

MEDICAL PRACTICE

Contemporary Themes

Cardiovascular Disease in the Tropics*—III, Blood Pressure and Hypertension

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In most populations the mean blood pressure level in males and females rises progressively with increasing age. This gradual increase in blood pressure is not a benign process and there is an increasing morbidity and mortality as the pressure rises, even at levels which most clinicians would accept as normal. There is no clear dividing line in these populations between normal and abnormal, and most workers would agree that what we call essential hypertension represents the upper end of a frequency distribution curve. Nevertheless, there are communities in whom blood pressure does not rise with age and in whom the problem of essential hypertension and its complications appears to be virtually non-existent. I must emphasize that in the vast majority of tropical communities blood pressure patterns are similar to those seen in the economically advanced countries of the world. I am speaking of the exceptional minorities.

Low-pressure Communities

The list of these low-pressure communities is a long one, and includes New Guinea highlanders, Kalahari bushmen, Congo pygmies, Pacific islanders, South American Indians, Australian aborigines, and nomadic tribesmen in East Africa. What emerges from the many studies in these relatively small and isolated communities is that blood pressure need not necessarily rise with age. Are all these findings the artefacts of sampling or do they reflect the presence of factors such as chronic infection, para-

sitism, or malnutrition which somehow prevent the "normal" rise of blood pressure with age? Or do these communities represent normality in terms of blood pressure? I use the term normal in the biological sense, meaning associated with or conducive to good health or the absence of disease.

We must also ask whether these isolated, often tropical communities are incapable of developing higher blood pressure or whether they will, under changed environmental circumstances, show a rise in blood pressure level.

There is a historical suggestion from studies in East Africa that socioeconomic change may be associated with changes in blood pressure patterns over a fairly short period of time.

A survey of blood pressure in African men on the shores of Lake Victoria in the 1920s showed a population with moderately low mean blood pressures, which fell even lower in subjects over 40 years of age.⁴¹ Studies in similar but not identical groups in the 1930s again showed low pressure patterns but with no fall in level in older age.⁴² In the 1960s, community studies on the shores of Lake Victoria, again in similar but not identical groups, showed blood pressure patterns with age similar to those seen in the economically advanced Western countries.⁴³ This historical information from East Africa is used only as a crude indicator of possibility, for the populations differed too much in their selection to be strictly comparable.

A somewhat more acceptable suggestion that these low-pressure groups are capable of change can be seen from studies of nomadic warriors entering the Army in Kenya.⁴⁴ From a diet consisting of milk, meat, and blood these young men had changed to a diet made up of about 53% carbohydrate, 20% protein, and 27% fat, and their salt intake had increased considerably (see Table).

They showed a significant rise in systolic blood pressure, not after their first six months in the Army, when their weight gain was considerable, but after an average of two years and when their weight gain was less appreciable than in the earlier period. And after six years in the Army the systolic blood pressure was still significantly higher than their age-matched controls. How

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Clinical Changes in Nomadic Samburu Warriors after Entering the Kenyan Army (Shaper et al.⁴⁶)

	No. of Subjects	Weight		Skinfolds§ (mm)	Blood Pressure (mm Hg)
		lb.	kg		
6 months Controls	15 15	136* 116	61.7* 52.6	13.4† 11.2	113/67 116/72
2 years Controls	29 29	127† 120	57.6† 54.4	12.1 11.1	122/70‡ 114/71
6 years Controls	30 30	134* 121	60.8* 54.9	13.5* 11.0	124/75* 112/71

* P < 0.001.

† P < 0.005.

‡ P < 0.01.

§ Sum of triceps and subscapular.

much this phenomenon has to do with selection of who goes into the Army and who does not we cannot say, and it would also be fascinating to know whether the raised systolic blood pressures fall when the subjects revert, as they usually do, to their original way of life as nomads.

I must admit that the use of these nomadic warriors as an illustration is an act of self-indulgence; there are far better and far more convincing studies which serve to show how low-pressure groups can alter blood pressure patterns when they alter their environmental situations. In New Guinea the rural highland people have a low level of blood pressure which does not rise with age. When their blood pressures are compared with those of an urban wage-earning group in Port Moresby blood pressure levels are higher in the older age groups, particularly among older women. The salt intake was very low in the rural group and very high in the Port Moresby subjects. Differences in body fatness or build did not account for the higher blood pressures in the urban group.⁴⁵

A series of studies have been carried out in Zulu subjects in South Africa with particular reference to sociocultural factors which relate to hypertension. Urban Zulus had significantly higher blood pressures than the rural Zulu, and the senior investigator, an anthropologist more concerned with society than with obesity or salt, observed that the "individuals most likely to be hypertensive were those who maintained traditional cultural practices and who were unable to adapt successfully to the demands of urban living."⁴⁶ (Fig. 1). The obvious questions which arise from these observations concern those features which these low-pressure groups might have in common and those factors which might possibly be concerned in producing an increase in their blood pressure levels.

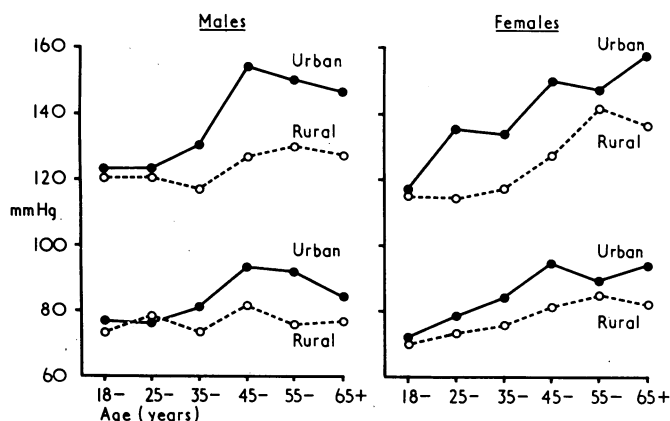


FIG. 1.—Blood pressure in urban and rural Zulu men and women (Scotch⁴⁶).

Obesity

An obvious physical feature of all these low-pressure groups is their lean body build and the virtual absence of obesity. In situations in which their blood pressures rise with environmental

change there is usually, but not always, an increase in body fatness. In the developed countries we know that there is a very strong association between body weight and the prevalence of hypertension. Lean persons are much more likely to have low normal blood pressure. Obese persons are much more likely to have high blood pressures than those who are not overweight. The risk of hypertension developing in a previously normotensive person is proportional to the degree of overweight.⁴⁷

The major unanswered question is whether the observed rise in blood pressure with increase in body bulk is directly due to the accumulation of adipose tissue. The relationship is almost certainly not direct and not simple. The Framingham community study found that hypertensives had an increased tendency to develop obesity and also that already-obese normotensive subjects subsequently developed an excess of hypertension, but only after some time lag.⁴⁷

Salt Intake

The relation of salt intake to hypertension is a controversial subject, and much circumstantial evidence suggests that there is a positive correlation between the level of salt intake and the prevalence of hypertension in a community.⁴⁸ Additional clinical and experimental data support this view, but as some individuals, in human and animal studies, chronically consume large amounts of salt without developing hypertension, while others appear to be remarkably sensitive to salt ingestion, the role of genetic factors must be considered in any hypothesis invoking salt intake.⁴⁹

In almost all the low-pressure groups salt intake is very low, and in those groups in whom a rise in blood pressure has been associated with social and environmental change the salt intake has almost always increased considerably.

Sociocultural Factors

For those concerned with the complex problem of man's adaptation to his society the most striking feature of the low-pressure groups is not their body build or dietary pattern but their social structure and its perpetuation by virtue of isolation. The possibility that higher blood pressures represent a failure of adaptation to a changing environmental situation is fascinating, and John Cassel suggests that "one of the most important . . . aspects of the environment for man (from the disease aetiology point of view) may be the presence of other members of the same species."⁵⁰

It clearly emerges from the study of the isolated communities that ageing itself does not cause blood pressure levels to rise. Miall *et al.*,^{51 52} from studies in Jamaica, Wales, and England, suggest that some trigger mechanism causes blood pressure to rise to a critical level at which the subsequent rate of rise is determined by the pressure itself. Any cause of minor but sustained rise in blood pressure could act in this way. Body weight is such a factor, but we have already seen that the relation of blood pressure to body weight is neither direct nor simple. Nevertheless, possibly within this complex and indirect relation between body fatness and blood pressure lies the key to the nature of essential hypertension. Perhaps the salt metabolism story could provide the additional factor linking body weight and blood pressure changes.

It seems unlikely that we shall unravel the essential hypertension problem solely in a community where the disorder is excessively common and where the presence of disorders such as obesity, diabetes, and atherosclerosis complicate the situation by their frequency. In communities where these complicating problems and hypertension are all infrequent studies of the few individuals or groups affected by the problem in the experiments of nature may be of vital importance.

Hypertension, renal disease, and heart failure

Having stressed the communities without hypertension, let me again emphasize that most urban or periurban tropical communities show blood pressure patterns similar to those seen in the United Kingdom or in North America and have similar or greater frequencies of individuals with "high blood pressure." In most tropical clinics the majority of subjects seen with raised blood pressures are classified as essential hypertension, particularly those over 40 years of age. A few cases are associated with underlying renal disease, but it is this group of cases that produces most of the severe hypertension problems admitted to hospital. Thus impressions gained from hospital admission studies tend to overemphasize the contribution of renal disease to the community pattern of blood pressure.

A recent necropsy study from Uganda gives some perspective on the problem.⁵³ Over a three-year period some 3,000 necropsies were carried out on patients who had died in the hospital; only 84 cases were finally diagnosed at necropsy as hypertensive heart disease, and these fell into four main groups (see Fig. 2).

Group 1.—Essential hypertension (25 cases). Most of these were elderly men with cerebrovascular disease as the commonest single cause of death.

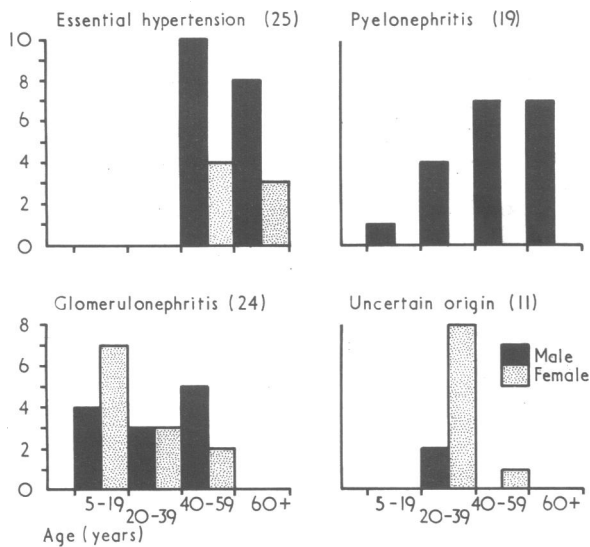


FIG. 2—Hypertensive heart disease at necropsy 1965-7 in Kampala, Uganda (Hutt and Coles⁵³).

Group 2.—Hypertension associated with glomerulonephritis (24 cases). There were equal numbers of males and females, although males outnumbered females in hospital admission (2 : 1) and at necropsy (2.5 : 1). Seventeen of the 24 patients were under 40 years of age and 11 were below 20 years of age.

Group 3.—Pyelonephritis (19 cases). All of these were males, and 10 had urethral stricture. Gonorrhoea and subsequent urethral stricture are very common tropical problems.^{54 55}

Group 4.—Hypertension of uncertain origin (11 cases). Nine of these were females, average age 26 years. In all cases there was a mild proliferative glomerular lesion, and in six cases there was pathological evidence of malignant hypertension.

Glomerulonephritis was thus present in 42% of the subjects in this study, accounting for nearly all cases of hypertensive heart disease at necropsy under the age of 30 years. The importance of glomerulonephritis in patients admitted to tropical hospitals is further emphasized by a clinical study in Uganda of African women found to have severe hypertension in pregnancy.⁵⁶ Eleven of these 15 women (average age 22 years) showed proliferative glomerulonephritis. This study emphasizes the importance of primary renal disease and in particular glomerulonephritis as a cause of severe hypertension in young patients in hospital in the tropics.

Let me summarize the situation regarding blood pressure and hypertension in the tropics.

(1) Chronic renal disease, particularly glomerulonephritis, is an important cause of severe and fatal hypertension in young people admitted to hospital in many tropical countries. The cause is unknown, though malaria and the streptococcus have each been considered as important factors.

(2) The majority of tropical communities have blood pressure patterns similar to those seen in the economically advanced countries of the world and a similar prevalence of hypertension. Most hypertension occurs over the age of 40 years, and the contribution of chronic renal disease to the prevalence of hypertension above this age is known to be negligible.

(3) A few isolated communities remain in whom blood pressure does not rise with age and in whom essential hypertension is absent. These communities are of considerable importance because it may no longer be possible to answer the basic question "Why does blood pressure rise with age?" in those countries where the phenomenon is so widespread as to be regarded as normal.

The conclusion of these lectures will appear in next week's issue, together with a list of references.

Profile of an Accident Flying Squad

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Summary

An analysis of 184 accident flying squad calls and of 280 patients injured in road accidents and treated by a flying squad based on an accident department inclusive from 1967 to 1971 has shown that such a service can provide an efficient system without disrupting the routine work of the hospital.

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Introduction

Since March 1955 Derby and the surrounding country have been served by an accident flying squad operating from Derbyshire Royal Infirmary casualty department.¹ The team, consisting of a senior casualty surgeon, an anaesthetist, and a trained nurse, travels to any accident victim about whom the already attending emergency services (police, ambulance or fire personnel, or general practitioner) are worried. The call-out originates from one of these groups and is relayed direct to the casualty department. Travel obviously has to be very rapid (and safe), and two police squad cars are used to achieve this.

The equipment (used for no other purpose) is designed to fit into the boots of these cars and consists of all the equipment necessary to treat any surgical, anaesthetic, or resuscitative