

BLOOD PRESSURE – Student Guide

Definition -Blood pressure is a measure of the force that your heart uses to pump blood around your body.

Blood pressure is measured in millimetres of mercury (mmHg) and is given as 2 figures:

- systolic pressure – the pressure when your heart pushes blood out
- diastolic pressure – the pressure when your heart rests between beats

For example, if your blood pressure is "140 over 90" or 140/90mmHg, it means you have a systolic pressure of 140mmHg and a diastolic pressure of 90mmHg.

As a general guide:

- ideal blood pressure is considered to be between 90/60mmHg and 120/80mmHg
- high blood pressure is considered to be 140/90mmHg or higher
- low blood pressure is considered to be 90/60mmHg or lower

‘White Coat’ hypertension:

- Raised BP reading in doctor’s surgery or hospital may be artefactual. This affects women more than men.
- Prevalence and incidence data for raised BP therefore often take into account more than one reading.
- For individual patients, more than one BP reading is mandatory before diagnosis.
- Ambulatory BP monitoring can be helpful in evaluating the ‘white coat’ effect, in the diagnosis and follow up of hypertensive patients.

Why is BP important?

- Raised BP is usually asymptomatic, but is a risk factor for several serious medical conditions, hence why it is called the silent killer including the following listed below:

- o Cerebrovascular disease
- o Coronary disease o Renal disease
- o Premature mortality
- Systematic identification of people with raised BP and their appropriate management and follow up will reduce morbidity and premature mortality.
 - Identification and appropriate clinical management remains a longstanding challenge.

Epidemiology

The prevalence of hypertension varies with several factors

- Age - In most developed and developing countries, BP increases with age – probably due to increasing arterial stiffness as elastin is replaced by collagen in large arterial walls. The decreased arterial compliance causes aortic lengthening and dilatation – elevation of BP compensates for these physiological changes.

In older people, BP measurement may more often than in younger adults be misleadingly raised due to a) vascular stiffness and b) white coat syndrome. However, isolated systolic hypertension is more common than diastolic hypertension in older people; systolic BP is a better predictor of adverse consequences than diastolic. Pulse pressure is probably the best predictor of adverse events, but systolic is convenient to measure and more acceptable as a way of monitoring and treating H/T in older people.

- Gender differences ;

The prevalence of hypertension is greater in men than women until the sixth decade of life. Systolic BP is lower in young women than men.

Throughout adulthood, BP rises with age – and the rate increases more sharply in women, so by 60 years of age, raised BP is more common in women than men.

Diastolic BP averages lower for women than men, increases in both sexes with age, and then declines in the 40s and 50s. The risk of adverse events is greater in women with (hypotension) H/T:

- Obesity – Central abdominal obesity [waist >34ins women, >39ins men] is particularly associated with an increased risk of hypertension. The Framingham studies demonstrated that for every 10% weight gain there was a rise of 6.5mm Hg in systolic BP. Conversely, a Scottish intervention study showed that modest (10%) weight loss leads to 10mmHg decrease in systolic BP and 20mmHg decrease in diastolic BP.
- Ethnicity - Prevalence varies among ethnic and racial groups. For example, amongst American males aged 65-74, the prevalence of hypertension was: o African Americans: 72% Whites: 53%

African Americans have a 2-4 fold risk of developing hypertension compared with Caucasians. Their onset of hypertension is earlier and the adverse impacts in terms of cardiovascular disease, end stage renal disease and mortality are more pronounced. In the UK, African Caribbean's are at particularly high risk: their relative risk for H/T is 1.49 compared with the general population, while South Asians have a lower than average relative risk.

Racial and ethnic differences are likely to be caused by a combination of: o Genetic o Pathophysiological o Environmental o Dietary o Psychosocial factors

- Socioeconomic factors - Hypertension prevalence is higher in social classes IV and V than in other social classes. There is a correlation with lifestyle factors, including smoking prevalence, lack of exercise, obesity, and dietary salt intake. Observed probably relevant differences comparing soc classes IV and V with the general population: Higher consumption of processed foods . Higher alcohol consumption , Low intake of fruit and veg ,Physical inactivity , Low birthweight .

Lifestyle modifications

Changes in lifestyle can prevent or help to manage hypertension in some people. For example, lifestyle modifications can decrease systolic BP by 6-10mm Hg and diastolic BP by 2-6mm Hg. Even with medication, lifestyle modifications may still reduce the dosage or number of medications required.

Modifications may include: • Stop smoking • Reduce dietary intake of saturated fat and cholesterol • Attain normal body weight • Limit alcohol intake to not more than 30ml [c.3 units] ethanol/day (for men - half for women) • Increase aerobic physical activity • Reduce sodium intake to not >2.4g Na or 6g NaCl • Maintain adequate dietary intake of K, Ca and Mg (K is potassium, Ca is calcium, Mg is magnesium).

Sodium intake Amongst overweight people, high sodium intake was associated with raised risk of incidence and mortality from stroke, cardiovascular disease mortality and mortality from all causes, in comparison with non-overweight people, in whom dietary sodium was not found to be significantly associated with cardiovascular disease risk.

Tea intake In China, the risk of developing hypertension among the Chinese population has been shown to be significantly reduced through consumption of 120ml/day or more of moderate strength green or oolong tea for one year. Consumption of 600ml/day or more conferred greater protection. Tea consumption for more than one year was not associated with further reduction in hypertension risk.

Compliance Compliance with lifestyle modifications is often poor, both by individuals trying to prevent or manage hypertension, and for populations hearing health promotion advice. Getting people to take seriously the idea of lifestyle modification in order to prevent a problem that they may not perceive as important or dangerous is problematic.

The recently published government public health White Paper for England, Choosing Health (DoH 2004) aims to encourage lifestyle change as a nationwide priority.

Figure 3: The impact of lifestyle modification

Fewer side effects from lower consumption of prescribed antihypertensive medication • Better health for the patient – and NB: lifestyle modification will impact favourably on risk factors for other conditions • Economic factors – lower prescribing costs • Self management – emphasis on patient empowerment – to establish generations of better informed patients, able to manage their own conditions with professional support, rather than being fully dependent upon professional advice.

Of those people who have raised BP, many do not receive adequate treatment and under half will not know they have raised BP (see Fig 2). In England, of those who are treated, just over half will be receiving adequate treatment

Common diseases associated with hypertension

Common diseases associated with hypertension

- Coronary heart disease – This is an important cause of serious morbidity and premature death. It is more associated with elevated systolic BP than diastolic, especially in older people. Treatment of hypertension – especially systolic - reduces risk of MI and CCF.

- Left ventricular hypertrophy - 50% of patients with hypertension have some degree of LVH. Antihypertensive treatment reduces LVH by reducing afterload.

- Cerebrovascular disease – Alongside other risk factors such as smoking and elevated cholesterol, hypertension is an important risk factor for stroke. Controlling blood pressure reduces risk of stroke AND reduces risk of subsequent stroke in patient who has already had a stroke. Hypertension may be a direct cause of haemorrhagic stroke; it is thought to indirectly cause thrombotic stroke by potentiating the cardiovascular causes of stroke (LVH, CCF).

It is estimated that a 5-6mm reduction in diastolic BP and 10-12mm in systolic BP would reduce annual stroke incidence from 7% to 4.8%: NNT of 45 to avoid one stroke per year.

- Diabetes - 30% of patients with T1DM eventually develop hypertension. This usually reflects the development of end organ damage, such as diabetic nephropathy. The mortality rate of patients with concurrent diabetes and hypertension is 2x higher than those without.

Hypertension does not directly cause diabetes; diabetes does not directly cause hypertension. Both are multifactorial. But the presence of one compounds the adverse effects of the other. Because of the strong association between hypertension and DM, BP goals for diabetics are set lower than for the general population. Standards for management of diabetes in England are set out in the NSF (2001 and 2003).

Renal disease - Renal disease progression is associated with diastolic BP>90mmHg. As for diabetics, BP goals are lower for patients with renal disease than the general population.

Hypertension causes raised glomerular blood flow, leading to raised glomerular filtration, leading to glomerular sclerosis. Sclerosis leads to proteinuria and cascade towards renal failure. Renal failure can occur with normal BP, but hypertension accelerates progression. In patients with renal disease, 25-28% will progress to end-stage renal disease because of H/T.