14.0
BMI (kg/m^2)	Mean±SD	26.01±4.1
	Range	19.1-32.1
	18.5-24.99	53 (48.2)
	25-29.99	55 (50.0)
	≥30.00	2 (1.8)

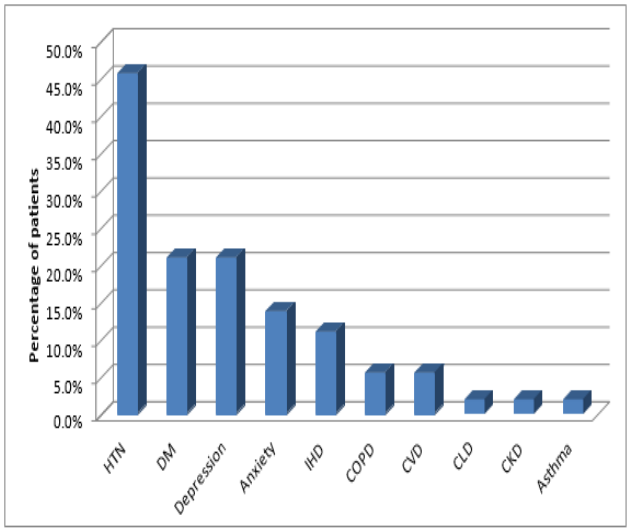

Figure 1: Comorbidity pattern among the patients (n=110).

*Included multiple responses; HTN: Hypertension, DM: Diabetes mellitus, IHD: Ischemic heart disease, COPD: Chronic obstructive pulmonary disease, CVD: Cerebro-vascular disease, CLD: Chronic liver disease; CKD: Chronic kidney disease.

Different chronic health conditions were observed among 110 patients with OA. Out of these most prevalent was HTN present in 50 (45.5%) patients followed by DM present in 23 (20.9%) patients. Depression and anxiety were noticed in 23 (20.9%) and 15 (13.6%) of patients respectively. Other less frequent diseases were IHD, COPD, CVD, CLD, CKD and asthma (Figure 1).

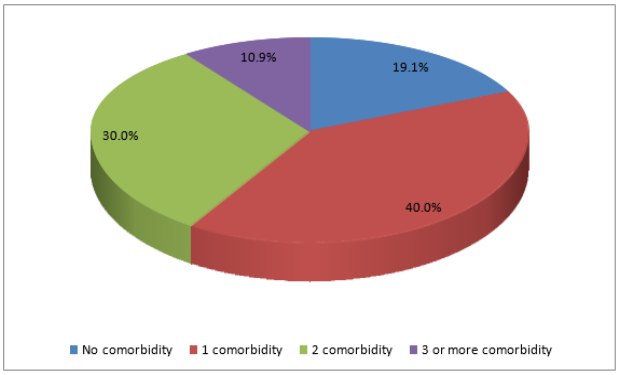

Figure 2: Total number of comorbidities among the patients (n=110).

In this study sample, about one fifth of the patients reported no associated comorbid conditions. Approximately three fourth of patients reported one or two comorbid conditions and another 11% reported three or more comorbid conditions (Figure 2).

Table 5 shows the mean pain score in different subgroups of patients according to their socio-demographic characteristics. It depicts significant differences of the mean pain score in subgroups of age and sex. Patients less than 50 years of age reported lower pain score compared to their counterpart and similarly mean pain score was significantly lower in male compared to female. There were no significant differences of the mean pain scores among different subgroups done in terms of residence, education and monthly family income of the OA patients.

Table 6 shows the mean pain and physical function score differences in patients with or without different comorbidities. Mean pain score were significantly higher in patients with comorbidity compared to the patients without any comorbidity. Regarding specific comorbidity only patients with DM and depression had reported significantly higher mean physical function score compared to patients without DM and depression respectively. Patients with depression had significantly higher pain score compared to the patients without depression.

Mean pain score was 18.1±7.2 in patients with any comorbidity and 16.0±8.1 in patients without any comorbidity. This difference was statistically significant (p <0.001, obtained from independent sample t test). Mean physical function score was 66.1±22.1 patients with any comorbidity and 60.2±20.4 in patient without any comorbidity. This difference was statistically significant (p <0.001, obtained from independent sample t test) (Figure 3).

The total score in WOMAC pain subscale ranges from 0-50. The mean of the pain score was found 17.8±7.1 with a range from 5-32 score. The total score in WOMAC physical function subscale ranges from 0-170. The mean of the pain score was found 63.6±21.7 with a range from 19-136 score (Table 4).

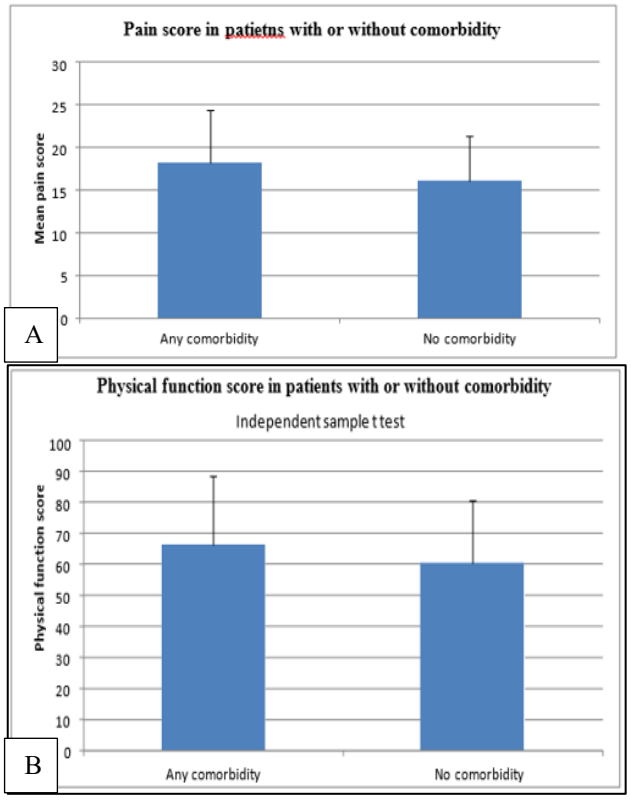

Figure 3 (A and B): Comparison of mean pain and mean physical score in patients with/without any comorbidity.

*(Error bars indicated 1 standard deviation).

Table 4: WOMAC pain and the physical function subscale scores in the patients with the knee OA (n=110).

Item	Mean	SD	Range
Walking	4.7	1.6	1-9
Upstairs downstairs	5.8	1.7	1-9
At night	1.7	1.0	0-3
Sitting/lying	2.1	1.1	0-5
Standing	3.5	1.4	1-7
Total	17.8	7.1	5-32
Item			
Descending stairs	4.5	1.4	1-9
Ascending stairs	5.9	1.5	1-9
Rising (from sitting)	3.2	1.5	0-3
Standing	3.5	1.4	0-5
Bending	3.9	1.1	1-7
Walking	3.2	1.3	1-9
In/out of rickshaw/auto-rickshaw	5.0	1.2	1-9
Shopping	4.7	1.1	0-3
Washing feet	1.5	1.1	0-5

Continued.

Item	Mean	SD	Range
Rising (from bed)	2.0	1.2	1-7
Wiping/drying feet	1.7	1.2	1-9
Lying in bed	1.4	0.9	0-5
In/out of bath	2.3	1.2	0-3
Sitting	2.2	1.2	0-5
On/off toilet	6.4	1.6	1-7
Heavy domestic duties	7.1	1.4	1-9
Light domestic duties	5.1	1.4	1-9
Total	63.6	21.7	19-136

Table 5: Mean pain and physical function score in different subgroups of OA patients by their socio- demographic characteristics, (n=110).

Characteristics	Label	Mean±SD	P value
Age (in years)	<50	16.4±6.3	0.001
	≥50	18.1±6.9	
Sex	Male	15.4±6.4	0.001
	Female	18.2±7.9	
Residence	Urban	18.6±7.7	0.064
	Semi-urban and rural	17.1±7.8	
Education	Below SSC	17.1±7.9	0.051
	SSC and above	18.1±6.3	
Monthly income	<20000 BDT	17.9±7.2	0.480
	20000-50000BDT	17.8±7.1	
	>50000 BDT	18.1 ±7.1	
Characteristics			
Age (in years)	<50	59.1±19.2	<0.001
	≥50	67.8±22.9	
Sex	Male	57.3±19.5	<0.001
	Female	66.5±21.9	
Residence	Urban	63.2±21.5	0.543
	Semi-urban and rural	63.7±21.8	
Education	Below SSC	64.2±21.4	0.078
	SSC and above	62.9±21.9	
Monthly income	<20000 BDT	65.1±22.3	0.065
	20000-50000BDT	64.2±20.5	
	>50000 BDT	62.4±21.8	

Table 6: Mean and standard deviation of the physical function and pain scales core in OA patients, according to the presence or absence of comorbidities.

WOMAC score	Present	Absent	P value
HTN	**Present, (n=50)**	**Absent, (n=60)**	
Pain score	18.1±7.5	17.5±6.9	0.415
Physical function score	63.7±21.8	63.5±21.9	0.564
DM	**Present (n=23)**	**Absent (n=87)**	
Pain score	18.8±7.5	17.2±8.1	0.074
Physical function score	66.4±22.4	62.2±21.5	0.042
Depression	**Present (n=23)**	**Absent (n=87)**	
Pain score	19.2±8.1	17.1±7.4	0.001
Physical function score	67.5±22.5	62.1±21.4	<0.001
Anxiety	**Present (n=15)**	**Absent (n=95)**	
Pain score	18.0±7.8	17.9±7.1	0.487
Physical function score	64.1±21.9	63.2±21.7	0.341
IHD	**Present (n=12)**	**Absent (n=98)**	
Pain score	17.7±7.7	17.8±7.4	0.784
Physical function score	64.6±22.9	63.5±21.2	0.141

Continued.

WOMAC score	Present	Absent	P value
Overweight /obese	**Present (n=57)**	**Absent (n=53)**	
Pain score	17.8±7.3	17.8±7.0	0.437
Physical function score	64.2±22.4	63.1±21.4	0.064
Any comorbidity	**Present (n=83)**	**Absent (n=27)**	
Pain score	18.1±7.2	16.0±8.1	0.001
Physical function score	66.1±22.1	60.2±20.4	0.001

Table 7: Spearman correlation coefficients between age, duration of diseases, GAD-7 and PHQ-9 and WOMAC pain, stiffness and physical function subscale values.

WOMAC scale	Age (in years)	Duration of pain	GAD-7	PHQ-9
WOMAC pain scale	0.19	0.34	0.12	0.33
WOMAC stiffness scale	0.16	0.22	0.09	0.12
WOMAC functional scale	0.23	0.31	0.11	0.29

Patient characteristics (age, duration of disease, GAD-7 score and PHQ-9 score) were checked for possible significant correlations with the WOMAC pain, stiffness and physical function subscale scores. Table IX shows that, age and duration of diseases of the OA patients was significantly positively correlated with the all three WOMAC subscales. GAD-7 scale score had no significant correlation with any of the three WOMAC subscales score. In contrast PHQ-9 scale had significant positive correlation with pain subscales only (Table 7).

DISCUSSION

This study was conducted in the department of medicine and physical medicine and rehabilitation of CMCH, Chattogram during the period of August 2019 to July 2020. Total 110 patients with OA of the knee joint diagnosed by ACR criteria were studied. In the present study, prevalence of symptomatic knee OA significantly higher in female than male. Out of them, 33 (30%) patients were male and 77 (70%) patients were female. Male female ratio was 1:2.33. More than two third of the patients were female. This is supported by other studies conducted in Bangladesh and in other countries of the world.[15-17] In the developing country like Bangladesh, most of the house wives used to do their household works in the bent knee position. The mean age of the patient was found 56.83 (±8.28) years in this study and out of 110 patients 54 patients belong to age group below 50 years. Ahmed et al showed the mean age is 55 years and the maximum number of female with OA was in the age group of 35 to 45 years.[16] Similarly, Shakoor et al from Chattogram reported that, mean age of the knee OA subject was 53.73±11.35 years and most of the patients of were in the age group of 50 to 59 years.[18] On the other hand in a study in USA, Cleveland et al. showed the mean age of their patients was 67.4 (±10.8) in their study.[10] In the present study mean BMI of the patient was found 26.01±4.1 kg/m^2 and mean duration of pain was four (4.1±2.9) years. This is in favor of findings of other studies conducted in Bangladesh.[16,18] On the other hand Cleveland et al. conducted a study at North Carolina, USA and found that the mean BMI of the patient with knee OA was 32.7 (±7.58) kg/m^2 which is higher than BMI of Bangladeshi patients.[10] This may be due to tall structure of the people of USA than that of Bangladeshi people. The findings of the current study go with the Ahmed et al and Shakoor et al study where the mean of the duration of pain was 3.6±2.8 years and 25.25±38.85 months respectively.[16,18] In this study sample, about one fifth of the patients reported no associated comorbid conditions. Approximately three fourth of patients reported one or two comorbid conditions and another 11% reported three or more comorbid conditions. An epidemiologic cohort study reported that, OA is more common in women than in men and is associated with comorbid conditions like hypertension, depression, chronic obstructive pulmonary disease and epilepsy.[17] Different meta-analysis also suggested that, people with OA are more likely to have other chronic conditions. The association is dose dependent in terms of the number of comorbidities, suggesting multimorbidities.[19,20] Among the reported comorbidity most frequent was HTN present in 45.5% patients followed by DM present in 23 (20.9%) patients. Depression and anxiety were noticed in 20.9% and 13.6% of patients respectively. Other less frequent diseases were IHD, COPD, CVD, CLD, CKD and asthma. The meta analysis of Sharma et al found that both anxiety and/or depression were highly prevalent among patients with OA.[21] Leite et al reported that among 91 patients 54.9% had metabolic syndrome, 75.8% had hypertension, 52.6% of the patients had dyslipidemia, 57.1% had obesity and the screening for depression was positive in 61.3% of patients.[22] In the current study pain and physical functional status was measured by the WOMAC scale. It was observed that, mean pain scale score was 17.8±7.1 with a range from 5-32 score and mean physical function score was 63.6±21.7 with a range from 19-136. Ahmed et al reported similar pattern of pain and physical function status in their patients of knee OA.[16] Moreover, they reported that, pain and physical function were associated with OA of the knee where the mean physical function score was 45.1±4.2 in patients who had pain score of >10. In the present study individuals with coexistence of any chronic health conditions have greater pain and physical function score compared to their counterpart. Patients with comorbidity have pain score 18.1 (±7.2) in comparison to

16.0 (±8.1) in patients without any associated with comorbidity, and it was statistically significant (p=0.001). Similarly, physical function score was significantly greater in patients having co-existence of any comorbidity compared to their counterpart, which was statistically significant too [66.1 (±22.1) versus 60.2 (±20.4); p=0.001]. This finding are in agreement with other studies.[11,21,22] OA patients with depression had higher pain score compared to OA patients without depression in the present study (19.2±8.1 versus 17.1±7.4, p=0.001). Similarly, physical function score was significantly higher in OA patients with DM compared to their counterpart (67.5±22.5 versus 62.1±21.4, p≤0.001). Leite et al reported that, OA patient's hypertension and depressive symptoms reported greater pain perception in patients with hand OA.[22] In addition, patients screening positive for depression had a more impaired hand function, with a statistically significant difference in their study. In the present study, a significant positive correlation was observed between age and duration of diseases of the OA patients and the all three WOMAC subscales. GAD-7 scale score had no significant correlation with any of the three WOMAC subscales score. In contrast PHQ-9 scale had significant positive correlation with pain subscales only indicating patients having depressive symptoms had increased pain perception.

CONCLUSION

In conclusion, the study analyzed the frequency of comorbidities in patients of OA and assessed their impact on pain and physical function. The study demonstrated that the frequency of comorbidities in OA patients is very high, mainly hypertension, diabetes mellitus, overweight/ obesity, and depression. Those associations can make vulnerable the result of the OA treatment due to the interaction of such comorbidities with the chronic pain symptom. The adequate control of each of those situations and referral to a specialist can help with the OA treatment and improve the quality of life of OA patients.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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