SPECIAL ARTICLE

Coronary Heart Disease and Future Expectation of Life

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SUMMARY
Mortality from coronary heart disease (CHD) has risen enormously over the last generation. Some regard the concomitant increase in life expectancy as the sole explanation; others maintain the increases at least in part to be real. Irrespective of the true causes, the question arises: If increases in CHD mortality continue in certain of the populations most affected, may not expectation of life ultimately decrease? An answer is sought by examining relevant information (1) on a large community of rural Indians having a low prevalence of CHD, and (2) on the offspring of Indian immigrants to South Africa, whose CHD mortality now exceeds that of the local whites. It is concluded that while promotive factors linked with urbanization and prosperity are chiefly responsible, the bearing of an ethnic propensity cannot be excluded. Continuation of the present CHD mortality trend in South African Indians almost undoubtedly will decrease their life expectancy, which, even at present, appears to compare unfavorably from youth onward with that of the rural Indian group described.

Additional Indexing Words:
Coronary heart disease mortality Westernization Urbanization Obesity Hypertension Diabetes Ethnic proneness

The Increase in Coronary Heart Disease: Is It Apparent or Real?

CORONARY HEART DISEASE has been recognized for several generations.1 John Hunter, who died in 1793, suffered from angina pectoris.2 At that period, a few cases of the latter were reported by Jenner3 and by Heberden.4 Much later, in 1910, when Osler lectured on angina, it remained rare.5 Since 1920, however, mortality rate from coronary heart disease has increased enormously. In some countries, for example, Denmark, Finland, and Sweden,6 the rate has now become steady. In the United States, it was still increasing from 1950-1962,7,8 although at present it appears to have reached a plateau.9 Up to 1962, in Norway6 and Australia,10 the rate continued to mount. In England, in 1966, it was reported that deaths from coronary and arteriosclerotic heart disease increased by 50% during the past 10 years; in 1965, the mortality rate totaled the highest on record, accounting for more than a fifth of all deaths.11

There is considerable controversy over the interpretation of the increases mentioned. Some believe the changes to be largely if not wholly apparent; yet others maintain that the increases to a large degree are valid. Those favoring the former view have attributed the increases primarily to the far higher proportion of populations who reach middle age and beyond compared with the

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past, to the greater availability of medical services, improved diagnosis, to revisions of the International Classification of Diseases, and to changes in certification. Thus, at the one extreme, there is Campbell,12 who, in 1964, maintained "that the increasing age of population . . . is the main, if not the only, reason for the large increase in the deaths from all heart disease since about 1924." This view has now been amplified by Robb-Smith13; he rejects the promotive influence of changes in "way of living," although he admits that there are racial differences in the incidence of various types of cardiovascular diseases. On the other hand, Oliver and Stuart-Harris,14 for example, are skeptical of the role of improved diagnosis within the last 10 to 15 years and believe that there must be an explanation other than that of an aging population to account for the increases. Furthermore, Reader and Wynn,19 in a study undertaken in Australia for the period 1950-1962, reported that "analysis of mortality rates by five year group showed that of the apparent increase in mortality in men, 25 per cent was due to the older age structure of the population and 75 per cent to an increase in the force of causal factors for the disease. For women it is entirely due to the increase in age structure."

The question arises, in populations which have high mortality rates for coronary heart disease and which are still increasing, is it conceivable that the upward trend, irrespective of the causes, could reach a stage where expectation of life might become diminished? This question may be partially answered by considering epidemiological information on one population which has been unusually affected.

**Indian Immigrants to Southern Africa**

Within recent decades, in many parts of the world among populations who were accustomed to living frugally, or who were primitive or technically retarded, there has been a transition toward sophistication of diet and manner of life. Simultaneously, there have been gross alterations in patterns of mortality and morbidity. The toll from infections, undernutrition, and malnutrition has fallen, but with prosperity, the toll of lives from diseases of degeneration has increased. The rapidity of changes has been most conspicuous in immigrants to western countries. Thus, numerous reports have drawn attention to the increased frequency of deaths from coronary heart disease in Japanese15, 16 who have migrated to Hawaii and to California and in African and Sephardic Jews who have settled in Israel.17, 18 In the populations affected, the number of lives saved from improved public health and allied measures almost invariably has exceeded the increased loss of life from diseases of "westernization." An exception to the foregoing appears to be certain Indian populations who migrated to Singapore, and to East, Central, and Southern Africa. Their mortality pattern has altered, from one in rural India where the major proportion of deaths were, and to a large extent still are, due to infections,19-21 to one in which the majority of deaths are due to coronary heart disease, hypertensive heart disease, "strokes," and diabetes.22-24

Among South African Indians (numbering about half a million), the prevalence of, and mortality from, these diseases now exceeds corresponding data on South African whites.23, 24 Among these Indians the rate of change may be assessed from the following: Judging from one report on a rural infection-ridden indigent group in India upon whom information is available,19 expectation of life from 5 years onward appears to be greater there than expectation of life in the offspring of those who emigrated to South Africa, who are largely urban-dwelling and far more prosperous.25, 26 By comparison, the mortality rate from coronary heart disease of Japanese resident in California is still markedly less than that of the local white population.27

The forebears of Indian immigrants to southern Africa, three to four generations ago, resided primarily in the rural areas in the Presidencies of Bombay, Madras, Bihar, Orissa, and other parts of India.28 No information of sufficient detail is available from
these particular areas, either in the past or in the present. The most comprehensive recent information relating to rural India is that given by Rau and Rao\textsuperscript{19} in a paper (170 pages) presented in 1959 at a WHO Expert Committee Symposium on Public Health Administration. The region they studied was Ramanagaram (population 78,183), near Mysore. It is considered that it would be enlightening to compare information on these people with present-day corresponding information on Indians mainly in the Transvaal (population 43,787), of whom about two thirds are traders.\textsuperscript{29}

In respect to climate (temperature, rainfall), and family size (about five members per household), the situations in the two populations are similar.

In the rural group in India, the staple foods are ragi and rice, with small amounts of ground nuts, pulses, and vegetables. Intakes of animal protein and of fat are very low; it is questionable whether fat supplies more than 10 to 15\% of the calories. Among Transvaal Indians, most families can buy whatever foods they desire. Fat and sugar consumptions are high; in the trader population, they are much the same, if not greater, than the amounts consumed by local and overseas whites.\textsuperscript{29, 20}

In the rural population in India half of the families live in mud and tiled dwellings, without windows, drains, or toilet facilities. Literacy rate is about 30\%. Everyone pursues an active life. In the Transvaal group, habitations are far superior, and about 95\% of persons are literate. Once children leave school, however, physical activity is slight. Among traders, over half of the families have cars, moreover, most have whole or part-time servants.\textsuperscript{29}

Regarding age structure, in the rural India and Transvaal Indian populations, the proportions under 21 years roughly are 54 and 61\%, respectively.\textsuperscript{19, 25, 26} In the 50-year and over segment, the proportions are 11.0 and 6.9\%, respectively. For total South African Indians the latter figure is 7.3\%.\textsuperscript{25, 26} In the rural group, expectation of life at 40 to 44 years was stated to be 28.2 years,\textsuperscript{19} a figure only slightly less than that obtaining in many western white populations. Among the total immigrant population in South Africa, expectation of life at the same period was 24.4 years.\textsuperscript{25}

In the rural Indian population cited, of the 10 leading causes of death listed all were infections.\textsuperscript{19} The very high proportion of deaths in rural India, due to infections, and the lower, although by no means negligible, proportion from heart disease and neoplasms has been referred to in other contemporary reports.\textsuperscript{20, 21, 31–33} In the Transvaal group, and South African Indians generally, as stated previously, leading causes of death are coronary heart disease, hypertensive heart disease, “strokes,” and diabetes.\textsuperscript{23, 24} Rates are higher in Transvaal Indians compared with the economically poorer Indians in Natal, according to health department reports from the larger centers of population.

The information given, even if only approximately true, argues against the belief that the rise in coronary heart disease mortality over the last 40 years is a phenomenon almost entirely explicable on the basis of increased expectation of life.\textsuperscript{12, 13} Understandably, the validity of the vital statistics used may be questioned. In India, however, it has been stated that at the relatively few health units that have been established, each of which comprises 50,000 to 70,000 persons, “registration of births and deaths is closely supervised.”\textsuperscript{34} The Health Unit at Ramanagaram was started in 1936.\textsuperscript{19} The standard of health prevailing there is superior to that of most other parts of rural India, since the expectation of life at birth was given as 52 years, whereas that for India generally is 42 years.\textsuperscript{35}

**Sequelea of Urbanization and Prosperity**

How much of the difference between the two Indian population groups can be attributed to the influence of factors due to, or associated with, the change from rural to a predominantly urban environment? The lower mortality rates from certain diseases in
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country compared with town people is well known. In his “National Atlas of Disease Mortality in the United Kingdom,” Howe showed that the mortality rate from coronary heart disease was lower in rural compared with urban centers of population. This was also noted in a nation-wide survey in the United States. Berkson and co-workers have shown that mortality from all cardiovascular renal disease is approximately twice as high in Chicago as it is in rural Illinois. In a study undertaken in North Dakota, subjects of urban American background had a ratio of observed to expected number of cases of coronary heart disease three times that for subjects of rural or urban European background. Perhaps most apposite, in Norway, it has been shown that in six rural centers of population, mortality rates for arteriosclerotic and degenerative heart disease and for malignant tumors were only a third of the corresponding rates prevailing in Oslo for the period 1952-1961. Only detailed and long-term studies will permit exact apportionment of blame to the various factors responsible for the differences described.

Of sequelae of urbanization, especially in emerging populations, two of the most common are increases in weight and blood pressure. In rural India, where insufficiency of food is usual, there is little gain in weight with age, although this readily occurs with urbanization and with rise in standard of living. At Ramanagaram, it was stated, “Deficiency in quantity as well as quality exists in the food of the community.” In the Transvaal Indian group, among the middle-aged and elderly, overweight is very common. Regarding blood pressure, in a rural group studied in central India, values rose only slightly with age. But with increase in weight, especially in urban areas, values rise as with whites. Among Transvaal Indians, compared with local whites, hypertension does not appear to be more prevalent. According to Seftel (personal communication, 1967), severe hypertension is relatively uncommon; when it does occur its cause often is explicable. On this account and for other reasons Seftel considers that a moiety of the large number of deaths ascribed to hypertensive heart disease may well be due to cardiac ischemia; this would add still further to the already large number of deaths attributed to the latter cause.

It is usual, although not invariable, for a rise in prevalence of coronary heart disease in a given population to be accompanied by an increase in the frequency of diabetes. The prevalence of the latter in rural India is not known but is believed to be low. But in centers of population and with prosperity, the disease is becoming more common. Among immigrant Indians, especially those in South Africa, diabetes occurs far more frequently than in whites; in two Transvaal communities, every member of whom was examined, over a third of those of 50 years or over were found to have diabetes.

Is an Ethnic Element Involved?

The questions arise: Are the immigrant Indians suffering from degenerative diseases more severely than would appear to be warranted from the environmental changes that they have experienced? Is it possible that an ethnic element is involved? That the latter may indeed be the case is not wholly speculative. In rural India there is no doubt that coronary heart disease does occur, even among the very poor and those who are wholly vegetarians. Seftel, from a visit to India, had the impression that the disease is commoner among the poor urbanized Indian than among the average urbanized South African Bantu despite the standard of living of the former being considerably below that of the latter. It is pertinent to note that in Singapore, Muir reported that in eastern racial groups, including Indians, coronary heart disease occurred earlier than in whites, and most patients studied died before 55 years of age. In Durban, in relation to this latter feature, of persons dying from the disease in 1962, 11.6% of whites, but 26.6% of Indians, succumbed before 51 years of age. Moreover, in
Johannesburg, Seftel (personal communication, 1967) has noted that myocardial infarction in premenopausal Indian women is far from rare.

Comment

In the past there have been many, such as Malthus, who had gloomy prognostications over the future of the human race. Although for a very different reason, a like foreboding, not altogether facetiously, was recently expressed by Thomas. In 1961, in a discussion on coronary heart disease, he said, "Looking at total deaths in this country, we find that in the age group of our autopsies—mostly middle-aged or older people—for the past ten years or so men have been dying faster than women, at a rate of just below 3:2. If we go on at the rate we are going now, we will have a population of women entirely." At the beginning of this paper, it was asked, "If coronary heart disease continues to increase in certain populations, as still appears to be the case, is it conceivable, ultimately, that expectation of life at middle age could decrease?" The lesson to be learned from the changes undergone by the South African Indian population is that a decrease in life expectation is not out of the question.

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