

Original Articles

Comparison of methods to assess coronary heart disease prevalence in South Asians

D. J. PATEL, M. WINTERBOTHAM, S. E. SUTHERLAND, R. G. BRITT, J. E. KEIL, G. C. SUTTON

ABSTRACT

Background. Migrants from the Indian subcontinent (South Asian migrants) in the United Kingdom have high mortality from coronary heart disease (CHD) in comparison to the indigenous population. Few studies have assessed the prevalence of CHD in South Asians, and the applicability of conventional survey methods in this population is not known. In this pilot random population survey of South Asian men and women living in West London, the prevalence of CHD as judged by the Rose questionnaire, past cardiac history, cardiologist and resting electrocardiogram were compared.

Methods. Subjects aged 30–64 years from randomly selected households were invited for a cardiological assessment. A lay person administered the Rose questionnaire and recorded the past cardiac history. A cardiologist also made an independent assessment and a 12-lead electrocardiogram was recorded and analysed according to the Minnesota code.

Results. Three hundred and seventy-six individuals (192 men and 184 women) were assessed. The prevalence of angina in men and women, respectively, was 3.1% and 4.9% by the Rose questionnaire; 2.6% and 2.2% by past cardiac history; and 4.2% and 0.5% according to the cardiologist. The prevalence of myocardial infarction in men and women, respectively, was 5.2% and 2.2% by the Rose questionnaire, 3.6% and zero by past cardiac history and 3.6% and 0.5% by the cardiologist. Q/QS codes were present in 1.6% men and 0.5% women and ischaemic codes in 13% men and 14% women.

Ischaemic changes were not associated with any cardiac history in 72% of men and 92% of women. For a diagnosis of CHD in men, there was poor agreement between the Rose questionnaire and either the past cardiac history or the cardiologist's assessment, but moderate agreement between the past cardiac history and the cardiologist. Agreement was poor between all three methods for a positive diagnosis of CHD in women.

Conclusion. Current accepted epidemiological methods for assessing CHD prevalence may be inaccurate in South Asians, especially women. Electrocardiogram abnormalities suggestive of ischaemia are common in South Asians and are usually not associated with evidence of CHD. Thus, their value as indicators of CHD is questionable.

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INTRODUCTION

High mortality due to coronary heart disease (CHD) is widely reported in migrants from the Indian subcontinent.^{1–4} Some of these reports have been based on post-mortem findings of increased or accelerated coronary atherosclerosis,¹ while others have been based on data available from death certificates.^{3,4} In the United Kingdom, the standardized mortality ratio (SMR) for South Asian men and women has risen between 1977 and 1989, even though there has been little change in the overall SMR.⁵ Despite this increased mortality, conventional risk factors are lower in South Asians. A high prevalence of glucose intolerance, insulin resistance and physical inactivity^{6,7} coupled with high lipoprotein (a) levels have been implicated.⁸

Although many studies have confirmed an increased mortality, the actual prevalence of CHD in South Asians has not been evaluated. Mortality-based prevalence rates underestimate the burden of the disease in the community and since most of the data are based on death certificates, bias or inaccuracies in reporting may significantly affect the overall result. Hospital admission rates for acute myocardial infarction have been high in South Asians,^{9,10} but these cannot accurately reflect the prevalence of the disease.

In the only random population survey of CHD prevalence in South Asian males, the prevalence of angina, based on a Rose questionnaire (RQ), was not increased but Q waves and ischaemic changes on a 12-lead electrocardiogram (ECG) were more common as compared to Caucasians.⁷ These epidemiological techniques, although widely applied, have not been validated for use in ethnic subgroups. However, an attempt to determine the prevalence of CHD in a district of Kerala (India) points out the problems with such an assessment.¹¹ The RQ was originally validated in male Caucasians hospitalized with CHD,¹² and its applicability to non-Caucasians has not been investigated. Although ECG analysis using Minnesota coding standardizes reporting, grouping of codes suggestive of CHD may vary across different ethnic populations.¹³

In this pilot random population survey, we report the difficul-

The Hillingdon Hospital, Pield Heath Road, Uxbridge, Middlesex UB8 3NN, United Kingdom

D. J. PATEL, M. WINTERBOTHAM, R. G. BRITT, G. C. SUTTON
Department of Cardiology

Medical University of South Carolina, Charleston, South Carolina, USA
S. E. SUTHERLAND, J. E. KEIL Department of Biometry and Epidemiology

Correspondence to G. C. SUTTON

ties associated with the use of such conventional epidemiological methods for assessing CHD prevalence when they are applied to South Asian men and women.

SUBJECTS AND METHODS

The study was conducted in a ward of Southall (West London) in which South Asian migrants constitute at least 80% of the residents. Women were deliberately included in this survey because they have a high SMR³ for CHD. Houses were selected at random and all residents, men and women aged 30–64 years were invited to the Hillingdon Hospital for assessment. Those who declined or failed to attend the hospital were seen and assessed at a local general practice surgery. In total, 376 individuals (192 men and 184 women) were assessed, representing a response rate of 78% of those originally selected.

The RQ for angina was administered by a lay person who also recorded the past cardiac history reported by the subject. When an individual was unable to comprehend English satisfactorily, a lay interpreter fluent in the subject's language administered the questionnaire. The cohort was then assessed independently by a cardiologist who was able to communicate in the subject's native language. An interpreter was used in case of difficulties. A 12-lead resting ECG was also recorded and analysed according to the Minnesota code.

Diagnosis of angina and myocardial infarction

Rose questionnaire. The RQ was interpreted as positive for angina if the subject gave a past or current history of chest pain, tightness or discomfort provoked by exertion causing the subject to slow down or stop (except with the use of glyceryl trinitrate; GTN). The pain should have been relieved within 10 minutes of rest and should have been felt either in the middle, upper or lower substernal site, or in the left side of the chest and left arm. Myocardial infarction was diagnosed if the subject described an episode of severe chest pain lasting for at least 30 minutes.

Past cardiac history (PCH). The subject's recollection of a previously established diagnosis of angina or myocardial infarction (made either by the patient's general practitioner or at a hospital review) was documented.

Diagnosis by the cardiologist. The cardiologist made his own assessment for diagnosis of angina (either past or current) and myocardial infarction. Angina was diagnosed from a history of chest, arm, jaw or shoulder discomfort caused by exertion or stress and not by respiration, cough or physical pressure, and quickly relieved by rest or the use of GTN. Diagnosis of myocardial infarction was based on the site and severity of pain as well as any associated symptoms. Whenever the episode of pain led to hospitalization, the reported diagnosis and duration of admission were taken into account.

Electrocardiographic diagnosis of CHD

The 12-lead ECG was analysed blindly using the Minnesota

code.¹⁴ The Q/QS code group (1.1–1.2) and 'Ischaemia' code group (1.1–1.3; 4.1–4.3; 5.1–5.3 and 7.1) were based on the Whitehall study grouping which has shown them to be of useful prognostic value.¹⁵

Statistical analysis

The Kappa statistic was calculated to test agreement between each of these methods of assessment for angina, myocardial infarction and for presence of CHD (by either method of diagnosis). ECG based categorization of CHD was compared for symptomatic and asymptomatic subjects using Chi-square analysis.

RESULTS

Prevalence of CHD

The overall prevalence rate of angina for men was not significantly different between the three methods of assessment (Table I). In contrast, the prevalence rate of angina in women judged by the RQ and the cardiologist was markedly different (4.3% v. 0.5%). The detected prevalence of myocardial infarction using the three methods was similar in men. However, the prevalence rate of myocardial infarction in women, as judged by the cardiologist, was low in comparison to that detected by the RQ. The prevalence rates of CHD were highest in both men and women when assessed using the RQ, and similar when assessed by PCH or by the cardiologist.

Agreement between methods

Despite the similarity in prevalence rates, there was poor agreement for a diagnosis of angina or myocardial infarction in men between the RQ and the PCH or cardiologist's assessment (Table II). The highest degree of agreement in men was between the past history and cardiologist's assessment. Agreement between all three methods was extremely poor in women.

ECG prevalence of coronary heart disease

Major Q waves were slightly more frequent in men than in women (Table III). The ischaemic codes, however, were as frequent. Two of three men with Q/QS codes reported either angina or myocardial infarction in one of the three methods of assessments (Table IV). However, only 7 of 25 (28%) men with ischaemic codes had a positive diagnosis of angina or myocardial infarction. In women, only 2 out of 25 (8%) with ischaemic codes had a positive diagnosis of angina or myocardial infarction and in one with a Q wave there was no supporting evidence for CHD from any of the three assessment methods. The frequency of Q/QS codes was too low for statistical comparison as was the frequency of ischaemic codes in the whole population.

DISCUSSION

Studies worldwide have reported increased mortality from CHD in South Asian migrants,¹⁻⁴ with similar findings in England and Wales.^{5,16} There is, however, little information on the prevalence

TABLE I. Prevalence of coronary heart disease

Method	Men			Women		
	Angina	Myocardial infarction	Coronary heart disease	Angina	Myocardial infarction	Coronary heart disease
Rose questionnaire	6 (3.1)	10 (5.2)	13 (6.8)	8 (4.3)	4 (2.2)	11 (6.0)
Past history	5 (2.6)	7 (3.6)	9 (4.7)	4 (2.2)	0	4 (2.2)
Cardiologist	8 (4.2)	7 (3.6)	10 (5.2)	1 (0.5)	1 (0.5)	2 (1.1)
Any three methods	11 (5.7)	14 (7.3)	17 (8.9)	10 (5.4)	5 (2.7)	13 (7.1)
All three methods	2 (1.0)	4 (2.1)	6 (3.1)	1 (0.5)	0	1 (0.5)

Figures in parentheses are percentages

TABLE II. Degree of agreement between different methods for a positive diagnosis of coronary heart disease

	Angina			Myocardial infarction			Coronary heart disease		
	Both methods	Either method	Agreement	Both methods	Either method	Agreement	Both methods	Either method	Agreement
<i>Men</i>									
RQ v. PCH	3	8	38%	5	12	42%	5	16	31%
RQ v. C	2	12	17%	4	13	32%	5	17	29%
PCH v. C	4	9	44%	6	8	75%	7	9	78%
<i>Women</i>									
RQ v. PCH	2	10	20%	0	4	—	3	12	25%
RQ v. C	1	8	13%	0	5	—	1	12	8%
PCH v. C	1	4	25%	0	1	—	1	5	20%

RQ Rose questionnaire PCH Past cardiac history C Cardiologist's diagnosis

TABLE III. Electrocardiographic prevalence of coronary heart disease

	Men	Women
Q/QS codes	3 (1.6)	1 (0.5)
Whitehall ischaemia codes	25 (13)	25 (13.6)

Figures in parentheses are percentages

TABLE IV. Comparison of electrocardiographic prevalence with the other methods

Any history of coronary heart disease (RQ, PCH, or C)	Q/QS codes	Whitehall ischaemia codes
South Asian men	2/3	7/25
South Asian women	0/1	2/25

RQ Rose questionnaire PCH Past cardiac history C Cardiologist's diagnosis

of CHD. In the only published population survey, a positive history of CHD, based on the RQ, was as frequent in South Asian males as in Caucasians, although Q waves or ischaemic changes on resting ECG were more frequent in South Asians.⁷

The RQ for angina was developed to deal with the subjective nature of a diagnosis of angina or myocardial infarction based on interpretation of history alone. It was originally validated in 36 Caucasian men admitted to hospital with CHD.¹² Although subsequently it has been widely applied in prevalence studies, the applicability in non-Caucasians or even in women is questionable. The Minnesota coding system, originally developed to standardize interpretation of ECGs,¹⁴ has been widely applied in epidemiological surveys, and certain groups of codes have been shown to predict the presence of CHD.¹⁵ Although the prevalence of Q/QS codes correlate well with CHD mortality due to myocardial infarction, it is possible that the prevalence is significantly underestimated since the infarction is often not transmural. Thus the Q/QS codes are likely to remain insensitive indicators of the prevalence of myocardial infarction or CHD. ST-segment and T-wave changes in the ECG are more common and have been shown to be useful in determining prognosis in Caucasian males.¹⁵ Significant variations in prevalence rates of such abnormalities, however, exist in different ethnic groups, and are often unrelated to underlying CHD. Thus their validity as indicators of CHD in different populations may vary.

South Asian men

The results of this study show that conventional epidemiological methods of estimating prevalence of CHD have important limita-

tions when applied to South Asians. The RQ in South Asian men detects a higher prevalence of CHD to that obtained from the reported PCH, or from assessment by a cardiologist. The degree of agreement between these techniques is at best moderate. Prevalence rates and agreement were more closely related between the cardiologist's assessment and the PCH. The overall level of disagreement between these methods suggests that CHD-prevalence estimates based solely on any one of the techniques need to be interpreted with caution. Perhaps a combination of techniques would be better, with prospective validation of the value of each of these techniques related either to the incidence of overt CHD or in relation to mortality.

The prevalence rates of Q/QS codes in South Asian men were low when compared to those obtained from surveys in Caucasians.^{15,17} McKeigue *et al.* reported higher rates of Q/QS codes in South Asians.⁷ However, their study group was older. ECG abnormalities suggestive of ischaemia were common in the present study and in agreement with the previous report. Both studies were carried out mainly in Punjabi subjects known to have a high prevalence of hypertension¹⁸ which could have accounted for the T-wave or ST-segment changes indicating left ventricular hypertrophy rather than underlying CHD.

In the report by McKeigue *et al.*, the prevalence of CHD, combining PCH and a positive RQ, was 8.5% in South Asians and 8.2% in Europeans. This is in agreement with the present study wherein the prevalence rate is 8.3% when using this combination, or 8.9% when considering a positive response from any of three methods (Tables I and II).

South Asian women

Few epidemiological studies in women have been performed using these methods in the UK. The Scottish Heart Health Study identified a greater prevalence of mild angina in women than in men, although the rates of severe angina, possible infarction, and the presence of Q/QS codes were lower compared to men.¹⁷ Without formal validation of these methods in women, it is impossible to resolve this apparent discrepancy between the prevalence of overt CHD and mortality. In the present study, agreement between any of the three methods of assessment for detection of CHD in South Asian women, was poor. Previous reports have shown reduced reliability in reporting of chest pain by women in epidemiological surveys.¹⁹ Bias in recording of symptoms by the cardiologist cannot be ruled out, but it is more likely that chest pain in Asian women is due to non-cardiac causes. The method of symptom recording may vary and in a suggestible population, positive responses to the RQ may be elicited more often. Similar difficulties in symptom reporting

have been noted in Zulu men and women²⁰ and in Ugandans (A. G. Shaper, unpublished communication).

Q/QS rates in South Asian women were too low to make meaningful comparisons; however 'ischaemic' changes were as frequent as in men. Almost all of these ECG changes (the majority consisting of deep anterior T-wave inversion) in South Asian women were in asymptomatic individuals. Hypertension is common among Punjabi women,¹⁸ and whether such changes reflect underlying left ventricular hypertrophy, or asymptomatic CHD, needs further assessment before such an ischaemic code grouping can be applied in South Asian women.

Limitations of the study

The findings may be influenced by the small sample in a population where the prevalence rate for CHD is low, rendering the study prone to beta error. We did not use a control Caucasian population since these techniques have been validated in previous studies of Caucasians. A 'gold standard' such as coronary angiography cannot be justified for such a survey and in its absence it is difficult to state the superiority of one method over another. The marked disagreement between methods would suggest that perhaps none are particularly good on their own and that a combination of two, or all three methods may be more useful in measuring the prevalence of CHD in ethnic populations. To avoid language and communication difficulties which could have influenced our findings, great care was taken to minimize this possibility by the use of an interpreter during all assessments, and even for the cardiologist's assessment in cases of difficulty.

This random population survey shows that the use of RQ for detecting prevalence of CHD in South Asian men and women may not be appropriate; additional testing of the RQ with and without modification should be considered before it is applied extensively in ethnic population surveys. Q/QS Minnesota codes in isolation are specific in men but relatively insensitive in detecting underlying CHD. Other code groupings suggestive of ischaemic changes are relatively common and are inclined to yield falsely high prevalence rates.

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—Editor