International Journal of Pharmaceutical Research and Applications
Volume 7, Issue 1 Jan-Feb 2022, pp: 106-113 www.ijprajournal.com ISSN: 2249-7781

Lifestyle and Hypertension: A Review Article

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Submitted: 01-01-2022 Accepted: 10-01-2022

ABSTRACT:
Hypertension (HTN) or high blood pressure, sometimes called arterial hypertension, is a chronic medical condition in which the blood pressure in the arteries is elevated. Blood pressure is summarized by two measurements, systolic and diastolic, which depend on whether the heart muscle is contracting (systole) or relaxed between beats (diastole). This equals the maximum and minimum pressure, respectively. Normal blood pressure at rest is within the range of 100–140mmHg systolic and 60–90mmHg diastolic. High blood pressure is said to be present if it is often at or above 140/90 mmHg. Hypertension is classified as either primary (essential) hypertension or secondary hypertension. Hypertension puts strain on the heart, leading to hypertensive heart disease and coronary artery disease if not treated. Hypertension is also a major risk factor for stroke, aneurysms of the arteries (e.g. aortic aneurysm), peripheral arterial disease and is a cause of chronic kidney disease. Dietary and lifestyle changes can improve blood pressure control and decrease the risk of health complications, although drug treatment is still often necessary in people for whom lifestyle changes are not enough or not effective.Despite significant advances in pharmaceutical treatment only 53% achieve targeted blood pressure goals largely due to poor patient compliance compelling a structured and flexible yet, individually tailored approach for treatment of HTN. This review addresses the pathophysiology, diagnosis and current management for the disease.

Keywords: Lifestyle, Hypertension, Salt intake, Physical activity

I. INTRODUCTION:

Essential hypertension (also called primary hypertension or idiopathic hypertension) is the most common type of hypertension, affecting 95% of hypertensive patients [1,2,3,4],it tends to be familial and is likely to be the consequence of an interaction between environmental and genetic factors. Prevalence of essential hypertension increases with age, and individuals with relatively high blood pressure at younger ages are at increased risk for the subsequent development of hypertension and it makes them suffer a lot.

Hypertension is the number one health related risk factor in India,with the largest contribution to burden of disease and mortality [5, 6]. It contributes to an estimated 1.6 million deaths annually in India, due to ischemic heart disease and stroke [7]. Fifty seven percent of deaths related to stroke and 24% of deaths related to coronary heart disease are related to hypertension [8]. Hypertension is one of the commonest non-communicable diseases in India, with an overall prevalence of 29.8% (95% CI: 26.7, 33.0) and a higher prevalence in urban areas (33.8% vs. 27.6%, p=0.05), according to recent estimates [9].India's demographic transition with an increasing proportion of elderly people and a sedentary lifestyle and obesityassociated with increasing urbanization, and other lifestyle factors like high levels of salt intake, alcohol and tobacco consumption, are contributing to this burden of hypertension.

Hypertension is a major modifiable risk factor for cardiovascular and renal disease in India, and improved detection and treatment of hypertension in Indiawould reduce a preventable burden of cardiac (congestive heart failure, coronaryartery disease), cerebrovascular (ischemic and hemorrhagic stroke) and renal(chronic kidney disease) disease related to hypertension. It has been estimated thata 2 mm population wide decrease in systolic blood pressure in India, would prevent151,000 deaths due to coronary artery disease and 153,000 deaths due to strokewould be prevented [8].

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ETIOLOGY:

Etiological factors correlated with hypertension in adults have also been associated with blood pressure elevations in youth. Intrauterine malnutrition, family history of hypertension,obesity, particularly excess abdominal fat, insulin resistance, high dietary sodium intakes, low dietary intakes of calcium, potassium and magnesium, physical inactivity, high alcohol intakes, tobacco use, drug use (e.g., cocaine, ecstasy, anabolic steroids), emotional stress, diet

pill use, oral contraceptives are the factors associated with development of hypertension [10,11,12].An inadequate supply of nutrients may program changes in foetal structure and

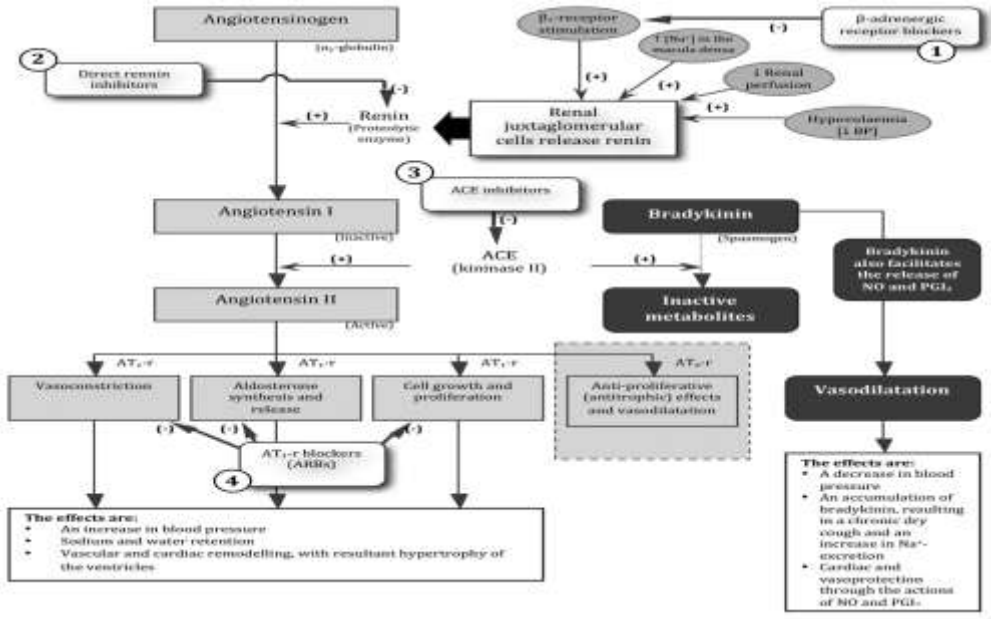
metabolism, increasing the risk of hypertension and other diseases in later life [13]. Hyperinsulinemia and insulin resistance are also associated with the development of

hypertension which leads to many problems. The elevated plasma insulin levels may cause sodium sensitivity [14,15]. Adequate dietary potassium, calcium, and magnesium intakes have been associated with lower blood pressure in youth. Potassium and calcium intakes are below recommended levels, particularly in adolescent females, while median intakes of phosphorus and protein, which promote calcium loss, are high [16].Lack of physical activity may increase the risk of developing hypertension by 20-50%.

Renin-angiotensin-aldosterone system (RAAS):

The renin-angiotensin-aldosterone system (RAAS), as well as the sympathetic nervous system, is involved in regulating arterial BP. Hypertension is usually viewed as a multifactorial condition, which interferes with different mechanisms and acts on several physiological systems. The three main factors that determine BP are renal sodium excretion (and the resultant impact on plasma and total body volume), vascular tone and cardiac performance. Each of these factors controls the vital determinants of BP, such

as cardiac output, intravascular volume and systemic vascularresistance. The RAAS plays a central role in elevating BP through these mechanisms. This system regulates the secretion of renin, with feedback systems from sodium balance, arterial BP levels and angiotensin II. The direct vasoconstrictor effect of angiotensin II, resulting from the secretion of renin, can increase systemic vascular resistance, and salt and water retention can lead to an increase in the extracellular blood volume. The rationale for combining drugs from different classes lies in reaching the BP target more rapidly, as each drug will work on a separate site, blocking different effector pathways [17,18,19,20].An overview of the RAAS system is presented in Figure 1[21].



ACE: angiotensin-converting enzyme, ARBs: angiotensin-receptor blockers, AT1-r: angiotensin II type 1 receptor, BP: blood pressure, NO: nitric oxide, PGI2: prostacyclin

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Figure 1: Diagram of the renin-angiotensin-aldosterone system, showing the sites of action of the β-adrenergic receptor blockers, the direct renin inhibitors, the angiotensin-converting enzyme inhibitors and the angiotensin II -receptor blockers [21].

RISK FACTORS:

Having a personal family history of hypertension increases the likelihood that an individual develops hypertension [22]. Essential hypertension is four times more common in black than white people, accelerates more rapidly and is often more severe with higher mortality in

black patients [23,24,25,26].Obesity can increase the risk of hypertension to fivefold as compared with normal weight, and up to two-thirds of hypertension cases can be attributed

to excess weight. More than 85% of cases occur in those with a Body mass index greater than 25 [27].Another risk factor is salt sensitivity which is an environmental factorthat has received the greatest attention. Approximately onethird of the essential hypertensivepopulation is responsive to sodium intake [28].The increased sodium ion concentration stimulates ADH and thirst mechanisms, leading to increased reabsorption of water in the kidneys, concentrated urine, and thirst with higher intake of water. Also, the water movement between cells and the interstitium plays a minor role compared to this. The relationship between sodium intake and blood pressure is controversial. Reducing sodium intake does reduce blood pressure, but the magnitude of the effect is insufficient to recommend a general reduction in salt intake [29].

Evaluation of Patient

The first step is to confirm the diagnosis of hypertension. The guideline recommended at least two BP measurement on at least two occasions with use of standard measurement technique, validated equipment, including cuff of correct size [30]. The 2017 ACC/AHA hypertension guideline recommended the use of ambulatory BP measurement or home BP monitoring for the diagnosis of white coat hypertension or masked hypertension [30]. White coat hypertension is diagnosed when BP is increased in hospital or clinic but normal in ambulatory BP monitoring technique or home BP monitoring. Masked hypertension is diagnosedif BP is normal in hospital or clinic but increased in ambulatory BP monitoring technique or in home BP monitoring. Ambulatory blood BP monitoring can measure the BP while patient perform normal daily activities and can measure mean BP during the entire monitoring periods, means BP during day and night time and diagnosed the symptomatic hypotension [30]. Once the diagnosis is confirmed, a complete history should be taken to assess the coexisting condition and contributing factors including lifestyle, CV risk factors associated with hypertension and feature suggest secondary causes of hypertension. On examination if presence of carotid, abdominal or femoral bruits increase the possibility of renal artery stenosis. Diminished femoral pulses or a discrepancy between arm and thigh blood pressure suggests aortic coarctation or significant aortoiliacdisease. Cushing disease is suggested by abdominal striae, moon faces or prominent interscapular fat deposition. A gradual rise in BP that associated with weight gain with positive family history suggests primary hypertension where as several or RH with target organ damage suggests secondary hypertension and common causes of secondary hypertension listed in Table 1. Initial laboratory investigation shown in Table 2, should assess for coexisting condition that may affect patient response to medication and assess for target organ damage.

The aldosterone/renin ratio is effective screening test for primary aldosteronism [32]. Collection of urine of 24 hours during ingestion of the patient normal diet can be helpful in estimating dietary sodium and potassium intake, calculating creatinine clearance and measuring aldosterone excretion. Measurement of 24 hours urinary metanephrines or plasma metanephrines is an effective screen for patients in whom Pheochromocytoma is suspected [33]. Imaging for renal artery stenosis should be reserved for patient in whom there is an increased level of suspicion. Regarding target organ damage, 24 hour urinary albumin excretion and left ventricular mass index are increased in resistant hypertension [34].

CLASSIFICATION OF HYPERTENSION:

Patients with hypertension should be classified in the following manner:

- **Grade 1 Hypertension:** systolic 140-159 mm and/or diastolic 90-99 mm
- **Grade 2 Hypertension:** systolic 160-179 mm and/or diastolic 100-109 mm
- **Grade 3 Hypertension:** systolic 180 or above and/or diastolic 110 or above

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• **Isolated systolic hypertension:** systolic > 140 mm but diastolic <90 mm.
• **Hypertensive urgency:** Severe asymptomatic hypertension (usually Systolic > 180 mm, Diastolic >120 mm)
• **Hypertensive emergency:**Severe hypertension accompanied by cardiac (e.g. acute left ventricular failure), neurological (e.g. hypertensive encephalopathy), or renal dysfunction.

Table 1. Common causes of secondary hypertension [31].
Following are the common causes of secondary hypertension

- Renovascular disease.
- Coarcation of the Aorta.
- Pheochromocytoma.
- Chronic kidney disease.
- Cushing syndrome.
- Primary hyperaldosteronism.
- Thyroid disease.
- Obstructive sleep apnea.
- Congenital adrenal hyperplasia.

Table 2. Basic investigation of hypertension [33,34,35,36,37].
Following are the basic investigation of hypertension:

- Complete blood count-TLC, DLC, Hb %, RBC
- Renal function test-Blood urea, serum creatinine, potassium, Sodium, calcium, uric acid
- Blood sugar level
- Urinalysis
- Lipid profile
- Thyroid function test
- Electrocardiography
- Urine albumin to creatinine ratio
- Measure plasma aldosterone/Renin ratio
- Measurement of 24 hours urinary metanephrines.

KEY RECOMMENDATIONS: PATIENT EDUCATION AND ASSESSMENT
1.1.Patients should be counselled about the nature of the disease, and the management of
hypertension, before being subjected to laboratory evaluation and drug treatment. The
education and assessment of the patients should be tailored to their understanding,
preferences and social circumstances.
1.1.1 Patients should be counselled about hypertension being an
asymptomatic condition which can lead to disabling and life-threatening
complications like stroke, heart attack and renal failure. Patient should be
counselled about need for long-term therapy, need for regularity of drug intake, informed about the targets for BP control, and encouraged to
monitor efficacy of therapy through regular check-ups which can include
home based monitoring of BP.
1.1.2 The patient should be counselled about the important role of
lifestyle measures in reducing hypertension and reducing risks of
cardiovascular disease.
1.2 The effective control of blood pressure by initiation of therapy, if required, should not be
delayed if laboratory evaluation is delayed or cannot be done.
1.3 The assessment of a patient with hypertension is aimed at assessing**overall cardiovascular risk for cardiovascular events like stroke, ischemic heart disease, heart failure, peripheral artery disease**.
1.3.1 The risk of clinical events in a patient with hypertension depends on

- the level of blood pressure
- risk factors (diabetes or impaired glucose tolerance, smoking,dyslipidemia, obesity, male gender, age >55 years in male,) ,
- target organ damage(heart, kidney, retina),
- Presence of associated clinical conditions [clinical cardiovascular disease(coronary artery disease, cerebrovascular disease, PAD), kidney disease].

1.4 The risk factors, target organ damage and associated clinical conditions can be detected on history, physical examination (including ophthalmoscopy), and investigations like blood glucose, lipids, serum creatinine, urinalysis, and ECG.

Treatment of Hypertension
The treatment of hypertension consists of both nonpharmacologic and pharmacological approaches. Treatment decision depends on whether there is pre-existing CV, DM, and CKD. For patient with stage one hypertension and without these conditions, the 2017 AHA/ACC guideline recommended calculation of 10 years risk of cardiovascular disease. If the risk is less than 10%, it is reasonable to implementation life style modification alone for 3 - 6 month. For stage 2

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hypertension with pre-existing like DM, CKD and 10 years risk of CV event is 10% or high both life style modification and medication is recommended.

Nonpharmacological Treatment

Following are the nonpharmacologic way to treatment of hypertensions.

- Dietary Salt Restriction

The restriction dietary sodium intake is below 1500 mg per day [38, 39]. The benefit of dietary salt reduction is well documented in general hypertensive patient in whom associated with reduction of 5 to 10 mmHg in Systolic BP and 2 to 6 mmHg diastolic BP.

- Weight Loss

Weight loss has a clear benefit in term of reducing of blood pressure and also reduce the number of prescribed medicine so weight loss if the patient is overweight or obese [40]. Long term weight loss studies have indicated that 10 kg weight loss is associated with average reduction of systolic BP 6 mmHg and diastolic BP is 4.6 mmHg.

- Physical Activity

The regular aerobic exercise produced average reduction of systolic BP 4 mmHg and 3 mmHg in diastolic BP. So patient is advice for aerobic or resistance exercise for 90 to 150 minute per week [41, 42]. So all patient of hypertension encouraged to do exercise.

- Moderate Alcohol Intake

All patient of hypertension advised for moderate of alcohol intake—≤ 2 drinks daily for men and ≤1 drink per day for woman will reduce systolic BP by 3 to 8 mmHg and diastolic BP by 1 to 4 mmHg [43, 44].

- High Fiber and Low fat Diet

Ingestion of diet rich in fruits and vegetable, potassium, magnesium, calcium, high in low fat diet and low in saturated fat that is dietary approach to stop hypertension (DASH) reduced systolic BP in hypertension patient by 11.4 mmHg and reduced diastolic BP by 5.5 mmHg [45]. High amount of fruit and vegetables in diet not lower the BP but also improve endothelial function.

- Withdrawal of Interfering Medications

Medicine that may interfere with BP control, mainly NSAIDS should be voided or if complete avoidance is difficult the lowest effective dose should be used.

When initiating treatment of hypertension with these agents should monitored BP closely because adjustment to antihypertensive regimen may become necessary.

Following medicine shown in Table 4 should be avoided during treatment of hypertension [46].

Table 3. Medicines avoided during treatment of hypertension [46].

Following are the medicines during treatment of hypertension:

•Non steroidal anti-inflammatory drugs
• Oral contraceptives pills
• Corticosteroids
• Tricycle antidepressant drugs
• Monoamine oxidase inhibitors

Pharmacological Treatment

Classes of antihypertensive drugs & preferred choices

- The primary issue in treatment of hypertension is reduction of cardiovascular

risk by effective control of blood pressure. Overall the benefits of antihypertensive treatment are due to lowering of blood pressure rather than choice of therapy. Many patients will require more than one drug for control of hypertension.

- All classes of drugs- calcium channel blockers, ACE inhibitors/ARBs, diuretics;

beta-blockers have approximately the same efficacy on lowering of blood pressure, and on outcomes, although beta-blockers have been associated with lesser protection against strokes. All combinations of drugs are not however similarly efficacious, and some are preferred.

- The different classes of drugs have differing side effect profiles and requirements for monitoring, which may influence their use and prescription in the health system.
- In the absence of any associated clinical conditions (noted below) providing a compelling indication for the use of a particular drug , a long acting calcium channel blocker, a low dose thiazide diuretic, or a low cost ACE inhibitor may be used as the initial antihypertensive drug.
- The presence of associated clinical conditions (diabetes, clinical cardiovascular

disease, chronic kidney disease) in a patient may provide compelling indication for the use of specific classes of drugs.

1. Preferred drugs for treatment of patients with diabetes and hypertension are ACE inhibitors, especially in those with proteinuria. Calcium

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Volume 7, Issue 1 Jan-Feb 2022, pp: 106-113 www.ijprajournal.com ISSN: 2249-7781

channel blockers /low dose diuretics may be used in addition if required to achieve control.

2. Preferred drugs for patients with heart failure and hypertension are ACE inhibitors, diuretics (including loop diuretics) and beta-blockers.

3. Preferred drugs for patients with coronary artery disease and hypertension are beta-blockers, ACE Inhibitors or calcium channel blockers.

- The specific drugs within these classes recommended on the basis of availability and affordability include amlodipine, (a long acting calcium channel blocker); enalapril or lisinopril, (ACE inhibitor); low dose hydrochlorothiazide, (thiazide) and if required and losartan, (a low cost angiotensin II receptor blocker).
- Angiotensin receptor blockers have a mode of action, efficacy and indicationssimilar to ACE inhibitors, but are currently more expensive than them. They should therefore be used in the place of ACE inhibitors, in case there are side effects with ACE inhibitors like cough, angioedema.

II. CONCLUSIONS

Hypertension has been recognized as a major risk factor for development of several cardiovascular diseases. On basis of literature data today available, there is clear evidence that lifestyle habits may influence blood pressure value. Then, lifestyle changes can provide beneficial effects in hypertensive patients, reducing global cardiovascular risk and all-cause mortality.

Adopting a healthy lifestyle is critical for the prevention of HBP and an indispensable part of managing it. We must think of these changes as a "lifestyle prescription" and make every effort to comply with them. If we have been diagnosed with high blood pressure, also called hypertension, or are concerned because we have some of the risk factors for the disease, we must understand this: while there is no cure, high blood pressure is manageable. Maintaining a healthy life style is necessary.

Public Health Authorities, by appropriate information campaigns, should promote and encourage the adoption of a correct lifestyle model not only in hypertensiveindividuals but in the general population.

REFERENCES:

[1]. Carretero OA, Oparil S (January 2000). "Essential hypertension. Part I: definition and etiology". Circulation 101 (3): 329–35. doi:10.1161/01.CIR.101.3.329.PMID 10645931. Retrieved 2009-06-05.

[2]. Oparil S, Zaman MA, Calhoun DA (November 2003). "Pathogenesis of hypertension". Ann. Intern. Med. 139 (9): 761–76. Doi:10.7326/0003-4819-139-9-200311040-00011.PMID 14597461.

[3]. Hall, John E.; Guyton, Arthur C. (2006). Textbook of medical physiology. St. Louis, Mo: Elsevier Saunders. p. 228. ISBN 0-7216-0240-1.

[4]. "Hypertension: eMedicine Nephrology". Retrieved 2009-06-05.

[5]. Forouzanfar MH, Alexander L, Anderson HR, Bachman VF, Biryukov S, Brauer M, et al.Global, regional, and national comparative risk assessment of 79 behavioural, environmental and occupational, and metabolic risks or clusters of risks in 188 countries, 1990-2013: a systematic analysis for the Global Burden of Disease Study 2013. Lancet. 2015 Dec 5;386(10010):2287-323.

[6]. Travasso C. High blood pressure is the leading health risk factor in India, finds study.BMJ. 2015;351:h5034.

[7]. India high blood pressure [database on the Internet]2014. Available from: Available from: http://www.healthmetricsandevaluation.org/search-gbd-data.

[8]. Deedwania P, Gupta R. Hypertension in South Asians. In: Black HR, Elliott WJ, editors. Hypertension : A companion to Braunwald's Heart Disease. Second ed: Elsevier Saunders; 2012.

[9]. Anchala R, Kannuri NK, Pant H, Khan H, Franco OH, Di Angelantonio E, et al. Hypertension in India: a systematic review and meta-analysis of prevalence, awareness, and control of hypertension. J Hypertens. 2014 Jun;32(6):1170-7.

[10]. Bartosh SM, Aronson AJ. Childhood hypertension: an update on etiology, diagnosis, and treatment. PediatrClin North Am 1999;46(2):235-252.

[11]. Carretero OA, Oparil S. Essential hypertension. Part I: definition and etiology. Circulation 2000;101(3):329-335

[12]. Osmond C, Barker DJ. Fetal, infant, and childhood growth are predictors of coronary heart disease, diabetes, and hypertension in adult men and women. Environ Health Perspect 2000;108 Suppl3:545-553.

[13]. National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents. Fourth report on the diagnosis, evaluation, and treatment of high blood pressure in children and adolescents. Pediatrics 2004;114(2):555-576. http://www.pediatrics.org/cgi/content/full/114/2/S2/555

[14]. Carretero OA, Oparil S. Essential hypertension. Part I: definition and etiology. Circulation 2000;101(3):329-335.

[15]. Contreras F, Rivera M, Vasquez J, De la Parte MA, Velasco M. Diabetes and hypertension physiopathology and therapeutics. J Hum Hypertens 2000;14Suppl 1:S26-31.

[16]. F ederation of Associated Societies for Experimental Biology. Third Report on Nutrition Monitoring in the United States. Vol. 1.Washington, DC: US Government Printing Office; 1995.

[17]. Sever PS, Messerli FH. Hypertension management 2011: optimal combination therapy. Eur Heart J. 2011; 32(20):2499-2506.

[18]. Gradman AH, Basile JN, Carter BL, Bakris GL. Combination therapy in hypertension. J Am SocHypertens. 2010;4(1):42-50.

[19]. Neutel JM. Prescribing patterns in hypertension: emerging role of fixed dose combinations for attaining BP goals in hypertensive patients. Curr Med Res Opin. 2008;24(8):2389-2401.

[20]. Mazzaglia G, Ambrosioni E, Alacqua M, et al. Adherence to antihypertensive medications and cardiovascular morbidity among newly diagnosed hypertensive patients. Circulation. 2009;120(16):1598-1605.

[21]. ChobanianAV, Hill M. National Heart, Lung, and Blood Institute Workshop on Sodium and Blood Pressure: a critical review of current scientific evidence. Hypertension. 2000;35(4):858-863.

[22]. Loscalzo, Joseph; Fauci, Anthony S.; Braunwald, Eugene; Dennis L. Kasper; Hauser, Stephen L; Longo, Dan L. (2008). Harrison's principles of internal medicine. McGraw-Hill Medical. ISBN 0-07-147691-1.

[23]. Loscalzo, Joseph; Fauci, Anthony S.; Braunwald, Eugene; Dennis L. Kasper; Hauser, Stephen L; Longo, Dan L. (2008). Harrison's principles of internal medicine. McGraw-Hill Medical. ISBN 0-07-147691-1.

[24]. Haffner SM, Lehto S, Rönnemaa T, Pyörälä K, Laakso M (July 1998). "Mortality from coronary heart disease in subjects with type 2 diabetes and in nondiabetic subjects with and without prior myocardial infarction". The New England Journal ofMedicine 339 (4): 229–doi:10.1056/NEJM199807233390404. PMID 9673301. Retrieved2009-06-08.

[25]. Lindhorst J, Alexander N, Blignaut J, Rayner B (2007). "Differences in hypertension between blacks and whites: an overview". Cardiovasc J Afr 18 (4): 241–7.PMID 17940670.Retrieved 2009-06-01.

[26]. Jump up^ Burt VL, Whelton P, Roccella EJ, et al. (March 1995). "Prevalence of hypertension in the US adult population. Results from the Third National Health and Nutrition Examination Survey, 1988-1991". Hypertension 25 (3): 305-13.doi:10.1161/01.HYP.25.3.305.PMID 7875754. Retrieved 2009-06-01.Nandhini.S /J. Pharm. Sci. & Res. Vol. 6(9), 2014, 305-307306

[27]. Haslam DW, James WP (2005). "Obesity". Lancet 366 (9492):1197–209.doi:10.1016/S0140-6736(05)67483-1. PMID 16198769.

[28]. A MissingLink Between a High Salt Intake and Blood Pressure Increase:Makoto Katori and MasatakaMajima, Department of Pharmacology,Kitasato University School of Medicine, Kitasato, Sagamihara,Kanagawa, Japan February 8, 2006

[29]. Jürgens G, Graudal NA (2004). "Effects of low sodium diet versushigh sodium diet on blood pressure, renin, aldosterone,catecholamines, cholesterols, and triglyceride". In Graudal, NielAlbert. Cochrane Database Syst Rev (1):CD004022.doi:10.1002/14651858.CD004022.pub2. PMID 1497405

[30]. Whelton, P.K., et al. (2018) 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines.

Journal of the American College of Cardiology, 71, e127-e248.

[31]. Pedrosa, R.P., et al . (2011) Obstructive Sleep Apnea: The Most Common Secondary Cause of Hypertension Associated with Resistant Hypertension. Hypertension, 58, 811-817

[32]. Schwartz, G.L. and Turner, S.T. (2005) Screening for Primary Aldosteronism in Essential Hypertension: Diagnostic Accuracy of the Ratio of Plasma Aldosterone Concentration to Plasma Renin Activity. Clinical Chemistry , 51, 386-394.

[33]. Sawka, A.M., Jaeschke, R., Singh, R.J. and Young, W.F. (2003) A Comparison of Biochemical Tests for Pheochromocytoma: Measurement of Fractionated Plasma MetanephrinesCompared with the Combination of 24-Hour Urinary Metanephrines and Catecholamines. Journal of Clinical Endocrinology and Metabolism, 88, 553-558.

[34]. Oliveras, A., et al . (2010) Urinary Albumin Excretion Is Associated with True Resistant Hypertension. Journal of Human Hypertension, 24, 27-33.

[35]. Calhoun, D.A., et al . (2008) Resistant Hypertension: Diagnosis, Evaluation, and Treatment. A Scientific Statement from the American Heart Association Professional Education Committee of the Council for High Blood Pressure Research. Hypertension, 51, 1403-1419.

[36]. De la Sierra, A., et al . (2012) Clinical Differences between Resistant Hypertensives and Patients Treated and Controlled with Three or Less Drugs. Journal of Hypertension, 30, 1211-1216.

[37]. Campese, V.M., Mitra, N. and Sandee, D. (2006) Hypertension in Renal Parenchymal Disease: Why Is It So Resistant to Treatment? Kidney International , 69, 967-973.

[38]. Aburto, N.J., et al . (2013) Effect of Lower Sodium Intake on Health: Systematic Review and Meta-Analyses. BMJ , 346, f1326. https://doi.org/10.1136/bmj.f1326

[39]. He, F.J., Li, J. and Macgregor, G.A. (2013) Effect of Longer Term Modest Salt Reduction on Blood Pressure: Cochrane Systematic Review and Meta-Analysis of Randomised Trials. BMJ , 346, f1325.

[40]. Neter, J.E., et al . (2003) Influence of Weight Reduction on Blood Pressure: A Meta Analysis of Randomized Controlled Trials. Hypertension, 42, 878-884.

[41]. Cornelissen, V.A. and Smart, N.A. (2013) Exercise Training for Blood Pressure: A Systematic Review and Meta-Analysis. Journal of the American Heart Association, 2, e004473.

[42]. Carlson, D.J., et al . (2014) Isometric Exercise Training for Blood Pressure Management: A Systematic Review and Meta-Analysis. Mayo Clinic Proceedings , 89, 327-334.

[43]. Xin, X., et al . (2001) Effects of Alcohol Reduction on Blood Pressure: A Meta-Analysis of Randomized Controlled Trials. Hypertension, 38, 1112-1127.

[44]. Roerecke, M., et al . (2017) The effect of a Reduction in Alcohol Consumption on Blood Pressure: A Systematic Review and Meta-Analysis. Lancet Public Health , 2,e108-e120.

[45]. Whelton, P.K., et al . (1997) Effects of Oral Potassium on Blood Pressure. Meta-Analysis of Randomized Controlled Clinical Trials. JAMA, 277, 1624-1632.

[46]. Calhoun, D.A., et al . (2008) Resistant Hypertension: Diagnosis, Evaluation, and Treatment. A Scientific Statement from the American Heart Association Professional Education Committee of the Council for High Blood Pressure Research. Hypertension, 51, 1403-1419.