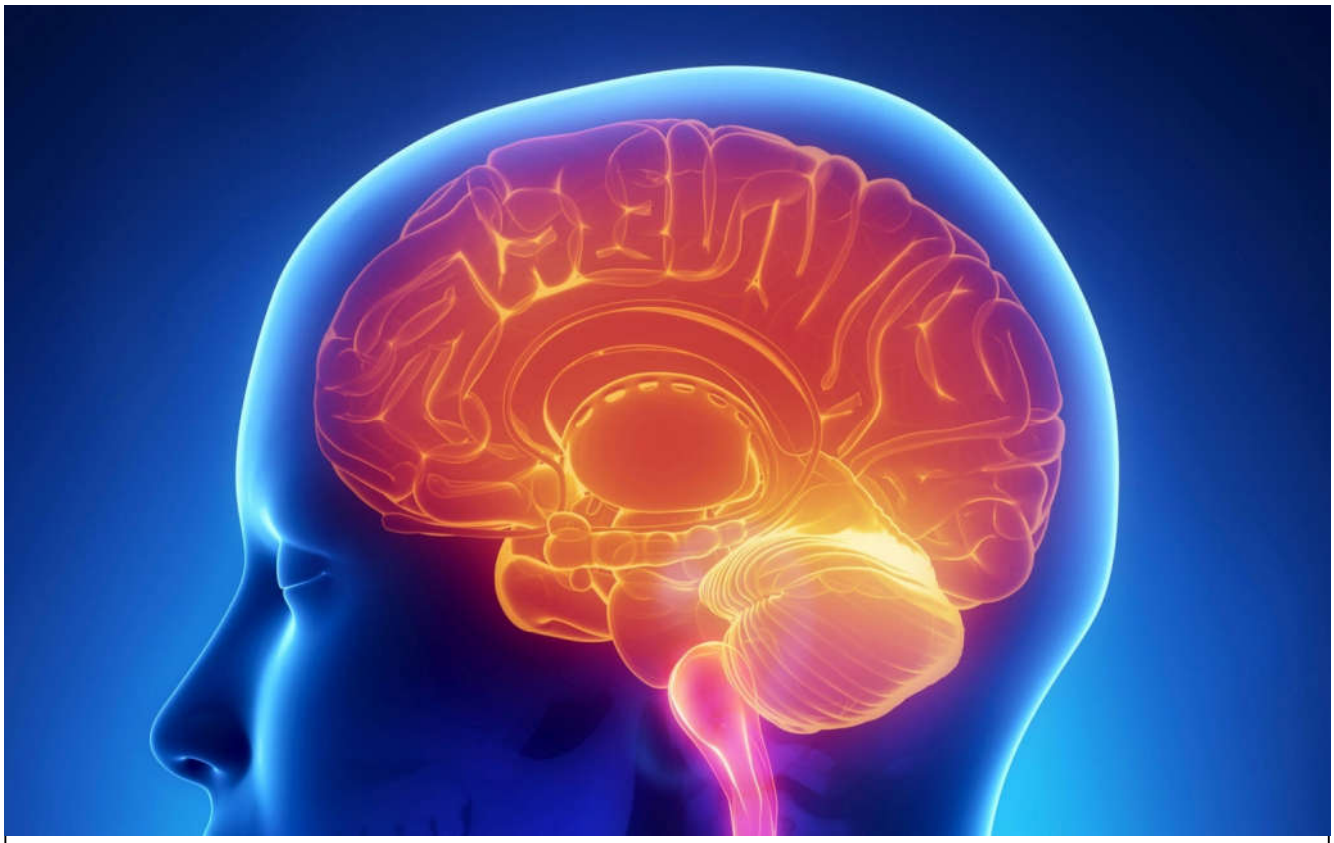

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Review Article

THE RELATIONSHIP BETWEEN BLOOD PRESSURE AND DIFFERENT ASPECTS OF LIFE: A REVIEW

Monireh Ghorbani[1]* and Gholamhassan Vaezi[2]

[1]Department of Physiology, Islamic Azad University, Damghan Branch, Semnan, Iran
[2]Department of Physiology, Faculty of Sciences, Islamic Azad University, Science and Research Branch, Tehran, Iran

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ABSTRACT

High blood pressure is a serious health threat which claimed many lives through cardiovascular problems all around the world. It is a disease with different reasons caused by interaction of environmental and genetic factors. It seems that lifestyle, level of the problem, and the ways to cope with it are related with formation and acceleration of this disease. The present paper gives an introduction on blood pressure and then, presents the relationship between blood pressure and different factors such as age, gender, anthropometric indices, nutrition, and place of living, education, and even noise pollution. Then, prevention and treatment methods for this disease are mentioned.

INTRODUCTION

High blood pressure is a serious health problem in the world and it has been claiming many lives all around the world. Undoubtedly, it is the second threatening factor to cause cardiovascular disease after smoking.

World Health Organization has estimated that high blood pressure is responsible for approximately 7.1 million unexpected deaths per year. The risk of heart coronary disease increases with higher systolic or diastolic blood pressure. High blood pressure defined as systolic pressure of ≥140 mmHg or diastolic pressure of ≥90 mmHg, is a serious problem in many countries and it has claimed the lives of 50 million people just in the US. The patients suffering from high blood pressure have many cardiovascular changes compared to normal people and it is best known with the reduced capacity of veins (Amirsasan and Sani, 2012). High blood pressure is prevalent in 24% of the people who are ≥18 years old which increases with age (Mohammadi *et al*., 2006).

High blood pressure is a disease with several causes which is caused because of interaction of various environmental and genetic factors. It seems that lifestyle, level of risk and the ways to cope with it are the factors related to this disease (Farajzadeh *et al*., 2005). The following factors are most important causes of high blood pressure:

- ***Age:*** The risk of high blood pressure increase with age. High blood pressure is more prevalent among men in the early middle age while it is more common among women after menopause.
- ***Race:*** This disease is more common in black people, especially in lower ages with stronger consequences.

Family background

- ***Weight:*** The risk is higher in heavier people.
- ***Low exercise:*** When a person exercises very little, his/her heart beats will be more and therefore, he/she will experience harsher heart constrictions leading to higher blood pressure.
- ***Smoking and drinking:*** The chemicals inside tobacco hurt the wall of veins and narrow them down. When the veins become narrower, blood pressure increase. Alcohol can also lead to higer levels of blood pressure.
- ***Overuse of sodium:*** Sodium results in lower water disposal from kidneys and therefore, a lot of liquid will be stored in water leading to higher volumes of blood and consequently, higher blood pressure.

*Corresponding author: **Monireh Ghorbani***
Department of Physiology, Islamic Azad University, Damghan Branch, Semnan, Iran

- ***Underconsumption of potassium:*** There is an antagonistic balance between sodium and potassium in human body. If potassium decreases, sodium goes up which is a risk factor leading to high blood pressure.
- ***Stress:*** It leads to temporary but considerable elevation of blood pressure.
- ***Other factors:*** High cholesterol level, diabetes, some renal disorders, pregnancy, breathing problem in sleep and etc. may increase the risk of high blood pressure (McGowan *et al*., 2001).

sympathetic activity increase and parasympathetic activity, maximum oxygen demand, and sensitivity of pressure receptors decrease leading to delayed recovery from blood pressure (Amirsasan and Sani, 2012). RahmaniGhobadi and Hosseini (2014) stated that cardiovascular disease and its risk factors such as diabetes, hypertension, and etc. increase with age. Old population is subjected to high blood pressure.

Table 1 The relationship between blood pressure and cardiovascular disease

Other risk factors	Systolic 120-129 mmHg Diastolic 80-84 mmHg	Systolic 130-139 mmHg Diastolic 85-89 mmHg	Systolic 140-159 mmHg Diastolic 90-99 mmHg	Systolic 160-179 mmHg Diastolic 100-109 mmHg	Systolic 180 mmHg Diastolic 110 mmHg
Without any risk factor	Average risk	Average risk	Low added risk	Moderate added risk	High added risk
One or two risk factor(s)	Low added risk	Low added risk	Moderate added risk	Moderate added risk	Very high added risk
Three or more risk factors, metabolic syndrome, diabetes, etc.	Moderate added risk	High added risk	High added risk	Very high added risk	Very high added risk
Cardiovascular disease or retinal disease	Very high added risk	Very high added risk	Very high added risk	Very high added risk	Very high added risk

Hypertension in Iran occurs in 17.1% of the people ranging in age between 15 and 64 years old. Also, it is surmised that 20% of Iranians suffer from high blood pressure (Cheraghi *et al*., 2015).

Definition of high blood pressure

Generally, there are two types of definitions for hypertension: hypothetical definition and operational definition. The former defines hypertension as a level of blood pressure in which advantages of medical intervention are higher than no intervention. The latter defines hypertension as the systolic blood pressure ≥140 mmHg or diastolic blood pressure ≥90 mmHg; the values lead to duplication of cardiovascular disease risks (Mancia and Grassi, 2005).

Some guidelines have recently been proposed by various professional organizations to define high blood pressure. One of the most updated ones is by European Hypertension Society and European Cardiology Society (Table 2).

Table 2 Classification of normal and high blood pressure as proposed by European Hypertension Society and European Cardiology Society

Group	Systolic blood pressure (mmHg)	Diastolic blood pressure (mmHg)
Optimal	<120	<80
Normal	120-129	80-84
Higher than normal	130-139	85-89
Slight hypertension	140-159	90-99
Medium hypertension	160-179	100-109
Severe hypertension	≥180	≥110
Isolated systolic hypertension	≥140	<90

The guideline has also proposed a definition for blood pressure in children and adolescents (Table 3).

Gender and age

Although hypertension has been found more prevalent among men all around the world, it is common among women in Iran (Amirsasan and Sani, 2012). Navaei *et al*. (2000) stated that hypertension causes higher risk of cardiac consequences in women than men. With age, systemic resistance of veins and

Table 3 Blood pressure in children and adolescent as proposed by European Hypertension Society and European Cardiology Society

Age (years old)	Normal blood pressure (systolic to diastolic in mmHg)	Threshold blood pressure (systolic to diastolic in mmHg)	High blood pressure (systolic to diastolic in mmHg)
>2	<104/70	<111/73	<112/74
3-5	<108/70	<115/75	<116/76
6-9	<114/74	<121/77	<122/78
10-12	<122/78	<125/81	<126/82
13-15	<130/80	<135/85	<136/86
16-18	<136/84	<139/89	<140/90

Blood pressure and anthropometric indices

High blood pressure has been mentioned as a risk factor for atherosclerosis. In many cases, the main cause of it is unclear but there are some factors that exacerbate this consequence such as overweight and obesity. Obesity and overweight are very serious problems in the world and they prepare a basis for hypertension and other problems (Farshidi *et al*., 2006).

The effect of obesity on blood pressure has been scrutinized in many investigations. Majority of the academic efforts have indicated the higher rate of hypertension in obese people compared to normal ones. The results obtained from epidemiological studies have proved that blood pressure in 70 percent of obese people exceeds normal levels (Navaei *et al*., 2000). In many studies, weight and BMI have been introduced as effective factors on changes in blood pressure. Outbreak of hypertension in obese people is higher than that in normal people. Higher insulin level in obese people, resistance of cells to insulin, hyperactivity of sympathetic nerve system and renin and angiotensin systems, and physical changes in kidneys are some of the physiological justifications of this relationship. Other anthropometric indices indicating fat distribution in body result in variations in blood pressure (Farshidi *et al*., 2006).

Blood pressure and nutrition

Understanding the relationship between nutritional factors and hypertension is important because it can be used as a guideline for prevention from hypertension and even treatment of high blood pressure. Epidemiological studies have shown a significant relationship between environmental factors such as diet and exercise with blood pressure. Examples of nutritional factors leading to reduction of blood pressure are higher uptake of potassium, calcium, fiber, and magnesium as well as lower consumption of energy and sodium (Rahimi *et al*., 2003).

The relationship between hypertension and hyperlipidemia has been indicated in several reports. Triglyceride and abnormal cholesterol have been found more frequent in the people with high or low systolic or diastolic blood pressure than the ones with the so-called normal blood pressure. Changes in metabolism of prostaglandins sue to the foods full of linoleic acid results in reduction of blood pressure. Reduction of daily total fat intake along with increase in unsaturated fatty acids and higher consumption of fibers significantly reduces blood pressure (Navaei *et al*., 2000). Improper diet is one of the most important causes of high blood pressure. A diet full of saturated fats and cholesterol increases levels of LDL through reduction of regulation of hepatic LDL (KarimiZarchi and Naghiei, 2009).

There is a direct and significant relationship between sodium intake and systolic and diastolic blood pressure. This relationship becomes more pronounced with higher daily intake of sodium per kCal. In contrast, there is an antagonistic and significant relationship between daily intake of potassium and blood pressure. There is no relationship between daily intake of calcium and blood pressure. Therefore, lower consumption of salt and higher consumption of food rich in potassium are recommended in order to prevent from hypertension (Rahimi *et al*., 2003).

In recent years, different epidemiological studies have shown a clear relationship between drinking water and cardiovascular disease. Cardiovascular diseases occur 10-30% more in the places with soft drinking water than the ones with hard drinking water. In some studies, drinking mineral water for four weeks decreased systolic blood pressure for 5 mmHg although in some other studies, such an effect has not been reported. Higher intake of calcium, magnesium, and potassium is accompanied with reduction of blood pressure leading to 30-35% reduction in ischemic diseases. Positive influence of drinking water with high level of hardness on blood pressure has been proven. There is a significant relationship between high level of hardness in drinking water and reduction of hypertension (Zahraei *et al*., 2014).

Blood pressure, living place, and education

Hypertension is one of the most important problems all over the world. High blood pressure increases the risk of cardiovascular disease. In countries such as china, India, Iran, and Sri Lanka, there have been reports of sudden increase in death caused by infarcts and hypertension. Some studies have indicated lower levels of hypertension and lower levels of control and knowledge on blood pressure in rural populations compared to urban populations. However, some other studies have stated that hypertension is more common among rural populations in comparison to urban populations (Delavari *et al*., 2007). Farajzadeh *et al*. (2005) reported that the majority of people suffering from hypertension live in cities and they have lower levels of education. There is a significant relationship between education level and high blood pressure so that hypertension is more prevalent among illiterate and less-educated groups (Yousefinejad *et al*., 2006).

Blood pressure and noise

Exposure to repeated noise causes chronic physiological and mental disorders in humans and also it causes variations in heartbeat and blood pressure. Exposure to the noise >85 db_A causes systolic and diastolic blood pressure and influences on performance and also difficulty in speaking. Fivedb_Anoise can increase systolic blood pressure for 0.51 mmHg and increase the risk of hypertension for 14%. Of course, in some studies, this effect was detected in people around 50 years old. Many authors have emphasized the chronic effect of noise on blood pressure and they have claimed that noise can cause hypertension through arthrosclerosis (Zamanian *et al*., 2014).

Blood pressure in pregnancy

One of the most prevalent causes of death among pregnant women is preeclampsia responsible for 20-25% of death in pregnancy. Prevalence of preeclampsia has been reported to be 5-7%. Clinical manifestations of preeclampsia is a 140/90 blood pressure after 20 weeks of pregnancy. Preeclampsia is strongly influenced by various factors such as nulliparity, 10 years difference between preganncies, the age over 35 years old or <15 years old, history of preeclampsia, history of chronic hypertension, and multiparity (DehghaniFirouzabadi *et al*., 2007). Preeclampsia causes several consequences for the fetus such as intrauterine growth restriction (IUGR), abnormal heartbeat, low Apgar score, and necessity of special care (Simbar *et al*., 2008).

In normal pregnancy, blood circulation in kidneys and glomerular filtration increase fundamentally while it decreases in preeclampsia. In severe conditions of preeclampsia, uric acid concentration in plasma increases. In majority of women suffering from severe preeclampsia, slight or average reduction of glomerular filtration is caused by lower volumes of plasma leading to increase in plasma creatinine (DehghaniFirouzabadi *et al*., 2007).

Blood pressure and stroke risk

Brainstroke is one of the most important diseases among elderlies. It is known as the second cause of death in the world and it is regarded as one of the most prevalent neurological diseases in adults. Brain stroke is caused by disruption in blood circulation in a part of brain and it can last for 24 hours and cause death and several consequences. Approximately 80 percent of all cases of brain stroke are ischemic which are caused by closure of a brain vein by a blood clot, a condition known as brain thrombosis. High blood pressure is one of the most important causes of brain strokes. Blood pressure control results in 30-40 percent reduction in brain strokes (Mohammadpour *et al*., 2013).

Blood pressure control and cure

Blood pressure control is very important to reduce the risk of lethal diseases. In other words, it is very important to take proper steps for diagnosis, prevention, and cure of hypertension. Prevention from hypertension includes prevention from its outbreak and its consequences. For prevention, educating the society on the importance of this disease and controlling effective factors on high blood pressure are very important. The most important effective factors on hypertension which are controllable are high blood sugar, obesity, high cholesterol in blood, low exercise, drinking, smoking, and stress. The factors which are not controllable are age, gender, race, and genetics (Goudarzi *et al*., 2004).

Choosing antihypertensive drugs is the most important part of treatment for high blood pressure. The first choice is usually effective in half of the patients for many years unless special consequences occur. In past, diuretics were the most acceptable antihypertensive drug but today, beta blockers are more common than diuretics. It is especially effective in younger people suffering from hypertension. Also, ACE-inhibitor drugs are used for all degrees and forms of hypertension (FallahTafti *et al*., 2001). Thiazide diuretics are also used as a drug to combat against hypertension. They have no influence on central nervous system in normal doses (25 mg daily). Long-term use of these drugs is not dangerous; however, some metabolic consequences of these drugs should be taken into account such as hypercalcemia, hyponatremia, hypokalemia, hyperuricemia, disrupted glucose resistance, and higher level of triglycerides (Mirzababaei *et al*., 2010).

Some patients complain about consequences of pharmacological treatments. Therefore, they are interested in non-pharmacological treatment. One of these treatments is yoga which is regarded as a part of supplementary treatment (Posadzki *et al*., 2014). In another study, positive effects of sport on the patients suffering from hypertension have been shown (Babu *et al*., 2015). Having a healthy lifestyle with a suitable diet and exercise schedule can reduce the risk of cardiovascular disease through controlling its risk factors such as hypertension (Nissensohn *et al*., 2016).

CONCLUSION

Hypertension is one of the most prevalent causes of cardiovascular disease with several consequences on people's health. This disease is caused by several factors. There are many factors that influence on blood pressure either directly or indirectly. Treatment for hypertension is a long-term process and the cures may not be very effective. Therefore, emphasis should be paid on prevention from high blood pressure. One of the most effective factors for prevention from hypertension is lifestyle where diet and exercise are two important factors.

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