Title	Prevalence and characteristics of chronic pain in the general population of Hong Kong
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Citation	Journal Of Pain, 2011, v. 12 n. 2, p. 236-245
Issued Date	2011
URL	http://hdl.handle.net/10722/142570
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Prevalence and characteristics of chronic pain in the general population of Hong Kong

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Submitted for original article.

Introduction

Patient populations[19] aside, there is considerable data indicating that chronic pain is widespread in general populations. A review of 15 epidemiologic studies of chronic pain prevalence in general adult populations produced estimates ranging from 2% to 45%, with back, head and lower extremities being the most common pain sites.[41] This large prevalence range may reflect sample heterogeneity. For instance, unequal representation of gender and education can substantially affect results. Use of ad hoc versus standardized measures also introduces variance into reported prevalence estimates. Other components of variation in these studies include, for example, lax definitions of "back", "head" and "lower limb" pain, and of chronicity, and the methods by which the data were collected (telephone survey, postal questionnaire, interview, or expert assessment).

Data on the prevalence of chronic pain among Chinese populations is scarce. A Hong Kong community-based study (n = 1,051) reported a prevalence for pain lasting longer than 3 months at 10.8% with ~70% of pain sufferers reporting at least some interference in daily life. A median of two pain locations was reported, with 31% rating headache as the most severe type of pain experienced. Women and respondents aged above 60 years were more likely to report chronic pain.[32] A second Hong Kong study claimed 46% of 1,853 adults surveyed reported pain at the time of interview while 40.1% reported persistent pain lasting more than 3 months. The highest prevalence (60%) was seen in the 45-64 year age group. Back pain (22%) and headache (20%) were the most common complaints.[11] The large difference in prevalence reported by these two studies arises from methodological differences in data collection. Ng et al.[32] employed a telephone survey while Chung and Wong[11] used an interactive-voice-response system. Interactive systems give very different prevalence estimates, for example of undesirable behavior,[16] compared to face-to-face interviews and therefore probably telephone interviews also. Consequently, the population prevalence of chronic pain by socio-demographic factors and associations between chronic pain and socio-demographic characteristics in Hong Kong remain uncertain.

We performed a large-scale, population-based epidemiological study of symptom prevalence implemented to inform service planning. This paper (1) describes the prevalence of chronic pain in the general population of Hong Kong, (2) evaluates its relationship with socio-demographic factors, (3) describes the pain characteristics among pain sufferers, (4) compares health and lifestyle characteristics between non-chronic pain and chronic pain sufferers, and (5) examines factors associated with chronic pain. (396 words)

Methods

A cross-sectional, population-based observational survey was conducted between March and May 2007. Ethical approval was obtained from the University of Hong Kong / Hospital Authority Hong Kong West Cluster IRB.

Sampling and procedures

We utilized telephone interviews because 98% of Hong Kong households have fixed line telephones with free local calls. A pain prevalence of 40.1%[11] underpinned the sample size calculation requiring 4,084 (rounded to 5,000) participants needed to estimate the true population prevalence with 80% power and 1.5% precision. The target population comprised non-institutionalized adult Hong Kong residents. Hong Kong's adult population (ages 18+ years) numbers approximately 6,500,000. A random sample of 15,000 telephone numbers was drawn from the most recent 2001 residential telephone directories, to allow for bad numbers, refusals and non-answers. One adult from each eligible responding household was selected using the Kish method.[24] These methods generally give excellent sample characteristics approximating to the general population. To enhance sample representativeness, interviews were performed in the evening (between 6pm and 10pm). Verbal consent was obtained before interviewing subjects. Individuals with insufficient Cantonese fluency, hearing or speech impairments or an illness precluding successful interview, such as active Axis I disorder or neurological deficit were excluded. Telephone numbers unanswered after a minimum of three unsuccessful dial attempts were dropped and replaced by another telephone number. Replacement also occurred for non-residential numbers, fax lines, or household with no eligible subjects. If the target subject refused to participate, the household was classified as a refusal and another telephone number was used, and the process repeated. Of 10,609 phone calls made, 2,052 (19%) numbers went unanswered after 3 dial attempts constituting invalid calls, leaving 8,557 (80%) valid calls. Of these, 935 (11%) failed to identify a target respondent and 2,621 (31%) were refused, while 5,001 (58%) produced completed interviews, a response rate of 5,001/8,557 = 58%.

Survey questionnaire

Chronic Pain

Chronic pain (pain persisting for at least 3 months) was defined by affirmative answers to two questions: (i) "Are you currently troubled by physical pain or discomfort, either all the time, or on and off?"; (ii) Have you had this pain or discomfort for more than 3 months?".[21] Subjects affirming both questions (classified as having chronic pain) were then asked about site of their pain. Chronic pain severity was assessed using the Chronic Pain Grade (CPG) questionnaire,[42] a seven-item instrument that measures severity in three dimensions: persistence, intensity and disability. Rating on an 11-point scale (0 = no pain at all; 10 = pain as bad as could be), three pain intensity items assess present, average, and worst pain. The three items measuring pain interference with daily activities, social activities, and working ability are rated on an 11-point scale (0 = no interference/change, 10 = unable to carry on activities/extreme change). The original questionnaire inquires about current pain and pain over the previous 6 months and classifies chronic pain into five hierarchical grades: Grade Zero (pain free), Grade I (low disability-low intensity), Grade II (low disability-high intensity), Grade III (high disability-moderately limiting) and Grade IV (high disability-severely limiting). We amended the time frame of CPG items from 6 months to 3 months to be consistent with the IASP definition of chronic pain.[21] The CPG is valid and reliable when used as a self-completion postal questionnaire in the UK general population ($\alpha > 0.9$)[39] and when administered over the phone.[43] It is also

responsive to change over time[14] and suitably brief. The CPG structure (excluding the screening questions) among Chinese was previously assessed using Exploratory Factor Analyses (EFA) showing that the six items comprise 3 main dimensions: Disability (explaining 43.33% of total variance with eigenvalues = 3.47), Intensity (which 15.25% of total variance with eigenvalues = 1.22) and Persistence (12.94% of total variance with eigenvalues = 1.04). All items loaded to their corresponding factors with moderate to high factor loading (ranging from 0.67 to 0.91). Cronbach's α's for the Disability and Intensity dimensions were 0.87 and 0.68 respectively.[17]

Sociodemographic Characteristics and Lifestyle Factors

Sociodemographic data on sex, age, education level, marital status, religion, and employment status were collected using the Hong Kong Census and Statistics Department format. Questions on tobacco use, alcohol consumption, and physical activity, were based on the Thematic Household Survey (THS2002)[40] periodically conducted by Hong Kong's Census and Statistics Department. Minor modification to the question format was made to suit telephone interviewing. Respondents' smoking status (current/ever-/non-smoker) and frequency of alcohol consumption (never/1–3 times per month/1–2 times per week/3–5 times per week/daily or almost daily) during the past three months were recorded. Questions addressing leisure time physical activity level (never or almost never/1–3 times per month/1–2 times per week/3–5 times per week/daily or almost daily) and perceived health during the past three months (1=poor, 5=excellent) were also included. Finally, the Hospital Anxiety and Depression Scale (HADS)[45] was used to assess psychological morbidity and the 12-item Short Form (SF12) of the MOS 36[25] was used to assess physical (PHQoL) and mental (MHQoL) quality of life. The Chinese version of HADS has good internal consistency (αs ranging from 0.77 to 0.86) and reliability (split-half r = 0.86).[27, 28] The Chinese version of the SF12 reportedly explains 82% and 89% of the variance of the SF-36 PCS and MCS scores respectively.[25]

Statistical analysis

Basic descriptive statistics detailed sample characteristics. Sample representativeness was assessed by estimating the effect size of differences between the sample and Hong Kong general population distributions of demographic variables derived from 2006 census data. Prevalence data are reported as proportions with 95% confidence interval (95%CI). Independent multiple logistic regression models were fitted to evaluate associations between chronic pain and sociodemographic factors. For each sociodemographic variable, we report odds ratios (OR) with 95% CI for the odds of reporting chronic pain. Among respondents with chronic pain, pain characteristics were described for both the unstratified sample and for sub-groups stratified by gender- and age. Based on the IASP definition of chronic pain, the sample was divided into two groups: those with and without chronic pain. These two groups were then compared on health and lifestyle characteristics. Independent-samples *t*-test was used to examine differences between two groups, and for multiple group comparisons, one-way ANOVA

or Kruskal-Wallis tests were used. Chi-squared test was used for comparing proportions. A separate hierarchical multiple logistic model using stepwise entry criteria was constructed to identify factors associated with chronic pain. Inclusion of sociodemographic variables into the stepwise multivariate model required a *p* value of < 0.05 in univariate analyses. All health, lifestyle, psychological morbidity and QoL variables were forced-entered in the multivariate model. For each predictor variable, the adjusted odds ratios (OR) and 95% CI for the likelihood of chronic pain for the final model were reported. Multicollinearity between variables was assessed before multiple regression analyses and all tolerance values ranged between 0.36 and 0.99, exceeding the 0.10 cutoff and indicating low multicollinearity. A 5% significance level was accepted for all the tests. Proportions in the text are rounded to the nearest whole number. More precise values are provided in the Tables. Analyses were performed using SPSS 15.0.

Results

Sample characteristics

Of the 5,001 respondents, those aged 18–29 years (25%) constituted the largest group in the present study (Table 1). Nearly 55% of the sample was women and 71% had no religion. About 65% of the sample reported a monthly household income below HK$25,000 (~€2,170/US$3,200). While 61% were married/cohabited, 19% of the sample had completed tertiary (post-matriculation) education and 48% were in full-time employment. Retirees and housewives constituted 17% and 13% of the sample, respectively. Comparisons with the Hong Kong population indicated slight sample misrepresentation of the 18-29 (+5%), 30–39 (-5%), 40-49 (+1%) and >60 (-1%) age groups, of females (+1.6%), and of the income groups between $15,000–$59,999 and underrepresentation of those income groups outside this range (-4.2% below and -2% above that income range). However, associated effect sizes were small (≤0.15-0.001) suggesting that despite these differences, the sample distribution on the five sociodemographic characteristics approximated to that of the Hong Kong general population. No weighting was therefore applied to prevalence estimates.

Prevalence of chronic pain and its association with sociodemographic factors

The overall prevalence of chronic pain was 35% (95% CI: 33.3 – 35.9) (Table 2). Nearly 40% (95% CI: 38.0 – 41.7) of women in the present study reported chronic pain. Women reported significantly more chronic pain than did men (OR = 1.68; 95% CI: 1.49 – 1.90). The prevalence of reported chronic pain was highest in the 40-49 year age group (42%, 95% CI: 38.9 – 44.5). Individuals in the 40-49 (OR = 2.43; 95% CI: 2.04 – 2.90) and 50-59 (OR = 2.27; 95% CI: 1.88 – 2.75) year age groups had higher odds for reporting chronic pain. About 58% of divorced or separated respondents (95% CI: 46.5 – 68.1) and 49% of widowers (95% CI: 40.4 – 58.0) reported chronic pain, and individuals in these two marital status groups had a higher odds of chronic pain than never-married individuals (divorced/separated: OR = 3.82; 95% CI: 2.41 – 6.06; widowed: OR = 2.71; 95% CI: 1.87 –

3.93). The prevalence of chronic pain was highest in income groups below HK$15,000 (39%, 95% CI: 36.3 – 41.3), those with only primary education (42%, 95% CI: 38.2 – 45.5), and those endorsing Buddhism/Daoism/Ancestor worship as their religion (42%, 95% CI: 38.1 – 46.1). Compared to individuals in full time employment, unemployed respondents were more likely (OR = 1.49; 95% CI: 1.11 – 2.01) whereas students were less likely (OR = 0.34; 95% CI: 0.26 – 0.44) to report chronic pain.

Pain site by gender and age

Respondents with chronic pain (n = 1,731) reported an average of 1.5 (*SD* = 0.93) different pain sites, with women (*M* = 1.56, *SD* = 0.97) reporting significantly more pain sites than men (*M* = 1.41, *SD* = 0.84) (Table 3). About 65% had pain in only one site and 35% in multiple sites. The three most common reported pain sites were legs (33%), back (29%), and head (19%). Significantly more women suffered from head pain (21%) and leg pain (36%). Across the five age groups, significantly more respondents 50-59 and ≥60 years old reported chest, hand, leg, and joint pain. Head, neck and shoulder pain were more common among younger age groups. For respondents reporting more than one pain site (n = 610), leg pain (24%) and back pain (22%) were most frequently rated as the most significant pain sites. While no significant gender differences were found, significantly more respondents in the 30-39 years age group reported neck pain as the most bothersome site. More respondents in younger age groups reported abdominal and menstrual pain as the most bothersome pains. Significantly more respondents in the oldest age group (≥60 years) identified leg pain (41%) as most bothersome.

Pain characteristics by gender and age

Among respondents' reporting chronic pain symptoms (n = 1,731) average ratings on an 11-point rating scale for current, average and worst pain were 4.02 (*SD* = 2.95), 5.22 (*SD* = 2.05), and 7.21 (*SD* = 2.1) respectively (Table 4). Women and the oldest respondents reported significantly higher pain intensities (Table 4). The number of disability days associated with chronic pain ranged between 0 and 90 days, averaging 36.28 (*SD* = 17.16) days. While 65% of the respondents reported no pain-associated disability days, 12% indicated pain had caused 1-3 days of disability. Respondents aged >60 years reported significantly more days of pain associated disability. About 6% reported at least 30 pain-associated disability days. Days of pain-associated sick leave ranged widely from 0 to 90 days, but the distribution was heavily left skewed, averaging 0.98 (*SD* = 6.81) days of sick leave. Most of the sample (89%) reported not taking any pain-related sick leave, while 8% reported 1-3 days of pain associated sick leave. The mean scores on pain interference with daily activities, social activities, and working ability were 4.01 (*SD* = 2.92), 3.57 (*SD* = 3.07), and 3.55 (*SD* = 3.14) respectively. Significant gender and age differences in pain interference were found. Females reported more pain interference in daily activities, social activities and working ability and older respondents reported more pain interference in daily activities and social activities. Based on the Chronic Pain Grade classification of pain symptoms, among the chronic pain sufferers (n = 1,731), 35% met Grade

I and 44% met Grade II criteria suggesting high intensity pain but low associated disability. About 15% were classifiable as Grade III --- high disability and moderately limiting, and 6% with the most severe Grade IV --- high disability and severely limiting. Three respondents (0.2%) self-reported pain symptoms but were subsequently classified as Grade Zero, suggesting that they were actually pain free. The distribution of pain grades was slightly shifted to higher grades in female relative to male respondents, and older pain respondents tended towards more severe gradings relative to their younger counterparts (Table 4).

Health and lifestyle characteristics of the sample by non-chronic pain and chronic pain sufferers

While 20% of the sample reported long-term health problems, most were non-smokers (84%) and never consumed alcohol (74%) (Table 5). About 30% had never engaged in exercise and 21% exercised daily. The proportion of chronic pain sufferers (30%) reporting long-term health problems was significantly higher than the equivalent proportion of non-pain respondents. While no significant difference was found between the two groups on smoking status and alcohol consumption, significantly more chronic pain sufferers (36%) reported never engaging in leisure time exercise. Respondents with no chronic pain consistently had better mental health, QoL, and self-perceived health than their chronic pain counterparts.

Factors associated with chronic pain

Excepting education level, all sociodemographic variables met the univariate pre-selection criteria ($p < 0.05$), and were entered in the multivariate model (Table 6). In the final model females (OR = 1.53, 95% CI: 1.27 – 1.84), individuals aged 40 or above (40-49: OR = 1.70, 95% CI: 1.23 – 2.37; 50-59: OR = 1.78, 95% CI: 1.23 – 2.58; ≥60: OR = 1.96, 95% CI: 1.20 – 3.22), divorced or separated (OR = 2.72, 95% CI: 1.37 – 5.40), and respondents in part-time employment (OR = 1.39, 95% CI: 1.01 – 1.92) were more likely to report chronic pain. Smoking status, leisure time exercise, and alcohol consumption (lifestyle factors) were eliminated but respondents with long-term health problems had double the odds of reporting chronic pain compared to those without long-term health problems (OR = 1.97, 95% CI: 1.57 – 2.47). More anxiety symptoms (OR = 1.14, 95% CI: 1.11 – 1.17), poorer QoL (mental health) (OR = 0.98, 95% CI: 0.96 – 0.99), and poorer perceived health in the past three months (OR = 0.47, 95% CI: 0.40 – 0.55) were also associated with increased reporting of chronic pain. The overall model was significant ($\chi^2 = 732.33$, $p < 0.001$), explaining 49.1% of the variance in chronic pain group membership.

Discussion

This is the largest population study on chronic pain prevalence among non-institutionalized Chinese carried out to date. Large random population samples maximize generalizability of results to the target population but can create biases. First, the observed prevalence embodies limitations in capturing all symptomatic populations. For example, the oldest, the sickest, nursing homes residents, and those with cognitive impairment, among whom prevalence of chronic pain-inducing conditions is higher, are largely inaccessible by telephone. Consequently,

telephone interview-based sampling underestimates the true prevalence. Second, women and older persons are both more likely to be at home to answer land-line telephones and cooperate with surveys than are working age adults, particularly males. This sample was nonetheless representative of the Hong Kong general population. The large sample size allowed stratified analyses of chronic pain by socio-demographic characteristics.

This survey permits comparisons of this Chinese population with other populations to investigate if pain patterns and correlates were comparable in this culturally and behaviourally different Chinese community, thereby extending chronic pain theory. The observed prevalence of chronic pain was ~35%, comparable to prior local studies[11, 32] corresponding to 2 million Hong Kong adults having some form of chronic pain. Compared with earlier Finnish and UK studies that yielded a prevalence of ~50-55%[1,13] and review estimates of up to 45%[41] our estimate of 35% in the Hong Kong general population appears low. However, more recent surveys typically generated estimates <20%.[6, 15, 33, 37] Early telephone surveys generated rates of 7-11%[8,12] and recent household interviews produce similar rates.[20] Despite methodological differences generating varying rates, few "middle ground" estimates are reported. A Finnish questionnaire study using the 3-month persistent pain criteria also obtained a 35% prevalence for "any" chronic pain and 14% for "daily" chronic pain.[29] It therefore seems that the "3-months' duration" definition of chronic pain is too loose without specifying frequency and intensity of pain, contributing to these disparate prevalence rates. As the criterion we used for defining chronic pain was being troubled by physical pain or discomfort either "all the time" or "on and off", the chronic pain cases indentified in this study might consist of individuals with persistent and intermittent pain. Under the existing criterion of "intermittent pain", two headaches, 89 days apart qualify as chronic pain. Clearly this differs from, for example, persistent arthritic joint pain. To avoid such concatenation the definition of chronic pain must differentiate intermittent, fluctuating and continuous pain. Surveys using existing IASP criteria will capture problems such as occasional headaches, inflating chronic pain prevalence estimates. Moreover the pain grading system (e.g., the four classifications in the CPG) would benefit from further refinement such that the graded pain items could more accurately reflect pain intensity and frequency.

Several other differences were seen relative to Western studies. In this Chinese sample, chronic pain prevalence showed a flattened peak over the 40-59 years age group, with indication of declining reporting in those >60 old. Chung and Wong[11] and Ng et al[32] also found the highest pain prevalence (60.1%) in the 45-64 years age group, but employed wider age strata, measuring pain at time of interview. Nevertheless, these three Hong Kong studies appear reasonably consistent, increasing confidence in the veracity of results. German[18] and American[20] studies reported similar prevalence peaks in the 50-59 age range with declines thereafter. Yet, prior population studies in the UK[13] and Canada[31] documented peaks in the oldest age group of ≥75 years (62% and 35% respectively) and in the 71-91 (73.6%), ≥67 (29%), 50-64 (9.3%), and 60-81 (31.2%) year age groups in Spain,[3] Denmark,[15] France,[7] and Norway[38] respectively. These differences probably reflect the underlying population structures. Hong Kong has a young population compared to most western populations with only about 12% of the

population aged >65 years. As populations age healthy survivor effects become more apparent. The healthiest elderly remaining in the community are less likely to have pain-inducing conditions. Proportionally more pain complaints will be located in institutionalized elderly invisible to telephone surveys. In younger populations like that of Hong Kong, the bulk of complaints will appear to occur in middle-age. Future studies using age-standardized population weightings can address population variability.

About 35% of the current sample reported multiple pain sites. Consistent with Western studies, prevalence was highest in legs (33%), back (29%), and head (19%). The USA NHANES[20] study found back (10.7%), legs/feet (7.8%), arms/hands (4.4%) and head (4.7%) to be the most frequently affected sites. Leg pain as opposed to back pain might reflect locomotor versus sedentary habits, or metabolic versus skeletal etiologies, while the differences in head pain frequency appears linked to the younger Hong Kong population. Older individuals more frequently reported pain in their limbs, such as hand, leg, and joints whereas younger respondents reported more head, neck and shoulder pain. These differences might be explained by the near ubiquitous requirement for close deskwork, extended working hours with intensive keyboard use among younger urban adults and the higher prevalence of degenerative musculoskeletal disorders among the elderly.

Nonetheless, most people with pain reported zero disability days and took no pain-related sick leave. This may be because of financial reasons but data were collected before the current economic downturn. Based on the CPG classification, 21% of the chronic pain (372/1,731) respondents, or 7% of the sample experienced moderately-to-severely disabling chronic pain trending to increase with age. Yet disruption from chronic pain was limited and appeared to be well tolerated. This is a significant fraction of population morbidity, reflected in lower perceived health and QoL data that should be addressed clinically. Hong Kong people appear to work on in spite of, rather than with indifference to chronic pain.

Correlates of pain in this study were comparable with prior studies.[41] After adjustment, women reported more chronic pain, but no significant differences in chronic pain prevalence by income, education, or religion remained. Divorced/separated individuals were more likely to report chronic pain. There is high comorbidity between chronic pain and psychological distress,[2, 5, 9, 34, 36] as well as impaired QoL.[4, 26] After controlling for chronic health problems and psychiatric disturbances, only the mental health component of QoL (MHQoL) remained significantly associated with chronic pain. Poorer MHQoL association with greater pain reporting is mediated by depression; conversely depression's impact on physical QoL is mediated by chronic pain.[44] implying close comorbidity between psychological wellbeing and chronic pain. This complex reciprocity between pain, depression and QoL needs elucidating. As elsewhere,[2, 34, 36] we found poor mental health associated with chronic pain yet, after adjustment, chronic pain remained associated with higher anxiety but not depression. After adjusting for age, sex and income, a post-hoc analysis revealed significant increases in HADS-D and HADS-A scores with increasing CPG grade (β=0.23 and β=0.25 respectively, $p< 0.001$). QoL was unrelated to CPG grading. This is likely due to two things. First, lower MHQoL probably accounted for the depression effect in the adjusted logistic model, as per

the foregoing discussion. Second, anxiety is probably associated with lower pain tolerance,[10, 22, 23] perceptions of pain,[30, 35] as well as greater pain-related fear and consequential disability.

Background differences in Hong Kong relative to Western populations include very low tobacco and alcohol use, and while the former is declining, the latter is increasing. This may account for the elimination of smoking status and alcohol consumption in the logistic model after adjustment for other covariates. Substance use levels showed no relationship with pain reporting. Although the proportion of chronic pain sufferers reporting no leisure time exercise was significantly higher (36%) than their non-chronic pain counterparts (27%), exercise was eliminated from the logistic model after adjustment.

This study is limited in being cross-sectional preventing us determining time course or inferring causality between chronic pain and other variables. The response rate (58%) was acceptable but not high. We cannot determine if response bias by those with symptoms selectively participating has inflated prevalence estimates. This is a real possibility for this dataset and culture, and may partially account for the high estimates. Caution should be exercised when interpreting and generalizing the current prevalence estimates viz-a-viz other populations. Marginal differences in socio-demographic characteristics between this sample and the population imply that true rates may vary slightly from those we report. Future studies should examine possible causes of and treatments sought for chronic pain that may affect symptom reporting, to provide a more comprehensive picture of pain patterns and health care utilization. Finally, while some discrepancies between this and prior studies might be due to methodological differences, for example in age stratification, lax definition of chronicity urgently need addressing for future studies, which should assess duration and disability and must differentiate intermittent, fluctuating and continuous pain. Because the present study was conducted in Hong Kong-Chinese, replication in other Chinese and Asian populations is therefore desirable.

In conclusion, chronic pain is common in the general population of Hong Kong. We document important epidemiologic data on chronic pain among Chinese, described similarities and differences and suggested hypotheses to account for these. Further in-depth analyses on chronic pain co-morbidities and their impacts on quality of life and healthcare utilization are underway. (Word count Text=1,500)

Acknowledgement

This project was supported by grant from the Hong Kong Government Health Services Research Committee (HSRC # 04060591). The following people contributed to the study in different ways and at different times and their help is acknowledged: Miss Adelaide Hung, Mr. Barry KH Tam and Mr. Nicholson YF Siu.

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