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Women with myocardial infarction are less likely than men to experience chest symptoms

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Abstract

Objectives. To assess similarities and differences between women and men regarding experience and interpretation of symptoms of acute myocardial infarction before hospital admission. *Design*. 149 women and 384 men responded to a questionnaire two weeks after hospital discharge. *Results*. Men were more likely than women to report chest symptoms. Women were more likely to complain of nausea, palpitations, dyspnoea, fainting, pain in the back and pain between the scapulas than men. Irrespective of sex only half the patients interpreted their symptoms as cardiac. Early onset of chest symptoms, previously diagnosed angina, symptoms in accordance with expectations, symptoms stronger than expected and familiarity with symptoms, all contributed to a cardiac attribution among both sexes. A diagnosis of hypercholesterolemia and prescribed nitroglycerin was related to a cardiac attribution among men only. *Conclusion*. Women were less likely to experience chest symptoms and more likely to experience atypical symptoms than men. Symptom experience and the patients' expectations of symptoms influenced interpretation and attribution among both sexes.

Key words: *Myocardial infarction, symptoms, sex (gender) differences*

The efficacy of medical treatment and percutaneous coronary intervention (PCI) in reducing morbidity and mortality after an acute myocardial infarction (AMI) is well established (1,2). However, the effectiveness of the treatment is highly dependent on rapid administration after onset of symptoms.

Chest pain is a classic symptom in AMI, but between 20% and 32% of AMI patients present without chest pain (3–7), and these patients probably have an increased mortality (5,6). There is growing concern that women and men have different symptoms with AMI, though whether women are less likely to experience chest pain than men (3–6,8–13), is still debated. In some studies increasing age has been associated with reduced frequency of chest pain (5,6,8). Limited data exist on the prevalence of other symptoms. Some studies indicate that women are more likely to complain about pain in the back and jaw, and also nausea (3,4,9,12).

Expectations about chest pain as an essential feature of AMI might make patients less concerned about other symptoms. Thus to recognize the symptoms as cardiac in origin may have vital implications in deciding whether or not to call for a doctor (7,14) particularly in women, who, it has been suggested, may be less likely than men to attribute their symptoms to cardiac causes (15). Hence we aimed to study whether women and men experience different symptoms with an AMI, and whether they differ in their interpretation of these.

Material and methods

Patient population

Patients below 76 years admitted to the coronary care unit with their first AMI between February 2003 and March 2004 were invited to participate, and questionnaires were sent by mail two weeks after hospital discharge. Patients not responding to the invitation received a reminder two weeks later. Patients who were hospitalized, or staying in another health institution at symptom onset, were excluded.

The patients were consecutively recruited from the coronary units in five Norwegian hospitals, two University hospitals with 900–1200 beds and three district hospitals with 200–400 beds, with emergency medical function for the surrounding urban and rural areas.

Patients who agreed to participate gave their written consent about participation, and permission

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to obtain information from their medical records. They were requested to call the principal researcher if items in the questionnaire were difficult to understand. The study was approved by the Regional Ethics Committee for Medical Research in Norway.

The calculation of sample size was based on data from a former study on prehospital delay with power 0.80, mean 3.0 and 3.5 hours and standard deviation 1.7.

Instrument and procedures

The questionnaire was developed by the researcher, based upon a previous study (16) and a pilot study on 20 AMI patients hospitalized in a regional hospital in December 2002. Discharge reports for all the patients were obtained from the hospitals, and diagnoses, the presence of STEMI/ NSTEMI and infarct location were based upon information in these records. The diagnoses of patients with first time AMI was based on serum cardiac troponin beyond cut off, electrocardiogram changes with ST-segment elevation, ST- segment depression or T wave abnormalities, and the presence of clinically appropriate symptoms. ST- segment elevation (STEMI) was confirmed by ≥ 1 mm in at least two standard leads or ≥ 2 mm in at least two contiguous precordial leads or the presence of a new bundle branch block. Location of the AMI was classified into anterior, posterior and other location based on ECG-criteria.

The questionnaire included patient characteristics, medical history, acute symptoms prior to hospitalization, illness expectations and illness behaviour. Acute symptoms were classified as early when experienced initially, the first occurring symptoms, and late when experienced after the onset of other initial symptoms. This question had multiple-choice alternatives. Further analysis of acute symptoms was based on the total number of symptoms, though chest symptoms were analyzed according to early and late onset. Chest symptoms were described as pain, discomfort, pressure and tightness, several classifications permitted. Musculoskeletal symptoms were defined as either pain located between the scapulae, back pain or shoulders. They also graded the intensity (unbearable, moderate or not strong) and symptom progress, whether or not the symptoms corresponded with expectations on a cardiac origin, and finally stated whether they attributed their acute symptoms to the heart, abdominal, musculoskeletal, flu or stress, one or more alternatives permitted. The patients' acute symptoms and medical history, and their knowledge and expectations about an AMI were used to analyze factors influencing their interpretation of the situation. Positive family history was defined as having siblings or parents who had suffered an AMI before 60 years of age. Hypercholesterolaemia, hypertension and diabetes were defined as being diagnosed by a physician and medically treated for these conditions, based upon information in the questionnaire. The definition of these conditions was not based upon specific drug treatment.

Statistical analyses

The analyses were conducted with SPSS for Windows version 11.5 (SPSS Inc. Chicago, Illinois). Twin-tailed χ^2 tests and Mann Whitney tests were used to compare characteristics and clinical presentations among women and men. The effect of age and sex on symptoms totally were analyzed by binary logistic regression. Continuous variables are presented as mean (SD). Statistical significance was set at 95% CI or p-value <0.05.

Results

Inclusion and exclusion of patients

The questionnaire was sent to 777 patients. Of them 39 patients were excluded due to information in the questionnaire, the medical records, information from relatives and the National Death Register. This exclusion was due to incorrect diagnosis (20 patients), coincident serious health problems (four patients), age over 76 years (five patients) and fatal outcome (ten patients). Of 738 eligible patients, 533 (67% women and 74% men) responded (149 women and 384 men).

Patient characteristics

Mean age was 61.2 (9.8), median 61, 25% quartiles 55 and 75% quartiles 69.5 years for the women and mean 58.5 (9.5), median 58, 25% quartiles 51 and 75% quartiles 64 years for the men. Mean age for non-responders was 59.0 (10.4) years. Non-responders did not differ significantly to responders regarding sex. Women and men differed in all patient characteristics (Table I). Hypertension and hypercholesterolaemia were significantly more common in women than in men. There were no sex differences as to prescribed nitroglycerin, previously diagnosed angina, diabetes and positive family history (Table I).

Location of the AMI and ST-elevation

Anterior infarct location was confirmed among 34% of the women and 31% of the men ($p = 0.598$), posterior among 31% vs. 40% ($p = 0.055$) and other location among 35% vs. 28% ($p = 0.136$). No

Table I. Patient characteristics and medical history among Norwegian women and men with first time AMI.

	Women n = 149 (%)	Men n = 384 (%)	p
Age:			
45 years and younger	9 (6)	44 (11)	< <0 .01
46–55 years	33 (22)	108 (28)	<0.01
56–65 years	48 (32)	150 (39)	<0.01
66–76 years	59 (40)	82 (21)	<0.01
Education:			
≤10 years	89 (60)	127 (33)	<0.01
11–13 years	36 (24)	148 (39)	<0.01
≥14 years	13 (9)	102 (27)	<0.01
Employment:			
full time	29 (19)	229 (60)	<0.01
part time	20 (13)	23 (6)	<0.01
on social security	96 (64)	140 (36)	<0.01
Marital status:			
married/ cohabitant	97 (65)	304 (79)	0.04
Single	52 (35)	80 (21)	0.04
Living alone	39 (26)	70 (18)	0.04
Medical history			
Hypertension	57 (38)	113 (29)	0.046
hypercholesterolemia	39 (26)	57 (15)	<0.01
Diabetes	12 (8)	27 (7)	0.684
prescribed Nitroglycerin	19 (13)	43 (11)	0.496
previously diagnosed angina	20 (13)	50 (13)	0.895
positive family history	55 (37)	133 (35)	0.558

statistical association was found between infarct location and age. STEMI was confirmed among 55% of the women and 62% of the men (p = 0.162).

Symptoms reported in the acute phase of the AMI

Men were more likely to experience chest symptoms than women in the acute phase (Table II). This sex difference was still statistically significant after adjustment for age and diabetes (OR 0.53, 95% CI 0.29–0.97). There was no difference between STEMI/NSTEMI regarding chest symptoms. Chest symptoms were equally distributed in the various age groups. Women, but not men, without chest symptoms had a higher prevalence of hypertension (62% vs.38%, 95% CI1.20–8.05, p = 0.016).

The relative frequency of the four most commonly reported symptoms (chest symptoms, sweating, left arm pain and dyspnoea) were similar among women and men. Women were more likely than men to report nausea, palpitations, dyspnoea, fainting, pain between scapulae, jaw/ throat pain and back pain.

Symptoms from the musculoskeletal system (pain located between the scapulae, in the back or shoulders) were experienced among 81 (54%) of the women and 148 (38%) of the men (OR adjusted for age 2.1, 95% CI 1.39–3.1). Men 55 years and younger were more likely to experience these symptoms than men older than 55 years (47% vs. 33%, OR 1.81, 95% CI 1.2–2.76), but among women these symptoms were equally distributed in all age groups.

The mean number of reported symptoms was 7.9 among women and 6.5 among men (p = 0.096.). Men 45 years and younger were more likely to report more symptoms than those in the other age groups (mean number 8.41 vs. 5.30, p = 0.031). Among women there was no effect of age on the numbers of symptoms.

Expectation and attribution of symptoms

More women than men described their acute symptoms as unbearable (CI 1.04–1.82, p = 0.027). There were no sex differences regarding other appraisals, expectations and attributions of symptoms (Table III). Between 6 o'clock and noon 60% of the women and 33% of the men described their symptoms as unbearable (CI 0.15–0.71, p < 0.01).

Aspects contributing significantly to a cardiac attribution among women were previously diagnosed angina, being familiar with AMI symptoms, early onset of chest symptoms, experiencing symptoms as unbearable and in accordance with expectations. Late onset of chest symptoms, experiencing fatigue, hot flushes and expecting other symptoms contributed to a non-cardiac attribution (Table IV). Aspects contributing significantly to a cardiac attribution among men were previously diagnosed angina, hypercholesterolemia, prescribed nitroglycerin, being familiar with AMI symptoms, early onset of chest symptoms and symptoms in accordance with expectations. Experiencing abdominal pain and expecting other symptoms contributed to a non-cardiac attribution (Table IV).

Male patients 55 years and younger were less likely to attribute their symptoms as cardiac than older men (CI 1.20–2.74, p < 0.01), but among women (p = 0.55) there was no such relationship.

Other acute symptoms, slow or rapid development of symptoms, hypertension, diabetes, positive family history and education had no influence on the patients' attribution of symptoms.

Discussion

Among these patients with acute myocardial infarction women were less likely to experience chest symptoms and more likely to experience atypical symptoms than men. Chest symptoms were equally distributed among all patients in the various age groups. Only half the patients attributed their

Table II. Symptom presentation, ranking and development in the acute phase before hospitalization among Norwegian women and men with first time AMI. OR for sex differences in total symptoms adjusted for age.

	Women n = 149 (%)			Men n = 383 (%)				
Symptom presentation	Early	Late	Total	Early	Late	Total	OR	95% CI
Chest symptoms: 1	119 (80)	9 (6)	128 (86)	1 337 (88)	16 (4)	353 (92)	0.52	0.28–0.95
pain	88 (59)	15 (10)	103 (69)	243 (63)	38 (10)	281 (73)	0.84	0.55–1.28
discomfort	71 (48)	13 (9)	84 (56)	198 (52)	26 (7)	224 (58)	1.04	0.7–1.54
pressure	77 (52)	6 (4)	83 (56)	183 (48)	21 (5)	204 (53)	1.19	0.8–1.75
Tightness	51 (34)	9 (6)	60 (40)	108 (28)	20 (5)	128 (33)	1.44	0.97–2.15
Sweating 2	78 (52)	8 (5)	86 (58)	2 191 (50)	23 (6)	214 (56)	1.29	0.87–1.93
Left arm pain 3	71 (48)	8 (5)	78 (52)	3 165 (43)	21 (5)	86 (49)	1.34	0.9–1.98
Dyspnoea 4	58 (39)	12 (8)	70 (47)	4 120 (31)	24 (6)	144 (38)	1.63	1.1–2.42
Nausea 5	58 (39)	11 (7)	69 (46)	7 92 (24)	18 (5)	110 (29)	2.38	1.59–3.56
Fatigue 6	53 (36)	15 (10)	68 (46)	4 106 (27)	40 (10)	146 (38)	1.43	0.97–2.11
Dizziness 7	48 (32)	10 (7)	58 (39)	6 104 (27)	21 (5)	125 (33)	1.54	1.03–2.32
Palpitations 8	44 (29)	13 (9)	57 (38)	13 58 (15)	12 (3)	70 (18)	3.14	2.02–4.88
Right arm pain 9	46 (31)	5 (3)	51 (34)	9 92 (24)	11 (3)	103 (27)	1.52	1.0–2.32
Between scapulae pain 9	44 (29)	7 (5)	51 (34)	10 81 (21)	10 (3)	91 (24)	1.78	1.17–2.72
Shoulder pain 11	44 (29)	4 (3)	48 (32)	8 94 (24)	13 (3)	107 (28)	1.37	0.9–2.1
Jaw/ throat pain 11	40 (27)	8 (5)	48 (32)	10 75 (20)	19 (5)	94 (24)	1.66	1.08–2.55
Hot flashes 13	38 (25)	5 (3)	43 (29)	12 76 (20)	7 (2)	83 (22)	1.63	1.0–2.54
Back pain 14	31 (21)	8 (5)	39 (26)	14 47 (12)	13 (3)	60 (16)	1.8	1.12–2.89
Headache 15	20 (13)	8 (5)	28 (19)	14 46 (12)	14 (4)	60 (16)	1.46	0.88–2.44
Abdominal pain 16	19 (13)	8 (5)	27 (18)	16 42 (11)	14 (4)	56 (15)	1.38	0.82–2.3
Fainting 17	17 (11)	3 (2)	20 (13)	17 20 (5)	7 (2)	27 (7)	2.34	1.25–4.4

Symptom presentation "early" refers to symptoms experienced at first in the acute situation. Symptom presentation "late" refers to symptoms experienced after the onset of other symptoms.

symptoms to the heart, and their medical history and specific symptoms had different influence on the interpretation among women and men. Over half the patients reported a mismatch between the symptoms they experienced and those they would have expected.

The fact that men with AMI were more likely to experience chest pain than women has been reported by some authors (4–6,11,12) but not by others (3,9,10,13). However, few studies have included only confirmed AMI patients and gender-based analyses, which makes comparison between studies difficult. The higher prevalence of hypertension among patients without chest symptoms has been found by others (4,6) but not exclusively among women. The four most frequently reported acute symptoms were equal in their proportions between the sexes, again agreeing with other results (3,17), as was our finding that women are more likely than men to report symptoms located to back, jaw, nausea and dyspnoea (3,4,9,10,12) and to report palpitations (11). Conversely, gender differences regarding the intensity of symptoms have not been documented by others and need to be confirmed by future research.

Table III. Appraisal and attribution of symptoms among Norwegian women and men with first time myocardial infarction.

	Women n = 140–149 (%)	Men n = 372–384 (%)
Symptom appraisal:		
unbearable	70 (50)	146 (39)
moderate	58 (41)	184 (49)
not very strong	12 (9)	43 (11)
rapid development	97 (67)	238 (64)
gradual development	47 (32)	134 (35)
not matching expectations	85 (58)	217 (57)
Symptom attribution:		
cardiac	73 (49)	205 (53)
musculoskeletal	29 (19)	66 (17)
stress	23 (15)	69 (18)
gastrointestinal	20 (14)	60 (16)
"flu"	7 (5)	27 (7)

Few studies have estimated the mean number of reported symptoms. Two of these are in agreement with our findings (3,18), but the fact that other studies included fewer symptoms complicates any comparison (7,15).

The mismatch between symptoms experienced and those expected was also found by Horne (7). More patients attributed their symptoms to the heart compared to other findings (15,19,20). That characteristically younger men were less likely than older men to attribute symptoms as cardiac, more likely to experience musculoskeletal symptoms and to report a higher number of symptoms has not been reported. Such findings need further investigation, as they have important implications. Similarly what influences the attribution of symptoms has also been scarcely investigated; though that previously diagnosed angina may underlie a cardiac attribution has

Table IV. Aspects contributing to a cardiac attribution among Norwegian women and men with first time AMI.

	Cardiac attribution among women n = 149 (%)				Cardiac attribution among men n = 384 (%)			
	Yes	No	95% CI	P	Yes	No	95% CI	P
Medical history:								
diagnosed angina	15 (10)	5 (3)	0.09–0.79	0.012	34 (9)	16 (4)	0.26–0.93	0.028
prescribed nitroglycerin	12 (8)	7 (5)	0.18–1.45	0.165	34 (9)	9 (2)	0.12–0.58	<0.01
hypercholesterolemia	20 (13)	19 (13)	0.42–1.83	0.739	40 (10)	17 (4)	0.24–0.9	<0.01
Acute symptoms:								
chest symptoms early	67 (45)	52 (35)	0.07–0.51	<0.01	187 (49)	150 (39)	0.27–0.97	0.04
chest symptoms late	0 (0)	9 (6)	0.81–0.96	<0.01	7 (2)	9 (2)	0.94–1.03	0.423
Fatigue	26 (17)	42 (28)	1.07–2.24	0.016	75 (20)	71 (18)	0.84–1.41	0.507
abdominal pain	12 (8)	15 (10)	0.61–2.39	0.601	21 (5)	35 (9)	1.16–3.17	<0.01
hot flushes	14 (9)	29 (19)	1.15–3.45	0.01	41 (11)	42 (11)	0.81–1.73	0.394
symptoms experienced as unbearable	44 (31)	26 (19)	0.18–0.69	<0.01	83 (22)	63 (17)	0.55–1.26	0.381
Knowledge and expectations:								
familiar with AMI symptoms	65 (44)	50 (34)	0.62–0.88	<0.01	184 (48)	119 (31)	0.68–0.85	<0.01
symptoms and expectations	44 (30)	19 (13)	0.11–0.45	<0.01	119 (31)	8 (12)	0.17–0.42	<0.01
corresponding expecting other symptoms	7 (5)	24 (16)	1.19–4.89	<0.01	19 (5)	50 (13)	1.35–3.3	<0.01

been reported (15). Our results show that patients' knowledge and expectations about acute symptoms had a major impact on interpretation among both women and men. Moreover, the patients' medical history more likely influenced a cardiac attribution among men than women, while symptom characteristics more likely influenced attribution among women. These findings are essential for better understanding the decision process between the onset of symptoms and the call for medical assistance, and need to be confirmed by future research.

Our finding of a higher prevalence of hypertension among women than men agrees with other results (4,8,9,12,15,19). Hypertension is a more common risk factor among elderly women than men. Female patients in our study were older than the men, thus explaining why women had more hypertension than men. During ischemia a history of hypertension may promote dyspnoea through diastolic dysfunction. Thus the difference in the history of hypertension may partly explain why women report more dyspnoea than men during an acute AMI. Increased occurrence of pulmonary oedema in elderly women has also been demonstrated (21). Though some studies (6,8,9,12,16,17,19) have found a higher frequency of hypertension among AMI patients, this might be due to inclusion of older patients and different criteria for medical treatment. The prevalence of hypercholesterolaemia among our patients was in accordance with or lower than other results (6,17). The prevalence of previously diagnosed angina was comparatively lower (9,12) but this might be due to younger patients in our study, while the low prevalence of diabetes compared to other studies (5,8,12,17,19) might be due to inadequate investigation. Few studies have included details of any family history of AMI, but those that did, were at variance with the patients in our study (6,17,21). The response rate was considered high (72%) which reduced selection bias.

Limitations

Patients older than 76 years were not invited, because some elderly persons might have problems in completing a self-administrated questionnaire, and we therefore cannot comment on aspects related to the oldest AMI patients. This selection of the patients may explain the discrepancies from observations made by other investigators. The patients' experiences of symptoms were elicited retrospectively two weeks after hospital discharge, with the possibility of inaccuracy. However, this possibility would be similar among women and men. The patient population did not differ from non-responders as to age and sex, but clinical conditions that might have influenced the symptom experience, are unknown for the non-responders. The infarct location and classification in this study was rather crude.

The strength of this study, however, is that it was a population-based sample, including public hospitals of various sizes. These hospitals were the only options for AMI patients in the acute setting. All patients experienced a first time AMI, verified by the patients' medical records.

Conclusions

The study showed significant sex differences in symptom presentation and attribution. Women were less likely to experience chest pain, and more likely to experience atypical symptoms than men.

Moreover, knowledge and prior expectations about AMI symptoms had implications for the patient's interpretation and attribution of symptoms. In men more than in women, their medical history influenced the interpretation of symptoms as cardiac. The Emergency Medical Service and ambulance staff, as well as other health care personnel, must be aware of these sex differences and the aspects influencing the patients' interpretation of their symptoms. More research is needed to explore the factors behind these aspects, which may be vital to decrease the delay before admission to hospital.

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