Co-morbidities of patients with knee osteoarthritis

Introduction

Osteoarthritis (OA) is one of the commonest medical conditions in elderly persons. It is also the most common reason for restricted daily activity and can significantly impact on quality of life. Worldwide estimates suggest that 9.6% of men and 18.0% of women aged 60 years have symptomatic OA of the hips or knees. While OA is a significant health issue, both locally and abroad, epidemiological data have revealed that there is an important difference in pattern between Caucasian and Chinese populations, with OA knee being more common among Chinese and OA hip among Caucasians. Hoaglund et al observed that in Hong Kong Chinese older than 54 years, the prevalence of OA hip was only 1.2% in men and 0.8% for women, whereas OA knee affected 5% of men and 13% of women. Osteoarthritis of the knee was therefore chosen as the subject of the present study.

A simple definition of co-morbidity is the co-existence of two or more health problems. In the context of general practice, it is not uncommon to see patients with more than one problem, especially among elderly patients. These co-existing health problems can interact with each other and produce high levels of disability and management problems that escalate health care use and costs. Since OA knee is a degenerative condition which is more common with increasing age, patients with this affliction are also likely to suffer from a number of other disabling and chronic conditions. Despite the clinical importance of this issue, there are few local published studies of relevant co-morbidities.

Objectives

To study the co-morbidities of general practice patients with knee osteoarthritis.

Design

Cross-sectional study.

Setting

Two private general practice clinics in Hong Kong.

Patients

All patients presenting at the two clinics were screened for osteoarthritis of the knee based on American College of Rheumatology diagnostic criteria. Patients with osteoarthritis then completed a semi-instructed questionnaire.

Results

A total of 455 patients were recruited into the study. Over half (56%) had knee pain plus more than three other diagnostic criteria. Almost all (95%) of the patients with osteoarthritis had no signs of inflammation at the time of screening. Their mean age was 54 years. Overall, 78% of them had at least one musculoskeletal co-morbidity and 82% had at least one non-musculoskeletal co-morbidity. On average they had 3.2 co-morbidities, of which 1.7 were musculoskeletal and 1.5 were non-musculoskeletal. Problems related to the back, upper limbs, neck, and lower limbs were the four most common musculoskeletal co-morbidities, of which neck problems were significantly more common among younger patients (55 years or below) [odds ratio for older to younger patients was 0.62; 95% confidence interval, 0.4-0.9]. The four commonest non-musculoskeletal co-morbidities were cardiovascular, gastro-intestinal, respiratory, and endocrine, of which cardiovascular diseases (odds ratio=8.76; 95% confidence interval, 5.6-13.7), endocrine problems (4.56; 2.8-7.4), and central nervous system diseases (12.74; 1.6-102.8) were significantly likely among older patients (more than 55 years).

Conclusion

General practitioners should be alert to the presence of co-morbidities when managing patients with osteoarthritis of the knee.
in general practice. Research carried out by the Hong Kong College of Family Physicians in 1998 studied co-morbidity in Hong Kong general practice. That study showed that OA knee was associated only with hypertension (odds ratio [OR]=1.35; 95% confidence interval [CI], 1.06-1.72). This was contradictory to findings from the United Kingdom and Australia, which showed that OA knee patients could have quite extensive musculoskeletal (MSK) and non-MSK co-morbidities.

Based on the above, we carried out this study to review the local situation and investigate the relationship between OA knee and its co-existing MSK and non-MSK co-morbidities.

Methods

The study was carried out in two private general practice clinics in Hong Kong from September 2006 to February 2007. Patients were recruited using convenience sampling. All patients presenting to either clinic were screened for a history of knee pain by receptionists. During the consultation, those with a history of knee pain were then further screened by the attending doctor for clinical features of OA knee, using the diagnostic criteria of OA knee established by the American College of Rheumatology (ACR). Patients who were diagnosed to have OA knee were then asked to fill in a semi-instructed questionnaire (with or without assistance from nursing or clerical staff).

The questionnaire (Appendix) consisted of three parts: part I on patient demographic data, part II on patient co-morbidities, and part III on previous use of health care resources. As part III was not related to the theme of this study, only data from parts I and II were analysed and the Statistical Package for the Social Sciences (Windows version 15.0; SPSS Inc, Chicago [IL], US) was used for the statistical analysis.

Results

Overall, 457 patients were recruited into the study; two of whom were excluded because of incorrect data collection.

Diagnosis of osteoarthritis knee

Concerning the diagnostic criteria of OA knee, all our patients had a history of knee pain (a ‘must’ criterion in the ACR guidelines). Besides having knee pain, 43.7% fulfilled the minimum of three other criteria, whereas the remaining 56.3% presented with more than three such diagnostic criteria (Table 1). The most common criteria were the presence of crepitus on bony motion and the absence of significant morning stiffness. Notably, 95.4% of the OA knee patients had no signs of inflammation at the time of screening.

<table>
<thead>
<tr>
<th>Osteoarthritis knee symptoms for classification</th>
<th>No. (%) of patients (n=455)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACR clinical classification criteria of osteoarthritis</td>
<td>455 (100)</td>
</tr>
<tr>
<td>(a) Knee pain (must criteria)</td>
<td>455 (100)</td>
</tr>
<tr>
<td>(b) &gt;50 Years old</td>
<td>277 (60.9)</td>
</tr>
<tr>
<td>(c) &lt;30 Minutes of morning stiffness</td>
<td>375 (82.4)</td>
</tr>
<tr>
<td>(d) Crepitus on active motion</td>
<td>436 (95.8)</td>
</tr>
<tr>
<td>(e) Bony tenderness</td>
<td>141 (31.0)</td>
</tr>
<tr>
<td>(f) Bony enlargement</td>
<td>114 (25.1)</td>
</tr>
<tr>
<td>(g) No palpable warmth of synovium</td>
<td>434 (95.4)</td>
</tr>
<tr>
<td>No. of criteria fulfilled (other than knee pain)</td>
<td>199 (43.7)</td>
</tr>
<tr>
<td>3</td>
<td>138 (30.3)</td>
</tr>
<tr>
<td>5</td>
<td>80 (17.6)</td>
</tr>
<tr>
<td>6</td>
<td>38 (8.4)</td>
</tr>
</tbody>
</table>

* ACR denotes American College of Rheumatology

Demographic data

Approximately 70% of the studied population were
TABLE 2. Body mass index (BMI) of patients

<table>
<thead>
<tr>
<th>BMI Category</th>
<th>Sex</th>
<th>Age (years)</th>
<th>No. (%)</th>
<th>BMI Mean (SD)</th>
<th>Independent t test</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;23 kg/m²</td>
<td>Female (n=317)</td>
<td>≤55 (n=275)</td>
<td>115 (36.3%)</td>
<td>23 (4.0)</td>
<td>P&lt;0.05</td>
</tr>
<tr>
<td></td>
<td>Male (n=138)</td>
<td>&gt;55 (n=180)</td>
<td>36 (20.0%)</td>
<td>25.2 (3.2)</td>
<td></td>
</tr>
<tr>
<td>≥23 kg/m²</td>
<td>Female (n=317)</td>
<td>≤55 (n=275)</td>
<td>109 (39.6%)</td>
<td>24.1 (4.0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Male (n=138)</td>
<td>&gt;55 (n=180)</td>
<td>144 (80.0%)</td>
<td>25.2 (3.2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Overall (n=455)</td>
<td>≤55 (n=275)</td>
<td>145 (31.9%)</td>
<td>24.5 (3.7)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;55 (n=180)</td>
<td>310 (68.1%)</td>
<td>24.5 (3.7)</td>
<td></td>
</tr>
</tbody>
</table>

The co-morbidities

In this study, OA knee patients had on average 3.2 co-morbidities, of which 1.7 were MSK and 1.5 were non-MSK. Overall, 78% of the patients had at least one MSK co-morbidity, and 82% had at least one non-MSK co-morbidity. Older patients (>55 years) had significantly more non-MSK co-morbidities than those who were younger (≤55 years) [mean difference, -0.69; 95% CI, -0.9 to -0.5]. An unexpected finding was that the same older patients had significantly fewer MSK co-morbidities than the younger patients [mean difference, 0.23; 95% CI, 0.0 to 0.5] [Table 3].

Problems related to the back, upper limbs, neck, and lower limbs were the four most common MSK co-morbidities in both patient groups. A significantly greater proportion of younger OA knee patients had neck problems than those who were older (OR=0.62; 95% CI, 0.4-0.9).

For non-MSK co-morbidities, the four commonest categories were cardiovascular (33%), gastro-intestinal (29%), respiratory (27%), and endocrine (21%). Among these, central nervous system diseases (eg stroke) were approximately 13 times as common (OR=12.74; 95% CI, 1.1-102.8). Cardiovascular diseases (eg hypertension) were about 9 times as common (OR=8.76; 95% CI, 5.6-13.7), and endocrine problems (eg diabetes) about 5 times as common (OR=4.56; 95% CI, 2.8-7.4). These three co-morbidities were significantly more common in older than younger patients. Approximately one third of OA knee patients in both age-groups had co-existing gastro-intestinal problems. The OA knee patients who were overweight or obese had significantly more cardiovascular disorders (OR=3.05; 95% CI, 1.9-4.9), endocrine problems (OR=2.41; 95% CI, 1.4-4.2), and mental problems (such as depression) [OR=2.23; CI 1.1-4.4] than individuals with BMIs that were not excessive.

Discussion

In our study, the mean age of our patients was 54 years, and 70% were female. These figures are in concordance with previous large studies in which older adults (aged >55 years) had radiographic evidence of OA and women had more OA knees than men. Obesity is a well-known powerful risk factor of OA knee. This was also reflected in our study, in that the majority (68.1%) were either overweight or obese; the overall mean BMI being 24.5 kg/m².

Since OA knee is an age-related condition, other co-existing MSK problems can be expected. Unexpectedly, our older patients (>55 years) had significantly fewer MSK co-morbidities than those who were younger (mean difference, 0.23; 95% CI, 0.0-0.5) [Table 3]. Further analysis revealed that this was due to a significantly higher percentage of neck problems in the younger patient group; the OR for neck problems in the older versus younger patients being 0.62 (95 CI, 0.4-0.9). High quantitative job demands, low social support at work, job insecurity, low physical capacity, poor computer workstation design and work posture, sedentary work positions, repetitive work, and precision work have all been associated with neck pain. One possible reason is that most of the younger patients attending the two general practice clinics belonged to the working class. Further studies are needed to look into the relationship between neck problems and OA knee.

Our study showed that cardiovascular, gastro-intestinal, respiratory, and endocrine problems were the four most common non-MSK co-morbidities in OA knee patients; cardiovascular problems being most common. This is consistent with similar findings from previous local and overseas studies. A similar study to ours conducted in a general practice in the Netherlands found that chronic conditions like...
TABLE 3. Proportion of patients with musculoskeletal (MSK) and non-MSK co-morbidities

<table>
<thead>
<tr>
<th>Overall (n=455)</th>
<th>BMI</th>
<th>Age</th>
<th>OR†</th>
<th>95% CI of OR</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSK co-morbidities (78% of patients had at least one MSK co-morbidity)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Back (eg low back pain)</td>
<td>234 (51)</td>
<td>124 (40)</td>
<td>3.05†</td>
<td>1.9 to 4.9</td>
</tr>
<tr>
<td>Upper limbs (eg tennis elbow)</td>
<td>230 (51)</td>
<td>83 (30)</td>
<td>0.91</td>
<td>0.6 to 1.4</td>
</tr>
<tr>
<td>Neck (eg neck pain)</td>
<td>164 (36)</td>
<td>73 (24)</td>
<td>0.59†</td>
<td>0.4 to 0.8</td>
</tr>
<tr>
<td>Lower limbs (eg ankle pain)</td>
<td>126 (28)</td>
<td>42 (12)</td>
<td>2.41†</td>
<td>1.4 to 4.2</td>
</tr>
<tr>
<td>Others (eg fractured hips)</td>
<td>24 (5)</td>
<td>17 (5)</td>
<td>1.14</td>
<td>0.5 to 2.8</td>
</tr>
<tr>
<td>Non-MSK co-morbidities (82% of patients had at least one non-MSK co-morbidity)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardiovascular (eg hypertension)</td>
<td>150 (33)</td>
<td>124 (40)</td>
<td>3.05†</td>
<td>1.9 to 4.9</td>
</tr>
<tr>
<td>Gastro-intestinal (eg ulcers)</td>
<td>132 (29)</td>
<td>83 (30)</td>
<td>0.91</td>
<td>0.6 to 1.4</td>
</tr>
<tr>
<td>Respiratory (eg asthma)</td>
<td>123 (27)</td>
<td>73 (24)</td>
<td>0.59†</td>
<td>0.4 to 0.8</td>
</tr>
<tr>
<td>Endocrine (eg diabetes)</td>
<td>97 (21)</td>
<td>79 (23)</td>
<td>2.41†</td>
<td>1.4 to 4.2</td>
</tr>
<tr>
<td>Mental (eg depression)</td>
<td>59 (13)</td>
<td>48 (15)</td>
<td>2.23†</td>
<td>1.1 to 4.4</td>
</tr>
<tr>
<td>Neoplasia (eg different types of cancer)</td>
<td>30 (7)</td>
<td>21 (7)</td>
<td>1.10</td>
<td>0.5 to 2.5</td>
</tr>
<tr>
<td>Autoimmune (eg rheumatoid arthritis)</td>
<td>13 (3)</td>
<td>7 (2)</td>
<td>0.54</td>
<td>0.2 to 1.6</td>
</tr>
<tr>
<td>Central nervous system (eg stroke)</td>
<td>9 (2)</td>
<td>8 (3)</td>
<td>3.81</td>
<td>0.5 to 30.8</td>
</tr>
<tr>
<td>Others</td>
<td>45 (10)</td>
<td>30 (10)</td>
<td>0.93</td>
<td>0.5 to 1.8</td>
</tr>
<tr>
<td>No. with different types of co-morbidities</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Musculoskeletal co-morbidities (out of the 5 types mentioned above)</td>
<td>1.7 (1.2)</td>
<td>1.7 (1.2)</td>
<td>0.20</td>
<td>-0.04 to 0.4</td>
</tr>
<tr>
<td>Non-musculoskeletal co-morbidities (out of the 9 types mentioned above)</td>
<td>1.5 (1.2)</td>
<td>1.5 (1.2)</td>
<td>0.28†</td>
<td>-0.5 to -0.1</td>
</tr>
<tr>
<td>All co-morbidities (out of the 14 types mentioned above)</td>
<td>3.2 (1.9)</td>
<td>3.2 (1.9)</td>
<td>-0.08</td>
<td>-0.4 to 0.3</td>
</tr>
</tbody>
</table>

# BMI denotes body mass index, OR odds ratio, CI confidence interval, SD standard deviation, and MD mean difference
† Interpretation of the OR—for the two BMI subgroups: OR>1 indicates patients with BMI≤23 were more likely to have that co-morbidity, OR<1 indicates patients with BMI≥23 were less likely to have that co-morbidity; for the two age subgroups: OR>1 indicates patients aged ≤55 were more likely to have that co-morbidity, OR<1 indicates patients aged >55 were less likely to have that co-morbidity
‡ Knee pain was not included
§ For patients aged ≤55 years or BMI<23 kg/m², the number of patients who had central nervous system co-morbidities was less than 5

Conclusion

The Chinese patients in our study shared the same risk factors for OA knee as reported by others. Our OA knee patients were likely to be elderly and have multiple concomitant health-related problems. These co-morbidities can interact with each other to produce high levels of disability, eg the increased pain and reduced mobility, particularly from MSK co-morbidities. Moreover, co-morbidities also lead to management problems, eg drug safety issues owing to the presence of cardiovascular co-morbidity and the prescription of COX-2 inhibitors, gastro-intestinal co-morbidity, and the use of NSAIDs. Primary care physicians should be aware of these co-morbidities. As all data in this study were drawn from only two private general practice clinics whose patient demographics may be different from those of government out-patient clinics, there could be sampling bias related to our locality. Hence the generalisability of the ORs we calculated may be limited.

Diabetes mellitus and heart diseases were associated with OA. Obesity, a known risk factor for OA knee, may explain this association, since it is also a risk factor for diabetes, heart disease, and hypertension. In our study, gastro-intestinal disorder (eg ulcer disease) was the second most common OA knee-related co-morbidity, which was present in about one third of our patients (irrespective of their age or BMI). Such a high prevalence calls for judicious use of non-steroidal anti-inflammatory drugs (NSAIDs) among OA knee patients. A population-based case control study conducted in the United States demonstrated that, after 10 years' follow-up, OA patients had significantly more peptic ulcer disease and renal disease; the most likely cause being the use of NSAIDs.18

The limitation of this study was that it was a one-armed cross-sectional investigation. Although we demonstrated that OA knee was significantly associated with both MSK and non-MSK co-morbidities, further case control studies are required to establish that OA knee is independently associated with these co-morbidities. As all data in this study were drawn from only two private general practice clinics whose patient demographics may be different from those of government out-patient clinics, there could be sampling bias related to our locality. Hence the generalisability of the ORs we calculated may be limited.

### Co-morbidities of osteoarthritis knee patients

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physicians should be alert to the presence of co-
morbidities and consider their impact when managing
patients with OA knee.

Appendix

Additional material related to this article can be found
on the HKMJ website. Please go to <http://www.hkmj.org>,
search for the appropriate article, and click on

Full Article in PDF following the title.

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APPENDIX. Questionnaire on the management of osteoarthritis of the knee

Q1 Criteria for OA knee by history and physical examinations:

1. Pain in the knee (Must) ☐
   And at least 3 of the followings
2. Over 50 years old ☐
3. Less than 30 minutes of morning stiffness ☐
4. Crepitus on active motion ☐
5. Bony tenderness ☐
6. Bony enlargement ☐
7. No palpable warmth of synovium ☐

Part I: Demographic data
Q2a Age: _____
Q2b Sex: Female ☐  Male ☐
Q2c Weight: _____ kg
Q2d Height: _____ cm
Q2e BMI: _____

Part II: Co-morbidities
Musculoskeletal co-morbidities:
Q3a Neck (e.g., neck pain)
No. ☐
   Yes. ☐ (Please specify): ____________________________
      No medication ☐  Occasional medication ☐  Medication > once a week ☐  Daily medication ☐
Q3b Back (e.g., LBP)
No. ☐
   Yes. ☐ (Please specify): ____________________________
      No medication ☐  Occasional medication ☐  Medication > once a week ☐  Daily medication ☐
Q3c Upper limbs (e.g., tennis elbow)
No. ☐
   Yes. ☐ (Please specify): ____________________________
      No medication ☐  Occasional medication ☐  Medication > once a week ☐  Daily medication ☐
Q3d Lower limbs (e.g., ankle pain)
No. ☐
   Yes. ☐ (Please specify): ____________________________
      No medication ☐  Occasional medication ☐  Medication > once a week ☐  Daily medication ☐
Q3e Others (e.g., fractures hips)
No. ☐
   Yes. ☐ (Please specify): ____________________________
      No medication ☐  Occasional medication ☐  Medication > once a week ☐  Daily medication ☐

Non-musculoskeletal co-morbidities:
Q4a CVS (e.g., HT, IHD)
No. ☐
   Yes. ☐ (Please specify): ____________________________
      No medication ☐  Occasional medication ☐  Medication > once a week ☐  Daily medication ☐
Q4b Endocrine (e.g., DM)
No. ☐
   Yes. ☐ (Please specify): ____________________________
      No medication ☐  Occasional medication ☐  Medication > once a week ☐  Daily medication ☐
Q4c CNS (e.g., CVA, Parkinsonism)
   No. ☐
   Yes. ☐' (Please specify): ________________________________
   No medication ☐' Occasional medication ☐' Medication > once a week ☐'
   Daily medication ☐'

Q4d Respiratory (e.g., asthma)
   No. ☐
   Yes. ☐' (Please specify): ________________________________
   No medication ☐' Occasional medication ☐' Medication > once a week ☐'
   Daily medication ☐'

Q4e Neoplasm
   No. ☐
   Yes. ☐' (Please specify): ________________________________
   No medication ☐' Occasional medication ☐' Medication > once a week ☐'
   Daily medication ☐'

Q4f Mental (e.g., depression)
   No. ☐
   Yes. ☐' (Please specify): ________________________________
   No medication ☐' Occasional medication ☐' Medication > once a week ☐'
   Daily medication ☐'

Q4g GI (e.g., ulcers)
   No. ☐
   Yes. ☐' (Please specify): ________________________________
   No medication ☐' Occasional medication ☐' Medication > once a week ☐'
   Daily medication ☐'

Q4h Autoimmune (e.g., RA)
   No. ☐
   Yes. ☐' (Please specify): ________________________________
   No medication ☐' Occasional medication ☐' Medication > once a week ☐'
   Daily medication ☐'

Q4i Others
   No. ☐
   Yes. ☐' (Please specify): ________________________________
   No medication ☐' Occasional medication ☐' Medication > once a week ☐'
   Daily medication ☐'

Q5a What medication(s) do you take regularly for the above co-morbidities (except knee pain)?
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________

Q5b What medication(s) do you take regularly for the knee pain?
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________

Part III: Health seeking behaviour

Q6 What treatment(s) that you have received for your knee pain? (can select more than one)
   ☐' General Practitioners ☐' Orthopaedics ☐' Self medicated ☐' Chinese herbalist
   ☐' Government Clinics ☐' Physiotherapy ☐' Bone Setters ☐' Acupuncturist
   ☐' Others __________________________