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Review on Concept of Blood Pressure

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Abstract: ***It's usually explained in terms of systolic and diastolic pressures. The systolic and diastolic pressures are measured in millimetres of mercury (mm Hg), with the systolic being stated first and the diastolic second. Most adults need to keep their blood pressure underneath 120/80 mmHg. A reading of less than 90/60 mm Hg is considered low blood pressure. Given the long-term connections between blood pressure and cardiovascular risk, any definition of high blood pressure should be based on thresholds where the benefits of treatment clearly outweigh the risks. The aim of this research is to figure out what constitutes ideal blood pressure.Blood pressure control mechanisms can be classified into two types: fast acting and slow acting.***

Keywords: Blood pressure, prevalence, blood pressure measurement, regulation of blood pressure

1. Introduction

1.1 What is blood pressure?

The lateral pressure exerted by blood on the walls of blood vessels as it flows through them is known as blood pressure (BP). A blood vessel's blood pressure is determined by two factors: 1) The heart's distance 2) The blood vessel's structure. [1] In blood vessels near the coronary heart, blood pressure is higher. [1] Blood pressure is higher in the arterial system than in the venous system.This is because of the fact that artery walls are thicker and much less bendy than vein walls, which are thinner and greater flexible. Normal blood pressure is 120/80 mm Hg, and systolic blood pressure (SBP) is 120 mm Hg in ventricular systole. The pressure range is 110-130 mmHg. The minimum pressure during ventricular diastole is called diastolic blood pressure (DBP).The pressure is 80 mmHg. 70-90 mmHg range. The difference between systolic and diastolic blood pressure is known as pulse pressure (PP). i.e., 40 millimetres of mercury BP in the systole: PP = 3:2:1 for diastolic BP. [1]
Symptoms of excessive blood pressure generally do now no longer seem till it has caused critical health problems. [7] As a result, its critical to get your blood pressure checked on a normal basis. [7] Blood pressure can be measured using a variety of instruments (electronic, mercury, and aneroid), with semiautomatic devices being the most accurate because measurements can be taken even if the batteries run out, which is a common issue in resource-constrained environments. [3] A considerable number of people suffer from high blood pressure (hypertension). However, they are usually unaware of it, which means that it will eventually kill blood vessels. If your blood pressure is chronically elevated, you're more likely to have a heart attack, stroke, or kidney problem. As the blood pressure rises, your chances of developing these medical conditions rise as well. [6]

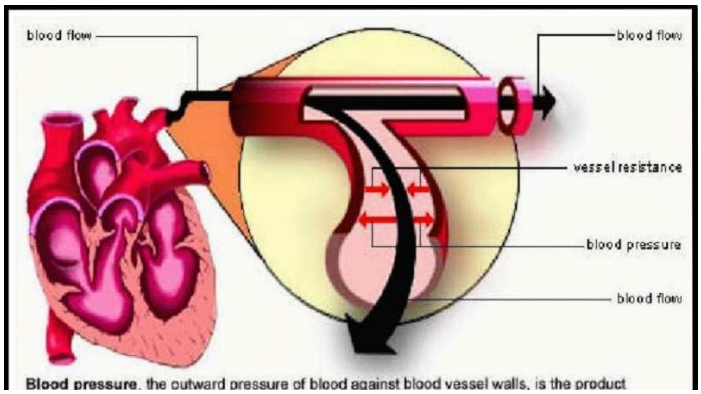

Figure 1: Blood pressure

The mean systolic blood pressure
It's not quite the arithmetic mean, but it's close. It's because, for the majority of the time, blood pressure is higher in the diastolic than in the systolic range. The reason for this is that ventricular diastole lasts longer than ventricular systole. [1]

Variations in Physiology
Age: Adults have higher blood pressure than infants.
Sex: Males have higher blood pressure than females.
Pregnancy: Blood pressure normally rises as the pregnancy progresses.
Altitude: People who live at higher altitudes have higher blood pressure.
Exercise: SBP rises as a result of physical activity.
Emotion: As people show their emotions, their blood pressure rises.
Sleep: During sleep, the pressure decreases.

Factors that Influence Blood Pressure
1) Blood volume
2) The heart's contraction force.
3) Heart rate and blood pressure are inversely proportional.
4) Blood viscosity.
5) Blood's composition.
6) Blood vessel elasticity. [1]

Effects of High Blood Pressure

High blood pressure puts too much pressure on your artery walls, which can damage your blood vessels and organs. The more your blood pressure rises and remains uncontrolled, the more damage it does. [2]

Excessive blood pressure that is not monitored may result in:

- Stroke
- Blindness
- Coronary artery disease/heart failure
- Kidney disease

What factors lead to high blood pressure?

Depending on if there is an essential clinical cause, high blood pressure may be classified as primary or secondary hypertension.

High blood pressure prevalence and burden:

According to 2009-2010 data, the average age-adjusted prevalence of high blood pressure (defined as 140/90 mm Hg or use of antihypertensive medication; or having been told at least twice by a health professional that one had high blood pressure) among U.S. adults aged 18 and up was 28.6%.[5] Men have a higher prevalence of high blood pressure than women at younger ages, but women have a higher prevalence of high blood pressure than men over the age of 65, as seen in Table 1. As a result, while the average prevalence of high blood pressure is comparable in men (33.6%) and women (33.2%), 19 there are variations between races and ethnicities.

African Americans have substantially higher blood pressure (42%) than whites (27.5%) or Hispanics (26.1%), and African American women have the highest rate of hypertension (47.0%) of any sex-specific race/ethnicity subgroup. 20 There are sex, racial, and ethnic differences in high blood pressure identification, treatment, and control. [4]

Table 1: Prevalence of High Blood Pressure in Adults Age 20 Years and Older in the United States, 2010

Demographic	Characteristic	Male	Female
Overall	All persons	33.6	32.2
Age (years)	20-34	9.1	6.7
	35-44	24.4	17.6
	45-54	37.7	34.0
	55-64	52.0	52.0
	65-74	63.9	70.8
	75+	72.1	80.1
Race	Non-Hispanic white	33.4	30.7
	Non-Hispanic black	42.6	47.0
	Mexican American	30.1	28.8
	Asian	21.2	
	American Indian/Alaska Native	24.8	

Blood Pressure Measurement

For proper diagnosis, the blood pressure should be an average of two or three measures taken at two or three different periods with the patient:

For more than 5 minutes, they were seated in a chair with their feet on the floor, their backs supported, and their limbs supported at heart level, with no clothing covering the part of the cuff placement.For at least 30 minutes, there has been no exercise, caffeine, or smoke. Measure blood pressure in both arms on the first visit, and then use the arm that provided the higher reading on subsequent visits.

- The upper arm is fitted with an appropriately sized blood pressure cuff. A properly sized cuff should cover two-thirds of the biceps; the bladder should be long enough to encircle > 80% of the arm, and the bladder width should be at least 40% of the arm circumference.

As a result, obese patients need broad cuffs. When listening over the brachial artery, the health care provider inflates the cuff above the expected systolic pressure and gradually releases the air.SBP is the pressure at which the first heartbeat can be heard as the pressure drops. The sound completely vanishes, indicating DBP. Blood pressure is measured in the forearm (radial artery) and thigh using similar concepts (popliteal artery). Mechanical machines should be calibrated on a regular basis; automatic readers are often inaccurate.

- Since BP that is > 15 mm Hg higher in one arm than the other necessitates measurement of the upper vasculature, BP is measured in both arms.
- To rule out aortic constriction, BP is measured in the thigh (with a much larger cuff), particularly in patients with reduced or delayed femoral pulses; with constriction, BP is significantly lower in the legs. More BP measurements are needed if blood pressure is in the stage 1 hypertensive range or is decidedly labile. This pattern likely accounts for "white coat hypertension," in which blood pressure is elevated when measured in the doctor's office but normal when measured at home or by ambulatory BP monitoring. [2]

Blood Pressure Regulation:

This entails maintaining a steady blood pressure within a narrow range. Hypertension (high blood pressure) and hypotension (low blood pressure) are both detrimental to the body. [1]

There are two types of mechanisms that regulate blood pressure.
1) Rapidly acting mechanism and 2) Slowly acting mechanism

I. Rapidly acting mechanism

This includes both nervous regulations along with endocrine or hormonal regulation.

a) Nervous Regulation of the BP

Blood vessels' smooth muscles will still be in a state of contraction. As a result, the blood vessels remain constricted, causing vasoconstriction. The sympathetic tone influences the degree of vasoconstriction. The degree of vasoconstriction would also increase as sympathetic tone rises. When vasoconstriction increases, total peripheral resistance (TPR) increases as well, raising blood pressure. Assume that the baroreceptors in the aortic arch and carotid sinus can sense a rise in blood pressure. The medulla

oblongata will receive impulses from these baroreceptors. A community of nervous cells in the medulla oblongata is responsible for controlling blood pressure.The vasomotor center is what it's called. There are two sections to the pressor: the pressor and the depressor. The pressor area would be inhibited by these baroreceptor impulses, resulting in a reduction in sympathetic sound. Vasodilation will increase as a result of this. TPR falls, and blood pressure returns to normal. This mechanism worked extremely quickly. It lowers blood pressure in a matter of seconds. [1]

Sympathetic nervous system and baroreceptors

The sympathetic nervous system's baroreflexes are responsible for the rapid moment-to-moment control of blood pressure. This results in vasoconstriction and improved cardiac output as a result of increased sympathetic and decreased parasympathetic output to the heart and vasculature. A compensatory rise in blood pressure results from these changes. [1]

b) Endocrine or Hormonal Regulation of BP

There are three important hormones taking part in regulation of BP:

1) Renin- Angiotensin- Aldosterone mechanism or system.
2) Regulation of BP by Vasopressin or ADH.
3) Adrenalin (Epinephrine) and noradrenalin (nor epinephrine).

1) Renin- Angiotensin- Aldosterone mechanism / system

If your blood pressure drops, your kidneys will be stimulated. Renin would be secreted by the kidney's juxta glomerular apparatus. Renin is a type of enzyme. It transforms angiotensin substrate, a plasma protein, into angiotensin I. By the action of the transforming enzyme, angiotensin I is converted to angiotensin II. Angiotensin II causes a temporary vasoconstriction. It works on blood vessel walls, increasing the degree of vasoconstriction. TPR will rise, bringing blood pressure back to normal. Furthermore, angiotensin II activates the adrenal cortex. Aldosterone secretion will increase as a result of this. Aldosterone is a hormone that mimics the function of the kidneys. It increases sodium and water reabsorption.This would result in an increase in blood volume. When blood volume increases, so does blood pressure. [1]

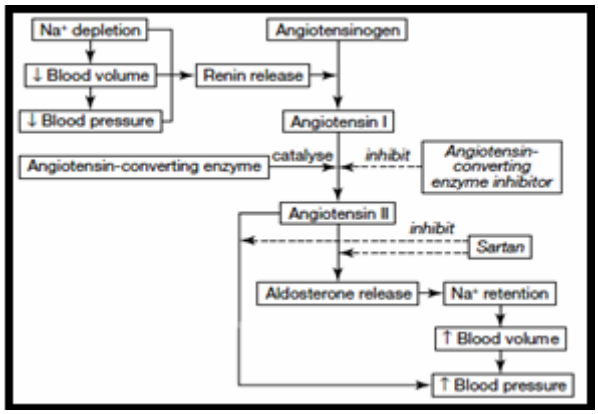

Figure 2: Mechanism of Renin- Angiotensin- Aldosterone

2) Vasopressin/ADH regulation of blood pressure

If the blood pressure drops, your hypothalamus will be stimulated. It raises the rate of water absorption. As a result, blood flow increases, and blood pressure returns to normal. [1]

3) Epinephrine (adrenaline) and noradrenaline (noradrenaline) (nor epinephrine)

If the blood pressure drops, your hypothalamus will be stimulated. In exchange, the hypothalamus stimulates the sympathetic nervous system. As a result, the adrenal medulla is stimulated. It secretes a greater amount of adrenaline. Adrenaline works on the blood vessel walls. It causes vasoconstriction to increase. This will raise TPR, which will return blood pressure to normal. [1]

II. Long-term BP oversight

Assume that the blood pressure rises. This will boost G.F.R, urine intake, and water loss from the body. This will reduce blood flow, which will lower blood pressure. [1]

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