Pain and frailty among community-dwelling older people in Hong Kong

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ABSTRACT

Introduction. Pain and frailty are common geriatric syndromes and can lead to adverse health outcomes. This study aims to examine the association between pain and frailty in community-dwelling older adults in Hong Kong and to suggest a patient-centred intervention for frail older people with pain.

Methods: Community-dwelling older adults aged ≥65 years were invited to attend a health check programme. Characteristics of pain were recorded, including the presence of pain, the total number of pain sites, the highest pain intensity, and the frequency of pain. The 5-item FRAIL scale was used to screen frailty. The Lawton instrumental activity of daily living (IADL) scale was used to assess independence. Handgrip strength of the dominant hand and walking speed for 6 meters were measured.

Results: Of 445 older adults who attended the health check programme, 265 women and 64 men (mean age, 75 years) agreed to participate and were included for analysis. Of them, 123 (37.4%) reported persistent pain, 116 (35.5%) reported sporadic pain, and 90 (27.4%) reported no pain. Participants were classified as frail (n=47, 14.3%), prefrail (n=200, 60.8%), or robust (n=82, 24.9%). Comparing the combined frail and prefrail group with the robust group, frailty was independently associated with age (odds ratios [OR]=1.053, p=0.007), Lawton IADL (OR=0.602, p=0.004), and sporadic pain (OR=2.072, p=0.031), after adjusting for walking speed and handgrip strength.

Conclusion: The prevalence of frailty is high among community-dwelling older adults in Hong Kong. Age, IADL, and sporadic pain are independently associated with frailty; only pain is amenable. Pain management may help prevent progression to frailty in older people.

Key words: Aged; Frailty; Pain

INTRODUCTION

Pain is a major health problem, especially among older people. About 50% of community-dwelling older people and 60% to 80% of nursing home residents have experienced chronic pain. Frailty is a common geriatric syndrome. It is characterised by a decrease in physiological reserve and an increase in vulnerability to stressors resulting in an increased risk of falls, hospitalisation, disability, institutionalisation, and death. The prevalence of frailty in community-dwelling older adults increases with age and ranges from 4% to 17%, depending on the definition of frailty. In Hong Kong, the frailty state of older people increases 10% in 3 years. Frailty is an interaction between diminished physiological capacity, life-course determinants, and medical conditions. Malignancy and degenerative bone and
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Pain and frailty in community-dwelling older people

Joint disease are common sources of pain among older people.8 Pain and frailty usually coexist and are associated with ageing. Pain is a risk factor for falls, functional impairment, and mortality.9,10 Constant pain is a manifestation of the frailty phenotype.11 Pain contributes to the development of frailty by acting as a stressor,12,13 although some studies report no significant association between pain and frailty.14,15 Nonetheless, pain may lead to greater sedentary and worse nutrition and hence frailty.16 Those who are frail (defined as having >3 components of the frailty phenotype) are more likely to have pain.17 Pain may diminish the physiological reserves for maintaining homeostasis when older adults encounter biological, psychological, or social stressors.12 Pain homeostasis is associated with development of frailty.18-20 This study aimed to determine the association between pain and frailty in community-dwelling older adults in Hong Kong.

METHODS

This study was approved by the Kowloon Central / Kowloon East Cluster Research Ethics Committee (reference: KC/KE-21-0258/ER-3). Between August 2019 and July 2021, a health check programme was organised by the Wong Tai Sin district council and Wong Tai Sin healthy city. The programme was suspended between September 2019 and March 2021 owing to social events and the COVID 19 pandemic. Community-dwelling older adults aged ≥65 years were invited by the district council office and elderly social centres to participate. Those who were chair-bound, cognitively incapacitated, or unable to communicate in Cantonese were excluded. Verbal informed consent was obtained from each participant.

Demographic data including age, sex, and body mass index were collected, as were self-reported comorbidities including diabetes, hypertension, heart disease, renal disease, stroke, and cancer. Characteristics of pain were recorded, including the presence of pain in the past month, the total number of pain sites, the highest pain intensity, and the frequency of pain. Pain sites were categorised into head and neck, back, bone and joints, legs, arm, and others. Pain intensity was rated by an 11-point scale ranging from 0 (no pain) to 10 (worst pain). Pain frequency was stratified into persistent (≥2 times per week in the past 6 months), sporadic (<1 time to 3 times per month), and no pain in the past 6 months.21

The 5-item FRAIL scale was used to screen frailty.22 It comprises five components: fatigue, resistance, ambulation, illness, and loss of weight. Total score ranges from 0 (best) to 5 (worst); a score of 3 to 5 is frail, 1 to 2 prefrail, and 0 robust. The Lawton instrumental activity of daily living (IADL) scale was used to assess independence. It comprises eight domains: ability to use the telephone, shopping, food preparation, housekeeping, laundry, mode of transportation, the responsibility of own medications, and ability to handle own finances. Total scores range from 8 (very low function) to 24 (independent).23 Handgrip strength of the dominant hand was measured using a handheld dynamometer. The maximum grip strength of three attempts was recorded. Walking speed (in m/s) for 6 meters at a comfortable pace was measured; use of walking aids was allowed.

Participants were classified as frail, prefrail, or robust. The three groups were compared using ANOVA with post hoc analysis, Kruskal Wallis test, or Chi square test, as appropriate. Backward stepwise logistic regression was used to determine independent factors of frailty after adjusting for physical performance. A p value of <0.05 was considered statistically significant.

RESULTS

Of 445 older adults attended the health check programme, 265 women and 64 men (mean age, 75±8.66 years) agreed to participate and were included for analysis. Of them, 123 (37.4%) reported persistent pain, 116 (35.5%) reported sporadic pain, and 90 (27.4%) reported no pain (TABLE 1). The median pain intensity was 4, and the median number of pain sites was 2; the most common pain site was bone and joints (n=163, 49.7%), followed by legs (n=98, 29.8%), head and neck (n=91, 24.6%), and back (n=80, 24.3%). Those with pain were more likely to have a history of cancer and arthritis.

Based on the FRAIL scale, participants were classified as frail (n=47, 14.3%), prefrail (n=200, 60.8%), or robust (n=82, 24.9%). Participants in the frail group were more likely to have hypertension, diabetes, history of stroke, history of cancer, and
arthritis. Participants in the frail and prefrail groups were significantly older and more common to have chronic diseases and poorer physical performance. The frail group reported more persistent pain, whereas the prefrail group reported more sporadic pain. Around one third of participants in the robust group did not have pain. The median pain intensity was higher in the frail group than in the prefrail group than in the robust group (5 vs 4 vs 3, p=0.043). Compared with participants with no pain, those with persistent or sporadic pain had slower walking speed (1.097 vs 0.964, p=0.001), weaker handgrip strength (20.5 vs 20, p=0.036), and were more commonly female (66.6% vs 85.8%, p<0.001).

In a backward stepwise logistic regression comparing the combined frail and prefrail group with the robust group, frailty was independently associated with age (odds ratios [OR]=1.053, p=0.007), Lawton IADL (OR=0.602, p=0.004), and sporadic pain (OR=2.072, p=0.031), after adjusting for walking speed and handgrip strength (Table 2).

**Table 1**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Robust (n=82)*</th>
<th>Prefrail (n=200)*</th>
<th>Frail (n=47)*</th>
<th>p Value†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, y</td>
<td>71.25±7.23</td>
<td>75.42±8.74</td>
<td>79.51±8.11</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>No. of women</td>
<td>62 (75.6)</td>
<td>165 (82.5)</td>
<td>38 (80)</td>
<td>0.414</td>
</tr>
<tr>
<td>Body mass index, kg/m²</td>
<td>23.86±4.74</td>
<td>24.29±3.86</td>
<td>24.09±3.66</td>
<td>0.714</td>
</tr>
<tr>
<td>Lawton instrumental activity of daily living score</td>
<td>24 (24-24)</td>
<td>24 (23-24)</td>
<td>23 (19.5-24)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Handgrip strength, kg</td>
<td>20.5 (15.2-28)</td>
<td>20.2 (16.5-24)</td>
<td>16 (12-20)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Walking speed, m/s</td>
<td>1.13 (0.98-1.31)</td>
<td>0.99 (0.75-1.2)</td>
<td>0.82 (0.82-1.02)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Presence of pain</td>
<td>53 (69.6)</td>
<td>146 (73)</td>
<td>40 (85.1)</td>
<td>0.042</td>
</tr>
<tr>
<td>Persistent</td>
<td>28 (34.1)</td>
<td>63 (31.5)</td>
<td>32 (68.1)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Sporadic</td>
<td>25 (30.5)</td>
<td>83 (41.5)</td>
<td>8 (17.02)</td>
<td></td>
</tr>
<tr>
<td>No pain</td>
<td>29 (35.4)</td>
<td>54 (27)</td>
<td>7 (14.9)</td>
<td></td>
</tr>
<tr>
<td>Pain intensity</td>
<td>3 (2-5)</td>
<td>4 (2-5)</td>
<td>5 (3-7)</td>
<td>0.043</td>
</tr>
<tr>
<td>No. of pain sites</td>
<td>1 (1-2)</td>
<td>2 (1-2)</td>
<td>2 (1-4)</td>
<td>0.086</td>
</tr>
<tr>
<td>Hypertension</td>
<td>10 (12.2)</td>
<td>133 (66.5)</td>
<td>37 (78.7)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Diabetes</td>
<td>6 (7.3)</td>
<td>45 (22.5)</td>
<td>14 (29.8)</td>
<td>0.003</td>
</tr>
<tr>
<td>Arthritis</td>
<td>11 (13.4)</td>
<td>38 (34.0)</td>
<td>25 (53.2)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Stroke</td>
<td>0</td>
<td>12 (6)</td>
<td>7 (14.9)</td>
<td>0.002</td>
</tr>
<tr>
<td>Heart disease</td>
<td>1 (1.2)</td>
<td>18 (9)</td>
<td>7 (14.9)</td>
<td>0.014</td>
</tr>
<tr>
<td>History of cancer</td>
<td>1 (1.2)</td>
<td>10 (5)</td>
<td>6 (12.7)</td>
<td>0.017</td>
</tr>
</tbody>
</table>

* Data are presented as mean ± standard deviation, No. (%) of participants, or median (interquartile range)† ANOVA was used for comparison of the three groups in terms of age and body mass index; the Kruskal Wallis test was used for comparison of the three groups in terms of Lawton instrumental activity of daily living score, handgrip strength, walking speed, pain intensity, and No. of pain sites; and the Chi square test was used for comparison of the three groups in terms of presence of pain, No. of pain, hypertension, diabetes, arthritis, stroke, heart disease, and history of cancer.

**Table 2**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Odds ratio (95% confidence interval)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>1.053 (1.014-1.094)</td>
<td>0.007</td>
</tr>
<tr>
<td>Lawton instrumental activity of daily living score</td>
<td>0.062 (0.127-0.85)</td>
<td>0.004</td>
</tr>
<tr>
<td>Sporadic pain</td>
<td>2.072 (1.069-4.014)</td>
<td>0.031</td>
</tr>
</tbody>
</table>

**Discussion**

In the present study, among the community-dwelling older adults, the prevalence of chronic pain was 72.6%, which is higher than the 53% reported in a study in the United States,24 of which approximately 50% were prefrail. The proportion of participants with chronic pain was significantly higher in the frailty group than in the robust group. Prefrail and frail statuses were common (75.1%), and 85.1% of participants in the frail group had chronic pain.
The high prevalence of frailty and chronic pain is similar to an epidemiological study that reported a prevalence of chronic pain of 65% to 78.8%.\textsuperscript{25} Chronic widespread pain is associated with higher risk of frailty and worsening of frailty (measured by the Frailty index).\textsuperscript{13} In older adults with osteoarthritis, osteoarthritis-related pain is associated with frailty (according to the Fried-based criteria) during a 4-year follow-up period.\textsuperscript{26} More severe pain is associated with a more frailty state. Pain is associated with poor physical function such as weaker grip strength, lower walking speed, low physical activity, and malnutrition.\textsuperscript{27-29} Pain can act as a stressor that may over-activate the hypothalamus-pituitary axis and lead to its dysfunction.\textsuperscript{30} This can then lead to a reduction of stressor response and predispose to the development of frailty.\textsuperscript{31}

Participants in the frail group were more common to have comorbidities such as hypertension, diabetes, arthritis, and stroke. Similarly, those with chronic pain had more medical illnesses including diabetes, arthritis, and a history of cancer. This finding is similar to that in a Korean study reporting that multi-morbidities are prevalent among older adults with both frailty and pain.\textsuperscript{32}

Arthritis was prevalent among the frail group (53.2%) and the prefrail group (34.2%). The central sensitisation phenomenon is proposed. Dysregulation of the central nervous system results in neuronal hyper-excitability and dysregulation and hence a hypersensitive response to noxious and non-noxious stimuli.\textsuperscript{33} Certain musculoskeletal syndromes such as fibromyalgia, chronic fatigue syndrome, and temporomandibular disorder are associated with central sensitisation, which can amplify pain intensity among patients with chronic low back pain, knee, and shoulder pain.\textsuperscript{34} As central sensitisation may be involved in older adults with chronic pain who have difficulty to relief their pain, clinicians should evaluate the component of central sensitisation among these patients.

The prevalence of pain was higher in female participants. Although arthritic was common in participants with pain, there was no significant sex difference. Although degenerative and rheumatic bone and joint problems are more common in women, this does not explain the sex difference in pain prevalence. Other sex-related differences such as mental and social function may contribute to this.\textsuperscript{27,35}

Although the frail group was significantly older, there was no age difference in terms of the presence of pain. The prevalence of pain is similar across different age groups,\textsuperscript{6,37} although pain increases with age. Longitudinal studies are needed to determine how age affects pain experience.

Comparing the robust and the combined prefrail and frail groups, frailty was independently associated with older age, poorer Lawton IADL score, and presence of sporadic pain. Persistent pain was not associated with frailty; this is in contrast to a study that identified chronic pain as an independent predictor for frailty.\textsuperscript{38} It is postulated that participants with persistent pain may have restrictions in physical activity and mobility and thus were less likely to attend the health check programme.

Pain intensity was significantly higher in the frail group than in the prefrail or robust groups. However, pain intensity was not predictive of frailty; only sporadic (not persistent) pain was predictive of frailty. It is argued that the presence of pain can only predict a small proportion of frailty. The association between pain and frailty is partly mediated by depression; older adults with pain and depressive symptoms have higher odds of physical frailty.\textsuperscript{38} It is postulated that depression impairs the endogenous descending inhibitory systems that modulate the transmission of nociceptive stimuli.\textsuperscript{39} Focusing on somatic complaints may lead to underdiagnosis and undertreatment of depression, which may lead to impairment of treatment effect for pain. When pain is considered as an organic disease (rather than a component of depression), ineffective management of pain symptoms increases the risk of frailty. Healthcare workers should be aware of co-existence of pain symptoms and depression among older adults.

There are limitations to the present study. The cross-sectional study design is unable to examine any causal relationship between pain and frailty. The survey recruited only those who volunteered to participate in the health check programme. The non-probabilistic sample limits the generalisability of the results. There may be inter-observer bias in the assessment of pain and frailty. There may be recall
bias in participants. Pain intensity was significantly higher in the frail group but was not predictive of frailty. Those who were too frail and had severe pain might not have attended the programme. Other factors that may contribute to frailty were not included in the analysis. Pain can lead to a decrease in physical activity, which in turn increases the risk of sarcopenia. Studies to investigate the interaction between pain, frailty, and sarcopenia are warranted.

The adverse impact on pain can lead to frailty and poor IADL performance. Age, IADL, and sporadic pain were independently associated with frailty; only pain is amenable. Pain management may improve mobility and prevent the progression to frailty. There are pharmacological and non-pharmacological treatments to relieve pain. Comprehensive assessment of patients on both physical and psychological symptoms of pain is essential for pain management. Prescription of analgesic drugs, physiotherapy, occupational therapy, and cognitive behavioural therapy, as well as education programmes for patients and their caregivers are recommended. Longitudinal studies are warranted to determine causality between frailty and pain, and the impact of pain on physical, psychological, and social aspects.

CONCLUSION

The prevalence of frailty is high among community-dwelling older adults in Hong Kong. Age, IADL, and sporadic pain are independently associated with frailty; only pain is amenable. Pain management may help prevent progression to frailty in older people.

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CONTRIBUTORS

The author designed the study, acquired the data, analysed the data, drafted the manuscript, and critically revised the manuscript for important intellectual content. The author had full access to the data, contributed to the study, approved the final version for publication, and take responsibility for its accuracy and integrity.

CONFLICTS OF INTEREST

The author has disclosed no conflicts of interest.

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DATA AVAILABILITY

All data generated or analysed during the present study are available from the corresponding author on reasonable request.

ETHICS APPROVAL

The study was approved by the Kowloon Central / Kowloon East Cluster Research Ethics Committee (reference: KC/KE-21-0258/ER-3). The patients were treated in accordance with the tenets of the Declaration of Helsinki. The patients provided written informed consent for all treatments and procedures and for publication.

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38. Ryan CG, Grant PM, Dall PM, Gray H, Newton M, Granat MH. Individuals with chronic low back pain have a lower level, and an altered pattern, of physical activity compared with matched controls: an observational study. Aust J Physiother 2009;55:53-8. Crossref
