The Changing Pattern of Heart Disease in South African Blacks

C. ISAACSON

SUMMARY
All autopsies on Black patients who died of heart disease at Baragwanath Hospital were examined for the years 1959, 1960 and 1976. The commonest form of heart disease encountered in South African Blacks is undoubtedly hypertensive heart disease and by far the majority of these cases are of essential hypertension. There appears to have been a slight rise in the incidence of hypertension. Rheumatic heart disease is extremely common, and affects young people, who often have advanced valvular lesions by puberty. The incidence of idiopathic cardiomyopathy does not seem to have altered materially, although there has perhaps been a slight drop, which may be accounted for by the tendency of clinicians to place cases of congestive cardiac failure with mild hypertension in the hypertensive group rather than in the idiopathic cardiomyopathy group. There was a significant alteration in the incidence of myocardial infarction; in 1959 and 1960 these cases comprised less than 1% of all cardiac deaths but in 1976 they comprised nearly 12%. There has also been a dramatic fall in the incidence of cardiovascular syphilis.


With increasing urbanization and westernization of the Black people of South Africa, an alteration in the distribution of the various types of cardiac disease would be expected both clinically and at necropsy. To investigate this possibility, the postmortem records at Baragwanath Hospital for 1959 and 1960 were compared with those for 1976. Baragwanath Hospital is a large (2500-bed) Black hospital which supplies the medical services for the town of Soweto on the outskirts of Johannesburg. The precise population of Soweto is uncertain but estimates vary between 900,000 and 1.2 million. The population has increased gradually over the years and there has been a concomitant rise in the standard of living; there is now a small, but nevertheless significant, fairly affluent middle class composed of professionals, including teachers and doctors, businessmen and better-paid white-collar workers in sedentary occupations. The process of industrialization, urbanization and westernization has been accelerated in recent years, and it seemed of value to compare the distribution of cardiac deaths found at autopsy in the years 1959 - 1960 with those of 1976.

MATERIAL AND METHODS
All the autopsy records for 1959, 1960 and 1976 were extracted and the deaths from cardiac disease examined in detail. The deaths from cardiac disease were expressed as a percentage of the total autopsies for that year, and in addition each category of cardiac disease was expressed as a percentage of the total number of autopsies done on cardiac patients. While this may not be an accurate reflection of the true incidence of the various types of cardiac disease in this population, it does however give an approximation. During these 3 years, necropsies were performed on an unselected basis, the only criterion for not performing a necropsy being refusal by the relatives to grant permission. In 1960 a neonatal disease survey was performed comprising 250 necropsies on neonates. These are not included in this study nor are they included in the total number of autopsies performed that year. Similarly, in 1976, 100 necropsies were performed on neonates as part of a survey of neonatal deaths and these are also not included in the total necropsies performed that year.

RESULTS
The results are depicted in Tables I and II. The striking finding is the marked increase in the percentage of cases of myocardial infarction. Of the 14 cases in 1976, 10 showed coronary artery occlusion and 4 showed marked narrowing of the coronary arteries with interstitial fibrosis and heart failure from myocardial ischaemia. The figure for 1976 is 2.0% of all autopsies compared with 0.13% in both 1959 and 1960. Expressed as a percentage of the total number of necropsies done on cardiac patients, cases of myocardial infarction have increased from 0.9% in 1959 and 0.81% in 1960 to 11.7% in 1976. The percentage of deaths due to hypertension has also risen, comprising 5.7% of all autopsies in 1959, 6.9% in 1960 and 7.5% in 1976. The other types of cardiac disease appear to be unchanged in incidence. There is a slight fall in the percentage of idiopathic heart failures (cryptogenic heart disease) in 1976.

<table>
<thead>
<tr>
<th>TABLE I. CARDIAC DISEASE AS A PERCENTAGE OF THE TOTAL AUTOPSIES</th>
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</thead>
<tbody>
<tr>
<td></td>
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<tr>
<td>Total autopsies</td>
</tr>
<tr>
<td>Cardiac disease</td>
</tr>
<tr>
<td>Idiopathic heart failure</td>
</tr>
<tr>
<td>Myocardial infarction</td>
</tr>
<tr>
<td>Hypertension</td>
</tr>
<tr>
<td>Syphilitic aortitis</td>
</tr>
<tr>
<td>Rheumatic heart disease</td>
</tr>
<tr>
<td>Cor pulmonale</td>
</tr>
<tr>
<td>Miscellaneous</td>
</tr>
</tbody>
</table>
### TABLE II. DISTRIBUTION OF CARDIAC DISEASES AT AUTOPSY AND THEIR PERCENTAGE OF THE TOTAL CARDIAC DEATHS

<table>
<thead>
<tr>
<th>Year</th>
<th>Total</th>
<th>1959</th>
<th>1960</th>
<th>1976</th>
<th>Higginson et al.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>111</td>
<td>122</td>
<td>120</td>
<td>537</td>
</tr>
<tr>
<td>Idiopathic heart failure</td>
<td>37 (33%)</td>
<td>22 (18%)</td>
<td>17 (14,1%)</td>
<td>80 (14,9%)</td>
<td></td>
</tr>
<tr>
<td>Myocardial infarction</td>
<td>1 (0,9%)</td>
<td>1 (0,81%)</td>
<td>14 (11,7%)</td>
<td>12 (2,2%)</td>
<td></td>
</tr>
<tr>
<td>Hypertension</td>
<td>44 (40%)</td>
<td>52 (43%)</td>
<td>52 (43,3%)</td>
<td>100 (18,6%)</td>
<td></td>
</tr>
<tr>
<td>Syphilitic aortitis</td>
<td>3 (2,7%)</td>
<td>2 (1,6%)</td>
<td>—</td>
<td>33 (6,1%)</td>
<td></td>
</tr>
<tr>
<td>Rheumatic heart disease</td>
<td>24 (22%)</td>
<td>33 (27%)</td>
<td>25 (20,8%)</td>
<td>174 (32,4%)</td>
<td></td>
</tr>
<tr>
<td>Cor pulmonale</td>
<td>2 (1,8%)</td>
<td>4 (3,2%)</td>
<td>—</td>
<td>84 (15,6%)</td>
<td></td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>(1,2%)</td>
<td>(6,4%)</td>
<td>(10%)</td>
<td>(10,2%)</td>
<td></td>
</tr>
</tbody>
</table>

### TABLE III. AGE AND SEX DISTRIBUTION OF VARIOUS CARDIOVASCULAR AND RENAL DISEASES

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Total</th>
<th>1 - 19</th>
<th>20 - 29</th>
<th>30 - 39</th>
<th>40 - 49</th>
<th>50 - 59</th>
<th>60+</th>
<th>Unknown</th>
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</thead>
<tbody>
<tr>
<td>Males</td>
<td>48</td>
<td>4</td>
<td>4</td>
<td>12</td>
<td>11</td>
<td>3</td>
<td>13</td>
<td>1</td>
</tr>
<tr>
<td>Females</td>
<td>28</td>
<td>1</td>
<td>3</td>
<td>7</td>
<td>5</td>
<td>7</td>
<td>5</td>
<td>—</td>
</tr>
<tr>
<td>Total</td>
<td>76</td>
<td>5</td>
<td>7</td>
<td>19</td>
<td>16</td>
<td>10</td>
<td>18</td>
<td>1</td>
</tr>
</tbody>
</table>

### DISCUSSION

In Table III the age and sex distribution of various cardiovascular and renal diseases among Blacks is presented.

**Idiopathic Heart Failure**

This entity was first described in South Africa by Gillanders, who called it nutritional heart disease, because he thought that malnutrition was the basic aetiology. His patients displayed the common signs of congestive failure with enlargement of the whole heart, gallop rhythm and severe oedema. He also maintained that liver disease was an invariable accompaniment, and found that in most cases signs of failure regressed when a well-balanced diet was substituted for the deficient diet to which patients had been accustomed, and that the disease relapsed when patients left hospital and reverted to their previous diets.

Subsequently Higginson et al. described the necropsy findings in 12 cases and later reported the detailed necropsy findings in 80 cases. They introduced the term 'cryptogenic heart disease' and found it to be the fourth commonest cause of heart failure at autopsy. The heart was hypertrophied and dilated in all cases and all chambers were affected equally. A significant number of patients had intraluminal thrombi, and visceral infarction was common. No valvular lesions were present. Histologically, there was hypertrophy of muscle fibres and, in many instances,
recent mural thrombosis with early organization. Kallichurum recently described the autopsy findings in 35 cases and found that right ventricular predominance was common. The aetiology of this form of heart disease has been a cause of considerable controversy. As mentioned above, Gillanders originally thought that malnutrition played a significant aetiological role, but most workers refuted this idea. However, Powell and Wright, reporting from Durban, maintained that there is a similarity between cardiomyopathy and alcoholic heart disease in Black patients, although they were not able to detect any relationship to alcoholism or malnutrition. Reid, however, was able to produce changes in rats resembling cardiomyopathy by feeding them a diet deficient in tryptophan. Bringen and Robinson also suggested that there is a close similarity between cardiomyopathy in Blacks and the findings in alcoholic heart disease. Shaper concluded that chronic malnutrition per se is not a significant factor in cryptogenic heart disease in South Africa although alcohol may play a direct and important role. Grusin, in describing the so-called acute reversible heart failure in Blacks, makes it clear that alcoholism is a significant feature in many patients with heart disease admitted to hospital in Johannesburg and that the response to thiamine may be very variable and may well depend on the chronicity of the heart disease. Shaper found it difficult to accept that in areas where undernutrition and protein deficiency are widespread, where alcohol is as important a social phenomenon as anywhere else in the world and where heavy drinking of an episodic or chronic nature is common, the population should be immune from the cardiac effects of alcohol. Various aetiologies have been suggested by authors from other parts of Africa describing their own particular variety of idiopathic heart failure, including a low serum potassium level following malnutrition, hyper-sensitivity, a micro-organism or a vector of disease.

Seftel emphasized that there is a great deal of evidence that excessive chronic consumption of ethanol may damage cardiac muscle and produce cardiomyopathy. The ethanol itself is probably noxious but it is also likely that the associated malnutrition is contributory. He suggested that alcoholism may be of central significance in the genesis of a whole spectrum of cardiac conditions in Johannesburg Blacks. It is undoubtedly the main factor conditioning the development of thiamine deficiency and reversible beriberi heart disease; in addition, alcohol excess may be cardiopathic in its own right. On the basis of clinical, epidemiological and laboratory evidence, Seftel et al. advanced the hypothesis that ethanol excess and/or chronic general malnutrition may explain the majority of cases of idiopathic cardiomyopathy in both men and women. It should however be pointed out that Seftel clearly differentiated beriberi heart disease from idiopathic cardiomyopathy. Ethanol excess cannot explain all the cases of idiopathic cardiomyopathy, and in a minority of men, a large proportion of women, and in all children, some other factor must be operating, probably malnutrition. With reference to the possible long-term effect of malnutrition, significant myocardial abnormalities have been demonstrated in children with kwashiorkor. The most striking being atrophy. These may be responsible for functional changes such as a reduction in cardiac output and also a liability to cardiac failure or sudden death during the early phases of treatment. In some fatal cases there are histological changes resembling those in idiopathic cardiomyopathy. The possibility that idiopathic cardiomyopathy in later life may be a sequel to kwashiorkor has still to be explored.

The incidence of idiopathic cardiomyopathy appears to have dropped slightly over the years. There was an exceptionally high rate in 1959 (33% of all deaths due to cardiac disease and 4.81% of all autopsies), whereas in 1976 it comprised only 14.1% of all deaths due to cardiac disease and 2% of all autopsies. The slight fall in the incidence of idiopathic cardiomyopathy may be attributed to a tendency to classify some cases of idiopathic cardiomyopathy in other cardiac groups, particularly hypertension. Not infrequently, patients in cardiac failure with cardiomyopathy are slightly hypertensive and the tendency in the past has been to consider these as examples of idiopathic cardiomyopathy with mild hypertension resulting from the congestive cardiac failure. However, many clinicians now assign these cases to the group of hypertensives. This approach is probably the more correct one. In the necropsy records, no case has been assigned to the group of hypertensives without confirmatory vascular changes. In Table III the age and sex distribution of 76 cases of idiopathic cardiomyopathy, the total number for 1959, 1960 and 1976, is shown. There is a distinct preponderance of males, the ratio being 2:1. Seftel claims that the male:female ratio is 3.3:1 which is in keeping with the sex ratio of drinkers in the city. The disease starts as early as the third decade but its highest incidence is from the fourth decade onwards. Several cases occurred in children but these must clearly have a different aetiology and pathogenesis. Idiopathic cardiomyopathy in children is probably secondary to myocarditis.

Myocardial Infarction

Higginson and Pepler were among the earliest authors to show that the severity of atherosclerosis was considerably less in Blacks than in corresponding White subjects. They failed to find the severe degrees of atherosclerosis seen in a high percentage of Whites, and also commented on the low frequency of deaths from coronary artery disease in Blacks. Their findings confirmed the observations of Becker, who found only 1 death due to coronary thrombosis in a series of 350 autopsies on Black subjects over 50 years old, and they concluded that severe atherosclerosis of the aorta and coronary arteries is considerably less frequent in the hospitalized South African Blacks than among American and Danish hospital populations. Similarly, Wainwright found more extensive vascular plaque formation, ulceration, thrombosis and calcification among Whites than among Blacks, with a low incidence of myocardial infarction. Schrire and Uys found only 3 proven cases at autopsy during a 6-year period in the Department of Pathology at Groote Schuur Hospital in Cape Town. Sacks also stated that in certain age groups, and particularly in women, the difference in the incidence of myocardial infarction in Coloured and White subjects was apparently more impressive than the difference in
incidence of severe coronary atherosclerosis, and that this finding might possibly be due to some additional factor operating more commonly in Whites. Walker and Simson also stressed the disparity between the occasionally severe atherosclerosis of the aorta and the low mortality from coronary occlusion. Among the Blacks at Baragwanath Hospital in the period 1951-1961 there were only 15 deaths from coronary heart disease verified at necropsy, whereas about 700 or more cases of myocardial infarction and sudden death would be expected in a White population of the same size and age structure. The low mortality is surprising, since data indicate that many Blacks are overweight, hypertension is very common and physical activity, although greater than in Whites, is decreasing every day in proportion to the level of prosperity. Smoking is prevalent. Walker suggested that the rarity of coronary heart disease may be due to a racial factor or to known environmental factors such as the comparatively low proportion of heavy smokers. He also maintained that the increase in coronary heart disease within the last 20 years is less than would be expected, and despite the increasing measure of sophistication of diet and manner of life, the Blacks of South Africa have possibly the lowest mortality from coronary heart disease of any intensively urbanized population in the world. Seftel and Kew also maintained that coronary heart disease is still uncommon in Johannesburg Blacks. However, it is not so rare now that it can be ignored in a differential diagnosis. As a group, these patients are considerably westernized in their diet, occupation, physical activity and high prevalence of conditions such as obesity, diabetes, hypertension and hyperlipidaemia, and the incidence of occlusive atheroma is similar to that among Whites.

In this series the most dramatic alteration in the incidence of a cardiac disorder is seen in the case of myocardial infarction. Both in 1959 and in 1960 1 case was found at autopsy (0.13% of all autopsies in each year), whereas in 1976 there were 14 cases (2.0% of all autopsies), comprising 10 with overt coronary artery occlusion and myocardial infarction and 4 with such severe degrees of coronary atherosclerosis and luminal narrowing as to precipitate congestive cardiac failure from myocardial ischaemia. In 1959 and 1960 myocardial infarction comprised less than 1% of all cardiac deaths found at necropsy, whereas in 1976 it comprised 11.7% - a thirteenfold increase in incidence. Nevertheless, it is worth recalling Walker's statement that the equivalent White population would have about 700 cases per annum of myocardial infarction and sudden death. The rise in incidence over a 16-year period is distinctly impressive, and must be ascribed to the increasing level of prosperity being enjoyed by a significant class of Blacks, who can now consume meat containing large quantities of fat, smoke heavily, and travel in limousines. Of the 16 cases of myocardial infarction, 10 were in males and 6 in females. The majority of patients were over 50 years old.

Hypertension

Hypertension is very common in Blacks and occurs at a younger age than in Whites. It behaves in an explosive manner, death frequently occurring from cerebral haemorrhage, uraemia or congestive cardiac failure. In the clinical series of Schwartz et al. hypertension was only third in the frequency of cardiac disorders after cryptogenic heart failure and chronic rheumatic heart disease. Hypertensive heart disease comprised 19.6% of all cardiac cases. However, recent authors have stressed that with increasing urbanization and associated stress, the incidence of hypertension in Blacks has increased and will rise even further in the future. The currently accepted view is that in Johannesburg the second most common cause of death in the adult Black population (after violence) is hypertension and its complications. In this series hypertension is by far the commonest cause of heart disease at Baragwanath Hospital. It comprised 5.7% of all autopsies in 1959, 6.9% of all autopsies in 1960 and 7.5% of all autopsies in 1976. There thus appears to be a slight but steady rise in the incidence. In 1959 hypertension was the cause of death in 40% of all autopsies on cardiac patients, 43% in 1960 and 43.3% in 1976. Hypertension is therefore by far the commonest cause of heart disease found at necropsy. In fact, in 1976 the second commonest cause (rheumatic heart disease) was far behind, comprising only 20.8% of all autopsies on cardiac patients.

There has been dispute whether hypertension in Blacks is essential or secondary to underlying renal disease. Isaacs and Kincaid-Smith extracted records and histological sections of 1232 consecutive autopsies on patients over the age of 50 years who had died of natural causes. Patients who had had a blood pressure of 200/100 mmHg or more and had died of the effects of hypertension, such as heart failure, uraemia or cerebral haemorrhage, were selected for study. Using these criteria, it became clear that a number of hypertensive subjects might have been excluded, but on the other hand it was unlikely that non-hypertensive subjects with a terminal transient rise in blood pressure would have been included. In the series, 6.4% of the patients presented features of essential nephrosclerosis and 36% had underlying renal disease. Only 10% of the total number showed chronic pyelonephritis. A feature was the comparative youth of patients, 57% being between 30 and 49 years of age. The incidence of malignant hypertension (48%) was also noteworthy. The incidence of chronic pyelonephritis in hypertensive Black subjects was lower than in a similar series from London. It is therefore clear that essential hypertension is the final pathological diagnosis in most cases of severe hypertension in Blacks, and that renal disease plays an even less important role than in the White population of South Africa or Britain. Similarly, in a renal biopsy study of pregnant hypertensive subjects, Seftel et al. showed that essential hypertension is by far the commonest pathological finding and that underlying renal disease, including pyelonephritis, is comparatively rare.

The total number of hypertensives found in 1959, 1960 and 1976 was 145. There was no particular sex bias, 83 of the patients being female and 62 male. Essential hypertensives dominated the picture (113 of the total of 145). The comparative youth of patients with essential hypertension is shown by the finding that 51 out of 113 (45%) were between the ages of 20 and 49 years (Table III). The cases of chronic glomerulonephritis and chronic
pyelonephritis were too few for significant comment. There were 12 patients with chronic pyelonephritis — 4 males and 8 females.

**Rheumatic Heart Disease**

According to Shaper, there is overwhelming evidence that rheumatic heart disease is today the commonest form of heart disease in children and young adults in most tropical or developing countries and one of the most common cardiovascular diseases in adults. Not only is it common, but there is clinical and necropsy evidence from several countries that the frequency of the disease is increasing. Schrire concluded that rheumatic heart disease is probably more common in Blacks than in Whites and he suggested that the non-White races are more severely affected by rheumatic heart disease and die earlier. Schwartz et al. showed that acute and chronic rheumatic heart disease accounted for 23.3% of the patients with clinical heart disease admitted to one of the medical wards at Baragwanath Hospital and was second in frequency only to idiopathic cardiomypathy. In almost all studies on acute rheumatic fever in the tropics the proportion of very young children affected is higher than that in temperate climates. A comparison of the incidence of rheumatic heart disease in Johannesburg Black children under 10 years of age already suffer from chronic valvular disease. Tropical rheumatic fever affects the young age groups and the severity, as measured by early mortality, is greater than in temperate countries. Chesler et al. pointed out that acute rheumatic fever appears to exist in a virulent form in Blacks, because of the frequency of cardiitis and congestive cardiac failure. These conditions have a remarkable predilection for young patients and the number of deaths in the younger age groups is high. Spodick pointed out that the high incidence of rheumatic heart disease in Blacks can be equated with a high prevalence of streptococcal infection and its consequences, which are related to poverty. In the necropsy series of Higginson, rheumatic heart disease accounted for 32.4% of all cardiac deaths.

In the present series, rheumatic heart disease comprised 3.1% of all autopsies in 1959, 4.3% in 1960 and 3.6% in 1976. The incidence does not therefore appear to have changed significantly in the 17 years. In 1959 rheumatic heart disease comprised 22% in 1960 27% and in 1976 20.8% of the total necropsies on cardiac patients. In 1960 and 1976 it was the second commonest cardiac death at necropsy, after hypertension. Table III shows the sex and age distribution of the total number of cases for 1959, 1960 and 1976. There was a total of 80 patients, of whom 45 were female and 35 male; 61% were below the age of 39 years. The distribution of the valvular lesions is shown in Table IV. In a necropsy study from Uganda, Shaper et al. also reported the distribution of lesions in rheumatic heart disease (also in Table IV). It was thought of interest to compare the Ugandan findings with the present series and to construct a formula to compare the two groups. The number of patients who had mitral valvular disease alone was used as the denominator and the other lesions were used respectively as the numerator, the subsequent fraction then being expressed as a decimal. The Ugandan findings were almost identical with those of the current series.

**Miscellaneous**

Cor pulmonale and syphilitic aortitis comprised a very small percentage of cardiac deaths. Even in the clinical series of Schwartz et al., syphilitic aortitis comprised only 1.1% of all patients with heart disease admitted to one medical unit during 1957 and cor pulmonale comprised 10.9%. Cor pulmonale comprised 1.8% of all cardiac deaths in 1959, 3.2% in 1960, none in 1976 and 15.5% of the cases reported by Higginson et al. There does not appear to be any significant alteration in the incidence of cor pulmonale. Syphilitic aortitis comprised 2.7% of all autopsies on cardiac patients in 1959, 1.6% in 1960, none in 1976 and 6.1% in the series of Higginson et al. There has clearly been a dramatic fall in the incidence of cardiovascular syphilis.

I should like to thank Miss N. M. Mazamisa for secretarial assistance.

**REFERENCES**

A Multicentre Study of the Susceptibility of a Variety of Bacteria to Cephalothin, Cefamandole, Tobramycin and Gentamicin


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SUMMARY

A multicentre study of antibiotic susceptibility was performed in South Africa. Sensitivity to cephalothin, cefamandole, tobramycin and gentamicin was tested on a variety of aerobic and anaerobic bacteria. Two disc susceptibility techniques were used, i.e. the Kirby-Bauer technique (aerobes) and the broth-disc method (anaerobes); minimum inhibitory concentrations (MICs) were determined according to the International Collaborative Study techniques, and regression lines for individual centres were constructed. Satisfactory lines were obtained for cephalosporins, but, in some centres, problems were experienced with the aminoglycosides. Variations in MICs for Haemophilus influenzae were probably due to an inoculum effect. Accumulative percentage tables of the number of strains inhibited were compiled, and the comparative performance of the antibiotics was assessed.


Although tests of bacterial susceptibility to antibiotics form an integral part of laboratory work in large hospitals, collaborative studies to standardize these techniques have been initiated only relatively recently. This is particularly true in the case of anaerobes. It was decided to use an in vitro trial concerning the sensitivity of a variety of aerobic and anaerobic organisms to cephalothin, cefamandole, tobramycin and gentamicin to initiate a multicentre

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