Int J. Curr Inn Adv Res, Vol: 6, Issue: 1, 2023; 17-23

Review Article

International Journal of Current Innovations in Advanced Research

Content Available at www.ijciar.com ISSN (O) 2636-6282 ISSN (P) 2659-1553

AN UPDATED REVIEW ON HYPERTENSION

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DOI: https://doi.org/10.47957/ijciar.v6i1.145

Received: 11 Jan 2023 Revised: 17 Feb 2023 Accepted: 14 March 2023

Abstract

A common, aging-related chronic condition called hypertension frequently results in kidney and heart problems that are quite serious. A number of additional cardiovascular risk variables are frequently reported together with blood pressure. Automated blood pressure testing methods are becoming more and more common in the diagnosis of hypertension. The main or secondary kidney's failure to drain salt at a normal blood pressure is a prerequisite for the pathophysiology of essential hypertension. Many people with hypertension are unaware of their disease, and among those who have been identified, therapy is typically insufficient. Population-level actions are necessary to stop the onset of hypertension as well as to enhance community hypertension awareness, care, and management. In this review we focus on the epidemiology, risk factors, and diagnosis, screening and preventive measures of hypertension.

Keywords: hypertension, kidney and heart problems, epidemiology, preventive measures

Introduction

One of the most common chronic diseases in the world today is hypertension, also known as the silent killer [1].According to WHO, hypertension is diagnosed when the systolic blood pressure readings on both days are 140 mmHg and/or the diastolic blood pressure readings on both days are 90 mmHg. A high blood pressure (BP) is one of the leading risk factors for cardiovascular disease and death. The hypertension definition limits are chosen to reflect the risk of disease associated with elevated blood pressure, though risk increases even within the 'normal' BP range. Stroke, myocardial infarction (MI), left ventricular hypertrophy (LVH) and failure, renal disease, retinopathy, and peripheral arterial disease are all risk factors for hypertension [2].

Worldwide, hypertension is the leading cause of cardiovascular disease and premature death. Global mean blood pressure (BP) has remained constant or decreased slightly over the last four decades due to the widespread use of antihypertensive medications. Hypertension, on the other hand, has become more common, particularly in low- and middle-income countries (LMICs). According to estimates, 31.1% of adults (1.39 billion) worldwide had hypertension in 2010. High blood pressure affects more than one billion adults worldwide and is the most important modifiable risk factor for cardiovascular disease death [3]. Hypertension, also known as high, raised, or elevated blood pressure, is a chronic non communicable disease (NCD) [4].

Blood pressure is the force exerted by circulating blood on the walls of the body's arteries, which are the major blood vessels. Blood pressure is represented by two numbers. The first (systolic) number represents blood vessel pressure when the heart contracts or beats. The second number (diastolic) represents the pressure in the vessels when the heart is at rest between beats. [The World Health Organization] Hypertension is common in young people, affecting 1 in every 8 adults aged 20 to 40. Although the mechanisms are unknown, early-life factors influence blood pressure (BP); BP tracks strongly within individuals from adolescence to later life. Higher blood pressure at a young age is linked to abnormalities on heart and brain imaging and increases the risk of cardiovascular events by middle age. However, diagnosis rates are lower, and treatment is frequently delayed in children [5].

The current prevalence of hypertension in children is estimated to be between 1% and 5%, with higher rates in minority adolescents. 1–3 Primary hypertension (PH), also known as essential hypertension, was previously thought to be a disease of adulthood but has now become more common in the paediatric population, owing largely to the obesity epidemic [4, 5]. Obese children are three times more likely than non obese children to develop hypertension [6]. Pulmonary hypertension definition a resting mean pulmonary artery pressure of 25 mm Hg is considered pulmonary hypertension. [7]

Epidemiology

Hypertension is a worldwide epidemic that affects one billion people and is the leading cause of death [8]. BP levels had narrow distributions in pre-industrial societies, with mean values that changed little with age and averaged around 115/75 mmHg12 [9]. A value that most likely represents the normal (or ideal) blood pressure for humans However, in most modern societies, both men and women's systolic blood pressure levels rise steadily and continuously with age. This pervasive finding could be explained by the fact that age is a proxy for the likelihood and duration of exposure to the numerous environmental factors that gradually raise BP over time, such as excessive sodium consumption, insufficient dietary potassium intake, overweight and obesity, alcohol consumption, and physical inactivity. Other factors, such as genetic predisposition or an adverse intrauterine environment (such as gestational hypertension or pre-eclampsia), have small but significant associations with adult high blood pressure levels[10].Even minor increases in mean population blood pressure result in significant increases in the absolute number of people with hypertension[11].

As economic development advances, hypertension initially affects those with a high socioeconomic status, but at later stages of economic development, the prevalence of hypertension and its consequences are greatest in those with a low socioeconomic status; this phenomenon occurs both within and between countries. Furthermore, the rate of change in hypertension prevalence from 2000 to 2010 has been much faster than in previous epidemiological transitions [10].

Diseases Burden

Currently, 874 million persons worldwide have systolic BP below 140 mmHg, while 3.5 billion adults around the world have non-optimal systolic BP values (defined as >110-115 mmHg). Consequently, almost one in 4 individuals suffers from hypertension. The number of healthy life years lost worldwide to non-optimal blood pressure increased by 43% between 1990 and 2015, as a result of population growth, population ageing, and a 10% increase in age-standardized prevalence of hypertension.

Non-optimal blood pressure continues to be the largest risk factor for the global burden of disease and global all-cause mortality, contributing to 9.4 million deaths and 212 million lost healthy life years (8.5% of the total global loss) annually, according to the Global Burden of Disease research [10].

Risk Factors

Over a five-year period, the risk factors for developing hypertension from normal blood pressure or prehypertension were evaluated using crude models as well as multivariable logistic regression models with adjustments for age, gender, smoking and drinking habits, baseline systolic and diastolic blood pressure, pulse rate, body mass index (BMI), diabetes mellitus, dyslipidemia, chronic kidney disease, and serum uric acid (or hyperuricemia), and ORs were analysed in each group. All analyses were gender stratified. Serum uric acid elevation is a strong risk factor for developing hypertension from pre hypertension [12]. According to multivariate logistic regression analysis, ageing, obesity, and abdominal obesity were the most common risk factors for pre hypertension and hypertension. Tobacco and alcohol use, low fruit and vegetable consumption, physical inactivity, overweight and obesity, HBP, hyperglycemia, and dyslipidemia were the risk factors studied (STEPS core modules)[13].The risk of hypertension rises steadily as anthropomorphic measurements (waist circumference, waist-to-hip ratio, and waist-to-height ratio) rise in tandem with BMI [14].

Cardiovascular Risk

Hypertension is the most serious or one of the most serious risk factors for almost every type of cardiovascular disease that can occur in life, including coronary disease, left ventricular hypertrophy and valvular heart disease, cardiac arrhythmias such as atrial fibrillation, cerebral stroke, and renal failure[15].Many recent hypertension guidelines strongly recommend risk assessment and stratification strategies for hypertensive patients in order to guide and recommend early intervention for high risk patients and prevent the progression to severe CVD [16]. Social determinants, lifestyle factors, biochemical factors, and genetic factors are the four broad categories of cardiovascular risk factors [17].

Pregnancy Induced Hypertension

Pregnancy-induced hypertension (PIH) affects approximately 6-10% of pregnancies. It is defined as systolic blood pressure (SBP) greater than 140 mmHg and diastolic blood pressure (DBP) greater than 90 mmHg. Mild (SBP 140-149 and DBP 90-99 mmHg), moderate (SBP 150-159 and DBP 100-109 mmHg), and severe (SBP 160 and DBP 110 mmHg) are the three levels.

During pregnancy, haemodynamic changes include a decrease in systolic, diastolic, and mean arterial blood pressure in the second trimester, followed by a slight increase in the third, a decrease in total vascular resistance, particularly in the second trimester, and an increase in cardiac output.PIH is a common health issue that has negative consequences for both the mother and the fetus/neonatal. It is thought to be a multi factorial health condition, the pathogenetic mechanism of which is still unknown. More research into the latter will also contribute to more effective medical treatment and pregnancy outcome optimization. In the meantime, there is great concern about the use of antihypertensive medication, particularly in cases of mild hypertension. More randomised controlled trials are needed to assess the ratio of maternal-fetal benefit to risk of foetal adverse effects [18].

Diabetes and Hypertension

Hypertension affects approximately 70% of diabetic patients and is roughly twice as common in diabetics as in non-diabetics. 3 The prevalence of coexisting hypertension and diabetes varies by ethnicity, race, and social class. Importantly, hypertension in diabetic patients increases the risk of vascular complications in this population, and both conditions predispose to chronic kidney disease. To avoid associated microvascular and macrovascular morbidity and mortality, both hypertension and diabetes should be diagnosed early and aggressively treated [19].

Pregnant women who have diabetes and high blood pressure are at risk for pre-eclampsia. End-organ disease is especially dangerous in children with type 1 diabetes and hypertension. The rise in childhood type 2 diabetes is concerning, as cardiovascular risk factors early in life can lead to accelerated atherosclerosis with aging [18, 19].

Kidney and Hypertension

At least four key kidney functions are involved in hypertension. One is the creation of renin, an aspartic protease that breaks down angiotensinogen into angiotensinI. This angiotensin I-converting enzyme then reacts on this angiotensin I-II to produce angiotensin II. Renin synthesis and secretion by the kidney are closely controlled processes because they are the rate-limiting step for activation of the circulating renin-angiotensin system (RAS) [23]. Pro-renin, an inactive precursor to renin, is first created; however, when it binds to the pro-renin receptor, it becomes active (PRR). Resetting or changing pressure diuresis and natriuresis is the second important function of the kidney in hypertension. The kidney's third and most recent role in hypertension is to control systemic sympathetic tone by producing reflex signals [20].

Causes

The most prevalent secondary cause of hypertension, obstructive sleep apnea, is commonly disregarded and is linked to resistant hypertension [21]. Certain drug classes can also cause hypertension [22]. Hypertension in humans has been linked to chronic lead exposure, which increases oxidative stress and adrenergic over activity [3]. Hypertension caused by a combination of subcutaneous DOCA pellet implantation, a high-salt diet, and unilateral nephrectomy [23]. Irving Page claimed that wrapping the kidneys in cellophane led to hypertension in 1939 [24]. While the main environmental causes of high blood pressure (BP) are mental stress, a high salt diet, and obesity [25], the genes that cause high blood pressure have not yet been conclusively found. Reduced micro vascular density is observed in hypertensive patients, and some data suggest that rarefaction plays a fundamental role in the development of hypertension [26]. Stress-related hypertension makes the hypothalamus more sensitive to excessive salt levels, which causes SNA and BP to rise even more. Later, structural remodelling of resistance arteries and non-neural functional changes (such as a decrease in nitric oxide) helped to further increase vasoconstriction [27]. Stress-related hypertension makes the hypothalamus more sensitive to excessive salt levels, which causes SNA and BP to rise even more. Later, structural remodelling of resistance arteries and non-neural functional changes (such as a decrease in nitric oxide) further intensify vasoconstriction. [27]. Many alkylating substances can raise blood pressure. Following autologous bone marrow transplantation, 15 of 18 patients in one critical case who were given numerous alkylating drugs developed hypertension. Patients who are older and have a family history of essential hypertension are more likely to experience glucocorticoid-induced hypertension [28]. The two most common causes of pulmonary hypertension are lung and left heart disease [7].

Diagnosis and Screening

Using validated and calibrated BP measuring devices and according to the standardised BP measurement process, primary health centres and facilities above that level should diagnose hypertension. Except in cases of hypertensive

urgencies and hypertensive emergencies, where hypertension is diagnosed during the initial visit, the diagnosis of hypertension should be based on at least 2 measurements taken in the clinic or by a healthcare provider on at least 2 visits, each of which should be at least 1-4 weeks apart. It is not advised to use ambulatory blood pressure monitoring or home blood pressure monitoring to diagnose the majority of hypertensive patients in India. When BP is consistently above a systolic of 140mm and/or diastolic of 90mm, hypertension should be diagnosed using validated and calibrated BP measuring devices and according to the standardised BP measurement process, primary health centres and facilities above that level should diagnose hypertension [29]. Except in cases of hypertensive urgencies and hypertensive emergencies, where hypertension is diagnosed during the initial visit, the diagnosis of hypertension should be based on at least 2 measurements taken in the clinic or by a healthcare provider on at least 2 visits, each of which should be at least 1-4 weeks apart. It is not advised to use ambulatory blood pressure monitoring or home blood pressure monitoring to diagnose the majority of hypertensive patients in India. When BP is consistently above a systolic of 140mm and/or diastolic of 90mm, hypertension should be diagnosed [7]. Opportunistic screening of people older than 18 at each point of contact with medical practitioners or allied health employees will be used to detect hypertension in all adults. The village/multipurpose health worker, trained non-physician personnel at sub-centers, main health centre, community health centre, and referral hospital will all be included in this (District hospital, Medical College). With the help of the right lifestyle changes, those with high normal blood pressure can be detected and prevented from developing hypertension [29].

Treatment

Initial Treatment of Hypertension

The 2017 ACC-AHA Hypertension Guideline redefines hypertension as a systolic blood pressure of at least 130 mm Hg or a diastolic blood pressure of at least 80 mm Hg. The target blood pressure is now less than 130/80 mm Hg.

- When deciding when to begin taking blood pressure-lowering medicine, the initial examination should take into account any coexisting diseases, such as cardiovascular disease, diabetes mellitus, chronic renal disease, and an increased risk of cardiovascular disease.
- Reducing dietary sodium intake, losing weight if the patient is overweight, exercising, drinking alcohol in moderation, and consuming more potassium-rich foods are all suggested lifestyle changes.
- In general, the first antihypertensive medicine should come from one of the four drug classes—ACE inhibitors, angiotensin-receptor blockers, calcium-channel blockers, and thiazide-type diuretics—that have been demonstrated to lower cardiovascular events.
- Subsequent visits are necessary to maintain hypertension management [30].

Aldosterone-Releasing Drugs

Aldosterone is a mineralocorticoid that regulates electrolyte and volume homeostasis in healthy individuals. However, when levels are elevated, it can also play a role in the onset of hypertension as well as a number of related pathologies, such as myocardial hypertrophy and fibrosis as well as heart failure (HF). The mineralocorticoid receptor (MR), a nuclear transcription factor that is expressed at high levels in the cortical collecting duct of the kidney, is the primary effector of aldosterone activity. A volume-expanded form of hypertension develops over time as a result of increased sodium, water, and potassium loss as a result of activated MRs' stimulation of sodium channel development. The development of hypertension and CVD is further aided by the activation of MRs in extraadrenal tissues, particularly the heart and blood vessels, by upregulating NADPH oxidase and boosting reactive oxygen species generation.Nitric oxide bioavailability is decreased as a result, which causes vascular disorders and endothelial dysfunction. Aldosteronesynthase, a mitochondrial cytochrome P450 enzyme that is encoded by the CYP11B2 gene11, produces aldosterone from 11-deoxycorticosterone in the zonaglomerulosa of the adrenal cortex. The last three rate-limiting steps in the synthesis of aldosterone—the 11-hydroxylation of 11-deoxycorticosterone to produce corticosterone, the 18-hydroxylation of corticosterone to produce 18OH-corticosterone, and the 18-oxidation of 18-OH corticosterone to produce aldosterone—are catalysed by aldosteronesynthase. The 11-hydroxylase enzyme, which is encoded by the CYP11B1 gene, is a mediator of cortisol synthesis, which takes place in the zonafasciculata of the adrenal cortex. Designing selective aldosteronesynthase inhibitors is difficult because CYP11B2 and CYP11B1 share an 11-hydroxylase reaction and have a high degree of sequence homology [31].

Hypertensive Medications Used While Pregnant

Everyone agrees that immediate treatment of severe hypertension is necessary to lower the risk of acute cerebrovascular problems in pregnant women. There is disagreement over whether antihypertensive medications in mild to severe hypertension improve maternal or foetal outcomes. Antihypertensive medications have been shown to cut the risk of severe hypertension in half during pregnancy. Antihypertensive medications have not been proven to lower preeclampsia or perinatal death, not been connected to better foetal growth. Clinical investigations show inconsistent results regarding the effects of antihypertensive therapy on the hospitalisation rate for pregnant women, proteinuria at delivery, and neonatal respiratory distress syndrome. Since a long time ago, hydralazine has been considered the first medication of choice for treating severe hypertension during pregnancy. Recent research suggests that nifedipine, a calcium antagonist, might be a preferable substitute. Due to fetotoxicity, angiotensin converting enzyme inhibitors and angiotensin II receptor antagonists should be stopped using. Low birth weight is linked to the first trimester 1-selective adrenoceptor blocker atenolol [32].

Antihypertensive Beta Blockers

The criteria were met by 13 RCTs. Diuretics (5 RCTs, 18,241 participants), beta-blockers (4 RCTs, 23,613 individuals), calcium-channel blockers (CCBs), renin-angiotensin system (RAS) inhibitors, and placebo was all compared (3 RCTs, 10,828 participants). The majority of these RCTs, which were carried out between the 1970s and the 2000s, had a significant risk of bias as a result of restrictions on research conduct, design, and data analysis. There were 40,245 participants who were using beta-blockers, with atenolol being used by 75% of them. No outcome trials using the more recent vasodilating beta-blockers were discovered (e.g. nebivolol) [33]. Treatment of pulmonary hypertension generally Patients with pulmonary hypertension who get rehabilitation treatments and active physical therapy had improved exercise tolerance, quality of life, and heart function [7].

Treatment Goal

The disease of hypertension cannot be cured. Containment of the disease, or stabilising the patient at a satisfactory clinical level without showing symptoms of right heart failure and, ideally, without disease progression, is the aim of treatment [7].

Prevention

By Environmental Factors

Due to a significant influence by important environmental and lifestyle factors, the risk for hypertension is changeable and substantially preventable. A healthy diet lowers blood pressure. The diet recommended by Dietary Approaches to Stop Hypertension (DASH) is notably efficient for reducing blood pressure [14]. A healthy diet lowers blood pressure. For decreasing blood pressure, the Dietary Approaches to Stop Hypertension (DASH) eating plan is very helpful. The DASH diet is low in cholesterol, refined sugar, and saturated fat while being high in fruits, vegetables, whole grains, nuts, legumes, lean protein, and low-fat dairy products[34]. Compared to sodium restriction or the DASH diet alone, the combination of low sodium intake and the DASH diet significantly lowers blood pressure [14, 35]. A lower incidence of incident hypertension has been linked to even moderate levels of physical activity [14].

In a graduated manner, both physical activity and CRF are linked to lower risk of hypertension development. These results give medical professionals a foundation on which to stress the significance of engaging in regular physical activity to enhance fitness for the primary prevention of hypertension in men [36].

Conclusion

One of the most important public health issues is hypertension. It is a condition that affects people of all ages worldwide. With its persistent effects, it can cause a wide range of disorders and has a fatally negative outcome. Exercise, yoga, and eating a diet rich in fruits, vegetables, and whole grains should all be practised regularly to avoid this disease. Day by day, the disease gets worse due to a lack of information and communication.

Conflict of Interest

Authors are declared No Conflict of Interest

Acknowledgement

Not Applicable

Author Contribution

All Authors Contributed equally

Ethical Considerations

Not Applicable

Inform Consent

Not Applicable

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