COMPARISON OF BLOOD PRESSURE IN SITTING, STANDING, AND LYING POSITIONS IN KEEPING HOMEOSTATIS

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ABSTRACT

This study aims to determine the ratio of blood in the sitting, standing and lying positions. The research method used is a laboratory experimental research method that uses 3 probands by using stethoscope and sphygmomanometer to calculate the heart rate probandus in a lying, sitting, standing position, after light exercise (running in place ±20 steps) after strenuous exercise (running in place ±50 steps) the heart rate will increase in a sitting position because the heart pumps blood will be harder to resist the force of gravity. This makes blood pressure tend to be stable.

The results showed that menunjukkan based on the results of individual studies on the first probandus, namely probandus 1, when sitting, fitriyanti's blood pressure is hypotensive with a pressure of 120/80MmHg, when she stands, her blood pressure is normal with a pressure of 110/70MmHg and when she lies down, her blood pressure is hypotensive with a pressure of 100/70MmHg. . In the 2nd Probandus, Rizka is 19 years old. When sitting down, Rizka's blood pressure is not normal with a pressure of 100/90MmHg, when she stands up, she has hypotension with a pressure of 100/60MmHg, while lying down, she has hypotension with a blood pressure of 100/70MmHg. In the third proband, sartin, the sex is female, aged 19 years. when sitting, sartin blood is hypotensive with a pressure of 110/80MmHg, when standing, sartin blood is hypotensive with a pressure of 100/70MmHg, and when lying down, the blood pressure of Sartin is hypotensive with a blood pressure of 100/60MmHg. This can happen because the probandus is in a state of dehydration, lack of nutrition and nutrition, or because the probandus is sick/unfit or because of other factors so that his diastolic pressure is low.

Keywords: blood pressure, homeostasis

INTRODUCTION

Pharmacyis a health-related profession related to health science and chemistry. Pharmacyis a profession in the health sector which includes activities in the field of discovery, development, production, processing, compounding, and distribution of drugs. In Pharmacy there are four areas to be studied, namely: Clinical pharmacy, Industrial pharmacy, Science pharmacy, and Traditional medicine pharmacy. Supporting skills that must be possessed are happy and familiar with physics, chemistry, biology, and mathematics; accuracy and precision; memorization and analytical skills; and likes to work in the laboratory. Pharmacy courses are indeed famous for courses or previously called chemistry subjects, but in the Department of Pharmacy there are also many supporting courses such as other natural science majors, namely mathematics, physics and

biology. In Pharmacy lectures are actually not much different when compared to the medical department. In Pharmacy, we learn more about all natural sciences, not only focusing on chemistry, Pharmacy students also learn the main lessons in medicine, namely basic human anatomy and basic human physiology [9].

The study of anatomy and physiology in humans is a lesson that leads to the physiology of the human body as the main object of giving pharmaceutical assignments. In the medical world this science is used as the basis for making various kinds of diagnoses for a person's condition. Pharmacies engaged in the health sector also need this knowledge. because this science is very important to learn. In this report we discuss the cardiovascular system. The cardiovascular system is a life-sustaining system that pumps blood throughout the body through the circulation of veins, arteries and capillaries. This system helps protect the body and regulates body temperature. The heart is located in the mediastinum, a cavity between the lungs. The heart wall consists of 3 layers, namely, Epicardium, Myocardium and Endocardium. And consists of 4 rooms, namely [17].

The cardiovascular system is a blood circulation organ consisting of the heart, blood components, and blood vessels that function to provide and circulate the supply of oxygen (O2) and nutrients to all body tissues needed in the body's metabolic processes [14].

The Cardiovascular System is a system whose role is to maintain Homeostasis, Transport essential materials such as O2 and Nutrients that must be transported continuously from the external environment and delivered to cells and waste metabolites that must be removed continuously which this system consists of. of the heart, blood vessels, and blood [14].

The cardiovascular system is a system consisting of the heart, blood vessels and blood and the lymphatic system which has a role to provide what body tissues need, to transport nutrients to body tissues, to transport metabolic waste to transport hormones from one part of the body to another. In general, this system plays a role and optimizes cell function. [7].

Inside the heart there are several organs that support the work of the heart, namely blood vessels. There are three main types of blood vessels in the cardiovascular system, namely arteries, veins and capillaries. Arteries carry blood away from the heart to organs throughout the body. arteries branch into arterioles, small blood vessels that carry blood to capillaries. Capillaries are microscopic vessels with very thin walls and are porous. The network of capillaries, called capillary beds, penetrates every tissue, passing through every cell of the body several times the diameter of the cell. By crossing the thin capillary walls, chemicals, including dissolved gases, are exchanged by diffusion between the blood and the interstitial fluid surrounding the tissue cells.

Blood pressure is the force that blood exerts on the walls of blood vessels. This pressure varies according to the associated blood vessels and heart rate. Blood pressure is highest in the large arteries that leave the heart and gradually decreases to the arterioles. Finally, upon reaching the capillaries, this pressure is so low that light external pressure will close these vessels and push the blood out. Blood pressure is almost always expressed in millimeters of mercury (mmHg) because the mercury manometer has been used for a long time as a standard reference for pressure measurement. Blood pressure actually

means the force exerted by the blood against each unit area of the vessel walls. Sometimes pressure is expressed in centimeters of water (cm H2O) [8].

The blood pressure test will show two numbers. A higher number is obtained when the heart is contracting (systolic), a lower number is obtained when the heart is relaxed (diastolic). Blood pressure is written as the systolic pressure, the slash of the diastolic pressure, for example 120/80 mmHg, read one hundred twenty eighty. It is said to have high blood pressure if the systolic pressure reaches 140 mmHg or more when sitting, or the diastolic pressure reaches 90 mmHg or more, or both. In high blood pressure, there is usually an increase in systolic and diastolic pressure. In isolated systolic hypertension, the systolic pressure is 140 mmHg or more, but the diastolic pressure is less than 90 mmHg and the diastolic pressure is still within the normal range [5].

Blood pressure will increase by 10 mmHg every 12 cm below the heart due to the influence of gravity, above the heart, blood pressure will decrease by the same amount [6].

Usually, when we stand up from a sitting position and sleep, there is an increase in arterial tone. When the tone has been maximized due to reduced vascular volume, the standing position will strengthen the force of gravity that is not restrained and blood pressure drops sometimes to irregularities [11].

Due to the increased pressure caused by the effects of gravity, there is accumulation of blood in the dilated veins, resulting in reduced venous return. Filtration through the capillary walls is also increased which causes ankles and feet to swell, unless compensatory measures are able to counteract the effects of gravity [18].

Sleep is a process of changing consciousness that occurs repeatedly over a certain period. In general, the sleep and wake cycle of an adult human consists of 8 hours of sleep and 16 hours of wakefulness for 24 hours. This sleep and wake cycle is regulated by a combination of two physiological systems of the body, namely the sleep homeostasis system and the circadian rhythm [10].

In general, homeostasis is the process by which the body maintains a balance of internal conditions such as blood pressure, body temperature, hormonal balance, and acid-base balance. For the sleep-wake process, there is a separate homeostasis that regulates the sleep-wake cycle itself, which is called sleep homeostasis [4].

Blood pressure is the pressure of the blood flowing in the arteries (arteries). The heart beats, usually 60 to 70 times in 1 minute at rest (sitting or lying down), blood is pumped into the blood through the arteries. The highest blood pressure occurs when the heart beats pumping blood, this is called the systolic pressure. Blood pressure decreases when the heart relaxes between two pulses, this is called diastolic pressure. Blood pressure is written as systolic pressure and diastolic pressure for example, 120/80 mmHg [13].

Blood pressure is the pressure exerted on the walls of the arteries. Blood pressure occurs as a result of cyclical phenomena. Peak pressure occurs when the ventricles contract and is called the systolic pressure. Diastolic pressure is the low pressure that occurs when the heart is at rest. Blood pressure is usually described as the ratio of systolic pressure to diastolic pressure, with normal adult values ranging from 100/60 to 140/90. Average normal blood pressure is usually 120/80 [2].

When to get blood pressure there must be cardiac output and resistance to systemic

circulation blood flow. This resistance is called the total peripheral resistance [18].

TD = CO x TPR

Information
TD: Blood Pressure
CO: Cardiac Output (heart output)
TPR: Total Peripheral Resistance

Factors that affect cardiac output such as heart rate and stroke volume. The resistance to blood flow lies mainly in the small arteries of the body, called arterioles. It is these small diameter blood vessels that provide the greatest resistance to blood flow [4].

1. Cardiac Output, a person's cardiac output is the volume of blood pumped by the heart (stroke volume) in 1 minute (heart rate) [18].

   Cardiac output = Heart rate x Stroke volume

2. Viscosity of Blood & Prisoner, the viscosity or viscosity of blood affects the ease with which blood flows through small vessels, and the viscosity of blood is determined by the hematocrit, when the hematocrit increases, blood flow slows, arterial blood pressure rises. Normal hematocrit for men is ± 42% while for women ± 38% [1].

   The resistance to blood flow is determined not only by the radius of the blood vessels (vascular obstruction) but also by the viscosity of the blood (Ganong, 2008). The smaller the vessel lumen, the greater the vascular resistance to blood flow, with increasing resistance arterial blood pressure also increases. Blood pressure also decreases when blood vessels dilate and resistance decreases [18].

3. Elasticity and Blood Volume, normally the arterial blood wall is elastic and easily distended, the distension ability prevents the widening of blood pressure fluctuations, and in certain diseases such as atherosclerosis, the blood vessel wall loses its elasticity [11]. The volume of circulating blood in adults is 5000 ml, normally the blood volume remains constant, the volume of circulating blood in the vascular system affects blood pressure. The pressure against the arterial wall becomes greater as the volume increases [18].

Normal levels of blood pressure vary throughout life. Infant blood pressure ranges from 65-115/42-80, normal blood pressure for a 7-year-old child is 87-117/48-64. The normal range for 19 year olds is 90 percent 124-136/77-84 for boys and 124-127/63-74 for girls. Adult blood pressure tends to increase with age. The normal standard for a tall, middle-aged teenager is 120/80 [18].

The systolic blood pressure of the elderly usually increases with age, while the systolic blood pressure usually increases only until the age of 50 and then decreases so that at that time, the formula for blood pressure is age plus 100. So if a person is 60 years old then the systolic blood pressure is 160 mmHg considered normal [12].

Measures arterial blood pressure using an instrument called a sphygmomanometer. The setting of the sphygmomanometer is placed over the brachial artery. A stethoscope is also used to hear pulses. The pressure is increased until no more pulse is heard. Then slowly reduce the set pressure so that the first "dup" sound (Korotkoff I) is heard. This first pulse represents the systolic blood pressure and at this time the blood vessels that were not previously drained begin to bleed again [15].

The setting pressure continues to be lowered slowly, the pulsating sound will

also be heard decreasing until it finally disappears. The last pulse is the diastolic blood pressure (Korotkoff V). The pulse finally disappears because the set pressure has dropped below the blood vessel pressure so that there is no resistance anymore. Cardiac pumping activity takes place by contracting and relaxing, so that it can cause changes in blood pressure in the circulatory system [15].

There are 2 (two) important measurements of blood pressure, namely systolic pressure and diastolic pressure. Systolic pressure is the blood pressure when the heart beats and pumps blood. Diastolic pressure is the blood pressure when the heart is resting between beats.

Table 1. Practicum Results in Probandus

Category	Systolic mmhg	Diastolic mmhg
Hypotension	<90	<60
Normal	90-119	60-79
Prehypertension	120-139	80-89
Hypertension grade 1	140-159	90-99
Hypertension grade 2	160-179	100-109
Emergency level hypertension	180	110

Source: Practicum Report

Based on the blood pressure classification table above, normal blood pressure is between 90 mmHg to 119mmHg for systolic pressure while for diastolic pressure it is around 60mmHg to 79mmHg. Blood pressure below 90/60 mmHg is categorized as hypotension (hypotension) or low blood pressure, while above 140/90 mmHg is categorized as high blood pressure or hypertension (Hypertension).

Techniques for Measuring Blood Pressure

Blood collection techniques can be done with the following steps:

1. The patient sits relaxed with the arms relaxed on the table, the palms facing up, and the muscles of the follow-up arms able to hold.
2. Place the sphygmomanometer device near the arm being examined with the scale facing the examiner. The examiner can sit or stand in front of the examiner.
3. Place the tensimeter cuff on the upper arm with the bottom of the bandage about 3 cm above the elbow crease. The accuracy of this installation position affects the results, the load should not be too tight nor too loose.
4. Place the tip of the stethoscope at the crease of the elbow where the loudest pulse is felt with the left hand. Place the other end of the stethoscope in both ear canals.
5. Hold the sphygmomanometer rubber ball with your right hand. Turn the valve at the base of the pump ball with your thumb and forefinger clockwise to close the hose. While holding the stethoscope in the left hand, keep pressing, then pump the rubber ball so that the mercury seems to gradually rise so that the sound of the heartbeat is still heard in the ear. Stop pumping after the sound of the heartbeat disappears. Increase pumping 30 millimeters of mercury above since the heartbeat has disappeared.
6. Slowly turn the valve dial counterclockwise with the thumb and forefinger of the right hand when you are done pumping. Set the rotary valve to loosen, so that the rate of descent of the mercury is about 3 millimeters per second.
7. Notice the drop of mercury on the scale when you first start to hear a heartbeat. That's when it is defined as the upper or systolic pressure value. Meanwhile the mercury continues to fall. Also note the mercury scale when the heart sounds are gone. That's when it is set as the diastolic value.

8. If you fail to hear the first thumping sound, try again but make sure the mercury scale shows a level below zero before starting to pump again [15].

RESEARCH METHODS

The research method used is a laboratory experimental research method that uses 3 probands by using stethoscope and sphygmomanometer to calculate the heart rate probandus in a lying, sitting position, after light exercise (running in place ± 20 steps) after strenuous exercise (running in place ±50 steps) the heart rate will increase in a sitting position because the heart pumps blood more hard against gravity. This makes blood pressure tend to be stable. The tools needed in this study are a stethoscope and a sphygmomanometer.

This research was conducted in the following way:

1. Calculate the probandus heart rate when lying down, sitting, standing, after light exercise (running in place ±20 steps) after strenuous exercise (running in place ± 50 steps)
2. Record this pulse rate in beats/minute
3. Calculate blood pressure by auscultation

RESEARCH RESULT

After doing small activities and then measuring blood pressure when sitting, standing and lying down, the results are presented in the table below.

Table 2. Comparison of blood pressure by sitting position

No	Proband	Sitting Position
1	Proband 1	120/80 mmHg
2	Proband 2	100/90 mmHg
3	Proband 3	110/80 mmHg

Source: Practicum Report

Based on the results of the study, blood pressure measurements in the sitting position showed that the blood pressure in proband 1 at the sitting position was 120/80 mmHg, in proband 2 it was 100 per 60 mmHg and in proband 3 it was 120/80 mmHg.

Table 3. Comparison of blood pressure by standing position

No	Proband	Standing Position
1	Proband 1	110/70 mmHg
2	Proband 2	110/60 mmHg
3	Proband 3	100/70 mmHg

Source: Practicum Report

Blood pressure measurements in the standing position showed that the 1st proband blood pressure was 110 per 70 mmHg in the 2nd proband it was 110 per 60 mmHg and in the 3rd probandus was 100 per 70 mmHg after going through a series of light exercises.

Table 4. Comparison of blood pressure by lying position

No	Proband	Lying Position
1	Proband 1	100/70 mmHg
2	Proband 2	100/70 mmHg
3	Proband 3	100/60 mmHg

Source: Practicum Report

Blood pressure measurements in the lying position showed blood pressure on proband 1 was 100 per 70 mmHg, on proband 2 100/70 mmHg and on probandus three, that was 100 per 60 mmHg.

DISCUSSION

In this study about the "cardiovascular system". The cardiovascular system itself is a blood regulatory system that involves several organs such as the heart, veins, and arteries and blood capillaries. This blood component will later carry and circulate the supply of oxygen or food through the blood throughout the body which will be used for metabolism in the body. The cardiovascular system requires many varied mechanisms so that its regulatory function can respond to body activities, one of which is increasing blood supply activity so that tissue activity can be fulfilled.

The pulse itself can be carried out by a simple examination, namely by auscultation, auscultation is an examination of the pulse by feeling, feeling and touching the structure of the pulse using the fingertips, while auscultation is a simple examination by listening to natural sounds that come out of the body. Then blood pressure is the force exerted by the blood on the unit area of blood vessels. And when the heart is relaxed, that is, it is fully filled with the heart, it is called diastole, while when it is contracted, it is the expulsion of blood from the heart, it is called systole.

The purpose of this study is to find out how to measure blood pressure and pulse and the factors that influence them. Where to measure blood pressure, a tool called Spyghnomanometer is used, which consists of a manometer, air cuff, rubber hose, rubber air pump+screw opening the cover, then we also need a stethoscope, while to measure pulse using a stethoscope. And the material we use is arteries in several probands.

In measuring blood pressure in the right way, the first is to make sure the blood pressure meter is on, by turning the screw under the manometer upwards so that the blood pressure meter is on. Then the clothes on the left arm are bent upwards, then place the air cuff above a distance of 2 fingers from the wrist of the elbow where the brachial artery is located. Next, put the stethoscope to the ear and ensure that the stethoscope is on by hitting the diaphragm of the stethoscope if a sound means that the stethoscope is on, if it is not on, the diaphragm of the stethoscope must be rotated first so that the blood pressure can be heard. After making sure the stethoscope is on. Then start the pump using an air pump until the line on the manometer shows 130 mmHg (this pumping is aimed at the scale pointing to 130mmHg so that the arterial flow is completely blocked at a pressure of 130mmHg) then slowly release the air screw (releasing this screw indicates that the pressure from the cuff is starting to decrease so that the brachial artery begins to loosen so that you can hear the initial pressure and the final pressure), while being released listen for the initial and final sounds of the blood pressure. The initial sound is systole or the heart begins to contract and the final sound is diastole, namely the heart is in a relaxed state, which is filled with blood. Systolic per diastole is a person's blood pressure. Then the screw is turned until the pressure in the manometer is actually in position 0. and remove the cuff from the probandus hand and then empty the air contained in it, and finally put the cuff into the storage box. Turn the screw on the stethoscope diaphragm to turn off the stethoscope after use. Take pressure measurements before and after running ±20 steps (this is done to determine changes in blood pressure after doing activities).

In the results of the first probandus study, namely Safitriyanti Gaghaube with a female age of 18 years. When sitting, Fitriyanti's blood pressure is hypotensive with a pressure of 120/80MmHg, when standing, Fitriyanti's blood pressure is normal with a pressure of 110/70MmHg and when lying down, Fitriyanti's blood pressure is Hypotension with a pressure of 100/70MmHg. In the 2nd Probandus, Rizka is 19 years old. When sitting down, Rizka's blood pressure is not normal with a pressure of 100/90MmHg, when she stands up, she has hypotension with a pressure of 100/60MmHg, while lying down, she has hypotension with a blood pressure of 100/70MmHg. In the third proband, sartin, the sex is female, aged 19 years. When sitting, the blood of Sartin is hypotensive with a pressure of 110/80 MmHg.

Differences in position can affect blood pressure, blood pressure will increase by 10 mmHg every 12 cm below the heart due to the influence of gravity, above the heart, blood pressure will decrease by the same amount Usually, when we stand up from a sitting position and sleep, there is an increase in tone arteries. When the tone has been maximized due to reduced vascular volume, the standing position will strengthen the force of gravity that is not restrained and blood pressure drops sometimes to irregularities [3].

More blood collection in the veins in the standing position, resulting in less blood volume returning to the heart, reduced stroke volume, reduced cardiac output, and possibly a decrease in blood pressure. Decreased blood pressure will determine the speed of blood to the target body part. The heart volume is reduced, the blood ejection and pressure are reduced, this is the reason why the results of the test while standing are reduced [8].

Sitting posture or position makes blood pressure tend to be stable. This is what causes blood pressure to be greater than when standing. This is because when sitting, the sympathetic vasocontractor system is stimulated through the skeletal nerves to the abdominal muscles. This situation increases the basic tone of these muscles which compress all of the abdominal venous reserves, helping to drain blood from the abdominal vascular reserves to the heart. This increases the amount of blood available for the heart to pump. This overall response is called the abdominal compression reflex. The heart works in a sitting position; in pumping blood it will be harder because it is against the force of gravity so that the heart rate increases [19].

This can happen because the probandus is in a state of dehydration, lack of nutrition and nutrition, or because the probandus is sick/unfit or because of other factors so that his diastolic pressure is low.

CONCLUSION

The anatomy of the respiratory system is to lift oxygen into the body, and remove carbon dioxide into the air. The respiratory system consists of the nose, pharynx (throat), larynx (vocal cords), trachea, bronchi and lungs. The function of the respiratory system is to enter air into the lungs while the organs of the respiratory system have a function, namely the nose as a breathing apparatus and the sense of smell, the pharynx as the digestive tract, the larynx protects the lower respiratory tract, the trachea to channel air, the main bronchus to the alveoli, bronchioles help the process of breathing, alveoli where air exchange and lungs to help oxygen from the air we breathe.

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