# ANALISA JENISDAN JUMLAH SEL LEUKOSIT PADA PENDERITA*TUBERCULOSIS* YANG MENJALANI PENGOBATAN OBAT ANTI *TUBERCULOSIS* SELAMA 2 BULAN DI RUMAH SAKIT KHUSUS PARU MEDAN

## SKRIPSI

## OLEH :

**MUHAMMAD NUR FADEL LUBIS**
**188700024**

**PROGRAM STUDI BIOLOGI**
**FAKULTAS SAINS DAN TEKNOLOGI**
**UNIVERSITAS MEDAN AREA**
**MEDAN**
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## ABSTRACT

Tuberculosis (TB) is one of the deadliest infectious infectious diseases in the world, this is because Mycobacterium tuberculosis has infected the world's population. Tuberculosis transmission itself can be through droplets of phlegm (droplets) when coughing or sneezing and can infect other healthy people. The effect of Anti Tuberculosis Drugs (OAT) on the number of leukocytes can reduce the number of leukocytes which previously increased in number due to infection and the presence of antibody drug complexes that bind to the leukocyte cell membrane, causing lysis of the leukocyte cells. The purpose of examining the number of leukocytes is useful as a diagnosis because it can describe the incidence and process of disease in the body, especially infectious diseases such as pulmonary tuberculosis. Analysis of the Type and Number of Leukocytes in Tuberculosis Patients Undergoing Anti Tuberculosis Drug Treatment for 2 Months at the Special Pulmonary Hospital Medan with a total of 20 patients, with the method used in this study was descriptive cross sectional looking at the description of the quantity and type of leukocyte cells. . The results obtained were 5 patients (25%) which increased from 20 patients who were examined overall.


**Keywords : Leukocyte Cells, Pulmonary Tuberculosis**

# CHAPTER I

# INTRODUCTION

## 1.1 Background of Study

Leukocytes are blood components that can detect infections caused by bacteria and viruses, and can see the body's immunity, because leukocytes play a role in the body's defense system. The number of leukocytes can help diagnose organ damage and be a source of information about the immune deficiency disease process (Mukarromah, 2013). Leukocytes are the most important part of the body's defense system that functions to fight microorganisms that cause infection in the body. Leukocytes are divided into several types, namely Basophils, Eosinophils, Segment Neutrophils, Stem Neutrophils, Lymphocytes, and Monocytes (Bakhri, 2018).

The immune system consists of cell types Basophils, Eosinophils, Segmented Neutrophils, Stem Neutrophils, Lymphocytes, and Monocytes that are fixed and attached to tissues or that are able to move and interact in lymph tissue scattered throughout the body. Lymph nodes are associated with white blood cells, which are immune cells that help the body fight infection. The lymph system collects fluids and waste substances such as viruses and bacteria in body tissues outside of the bloodstream. Lymph vessels carry lymph fluid to the lymph nodes. As the fluid drains the lymph nodes filter, trapping bacteria, viruses and other foreign substances. Then harmful foreign substances are destroyed by lymphocytes which are white blood cells (Louise, 2011).

Tuberculosis (TB) is a disease that most often occurs in the lungs with a percentage of 80% caused by acid-fast bacilli (BTA) which is the bacterium Mycobacterium tuberculosis (Tan, 2007). Mycobacterium tuberculosis bacteria as the causative agent of TB which is spread through the air when individuals with TB spread

the germs by coughing. As an infectious pathogen and infect humans mainly through the respiratory tract. The main function of the airway mucosa is as an induction site where the mucosal immune system response begins which then gradually provides the first defense for the host to defend itself from pathogens (Syafa'ah, 2016).

WHO data in 2015 stated that Indonesia was the country with the second most pulmonary TB sufferers in the world, namely 10% of the total global cases of pulmonary TB in the world. Based on Indonesian health profile data reported by the Indonesian Ministry of Health (2013) that the number of pulmonary TB patients recorded in 2012 was 202,301 with a prevalence of 138/100,000 Indonesian population and in 2013 according to the Indonesian health profile report from the Indonesian Ministry of Health (2014) there were a decrease in the number of patients with pulmonary TB so that the number of sufferers became 196,310 people with a prevalence of 113/100,000 Indonesian population (Yoannes, 2008).

TB drugs or Anti Tuberculosis Drugs (ATD) have been known to treat TB disease, but will drop out if they do not comply with drug consumption. Inaccurate treatment can cause TB germs to become resistant to ATD and can become Multi Drug Resistance (MDR) TB (Putri J, 2015). Anti Tuberculosis drugs consumed can reduce the number of leukocytes which increases during an infection. In addition, normal leukocytes in tuberculosis patients can be the body's response to the healing and treatment process. The normal leukocyte count found in tuberculosis patients who underwent 2 months of treatment was caused by a drug reaction capable of kills Mycobacterium tuberculosis bacteria slowly during treatment (Diana, 2007).

Pyrazinamide, Rifampicin, Isoniazid, Ethambutol, and Streptomycin are the therapies used for TB patients. These drugs are often called Anti Tuberculosis Drugs (ATD) where the drug is given to patients in combination form. TB treatment with ATD

can reduce the number of leukocytes, which previously increased in number due to infection, after a few months of treatment the results of the leukocyte count returned to normal (Bestari et al, 2014). Isoniazid and rifampin are drugs that can cause immune complex mechanisms to occur, antibody drug complexes bind to leukocyte cell membranes and trigger complement activation, causing lysis of leukocyte cells or destruction of leukocyte cells (Istiantoro et al, 2012).

Treatment for the first 2 months aims to reduce the number of germs in the patient's body. Treatment for 2 months is also carried out to minimize the influence of a small number of germs that may have been resistant to treatment. In general, after the first 2 weeks of patients undergoing regular treatment, the patient's infectiousness has decreased. The patient has experienced a change in sputum examination results to negative at the end of 2 months of treatment (the Ministry of Helath, 2016).

In a previous study conducted by Eti Khotimah (2010) showed an increase in leukocyte levels, whereas after administration of ATD, leukocytes decreased. This means that the administration of ATD can significantly reduce the number of leukocytes. Based on the archives of TB reports from the Medan Pulmonary Hospital in 2008 there were 131 people with pulmonary TB. Out of the total, 54 people were declared cured and 77 people were in the treatment period.

Based on the background above, the researcher wanted to know how the types of leukocytes and the number of leukocytes in TB patients who have taken ATD for 2 months. This is the basis for conducting research on the effect of ATD on TB patients.

## 1.2 The Formulation of Problems

From the background above, the researcher wanted to know how the type and number of leukocytes in Tuberculosis patients who underwent Anti Tuberculosis Drug treatment for 2 months at Medan Pulmonary Hospital.

## 1.3. The Aim of Study

This study aims to determine the type and number of leukocyte cells in Tuberculosis patients who were treated with Anti Tuberculosis Drugs for 2 months at the Medan Pulmonary Hospital.

## 1.4. The Significance of Study

The research can be used to be information and knowledge about the type of leukocyte cell and the number of leukocytes in Tuberculosis patients who were treated by Anti Tuberculosis Drug treatment for 2 months, and know the side effects after taking ATD so that it can help to provide information about pulmonary Tuberculosis patients to relatives and closest people.

# CHAPTER II

# LITERATURE REVIEW

## 2.1 Blood

Blood is a liquid system consisting of two parts. The intercellular material is a liquid called plasma and in it are solid elements, namely blood cells. The total blood volume is one twelfth of body weight or about 5 liters. About 55% of it is fluid, while the remaining 45% is made up of blood cells. This figure is expressed in the hematocrit value or the volume of blood cells obtained which ranges from 40-47 (Sutedjo, 2006).

Blood is a functional system consisting of blood plasma and blood cells. The main function of blood is to transport nutrients and oxygen throughout the body and to carry metabolic wastes to be excreted through the excretory system. Blood contains blood plasma and blood cells (Sutedjo, 2006).

Blood plasma is the system contained in the blood which consists of 91.5% water. Blood cells consist of erythrocytes (red blood cells), leukocytes (white blood cells) and thrombocytes (blood platelets). The function of erythrocytes is to carry nutrients and oxygen because they contain hemoglobin. The function of leukocytes is to clot the blood that comes out of the body due to injury. Platelets function as blood clots when there is an injury that causes bleeding. Platelets are formed in the spinal cord and are round or oval in shape without a nucleus (Evelyn, 2010).

### 2.1.1 Functions of Blood

Blood works as the transport system of the body, delivering all the chemicals, oxygen, and nutrients needed for the body to function normally, and getting rid of carbon dioxide and other waste products. White blood cells provide many protective materials

due to the phagocytic movement of some cells and thus protect the body against attack--bacterial attack. Red blood cells deliver oxygen to the tissues and remove some of the carbon dioxide. White blood cells provide a lot of protective material because of the phagocytic movement of some cells, thus protecting the body against bacterial attack. Plasma divides the proteins needed for tissue formation and refreshes tissue fluid because through this fluid all body cells receive their food, and are vehicles for transporting waste materials to various organs. esthetics for disposal. Hormones and enzymes are transported from organs to organs by means of blood (Evelyn, 2010).

### 2.1.2 Components of Blood Composition

**1. Red Blood Cells (Erythrocytes)**

Red blood cells or also called erythrocytes comes from the Greek, namely erythos which means red and kytos which means sheath / cell. Erythrocytes are part of blood cells that contain hemoglobin (Hb). Hemoglobin is a biomolecule that binds to oxygen that is absorbed from the lungs. when blood flows throughout the body, hemoglobin releases oxygen, while the bright red blood is influenced by oxygen absorbed from the lungs when blood flows throughout the body, hemoglobin releases oxygen to cells and binds to carbon dioxide, the amount of hemoglobin in adults is approximately 11.5-15 grams in 100cc of blood. Normal Hb for women is 11.5 mg% and men are 13.0 mg%. Red requires protein because its structure consists of amino acids and also requires iron, so a balanced diet of iron is needed (Sutedjo, 2006).

**2. White Blood Cells (Leukocytes)**

Leukocytes are components of white blood cells which are part of the immune system that plays a role in helping the body fight various infectious diseases caused by

viruses and bacteria, one of which is Tuberculosis disease caused by Mycobacterium. Lymphocytes and Monocytes. One type of Leukocytes that act as macrophages to help the body fight infections caused by viruses or bacteria, namely Monocytes. White blood cells function as a defense and immune system. Leukocytes maintain immunity by killing and eating microorganisms and foreign substances that enter the body. Leukocytes are formed in the bone marrow and lymph nodes (Kiswari, 2014).

Leukocytosis is a term to indicate an increase in the total number of white cells in the blood, that is, if the addition exceeds 1000 grains per cubic millimeter. Leucopenia means a reduced white blood cell count to 5000 or less. Lymphocytosis an increase in the number of lymphocytes. Agranulocytosis is a marked decrease in the number of granulocytes or polymorphonuclear cells (Desmawati, 2013).

**3. Platelets**

Blood platelets have the smallest size, irregular shape, and does not have a cell nucleus. Blood blood is made in the red marrow found in flat bones and short bones. For every 1mm3 of blood found in flat bones and short bones. Every 1mm3 of blood there are 200,000-300,000 pieces of blood platelets (Nuzul, 2013).

### 2.1.3 Formation of Leukocytes

Firstly, the formation of blood begins in the bone marrow (Kociba, 2000). The cell system becomes myeloblast and lymphoblast then myloblast and lymphoblast will differentiate through different processes. Myeloblasts will differentiate into lymphocytes, basophils, and monocytes, while lymphoblasts will differentiate into lymphocytes. The process that occurs in myelocytes begins with the breakdown of myelocytes into 2 parts, namely meilocyte neutrophils and meilocyte eosinophils. Some

promyelocytes will differentiate into megakaryocytes and some will split into 3 parts, namely neutrophils and then become metameilocyte eosinophils and then become eosinophils, in the development of basophils meilocytes will develop into basophils, while monocytes myelocytes will differentiate to form monocytes. The development of lymphoblasts themselves will also continue to differentiate into lymphocytes. Leukocytes that have been formed in the bone marrow, especially granulocytes will be stored in the bone marrow until they are needed in the circulation. Then if needed, granulocyte leukocytes will be released into the body's circulatory system (Guyton, 2006).

### 2.1.4 Functions of Leukocytes

The function of leukocytes is to protect the body against infection with microorganisms, while also helping to produce substances that helps attack foreign bodies and also produces antibodies to fight and kill microorganisms that expose the body. Some types of leukocytes are granular or granulocytes have enzymes that can break down proteins that will damage living blood system. By phagocytosing microorganisms or foreign objects that enter through the wound, the injured system can heal quickly. One type of leukocyte cell that moves from one system to another to clean and transport dead cells is monocytes (Kee, 2008).

### 2.1.5 Types of Leukocytes

a. Neutrophil

Neutrophils are a type of leukocyte that are abundant in the circulation, have granules in their cytoplasm and a nucleus with lobes. Neutrophil granules are bluish red in color. Neutrophils are associated with the body's defense against bacterial infections

and other inflammatory processes, as well as being the first cells to be present when an infection occurs somewhere. The number reaches 50-60%, and will increase to ten times as well as acute inflammation (Hoffbrand, 2002). Neutrophils have a function in the phagocytosis process of pathogenic bacterial infections such as bacteria or foreign substances such as urea acid crystals that can be found in the knee joint (Latifynia, 2009). Any foreign material that is phagocytized will be degraded by neutrophil granules containing lysozyme and myeloperoxidase enzymes. Neutrophils are known as white blood cells with high amoeboid and phagocytic activity due to the attraction of activating chemotactic materials. When inflammation occurs, neutrophils will leave the blood vessels to the site of infection to phagocytize microorganisms (Hiremath, 2010).

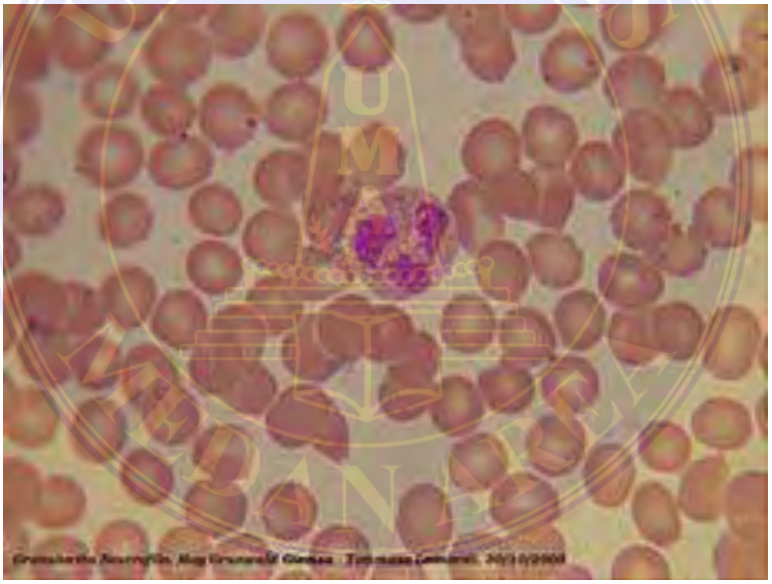

Figure 1. Segment of Neutrophils
Source: Hiremath, 2010

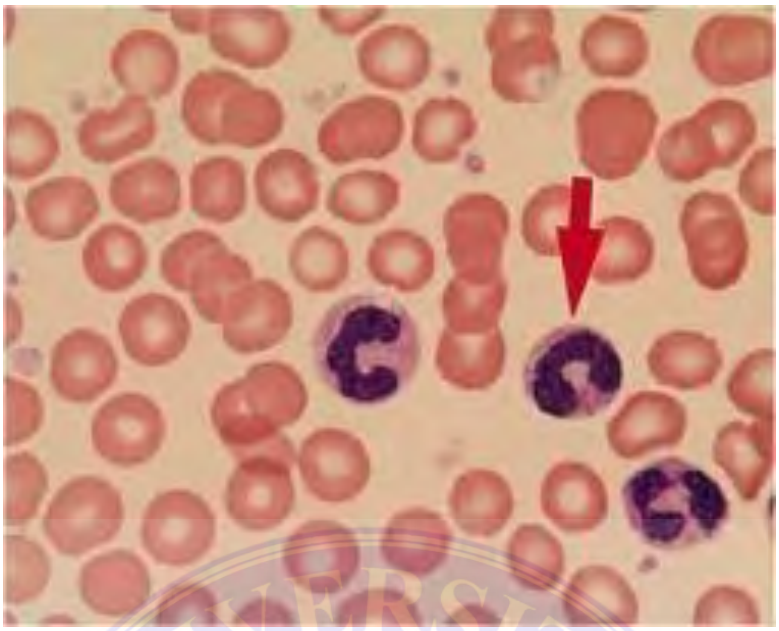

Figure 2. Stem of Neutrophils
Source: Hiremath, 2010

b. Eosinophils

Eosinophils are eosinophilic cell types, so they are easily recognized by their eosinophilic colored cytoplasm with clear and large granules. The nucleus has 2 lobes but sometimes a small third lobe is also found. The number is 1-3% of the total number of leukocytes (Hoffbrand, 2002).

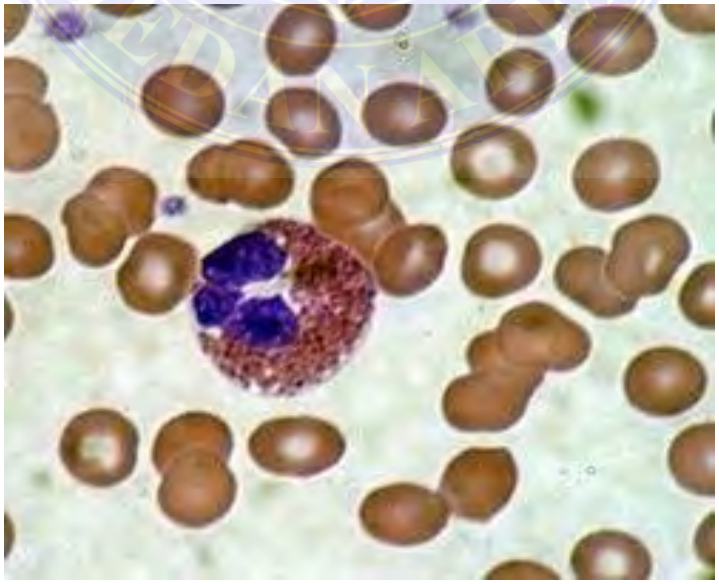

Figure 2. Eosinophils
Source: Stock, 2000

c. Basophils

Basophils are granulocytes with the least population, which is about 0.01 - 0.3% of circulating white blood cells. Basophils contain many cytoplasmic granules, with two lobes. Basophils play a role in allergic reactions (such as asthma). The shape of the basophil nucleus is variable, lobed or segmented. Basophils are also called polymorphonuclear leukocytes because their nuclei have various shapes. The granules in basophils are not as many as granules in eosinophils, but have a more variable size, slightly dense and dark blue or brown in color (Hoffbrand, 2002).

Figure 3. Basophils
Source: Stock, 2000

d. Lymphocytes

Lymphocytes are white blood cells in the agranula group. Lymphocytes are produced in the body by lymphogenous organs and are more abundant in lymphatic vessels than in blood plasma. Lymphocytes have various functions in the body's immunity such as producing immunoglobulins and modulators of immune defense. Lymphocytes are generally divided into B lymphocytes (B cells), T lymphocytes (T

cells), and natural killer cells (NK cells). The number of lymphocytes in the body can also be influenced by cortisol levels in the body, along with the increase in the amount of cortisol in the body, the number of lymphocytes will decrease. Excess levels of cortisol in the body can cause immunosuppression, this situation causes lymphocytes to be reduced in the circulatory system, cortisol will inhibit DNA synthesis of T lymphocytes in the bone marrow. Monocytes make up about 6% of the total leukocytes and have a unique role in the defense system, having a nucleus shaped like a kidney and not granular (Hoffbrand, 2002).

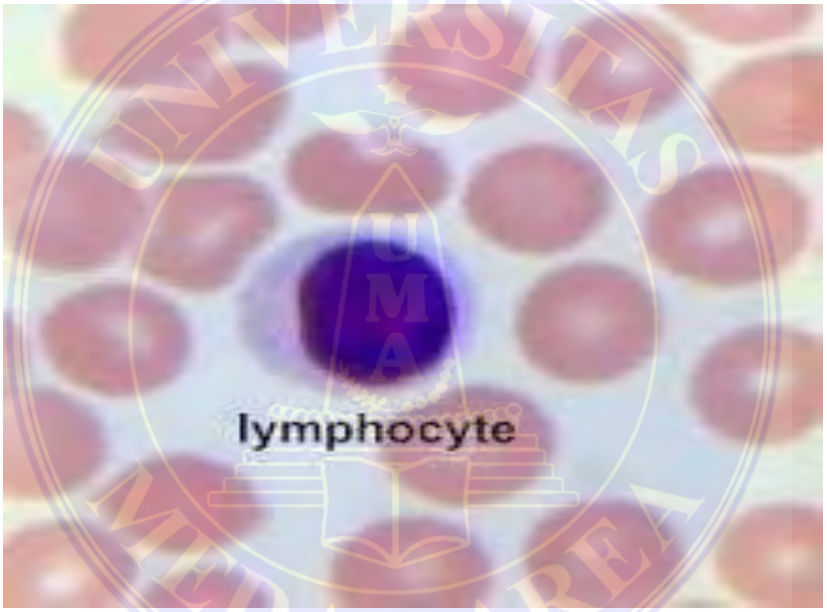


Figure 4. Lymphocytes
Source: Stock, 2000

e. Monocytes

White blood cells, amounting to 2-8% which have various shapes, are usually larger than leukocytes, usually measuring 10-22 microns which have a reddish/purplish color and have a core shape at will, for example brain-like form. Monocyte chromatin is coarser in structure and relatively larger in area and width, the cytoplasm is pale blue in color and sometimes there are pseudopods of cytoplasmic granules.

Monocyte precursors in the bone marrow (monoblasts and promonocytes) are difficult to distinguish from myoleblasts and monocytes. Monocytes only stay briefly in the marrow and after circulating for 20-40 hours, leave the blood to enter the tissues where they mature and carry out their main functions. Monocytes can perform specific functions in different tissues, such as skin, intestines, liver, and so on (Kee, 2008).

Monocytes play an important role in the immune response in tuberculosis infection. Monocytes work as a cellular reaction against Tuberculosis bacteria. Mycobacterium tuberculosis phospholipids undergo degradation in monocytes and macrog cells which causes the transformation of these cells into epithelioid cells. Monocytes are the main cells in the formation of tuberculosis. The formation activity is considered as an active sign of the spread of Tuberculosis. In the healing phase, the number of monocytes decreases or is normal (Hoffbrand, 2002).

Monocytes are a type of leukocyte or white blood cell that plays a role in the function of the immune system. Monocytes are produced in the bone marrow from hematopoietic stem cells called monoblasts. Monocytes are great phagocytic cells with the ability that almost all kinds of foreign objects can be phagocytized and lysed in them and can eat 100 bacteria per cell (Evelyn, 2010).

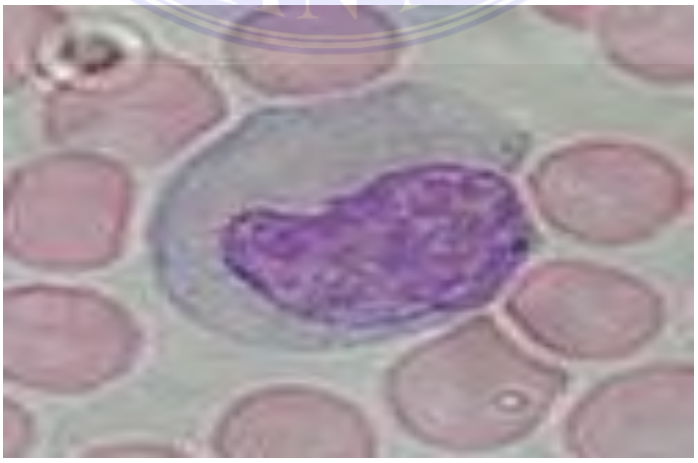

Figure 6. Monocytes
Source: Wikimedia Commons

### 2.1.6 Characteristics of Leukocytes

According to Desmawati (2013) the characteristics of leukocytes are as follows:

1. Shape

Other characteristics of leukocytes with erythrocytes when we look under a microscope, it will be seen that the core is different from erythrocyte cells. These cells have a variety of cell nuclei that can be distinguished based on the shape of the nucleus.

2. Function

As a killer and eaters of germs or bacteria that enter the system, the place of breeding in the spleen and lymph nodes as a carrier is to carry fatty substances from the walls of blood vessels.

3. Diapedesis

It is the ability of leukocytes to penetrate the pores of the capillary membrane and enter the system.

4. Chemotaxis movement ability

The release of chemicals from damaged system causes leukocytes to move toward and away from the source of the substance.

5. Life span

After being produced in the bone marrow, leukocytes last approximately one day in the circulation, before entering the system, these cells remain in the system for several months, depending on the type of leukocyte.

### 2.1.7 Increase in Leukocytes

An increase in the number of leukocytes indicates an acute infectious or inflammatory process, such as pneumonia (inflammation of the lungs), meningitis

(inflammation of the lining of the brain), appendicitis, tuberculosis, tonsillitis, and others. In addition, it can also be caused by drugs such as aspirin, procainamide, allopurinol, antibiotics especially ampicillin, erythromycin and others (Kee, 2008).

### 2.1.8 Decrease in Leukocytes

Decrease in the number of leukocytes (called Leukopen), can occur in certain infections, especially viruses, malaria, alcoholics, and others. It can also be caused by drugs, especially cancer chemotherapy, acetaminophen (paracetamol), antibiotics, oral antidiabetics (penicillin, cephalosporin, chloraphenicol), sulfonamides (anti-infective drugs, especially those caused by bacteria) (Devi, 2009).

## 2.2 Tuberculosis

Pulmonary Tuberculosis is a disease caused by Mycobacterium tuberculosis, which is an aerobic bacterium that can live mainly in the lungs or in various other organs of the body that have a high partial pressure of oxygen. to acids and the growth of the germs takes place slowly. These bacteria are not resistant to ultraviolet, therefore their laying mainly occurs at night (Sundari, 2017).

To diagnose TB can be done by microscopic examination of acid-fast bacilli (BTA) and sputum culture. On microscopic examination, if acid-fast bacilli (BTA) are found and it is recommended that a positive identification (sputum culture) examination be diagnosed, the diagnosis is TB on routine blood examinations, the type of leukocytes on the count examination, the type of leukocytes that often appears and conspicuous is monocytes. In patients with TB monocytes are always high because TB germs really like lipids and fat drops are found in many infectious diseases (Mulyorejo, 2013).

### 2.2.1 Morphology

In blood system, tubercle bacilli are straight rod bacteria with a size of about 0.4-3um. On artificial media, coccoid and filamentous forms appear to vary from one species to another. These bacilli do not move and do not form, do not form capsules, spores do not form spores, and do not form capsules and when stained often appear beaded or granular (Mulyrejo, 2013).

### 2.2.2 Infection/Transmission

Tuberculosis is an infectious disease caused by the bacterium Mycobacterium tuberculosis with a percentage of 80% which most often occurs in the lungs. TB is spread through droplets of phlegm (droplet nuclei) when coughing or sneezing and can infect other healthy people. If these germs have settled in the lungs of people who inhale them, the germs will begin to defend themselves (multiply) and infection occurs. People who live at home with smear-positive TB sufferers are people who are most likely to be exposed to tuberculosis germs (Andareto, 2015).

Bacteria usually enter the human body through respiratory air in the lungs and can spread from the lungs to other parts of the body, through the circulatory system. The lymphatic system, through the respiratory tract (bronchus) or spreads directly to other parts and can occur in groups, ages, both inside the lungs and outside the lungs (Widoyono, 2008).

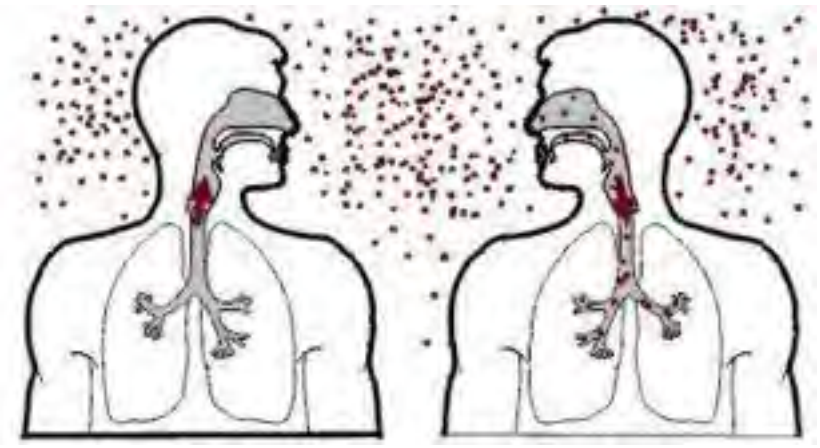

Figure 7. TB can be transmitted through the air
Source: Dr widoyono, MPH, 2008

### 2.2.3 Symptoms of Tuberculosis

Tuberculosis or TB most often attacks the lungs, but a small portion can attack other organs, such as the brain, bones, lymph glands, skin, intestines, eyes and others. Symptoms and signs that appear depend on which organs are affected, a person is suspected of having TB (Dowling, 2014).

1. Common symptoms

Weight loss for 3 months in a row for obvious reasons and does not increase in 1 month despite good nutritional management and prolonged or recurrent fever for no apparent reason.

2. Other Symptoms

Fever (especially in the afternoon), decreased appetite, weight loss, night sweats, body feels weak/tired easily/lazy, shortness of breath (if the disease is advanced) and chest pain (inflammation of the lining of the lungs/chest wall) (Ahmad, 2014).

### 2.2.4 Clinical Pathology

Mycobacterium tuberculosis can cause system damage in the lungs, but its immunopathological mechanism is not well understood. Mycobacterium tuberculosis expresses the Minnesota Multiphasic Personality Inventory (MMP-I) which can promote the breakdown of pH neutral collagen leading to alveolar destruction in TB. In some people with a good immune system, this form will remain dormant throughout its life, while in people with a weak immune system, these bacteria will multiply so that tuberculosis multiply. This multiple tuberculosis forms a space in the lungs. This space will later become a source of phlegm production (Brown, 1983).

After infection through the respiratory tract, in the alveoli (lung waves) inflammation occurs. This is caused by TB germs that develop well by dividing themselves in the lungs. The time of infection so that the formation of the primary complex is about 4-5 weeks. Primary infection depends on the number of germs that enter and the immune response that can stop the growth of TB germs by covering the germs with connective tissue. There are some germs that stay "persistently or dormantly", so the body's immune system can't stop germs. As a result, the person concerned will become a TB patient in a few months (Rabtabrani, 2010).

The incubation period is about six months, post-primary infection occurs after several months or years after primary infection, the hallmark of post-primary TB is extensive lung damage with the occurrence of cavities or pleural effusions. determined by various health factors (Rabtabrani 2010).

### 2.2.5 Diagnosis of Tuberculosis

The diagnosis of pulmonary TB in adults can be confirmed by the discovery of acid-fast bacilli (BTA). On microscopic examination of sputum so that most TB

diagnoses are based on clinical features. A chest X-ray and tuberculin testing on laboratory examination showed leukocytosis (20,000-50000/ul) (Halim, 2014).

### 2.2.6 Prevention of Tuberculosis

Use a clean mouth mask, and change every time you've used it. If you don't change the mask, the disease will nest in the mask and make your situation worse. Don't spit anywhere. This can prevent transmission to the people around us. Avoid in a place that is too cold for you, eat good and healthy food. Foods that contain carbohydrates and protein. Do not eat unclean food and food that contains poison, it is very dangerous for your condition. TB disease will be more easily spread if the patient is in a closed room and where the air cannot move freely. Therefore, try to ventilate the room or house well, and open windows so that air circulation runs smoothly. For sufferers, hurry up go to the closest doctor or hospital. In order to be treated immediately and so that TB disease does not get worse (Tjand. Y. A. 2013).

### 2.2.8 How Tuberculosis is Transmitted

The number of germs in the patient's lungs results in the rapid transmission of this tuberculosis disease to a person. The spread of tuberculosis germs occurs in the air through sputum in the form of droplets. For patients with pulmonary tuberculosis who have a lot of germs, it can be seen directly with a microscope on examination of the sputum. This is of course very contagious and dangerous for the patient's environment (Tjand. Y. A. 2013).

When the patient coughs or sneezes, these pulmonary TB germs and positive smears in the form of very small droplets will fly in the air. Very small droplets will dry up quickly and become droplets containing tuberculosis germs. These germs can survive

in the air for several hours, so that sooner or later droplets containing elements of tuberculosis germs will be inhaled by other people. If the droplets have been inhaled and lodged in a person's lungs, these germs will begin to divide or multiply. From here, infection will occur from one patient to another prospective patient (those who have contracted the disease) (Brown, 1983).

### 2.3 Blood Test

Routine blood tests cannot be used as an enforcer of diagnosis but can support the diagnosis of pulmonary TB because the results of blood tests do not show a typical picture. Blood picture can sometimes help determine disease activity. In the active process and obtained the number of leukocytes slightly increased and the erythrocyte sedimentation rate (ESR) began to increase.

### 2.4 Chest X-ray (Lung)

First of all, it should be pointed out that the current fluorescence of coffee must be abandoned because it is not objective and always implies a hasty factor (considering the dangers of X-rays) besides that this examination will also not leave authentic documents.

At the initial stage, as previously disclosed TB may pass on physical examination. However, by examining the lungs, everything will definitely be known. This is where the importance of the pulmonary X-ray examination for early diagnosis of TB lies.

### 2.5 Tuberculosis Treatment

So far, patients who have been taking medicine for 2 months have felt better, because all the symptoms and complaints disappeared, so the patient stopped the

medicine himself. As a result, after stopping taking the drug, a few months the pain will return. Figures can be fatal, namely the occurrence of resistant germs. Therefore, a companion who is willing to be patient and supervising is needed and a strategy that has been carried out by the WHO world health agency is needed, namely the DOTS strategy (Directely Observed Treatment Short course) (Hudoyo, 2008).

The DOTS itself has 5 components:

1. The government's commitment to limit TB in the community to completion.
2. Diagnose TB patients based on microscopic examination of sputum (BTA).
3. Administration of drugs according to standard (Short-course) for 6 months, this drug must be believed to be taken regularly, for that we need a companion called a drug taking supervisor (PMO).
4. Guaranteed drug availability.
5. Good recording and reporting of TB cases being treated (Hudoyo, 2008).

## 2.6 The Relationship between Leukocytes and Lung Tuberculosis

1. Lymphocytes Relationship with tuberculosis

Active macrophage cells will experience increased oxidative metabolic changes so that they are able to produce substances that can kill the product, the most important substance is hydrogen peroxide (H202).

2. Neutrophils related to tuberculosis

Neutrophils constitute more than half the number of circulating white blood cells and have a multilobed nucleus with cytoplasmic granules.

3. Eosinophil relationship with tuberculosis

Eosinophils perform their functions in the tissues and will not return to the circulation, and will be eliminated through the respiratory and gastrointestinal mucosa.

# CHAPTER III

# RESEARCH METHOD

## 3.1 Research Location and Time

The study was conducted in August 2020 at the Lung Hospital in Medan.

## 3.2 Research Materials and Tools

### Materials

The ingredients in this study were alcohol, EDTA and venous blood of all patients with pulmonary tuberculosis who had consumed ATD for 2 months as many as 20 patients.

### Tools

The tools used are: syringe, tourniquet or bridging, clean and dry test tube, 70% alcohol, cotton and gloves.

## 3.3 Research Method

The method used in this study was a descriptive cross-sectional data collection using primary and secondary data.

### 3.3.1 Primary Data

The results of the examination of the type and number of Leukocyte Cells in Tuberculosis patients who underwent Anti Tuberculosis Drug treatment for 2 months at Medan Lung Hospital in August 2020.

### 3.3.2 Secondary Data

Data was obtained from medical records at Medan Lung Hospital in June.

## 3.4 Work Procedure

### 3.4.1 Sample Preparation (Venin Collection)

Before we take venous blood, firstly, place the tourniquit on the patient's arm at a distance of about 3 fingers from the area of the vein to be punctured. The patient clenched his fist so that the median cubital vein was clearly visible. Then palpate the vein, the area to be punctured is cleaned with 70% alcohol cotton and allowed to dry. Then pierce with the needle hole facing up at an angle of 450C until the tip of the needle goes into the vein. Then we draw the blood slowly using a 5 ml syringe, after enough samples have been taken, then the fist is opened. Then we put the cotton on the syringe, open the turniquit and pull the syringe slowly, clean the marks that have been punctured with cotton, and cover with plaster. Then we put the blood in the syringe into a chemical tube through the tube wall and label it.

### 3.4.2 Sample Checker

Firstly, we insert the EDTA tube containing the blood sample into the hematology analyzer and start running the tool until the tool finishes processing and the final results were obtained for data analysis of leukocytes and leukocyte cell types.

## 3.5 Data Analysis

The data from the examination were analyzed descriptively by looking at the description of the quantity and type of leukocytes presented in tabular form and based on

percentages in order to know how the results of the quantity and type of leukocytes were presented to the patient.

The data obtained were presented in percentage using the formula:

$$\% = \frac{t}{n} \times 100\%$$

Description:

% = Research result

t = Normal sample amount, increase and decrease

n = Whole sample amount

# CHAPTER V

# CONCLUSION AND SUGGESTION

## 5.1 Conclusion

Based on the research that has been done on 20 patients with pulmonary tuberculosis at Lung Hospital Medan, it can be concluded that Leukocyte cells were normal in 75% of patients and increased in 25% of patients. Eosinophils increased by 5% and normal by 95%. Neutrophils decreased by 10% and normal by 90%. Lymphocytes increased by 5% and normal by 95%. Monocytes increased by 35% and normal by 65%. The cause of the increase in the number of leukocytes and the type of leukocyte cell was due to a lung infection caused by Mycobacterium tuberculosis, so that by itself the leukocytes and the type of leukocyte cell would increase.

## 5.2 Suggestion

1. Health workers should hold complete blood checks on pulmonary TB patients on a regular basis and avoid transmission of pulmonary tuberculosis. It is recommended to wear masks and gloves when examining the patients, and provide health education to the public about the dangers caused by pulmonary tuberculosis.

2. Patients with pulmonary TB should routinely check themselves or consult to doctors, consume adequate nutritional intake and maintain environmental health and cleanliness and use ATD regularly, because inappropriate and interrupted use of ATD can result in bacterial resistance to drugs and can occur Multi Drug Resistance (MDR).