MYOCARDIAL INFARCTION— THE COMPARATIVE RACIAL PREVALENCE IN CAPE TOWN, 1957— AN ELECTROCARDIOGRAPHIC STUDY

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An accurate estimate of the prevalence of ischaemic heart disease is very difficult to obtain. National vital statistics carry with them all the inherent and only too well-known inaccuracies of death certification. In addition, they take no account of the prevalence of the disease in the living. The clinical manifestations of ischaemic heart disease are very varied, and include such diverse syndromes as angina pectoris, coronary insufficiency, arrhythmias, heart block, congestive cardiac failure and myocardial infarction, apart from sudden death. Even myocardial infarction may be silent clinically, and manifest as a transient cerebral episode, vomiting, or just arrhythmia. Paton (1957) has recently emphasized the rather low degree of accuracy in clinical diagnosis of even myocardial infarction in a review of 266 necropsies of patients dying from this cause at the Royal Infirmary in Edinburgh. In contrast to this, a high degree of accuracy was obtained in the group with recent infarction in whom an electrocardiogram had been obtained. In 97 cases, only six incorrect diagnoses were made on the electrocardiogram. In three of these a left-bundle branch block obscured the electrocardiographic pattern, and in the other three patients ischaemia was diagnosed rather than frank infarction. The importance of electrocardiography, therefore, cannot be underrated.

The same study also serves to emphasize that in a considerable number of the cases with myocardial infarction found at post-mortem the diagnosis was not made before death. Certainly some of these cases were sudden deaths, when there had been no time for electrocardiographic examination, but in others the clinician had deemed that electrocardiographic investigation was not necessary, i.e. insufficient attention was directed towards the heart. Electrocardiography, therefore, especially when 12 leads are interpreted, is an extremely accurate aid in the diagnosis of recent myocardial infarction, but cases will be missed if no call is

made on this form of investigation. Although abnormal, the electrocardiogram may not be characteristic in that it may be masked by previous infarction, bundle branch block or a left-ventricular strain pattern. Q-waves may be absent unless the infarct is trans-mural.

The accuracy with which the electrocardiogram can diagnose infarction applies to recent infarctions. Recovery from myocardial infarction may leave no electrocardiographic residua. A normal electrocardiogram, therefore, cannot exclude the possibility of an infarction having occurred in the past.

Any comparison, therefore, of the prevalence of ischaemic heart disease between groups utilizing the electrocardiogram as a measure would have to take into account the availability of electrocardiographic investigation to each group, the ability of the physician and/or patient to have attention directed towards the heart, and the interpretation placed upon the electrocardiogram. In the interpretation of electrocardiograms where several interpreters are involved, observer error can be very great unless very rigid criteria are laid down (Thomas *et al.*, 1958). This may have the disadvantage that a highly selected type of myocardial infarction will be studied, as for example, if Q-waves are demanded, the conclusions drawn from such a study must be limited solely to transmural infarctions. In the communication to follow it will be seen that only one observer has been operative throughout.

Any conclusions that arise out of such a comparative study will, in addition, depend on the nature of the populations at risk. Ischaemic heart disease, characteristically, has a higher prevalence in the elderly and in the male sex. Bias would be introduced, therefore, if the one group consisted of a large number of middle-aged or elderly males or if there were an unduly large proportion suffering from diseases known to be associated with an increased prevalence of ischaemic heart disease.

such as diabetes mellitus, xanthomatosis, etc. Prevalence is a ratio, both components being important in this regard.

Previous analyses of the electrocardiograms of adult in-patients and out-patients attending Groote Schuur Hospital have shown that, whereas ischaemic heart disease is very uncommon in the Bantu, it is frequently encountered in the White. The prevalence in the Cape Coloured population falls between the two extremes (Vogelpoel and Schrire, 1955; Schrire, 1958a, b). In this communication, the prevalence of this disease during 1957 is analysed and compared with the figures obtained during the years 1952 to 1956.

The Populations at Risk in Cape Town

Groote Schuur Hospital during 1957 was the main hospital serving the population of Cape Town and the surrounding districts. It is an 854-bed hospital with slightly more White than non-White beds. The New Somerset Hospital, on the other hand, is a smaller hospital serving the non-White population only. The 44 teaching beds of the New Somerset Hospital were included in the electrocardiographic service, so that the bed strength of White and non-White patients was approximately equal.

Figures compiled by the Bureau of Census and Statistics for March, 1957, reveal that the population of Metropolitan Cape Town consisted of 280,000 White, 351,100 Cape Coloured and 67,800 Bantu, giving a proportion of 4 : 5 : 1 respectively. Thus, even taking the question of age into consideration, there are more non-Whites at risk than Whites. The population attending the hospital, however, is selected, because a means test prevents the attendance of all but the poorest section of the community. Almost all the non-Whites are eligible and this certainly applies to the Bantu, but only the less economically privileged White. It has generally been accepted (Osler, 1910; Stocks, 1951), that ischaemic heart disease occurs in the more economically privileged section of the community. This means that, if anything, the prevalence of ischaemic heart disease in the White at large is under-estimated by the figures obtained at our hospital (Schrire, 1958a).

During 1957, attendances of patients of all ages at the general out-patient section totalled 288,091, of which 135,815 were Cape Coloured and 24,606 Bantu, the remaining 127,670 being White: 50 per cent. of these patients attended for the first time during 1957. Of the adults admitted to the wards of Groote Schuur Hospital, 9,947 were Coloured, 2,111 Bantu and the remaining 10,311 White.

Thus it is fair to conclude that if the prevalence of ischaemic heart disease was the same in all races

the number of non-Whites found to have ischaemic heart disease during 1957 should at any event equal that found in the White. Although the Bantu population at risk is only a quarter of the White, a significant number of Bantu patients with ischaemic heart disease should be recorded.

The Electrocardiographic Measurement

As in previous years (Vogelpoel and Schrire, 1955; Schrire, 1958a, b), the electrocardiographic service of the Cardiac Clinic was available to all in-patients and out-patients attending Groote Schuur Hospital and the 44 in-patient teaching beds of the New Somerset Hospital. Electrocardiograms in all cases included the six-limb leads and the praecordial leads V₁-V₇. Since all records were interpreted by the author, any errors in electrocardiographic interpretations were constant for all races and the facilities for obtaining electrocardiographic investigations are equal. The data obtained, therefore, should reflect the relative prevalence of the diseases which occur in this hospital.

The Use of Rigid Criteria

During 1957, the number of electrocardiograms requested for individual adults (over the age of 19) was 3,525. Slightly more were requested for Whites than for non-Whites (Table 1), although more of the latter attended the hospital. This suggests that attention is drawn to the heart more often in the White than in the non-White. Of the 3,525 electrocardiograms, 332 showed the classical pattern of myocardial infarction. Of these, 252 (75.9 per cent.) were in Whites and 79 (23.8 per cent.) in Cape Coloured; there was one Bantu case (0.3 per cent.). These figures correspond closely to those obtained during 1956 (74.4, 25.3 and 0.3 per cent. respectively).

Rigid criteria were used in the diagnosis of myocardial infarction. Abnormal T-wave and ST-segment changes alone were not accepted. As previously described (Vogelpoel and Schrire, 1955) in anterior infarction wide or deep Q-waves in the praecordial leads (V₁-V₇) or diminution in the R-waves across the praecordium with T-wave inversion or ST-segment change were required. In posterior infarction, a Q-wave of at least 0.04 seconds in width or deeper than 30 per cent. of the R-wave in AVF was accepted. In the presence of right-bundle branch block, a Q-wave of 0.04 seconds in AVF or abnormally wide Q-waves in the praecordial leads indicated infarction. Infarction was very seldom diagnosed in the presence of left-bundle branch block, unless Q-waves or definite ST-segment depressions over the left ventricle were present. That these criteria were

TABLE 1.—COMPARATIVE RACIAL PREVALENCE OF MYOCARDIAL INFARCTION DETERMINED ELECTROCARDIOGRAPHICALLY (RIGID CRITERIA) IN ADULTS OVER THE AGE OF 19

Race	Racial Distribution of Electrocardiograms		Racial Distribution of Infarct Patterns		% of Races in 332 Infarct Patterns	% of ECG's showing Infarcts
	No.	Ratio	No.	Ratio		
White	1,966	1.3	252 (250)*	3.1	75.9 (74.4)	13
Coloured	1,338	1	79 (85)	1	23.8 (25.3)	6
Bantu	221		1 (1)		0.3 (0.3)	0.5
Total	3,525		332			

*The figures in brackets refer to 1956 data (3)

TABLE 2.—COMPARATIVE RACIAL PREVALENCE OF ISCHAEMIC HEART DISEASE DETERMINED ELECTROCARDIOGRAPHICALLY IN ADULTS OVER THE AGE OF 19

Race	Racial Distribution of Electrocardiograms		Racial Distribution of Abnormal Patterns		% of Races in 617 cases	% of Abnormal ECG's
	No.	Ratio	No.	Ratio		
White	1,966	9	442 (471)*	2.5	71.6 (73.2)	22.5
Coloured	1,338	6	172 (173)	1	27.9 (26.75)	13
Bantu	221	1	3 (1)		0.5 (0.15)	1.4
Total	3,525		617			

*The figures in brackets refer to 1956 data (3)

TABLE 3.—AGE DISTRIBUTION OF PATTERNS SUGGESTING ISCHAEMIC HEART DISEASE IN THREE RACIAL GROUPS

Years	Whites		Coloured		Bantu	
	No.	Total ECG's	No.	Total ECG's	No.	Total ECG's
20-29	0	111	1 (1%)	159	0	32
30-39	10 (4%)	138	7 (9%)	214	0	64
40-49	49 (20%)	365	19 (24%)	305	0	65
50-59	75 (30%)	504	21 (27%)	336	0	34
60+	118 (46%)	848	31 (39%)	324	1	26
Total	252 (100%)	1,966	79 (100%)	1,338	1	221

TABLE 4.—ATTENDANCE OF BANTU OUT-PATIENTS DEPARTMENT IN DECEMBER, 1957, ACCORDING TO AGE AND SEX, WITH THE AGE DISTRIBUTION OF THE CAPE TOWN BANTU POPULATION

Age	Attendance at O.P.D. December, 1957			Population Census, 1951
	Male	Female	Total	
20-29 ..	40	37	77	15,317
30-39 ..	83	41	124	12,669
40-49 ..	37	18	55	5,959
50-59 ..	25	18	43	2,105
60-69 ..	19	3	22	588
70+ ..	9	2	11	249
Total ..	213	119	332	36,887

valid has been shown in a previous study, where 559 of 581 cases with such patterns were found to be acceptable clinically as cases of ischaemic heart disease (Schrire, 1958a).

The Use of Less Rigid Criteria

It might be argued, however, that the pattern of 'through and through' infarction occurs only in the more severe forms of ischaemic heart disease and that if patients with a lesser degree of electrocardiographic change are excluded a false idea of the true racial prevalence may be obtained. The differing inter-racial prevalence may, therefore, be only one of degree. The remaining 641 electrocardiograms from patients in whom the question

TABLE 5.—COMPARATIVE RACIAL PREVALENCE OF MYOCARDIAL INFARCTION DETERMINED ELECTROCARDIOGRAPHICALLY (RIGID CRITERIA) DURING THE YEARS 1952-1957

Race	1953-1954			1952-1956			1957		
	No. of ECG's	No. of Infarct Patterns	% of Races in 550 Infarcts	No. of ECG's	No. of Infarct Patterns	% of Races in 991 Infarcts	No. of ECG's	No. of Infarct Patterns	% of Races in 214 Infarcts
White ..	3,309	448	81.5%	7,232	760	76.6%	1,966	161	75%
Coloured ..	1,471	100	18.1%	4,397	228	23.1%	1,338	53	25%
Bantu ..	224	2	0.4%	783	3	0.3%	221	0	

of ischaemic heart disease had been raised (425 White, 204 Coloured and 12 Bantu) were, therefore, analysed. By using less rigid criteria (Schrire, 1958a, b) 285 of these cases were found to be acceptable. In these cases there was a history strongly suggestive of ischaemic heart disease (angina pectoris or cardiac infarction), confirmed by an electrocardiogram showing T-wave inversion without Q-waves over the antero-lateral or posterior aspects of the left ventricle, or bundle branch block without significant Q-waves (particularly left-bundle branch block). In a previous study (Schrire, 1958a) it has been shown that these electrocardiographic changes alone are not sufficiently distinctive to accept the cases as ischaemic heart disease in the absence of a clear history, particularly in the presence of hypertension. Patients with normal graphs were also excluded from this analysis as before (Schrire, 1958a).

Of these 285 cases, 190 were White, 93 were Coloured and two were Bantu. The total number of electrocardiograms showing evidence of ischaemic heart disease during 1957 was, therefore, 442 White, 172 Coloured and three Bantu (Table 2).

Although more electrocardiograms were done on Whites than non-Whites, the ratio was only 1.3 : 1, and this cannot be the sole explanation of the striking inter-racial differences found in the prevalence of myocardial infarction. If we express the number of infarctions as a percentage of the total number of electrocardiograms taken in each racial group, as in a previous communication (Vogelpoel and Schrire, 1955), the actual difference is well shown (Tables 1 and 2). Thus, 100 electrocardiograms in Whites include 13 infarctions (rigid criteria) or 22.5 (less rigid criteria); 100 electrocardiograms in Cape Coloured show 6 and 13 respectively, whereas electrocardiograms in Bantus include only 0.5 and 1.4 respectively.

Discussion

The difference in the prevalence of ischaemic heart disease in the three racial groups cannot be attributed entirely to an age factor (Table 3). At each age-range the greatest number of patterns

suggesting ischaemic heart disease occurred in the White as compared with the Coloured and the Bantu. This is true for the decades 30-39, 40-49, 50-59 and also for patients over the age of 60 years. A detailed knowledge of the nature of the population attending the hospital or of their relative age incidence is not known. An attempt was therefore made to analyse the minimum Bantu attendances at hospital during December, 1957, and the results are shown in Table 4. The Bantu population of the Cape Town Metropolitan area only, in age groups, is also included as published by the Bureau of Census and Statistics for 1951.

The extremely low incidence of ischaemic heart disease in the Bantu cannot, therefore, be attributed to absence of sufficient subjects of the 'coronary age group' in the Bantu population, as there are at least 3,000 Bantu subjects of this age in the population (Table 4). It is well recognized that the official census for Bantu is unreliable and that many more live in Cape Town than the official figures indicate. Even the official statistics show that the Bantu population has risen from 47,793 to 67,800 between 1951 and 1957, and the 'population at risk,' therefore, probably numbers well over 3,000. Moreover, an adequate number of Bantu attend the out-patients' department in the age group usually affected by ischaemic heart disease, so the low incidence of the disease cannot be attributed to the absence of these subjects at Groote Schuur Hospital (Table 4.)

As a number of patients with ischaemic heart disease are on long-term anticoagulant therapy, particularly the White population, and for this or other reasons have repeated electrocardiograms done year after year, the figures in Tables 1 to 3 may be weighted for the White. In Table 5, the prevalence of infarction (rigid criteria) during 1957 is compared with that in 1953 and 1954 (Vogelpoel and Schrire, 1955) and with that in 1952 to 1956 (Schrire, 1958a). The figures for 1957 have been corrected to exclude all patients electrocardiographed in previous years for ischaemic heart disease. The figures for 1952 to 1956 include those of 1953 and 1954. The same criteria for the diagnosis of infarction were used in all series.

The results (Table 5) show that there has been

virtually no change in the prevalence of the disease measured electrocardiographically in the three racial groups during the period under review (1952 to 1957).

The effect of sex on the prevalence of infarction was again well borne out during 1957 in all races. Only 64 of the 262 cases in Whites were women, and 56 of these were 50 or over, with a peak prevalence between 60 and 69. In the 79 Coloured cases, 22 were women, 17 were 50 and over, with a similar peak prevalence between 60 and 70. No case of ischaemic heart disease has yet been encountered in a Bantu female. The peak incidence in White and Coloured males was between 50 and 59, with 27 per cent. of the Whites below 50 and 37 per cent. of the Coloureds. The only Bantu case was over 70 years old. These figures are very similar to those published for 1952 to 1956 (Schrire, 1958a).

Conclusions

Electrocardiograms of 3,525 adults attending the Groote Schuur Hospital and the New Somerset Hospital, Cape Town, during 1957 were analysed to determine the inter-racial prevalence of myocardial infarction.

Electrocardiographic evidence of myocardial in-

farction was found in only one Bantu during 1957 and this patient had been seen before in previous years.

Electrocardiographic evidence of myocardial infarction and ischaemic heart disease was found far more commonly in the White than in the Cape Coloured, in both of whom the disease was common.

The higher prevalence of ischaemic heart disease in Whites than in non-Whites was confirmed and was not attributable to a significant difference in age distribution of the population studied.

The peak prevalence in males was between 50 and 59 and in females between 60 and 69. The disproportionate prevalence in males was confirmed.

The results were compared with the findings of previous years.

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