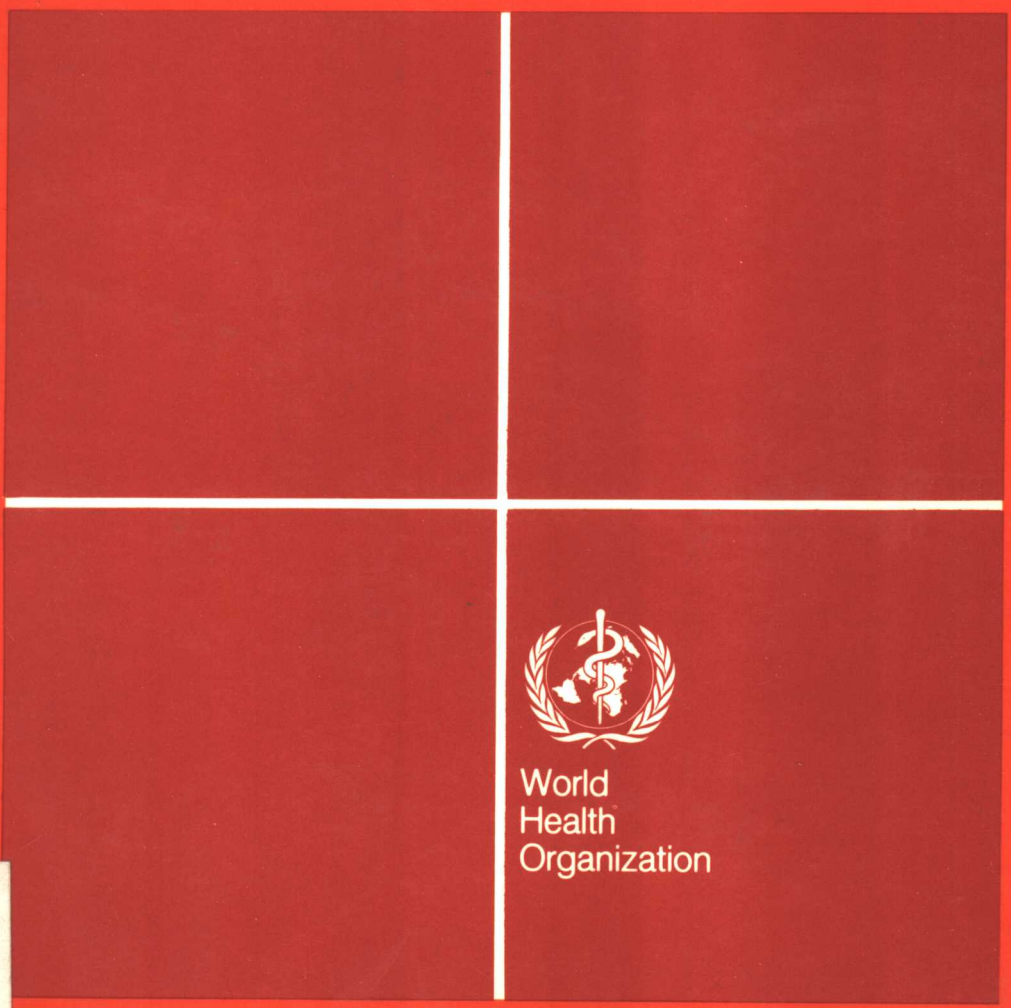
Management of Arterial Hypertension

A practical guide for the physician and allied health workers

F. Gross, Z. Pisa, T. Strasser and A. Zanchetti



World Health Organization

Management of Arterial Hypertension

A practical guide for the physician and allied health workers

by

F. Gross, Z. Pisa, T. Strasser and A. Zanchetti

with the assistance of:
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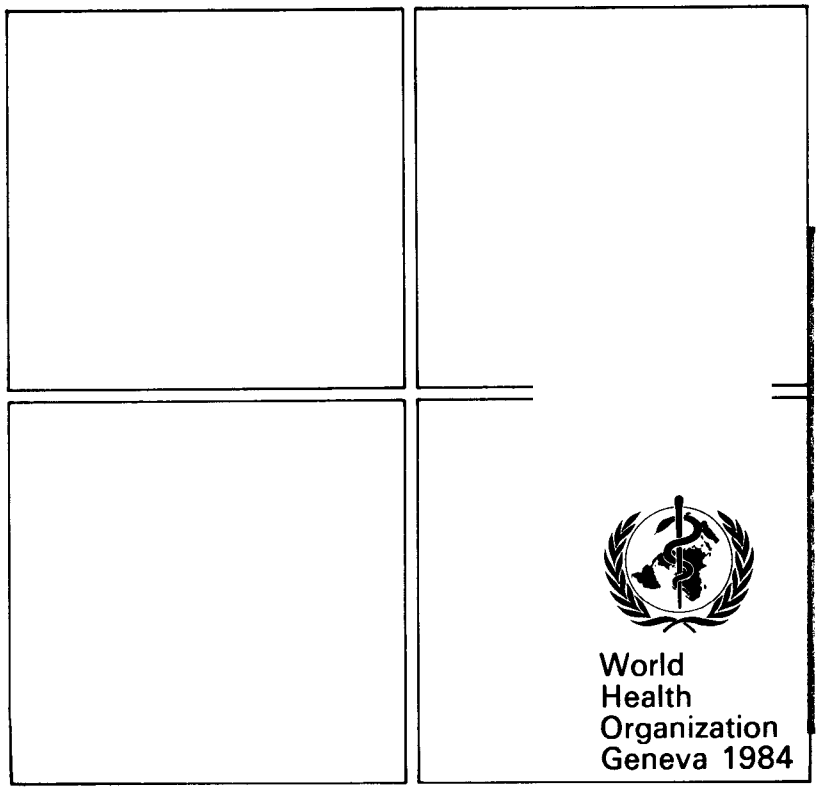

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Preface

Hypertension is a very common condition and is an important public health problem in all countries of the world—hence the World Health Organization's commitment to promote better control, management, and treatment. Although virtually symptomless, it is an important contributing cause to cerebrovascular, heart, and renal disease.

WHO's efforts in this field have included promoting the control of hypertension; analyses of, and recommendations for, the worldwide control of hypertension; special projects to demonstrate the feasibility of community control of hypertension; health care related research; and the production of health education material to help people understand the hazards of high blood pressure. The present volume is based on the report of a WHO Expert Committee on Arterial Hypertension[1] and is an attempt to provide practical and balanced information for all health workers on how to manage hypertensive patients.

Although the management of hypertension is a rapidly changing field, and new drugs are constantly being developed, they are not necessarily more useful than some older ones, and the *principles* of therapy will probably not change much in the course of a few years.

Practicality and clarity were the chief concerns of the authors in preparing the text and illustrations. Simplifications were both unavoidable and intentional.

[1] WHO Technical Report Series No. 628, 1978 (*Arterial hypertension*: report of a WHO Expert Committee).

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CONTENTS

1
INTRODUCTION

What is hypertension?

The term arterial hypertension describes the persistent elevation of (arterial) blood pressure. This definition is based on two critical features: *elevation* and *persistence*.

Elevated blood pressure values are a systolic pressure equal to or greater than 160 mmHg (21.3 kPa) and/or a diastolic pressure (5th phase) equal to or greater than 95 mmHg (127 kPa). Normal blood pressure in adults is equal to or below 140 mmHg (18.6 kPa) systolic and 90 mmHg (12.0 kPa) diastolic. The pressure values between elevated and normal are known as borderline (Fig. 1).

These limits apply to adults of both sexes of any age. The values for children that would be regarded as hypertensive are lower, but no precise figures have been generally accepted.

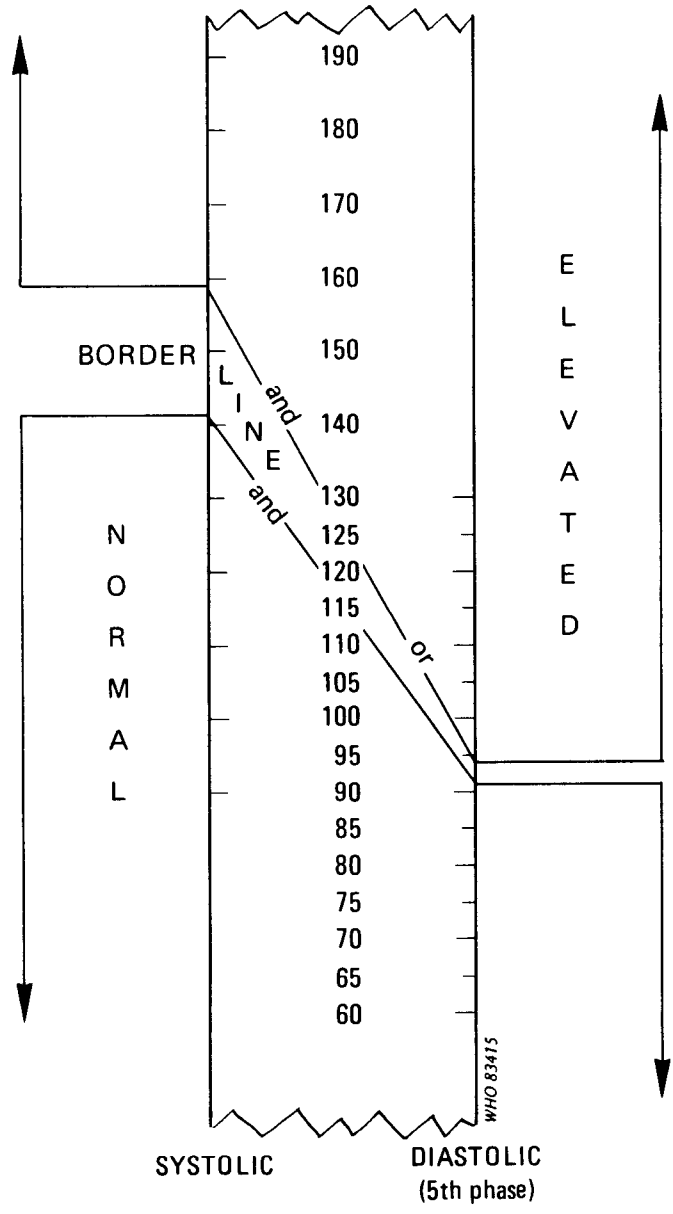
Persistent elevation of blood pressure can be ascertained only by repeated measurements over a longer period of observation. A single, casual finding of elevated blood pressure does not justify the diagnosis of hypertension (unless very high values are found). At least three blood pressure readings should be taken on each of at least two different occasions before declaring that a subject has hypertension (for more details see section 5).

Blood pressure varies during the day and is usually considerably lower at night. This applies to both normal and hypertensive subjects, but the latter still have higher values at night than normotensive individuals.

The arbitrary nature of diagnostic criteria

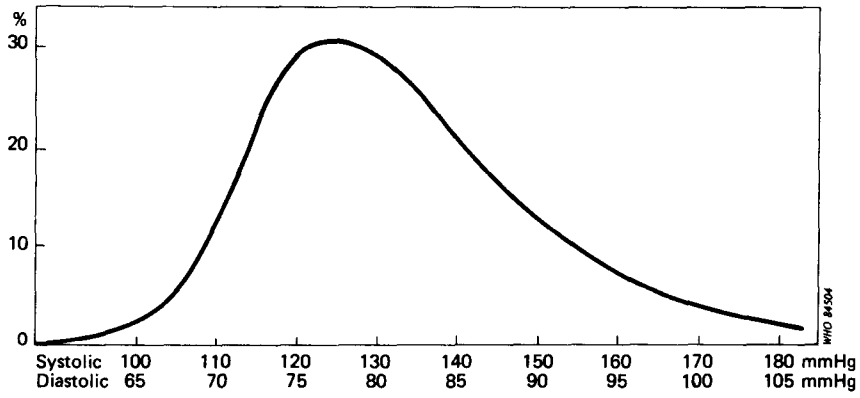
There is no natural dividing line between normal blood pressure and hypertension. The simplified definition proposed by WHO is based on

Fig. 1. Normal, borderline, and elevated blood pressure (mean values of 3 readings on 2 different occasions)



consensus. In any population, blood pressure values have a continuous, bell-shaped distribution skewed to the upper end (Fig. 2). Because of this it is not possible to distinguish clearly "pathological" from "normal" values.

Fig. 2. The continuous distribution of blood pressure values in a population



Blood pressure is a graded phenomenon, associated with graded risk. The higher the arterial pressure—systolic or diastolic—the greater the risk of complications and the shorter the life expectancy of the patient (see below). The discrete categories of "hypertensive" and "normal" levels of blood pressure are useful, practical simplifications, but it should always be remembered that blood pressure is a *quantitative* entity.

The diagnosis of hypertension alone does not necessarily indicate the need for drug treatment. Guidelines for management and treatment are given in sections 6–10.

The hazards of hypertension

Persistently elevated blood pressure imposes an increased workload on the heart, resulting eventually in left ventricular hypertrophy. If it is untreated, chronic marked hypertension may eventually lead to *hypertensive heart disease* which is a severe and potentially fatal condition involving dilatation and failure of the left ventricle. However, the signs of left ventricular hypertrophy may disappear after persistent and adequate therapy of moderate hypertension.

The changes in the arterial wall induced by chronic hypertension, and the clinical consequences, are summarized in Table 1.

The *malignant* (*accelerated*) *phase* is the most serious of all the complications of hypertension. Fortunately, it is uncommon. If

Table 1. Changes in the arterial walls provoked or promoted by high blood pressure, and the resulting clinical consequences

Changes in arterial wall	Clinical complications
(1) Atheroma	– Coronary heart disease – Cerebral thrombosis and infarction – Dissecting aneurysm
(2) Thromboembolism from atheroma	– Cerebral infarction – Transient cerebral ischaemic attacks – Retinal arterial occlusion
(3) Charcot-Bouchard aneurysms	– Cerebral haemorrhage
(4) Fatty hyalinosis and elastosis of small arterioles	– Renal impairment – Retinal arterial thickening and irregularity – Retinal arterial occlusion
(5) Fibrinoid necrosis of small arteries	– Malignant (accelerated) phase – Signs: retinal haemorrhages, "cotton-wool" and discrete exudates and papilloedema; hypertensive encephalopathy; renal glomerular infarction with proteinuria, haematuria and renal failure; cerebral haemorrhage

untreated, the malignant phase is fatal within a few months. The course of this phase may be abruptly terminated by a catastrophic cerebral haemorrhage or by cardiac failure; the patient who escapes or survives these events eventually succumbs to renal failure.

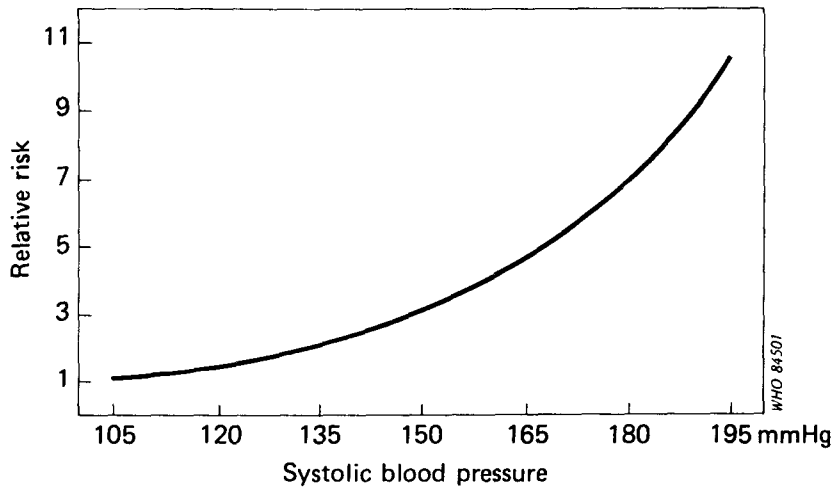
Hypertensive encephalopathy is a rare manifestation of severe hypertension. The cerebral arterioles are forcibly dilated by the very high arterial pressure and hence the brain is over-perfused, rapidly becoming oedematous. The symptoms are headache, with impairment of consciousness ranging from drowsiness and confusion to coma. Epileptiform fits occur in the later stages. The patient rapidly succumbs if the blood pressure is not promptly reduced. Hypertension is a more dominant risk factor in relation to stroke than it is for coronary heart disease, where it is one of several important risk factors.

Stroke (cerebral infarction and haemorrhage) and *coronary heart disease* (angina pectoris and especially myocardial infarction) are by far the most common complications of hypertension. Both conditions are the result of a number of influences, but hypertension is one of the principal pathogenic factors; its role as a risk factor has been assessed quantitatively in prospective epidemiological studies.

The probability that hypertensive subjects may develop the above conditions can be expressed in terms of absolute[1] and as relative risk.[2] The absolute risk of both stroke and myocardial infarction differs in various populations, in men and women, and at various ages; on the other hand, the relative risk due to high blood pressure seems to be rather uniform. Fig. 3 and 4 show the relative risks of stroke and myocardial infarction at various blood pressure levels.

With higher blood pressure values the risk increases more steeply, but subjects with only slightly raised blood pressure are already at a higher risk than those with normal or low values. Since in many populations there are many more individuals with slightly raised blood pressure than with severe hypertension, the resulting community attributable risk[3] of mild hypertension is greater than that of severe hypertension—although, clearly, the individual with severe hypertension is personally at a much greater risk (Fig. 5).

Fig. 3. Relative risk of developing stroke within 8 years in a 55-year old male related to systolic blood pressure levels



Hypertension around the world

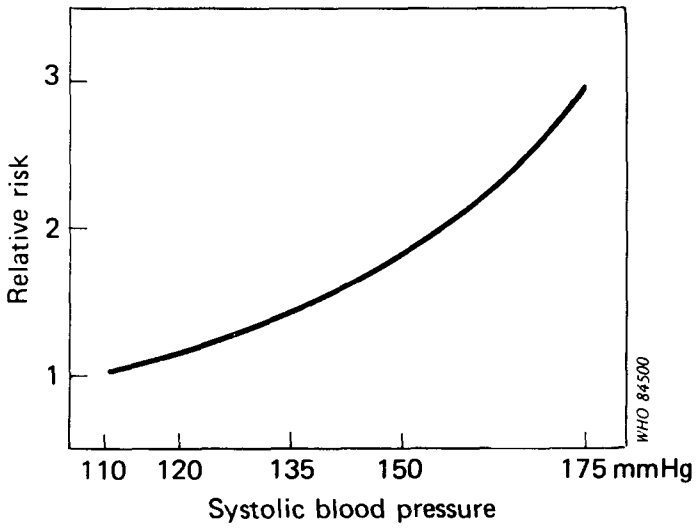
The blood pressure ranges of a large proportion of the adult population in many parts of the world are associated with excess

[1] Absolute risk: the probability that a person will develop a disease within a defined period of time.

[2] Relative risk: a measure of the risk for a subject exposed to a given risk factor, compared with the risk for a non-exposed subject.

[3] Community attributable risk: portion of the expected incidence of a disease attributable to the prevalence or level of a risk factor in a defined population or community.

Fig. 4. Relative risk of developing myocardial infarction within 5 years in a 45-year old male related to systolic blood pressure levels

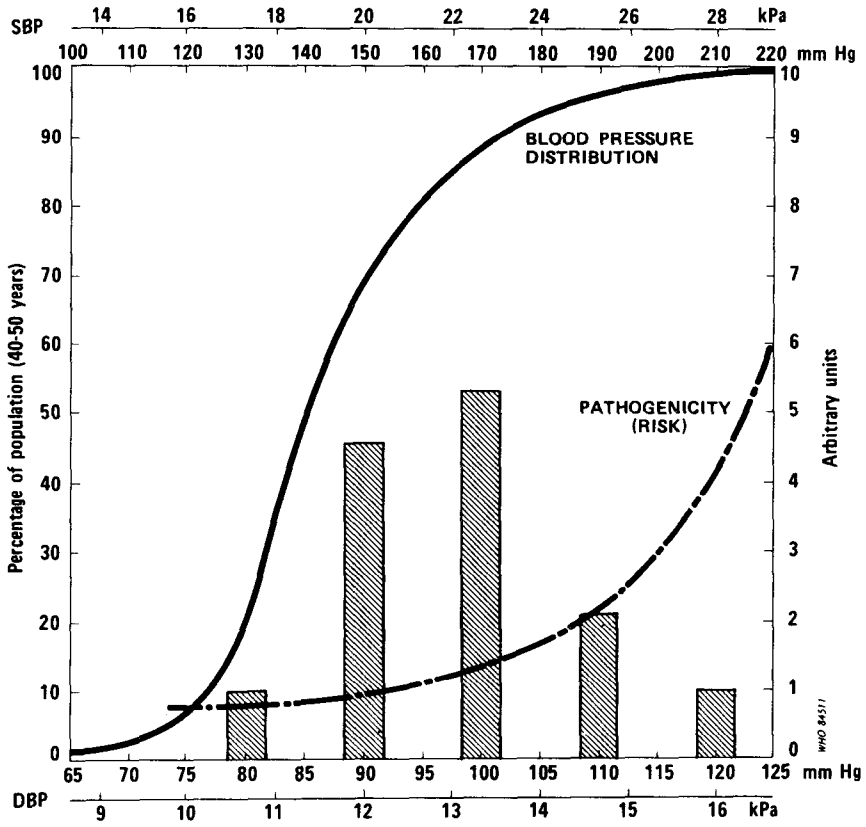


morbidity and mortality. From 5–18% of adults have casual[1] blood pressure above 160 mmHg (21.3 kPa) systolic and/or 95 mmHg (12.7 kPa) diastolic. Data on the prevalence of hypertension, as defined in this manual, are not available; nevertheless, findings based on casual measurements do have definite epidemiological importance.

Virtually all surveys in developed and developing countries, including those from Africa, Latin America, India and Oceania, have shown an age-related rise in blood pressure in both men and women; in women this phenomenon is more marked after the age of 50 years. The increase in systolic pressure appears to continue throughout life, whereas there is a tendency for diastolic pressure to level off at the age of 55–60 years (Fig. 6). Longitudinal studies have indicated that the increase in blood pressure with age is more marked in individuals in whom the blood pressure initially recorded at any age was higher than normal. In young adults in the United States of America, the increase in pressure with age is greater in blacks than in whites; hence, there is a significant excess prevalence of high blood pressure in the black population. However, there are certain notable exceptions. In some small, mostly isolated communities in which generally low blood pressure values are found

[1] Casual blood pressure: values obtained on *ad hoc* examination.

Fig. 5. Some quantitative relationships in hypertension care: a conceptual scheme



The bars illustrate the community attributable risk of hypertension.

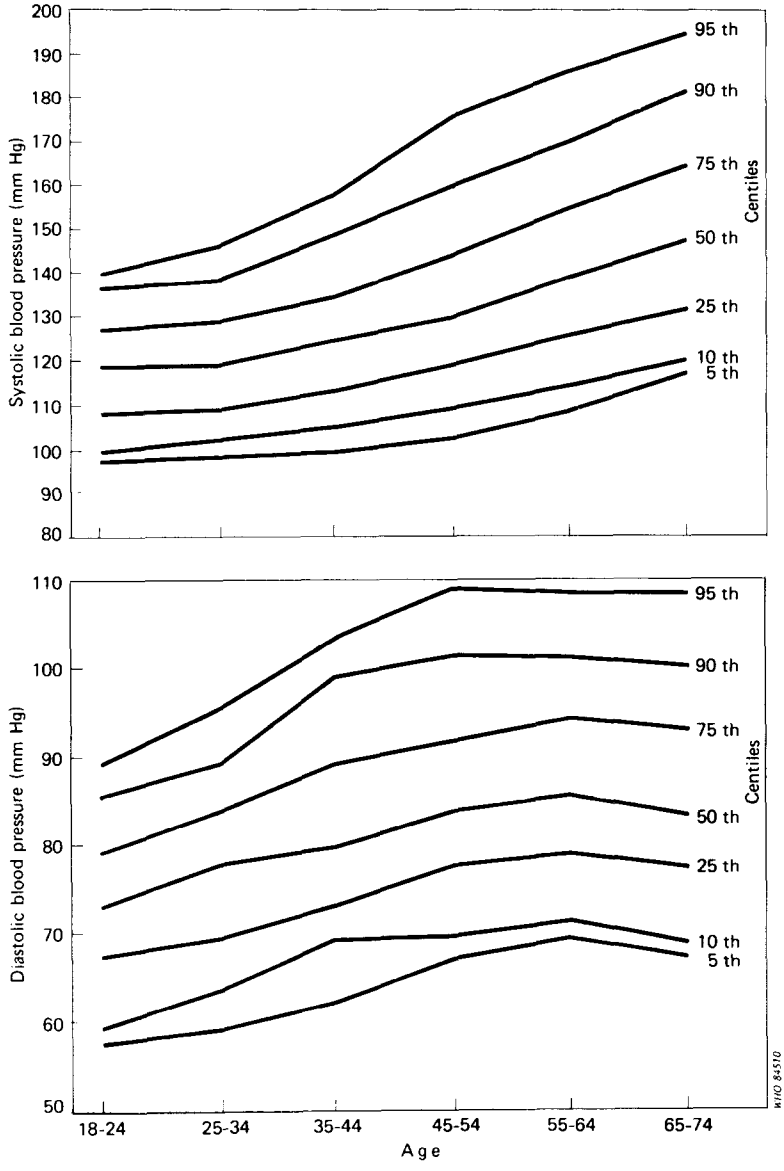
The blood pressure distribution curve has been idealized in order to accommodate both systolic and diastolic pressures on a single curve.

there is no observed increase with age. The importance of such exceptions is discussed in section 4.

Geographical aspects

People living in the mountainous regions of South America tend to have low blood pressure; however, these levels increase and also show a normal rise with age when the high-altitude residents migrate to the less primitive lowland regions. Interestingly, in Ethiopia, where highlanders have a higher socioeconomic status than lowlanders, they also have

Fig. 6. Systolic and diastolic blood pressure levels of adults aged 18–74 years, by selected centiles[a] (USA, 1971–74)



[a] Centile: the value of an item in a series of one hundred such items ranking from the smallest to the largest, e.g., the 10th centile is the value of the 10th member.

higher average blood pressures. Both Tokelauans migrating to New Zealand and Easter Islanders migrating to Chile show a subsequent rise in blood pressure. Some small communities have a tendency to higher than average blood pressures; for instance on the Hebridean island of Tiree higher pressures have been observed than on the mainland of west Scotland.

Although many of these studies are interesting, they fail to disentangle the complicated and sometimes conflicting influences of genetics, geographical location, culture, socioeconomic status, and diet.

2
HOW TO MEASURE BLOOD PRESSURE

IT is important not to be misled by the apparent simplicity of the procedure for measuring blood pressure. However, valid results can be obtained by observing basic rules concerning the patient, the instrument, the examiner himself, and the environment.

The patient

Most spurious diagnoses of hypertension are probably due to quick measurements made on unprepared and tense patients.[1] Before starting the measurement, the person to be examined should have been seated for at least 5 minutes, relaxing in a comfortable chair in a pleasant and reassuring atmosphere and must not have made any vigorous effort during the preceding 30 minutes, smoked, or taken coffee. The patient's upper arm should have been previously stripped and should be placed on a soft arm rest.

Measurement of arterial pressure with the patient in the sitting position is the most practical method. Measurement of arterial pressure with the patient in the lying position and again after he has been standing for 1–5 minutes may give useful clinical information about the hypertensive patient, particularly when under treatment.

It is also valuable to record the heart rate at the same time as the blood pressure measurement; this is particularly important during treatment with certain drugs (e.g., vasodilators, adrenergic inhibitors, and beta-adrenoceptor blockers).

[1] In the present context, "patient" includes healthy individuals undergoing a health check.