

WHAT IS NORMAL BLOOD PRESSURE?

By

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Blood Pressure is a quantity defying clear delineation between normal and raised values. The borderline between normal and abnormal blood pressure is so hazy and imperceptible as to represent a continuum. Essential hypertension does not differ qualitatively from the normal blood pressure being simply a quantitative extension of the normal. It represents the upper limits of the so called normal frequency distribution curve for blood pressure. The consequences of the high blood pressure are merely the mechanical or metabolic derangements effected by a physical quantum deviation of blood pressure. Blood pressure as a quantity is polygenically inherited as a graded characteristic and parents, sibilings, children and relatives resemble each other as much in their blood pressure as in their other physical characteristics. Besides what is normal blood pressure for one person may be abnormal for another. The actuarial statistics reveal that even within the normal range, persons with higher blood pressure are more prone to cardiovascular complications, morbidity, and mortality than those with lower blood pressure. This relationship begins with blood pressure level as low as 100/60 mm.Hg. (Build and Blood Pressure Study, 1959).

It has been reported that in isolated primitive tribes, no increase in blood pressure is witnessed with age (Lowenstein, 1961; Maddocks, 1961). Eastern Islanders living traditional lives

in isolation show no tendency for the blood pressure to rise with age. (Uruz-Coke, R. et al., 1964). In a longitudinal study reported by Harlen et al. (1962, 1971), the behaviour of blood pressure with respect to age resolved into three groups: one in which no rise of blood pressure occurred between the age 24 to 54; second, one in which blood pressure rose with age until the mid-thirties and, thereafter, stabilised and remained normotensive and the third in which there was progressive rise in blood pressure to above normal that became stabilised by the age of 36 and thereafter continued to rise progressively with age. It follows, therefore, that blood pressure as a quantity should remain constant from early childhood to old age unless disturbed by the factor not operant in primitive tribes living a community life free from environmental stresses inherent in modern environmental and political instability and insecurity and geographical mobility.

The limits of normal reported by several workers are given in the table 1. It shows that the upper limit of normal systolic blood pressure varies from 120 to 180 mm.Hg. and that of diastolic blood pressure from 70 to 110 mm.Hg. Obviously it does not help the clinician. Table 2 shows the average blood pressure in 1000 normal adults of rural and urban areas (100 subjects in each group).

The average blood pressure is relatively higher in urban population than in rural popula-

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tion. It is perhaps because of the environmental and psychosocial stresses to which the urban population is more prone. Table 3 shows that 10 subjects over the age of 70 years apparently in good health had blood pressure on the lower side of normal. It is perhaps relatively low blood pressure which spared these elderly subjects the onslaught of degenerative changes in the cardiovascular system. Table 4 outlines the factors which may affect the level of blood pressure.

The mechanism of rise in blood pressure is depicted in figure 1. The arteriolar wall is the target of morbid changes effected by neurogenic, renin-angiotensin-aldosterone system (RAA system) and volume overload. The three main determinants operate through increasing the circulating blood volume and narrowing arteriolar lumen. The neurogenic influences occasion release of catecholamines which increase the cardiac output through their inotropic and chronotropic effect and enhance peripheral arteriolar vasoconstriction and cause increased release of renin from juxtaglomerular apparatus leading to enhanced aldosterone secretion with consequent sodium and water retention. Renin-angiotensin-aldosterone system is activated by reduction in circulating blood volume and pressure or stretch in afferent arterioles or by autonomic stimulation. It sets in motion the events depicted in Figure 1, which culminate in sodium and water retention.

Circulating blood volume may be increased by excess salt intake, renin-angiotensin-aldosterone system activation and neurogenic stimulation, all operating through sodium and water retention, swelling the contents and walls of the arterioles.

Since in Pakistan, salt intake by habit, tradition and culture is excessive, dehydration occasioned by extremely hot climate during summer extending virtually over eight and nine months perpetually activates the (renin-angiotensin-aldosterone system). Besides, psychosocial stresses dictated by rapid urbanisation, geographic mobility, fast changing social values and political consciousness provoke vicious neurogenic influences. It is not, therefore, unexpected that blood pressure levels in Pakistan especially in urban population are on the upper limits of normal. These so called normal levels are in fact abnormal and inappropriate for the population at large magnifying morbidity and mortality specially from cardiovascular degenerative diseases.

It is proposed that systolic blood pressure exceeding 115 to 120 mm.Hg. and diastolic blood pressure exceeding 80 to 85 mm.Hg. should be treated under circumstances delineated in Table 5. The ideal therapeutic approach would be to advise salt restriction in the nation as a whole. If this is not enough, a thiazide diuretic coupled with a potassium sparer such as triamterene may be exhibited. If blood pressure is still in the upper limit of normal, it may be because either there is hyperreninaemia due to depleted fluid volume or hyperdynamic circulation with increased cardiac output and enhanced peripheral vasoconstriction due to excessive or inappropriate catecholamine function. In both situations, a beta blocker such as propranolol or oxprenolol would subdue blood pressure bringing it within average or lower limits of normal. Such an approach seems justifiable taking into consideration the higher mortality accompanying high blood pressure or blood pressure within the arbitrary normal range, and increased incidence of coronary artery disease and cerebral thrombosis in sub-

with so called 'normal' blood pressure showing hyperreninaemia apparently suppressed by fluid retention becoming manifest after the institution of fluid depleting therapy such as diuretics.

Table 1: Normal Blood Pressure

B.P.	Reference
120/ 80	Brucer (1939)
130/ 70	Brown (1947)
140/ 80	Aymen (1934)
140/ 90	Prera (1948)
140/ 90	Hurst & Logue (1947)
145/ 90	Wood (1960)
150/ 90	Friedberg (1956)
180/110	Evans (1956)

Table 2: Average Blood Pressure in 1000 Normal Adults

Age	Urban	Rural
21 to 30	120 75	110 70
31 to 40	130 80	120 75
41 to 50	145 90	130 80
51 to 60	150 95	140 80
61 to 70	160 100	145 85

Table 3: Blood Pressure in Old Age

No.	Age in Years	B.P.
1.	73, M	125/85
2.	72, M	120/70
3.	80, M	115/80
4.	75, M	130/85
5.	78, M	130/80
6.	73, M	140/80
7.	71, F	130/85
8.	74, F	125/80
9.	77, M	130/80
10.	95, M	140/90

Table 4: Variables Affecting B.P.

1.	Age
2.	Environmental Factors. —Emotional Upset —Pain —Exercise —Exposure to Cold —Diurnal Variations —Sleep —Social & Cultural Stresses Physician
3.	—Induced Defence Reflexes
4.	Salt Intake

Table 5: Indications for Intervention

1.	Family History of Hypertension and Ischaemic Heart Disease.
2.	Episodic Transient Overshoot of B.P.
3.	Evidence of Autonomic Hyperactivity
4.	Rise of BP after 35 Years of Age.
5.	High Plasma Renin Activity.

References

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INCREASED CIRCULATING VOLUME

EXCESS SODIUM CHLORIDE
INTAKE, HIGHER TASTE
THRESHOLD FOR NaCl, CULTURAL
AND EATING HABITS.

