Chronic pain and psychiatric morbidity: A comparison between patients attending specialist orthopedics clinic and multidisciplinary pain clinic

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ABSTRACT

Objective: To examine the associations between chronic pain and psychiatric morbidity using interview-based assessments of psychiatric symptomatology. We compared the prevalence of common mental disorder (CMD; consistent with neurotic and somatic symptoms, fatigue and negative affect), depression, and anxiety disorder(s), and associated factors with these psychiatric illnesses among Chinese patients with chronic pain attending specialist orthopedics clinic and multidisciplinary pain clinic.

Methods: A total of 370 patients with chronic pain were recruited from an Orthopedics Clinic (n = 185) and a Pain Clinic (n = 185) in Hong Kong. Psychiatric morbidity was assessed using the Revised Clinical Interview Schedule (CIS-R). Individual scores for neurotic symptoms and neurotic disorders (including depression and four types of anxiety disorders) were also calculated.

Results: The reported lifetime prevalence rates of CMD were 35.3% and 75.3% for the Orthopedics and Pain Clinic sample respectively. Rates of depression and anxiety disorders in the Pain Clinic (57.1% and 23.2% respectively) were significantly higher than those in the Orthopedics sample (20.2% and 5.9% respectively) (all $p < 0.001$). Pain characteristics including number of pain sites, pain duration, pain intensity, and pain interference were all significantly associated with psychiatric morbidity after controlling for sociodemographic factors. Pain duration and litigation/compensation status consistently predicted concurrent pain intensity and disability.

Conclusions: Chronic pain is associated with psychiatric morbidity. The higher rate of depression than anxiety disorder(s) among patients with chronic pain is consistent with previous studies that have found depression to be highly prevalent in chronic pain.

Keywords: chronic pain; psychiatric morbidity; depression; anxiety disorders; Chinese.

Introduction

Chronic pain is a significant public health problem both in terms of the numbers of people affected and the enormous social and economic implications for the health care system and society. In addition to its deleterious effects on general health [1] and physical functioning [2], chronic pain is also a strong predictor of future mortality [3, 4]. People with chronic pain reported greater use of general medical services [5], consuming medical services up to five times more frequently than the rest of the population [6]. One estimate of the direct costs attributable to chronic pain in the United States amounted to nearly 2.8% of the gross national product [7].

One possible reason for the high associated consumption of health services resources emanating from chronic pain may be that psychiatric morbidity is common among those reporting pain symptoms. Previous research has indicated that major depression (30-54%) [8, 9] and anxiety disorder (25%) [10] are significantly more prevalent in pain populations than in the general population (5% for depression; 8.8% for anxiety disorder) [11, 12]. The prevalence of depression among patients with chronic pain ranges from 10% [13] to 100% [14], whereas about 30% [15] to 100% [16] of depressed patients report pain. Pain has been found to predict subsequent depression [17]. However, current or previous psychiatric disorder also predicted pain [18].

Despite the accumulating empirical evidence for the comorbidity of chronic pain and psychiatric disorders, most research in chronic pain and its association with psychiatric disorders has been conducted in Western populations only. Little is known about the relationship of psychiatric disorders and chronic pain among patients in non-Western countries. Additionally, in previous studies psychiatric morbidity has generally been assessed by self-administered questionnaires. Self-report methods cannot be used for diagnostic purposes as they typically provide only general information about mental well-being. Interview methods have obvious advantages over questionnaire measures [19] and are the preferred form of assessment for psychiatric disorder [20].

A recent population-based study estimated the point prevalence of chronic pain to be 35% among Hong Kong-Chinese, which corresponds to 2 million adults in Hong Kong [21]. Specialist services for chronic pain in Hong Kong are currently limited to eight multidisciplinary pain clinics in public hospitals. Most patients with chronic pain are managed by orthopedics specialists where patients may be treated with surgery, conservative treatments (e.g., pain mediations and nerve blocks), and/or physiotherapy/occupational therapy. Under the current public service model for pain management in Hong Kong, if pain patients attending orthopedic clinic do not show improvement in 1-2 years, they are referred to a specialist pain clinic. By this time, pain, disability and collateral psychiatric problems often have become well established. Most of the pain clinics have the support of anesthesiology-based pain specialists, pain nurses, physical and occupational therapists and clinical psychologists. Other medical specialists such as psychiatrists, orthopedic surgeons, neurologists, and neurosurgeons provide ad hoc support to patients attending pain clinic services, as needed. One major difference between orthopedics and pain services is that all patients referred to pain clinics will receive a thorough clinical and psychological assessments conducted by specialists from different disciplines, while orthopedics clinics mainly focus on clinical assessment only.

The present study aimed to (1) assess the rates of depression and anxiety disorders in two clinical populations, (2) examine factors associated with these psychiatric illnesses, and (3) evaluate the association of pain characteristics and neurotic symptoms with concurrent pain intensity and disability among Chinese patients with chronic pain attending orthopedics or multidisciplinary pain services. The Revised Clinical Interview Schedule (CIS-R) [22] was used in this study to assess psychiatric illness. The advantage of using CIS-R over self-report measures is that it collects information about symptoms including their onset and frequency, and information that is not easily obtained from questionnaire assessments [22].

Methods

Study sample

Following ethics approval from both the university and hospital Institutional Review Boards, consecutive patients attending for musculoskeletal pain problems at an orthopedics specialist out-patient clinic and a pain specialist clinic of two different Hong Kong public hospitals were invited to participate in the present study. Patients who were: (1) ≥18 years of age; (2) native Cantonese speakers; (3) lacking communication problems or physical conditions preventing completion of the study measures; (4) exhibiting no confusion and having no prior diagnosis of cogitive impairment from medical records; and (5) willing to participate in the study and to give written consent met eligibility criteria. Interviews generated information on pain and socio-demographic characteristics.

Procedures

Patients were recruited during visits for clinical consultations with doctors. In each targeted clinical session, where manpower permitted, every patient attending a given clinic session was invited by research assistants to participate. Individual face-to-face interviews were conducted before or after clinical consultation among patients meeting chronic pain criteria (pain duration > 3 months) and fulfilling the inclusion criteria. The interviews were performed by trained interviewers who had at least 1 year prior interviewing experience and had undertaken a 1-day training programme in the use of the study measures. Fieldwork was closely monitored by the principal investigator of the project.

Measures

Psychiatric morbidity

The Revised Clinical Interview Schedule (CIS-R), a structured diagnostic interview devised for use by non-medical professionals, was employed to assess lifetime psychiatric morbidity for all participants in this study [22]. Common mental disorder (CMD) was defined based on the standard criteria of the summation of scores from each of the 14 sections of the CIS-R assessing 14 neurotic symptoms in the week before the interview: somatic symptoms, fatigue, concentration and forgetfulness, sleep problems, irritability,

worry about physical health, depression, depressive ideas, worry, anxiety, phobias, panic, compulsion and obsession. With a maximum of 57 points, CMD is defined as present on the basis of 12 or above. In addition, five specific disorders were diagnosed from CIS-R scores by applying algorithms of the ICD-10 system of classification [23]. These included (i) depressive episodes (classified as mild, moderate or severe with or without somatic symptoms), and (ii) four types of anxiety disorder, namely phobia, panic disorder, generalized anxiety disorder (GAD), and obsessive-compulsive disorder (OCD). The Cronbach's alpha of the CIS-R was 0.82. The kappa for agreement for case definition was 0.73 and the agreement between the first and second interview (kappa = 0.72, 95% CI, 0.65, 0.79), between two psychiatrists (kappa = 0.75, 95% CI, 0.54, 0.96), and between lay interviewer and psychiatrist (kappa = 0.70, 95% CI, 0.51, 0.88) was moderately high [22]. The overall discriminability of the CIS-R against the criterion of the Schedules for Clinical Assessment in Neuropsychiatry (SCAN) was 0.87 (95% CI, 0.79, 0.95) and high positive predictive values were obtained for the CIS-R on any depressive episode (PPV = 90), any anxiety disorders (PPV = 93), and any ICD-10 diagnosis (PPV = 90) [24]. The CIS-R has been extensively used in Western [23, 25] and Asian [26, 27] countries.

Pain characteristics

The 7-item Chronic Pain Grade Questionnaire (CPG) assesses three domains of pain severity: persistence, intensity and disability/interference [28]. Three intensity items ask respondents to rate their current, average and worst pain intensity on 0–10 Numerical Rating Scales (NRS). A Characteristic Pain Intensity Score is derived by averaging the responses to the intensity items and multiplying this by 10. Three CPG items assess pain interference with (1) daily activities, (2) social activities, and (3) working ability using 0–10 NRSs. The CPG Disability Score is derived by multiplying the average of the three interference items by 10. Persistence is assessed in the original CPG by asking the respondent to indicate the number of days out of the past six months days that he/she was disabled by pain (although we modified this to "the past three months" because chronic pain is now defined as pain that persists for at least three months) [29]. The

Disability Score and the number of disability days are recoded into 5-point scales and summed, yielding "Disability Points". Based on the Pain Intensity Score and Disability Points, the CPG classifies respondents into five hierarchical grades (see Table 2). The English version of the CPG possesses good psychometric properties [30] and is responsive to change in pain severity over time [31]. The underlying structure of the CPG (excluding the screening question) among Chinese was assessed using exploratory factor analyses [21], revealing that the six items grouped into the 3 domains. All items loaded on the corresponding factors with moderate to high factor loadings (ranging from .67 to .91). Cronbach's αs for the CPG Disability and Characteristic Intensity scales were .87 and .68, respectively. Additional questions including pain duration, pain site, pain-related litigation and compensation, reason for the first clinic visit, and pain associated disability days/sick-leave, were also included in the interview, along with sociodemographic information.

Statistical Analysis

Standard descriptive analyses (mean and standard deviation [*SD*]), chi-squared [χ^2] and *t*-tests were performed to assess sociodemographic and pain characteristics of the sample. Eight independent binary logistic regression models were constructed to identify factors associated with CMD, depression, anxiety disorder(s), and comorbid depression and anxiety disorder(s) in orthopedics and pain clinic. Inclusion of sociodemographic variables into the forward stepwise multivariate model was pre-specified by a *p* value of <0.05 in univariate analyses. All pain variables were force-entered in each logistic regression model. For each independent variable, the adjusted odds ratios (AOR) and 95% Confidence Interval (CI) for the likelihood of CMD, depression, anxiety disorder, and comorbid conditions (dependent variables) in orthopedics and pain clinic were reported. Next, four hierarchical multiple regression models were fitted to evaluate the extent to which pain characteristics and CIS-R neurotic symptoms were associated with concurrent criterion variables (pain intensity and pain disability) for the two samples. In all hierarchical models, sociodemographic variables meeting the pre-selection criteria of $p<0.05$ were included. The dependent variables of pain intensity and disability were indexed by the CPG Characteristic Pain intensity

score and Disability Score, respectively. All significance tests were two-sided. Statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS) version 15.0 [32].

Results

Sample socio-demographic profile

Of 395 eligible patients, 382 participated in the interview (96.7%) (Figure 1), of whom 370 (Orthopeadics Clinic: n = 185; Pain Clinic: n = 185) provided complete data and were included in the present analysis. Table 1 summarizes their socio-demographic characteristics. While women constituted over half of the sample in both clinics (≥51.9%), Pain Clinic participants were older (mean=43.62 vs 39.05 years, *SD*=11.11; *t*=-3.96, $p<0.001$) and more (62.5%) reported low monthly household income (<HK$15,000; $\chi^2=11.22$, $p<0.01$) compared to the Orthopaedics participants. More Orthopaedic clinic participants (39.5% vs. 23.8%) were never married ($\chi^2=12.73$, $p<0.01$), or had attained tertiary education (12.0% vs. 6%; $\chi^2=12.14$, $p<0.05$). While more Orthopaedic clinic participants were in full-time employment (59.6% vs. 35.9%), more than twice as many Pain Clinic participants reported that they were unemployed (38.2% vs 16.4%) ($\chi^2=43.18$, $p<0.001$).

Pain characteristics of the sample

Table 2 reports the pain characteristics of the sample. The two samples differed quite markedly in their clinical characteristics. Significantly almost twice as many Pain Clinic participants reported pursuing pain-related litigation (40.5% vs. 22.7%; $\chi^2=13.61$, $p<0.001$) and medico-legal compensation (37.3% vs 18.4%; $\chi^2=16.48$, $p<0.001$) than did their Orthopedics counterparts. The proportion of patients that cited pain as the main reason for their first clinic visit was 91.8% for the Orthopedics Clinic and 81.8% for the Pain Clinic. Moreover, compared to just 6% of Orthopedic Clinic participants, more Pain Clinic participants (16%) indicated pain was one, but not the main symptom driving their first clinic visit ($\chi^2=9.47$, $p<0.01$). Pain Clinic participants reported a duration of chronic pain averaging 5.25 years/1915 days (*SD*=6.67 years/2434

days; median=3 years/1,095 days), over 50% longer than the average duration reported by Orthopaedics participants (mean=2.55 years/929 days; *SD*=3.61 years/1316 days; median=1 year/365 days) (*t*=-4.83, *p*<0.001). Most Orthopaedics participants (59.6%) had suffered from chronic pain for ≤2 years, while 10.4% of the Pain Clinic participants reported having had chronic pain for more than 10 years. The number of pain sites reported by Pain Clinic participants (mean=3.01, *SD*=2.18) was significantly higher than that reported by Orthopaedics participants (mean=1.62, *SD*=0.93, *t*=7.93, *p*<0.001). While over half of the Orthopaedics Clinic participants had only one pain site, 11.4% of the Pain Clinic participants had 6 or more pain sites.

Pain Clinic participants reported greater pain intensity (present pain: mean=5.07, *SD*=2.73; average pain: mean=6.34, *SD*=1.78; worst pain: mean=8.85, *SD*=1.55) than their Orthopaedics counterparts (present pain: mean=3.29, *SD*=2.78; average pain: mean=4.69, *SD*=2.06; worst pain: mean=7.52, SD=2.36) (all *p*<0.001). The two samples also significantly differed on pain interference measures, with Pain Clinic participants scoring significantly poorer on daily activities (mean=6.58, *SD*=2.52; *t*=-6.49, *p*<0.001), social activities (mean=6.74, *SD*=2.92; *t*=-7.62, *p*<0.001), and working abilities (mean=7.39, *SD*=3.00; *t*=-5.04, *p*<0.001). Compared to Orthopaedics Clinic patients (disability: mean=11.76, *SD*=25.79; sick leave: mean=12.57, *SD*=26.65), Pain Clinic participants reported a significantly greater mean number of pain-associated disability days (mean=38.99, *SD*=42.71, *t*=-6.92, *p*<0.001) and pain-associated leave of absence (mean=25.28, *SD*=38.59, *t*=-3.44, *p*<0.001). The CPG classified 57.9% of Orthopaedics participants as Grade II or below (high pain intensity but low related disability), while 32.6% and 46.7% of Pain Clinic participants were classified as Grade III and IV respectively. Significantly more Pain Clinic than Orthopaedics participants achieved a higher CPG classification (χ^2=64.73, *p*<0.001).

Lifetime prevalence of common mental disorder, depression, and anxiety disorders

CMD was present in 75.3% of the Pain Clinic sample, a significantly higher rate than that of the Orthopaedics sample (35.3%; χ^2=59.04, *p*<0.001). Excepting obsessions, more participants in the Pain Clinic than the Orthopedics samples met criteria for the remaining 13 neurotic symptoms (all *p*<0.05). Fatigue and

sleep problems were the two most common symptoms in both Orthopedics (fatigue: 58.4%; sleep problems: 49.2%) and Pain (fatigue: 82.2%; sleep problems: 81.6%) samples (Table 3).

More of the Pain Clinic sample (57.1%) than of the Orthopedics sample (20.2%) evidenced depressive episodes (χ^2=52.51, p<0.001). This was the case for moderate depressive episodes without somatic symptoms (3.3% vs. 0%; χ^2=6.00, p<0.05), moderate depressive episodes with somatic symptoms (25% vs. 9.8%; χ^2=12.25, p<0.001), and severe depressive episode (20.1% vs. 4.4%; χ^2=18.69, p<0.001).

Of the 4 categories of anxiety disorders assessed, phobia was the most common in both Orthopedics (5.9%) and Pain (23.2%) Clinic samples (χ^2=22.20, p<0.001). GAD was more prevalent in the Pain Clinic (17.3%) than the Orthopedics Clinic samples (1.6%; χ^2=26.54, p<0.001). The two samples did not differ by panic disorder and OCD rates (all p>0.05).

Although more Pain (22.4%) than Orthopedics (11.5%) Clinic participants met the criteria for depression only (χ^2=6.45, p<0.05), the groups did not differ for rates of anxiety disorder only (p>0.05). About 34% of the Pain Clinic sample had comorbid depression and anxiety disorder(s), against the Orthopedics sample's 8.7% (χ^2=27.96, p<0.001).

Factors associated with CMD, depression, anxiety disorder, and comorbid conditions

CMD, depression, anxiety disorder and comorbid conditions in Orthopaedics and Pain Clinic samples were regressed on socio-demographic and pain variables (Table 4). Model 1 regressed CMD in the Orthopaedics sample, finally retaining only education level. Patients with secondary and matriculation education had 6.77 and 4.76 times higher odds of reporting CMD than those with no schooling or pre-primary education. Patients who reported more pain sites (AOR=1.59, p<0.05), higher present pain intensity (AOR=1.21, p<0.05), greater pain interference on daily activities (AOR=1.33, p<0.001), but shorter pain duration (AOR=0.85, p<0.05) had an increased odds of presenting CMD. Model 2 regressed CMD in the Pain Clinic sample on demographic and pain variables, finally retaining only those with greater pain interference with daily activities (AOR=1.30, p<0.01) a higher odds of presenting CMD.

Model 3 indicated sociodemographic factors were not associated with depression in both Orthopaedics and Pain Clinic samples. Among Orthopaedics Clinic patients, those reporting more pain sites (AOR=1.65, $p<0.05$), higher worst pain intensity (AOR=1.38, $p<0.05$), but shorter pain duration (AOR=0.81, $p<0.05$) had a higher odds of depression. Though pain interference on social activities was retained in the final model, it was not significantly associated with depression. Model 4 indicated that Pain Clinic patients with higher average pain intensity (AOR=1.31, $p<0.05$) and greater interference in social activities (AOR=1.23, $p<0.01$) had significantly higher odds for depression.

In Model 5, number of pain sites (AOR=1.94, $p<0.01$) and interference with working ability (AOR=1.50, $p<0.001$) increased the odds of anxiety disorder(s) among orthopaedics patients, whereas in Model 6, Pain Clinic patients reporting greater interference on social activities (AOR=1.29, $p<0.01$) had a higher odds of anxiety disorder(s).

Model 7 found only present pain intensity (AOR=1.35, $p<0.01$) increased odds of comorbid depression and anxiety in the Orthopaedics sample. In Model 8 Pain Clinic patients endorsing Buddhism/Daoism/Ancestor worship had lower odds of comorbid depression and anxiety than those not endorsing a religion (AOR=0.14, $p<0.05$), while those reporting greater pain interference with daily activities (AOR=1.26, $p<0.01$) had a higher odds of comorbid depression and anxiety.

Factors associated with concurrent pain intensity and disability

After adjustment for sociodemographic factors, hierarchical regression indicated pain characteristics and CIS-R symptoms contributed significantly to the prediction of concurrent pain intensity among orthopaedics patients, explaining 25% of total variance (Model 9; $F(1,185)=14.48$, $p<0.001$) (Table 5). Pain duration emerged as significant independent correlate of concurrent pain intensity (stdβ=0.38, $p<0.05$), CIS-R symptoms including concentration and forgetfulness (stdβ=1.37, $p<0.01$), sleeping problem (stdβ=1.06, $p<0.01$), and somatic symptoms (stdβ=1.07, $p<0.05$) significantly predicted concurrent pain intensity. After adjusting for sociodemographic factors, Model 10 showed that among Pain Clinic patients, pain characteristics and CIS-R symptoms contributed significantly to the prediction of concurrent pain intensity,

explaining 22% of total variance ($F(1,185)=14.58$, $p<0.001$). Additional to pain duration (stdβ=0.18, $p<0.05$), CIS-R symptoms concentration and forgetfulness (stdβ=0.84, $p<0.001$) and sleeping problem (stdβ=0.93, $p<0.01$) associated with concurrent pain intensity.

After adjusting for sociodemographic factors, three variables emerged as significant predictors for concurrent pain disability among orthopaedics patients (Model 11): pursuing litigation because of pain (stdβ =4.38, $p<0.05$), depression (stdβ=1.44, $p<0.001$), and somatic symptoms (stdβ=1.35, $p<0.01$). The amount of unique variance explained by these three variables was 20% ($F(1,185)=14.05$, $p<0.001$). Among patients in the Pain Clinic (Model 12), pain characteristics and CIS-R symptoms significantly associated with concurrent pain disability, explaining 31% of the total variance ($F(1,185)=23.14$, $p<0.001$). Pursuing or having received compensation because of pain was significantly associated with concurrent pain disability (stdβ=3.46, $p<0.05$). Of the 14 CIS-R symptoms, concentration and forgetfulness (stdβ=1.18, $p<0.001$) and sleeping problem (stdβ=1.31, $p<0.01$) significantly associated with pain disability after adjusting for sociodemographic factors.

Discussion

This study compared the prevalence of psychiatric disorders and associated factors in samples of Chinese patients attending specialist orthopaedic and multidisciplinary pain clinics. Among these Chinese patients with chronic pain, psychiatric illnesses were highly prevalent and were substantially more common in the Pain Clinic sample than the Orthopaedics Clinic sample. By definition, CMD was present in 35.3% of the Orthopedics sample and 75.3% of the Pain Clinic sample. Depression and anxiety disorder(s) was 2-3 times more prevalent in the Pain Clinic sample than in the Orthopaedics sample. These findings on psychiatric morbidity are similar to those reported by Banks [8] and Romano and Turner [9] on depression and by Polatin et al. [10] on anxiety disorder in Western populations.

Our results further substantiate the evidence that depression (57.1%) is more than twice as prevalent as anxiety (23.2%) disorder(s) in chronic pain. Notably, 48.4% of the Pain Clinic sample met the criteria for

a moderate to severe depressive episode, supporting the bulk of existing data that depression frequently accompanies chronic pain and vice versa [33]. The nature and mechanisms underpinning the pain-depression association have been widely investigated [34], yet remain largely inconclusive. Research on the causal direction(s) of the pain-depression relationship has focused on three major lines of investigation [35]. First, depression as a precursor for pain, sensitizing individuals to experience pain [36]. Second, depression as a result of pain due to the sustained reduction in physical and social activities [37]. Lastly, depression and pain sharing the same or similar underlying biophysiological mechanisms [38]. The chronic pain-depression association has also been examined by testing hypotheses derived from theoretical models. For instance, the fear-avoidance model (FAM) [39] specifies depression is an outcome of chronic pain; however, to date, except for one longitudinal study [40], existing research in FAM has been cross-sectional, prohibiting elucidation of causality. Specific characteristics that precede or result from depression or pain have yet to be determined in future studies using prospective, longitudinal designs.

The most remarkable difference between the two samples is the prevalence of GAD which is nearly 11 times higher in the Pain Clinic compared to the Orthopaedic Clinic respondents. While pain interference on working ability emerged as a predictor of anxiety disorder(s) in the Orthopaedics Clinic sample, pain interference on social activities predicted anxiety disorder(s) in the Pain Clinic sample. These findings can be partially explained by the younger age and higher rate of full-time employment in the Orthopaedics sample. The FAM specifies pain-related anxiety as one of the antecedents of adjustment outcomes. A few studies have documented a moderate association between anxiety and pain-related fear [41, 42], and that chronic pain patients with higher anxiety level displayed greater fear of pain [43]. More research is needed to elucidate the role of anxiety and anxiety disorder(s) in chronic pain adjustment.

The significantly higher rates of psychiatric illness in the Pain Clinic sample than in the Orthopaedic Clinic sample may be explained by the marked differences between the two samples on pain characteristics and sociodemographic background. Patients attending pain clinic services generally reported more pain sites, suffered a longer duration of pain, had greater pain intensity and pain interference, and longer pain associated

disability and leave of absence. Nearly half of the sample was classified as CPG Grade IV --- high disability, severely limiting. Patients in the Pain Clinic sample were also older, had a lower monthly household incomes and education levels, and the proportion of those who were divorced or separated, and unemployed was also significantly higher. One possible reason for the significantly higher rates of pursuing litigation and compensation in the Pain Clinic is many patients attending pain clinic had work-related injuries. The differences of psychiatric morbidity between the two clinics in this cross-sectional study may reflect psychiatric illnesses presenting at different points of the chronic pain trajectories --- patients attending orthopedics clinics tend to have less severe psychiatric illnesses whereas patients attending pain clinics tend to have more severe psychiatric illnesses. This may reflect the two samples representing two different populations of pain patients, with those attending pain clinic services reflecting a "chronic", treatment resistant category whereas those attending orthopedics services are "acute/subacute" category of patient. Future longitudinal follow-up studies with Orthopaedic sample to explore this issue would be desirable.

Although significantly more patients in the Pain Clinic sample reported pursuing litigation and pursuing or having received medico-legal compensation because of their pain problems than those in the Orthopedics Clinic sample, only compensation status remained significantly associated with concurrent pain disability in the Pain Clinic sample, after multivariate adjustment, while ongoing litigation remained significantly associated with pain intensity in the Orthopedics sample. More importantly, results of regression analyses indicated both litigation and compensation status were not associated with any psychiatric disorders assessed (Model 1-8). These findings on the one hand partially replicate previous studies' findings that litigation and compensation influenced pain outcomes, particularly pain-related disability [44-46]. But on the other hand, the lack of significant association between psychiatric illness and litigation/compensation status in the present sample refutes the hypothesis [47] that stress meditates the link between litigation and negative pain outcomes. The role of secondary gain, whereby individuals exaggerated their symptoms and pain related interference in order to maximize financial compensation or work absenteeism is one possible explanation,

but no conclusion can be drawn since compensation status and involvement in litigation cannot be unequivocally equated with secondary gain.

Previous studies documented the relationship between multiple pain sites and mental disorders [48, 49]. Individuals with multiple pain conditions had a higher odds of reporting depressive illness [50, 51]. Number of pain sites was a stronger predictor than pain severity and pain persistence in predicting major depression [50]. Similarly, we found that after controlling for sociodemographic factors, number of pain sites remained consistently associated with CMD, depression, and anxiety disorder(s) in the Orthopaedics sample, with increased number of pain site associated with presence of psychiatric illness. Pain duration however displayed an inverse relationship with CMD and depression, with shorter pain duration associated with presence of psychiatric illness. These seemingly perplexing findings may be due to delayed psychological adjustment during earlier disease stage; as patients learn more adaptive coping strategies as the disease progress and/or the effectiveness of treatment program gradually shows, psychological functioning also improves over time.

Although fatigue was the most common symptoms in both samples, it was not associated with concurrent pain intensity and disability. Up to 63.6% and 21.6% of patients in the Pain and Orthopaedics Clinic samples respectively reported impaired concentration and forgetfulness. This may reflect distraction by pain, ruminative focus on pain sensations or simply the consequences of chronic poor sleep quality. Fatigue was also significantly associated with concurrent pain intensity in both samples and concurrent pain disability in the Pain Clinic sample. Consistent with previous studies [52, 53], sleeping difficulties, the second commonest symptom reported by both samples, was significantly associated with concurrent pain intensity in both samples and with concurrent pain disability in the Pain Clinic sample, after adjustment for sociodemographic factors. Five explanations are possible: first, the neurobiological perspective suggested that increased in sensitivity of the neuro-anatomical pathways of nociception among patients with chronic pain interferes the ability to initiate and maintain sleep which may increase emotional arousal, thereby compounding the problem [54]; second, pain medication such as opioids disrupts the sleep-wake cycle [55];

third, chronic pain and depression share a common pathophysiology of serotonin deficiency that influences sleep [34]; fourthly, the link between sleep problems and psychological distress may be mediated by increased health-related anxiety and heightened bodily sensation [52, 56]. Finally, when there is bodily discomfort, this makes sleep difficult as movement may elicit pain sensation, which can disturb sleep. More research is needed to clarify which of these is most likely. In particular, the extent to which concentration and forgetfulness are the cognitive outcomes of impaired sleep, the side effects of pain medication, or result from inattention due to ongoing discomfort in chronic pain should be examined in future studies.

Our data are limited by their cross-sectional nature, limiting etiological inference and causality. These findings illuminate the complex interrelationships between psychiatric illness sociodemographics and pain-related variables, but the causal mechanisms remain unclear. Apart from the sociodemographic and pain variables that assessed, other potentially influential psychosocial and clinical factors, such as pain diagnosis and previous/concurrent medical services sought, were not assessed in this study. Future studies should adopt longitudinal designs with non-pain medical patients or healthy controls and analytical approaches such as structural equation modeling. Similarly, in addition to the four categories of psychiatric illness assessed in this study, other types of psychiatric illness such as posttraumatic stress disorder that were not evaluated, may also be present in chronic pain. It is important to note that while most chronic pain is managed by orthopedic specialists in Hong Kong, in Europe and North America, primary care physicians manage most chronic pain. Since service model may affect medical help-seeking behaviors and symptoms reporting, caution is warranted when interpreting and generalizing current findings vis-à-vis other populations.

Despite these shortcomings, our findings point to the significance of psychiatric morbidity in chronic pain population. Patients with both chronic pain and psychiatric disorder usually require extra resources and more collaboration between different medical specialties in their management due to the more intensive care required. The presence of psychiatric disorder(s), especially if they remain untreated or suboptimally treated, is a barrier to achieving progress in pain management. These highlight the importance of early identification of patients with chronic pain who are at a higher risk of psychiatric morbidity. In particular, the high

prevalence of chronic pain (35%) in the Hong Kong general population [21] implies there might be a significant fraction of individuals in the general population with comorbid chronic pain and psychiatric disorders. Administering psychiatric screening among chronic pain patients attending orthopedics clinics or primary care services may potentially prevent and/or control chronicity of the pain problems of these patients, which can expedite treatment as well as reduce subsequent referrals to multidisciplinary pain services.

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