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THE PREVALENCE OF ISCHAEMIC HEART DISEASE IN THREE RURAL SOUTH AFRICAN COMMUNITIES

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Abstract—In a population reportedly excessively prone to ischaemic heart disease (IHD) i.e. South African (SA) whites, a 3-community study of 7188 subjects aged 15–64 showed a high prevalence of chest pain by questionnaire (9.5% of males, 7.7% of females) or by ECG findings suggestive of IHD (12.8% males, 6.7% females). In the oldest decile (55–64 years) the prevalence of chest pain and/or ECG findings was 33.4% of males and 26.1% of females. For all ages, 18.4% of males and 13.1% of females were apparently affected. Though females were as likely as males to have a history of chest pain they had fewer ECG findings suggestive of IHD and the history was less likely to have been confirmed by a doctor. The significance of individual findings, assessed by the strength of their associations with symptomatic history and age, appeared to differ between the sexes; though very common, medium S-T depression was not classed as suggestive of IHD in females, while left ventricular hypertrophy was unimpressive in males. Large and medium Q waves, large S-T depression, large and medium T wave inversion were positive in both sexes, but left and right bundle branch block only in males. There was little overlap between a history of chest pain and suggestive ECG findings; however, a previous diagnosis of IHD by the family doctor increased the overlap by up to 6 times.

INTRODUCTION

The mortality from ischaemic heart disease (IHD) has been documented to be very high in rural South African (RSA) whites [1]. Suggestions, thus far unconfirmed, have been made that the Afrikaans-speaking section of the white community, which is descended mainly from Dutch, French and German immigrants, is especially at risk, at least partly because of the extraordinarily high prevalence of familial hypercholesterolaemia [2]. Data from the 1979 Coronary Risk Factor Study (CORIS) indicate that Afrikaners in the South West Cape have, additionally, a high prevalence of the primary reversible risk factors for IHD [3]. However, no information on the prevalence of IHD in the community is available. As part of the baseline examination of the CORIS study, respondents were subjected to a standardised chest pain questionnaire and a resting electrocardiogram, and an analysis of these data forms the substance of the present report.

STUDY POPULATION

During the first half of 1979 a community coronary risk factor survey (CORIS) was carried out in the magisterial districts of Swellendam (white population 5860 in 1980 census), Riversdale (5540) and Robertson (5320). All 3 towns are in the south-western Cape and are similar in cultural and socioeconomic structure. Mortality rates from IHD

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in economically-active white males averaged 214/100 000 (females 72/100 000) in the 3 towns during 1970. The national figure for white SA males was 240/100 000 in that year (Pretorius, personal communication). In each town, more than 90% of the white inhabitants were Afrikaans-speaking, and farming, small businesses and services were the main occupations. By means of an intensive mass media and postal campaign, 3357 white male and 3831 female subjects between the ages of 15 and 64 were recruited. They represented 82% of the known target population between these age limits, as ascertained from ratepayers' and electricity consumers' records and a postal census, and 68% of the 1980 census population aged 15–64 years. The age and sex distribution is shown in Table 1. The CORIS sample has an almost rectangular age distribution, which corresponds to the distribution found in the 3 towns during the 1980 general census, but differs from national figures for RSA whites. Ascertainment amongst males (63%) was uniformly lower than amongst females (73%). Comparison of educational qualifications and occupations between the CORIS sample and those obtained in the study areas during the 1980 census show close agreement, therefore differential selection on these grounds is unlikely.

METHODS

All subjects completed the standardised and validated questionnaire of the London School of Hygiene [4] by interview. Angina pectoris (AP) was scored positive when the subject experienced chest pain or discomfort upon walking uphill or on the level, which was relieved by rest within 10 min and which was situated over the sternum, or over the left chest with radiation down the left arm. Subjects who were scored positive were additionally asked if the pain was relieved within 5 min by glyceryl trinitrate, whether they had seen a doctor for the pain and what his diagnosis was, but the responses to these questions were not used to alter the scoring. Myocardial infarction (MI) was scored positive if the subject had ever experienced severe chest pain with no obvious non-cardiac origin lasting more than 30 min. Any concomitant symptoms (e.g. sweating, nausea, dyspnoea) were recorded and also whether a doctor had been consulted, and if so, what his diagnosis was, but this was again not used to alter the scoring.

Resting 12-lead electrocardiograms were taken in the recumbent position, using a Hewlett-Packard Model No 1516 ECG Tape Terminal. Hard copies of the ECG's were obtained by playback through a Hewlett-Packard 5600 ECG Management System. The hard copies were measured and classified according to the Minnesota criteria [5] by two experienced cardiology technologists. All disagreements as well as complicated ECG's were submitted to the cardiologist (H.F.H.) for final interpretation. Regular controls were done by the cardiologist to ensure the accuracy of coding. Finally, the ECG's were again independently coded by two observers (a doctor and a nursing sister) who had been specially trained and standardised in the coding system. The observers were blind to the previous coding, but were allowed to subsequently modify their coding if re-examination indicated the need to do so. Any disagreements which could not be resolved were referred to a physician (J.E.R.) for final arbitration.

The relevance of individual ECG findings in IHD, in males and females separately, was determined by means of the strength of its association with a history of chest pain (AP and/or MI) and with age. The iterative procedure for fitting models to multiway tables as

TABLE 1. AGE AND SEX DISTRIBUTION OF WHITES IN THE RSA, IN THE STUDY AREAS, AND THE CORIS POPULATION SAMPLE

	% Of total			Number of respondents	
Age	RSA*	Study areas	CORIS sample	Males	Females
15–24	27.4	22.8	18.0	635	658
25–34	25.1	16.2	18.7	634	713
35–44	20.7	20.2	20.2	641	813
45–54	14.9	20.0	21.6	705	845
55–64	11.9	20.8	21.5	742	802
Total	100.0	100.0	100.0	3357	3831

*From the 5% subsample of the 1980 general census.

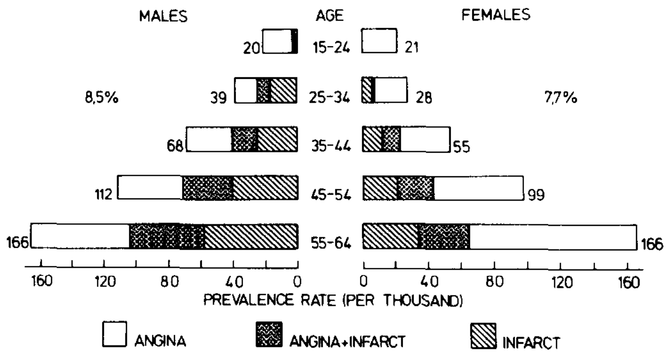

FIG. 1. The age- and sex-specific prevalence (per thousand) of chest pain (angina pectoris and/or myocardial infarction), and the crude rate (%) for males and females aged 15-64 years.

described by Goghale and Kolbeck [6] and by Brown [7] was employed to determine the partial associations between ECG findings, chest pain and age. A significant partial association as defined by Brown [7] ($p \leqslant 0.01$) with chest pain was regarded as being the strongest evidence, but in the presence of a very strong partial association with age ($p \leqslant 0.01$), $p \leqslant 0.05$ for chest pain was also regarded as being significant. Cognisance was also taken of the male:female ratio of ECG findings.

Total IHD prevalence was estimated by summing those subjects with a history of chest pain and/or an ECG finding suggestive of IHD. Age-specific, crude and age-adjusted (to RSA whites) data is presented. The influences of a doctor's confirmation of chest pain as IHD and of relief by glyceryl trinitrate on the likelihood of a suggestive ECG finding being recorded, were also determined.

RESULTS

History of chest pain

The prevalence of a history of chest pain (AP and/or MI) increased in a curvilinear fashion with age in both males and females until almost 17% were positive at age 55–64 (Fig. 1). Males had a much higher prevalence of MI history at all ages, while the female prevalence of AP exceeded that of the males after the age of 45 years. Considering all age groups together, the crude prevalence (age-adjusted figures in brackets) of MI in males and females was 51 (39) and 30 (21)/1000 respectively and that of AP was 55 (43) and 62 (48)/1000. The crude prevalence of a history of chest pain (AP and/or MI) was similar in males and females, i.e. 85 (66) vs 77 (59)/1000 respectively.

A diagnosis compatible with IHD was made by a doctor in 27% of subjects reporting AP only, and 58% of those with MI history. The diagnosis was more often confirmed in males than in females (Table 2) in the case of angina (36 vs 22%) as well as that of MI (66 vs 42%). Glyceryl trinitrate was used less often by females with AP (32%) than males (42%), but, if used, over 82% of both groups obtained relief within 5 min. MI subjects frequently reported associated symptoms during the attack, e.g. sweating (77%), nausea (27%), shortness of breath (16%), faintness or dizziness (10%) and tiredness (4%).

AP and MI frequently co-existed. Thus, of the total 420 subjects with AP, 125 (30%) also had a history of MI. Conversely, 44% of the 284 with MI history also had AP. Of this group of 125 with both AP and MI history the diagnosis was confirmed by a doctor in 66% overall (77% of males and 50% of females).

TABLE 2. NUMBER OF SUBJECTS WITH A HISTORY OF CHEST PAIN AND % CONFIRMATION OF IHD BY DOCTOR

	Males (N = 3357)				Females (N = 3831)			
	AP only	MI only	Both AP and MI	Total	AP only	MI only	Both AP and MI	Total
N	113	100	71	284	182	59	54	295
% Confirmed as IHD by doctor	36%	66%	77%	60%	22%	42%	50%	36%

TABLE 3. PREVALENCE OF INDIVIDUAL ELECTROCARDIOGRAPHIC FINDINGS AND THEIR ASSOCIATION WITH CHEST PAIN AND AGE

Electrocardiographic findings (and Minnesota code)		Males ($N = 3357$)				Females ($N = 3831$)			
				Significance (p) of partial association with:				Significance (p) of partial association with:	
		Prevalence numbers (and crude rates/1000)	Symptomatic history (%)	Symptomatic history	Age	Prevalence numbers (and crude rates/1000)	Symptomatic history (%)	Symptomatic history	Age
Large Q waves	(1.1)	43 (12.8)	63	0.00	0.00	23 (6.0)	40	0.00	0.00
Medium Q waves	(1.2)	102 (30.4)	22	0.00	0.01	63 (16.4)	19	0.01	0.00
Small Q waves	(1.3)	73 (21.7)	14	0.13	0.12	57 (14.8)	11	0.42	0.18
Left axis Deviation	(2.1)	134 (39.9)	16	0.10	0.00	84 (21.9)	17	0.11	0.00
Right axis Deviation	(2.2)	13 (3.9)	0	0.38	0.62	8 (2.1)	—	—	—
Left ventricular hypertrophy	(3.1)	281 (83.7)	7	0.19	0.00 (NEG)	54 (14.1)	22	0.01	0.04
Large S-T depression	(4.1)	40 (11.9)	38	0.00	0.00	68 (17.8)	21	0.01	0.00
Medium S-T depression	(4.2)	181 (53.9)	16	0.02	0.00	578 (151.3)	9	0.97	0.00
Small S-T depression	(4.3)	3 (0.9)	—	—	—	14 (3.7)	29	0.02	0.97
Large T inversion	(5.1)	5 (1.5)	—	—	—	3 (0.8)	—	—	—
Medium T inversion	(5.2)	108 (32.2)	38	0.00	0.00	99 (25.8)	32	0.00	0.00
Small T inversion	(5.3)	132 (39.3)	16	0.06	0.00	219 (57.2)	6	0.15	0.00
3° A-V block	(6.1)	0 (0.0)	—	—	—	0 (0.0)	—	—	—
2° A-V block	(6.2)	0 (0.0)	—	—	—	0 (0.0)	—	—	—
1° A-V block	(6.3)	38 (11.3)	19	0.17	0.00	26 (6.8)	15	0.54	0.00
Wolff–Parkinson–White	(6.4)	0 (0.0)	—	—	—	1 (0.3)	—	—	—
Accelerated A-V conduction	(6.5)	8 (2.7)	—	—	—	35 (9.1)	6	0.71	0.00
Left bundle branch block	(7.1)	20 (6.0)	30	0.00	0.07	22 (5.2)	18	0.42	0.00
Right bundle branch block	(7.2)	39 (11.6)	29	0.00	0.00	16 (4.2)	13	0.79	0.00
Incomplete RBBB	(7.3)	38 (11.3)	3	0.11	0.43	12 (3.1)	0	0.34	0.51
Intraventricular block	(7.4)	14 (4.2)	43	0.00	0.39	0 (0.0)	—	—	—
Extrasystoles	(8.1)	60 (17.9)	15	0.28	0.00	70 (18.2)	16	0.09	0.00
Ventricular tachycardia	(8.2)	1 (0.3)	—	—	—	0 (0.0)	—	—	—
Atrial fibrillation	(8.3)	18 (9.4)	28	0.05	0.04	10 (2.6)	30	0.08	0.19
Supraventricular tachycardia	(8.4)	2 (0.6)	—	—	—	1 (0.3)	—	—	—
Idioventricular rhythm	(8.5)	0 (0.0)	—	—	—	0 (0.0)	—	—	—
A-V nodal rhythm	(8.6)	4 (1.2)	—	—	—	1 (0.3)	—	—	—
Other*	(8.7)	2 (0.6)	—	—	—	1 (0.3)	—	—	—

*Pacemaker; NEG = Negative association. Tables containing cells with a frequency of <10 were not further analysed.

Electrocardiographic findings

The prevalence of individual ECG findings, the percentage with symptomatic history and the significance of associations with symptomatic history and with age are given in Table 3.

Q wave

Large Q waves (1.1) had the highest percentages with symptomatic history and a strong association with age in both sexes. Medium Q waves (1.2) were more common than large Q waves but were somewhat less strongly associated with symptomatic history; nevertheless they qualified as suggestive. Small Q waves (1.3) were less common and not associated with chest pain or age. Males had appreciably more Q wave items than females.

Axis deviation. Left axis deviation (2.1) was common in both sexes but, showed only a weak association with chest pain, though strongly linked to age. Right axis deviation (2.2) was uncommon (perhaps because the Minnesota criteria are rather severe, requiring an axis of $+120^\circ$ or more) and showed no strong associations in males. In females numbers were insufficient for analysis.

Left ventricular hypertrophy. 3.1 was the most frequent ECG finding in males. It did not have a significant relationship with symptomatic history and was more common in younger than older males. In females it was less common, but it was strongly associated with chest pain and moderately with age.

S-T depression. Large S-T depression (4.1) was more prevalent in females than males. In both sexes the association with chest pain and age was strong. In males, medium S-T depression (4.2) was the second most common finding and appeared to be suggestive of IHD. However, in females medium S-T depression was extraordinarily common (581 cases), and increased with age, but showed no relationship at all with a symptomatic history ($p = 0.97$). Few cases of small S-T depression (4.3) were found, and they did not appear to be suggestive of IHD. Elevated S-T segments (4.4) were not coded.

T wave inversion. Large T inversion (5.1) was uncommon, but in view of the findings that medium T inversion (5.2) was strongly associated with chest pain and age in both sexes, large T inversion was accepted as being suggestive of IHD as well. Small T inversion (5.3) was common and increased with age but was not strongly associated with chest pain.

A-V conduction. No cases of 3° or 2° A-V block (6.1 and 6.2) were found. The relatively small number of 1° A-V block (6.3) cases did not have a strong association with chest pain, and neither did the small number of cases of Wolff–Parkinson–White syndrome (6.4) or accelerated A-V conduction (6.5), where numbers were sufficient for analysis.

Intraventricular conduction. Both left bundle branch block (7.1) and right bundle branch block (7.2) was strongly associated with chest pain in males, but not in females. In both sexes the prevalence increased with age. Incomplete right bundle branch block (7.3) had little, if any, association with symptomatic history or age, while intraventricular block (7.4) had an association with chest pain in males but not with age.

Rhythm. Extrasystoles (8.1) and atrial fibrillation (8.3) were the only arrhythmias found with any degree of frequency. Extrasystoles had little association with symptomatic history but increased with age. Atrial fibrillation showed a marginally significant ($p = 0.05$) association with chest pain in males only, but in the absence of strong age trend ($p = 0.04$) was not regarded as being strongly linked to IHD. Numbers were, however, small and this may have influenced the results.

With the exception of S-T depression (4.1, 4.2, 4.3), small T inversion (5.3), accelerated A-V conduction (6.5) and extrasystoles (8.1), ECG items were generally more frequent in males than in females. For the further analysis of ECG data, only those items regarded as being significantly associated with IHD, as defined under Methods, were considered (Table 4).

The age- and sex-specific distribution of total suggestive ECG findings (Fig. 2) reveals that there is a steep age gradient, especially after age 45, and that ECG findings are almost

TABLE 4. ELECTROCARDIOGRAPHIC FINDINGS SUGGESTIVE OF IHD*

Males		Females	
Large Q waves	(1.1)	Large Q waves	(1.1)
Medium Q waves	(1.2)	Medium Q waves	(1.2)
—		Left ventricular hypertrophy	(3.1)
Large S-T depression	(4.1)	Large S-T depression	(4.1)
Medium S-T depression	(4.2)	—	
Large T inversion	(5.1)	Large T inversion	(5.1)
Medium T inversion	(5.2)	Medium T inversion	(5.2)
Left bundle branch block	(7.1)	—	
Right bundle branch block	(7.2)	—	

*As determined by partial associations between ECG findings, symptomatic history and age, tested for significance by χ^2, $p \leqslant 0.01$ (see text).

twice as common in males than in females at all ages. For all ages together, the percentage of males with suggestive ECG findings was 12.8% (10.5% age-adjusted) and of females 6.7% (5.5%): It should be kept in mind, however, that if the total number with any ECG finding was to be calculated, the females would have a higher prevalence than males due to the very large number of females with medium S-T depression (4.2).

Total prevalence of IHD

Overall apparent ischaemic heart disease prevalence (chest pain and/or ECG findings) was higher at all ages in males than in females (Fig. 3). ECG findings accounted for a larger contribution to the male prevalence than chest pain history, while the converse was true for females. In the highest age group of 55–64 years, the prevalence of symptoms and/or ECG findings suggestive of IHD was very high indeed, being found in 33.3% of males and 26.3% of females. For all ages, 18.4% (15.1% age-adjusted) of males and 13.1% (10.5%) of females were apparently affected.

Relationship of chest pain to ECG findings

As can be seen from Fig. 3, there is relatively little overlap between the symptom of chest pain and ECG finding suggestive of IHD. Indeed, in the youngest age group there was

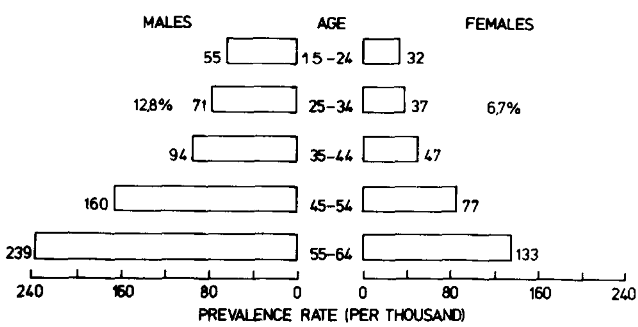

FIG. 2. The age- and sex-specific prevalence of ECG findings suggestive of IHD, and the crude rate (%) for males and females aged 15–64 years.

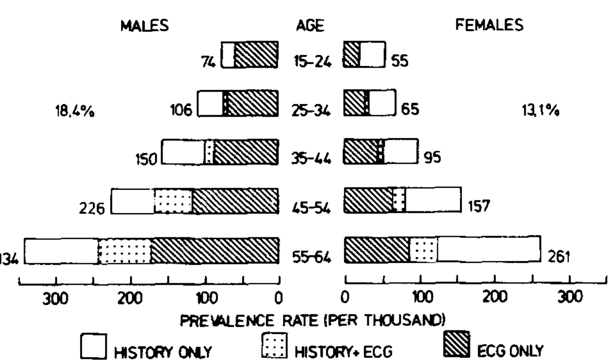

FIG. 3. The age- and sex-specific prevalence of total ischaemic heart disease estimated by the sum of chest pain history and/or suggestive electrocardiographic findings, and the crude rate (%) for males and females aged 15–64 years.

TABLE 5. CHEST PAIN: EFFECT OF THE DOCTOR'S DIAGNOSIS ON THE PREVALENCE (%) OF ECG FINDINGS SUGGESTIVE OF IHD

	Males (N = 284)	Females (N = 295)
"Did not visit doctor/doctor's diagnosis not IHD"	8	8
"Visited doctor—doctor's diagnosis IHD"	46	30
Total	34	18

no overlap at all. With increasing age, the overlap increased, but even at age 55–64 years only 42% of males and 23% of females with chest pain had ECG findings. For all age groups combined, the figures were 34% for males and 18% for females. An analysis of the effect of a doctor's confirmation of chest pain as IHD (Table 5) shows that those individuals who had suggestive ECG findings were virtually confined to the group who had visited a doctor and had reportedly been diagnosed as having IHD. Only 8% of those who had not visited a doctor or who had not been diagnosed as IHD had suggestive IHD findings—a figure little different from the prevalence of ECG findings in the total population. For angina pectoris, relief obtained from glyceryl trinitrate within 5 min also served to distinguish those with ECG findings. In males reporting angina, the proportion with ECG findings improved from 25.2 to 45.0% and in females from 12.7 to 35.2% if relief was obtained from glyceryl trinitrate.

DISCUSSION

The London School of Hygiene chest pain questionnaire has been validated and used in several IHD prevalence surveys [8–11]. Its sensitivity and specificity, however, remains in some doubt [12] and its main advantage is that use of a standardised method of history-taking facilitates comparison between study groups. Similar considerations apply to the use of the Minnesota code for classification of electrocardiographic findings [13, 14]. For instance, in the postmortem study of Horan and Flowers, only 16% of their subjects with myocardial infarction or scar had abnormally wide Q waves; conversely, 11% of subjects without myocardial lesions had Q waves [15]. Together chest pain history and ECG findings are capable of predicting about half of the IHD deaths over a 5-yr period, operating largely independently of each other and with equal power [8]. Although this predictive power is greater than that of the classical major risk factors, the sensitivity (ability to diagnose true positives) of the methods combined is still only moderate. The specificity (ability to diagnose true negatives) is also likely to be low, as judged from the fact that only a very small proportion of those deemed to be positive by either method will actually die from IHD [16]. Specificity becomes crucial when the condition under consideration, e.g. abnormal electrocardiographic findings, occurs in only a minor proportion of the study population [13]. It can be improved by considering as positive only those individuals positive on both questionnaire and electrocardiogram, but this will seriously diminish sensitivity. The specificity of an ECG finding can also be improved by taking into account whether the pain had been confirmed by a doctor or whether the subject was under medical care for heart disease [9, 17]. In the present series a doctor's confirmation of chest pain as IHD increased the chances of obtaining a positive ECG by 6-fold.

If a male subject had a history of both AP and MI, the chances of confirmation by a doctor and/or suggestive ECG findings were greatly increased. This group, presumably, would be at higher risk of subsequent IHD mortality. The age of the respondent also played a role. In younger persons (15–34), there was little chance of chest pain being associated with ECG findings. Interestingly, Rose found that chest pain in men aged 40–49 had little prognostic significance whereas it was a powerful predictor in those aged 50–64 [8].

As found in a number of other studies [14, 17], the overlap between a positive chest pain questionnaire and ECG findings was small. Only 15% of males and 10% of females classified as having IHD were positive for both. In the Whitehall study on older males, the overlap was 31% [17]. This is a cause for concern, as it suggests an inherent lack of sensitivity of the methods employed. It is known that subjects who have suffered a myocardial infarct frequently have a normal ECG some months later. Rose has shown that point-prevalence studies may underestimate the extent of IHD [12]. A population subjected to repeated chest pain questionnaires and ECG examinations yielded a much higher prevalence than any single sampling. At present, however, there is no viable alternative to the use of a standardised chest pain questionnaire and ECG coding system in population studies. The credibility of the results obtained from such studies depends heavily on good quality control [13].

The prevalence of a positive chest pain history would appear to be high in the CORIS study population, in agreement with the high IHD mortality rate for SA whites. For instance, both AP (69/1000) and MI (66/1000) rates (age-adjusted) in men aged 40–59, were higher than crude rates found in the Busselton [9] (AP = 51, MI = 54 per thousand), Belgian [11] (AP = 57) or Whitehall [8] (P = 44, MI = 65) studies which also made use of the London School of Hygiene questionnaire. It should be kept in mind that the Whitehall study of 18,403 British civil servants was not a community study and may thus have had lower rates through selection bias. Few studies have looked at the prevalence of chest pain in females, but age-adjusted CORIS prevalences (AP = 77, MI = 40 in the 40–59 year old group) seem to be higher than in the Busselton study [9] (AP = 44, MI = 18).

Although interstudy comparisons of chest pain prevalence should be cautiously interpreted in view of likely interobserver and population differences, the magnitude and consistency of these trends and their agreement with mortality experience argue that they are real. Age-adjustment of the CORIS prevalences were necessary to minimize age bias in these comparisons. Other workers have indicated that the use of a standardised chest pain questionnaire permits international comparisons. Thus, the finding of AP and MI prevalences of 53 and 84/1000 in American telephone workers [18] compared to 40 and 24/1000 in British postal workers [19] was consonant with the differences in IHD mortality between these two countries at the time of those studies. Additional support is provided by the greater frequency of Q wave findings in our study compared to those from elsewhere. Whereas the crude rate (per thousand) of Minnesota Code 1.1–1.2 findings for males aged 40–59 was 26, 19 and 5 in the Tecumseh [10], Busselton [9] and Whitehall [17] studies respectively, it was 51 (age-adjusted) in the CORIS males. CORIS females had a rate of 27/1000 for these items, compared to 4 and 3 for the Tecumseh and Busselton females. Since IHD mortality has in recent years declined in Australia and North America [20], some of these differences in reported prevalence of chest pain may well be an underestimation at the present time.

An unexpected finding in this study was the high prevalence of a history of chest pain in females; at most ages it rivalled that of males. The mortality from IHD in South African white females is, however, very much lower than that of males; an equally high prevalence of symptoms of IHD would thus imply that females live with the disease for a longer time. Such an assumption cannot, however, be justified in view of the reservations about the sensitivity and specificity of the methods employed. In addition, this study has provided circumstantial evidence that a history of chest pain in females does not have the same importance as in males. Thus the history was less often confirmed by a doctor as being compatible with IHD in females, and in only 18% was there an associated "suggestive" ECG finding compared to 34% of males. Qualitative differences exist in the electrocardiographic findings as well; e.g. marked Q wave findings (1.1) generally accepted as providing "hard" evidence of previous MI, were almost twice as common in males. Data from both the Busselton [9] and Tecumseh [10] studies indicate that although overall prevalence of IHD may appear to be similar in both sexes, males predominate when only "hard" evidence such as Q waves is taken into account.

The statistical treatment employed in the present study also suggested that certain ECG findings in females (medium S-T depression and bundle branch blocks) do not have the same diagnostic power as in males, while the converse applied for left ventricular hypertrophy. Estimation of the electrocardiographic prevalence of IHD after eliminating these codes where appropriate resulted in a male:female ratio of 1.8:1, which still falls short of the observed 3.2:1 sex ratio for IHD mortality amongst South African whites. The judgement of which individual ECG findings in males are suggestive of IHD is in close agreement with a similar analysis of the Whitehall study population by Rose [17]. When he included the subsequent 5-yr IHD mortality in his analysis, minor Q wave (1.3), S-T segment (4.3) and T wave (5.3) changes also appeared to be positively associated with IHD. Unlike the present study, in which atrial fibrillation (8.3) just missed being statistically significantly associated with chest pain (perhaps because of the small numbers), Rose found atrial fibrillation to be strongly associated with IHD.

The differences in the apparent significance of individual ECG findings between males and females are of interest, since such comparisons have been made rather infrequently. In some instances, e.g. right and left bundle branch block, it may well be that the present findings are spurious due to small numbers; however, in the case of left ventricular hypertrophy (negative in males, positive in females) and medium S-T depression (positive in males, negative in females) the numbers were large and the p-values obtained were unequivocal. Left ventricular hypertrophy (LVH) was more common in younger than in older men and showed no rise in the older men. The latter finding is in agreement with that of Rose [17]. He also found that LVH was not associated with subsequent IHD mortality, in contrast to the grave prognostic significance attached to this ECG finding in men aged 45–62 in the Framingham study [21].

Most problematical of all, however, was the category of medium S-T depression (4.2); it was three times more common in females than males and though it rose with age it was not associated with chest pain in females. It seems clear that S-T depression in females has to be viewed in a somewhat different light from the same finding in males. In both the Tecumseh [10] and Busselton [9] studies, "borderline" electrocardiographic changes, which would have included S-T and T items other than 4.1, 5.1 and 5.2 were more common in females than males. The reasons for this excess of S-T items in females are unknown, but it would be difficult to ascribe a grave prognostic significance to it. The slight excess of hypertension in females, previously documented [22] in this population, is unlikely to account for more than a small fraction of the excess S-T items. In males, however, major (4.1), medium (4.2) and even minor (4.3) S-T segment depression has been found to be significantly associated with IHD [23]. Obviously, prospective mortality data may alter the interpretation attached to individual ECG findings as a result of a cross-sectional analysis.

The present study has provided suggestive evidence of a high prevalence of IHD in 3 rural Afrikaans-speaking communities, whether assessed by chest pain questionnaire, ECG findings, or both. Up to a third of males and a quarter of females of the age decile 55–64 has some indication of IHD. This evidence is in agreement with the high prevalence of primary risk factors in these communities and with the high IHD mortality in South African whites.

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