# Mustansiriyah University / Pharmacy College

Practical Physiology 2024-2025
Second Stage

Lab Two
# Determination of blood pressure

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# Blood Pressure

Is the pressure exerted by the column of blood on the wall of the artery.

Blood pressure plays a vital role in the functioning of the human body. However, blood pressure can change rapidly and vary by multiple causes such as stress, physical exercise or certain foods, which may eventually cause serious health issues. Therefore, it is important to know how to measure blood pressure on a regular basis.

**Aim:** To determine the blood pressure of the given subject at rest and after moderate exercise.

## Principle
The pressure of blood in the artery (brachial artery) is balanced against the pressure of air in a rubber cuff surrounding the artery. The pressure of air in the cuff is then measured by means of a mercury manometer

## Two type of blood pressure:

- **Systolic blood pressure (SBP)** is the maximum pressure exerted by the blood against the artery walls.it results when the ventricles contract. Normally, it measures 120 mm Hg.
- **Diastolic blood pressure (DBP)** is the lowest pressure in the artery. It results when the ventricles are relaxed and is usually around 80 mm Hg.

The atrial blood pressure is the product of the cardiac output (amount of blood pumped out of the left ventricle per unit time) and peripheral resistance (viscosity, elasticity).
**Blood Pressure = Cardiac Output X Peripheral Resistance**

**Pulse pressure** is the difference between the systolic and diastolic pressures. It is the rise in pressure caused by the ejection of blood into the aorta by ventricular contraction. It is a measure of stroke volume and compliance of arteries.

**Mean arterial pressure (MAP)** is the average pressure present throughout the cardiac cycle. It is responsible for pushing the blood through the systemic circulatory system. It is equal to diastolic pressure + 1/3 pulse pressure

**What is a Normal Mean Arterial Pressure (MPA)?**

A normal MAP is between 70 and 100 mmHg.

1- If the MAP drops below 60 mmHg, there is a concern there won't be enough pressure to perfuse vital organs including the brain.

2- If the MAP is above 100 mmHg, the patient may be experiencing a high artery pressure. The high pressure experienced in the arteries may lead to blood clots or heart muscle damage.

**Normal value:-**
According to WHO the "normal" blood pressure varies by age in children and teens.

|  | Systolic | Diastolic |
|---|---|---|
| **Newborns up to 1 month** | 60–90 mm Hg | 20–60 mm Hg |
| **Infants** | 87–105 mm Hg | 53–66 mm Hg |
| **Toddlers** | 95–105 mm Hg | 53–66 mm Hg |
| **Preschoolers** | 95–110 mm Hg | 56–70 mm Hg |
| **School-aged children** | 97–112 mm Hg | 57–71 mm Hg |
| **Adolescents** | 112–128 mm Hg | 66–80 mm Hg |

In adulthood, the average blood pressures by age and gender are:

|  | Women | Men |
|---|---|---|
| **18-39 years** | 110/68 mm Hg | 119/70 mm Hg |
| **40-59 years** | 122/74 mm Hg | 124/77 mm Hg |
| **60+ years** | 139/68 mm Hg | 133/69 mm Hg |

## Physiological variation:-

1- Age: The ABP increase with age.

2- Sex: in women is slightly less than men.

3- It is more at evening and less in morning.

4- It is more after meal exercise and well-built person and Emotional excitement.

5- It is less in sleep and in lying position.

6- The blood pressure especially the diastolic is highest in the standing position, lower in the sitting and lowest while the subject is lying down

## Pathological variation:-

1- Heart Attack and Heart Disease

2- Stroke and Brain Problems

3- Kidney Disease

4- Infection, inflammation and fever
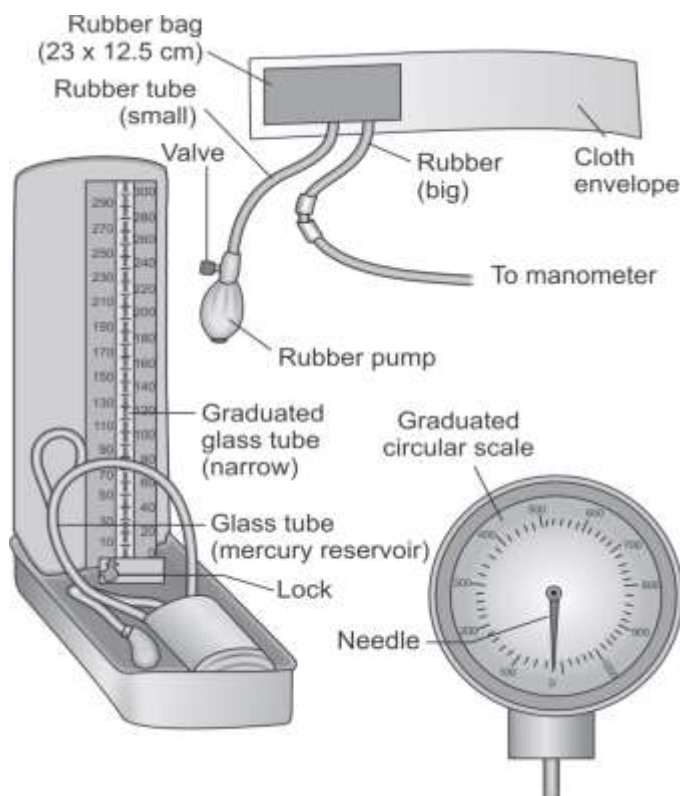
## Determination of blood pressure

There are two methods to measurement of ABP:

1- **Direct method**:- A cannula or needle filled with anticoagulant is inserted in artery. Then it is connected to the manometer ( It is usually used in surgeries and heart surgeries

**2- Indirect method:** it is include (**Palpatory method and Auscultatory method**), these two method use instruments called **Sphygmomanometer**

### Sphygmomanometer parts :-

. 1- Graduated vertical limb which open to atmosphere. It has marking from 0 – 250 mmHg from below upward.

3- Rubber bag covered with linen cuff.

4- Rubber bulb with valve.

5- Release screw.

6- Mercury reservoir.

7- Rubber tubes.



Figure 1: Sphygmomanometer and its part

A- **Palpatory method:** This method relies on feeling with the fingers and requires a lot of experience The systolic blood pressure can be determined by inflating an arm cuff and then letting the pressure fall and determining the pressure at which the radial pulse first becomes palpable.

Note: Diastolic pressure cannot be measured by palpatory method **because: As the cuff pressure is decreased more towards the diastolic pressure the pulse faints to become normal which cannot be distinguished.**



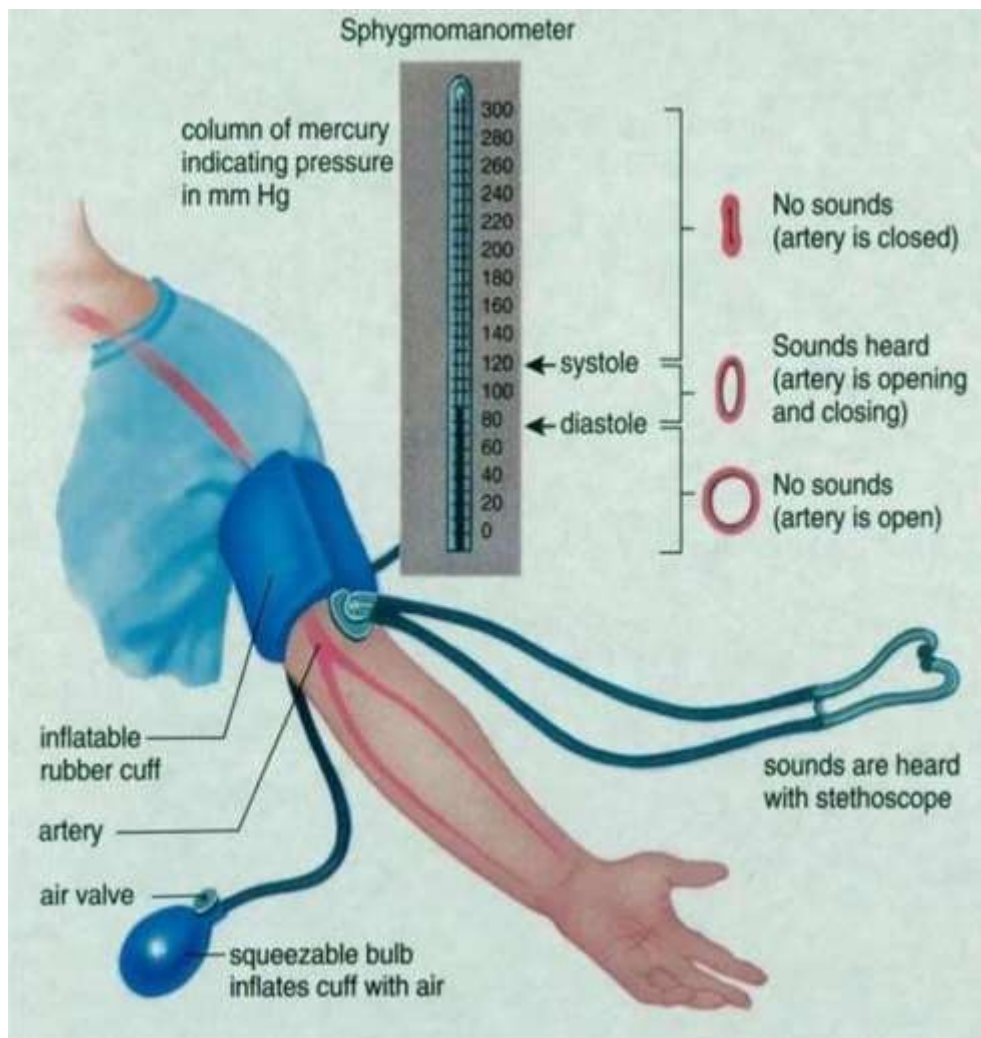**Figure 2: Palpatory method to determined blood pressure**

B- **Auscultatory method**: It is standard method of taking a patient blood pressure by use technique developed by Korotkoff in 1905 it used with <span style="color:red">**Stethoscope**</span>



**Figure 3: Stethoscopes**

## **Procedure:**

1- Subject should be relaxed, sitting or lying for five minutes.

2- Manometer is placed at level of observer's eyes.

3- All clothing should be removed from upper arm.

**4-** The arm of subject should be supported because failing of it causing isometric contraction which leads to false measurement

**5-** To begin blood pressure measurement, use a properly sized blood pressure cuff.

6- Wrap the cuff around the upper arm with the cuff's lower edge one inch above the antecubital fossa.

7- Lightly press the stethoscope's bell over the brachial artery just below the cuff's edge. Some health care workers have difficulty using the bell in the antecubital fossa, so we suggest using the bell or the diaphragm to measure the blood pressure.

8- Rapidly inflate the cuff (180 mmHg).

9- Release air from the cuff at a moderate rate (3 mm/Sec).

10- Listen with the stethoscope and observe the dial or mercury gauge. The first knocking sound is the subject's systolic pressure. When the sound disappears, that is the diastolic pressure (such as 120/80).

**Figure 3: Auscultatory method to determined blood pressure**

## The number of precautions must be observed:-

1- The cuff must be at heart level
2- Using standard arm cuff
3- Compare blood pressure in both arms
4- Tell the subject not to talk during measurement of pressure.
5- Avoid using an arm with I.V, edema, injury or paralysis.
6- Smoking and drinking alcohol within last 15 minutes alter reading.
7- Pain, anxiety and discomfort give a falsely high pressure.

**Blood pressure worksheet**

**Student name:**                                                          **Group:**
                                                                                **Date:**

Aim of the experiment:………………                    Materials:…………………….

Results:

| Effect of exercises on BP | | | | |
|---|---|---|---|---|
| procedure | Systolic BP (mm Hg) | Diastolic BP (mm Hg) | Pulse pressure (mm Hg) | MAP(mm Hg) |
| Before exercises | | | | |
| After exercises | | | | |

| Effect of posture on BP (from Sitting to Standing ) | | | | |
|---|---|---|---|---|
| procedure | Systolic BP (mm Hg) | Diastolic BP (mm Hg) | Pulse pressure (mm Hg) | MAP(mm Hg) |
| Sitting | | | | |
| standing | | | | |

Discussion:

1. What are the BP changes you observe during exercise in the subjects?

2. What are the changes in heart rate you observe after exercise? What is the physiological basis for these changes?