

PAIN

## Gender differences on chest pain perception associated with acute myocardial infarction in Chinese patients: a questionnaire survey

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**Aims.** To investigate gender differences in chest pain perception among Chinese patients with acute myocardial infarction.

**Background.** Thrombolytic therapy is beneficial to outcomes of acute myocardial infarction if administered within 12 hours from the onset of chest pain. However, cardiac symptom interpretation may impact time of presentation to hospital. Differences in cardiac symptom reports by gender partly explain misdiagnoses and delays in treatment, particularly among women. Whether, such trends apply to Chinese patients with myocardial infarction is unknown.

**Design.** A descriptive prospective study.

**Methods.** Using questionnaires, data on demographic variables, the number of patients reporting chest pain and other chest sensations at the onset of acute myocardial infarction and chest pain intensity, description, location and radiation across the chest were collected.

**Results.** A total of 128 participants equally divided by gender were recruited. Chest pain was more prevalent among men than women (84.37% vs. 67.19%,  $p < 0.05$ ). Although no statistical significance was found, Chinese men had higher mean chest pain intensity scores (7.54 SD 2.35 vs. 7.51 SD 2.25) and reported less atypical chest pain (0.00% vs. 9.3%) compared with women. Men had more upper right sided chest pain (40.74% vs. 20.93%,  $p = 0.038$ ) whereas women experienced increased neck pain and pain to the upper central chest, middle central chest, upper central back, middle central back and middle right back regions.

**Conclusions.** Discreet gender differences in chest pain perceptions exist between Chinese men and women, with the latter group, who may be considered as a high-risk group for missed and delayed diagnosis from myocardial infarction, reporting more atypical presentations.

**Relevance to clinical practice.** Irrespective of culture, women with myocardial infarction tend to present with atypical chest pain symptoms and therefore they should be aggressively investigated.

**Key words:** acute myocardial infarction, cardiovascular, chest pain, Chinese, gender, nursing

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### Introduction

It is well established that thrombolytic therapy is beneficial to the survival of acute myocardial infarction (AMI) patients if

administered within six or 12 hours from the onset of chest pain, with the greatest impact achieved if individuals are treated in the first two hours (Boersma *et al.* 1996, Weaver *et al.* 1997). In Hong Kong, over 81% of patients with AMI

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reach hospital within this critical time-window; however, only 60% receive thrombolytic therapy (Woo *et al.* 2004) compared with 86% of patients with AMI attending hospitals in the USA (Lambrew *et al.* 1997). The low administration rate of thrombolytics in Hong Kong has been attributed to misdiagnosis of AMI (Chan *et al.* 1998). In Europe, several studies have identified that women with AMI tend to experience cardiac symptoms which they describe as vague, intermittent with abnormal pattern of distribution (Lockyer 2005, Albarran *et al.* 2007) and this may explain rates of delay in presenting to hospital and levels of misdiagnosis among this gender (O'Donnell *et al.* 2005).

## Background

Available data from North America indicate that between 33 and 47% of patients who are subsequently diagnosed with myocardial infarction initially present without chest pain, this being more prevalent in women and ethnic minority groups (Summers *et al.* 2001, Barakat *et al.* 2003, McSweeney *et al.* 2003, Milner *et al.* 2004). Other studies have also reported that during AMI, women are more likely than men to report shortness of breath, nausea, vomiting, cough and fatigue and abnormal patterns of pain distribution, such as back pain, jaw pain, neck pain (Chen *et al.* 2005, DeVon & Ryan 2005, Modena 2005). These symptoms can represent a range of different underlying physiological problems that mask accurate diagnosis of AMI. The presence of atypical symptoms and absence of chest pain arguably contributes towards the number of incorrect diagnosis. Part of the problem is that the depiction of 'classic cardiac' symptoms of coronary heart disease have developed from the inclusion of white, middle-aged men who have been over-represented in cardiovascular trials (O'Donnell *et al.* 2004). However, in the past two decades there has been growing recognition that women have unique cardiac symptom experiences which are different from men (Meischke *et al.* 1998, Pope *et al.* 2000, Lundberg *et al.* 2001).

Studies exploring the role of gender and ethnic background are increasing and identifying some important differences in cardiac symptom experience. For example, differences in the presentation of chest pain associated with AMI between Caucasian people and ethnic groups have been reported both in the UK and in the USA. In one study, Bangladeshi patients with myocardial infarction were 89% less likely to experience central chest pain and 87% less likely to describe chest pain using the typical words as ethnically UK patients, therefore were less likely to be aggressively managed (Barakat *et al.* 2003). In another study, African Americans were twice more likely to report

atypical chest pain symptoms than Caucasians resident in the southern United States (Summers *et al.* 2001).

Currently little is known with regard to gender presentations of AMI related chest pain among Chinese people who are the largest population in the world and nor it is known how these compare to other communities. As chest pain is regarded a core feature of coronary ischaemia and commonly reported by men with AMI, a study examining the gender differences according to symptom reports among the Chinese people is warranted. This is timely and reflects the need to improve understanding of the global impact of cardiovascular disease as highlighted in a recent editorial (Sanderson *et al.* 2007). Therefore, the aim of this study was to investigate gender differences in chest pain perception among Chinese patients with AMI. The specific objectives were to (1) determine gender difference in the prevalence of chest pain; (2) explore gender difference in chest pain tolerance threshold; (3) identify gender difference in chest pain description; and (4) examine gender differences in chest pain location.

## Methods

### Design

A quantitative descriptive prospective design was used to conduct the study. This design allowed the characteristics of chest pain experienced by patients during AMI to be investigated and any difference in symptom perception to be identified. Use of a prospective design is recommended as a consistent approach for evaluating gender differences in symptoms of acute coronary syndrome, including AMI and as means of enhancing the reliability data collection (DeVon & Zerwic 2002).

### Participants

Patients over 20 years of age with evidence of AMI as defined by the Joint European Society of Cardiology and American College of Cardiology consensus document (2000) were recruited to the study. These criteria included elevated levels of enzymes (including creatine kinase-MB or troponin I or T) with either symptoms or changes suggestive of ischaemia and/or development of new Q wave on the electrocardiogram (ECG). Those with cognitive impairment, highly anxious, in cardiogenic shock, or undergoing mechanically ventilation were excluded.

Over 11 months, potential subjects meeting study criteria were recruited from the case bookings at one cardiac care centre in Hong Kong. To eliminate cultural differences in the interpretation and reporting of cardiac symptom, only

Cantonese speaking Chinese patients were recruited to the study. Subjects were approached with an invitation to participate in the study, 12–48 hours following admission, a period when their anxiety levels would be expected to have decreased (An *et al.* 2004). Additionally, pain intensity would not be overrated because of emotional distress, as memory recall of symptoms among patients is also known to be optimal at this time (Everts *et al.* 1999). Furthermore, for MI patients without complications, the risk of adverse events is reduced during this phase of recovery (Del Bene & Vaughan 2000). All data collection took place at a time convenient to participants.

### Data collection

We obtained ethical approval from the ethics review board of a large acute hospital and from the university. The principal investigator collected all the data having first obtained informed consent from patients. Prior to data collection, the aims of the study were explained. Patients were informed that they were also free to withdraw from the study anytime without affecting the care they were receiving. Questionnaires were coded to ensure confidentiality and stored in a locked cabinet where only the research team could have access to the data.

Information regarding perception of chest pain among study participants was collected by means of self-administered questionnaires. Demographic and clinical data were collected from the medical records and from the patients. Patients initially were asked to indicate the location of their chest pain on a body map (Fig. 1). Other data obtained included the number reporting the presence or absence of chest pain and other chest sensations at the onset of AMI. Chest pain intensity was measured using a Numeric Rating Scale, which is a 10-point rating scale ranging from 0 = no pain to 10 = worst possible pain (Chung 2002). This tool has been used worldwide for measuring chest pain intensity for cardiac patients (Klinger *et al.* 2002, Granot *et al.* 2004, Diercks *et al.* 2005). Patients were also provided with a list of verbal descriptors and were invited to select those that most closely represented their own discomfort. These descriptors have been previously used to discriminate typical and atypical cardiac chest pain (Paiano *et al.* 2000, Barakat *et al.* 2003). In situations where none of the descriptors listed corresponded with their experience, patients were asked to describe the nature of their chest sensations at the time of AMI. Location and radiation of chest pain were assessed by asking patients to identify on the body map, (Fig. 1) the location of pain across the frontal and dorsal regions of the upper body. The body map has been

previously used to assess and compare the location and radiation of chest pain in the UK (Albarran *et al.* 2002) and in Sweden (Everts *et al.* 1996). The original body map had only six locations for each the frontal and dorsal regions (Fig. 2). In this study, the body map was modified by including the jaw and assigning different numbers to denote the shoulders and the arms of both the frontal and the dorsal regions (Fig. 1). All data collection tools were translated into the Chinese language and reviewed by two bilingual cardiac nurses for accuracy.

### Data analysis

Data were entered and analysed using the software of the Statistical Package for the Social Sciences (SPSS) version 14.0 (SPSS Inc., Chicago, IL, USA). Descriptive statistics such as frequency distribution, percentages, means and standard deviation (SD) were used to analyse the demographic and clinical data, chest pain intensity, chest pain descriptors and location and radiation of pain regions. Prevalence of chest pain between genders was compared using chi-square test. The demographic and clinical data of male and female participants presenting with chest pain were compared using chi-square test, two-tailed independent *t*-test and the Mann-Whitney *U*-test depending on the level of measurements. Gender differences in chest pain intensity were analysed by two-tailed independent *t*-test and chest pain descriptors, location and radiation of pain regions with chi-square tests. We used the Fisher's exact test when minimal expected frequency was less than five (Munro 2005);  $p \leq 0.05$  was used to report for any statistical significant results.

## Results

### Differences in demographic and clinical data in the total sample and prevalence of chest pain

Out of 140 potential eligible participants, a total of 128 patients with AMI volunteered to the study, with the sample being equally divided among men and women. Women were significantly older (mean 70.47 SD 12.59 vs. 62.67 SD 2.66,  $p < 0.001$ ) and had a higher incidence of hypertension (75% vs. 42.19%,  $p < 0.001$ ) than men (Table 1). Men and women reporting episodes of chest pain had similar comorbidities including history of hypercholesterolaemia, diabetes mellitus, congestive heart failure and ischaemic heart disease with no significant gender differences found. Women, however, had a higher incidence of hypertension than men (74.42% vs. 37.04%,  $p < 0.001$ ). Thirty-nine women (90.70%) who had chest pain were menopausal.

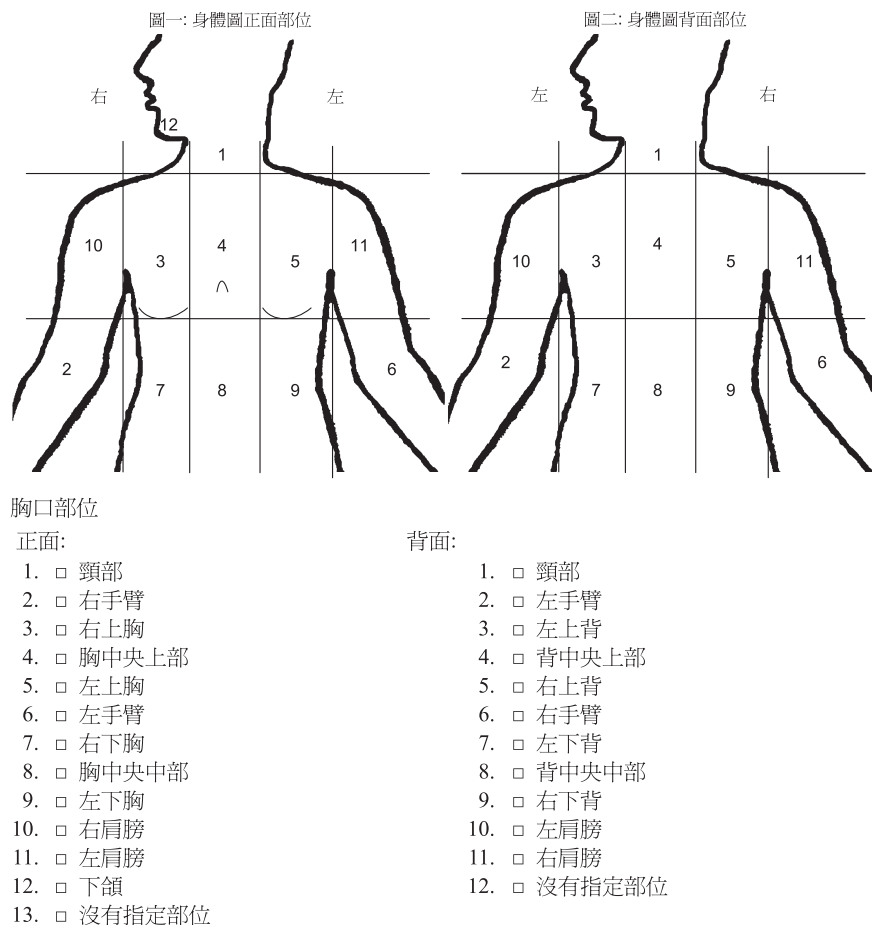


Figure 1 Body map for chest pain location (Chinese version).

Out of the total study sample, 54/64 (83.37%) of men and 43/64 (67.19%) of women described chest pain as an initial symptom of their AMI. Table 1 also identifies that 22 (23%) of patients presenting with acute central chest pain had a history of ischaemic heart disease, this being more common in women than men (28% vs. 19%). Absence of chest pain and atypical sensations across the chest was likewise more common in women than men ( $n = 21$  vs.  $n = 10$ ,  $p = 0.016$ ). Women reporting an episode of chest pain were significantly older than their male counterparts (mean 71.95 SD 11.7 vs. 61.98 SD 12.81,  $p < 0.001$ ). The educational level of both men and women ranged from being illiterate to having completed a university degree, although the former were more highly educated ( $p < 0.001$ ) and be in employment ( $p < 0.001$ ) when compared to the latter.

#### Difference in chest pain intensity and pain description

Although men reported slightly higher mean chest pain intensity scores (7.54 SD 2.35) than women (7.51 SD 2.25),

no significant differences were observed ( $p = 0.957$ ). As for use of verbal descriptors at the time of AMI, no gender differences were noted (Table 2).

#### Differences in chest pain location and radiation

For the frontal regions of the chest, significant gender differences were found with more women locating pain in the neck ( $p = 0.027$ ), the upper central chest ( $p = 0.004$ ) and middle central chest ( $p = 0.036$ ), while more men located pain in the upper right chest ( $p = 0.038$ ). In respect of chest pain to other frontal regions, no other differences were observed (Table 3). For the dorsal regions, women ( $n = 34$ ) reported more pain at the back at the time of AMI than their male ( $n = 19$ ) counterparts ( $p = 0.042$ ); differences were most marked at the back of the neck (23% vs. 7.4%,  $p = 0.027$ ) and the upper central region (37% vs. 18.5%,  $p = 0.039$ ). None of the men reported pain radiating either to the middle right or at the centre of the back, and there were no other significant differences in relation to pain distribution across the dorsal regions (Table 3).

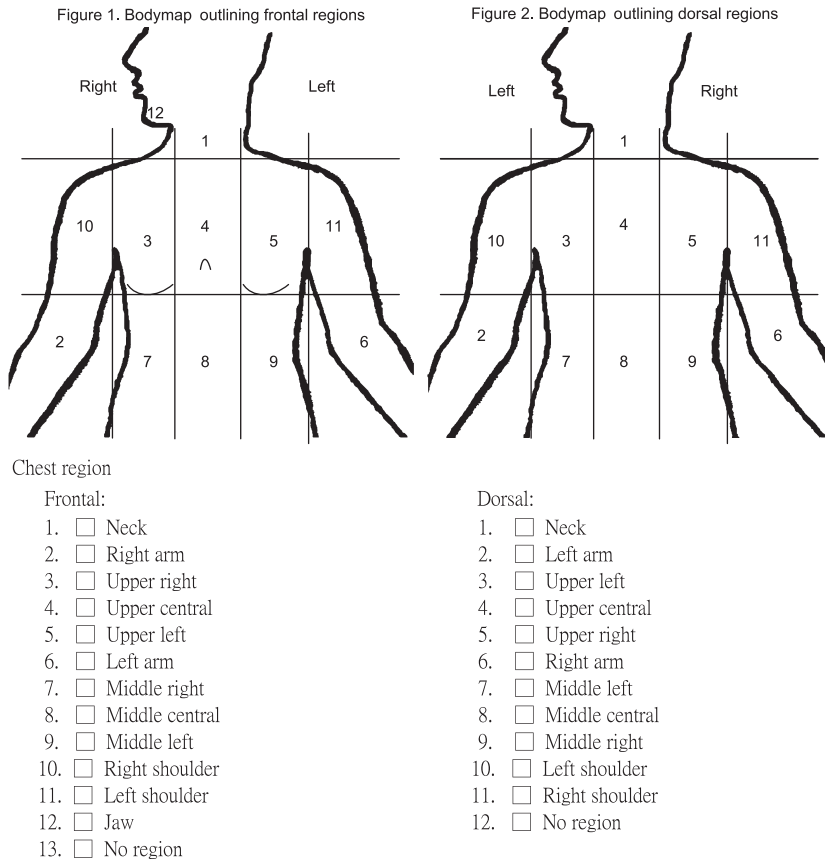


Figure 2 Body map for chest pain location (English version).

## Discussion

This descriptive prospective study aimed to investigate the nature of gender differences in the perception of chest pain among a sample of Chinese patients with AMI. The data did identify some subtle differences in how symptoms of AMI were perceived and reported by study participants; these are discussed under key headings.

### Gender difference in the prevalence of chest pain

Our data suggest that reports of chest pain, as an initial symptom, are marginally more prevalent in Chinese men than in women. Women who were subsequently diagnosed with MI were more likely to report chest discomfort as either pressure, gripping or dull sensation or to present without pain across the chest. These results concur with previous studies which indicate that women tend to report less episodes of acute chest pain at the time of their AMI (Goldberg *et al.* 2000, Čulić *et al.* 2002, Albarran *et al.* 2007). One possible explanation is that compared to men, women in this study had an advanced mean age of 70 years and a statistically higher incidence of hypertension. Around

a third of women with AMI ( $n = 21$ ) did not experience a sudden episode of central chest pain, this observation is supported by a previous study where absence of this symptom was reported to be as high as 43% (McSweeney *et al.* 2003). Our findings likewise mirror data from Hong Kong, where Chan *et al.* (1998) reported that misdiagnosis was more common among the 39.4% patients who presented with AMI but without an initial episode of chest pain, a finding that was typically noted in women. Douglas and Ginsburg (1996) in an analysis of the literature concluded that those presenting without chest pain were likely to be older and women and that this group also experienced higher mortality rates of around 49.2% and were more likely to be misdiagnosed and to receive suboptimal care. The higher number of women reporting an initial episode of acute chest pain in our study may be explained by the fact that 28% had a previous history of ischaemic heart disease (Table 1). Arguably this group of women may have adopted terms for describing their symptoms that are understood by health professionals and so accounting for their more traditional chest pain reports. It may also reflect cultural biases discussed in the following section.

Table 1 Characteristics of the sample

	Men ( <i>n</i> = 64)	Women ( <i>n</i> = 64)	<i>p</i> -value
Characteristics of the total sample			
Age (years)			
Range	41–81	31–92	
Mean, SD	62.67 ± 2.66	70.47 ± 12.59	< 0.001
Hypertension ( <i>n</i> , %)	27 (42.19)	48 (75)	< 0.001
Chest pain ( <i>n</i> , %)	54 (84.37)	43 (67.19)	0.016
Chest sensation (such as discomfort) ( <i>n</i> , %)	10 (15.63)	15 (23.44)	
Nil chest pain or sensation ( <i>n</i> , %)	0 (0)	6 (9.38)	
	Men ( <i>n</i> = 54)	Women ( <i>n</i> = 43)	<i>p</i> -value
Characteristics of the sample with chest pain			
Age (years)			
Range	41–81	42–92	< 0.001
Mean, SD	61.98 ± 12.81	71.93 ± 11.57	
Education ( <i>n</i> , %)			< 0.001
Nil	12 (22.22)	22 (51.16)	< 0.001
Primary	10 (18.52)	16 (37.21)	
Secondary	28 (51.85)	16 (37.21)	
University	4 (7.41)	1 (2.33)	
Employment ( <i>n</i> , %)			
Employed	16 (29.63)	5 (11.63)	< 0.001
Unemployed	7 (13.96)	0 (0)	
Retired	31 (57.41)	15 (34.88)	
Homemaker	0 (0)	23 (53.49)	
Menopause ( <i>n</i> , %)		39 (90.7)	
Hypertension ( <i>n</i> , %)	20 (37.04)	32 (74.42)	< 0.001
Hypercholesterolaemia ( <i>n</i> , %)	24 (44.44)	19 (44.19)	0.980
Diabetes mellitus ( <i>n</i> , %)	19 (35.19)	13 (30.23)	0.606
Congestive heart failure ( <i>n</i> , %)	4 (7.40)	6 (13.95)	0.331
Ischaemic heart disease ( <i>n</i> , %)	10 (18.52)	12 (27.91)	0.273

### Gender differences in chest pain intensity

We found no gender difference in chest pain intensity scores. This is in contrast to the finding of Granot *et al.*'s (2004) study which reported that Israeli women had higher levels of chest pain than men. A possible explanation for this inconsistency may be explained by the cultural difference between the East Asian and Western community's personality types and coping strategies (McCrae *et al.* 1996). Unlike the expressive behaviours of Western societies, Chinese people tend to suppress emotional feelings such as pain, this being linked to Confucian culture and values; men are expected to be dominant and taught to be self-reliant from an early age (Gabrenya & Hwang 1996). Because of the gender-role expectation, Chinese men are more stoical to pain response than Chinese women (Chung *et al.* 2004, Soetanto *et al.* 2004). To Chinese people the term 'patient' implies weakness, dependence and vulnerability, needing help and

protection from family members (Shih 1996); men will therefore attempt to cope with pain as much as possible to demonstrate resilience, avoid public shame and disgrace (Holroyd *et al.* 1998).

It has been suggested that socioeconomic status and education could affect chest pain perception on the basis of gender and the presence of AMI. Indeed, one study (Inal-Ince *et al.* 2004) found that, during AMI, higher chest pain intensity being reported by patients aged 60 or above was related to lower education level and income status. However, these factors had no impact on the perception of chest pain in our Chinese elders, as lower chest pain intensity was reported by the women rather than the men.

### Gender differences in chest pain description

Similar to other international studies (Albarran *et al.* 2000, Zuzelo 2002), we found no gender difference in the use of

**Table 2** Chest pain intensity scores and use of verbal descriptors reports of Chinese patients presenting with central chest pain following the onset of AMI

	Men (n = 54)	Women (n = 43)	p-value
Chest pain intensity			
Range (SD)	2–10 ( $\pm$ 2.35)	3–10 ( $\pm$ 2.25)	
Mean	7.54	7.51	0.957
Descriptors (n, %)			
Gripping	26 (48.15)	26 (60.47)	0.227
Pressure	16 (29.63)	7 (16.28)	0.125
Tightness	7 (12.96)	1 (2.33)	0.073
Squeezing	5 (9.26)	5 (11.63)	0.747
Dullness	0 (0)	1 (2.33)	0.443
Being punched	0 (0)	1 (2.33)	0.443
Fullness	0 (0)	2 (4.65)	0.194

**Table 3** Gender differences in localisation and radiation of chest pain symptoms

	Men (n = 54)	Women (n = 43)	p-value
Front regions (n, %)			
Neck	4 (7.41)	10 (23.26)	0.027
Right arm	8 (14.81)	7 (16.28)	0.843
Upper right	22 (40.74)	9 (20.93)	0.038
Upper central	26 (48.15)	33 (76.74)	0.004
Upper left	39 (72.22)	26 (60.47)	0.221
Left arm	12 (22.22)	10 (23.26)	0.904
Middle right	1 (1.85)	4 (9.30)	0.167
Middle central	0 (0)	4 (9.30)	0.036
Middle left	1 (1.85)	4 (9.30)	0.167
Right shoulder	10 (18.52)	10 (23.26)	0.567
Left shoulder	18 (33.33)	15 (34.88)	0.873
Jaw	6 (11.11)	5 (11.63)	1.000
No region	0 (0)	0 (0)	*
Dorsal regions (n, %)			
Neck	4 (7.41)	10 (23.26)	0.027
Right arm	8 (14.81)	7 (16.28)	0.843
Upper right	11 (20.37)	7 (16.28)	0.607
Upper central	10 (18.52)	16 (37.21)	0.039
Upper left	17 (31.48)	16 (37.21)	0.554
Left arm	12 (22.22)	10 (23.26)	0.904
Middle right	0 (0)	4 (9.30)	0.036
Middle central	0 (0)	5 (11.63)	0.015
Middle left	1 (1.85)	4 (9.30)	0.167
Right shoulder	10 (18.52)	10 (23.26)	0.567
Left shoulder	18 (33.33)	15 (34.88)	0.873
No region	35 (64.81)	19 (44.19)	0.042

Sum of percentages is not equal to 100 as some subjects had more than one site of pain.

\*No statistics are computed because the data is a constant.

descriptors for chest pain (Table 2). It has been reported that descriptors characterising chest pain are influenced by cultural factors. In our study all men and nearly all women

described their chest pain by citing typical semantic terms, although over 70% of men and women had never experienced an episode of acute coronary ischaemia. This suggests that how individuals describe chest pain that is associated with AMI is mainly affected by culture rather than educational factor or the professional use of language. Only 9.3% of women reported atypical chest pain unlike studies involving patients from Western communities, where the incidence for this has been higher. Differences in reports of atypical symptoms of AMI have been also observed in Black communities where women were twice more likely to describe these than their male counterparts (Summers *et al.* 1999). Vodopiutz *et al.* (2002) observed that gender difference in the descriptions of chest pain were not solely influenced by age, health status or patients' previous experience with pain but through the use of language. This may explain why atypical chest pain description was found only in women. Besides, both genders in this study used fewer terms to describe chest pain than observed in Western studies (Albarran *et al.* 2000, Zuzelo 2002, McSweeney *et al.* 2003). This pattern of results reflects those reported by Hui and Chen (1989) involving the assessment of headaches in Taiwan residents, where the average number of words chosen to describe pain was markedly less than that of the Westerners (2 vs. 12 words). Such difference might have resulted because the words in the data collection tool were translated directly into Chinese by employing common Western-Chinese dictionaries. Therefore, the translated words for use with Chinese patients with AMI may have been inappropriate or lacked equivalent meaning. As the descriptors for evaluating of chest pain in this study were also translated from the English language, rather than using the terminology derived qualitatively from Chinese patients, similar problem may also have occurred.

### Gender differences in the location and radiation of chest pain

Based on body map data, Chinese patients indicated that they experienced chest pain not only in the upper central chest but also in the right side or in the left side of the chest or occurred in more than one region simultaneously. Generally, male participants reported chest pain more frequently in the upper right side of the chest and less frequently in the upper central chest. A possible explanation for this difference was that the number of men and women in our study were equal, unlike previous studies (Albarran *et al.* 2002) where the latter were numerically under-represented when compared to the former. Additionally, right-sided chest pain is common before menopause whereas

substernal chest pain is more frequently described by postmenopausal women with acute coronary syndromes (Methot *et al.* 2004).

With regard to chest pain radiation, significant statistical differences were found only with Chinese women experiencing more pain in the back of the neck, upper abdomen and the back, particularly in the upper back central, middle back central and the middle right of the back, compared with Chinese men. These findings are congruent with previous studies, in Europe and North America, reporting that unlike men with AMI, women experience significantly more pain in the neck and the back (Everts *et al.* 1996, Goldberg *et al.* 1998, Meshack *et al.* 1998, Penque *et al.* 1998, Albarran *et al.* 2002, Kosuge *et al.* 2006). From a practical perspective, the presence of pain in the neck and the back may fail to provoke concern in women patients and to consider this as an indication to seek urgent medical help.

It is reasonable to assume that the presence of atypical symptoms makes the diagnosis of AMI in women more difficult. Indeed, women are 40% less likely to be diagnosed with MI when compared to men (Willingham & Kilpatrick 2005). The Euro Heart Survey of stable angina also demonstrated that women were less likely to be referred for functional testing, be investigated with angiography or be referred for revascularisation (Daly *et al.* 2005). Erroneous perceptions by health care professionals may account for why women are under investigated nor offered access to specialists.

### Implications for practice and research

To our knowledge, this study is the first study to have examined differences in chest pain reports between Chinese AMI men and women. Our data resonates with other international data and demonstrates that there are discreet gender differences in symptom report among Chinese that transcend cultural barriers; however, it is also apparent that values in East Asian societies can interplay and mediate how individuals respond when experiencing AMI, particularly among men. Our study reinforces a global concern centred on the potential for misdiagnosis among women presenting with more discreet symptoms of MI. The importance of developing gender-sensitive chest pain assessment tools that are relevant to women suspected of AMI and which embrace the significance cultural characteristics must be a research priority.

### Strengths and weaknesses of the study

One of the strengths of this study is that we have recruited only the Hong Kong Chinese-speaking Cantonese so that it

could assure that pain was expressed in the similar way. Moreover, the equal number of patients in the female and male groups had widened the power for statistical test to identify differences and increased validity of the results. However, we only recruited patients from one centre in Hong Kong serving a specific population. Moreover, patients presenting with complications of AMI were excluded and therefore the findings may only apply to those with AMI and clinically stable. The study was only confined to the investigation of chest pain without including the totality of symptoms of AMI such as shortness of breath, nausea, vomiting, dizziness that may aid clinician diagnosis. We did not explore whether or not chest pain was the first symptom experienced by women that resulted in them seeking medical help. Excluding patients with a history of heart disease would have given a clearer picture on the number of women an initial episode of acute chest pain following AMI. In terms of data collection, the translated verbal descriptors may not have captured the individual nature of the chest pain experienced by the Chinese because linguistic expressions are mediated by cultural and language differences. Another limitation concerned the body map, which omitted to include teeth and hands; therefore it was not impossible to measure radiation pain to these regions. Moreover, the frontal neck area indicating the throat and the epigastric area was included in the upper central chest region as these areas may also be a source of chest pain in some patients. Further modification and validation of the body map for use in clinical practice and in research need to be conducted in future.

### Conclusions

This descriptive prospective study investigated that gender differences in the perception of chest pain exist among Chinese patients with AMI. Chest pain intensity on both the left and the right side was experienced more by men whereas women tended to describe chest pain atypically, experienced more upper central chest pain and radiation of chest pain to the neck, upper abdomen and the back, particularly in the upper central back, the middle central back and the middle right side of the back.

### Relevance to clinical practice

The results of this study are of relevance to the international community in that they add to the growing body of knowledge on the subtle differences in the cardiac symptoms reports among men and women with AMI, with the latter being more at risk for misdiagnosis and not to benefit from interventions which influence recovery and survival out-

comes. Because of this recognised threat, women presenting with atypical chest pain symptoms must be defined as high-risk groups and investigated aggressively until AMI can be excluded. Clinicians need to be attentive to how patients verbally report and manually localise their cardiac symptoms, but consider the impact of language, culture and gender on the assessment process. The development and use of validated gender-sensitive cardiac assessment tools may improve the detection of women who are most vulnerable for and risk of AMI. Nurses because of their direct contact with patients must provide tailored information on how to recognise and respond to typical and untypical symptoms of AMI.

## Contributions

Study design: JBK, VL, SYC; data collection and analysis: JBK, VL, SYC and manuscript preparation: JBK, JWA, VL, SYC.

## Conflict of interest

None.

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