

## 8 Hypertension

### Burden, epidemiology and priority interventions

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Raised blood pressure (BP) is the leading cause of mortality worldwide and the main risk factor for cardiovascular disease (CVD). Most people with raised BP have no symptoms and are only diagnosed through screening, through a health check or when they have a CVD event, such as a stroke, a heart attack or heart failure. Reducing the prevalence of raised BP is one of the nine targets of the WHO Global NCD Action Plan. A number of cost-effective interventions at the population and individual levels are available to prevent and control raised BP. Diagnosis and treatment of hypertension should be a priority public health intervention in all countries as well as the main component of any programme aiming to reduce CVD.

#### **Definitions**

'Optimal' BP is most often defined as <120/80 mmHg. Hypertension is usually defined as BP  $\geq$ 140 and/or 90 mmHg<sup>1,2</sup> but reduced to  $\geq$ 130/80 mmHg for example in guidelines in the USA.<sup>3</sup> As BP increases, so does the risk of CVD. Accurate measuring of BP is critically important because once a patient is started on the treatment they often should remain on it for life. Therefore to confirm the diagnosis of hypertension, multiple readings of high BP need to be obtained over a period of time. The increase in BP that transiently results from the normal physiological response to stress or during physical activity is not hypertension.

#### **Prevalence and disease burden**

##### *Prevalence of high BP*

The global number of persons with high BP has doubled over the past 30 years, affecting around 1.3 billion people in 2019,<sup>4</sup> and numbers will continue to increase because of growing and aging populations. Prevalence of hypertension in most countries ranges from 2–10% at 5–30 years of age to 15–40% (30–60 years) and 30–60% (60+ years). It is therefore important to standardize for age when comparing the prevalence of high BP across different populations or over time. The age-standardized mean BP seems to have decreased between

Table 8.1 Number and percent of deaths and age-standardized mortality attributable to high BP (IHME)

	<i>Global</i>		<i>HICs</i>		<i>Upper-MICs</i>		<i>Lower-MICs</i>		<i>LICs</i>	
	2019	1990	2019	1990	2019	1990	2019	1990	2019	1990
Number of deaths (million)	10.9	6.8	1.9	2.1	4.6	2.6	3.8	1.8	0.5	0.3
% of all deaths	19.2	14.5	17.5	24.9	23.8	17.4	18.1	9.8	9.8	5.2
Age-standardized mortality rates (per 100,000)	139	198	73	166	153	214	187	215	183	203

1975 and 2015 in high-income countries (HIC), but with varying trends in other countries, reflecting differences in prevention, treatment and progression of the obesity epidemic across countries.<sup>5</sup>

### ***Disease burden attributable to high BP***

High BP caused 10.9 million deaths worldwide (19.2% of all deaths) in 2019 (Table 8.1), of which 92% were attributable to CVD (mainly heart attack, heart failure, and stroke) and 8% were attributable to kidney disease (IHME). The overall disease burden attributable to high BP increased between 1990 and 2019 in most regions (except in HICs), largely because of growing and aging populations. However, age-standardized mortality rates attributable to high BP decreased in most countries between 1990 and 2019, more markedly in HICs than in low- and middle-income countries again, partly reflecting better prevention and control in the former than the latter.

### **Risk factors**

The main modifiable risk factors of hypertension are overweight/obesity, unhealthy diet (high in salt and low in vegetables and fruit), harmful use of alcohol and physical inactivity. Being overweight/obese alone can account for up to 20–50% of cases of hypertension,<sup>6</sup> especially among children. The majority of obese people with high BP will reduce their BP to normal if they return to normal weight. Diets rich in fruit and vegetables, which are high in potassium (which can include substituting sodium chloride for potassium chloride), reduce BP and thus CVD risk.<sup>7</sup> Similarly, hypertension is less common among populations that are lean and physically active.

### **Interventions at the population level**

Population-based interventions to reduce the exposure to the risk factors described above can have a large impact on the hypertension-related burden because they lower BP in the entire population – and even if this is by a

small amount it can have a significant impact on the population level (see Chapter 36).<sup>8</sup> These interventions (which include several WHO best buys) are described in detail in other chapters of the compendium.

## **Interventions at the individual level**

### ***Diagnosis of hypertension***

Measuring BP should be considered at any face-to-face consultation with a healthcare professional and health checks provide an opportunity to do this (Chapter 43 on health checks). For young adults, measurement of BP every 3–5 years is reasonable. For older adults, this should be more frequent.<sup>9</sup>

Where an initial reading is elevated, at least one or two additional readings should be taken on the same visit, and readings repeated on at least two additional visits at several day or week intervals. In up to 20% of patients, BP can be systematically higher (and sometimes substantially higher) when assessed in a healthcare setting compared to being measured at home. BP self-measurement at home using a personal BP device should therefore be encouraged to support measurements done in the clinic.<sup>10</sup> Guidelines are available on how to measure BP accurately (e.g. cuff width in relation to arm circumference, rest duration before a reading is made, time intervals between BP readings).

Where BP is dangerously high ( $\geq 180/120$  mmHg), or there has been an acute CVD event, or damage is identified to the heart, kidney or other organs as a result of raised BP, immediate treatment should be provided.

## **Management of hypertension**

### ***Reducing behavioural risk factors***

Before initiating medical treatment, individuals should be encouraged to develop a healthier lifestyle, including a healthy diet (reducing salt intake to  $<5$  g daily, eating more fruit and vegetables and limiting the intake of foods high in saturated fats and reducing/eliminating trans fats), being physically active, controlling their body weight and reducing alcohol consumption. Together, these interventions can reduce BP by around 5–10 mmHg on average in standard clinical settings. All patients should also be strongly encouraged to quit smoking to reduce their CVD risk.

### ***Medication***

Drug treatment should be started if BP remains high after a few weeks or months of lifestyle changes – the time depends on the level of BP and risk of CVD risk. A number of national and international authorities have published

guidelines on when to start treatment, including by WHO. The criteria below are those from WHO:

- Systolic BP is  $\geq 140$  mmHg and/or diastolic BP is  $\geq 90$  mmHg.
- Systolic BP is  $\geq 130$  mmHg in individuals with existing CVD and individuals without CVD but with high CVD risk, diabetes or chronic kidney disease.

Generic antihypertensive drugs are commonly available and are generally inexpensive. Most have relatively few side effects. It is now well recognized that a larger benefit can result from combining several drugs in single-pill combinations.<sup>11,12</sup>

A number of authorities have issued guidance on treatment regimens. Those from WHO are that initial treatment should be with a single-pill combination (to improve adherence and persistence), consisting of  $\geq 2$  drugs from the following classes: diuretics (thiazide or thiazide-like), angiotensin-converting enzyme inhibitors or angiotensin-receptor blockers and calcium channel blockers. The aim should be to reduce BP to  $< 140/90$  mmHg ( $< 130$  for those with a history of CVD, diabetes or chronic kidney disease). Beta-blockers are recommended for patients with hypertension and cardiac diseases.

Other classes of medications can be useful in particular situations (e.g. labetalol [a beta blocker] or methyldopa for hypertension in pregnancy or resistant hypertension). Antihypertensive treatment typically reduces office BP by  $\sim 10$ – $30$  mmHg on average, which translates into a 20–60% relative reduction in the risk of CVD. Medication will normally be required for life, yet a major challenge is to ensure that patients continue to take treatment over the long term to maintain BP control.

After the start of treatment or when changing treatment, patients should be reviewed monthly until the target BP is reached, and then at 3–6 months intervals afterwards. A CVD risk assessment (see below) and screening for comorbidities should be undertaken where feasible and provided this does not delay treatment.

As high BP is asymptomatic, and in many settings the costs are significant and/or the availability of drugs is limited, adherence to treatment decreases rapidly over time and does not exceed 50% globally.<sup>13,14</sup> In LICs, less than 10–20% of those with hypertension have their BP effectively controlled.<sup>15</sup> There is therefore continued interest in tools and interventions that can support treatment adherence, e.g. using polypills, pill organizers or the use of mobile technologies.<sup>16</sup>

### ***Resistant hypertension and secondary hypertension***

Where BP is not decreasing with treatment and it is not believed to be due to lack of adherence to medication (which is the most common cause, albeit often difficult to ascertain), an underlying cause ('secondary hypertension') can be

investigated (such as a renal or endocrine conditions, such as primary aldosteronism)<sup>17</sup>, with hypertension responding sometimes to appropriate treatment.

### ***Surgery***

Where individuals are morbidly obese, gastric surgery is performed in some settings. This procedure often reduces BP significantly and, in many cases, to levels that no longer require treatment.<sup>18</sup>

### ***Ongoing care***

This is required to monitor BP, ensure optimal treatment and assess risk or emergence of CVD, renal and/or other diseases and manage them appropriately. This can all be managed at a primary care level, in partnership between local healthcare workers and the patient. Low-cost electronic BP monitors are now widely available for patients to use and can improve adherence to treatment and a healthy lifestyle. It is important to ensure this equipment is reliable and accurate.<sup>19,20</sup>

### **Hypertension as part of total CVD risk assessment and treatment**

Screening and treatment of hypertension should be part of a broader assessment of CVD risk and management programme. CVD risk assessment takes into account additional risk factors such as age, BMI, blood lipids, glucose levels, tobacco use, alcohol consumption and history of CVD. A range of charts and calculators are available to assess an individual's risk of CVD.<sup>21,22</sup> Ideally, risk scores should be underpinned by data obtained from the local population and updated regularly to take account of changing risk (as CVD risk is decreasing in most populations). Where this is not possible, risk scores are available, for example WHO region-specific risk scores.<sup>23</sup>

### **The importance of strong health services and systems**

The very large numbers of people who need individual-based management for their hypertension, which is often lifelong, emphasize the importance of effective and efficient health services and systems (Chapter 42). This includes:

- Patient-centred services that reduce barriers to use and access, including low-cost or free medical visits and medications, convenient times for consultations and repeat (and in stable patients multi-month) prescriptions, once-daily/single-pill combination treatment regimens, ready access to free BP monitoring (including devices for self-measurement), and the opportunities to increase health literacy around BP control and CVD.
- Community-based multidisciplinary teams, with task sharing so the healthcare workers who are most accessible to patients can provide care,

including adjusting regimens. Pharmacological treatment of hypertension may be provided by non-physician professionals such as pharmacists and nurses, provided the following are in place: proper training, prescribing authority, specific management protocols and physician oversight.

- Uninterrupted supply of quality-assured medications.
- Patient registers for easy retrieval of risk factors measurements and treatment over time. Electronic medical files are particularly helpful.
- Regular training of healthcare staff on the diagnosis and management of hypertension and NCDs.
- Treatment protocols. These need to be simple and practical, yet provide sufficient detail on diagnosis and management, including treatment regimens, as well as criteria for referral.

The WHO HEARTS technical package provides an example of a strategic approach to improving cardiovascular health through a set of six modules (**h**ealthy-lifestyle counselling, **e**vidence-based treatment protocols, **a**ccess to essential medicines and technology, **r**isk-based CVD management, **t**eam-based care, **s**ystems for monitoring).<sup>24</sup>

#### Relevant WHO Global NCD Action Plan targets for raised BP

A 25% relative reduction in the prevalence of raised BP, or contain the prevalence of raised BP, according to national circumstances.	Age-standardized prevalence of raised BP among persons aged 18+ years (defined as systolic/diastolic BP $\geq 140/90$ mmHg) and mean systolic BP.
At least 50% of eligible people receive drug therapy and counselling (including glycaemic control) to prevent heart attacks and strokes.	Proportion of eligible persons (defined as age 40+ years with a ten-year CVD risk $\geq 30\%$ , including those with existing CVD) receiving drug therapy and counselling (including glycaemic control) to prevent heart attacks and strokes.
An 80% availability of affordable basic technologies and essential medicines, including generics, required to treat major NCDs in both public and private facilities.	Availability and affordability of quality, safe and efficacious essential NCD medicines, including generics, and basic technologies in both public and private facilities.

Global targets on reducing: (i) harmful use of alcohol; (ii) salt/sodium intake; and (iii) physical inactivity, as well as the target to halt the rise in diabetes and obesity are important related targets.

#### Monitoring

Population-based surveys such as STEPS (Chapter 5) are required to estimate the prevalence of raised BP, as well as trends in the proportions receiving

treatment/counselling and being controlled. Ideally, surveys should allow BP to be measured in individuals who have raised BP on more than one occasion as surveys based on measurements on a single day tend to overestimate the actual prevalence of hypertension.<sup>25</sup> The availability of equipment, medicines and protocols for treating raised BP can be assessed through surveys such as the Health Service Availability and Readiness Assessment (SARA) which are used to monitor the delivery of NCD services.

## Notes

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