Chest pain and ischaemic heart disease in primary care

S Nilsson, M Scheike, D Engblom, L G Karlsson, S Mölstad, I Åkerlind, K Örtoft and E Nylander

SUMMARY

Background: *Chest pain is the main symptom of first presentation with ischaemic heart disease (IHD). Little is known about the incidence of IHD among patients consulting the general practitioner (GP) for chest pain.*

Aims: *To estimate the occurrence of IHD among patients consulting for chest pain, to study the results of the bicycle exercise test, and to estimate the incidence of IHD in the population.*

Design of study: *Prospective descriptive study.*

Setting: *Three primary health centres in south-eastern Sweden.*

Method: *All patients without a current IHD diagnosis, aged 20 to 79 years, and consulting for a new episode of chest pain, were included consecutively. The outcome was classified as IHD, possible IHD or not IHD, according to the results of a postal questionnaire, an exercise test or hospital care. Data from the hospital registry on patients with a diagnosis of IHD were analysed retrospectively.*

Results: *Out of 38 075 GP consultations, 577 (1.5%) were for chest pain. IHD was diagnosed in 41 (8%) of the chest pain patients, in 441 (83%) the diagnosis was excluded, and in 50 (9%) the diagnosis was judged as being uncertain. Even though the diagnostic criteria were strict, the exercise tests led to a diagnostic conclusion in 77% of the cases, most frequently a normal test result. Combining data from primary and hospital care, the yearly incidence of IHD was 6.5 diagnosed per 1000 inhabitants (aged 20 to 79 years old).*

Conclusion: *The incidence of a new episode of chest pain bringing the patient to the GP was low. Eight per cent of the patients received an IHD diagnosis, and in 9% further investigation or clinical assessment is needed.*

Keywords: *chest pain; primary health care; epidemiology; myocardial ischaemia; exercise test.*

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Introduction

CHEST pain often makes the patient, as well as the doctor, concerned about the possibility of manifestations of ischaemic heart disease (IHD), angina pectoris or myocardial infarction. It is of great individual and socioeconomic importance that a diagnosis of IHD is, wherever possible, correct. The causes of chest pain, however, range from benign conditions, such as musculoskeletal pain, psychosomatic disorders, and gastroesophageal reflux, to immediately life-threatening disorders, such as aortic dissection or pulmonary embolism. In a Swedish study, 20% of all emergency room visits were owing to chest pain, and a quarter of these patients received a diagnosis of acute myocardial infarction or myocardial ischaemia within a few days.[1,2] In the few published primary care studies, the frequency of chest pain as the presenting complaint varied between 0.7% and 7%, with IHD diagnosed for between 9% and 22% of cases, and chest pain of unknown aetiology accounting for approximately 15% of the cases.[3-6] The IHD diagnosis is sometimes difficult to make, since the primary care patient often presents with unspecific symptoms and IHD may have vague symptoms, or even be silent.[7] It has, furthermore, been questioned whether the large number of patients with chest pain of unknown aetiology in studies did not, in reality, represent undiagnosed angina.[3]

The aim of this study was to estimate the occurrence of IHD among patients with a new episode of chest pain in primary care, to study the results of the bicycle exercise test when IHD could not be excluded, and to estimate the incidence of IHD in the population.

Method

Demographics

The study was performed at three neighbouring healthcare centres in the county of Östergötland, in south-eastern Sweden. Two of the healthcare centres were situated in the main villages of rural areas, and the third was situated in a suburban area. Each healthcare centre was served by four general practitioners (GPs). All three healthcare centres rely on the same hospital for referrals and emergencies within a distance ranging between 15 and 50 kilometres. The age distribution of the population enrolled on the lists of the health centres is shown in Table 1.

Patients

From May 1998 until April 2000, all patients aged 20 to 79 years old with a new episode of chest pain as the presenting complaint were consecutively included. 'New' was defined as having commenced during the past six months and with a free interval of at least six months after any previous episode of the same type of complaint. 'Pain' was

HOW THIS FITS IN

What do we know?

Chest pain as the presenting complaint often causes concern and diagnostic problems, since ischaemic heart disease (IHD) may have vague symptoms. In the few primary care studies available, the occurrence of IHD among patients consulting a GP for a new episode of chest pain varies greatly.

What does this paper add?

In half of the cases under study, an IHD diagnosis could be excluded after clinical examination. In the studied primary care population the occurrence of IHD was 8%, but in 9% of patients further investigation and assessment were judged to be necessary. The exercise test was conclusive in 77% of cases, in spite of strict diagnostic criteria. The yearly incidence of IHD was estimated to be 6.5 per 1000 inhabitants aged 20 to 79 years old.

defined as pressure, ache, burning or a stabbing sensation in the chest. Patients were included by the GP during sessions held Monday to Friday, from 8.00 am to 5.00 pm, corresponding to the opening hours of the three healthcare centres. Owing to staff holidays, there were intermissions during July 1998, June 1999, and July 1999. The total study time was 21 months.

Patients who had been diagnosed as having coronary insufficiency by physiological methods were excluded, as were those who had had an acute myocardial infarction or had been the subject of coronary revascularisation during the previous year.

Retrospectively, data from the diagnosis registry of the referral hospital concerning angina pectoris (ICD 10; I 200-209) and acute myocardial infarction (I 210-219) were analysed to obtain information about patients who bypassed the healthcare centre and went directly to hospital. Those who had been hospitalised with any of the diagnoses during the previous year were excluded.

The study was approved by the ethics committee of the Faculty of Health Sciences of Linköping University.

Clinical assessments

Patients without suspected IHD were followed up three months later using a postal questionnaire. In cases of suspected stable angina, referral for an exercise test was made.

If there was any suspicion of myocardial infarction or unstable angina then an acute referral was made to emergency hospital care, according to normal clinical routines. In those patients where there was still diagnostic uncertainty at the end of hospital care, GPs had the option of referral for an exercise test at this point of the study. These patients were included in the hospital group in the analysis.

Questionnaire

The questionnaire included questions about further healthcare visits for chest pain and whether a diagnosis of myocardial infarction or angina pectoris had been made. One postal reminder was issued. If no answer was received despite the reminder, a review of the healthcare centre chart was made to obtain an IHD diagnosis, if there was any made during the four months following the inclusion. In addition, any death certificates of included patients were examined.

Classification of exercise test results

The results of the exercise tests were categorised into three groups: Group 1 — IHD; Group 2 — possible IHD; and Group 3 — not IHD. Patients who showed ST-segment depressions exceeding 0.1 mV (absolute depression) and had chest pain in relation to exercise were classified as belonging to Group 1. Patients with equivocal test results, who had chest pain but no ST changes during or after exercise, or the opposite (i.e. no chest pain but electrocardiograph [ECG] changes), were included in Group 2. Also included in Group 2 were those with non-assessable test results; that is, those who could not be categorised into the other groups; for example, those with left bundle branch block on ECG, or patients medicated with digitalis. Those who had neither chest pain nor ECG changes were classified as belonging to Group 3. All exercise tests were assessed by, and all but five were supervised by, the same clinical physiologist.

Classification after emergency hospital care

According to hospital charts, the primary care physician classified the results from emergency hospital care into three groups. These were: Group 1 — IHD (acute myocardial infarction, IHD verified by tests or IHD not objectively assessed); Group 2 — possible IHD (no conclusion in hospital chart whether IHD or not); and Group 3 — not IHD.

Exercise testing

Exercise tests were performed at the Department of Clinical Physiology at the local county hospital within six weeks of referral. All tests were performed using a bicycle ergometer with continuous workload increase. The initial load was 10 W to 50 W and was successively increased every 30 seconds by 5 W or 10 W, respectively. The load profile was set with

Table 1. Age and sex distribution of the listed population, all consultations and consultations for a new episode of chest pain, during a 21-month period.

Age range (years)	20–44	45–64	65–74	75–79	Total population
Population *n* (% women)	6 545 (48)	6 701 (48)	2 101 (50)	805 (52)	16 152 (48)
All consultations *n* (% women)	11 956 (60)	15 381 (58)	6 876 (52)	3 862 (56)	38 075 (57)
Chest pain consultations: *n* (% women)	132 (46)	290 (51)	96 (55)	59 (49)	577 (50)
Percentage of all female consultations that were for chest pain	0.85	1.7	1.5	1.3	1.3
Percentage of all male consultations that were for chest pain	1.5	2.2	1.3	1.8	1.8
Percentage of all consultations that were for chest pain	1.1	1.9	1.4	1.5	1.5

respect to the patient's physical condition, and with the aim that the patient should exercise for approximately seven to ten minutes. In non-complicated tests, the patient was encouraged to continue the exercise for as long as possible. Reasons for discontinuing the exercise were severe chest pain, blood pressure drop (>15 mmHg), systolic blood pressure exceeding 280 mmHg, severe ventricular arrhythmia, and ST-elevation or ST-segment (J-point + 60 ms) depression exceeding 0.3 mV. During exercise and five minutes thereafter, the patient was monitored with a 12-lead ECG. Respiratory rate and systolic blood pressure (obtained using the Doppler technique) were measured every third minute.

Statistical methods

Age and sex distribution were analysed by χ^2 and unpaired *t*-test. StatView software for Windows was used.

Results

During the study period, a total of 38 075 GP consultations were registered, of which 577 (1.5%) were caused by a new episode of chest pain (Table 1). The highest frequency of chest pain consultations was observed in the age category 45 to 64 years. In 23 of the 577 chest pain consultations, the patient was included for the second or third time. Hence 554 patients consulted for chest pain. Using the listed population of 16 152 patients aged 20 to 79 years, this represents a rate of 19.6 chest pain patients per 1000 at risk during a one-year period.

Women accounted for 57% of all GP consultations. However, the proportion of chest pain consultations among female consultations was lower than in male consultations (1.3% versus 1.8%, 95% confidence interval [CI] = 0.3 to 0.8%, Table 1).

After clinical assessment, the GP ruled out IHD in 281 (51%) of the 554 included patients (Figure 1). Among these 281 patients, the diagnoses were musculoskeletal in 162 patients (58%), psychogenic in 40 (14 %), oesophageal in 28 (10%), infections in 23 (8%), pulmonary in 13 (5%), not specified in 13 (5%), and other heart diseases in two (1%). The mean age in this group was significantly lower (49 years versus 60 years, 95% CI = 9 to 14). It contained significantly more women (57% versus 44%, 95% CI = 4 to 21), compared with the patients with suspected IHD. Of the 281 patients without suspected IHD, 279 were followed up through the questionnaire. The response rate was 89%. Five patients reported receiving an IHD diagnosis (one myocardial infarction, four angina) (Figure 2). Among those who did not return the questionnaire, none had been given an IHD diagnosis according to the review of their medical charts. Two had been reported dead, from causes other than IHD.

In 208 patients (38%), stable IHD was suspected and 198 of these (mean age = 60 years) were referred for exercise testing (Figure 1). In total, 181 exercise tests were performed and the results were consistent with IHD in 12 (7%) of the cases, and with possible IHD in 42 (23%), of which 30 were equivocal, 10 were non-assessable and two could not be classified other than as possible IHD (Figure 2). Five were given an IHD diagnosis while waiting for an exercise test, four were given an IHD diagnosis in hospital (two acute myocardial infarctions and two others), and one was reported to have died (not in hospital) from IHD (Figure 1).

Sixty-five (12%) patients were referred as emergency cases to hospital. The outcome of hospital care was an IHD diagnosis in 19 cases, of which seven were myocardial infarctions (Figure 2).

Of all the 554 patients included, 22 had dropped out or were not assessable (Figure 1). In total, 41 patients were given an IHD diagnosis, 50 were classified as possible IHD, and in 441 cases IHD was excluded (Table 2). Using the listed population of 16 152 patients aged 20 to 79 years, this represents a rate of diagnosis of 1.5 IHD and 1.8 possible IHD per 1000 at risk during a one-year period. According to the hospital diagnosis registry, 80 patients diagnosed with acute myocardial infarction and 63 with angina pectoris were admitted without referral from their GP. Their mean age was 68 years (range = 24 to 79 years) and 67% were men. When data from primary and hospital care were combined, the yearly incidence was 6.5 diagnosed per 1000 at risk in the population.

Discussion

In this study, a new episode of chest pain was the presenting complaint in 554 patients who made 577 visits, constituting 1.5% of all visits in the age range 20 to 79 years. IHD was diagnosed in 8% of the patients with chest pain; in 83% an IHD diagnosis was excluded, and in 9% the diagnosis was judged as being uncertain (Figure 1, Table 2). The majority of patients with IHD, especially those with acute myocardial infarction, consulted directly at the hospital and bypassed the health centre. When data from primary and hospital care were combined, the yearly incidence of IHD was 6.5 diagnosed per 1000 inhabitants aged 20 to 79 years old.

There are some limitations to the study. The inclusion criteria were based on a wide definition of new chest pain, which might have been interpreted differently by the GPs, but it was not possible to validate that all eligible patients with chest pain were included. However, the proportion of patients who received an IHD diagnosis was similar when comparing the results from the three healthcare centres. There was also an almost complete follow-up of the included chest pain patients. This is important since, during 1999 in Sweden, more than one in five patients aged 30 to 89 years old died the day they had an acute myocardial infarction. Most of them never reached hospital.[8] Retrospective data obtained from a diagnosis registry must be interpreted with caution. It is possible that some patients registered as having angina pectoris would not fulfil the strict criteria set up for the exercise test in this study. Nevertheless, the combined data from primary and hospital care should give a fair estimate of the incidence of IHD in the population.

Compared with an American study where the inclusion of patients was carried out in a similar way, the frequency of chest pain as the presenting complaint was about the same.[4] In a study in Iceland, the frequency was much lower, probably because the study was carried out retrospectively.[5] In a Canadian study from 1977, a much higher incidence of chest pain was found (7%).[9] In that study, however, chest pain could be any one out of four presenting complaints.

In this study, the occurrence of IHD was lower than in other primary care studies, which might be owing to the

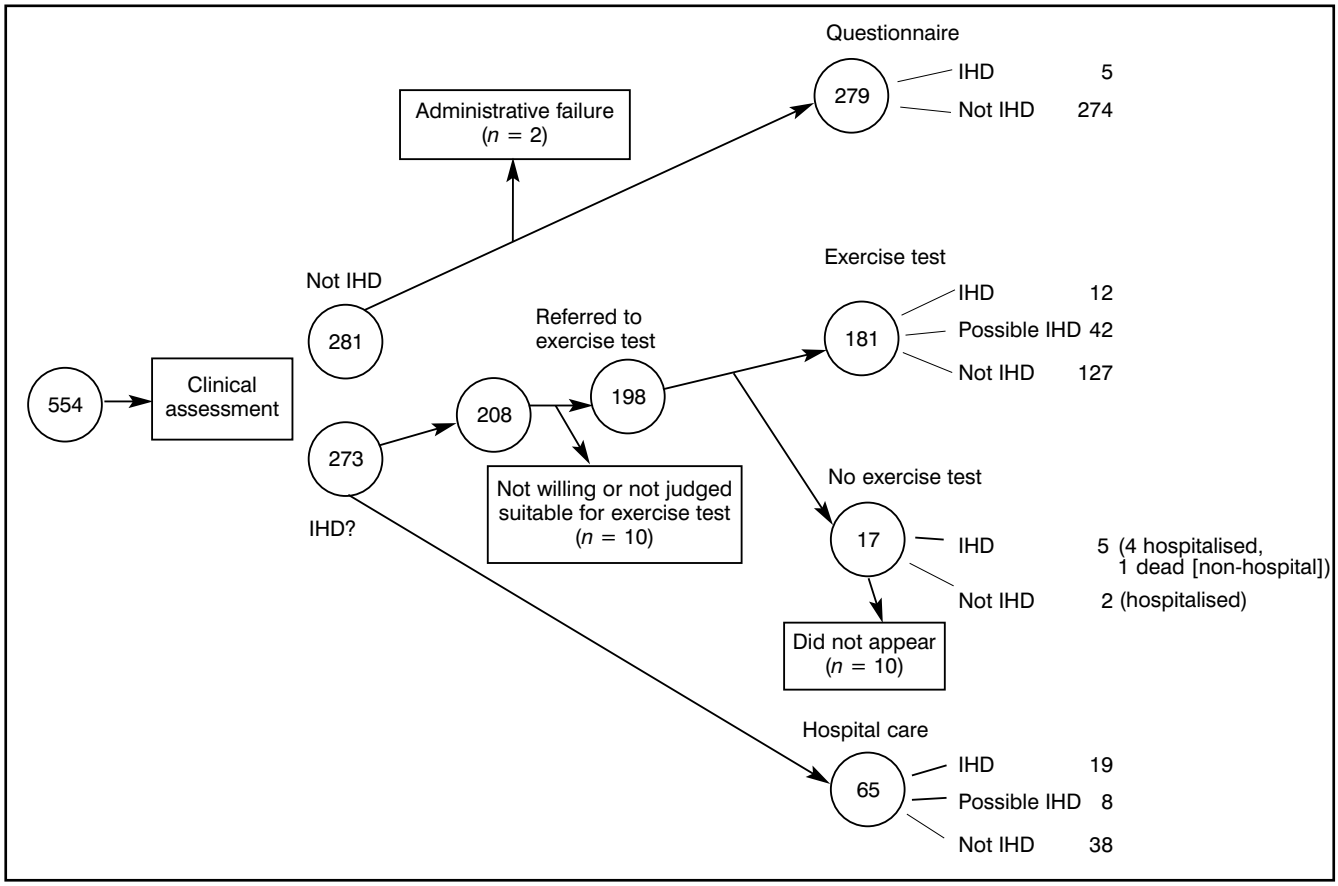

Figure 1. Flow chart for 554 consecutive patients consulting for a new episode of chest pain, during a 21-month period. Outcome classified as IHD, possible IHD or not IHD. Patients who dropped out and those who were not able to be assessed are shown in rectangles.

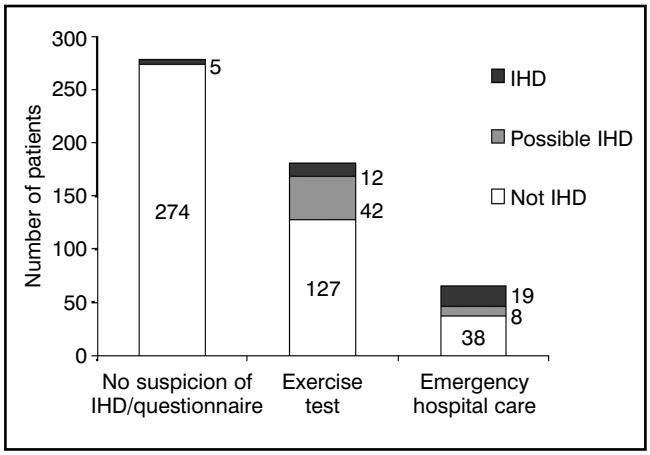

Figure 2. Bar graph showing outcome for 525 consecutive patients consulting for a new episode of chest pain in relation to the GP's assessment and outcome of investigation. Outcome classified as IHD, possible IHD or not IHD. The seven patients who experienced manifestations of IHD while on the waiting list for exercise test are not shown.

more thorough investigation and follow-up.

According to the questionnaire survey, five patients received an IHD diagnosis after their consultation at the healthcare centres. It is debatable whether or not these IHDs were present at that time, but five possible misjudgements out of a total of 279 consultations (<2%) can be regarded as almost unavoidable.

In the literature, a pathological ST depression has often been used as the sole criterion for a positive test response, and the probability of IHD for a certain ST depression with different pre-test likelihood levels has been calculated.[10] In the present study, the exercise test results were classified as positive only if pathological ST changes and chest pain appeared in relation to exercise, and as negative only if neither was present. This was done to enhance the predictive accuracy of positive and negative tests, and it is planned to further analyse the patient group with intermediate results more extensively. In spite of these strict criteria, IHD could be diagnosed or excluded in 77% of the patients who underwent exercise testing.

Meta-analysis has shown a sensitivity of around 70% and a specificity of around 80% for the exercise test, in comparison with coronary angiography.[11] This applies to a 'yes' or 'no' interpretation of the exercise test, and, if instead the exercise result is classified as consistent with high, low or intermediate probability of IHD, and if the 'intermediate group' is either investigated with complementary methods or added to the disease group, the specificity of the exercise test increases substantially.[12] According to Bayes' theorem, a low prevalence of disease in the studied population would enhance the predictive value of a negative test.[13] Accordingly, it is not surprising that, in the present study, only a small proportion of the patients investigated had a

Table 2. Age and sex characteristics in relation to outcome for 532 consecutive patients consulting the GP for a new episode of chest pain. Outcome classified as IHD, possible IHD or not IHD.

Outcome	*n* (%)	Age			Men (%)
		Mean	Minimum	Maximum	
IHD	41 (8)	67.2	41	79	70.8
Possible IHD	50 (9)	59.0	33	79	60.0
Not IHD	441 (83)	52.4	20	79	46.7
Total	532[a] (100)	54.2	20	79	49.5

[a]Represents 554, minus 22 not assessed (see Figure 1).

positive test result and that an equivocal result was much more common. The pre-test probability of IHD is strongly age dependent.[10] This was included in the GPs' decision to refer for exercise testing or to rule out IHD on clinical grounds, since the mean age of the referred patients was significantly higher. The diagnostic value of the test in women is the same as that in men, if age groups with a similar prevalence of the disease are studied; that is, older women are compared with younger men.[12] It was noteworthy that several patients experienced manifestations of IHD while on the waiting list for the exercise test. Waiting time was a maximum of six weeks. When there is a significant clinical suspicion of IHD, therefore, the exercise test should be available without a long delay. The results of the exercise tests led to a diagnostic conclusion in 77% of the cases, most frequently a normal test result. Even though a number of patients still needed additional diagnostic procedures despite the strict criteria used for a conclusive test, this shows that the exercise test is a useful diagnostic tool in primary care patients with chest pain.

In conclusion, the incidence of a new episode of chest pain bringing the patient to the GP was low. In half of the cases with new chest pain, an IHD diagnosis could be excluded clinically with high accuracy. However, 8% of patients with a new episode of chest pain received an IHD diagnosis, and in 9% of these patients further investigation or clinical assessment is needed.

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