**Blood Pressure**

**Blood pressure** is defined as the force of blood against the walls of arteries. The blood must reach the hands and feet, the brain, and every other part of the body in order to nourish those cells. In order the reach every extremity, it must be pumped out of the heart under considerable pressure. The highest pressure occurs in the aorta, the large vessel that carries oxygenated blood away from the heart. As the blood passes into smaller vessels and the distance from the heart becomes greater, the pressure becomes reduced.

The pressure in any artery varies as a result of two major factors.

1. **Cardiac Output** 
   * **Volume of blood**. The volume blood pumped with each beat of the heart will affect blood pressure in the arteries. If as a result of some injury a person has lost a lot of blood, the pressure in the system drops because of the decrease in volume.
   * **Heart rate**. The faster the heart pumps blood, the greater the pressure which is built up. The pressure falls as the heart rate decreases, especially during rest or sleep.

**2. Arteriolar Resistance**

* + **Size**. When the arteries dilate (become bigger in diameter), the volume of the vessels increases and the pressure falls. If the arteries constrict (become smaller in diameter), pressure is built up because of the extra resistance to blood flow.
  + **Elasticity**. The walls of the artery must be flexible and elastic. They must be able to expand as a surge of blood is forced out of the heart, and then relax after the surge has passed. If they cannot stretch this way they are described as hardened. Hardened arteries lead to increased blood pressure.

**Measuring Blood Pressure**

Two different pressures are measured and compared in a blood pressure reading. **Systolic pressure** is the amount of pressure the blood exerts on the walls of the arteries when the **ventricles contract**. **Diastolic pressure** is the amount of pressure the blood exerts on the walls of the arteries when the **ventricles are relaxed**.

The pressure of the blood pressing against the arterial walls can be measured using a device called a **sphygmomanometer**. To measure blood pressure, an inflatable rubber cuff is wrapped around the upper arm. As air is pumped into the cuff, the cuff presses on the arteries of the arm. When the pressure in the cuff is high enough, the blood flow through the arteries ceases. A **stethoscope** is placed over one of the arteries in the elbow, and the air in the cuff is gradually released. At first, the person listening through the stethoscope hears no sound. Then, a sharp tapping sound is heard. This sound is made by the blood spurting through a narrow opening in the compressed artery. The pressure reading just as this sound is heard is the systolic pressure. As more air is released from the cuff, the sound becomes muffled and then stops as the cuff ceases to press on the artery. The pressure reading just as the sound stops is the diastolic pressure.

Blood pressure is measured in millimeters of mercury (mm Hg). It is expressed as a ratio of systolic pressure to diastolic pressure. A reading of 120/70 means that the person's systolic pressure is 120 mm Hg and the diastolic pressure is 70 mm Hg. It is expressed verbally as "120 over 70."

Normal blood pressure is less than 130 mm Hg systolic and less than 85 mm Hg diastolic. Optimal blood pressure is less than 120 mm Hg systolic and less than 80 mm Hg diastolic. A typical reading for a healthy adult is 120/70. Readings for children and adolescents may be slightly higher.

A physician can infer much about a person's health by taking a blood pressure reading.

**Hypertension**

High blood pressure or **hypertension** is defined in an adult as a blood pressure greater than or equal to 140 mm Hg systolic pressure or greater than or equal to 90 mm Hg diastolic pressure. High blood pressure directly increases the risk of coronary heart disease (which can lead to heart attack) and stroke, especially along with other risk factors.

High blood pressure can occur in children or adults, but it's more common among people over age 35. It's particularly prevalent in middle-aged and elderly people, obese people, heavy drinkers and women who are taking birth control pills. It may run in families, but many people with a strong family history of high blood pressure never have it. People with diabetes mellitus, gout or kidney disease are more likely to have hypertension.

The diastolic pressure is particularly important and a reading above 90 is considered high. This means that even when the heart is at rest, the pressure in the arteries is too high, and this may lead to blood vessel damage in the heart, brain or kidneys.

Blood pressure is normally controlled by nerves that have their center in the brain. If the blood pressure in certain vessels increases, the brain sends nerve impulses to the heart and to the blood vessels, causing the heart rate to slow and the blood vessels to widen. As a result the blood pressure decreases. If the blood pressure becomes too low, the brain sends impulses that cause the heart rate to increase and the blood vessels to narrow, increasing the blood pressure. This is another case of homeostasis—maintaining a constant internal environment. If this regulatory mechanism cannot bring the blood pressure to normal levels, a condition known as hypertension is evident and medical assistance is required.

The factors causing hypertension are not well understood. In 90% of the cases of hypertension, the cause is unknown. It is well documented that hypertension is more common in societies in which salt consumption is high. Hypertension is also a much greater problem among obese (over-weight) people. There is a strong heredity influence, as hypertension tends to "run in families." The current view is that excessive salt intake and obesity trigger hypertension only when an underlying genetic predisposition is present. Drugs such as nicotine and caffeine can also increase blood pressure as they are categorized as stimulants. Stimulants increase heart rate and therefore increase blood pressure. People with high blood pressure are encouraged to reduce coffee consumption and quit smoking.

**Risk Factors You Can Control**

* Smoking
* Physical Inactivity
* Obesity
* Diet (Salt Intake)
* Diabetes
* Stress

**Risk Factors You Can’t Control**

* Age
* Ethnicity (South Asians, First Nations/Aboriginal Peoples or Inuit and people of African descent are at increased risk)
* Family history

The goal of treatment is to reduce the diastolic blood pressure to less than 90 mm Hg. Treatment consists of a combination of no-added-salt diet, weight loss if the person is over-weight, and drug medication. The excess fluid that sodium (salt) holds in the body may also put an added burden on the heart and "waterlog" the blood vessels, causing them to contract or narrow more easily. The blood vessels then take less diluted blood to the organs of the body than the quantity of normal blood that is required, depriving the cells of some oxygen and nutrients that they need. For this reason, low-sodium diets are used in treating mild to moderately severe hypertension. However, in individuals with severe hypertension, salt restriction must be severe.

When the demand for blood in various parts of the body is high (e.g. during exercise), the heart must pump faster, increasing the blood pressure in the vessels. Fatty tissue requires a lot of blood to feed it. Therefore, another way to reduce blood pressure and the stress on the heart is to lose weight. In addition to possibly lowering blood pressure and reducing weight, a low-fat, low-cholesterol diet may also help delay the beginning of arteriosclerosis. Medications called diuretics, which help rid the body of excess salt and therefore, of excess water, are often prescribed by the doctor in the treatment of hypertension.

**Blood Pressure Questions – *Answer Key***

1. Aspects of Blood Pressure
   1. What is blood pressure?  
      *Blood pressure is defined as the force of blood against the walls of arteries.*
   2. List and describe two major factors that affect blood pressure.  
        
      *The pressure in any artery varies as a result of two major factors.*
      1. *Cardiac Output*
         * *Volume of blood. The volume blood pumped with each beat of the heart will affect blood pressure in the arteries.*
         * *Heart rate. The faster the heart pumps blood, the greater the pressure which is built up.*
      2. *Arteriolar Resistance*
         * *Size. When the arteries dilate, the volume of the vessels increases and the pressure falls. If the arteries constrict, pressure is built up because of the extra resistance to blood flow.*
         * *Elasticity. The walls of the artery must be flexible and elastic. They must be able to expand as a surge of blood is forced out of the heart, and then relax after the surge has passed. If they cannot stretch this way they are described as hardened. Hardened arteries lead to increased blood pressure.*
   3. Differentiate between systolic and diastolic blood pressure.  
        
      *Systolic pressure is the amount of pressure the blood exerts on the walls of the arteries when the ventricles contract. Diastolic pressure is the amount of pressure the blood exerts on the walls of the arteries when the ventricles are relaxed.*
   4. How is blood pressure measured?  
        
      *Blood pressure can be measured using a device called a sphygmomanometer. To measure blood pressure, an inflatable rubber cuff is wrapped around the upper arm. As air is pumped into the cuff, the cuff presses on the arteries of the arm. When the pressure in the cuff is high enough, the blood flow through the arteries ceases. A stethoscope is placed over one of the arteries in the elbow, and the air in the cuff is gradually released. At first, the person listening through the stethoscope hears no sound. Then, a sharp tapping sound is heard. This sound is made by the blood spurting through a narrow opening in the compressed artery. The pressure reading just as this sound is heard is the systolic pressure. As more air is released from the cuff, the sound becomes muffled and then stops as the cuff ceases to press on the artery. The pressure reading just as the sound stops is the diastolic pressure.*
   5. What are “normal” blood pressure measurements?  
        
      *Normal blood pressure is less than 130 mm Hg systolic and less than 85 mm Hg diastolic. Optimal blood pressure is less than 120 mm Hg systolic and less than 80 mm Hg diastolic. A typical reading for a healthy adult is 120/70.*
   6. What effect does exercise have on blood pressure?  
        
      *During exercise, the demand for blood in various parts of the body is high and heart must pump faster, increasing the blood pressure in the vessels.*

1. High Blood Pressure
   1. Define hypertension.  
        
      *Hypertension or high blood pressure is defined in an adult as a blood pressure greater than or equal to 140 mm Hg systolic pressure or greater than or equal to 90 mm Hg diastolic pressure.*
   2. What are some of the possible side effects of hypertension?  
        
      *High blood pressure directly increases the risk of coronary heart disease (which can lead to heart attack) and stroke, especially along with other risk factors. It may also lead to blood vessel damage in the heart, brain or kidneys.*
   3. Discuss the causes, risk factors and treatment of hypertension.  
        
      *The factors causing hypertension are not well understood. In 90% of the cases of hypertension, the cause is unknown. It is well documented that hypertension is more common in societies in which salt consumption is high. It is also common in people with diabetes. Hypertension is also a much greater problem among obese (over-weight) people. There is a strong heredity influence, as hypertension tends to "run in families." The current view is that excessive salt intake and obesity trigger hypertension only when an underlying genetic predisposition is present. Drugs such as nicotine and caffeine can also increase blood pressure as they are categorized as stimulants. Stimulants increase heart rate and therefore increase blood pressure. People with high blood pressure are encouraged to reduce coffee consumption and quit smoking.*,

***Risk Factors You Can Control***

* 1. *Smoking Physical Inactivity Obesity Diet (Salt Intake) Diabetes Stress*

***Risk Factors You Can’t Control***

*•*

* 1. *Age •*
  2. *Ethnicity (South Asians, First Nations/Aboriginal Peoples or Inuit and Blacks are at increased risk) •*
  3. *Family history*

*The goal of treatment is to reduce the diastolic blood pressure to less than 90 mm Hg. Treatment consists of a combination of no-added-salt diet, weight loss if the person is over-weight, and drug medication. Low-sodium diets are used in treating mild to moderately severe hypertension. However, in individuals with severe hypertension, salt restriction must be severe. Another way to reduce blood pressure and the stress on the heart is to lose weight. In addition to possibly lowering blood pressure and reducing weight, a low-fat, low-cholesterol diet may also help delay the beginning of arteriosclerosis. Medications called diuretics, which help rid the body of excess salt and therefore, of excess water, are often prescribed by the doctor in the treatment of hypertension.*