ACUTE CORONARY SYNDROMES

Acute coronary syndromes and their presentation in Asian and Caucasian patients in Britain

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Objective: To describe and compare demographics and symptom presentation in Asian and Caucasian patients with acute coronary syndromes.
Design: Long-term prospective survey of symptom presentations in two racial groups.
Setting: A London hospital.
Participants: A consecutive series of patients admitted to hospital with acute coronary syndromes between November 2001 and November 2005.
Main outcome measure: Comparison of demographics and location, character, intensity and symptom distribution at presentation between Asian and Caucasian patients.
Results: Asian patients were younger than Caucasian patients (61 *v* 69 years, $p<0.001$) and more had diabetes (43% *v* 17%, $p<0.001$). Proportionally, more Asian patients had angina (51% *v* 37%, $p<0.001$), but more Caucasian patients had myocardial infarction (63% *v* 49%, $p<0.001$) and non-ST elevation infarcts (40% *v* 29%, $p<0.001$). Men reported smaller areas of discomfort than women. Asian patients more frequently reported discomfort over the rear of their upper bodies compared to Caucasian patients (46% *v* 25%, $p<0.001$) and radiation of discomfort to their arms and necks. A higher percentage of Asian than Caucasian patients demonstrated a ''classical'' location of symptoms (90% *v* 82%, $p<0.001$). Patients with diabetes were more likely to feel no discomfort. A higher percentage of Caucasian than Asian patients presented with ''silent'' events (13% *v* 6%, $p>0.001$), with age being a major determinant.
Conclusion: Asian patients were younger, more likely to be diabetic and tended to report a higher intensity of pain and over a greater area of their body, and more frequent discomfort over the rear of their upper thorax than Caucasian patients.

Up to 2.3 million people whose racial origins lie in the Indian sub-continent live in the United Kingdom, representing 4% of the UK population.[1] The established high rates of coronary heart disease in Asian individuals[2–5] seem likely to be influenced by genetic factors.[6] Less well described are differences in the mode of presentation of acute coronary syndromes in Asian patients. Previous reports have suggested that atypical presentations in patients with myocardial infarction have led to an increased risk of delays in seeking medical attention,[7] less aggressive clinical management and a worse in-hospital mortality.[8] However, despite high rates of coronary disease and poorer outcomes,[9 10] there is no evidence that British Asian individuals have less access to cardiac investigations or therapies.[11] Furthermore, Asian patients appear as capable as European patients in interpreting their symptoms and may be even more likely to seek medical assessment.[12]

We performed a 4-year prospective survey of patients from both racial groups to determine if differences in symptomology might exist when presenting with an acute coronary syndrome.

METHODS

Patients

A consecutive series of Asian and Caucasian patients requiring hospital admission for an acute coronary syndrome were recruited by a senior cardiac nurse. Patients from other racial groups or mixed racial groups were not included. The patient's decision was final in the determination of racial origin. A diagnosis of an acute coronary syndrome was decided by a cardiologist on the basis of the results of electrocardiograms, exercise testing and troponin T testing. Recruitment commenced in November 2001 and finished in November 2005.

Study design

Patients were asked to complete a brief three-question survey. The proforma asked for the location of their symptoms on a schematic diagram of the front and back views of the upper body (fig 1). The area was scored using a transparent overlay grid which divided the upper torso into a total of 32 segments (18 anterior and 14 posterior). A ''classical distribution'' was defined as discomfort in the centre or left of the praecordium with or without radiation to the left arm and or both sides of the neck or jaw. Additional volunteered symptoms or sensations were also recorded. Patients were asked to choose one or more descriptive terms to describe their discomfort. The intensity of the symptom also had to be selected on a pain scale of 1 (minor discomfort) to 10 (worst pain ever experienced). Care was taken to ensure that all patients received the same verbal instruction. Pictorial content was present to assist in their choice. Patients unable to understand the survey sheet were given assistance in their own language. Patients unable to describe their symptoms, due their conscious or mental state, were also documented.

Data recorded

Demographics, including age, gender, race, diagnosis and if diabetic were recorded and transcribed to an Excel database. Acute coronary syndromes were subdivided into three categories: ischaemic events due to angina, non-ST elevation myocardial infarction and myocardial infarction associated with ST-segment elevation.[13]

Data analysis

Comparisons of demographics were carried out using t tests, Pearson χ^2 tests and Mann Whitney U tests where appropriate.

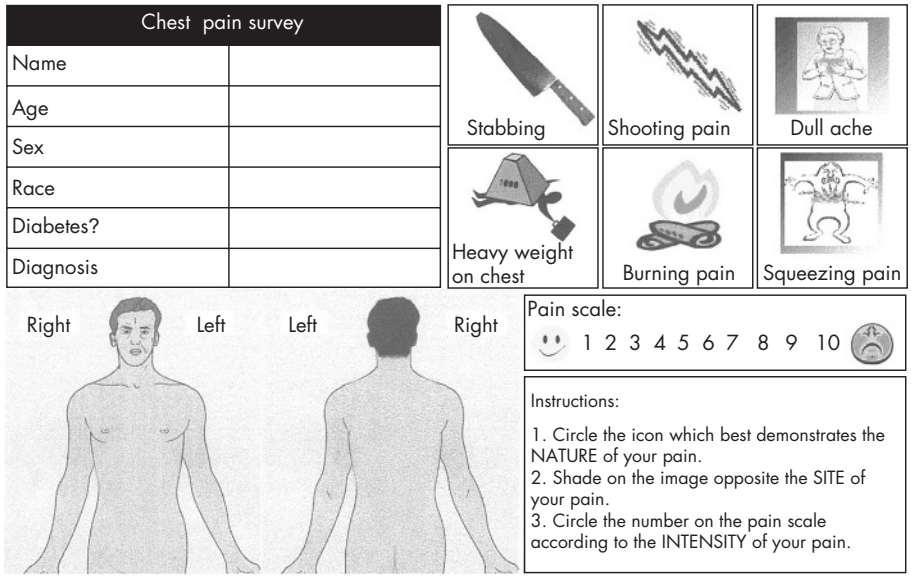

Figure 1 Template distributed to all patients with instructions to draw on the figure the location of all discomfort experienced with this event, to describe the character of discomfort and to select the intensity.

Logistic regression was used to determine the most significant factors contributing to patient reporting of the intensity and area of discomfort. Analysis was performed using STATA, version 7 (StataCorp, College Station, Texas, USA).

RESULTS

Demographics

Of 3000 patients surveyed, 95 (3.2%) were of neither Caucasian nor Asian race, or were of mixed racial origins. Of the remaining 2905 patients, 604 (21%) were Asian and 2301 (79%) were Caucasian. The demographic information for both groups is shown in table 1.

The type of acute coronary syndrome is also included in table 1. Both Asian and Caucasian patients with myocardial infarction tended to be older (63 (standard deviation (SD) 13) years and 71 (SD 14) years, respectively) than those presenting with angina (58 (SD 12) years and 65 (SD 13) years, respectively).

Forty Asian patients (6.6%) required the assistance of a translator to complete the proforma. One patient was unable to rate or locate their chest discomfort. One native French Caucasian patient required a translator. A further 31 patients in the Caucasian group were unable to complete the survey due to poor memory (n = 10, of whom four had had out-of-hospital cardiac arrest), dementia (n = 20) and blindness (n = 1).

Table 1 Demographics and cardiac diagnosis at presentation in the Asian and Caucasian groups

	Asian patients, n = 604	Caucasian patients, n = 2301	p Value
Age (years), mean (SD)	60.6 (12.7)	68.9 (13.9)	<0.001
Male, n (%)	396 (66)	1431 (62)	0.13
Diabetic, n (%)	262 (43)	398 (17)	<0.001
Myocardial infarction, n (%)	294 (49)	1439 (63)	<0.001
ST-segment elevation MI, n (%)	109 (18)	482 (21)	0.12
Anterior ST-segment elevation MI, n (%)	54 (9)	206 (9)	0.99
Non ST-segment elevation MI, n (%)	173 (29)	917 (40)	<0.001
Left bundle branch block, n (%)	12 (2)	40 (2)	0.68
Angina, n (%)	310 (51)	851 (37)	<0.001

MI, myocardial infarction.

Location and extent of discomfort

The area of discomfort reported for Asian patients ranged from no discomfort (0 segments) to a maximum of 19 segments, with a median of 5. The Caucasian group ranged from 0 to 24 segments, with a median of 4 ($p<0.001$). The distribution of reported discomfort for the Asian and Caucasian groups is shown in fig 2 and described in table 2.

Patients who reported discomfort in at least one area of the body (n = 2554) were then split into two groups depending on the size of the area of discomfort they experienced. Patients who felt discomfort in 1–4 segments of the body were placed into the ''small area'' group (47%) and those reporting pain in 5–25 segments of the body into the ''large area'' group (53%). The distributions of Asian and Caucasian patients in the groups were different, with 37% of Asian patients in the small area group and 63% in the large area group. This compared with 49% of Caucasian patients in the small area group and 51% in the large area group.

Table 2 Comparison of pain characteristics between the Asian and Caucasian groups

	Asian patients, n = 604	Caucasian patients, n = 2301	p Value
Frontal discomfort, n (%)	565 (94)	1975 (86)	<0.001
Posterior discomfort, n (%)	278 (46)	562 (25)	<0.001
Classical distribution of discomfort, n (%)	545 (90)	1887 (82)	<0.001
Silent pain, n (%)	35 (6)	299 (13)	<0.001
Intensity of discomfort, median (range)	7.5 (0–10)	7 (0–10)	0.002
Maximum discomfort intensity of 10, n (%)	148 (25)	459 (20)	0.02
Area of discomfort, median (range)	5 (0–19)	4 (0–24)	<0.001

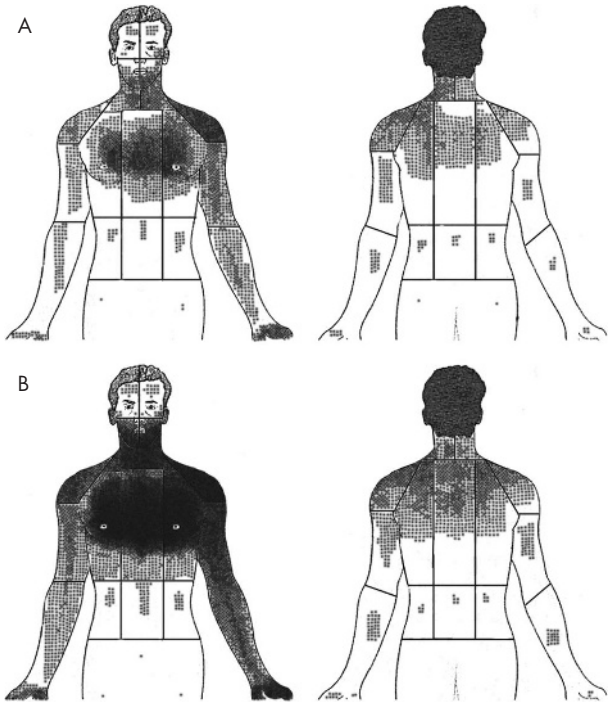

Figure 2 Schematics of the front and back of the upper torso, arms and head showing the cumulative location of discomfort for the Asian (A) and Caucasian (B) groups. All 604 patients are summated for the Asian group; the results for the first 2000 Caucasian patients recruited are shown.

Racial group, gender and age were all statistically significant. Gender had the largest effect on extent of discomfort, with males more likely to report a small area of pain compared with females (odds ratio (OR) = 0.59, 95% confidence interval (CI) 0.50 to 0.70) and age was also significant (OR = 0.98, 95% CI 0.98 to 0.99). Caucasian patients were more likely to report a smaller area of pain (OR = 0.95, 95% CI 0.98 to 0.99). However, the odds ratios for age and racial group are close to 1, so these results may have limited clinical significance.

Frontal upper body discomfort was reported by 94% of Asian patients and 86% of Caucasian patients ($p<0.001$), while almost twice as many Asian patients (46%) reported pain on the rear of their upper body compared with Caucasian patients (25%) ($p<0.001$).

Figure 3 shows the location of discomfort in both groups. A small number of patients from both groups reported symptoms in their lower limbs which included parasthesae, or in some cases actual discomfort.

Character of discomfort

The most frequently selected term to describe the discomfort experienced within the Asian group was ''weight'' (34%), followed by ''squeeze'' (28%) and ''ache'' (14%).

In the Caucasian group the most frequent term selected was ''weight'' (28%), followed by ''ache'' (23%) and ''squeeze'' (20%). Figure 4A,B shows the breakdown of terms selected by both groups. Descriptive terms most frequently volunteered in the Asian group were ''tightness'' or ''tight'' by 5.1% and ''sharp'' by 3.5%. In the Caucasian group, the terms most frequently volunteered were ''tightness'' or ''tight'' by 6.1% and ''pressure'', ''pressing'', ''pulling'' or ''pushing'' by 1.5%. Less classical descriptive terms for discomfort, including ''stabbing'', ''shooting'' and ''burning'', were used with similar frequency by both racial groups. Caucasian patients used a wider terminology of words and phrases (for instance, ''cramp-like'', ''crushing'', ''band-like'', ''rawness'', ''gnawing'', ''throbbing'', ''searing'', ''bruised'', ''punched'') than Asian patients.

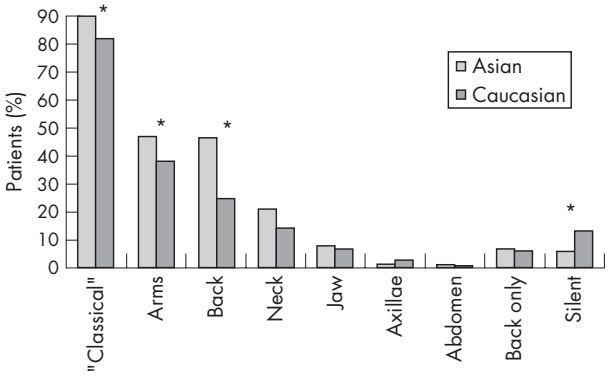

Figure 3 Histogram showing the location of discomfort for both Asian and Caucasian groups presenting with an acute coronary syndrome. A classical distribution is defined as discomfort in the centre or left of the praecordium with or without radiation to the left arm and or both sides of the neck or jaw. *$p<0.05$, Asian *v* Caucasian patients.

Intensity of discomfort

There was a small but statistically significant difference in the intensity of discomfort reported, with Asian patients reporting a median pain rating of 7.5, compared with 7.0 in the Caucasian group ($p = 0.002$). A quarter of Asian patients (145 of 604, 24%) rated their discomfort at the maximum value of 10, compared with a fifth of Caucasian patients (442 of 2301, 19.2%).

Patients were categorised as having high or low intensities of discomfort, with patients scoring their discomfort as 1–7 classed as low and as 8–10 classed as high (table 3).

This resulted in 1195 (47%) patients in the low group and 1348 (53%) in the high group. The distribution of Asian and Caucasian patients in each group was very similar with 54% and 53%, respectively, in the high pain group.

Table 4 shows the results of performing logistic regression on patients with low or high intensity discomfort. The variable most significantly associated with reporting intensity of discomfort was age (OR = 0.99, 95% CI 0.98 to 0.99). As with location of discomfort, the odds ratio for age is very close to 1 and so the result may not be clinically significant. The diabetic status of the patients was also significant (OR = 0.81, 95% CI 0.65 to 0.98). If they reported feeling some discomfort during presentation, patients with diabetes were 19% more likely to report a lower level of discomfort. Gender had some effect on reporting pain, with males likely to report a lower level of discomfort (OR = 0.86, 95% CI 0.73 to 1.01), but the result was not significant at the 5% level ($p = 0.07$). Racial group was not associated with reporting a different intensity of discomfort.

Silent presentation

A smaller percentage of Asian patients (6%) reported feeling no discomfort on presentation (silent presentation) compared with Caucasian patients (13%) ($p<0.001$). These patients were identified by a combination of symptoms, including fatigue, shortness of breath, collapse and resuscitation following cardiac arrest.

Table 5 shows the results of performing logistic regression on whether patients reported a silent episode, and which factors were most likely to contribute to it.

The most significant factor was a patient's diabetic status. Patients with diabetes were over twice as likely (OR = 2.08, 95% CI 1.56 to 2.76) to report that they felt no pain during presentation than patients without diabetes. Caucasian patients

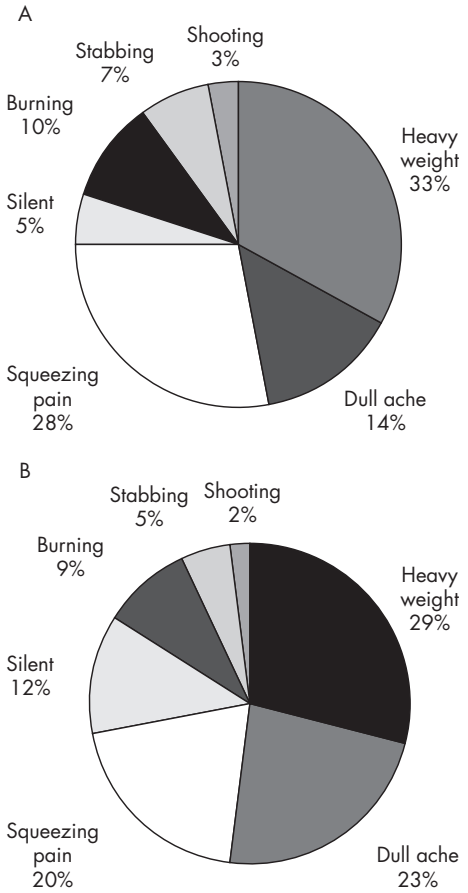

Figure 4 Pie diagrams illustrating the selection of terms chosen by Asian (A) and Caucasian (B) patients to describe the character of discomfort experienced.

were also more likely to feel no discomfort (OR = 1.61, 95% CI 1.08 to 2.40) than Asian patients, and age was also a significant factor (OR 1.09, 95% CI 1.08 to 1.10). In patients presenting silently, Caucasian individuals had a mean age of 79 years compared with 74 years for Asian patients (p = 0.007). No discernible difference between patients presenting silently was attributable to a difference in gender (OR = 0.97, 95% CI 0.76 to 1.25).

DISCUSSION

Inspiration for this study came from a clinical observation that Asian patients appeared to report discomfort over the inter-scapular region during acute coronary syndrome episodes more often than Caucasian patients. The Government of the United Kingdom has identified equality of distribution of health care as one of the targets for its Health of the Nation Strategy.[14] In the mid-1990s some centres had reported that, compared with Caucasian patients, British Asian patients were less likely to receive thrombolysis for a myocardial infarction,[15] less likely to be referred for stress testing,[15] and less likely to undergo coronary angiography.[16] Could different or atypical presentations of acute coronary syndromes be contributing to discrepancies in health care delivery?[17]

Demographics

Asian patients were younger than Caucasian patients in this study by 8 years on average. A much smaller study in 1989 reported age at first myocardial infarction to be younger in Asian patients (50.2 years) than in Caucasian patients (55.5 years) by 5.5 years on average.[18] These patients, by virtue of their events being exclusively a first presentation, were younger than our patients. As expected, our Asian patient cohort had a prevalence of diabetes that was 2.5 times greater than the Caucasian patient cohort. However, even this excess is much lower than a reported 4.3-fold higher prevalence of diabetes in Indo-Asian men compared with European men in west London (19.6% *v* 4.8%).[19]

Location

In accord with our original clinical observations, we found that discomfort in the back (scapular and interscapular) was reported almost twice as frequently by Asian compared with Caucasian patients. Interscapular pain might open up a differential diagnosis that would include the archetypal condition, notably aortic dissection. The consequence of this can delay the use of thrombolytic therapies and, in an acute coronary syndrome, worsen the prognosis. Discomfort limited only to the back was similarly frequent in both racial groups.

Other statistical differences in the location of experienced discomfort are probably of no clinical relevance, particularly with regard to the classical distribution of discomfort (centre and left chest and/or arms and/or neck). Generally, Asian patients had a wider distribution of discomfort, with an excess of arm, neck and jaw discomfort (fig 3). Atypical chest pain location has been previously described in Bangladeshi patients in east London presenting with myocardial infarction.[20] An earlier study that examined differences in the presentation of acute coronary syndromes reported a very similar proportion of patients to our Asian group (46%) experiencing arm pain with an acute coronary syndrome.[21] However, despite recruitment of nearly 1800 patients, the authors of this earlier study were unable to perform any comparisons with regard to ethnicity due to the relatively small numbers of non-white patients in their cohort. Differences in the location of chest discomfort with

Table 3 Frequency distribution, adjusted odds ratios (ORs) and 95% confidence intervals (CIs) comparing low and high discomfort intensity for patients reporting some degree of discomfort

		Low intensity		High intensity			
		n	%	n	%	OR (95% CI)	p Value
Race	Asian	262	46	305	54	1.0	
	Caucasian	933	47	1043	53	0.95 (0.78 to 1.16)	0.61
Diabetic	No	912	46	1074	54	1.0	
	Yes	283	51	274	49	0.81 (0.65 to 0.98)	0.03
Gender	Female	412	45	497	55	1.0	
	Male	783	48	850	52	0.86 (0.73 to 1.01)	0.07
Age	Continuous variable data used for age analysis					0.99 (0.98 to 0.99)	0.03

Table 4 Frequency distribution, adjusted odds ratios (ORs) and 95% confidence intervals (CIs) for patients comparing small and large areas of reported discomfort at presentation

		Small area		Large area			
		n	%	n	%	OR (95% CI)	p Value
Race	Asian	209	37	359	63	1.0	
	Caucasian	981	49	1005	51	0.65 (0.52 to 0.79)	<0.001
Diabetic	No	932	47	1062	53	1.0	
	Yes	258	46	302	54	0.90 (0.74 to 1.10)	0.31
Gender	Female	367	40	544	60	1.0	
	Male	822	50	820	50	0.59 (0.50 to 0.70)	<0.001
Age	Continuous variable data used for age analysis					0.98 (0.98 to 0.99)	<0.001

angina between Indian, Bangladeshi and Pakistani patients have been highlighted by the Newcastle Heart project, but in south Asian patients generally the anatomical location of discomfort was more variable than in European patients.[22]

Character

Atypical presentations have previously been reported to be more common in Indo-Asian patients when compared with a European population experiencing acute myocardial infarction.[15 16 20 23] Studies in the United States have also reported that atypical presentations of acute myocardial infarction are associated with non-white, predominantly African-American and Hispanic racial groups.[8 24] Despite showing differences in location and intensities of discomfort, we have shown little difference in the character of discomfort described between our two racial groups. Better language skills will have contributed to the wider choice of terms used by Caucasian patients. Variation towards an atypical presentation is associated with poorer prognosis.[25]

Intensity

We have found that diabetes was the most important factor in not reporting discomfort. Patients presenting with myocardial infarction or ischaemia without chest pain have previously been described as having a poor prognosis.[8 26 27] The proportion of patients in our study with a silent episode was modest compared with an earlier large study which reported this as being as high as 33%.[8] Patients were on average 7 years older than our patients, a feature which agrees with our finding that older patients were more likely to experience silent events. Women in our study showed a trend to report higher levels of pain discomfort and assigned larger areas of discomfort than men. Several studies have also reported that women report higher discomfort levels than men,[28 29] and that back, jaw [21] and neck pain are more common than in men.[30]

Overall

Language must clearly have a contributory role, with reports of over 43% of Pakistani and 87% of Bangladeshi British individuals aged 65 or over having English language difficulties.[31] Language problems are also more prevalent in women than in men of all south Asian groups. However, a study of south Asian individuals in London showed that any delays in obtaining cardiac services were unrelated to difficulties in interpretation of symptoms or willingness to seek care.[12] Bangladeshi patients in London have also been shown to be ''as likely as whites'' to interpret their symptoms as being due to a heart attack and no less likely to seek medical care.[20] A greater tendency to globalise symptoms in relation to musculoskeletal pain has been previously described in south Asian communities in the UK, compared with the white population.[32] Inability to communicate a symptom might lead to exaggeration of symptoms. These factors contribute to making the diagnosis in Asian women even more difficult, with some authors reporting that the description of chest pain in Asian women is less reliable than in men.[22 23]

Limitations to the study

This study is limited by including only those patients who survived to be admitted to hospital. A symptom of some kind must have initiated admission and patients totally asymptomatic will not have been identified. We have ignored the heterogeneity of different Asian national, religious, cultural, geographic and dietary groups. However, all these sub-groupings appear to be associated with an increased risk of coronary disease in Asian populations.[33] This does not exclude the fact that significant differences might still exist between Asian subgroups.[20] The nature of an ongoing immigrant population will mean several different generations since arrival are represented and will therefore have widely variable socio-economic status. Education and language may have been influential in the

Table 5 Frequency distribution, adjusted odds ratio (ORs) and 95% confidence intervals (CIs) comparing silent and non-silent episodes

		Silent		Non-silent			
		n	%	n	%	OR (95% CI)	p Value
Race	Asian	35	6	569	94	1.0	
	Caucasian	299	13	1991	87	1.61 (1.08 to 2.40)	0.02
Diabetic	No	235	11	1999	89	1.0	
	Yes	99	15	561	85	2.08 (1.56 to 2.76)	<0.001
Gender	Female	158	15	915	85	1.0	
	Male	176	10	1644	90	0.97 (0.76 to 1.25)	0.84
Age	Continuous variable data used for age analysis					1.09 (1.08 to 1.10)	<0.001

choice of terms although this would have been minimised by the use of the pictorial proforma.

CONCLUSION

As recently as 2005, a large Swedish study demonstrated that only a small proportion of individuals reported symptoms that are commonly associated with an acute coronary syndrome.[29] To improve our recognition of symptoms across all the acute coronary syndromes, an understanding of atypical presentations in different groups of patients is essential.

Our observations reveal that Asian patients are younger, more likely to be diabetic and tend to report a higher intensity of pain and over a greater area of their body, including over their backs, than Caucasian patients. Diabetic patients were twice as likely not to have discomfort on presentation.

The nature of the acute coronary syndromes means that an accurate and timely diagnosis is vital. Although determined in a hospital population, the implications are similar for rapid access chest pain, hospital cardiology out-patient, community-based and primary care clinics. Earlier recognition, particularly by patients themselves, of atypical presentations or absence of chest discomfort in high risk groups, including Asian subjects, the elderly and diabetic patients, may allow more timely diagnosis and therapeutic interventions.

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