Accuracy Evaluation of Enforcement Diagnosis of Pulmonary Tuberculosis Patients in UKI General Hospital Period 2015

ABSTRACT

Tuberculosis (TB) remains a significant health problem globally, both in developed and developing countries. Riskesdas 2013 states that the prevalence of TB based on the diagnosis is 0.4% of the population, with an average per 100,000 inhabitants. There were 400 people diagnosed with pulmonary tuberculosis by health workers. Following the criteria issued by the Ministry of Health and WHO, diagnosing TB is by sputum smear examination, not only chest X-ray examination. **Aim:**This study aimed to determine the accuracy of the diagnosis in patients with pulmonary tuberculosis at UKI General Hospital. **Method:** The study was conducted with a retrospective approach to source medical records. **Population and Sample:** The population is pulmonary tuberculosis patients hospitalized at UKI General Hospital from January to December 2015. Samples were taken from the total sampling with specific criteria. **Result:** Analysis of the accuracy of the diagnosis based on diagnostic criteria according to the Ministry of Health and WHO. Of 61 patients studied, the number of samples of men (65.6%) was more than the number of samples of women (34.4%). Most of them are 44-52 years old (21.3%). The results showed that 21.3% of patients met the diagnostic criteria of the Ministry of Health and WHO. **Conclusion:** Inaccuracy of diagnosis of pulmonary tuberculosis will affect the rate of transmission and treatment success.

Keywords: *tuberculosis,sputum smear examination, the accuracy of diagnosis*

Introduction

Tuberculosis (TB) is still a significant health problem globally, both in developed and developing countries [1]. Tuberculosis is a disease that is easily transmitted, namely through droplets infected with TB bacteria. It makes a reason that TB disease must be followed up, considering that the number of TB sufferers continues to increase every year, which has an impact on treatment. In addition to treatment, what needs to be focused on is the examination of phlegm or sputum, especially on discovering Acid-Resistant Bacteria (ARB) [2]. It is essential because if the TB bacteria are not cured, it is likely that the bacteria will spread and infect people around [3].

The easy transmission of tuberculosis causes health problems for millions of people per year and ranks second as the leading cause of death from infectious diseases after HIV [4]. The World Health Organization (WHO) estimates that between 2002 and 2020, a total of 1/3 of the world's population has been infected with TB and 8.7 million are new cases, while every year, 1.7 million die from TB [5].

The Ministry of Health (Kemenkes) RI 2015 evaluated and monitored the discovery of new TB cases with a positive smear diagnosis in Indonesia. There was a decrease in new patients with positive smears from 2013 (196,310 points) to 2014 (176,677 points). The highest number of smear-positive cases was reported in provinces with large populations, namely West Java, East Java, and Central Java. New smear-positive cases in the three areas accounted for 40% of Indonesia's total number of new topics [6]. In addition, diagnosing pulmonary TB based on chest X-ray examinations because chest X-rays do not always give a specific picture of pulmonary TB [7].

WHO and International Union Against Tuberculosis and Lung Tuberculosis (IUATLD)have developed a TB control strategy known as the Directly Observed Treatment Short-Course (DOTS) strategy. The DOTS strategy consists of 5 key components, namely: a) Political commitment, with increased and sustainable funding; b) Case finding through quality-assured microscopic examination of sputum; c) Standardized treatment, with patient supervision and support; d) Effective Anti-Tuberculosis Drugs (ATD) management and availability system; and e) Monitoring, recording, and reporting system capable of providing an assessment of patient treatment outcomes and program performance.

Related to this, the authors evaluated by comparing the diagnosis of pulmonary tuberculosis patients at the UKI General Hospital with the provisions of the Indonesian Ministry of Health and WHO. Based on the background described above, the research problem can be formulated as follows: a) Does the 2015 UKI General Hospital fulfill the criteria issued by the Indonesian Republic Health Minister and WHO? and b) What percentage of patients at UKI General Hospital in 2015 was diagnosed based on criteria from the Ministry of Health of the Republic of Indonesia and WHO? This study aimed to determine the accuracy in establishing a diagnosis in pulmonary tuberculosis patients at the UKI General Hospital in 2015.

Tuberculosis (TB) is an infectious disease caused by Mycobacterium tuberculosis and is contagious [8]. Pulmonary tuberculosis is a chronic infectious disease that has long been known and is still the leading cause of death globally [9].

Based on the 2013 WHO report, Indonesia ranks third after India and China, with almost 700 thousand cases [10]. Riskesdas 2013 states that the prevalence of TB based on diagnosis is 0.4% of the total population, with an average of 400 people being diagnosed with TB cases per 100,000 Indonesian population. Five provinces with the highest pulmonary TB are West Java (0.7%), Papua (0.6%), DKI Jakarta (0.6%), Gorontalo (0.5%), and Central Java (0.4%) [11].

The 2014 Indonesian Health Profile results showed a decrease in positive smear cases from 2013 (196.310 cases) to 2014 (176.677). When viewed from the gender, smear-positive cases in men were higher than in women, namely 1.5 times compared to smear-positive cases in women. In each province throughout Indonesia, smear-positive cases were more common in men than women. The highest disparity between men and women occurs in the Bangka Belitung Islands. Cases in men are almost twice that of cases in women. From the age group, the newest cases were found in the 25-34 year age group, which was 20.76%, followed by the 45-54 year age group at 19.57%, and in the 35-44 year age group at 19.24% [6].

The discovery of cases of patients with positive smears by the Ministry of Health of the Republic of Indonesia, namely from 2008-to 2014, did not see a significant change where the expected number was more than 65%, while in 2014, it only reached 62%. This incident shows that until 2014, the discovery of new smear-positive patient cases among all TB cases had not reached the expected [6].

In body tissues, the bacterium Mycobacterium tuberculosis is in the form of tubercle bacilli which is slender rod-shaped and on particular media for Lowenstein Jensen culture will produce coccoid and filamentous structures [12]. Tuberculosis germs have a width of 0.3-0.6 um and a length of 1-4 um. M. tuberculosis does not produce spores and is not motile [13].

The cell wall of M. tuberculosis is rich in lipids and a thick layer of peptidoglycan which contains arabinogalactan, lipoarabinomannan, and mycolic acid. This complex

cell wall structure causes bacteria to be acid-fast so that in the Ziehl-Neelsen staining, the bacteria will be red on a blue background [1].

M. tuberculosis is an obligate aerobic which obtains energy from the oxidation of several simple carbon compounds [12]. This property indicates that bacteria prefer tissues that have a high oxygen content. It causes oxygen pressure in the apical part of the lung to be higher than in other parts so that the apical part of the lung becomes a predilection site for tuberculosis [14].

In tissue, bacteria grow intracellularly in phagocytic cells, especially in the cytoplasm of macrophages. In macrophages after M. tuberculosis phagocytosis, the phagosome-lysosomal fusion process will be inhibited so that it cannot be digested [1, 14]. The resistance of M. tuberculosis is more significant when compared to other bacteria because it is hydrophobic on the cell surface, so it tends to be more resistant to chemical factors [12]. M. tuberculosis can quickly die when exposed to direct sunlight but can survive several hours in a dark and humid place. It is because the bacteria are in a dormant state. The bacteria can bounce back and become active tuberculosis bacteria [14]. Reactivation of these bacteria occurs when there is a decrease in the immune system and the aging process [10].

Pulmonary tuberculosis transmission occurs because the bacteria are coughed or sneezed and released into droplet nuclei in the air for 1-2 hours, depending on the presence or absence of ultraviolet light, poor ventilation, and humidity. In damp and dark conditions, germs can survive for days to months. When a healthy person inhales infected particles, they will stick to the respiratory tract or lung tissue. Particles can enter the alveoli if the particle size is < 5 micrometers. Bacteria will be phagocytosed first by neutrophils and phagocytosed again by macrophages. Most of the particles will die or be cleared by macrophages out of the tracheobronchial tree and cilia's movement with their secretions.

When bacteria settle in lung tissue and multiply in the cytoplasm of macrophages, bacteria can be carried into other body organs. Bacteria nest in the lung tissue will form a small nest of tuberculosis pneumonia called the primary nest or primary affect or Gohn's nest (focus). This primary nest can occur in any part of the lung tissue, and if it spreads to the pleura, pleural effusion will occur. Bacteria can enter through the gastrointestinal tract, lymph tissue, oropharynx, and skin. Regional lymphadenopathy occurs when bacteria enter the veins and spread to all organs such as the lungs, brain, kidneys, and bones. When bacteria enter the pulmonary artery, they will apply to all parts of the lung to become miliary TB.

From the primary nest, there will be inflammation of the lymph channels to the hilum (local lymphangitis), followed by enlargement of the hilar lymph nodes (regional lymphangitis). The primary hives of local and regional lymphangitis will be the primary complex. All this process takes 3-8 weeks.

Post-primary tuberculosis will appear for years as an endogenous infection from dormant bacteria in primary tuberculosis. Post-primary tuberculosis begins with an early nest and is generally located in the apical segment of the superior lobe and inferior lobe, which is the upper region of the lung. The invasion is into the lung parenchyma and not the hilar nodes of the lung. This early nest is initially in the form of a small pneumonia nest that will turn into a tubercle in 3-10 weeks, which is a granuloma consisting of Histiocytes cells and Datia-Langhans cells (large cells with many nuclei) surrounded by lymphocytes and various types of cells connective tissue [15].

In total, there will be three types of nests, namely: a) Nests that have healed and do not require further treatment; b) Exudative active nests that need complete and perfect treatment; and c) Nests that are between active and healed which can heal spontaneously, but given the possibility of re-exacerbation, treatment should be given.Complaints felt by tuberculosis patients can vary, or even many patients find pulmonary TB without complaints, usually in new cases. The most common complaints were fever, cough with or without blood, shortness of breath, chest pain, and malaise [16].

To control TB nationally, the diagnosis of pulmonary TB in adults must first be established by bacteriological examination. The bacteriological examination is the direct microscopic examination, culture, and rapid tests. If the bacteriological examination is negative, then the diagnosis of TB can be made clinically using appropriate clinical and supporting examinations (chest x-ray examination) determined by the doctor. In limited facilities, clinical diagnosis is made after giving broad-spectrum antibiotic therapy (Non-ATD and Non-quinolones), which does not provide clinical improvement. It is not justified to diagnose TB by serological examination. It is not warranted to diagnose TB based on a chest X-ray alone. Chest X-ray does not always give a specific picture of pulmonary TB, so that it can lead to overdiagnosis or underdiagnosis. It is not justified to diagnose TB only by examining the tuberculin test in children [7].

Sputum examination serves to establish a diagnosis, assess the success of treatment, and determine the potential for transmission. Sputum examination for diagnosis is carried out by collecting three samples of sputum tests ordered on two consecutive visit days in the form of SPS (Time-Morning-Timely) [7]: S (at any time): sputum is collected when a suspected TB patient comes for the first visit to the health facility. On returning home, the patient allegedly brought a phlegm pot to collect the morning phlegm on the second day. P (morning): sputum is collected at home on the morning of the second day, immediately after waking up. The pots were brought and handed over to the officers at the health facilities. S (at the same time): phlegm is collected at the health facility on the second day when the phlegm is delivered in the morning. A TB patient is determined if at least 1 (one) of the SPS sputum sample examination results in a positive smear. The microscopic examination can be divided into ordinary microscopic examination, where staining is carried out with Ziehl-Neelsen, and fluorescent test, where the staining is carried out with auramine-rhodamine (especially for screening) [17].

Table 1. Interpretation of Pulmonary TB Examination Results

Three times positive or two times positive, 1-time negative	ARB +
One time positive, two times negative	Repeat ARB 3 times
If one time is positive, two times is negative	ARB +
When three times negative	ARB -

The interpretation of microscopic examination is read with IUATLD scale, which is a WHO recommendation [18].

Table 2. Interpretation of Lung TB Microscopic Examination IUALTD Scale

Not found AFB in 100 visual fields	Negative
Found 1-9 ARB in 100 fields of view	Write down the number of germs found

Found 10-99 ARB in 100 fields of view	+ (1+)
Found 1-10 AFB in 1 field of view	++ (2+)
Found >10 AFB in 1 field of view	+++ (3+)

The basis of this BACTEC examination technique is the radiometric method. M. tuberculosis metabolizes fatty acids, producing CO2, which this machine's growth index will detect. This system can be an alternative for rapid culture examination to help establish a diagnosis and perform a sensitivity test. Another form of this technique is to use the Mycobacteria Growth Indicator (MGIT) [19].

The routine blood tests do not show as a specific indicator for pulmonary TB. The erythrocyte sedimentation rate (ESR) in the first and second hours is required. This data can be used as an indicator of the stability level of the patient's balance so that it can be used as a response to the patient's treatment and the possibility of detecting the patient's healing rate. Similarly, ESR levels are often elevated in active processes, but a normal ESR does not exclude the diagnosis of TB [19]. The standard examination is a PA chest X-ray. Other indications reviewed are lateral, top lordotic, oblique, and CT scans. In cases where several SPS sputum examinations are positive, a chest X-ray is no longer necessary.

The drug susceptibility test aims to determine the presence or absence of M.tb resistance to ATD. This drug sensitivity test uses a rapid test, namely GeneXpert, which the Indonesian Ministry of Health has provided. The sensitivity test must be carried out by a laboratory that has been certified or passed the Quality Assurance (OA) test to ensure the quality of the results of the examination, which is intended to minimize errors in determining the type of ATD resistance and in making decisions about the treatment combination of patients with drug resistance [7, 20].

Research Method

The research design chosen was a retrospective case study. Data collection was taken from secondary data in the form of patient medical records, and the results of the study were presented in descriptive form. The study was conducted at the UKI General Hospital. The study was conducted from November 2016 to December 2016, and all pulmonary tuberculosis patients were hospitalized at UKI General Hospital from January 2015 to December 2015. All pulmonary tuberculosis patients hospitalized at UKI General Hospital met the inclusion criteria. The data were taken retrospectively through the medical records of pulmonary tuberculosis patients hospitalized at the UKI General Hospital for one year (1 January 2015 to 31 December 2015).

Result and Discussion

The research design chosen was a retrospective case study. Data collection was taken from secondary data in the form of patient medical records, and the results of the study were presented in descriptive form. The study was conducted at the UKI General Hospital, and the study was conducted from November 2016 to December 2016. All pulmonary tuberculosis patients were hospitalized at UKI General Hospital from January 2015 to December 2015. All pulmonary tuberculosis patients hospitalized at UKI General Hospital met the inclusion criteria. The data were taken retrospectively through the medical records of pulmonary tuberculosis patients hospitalized at the UKI General Hospital for one year (1 January 2015 to 31 December 2015).

Table 3. Distribution of Pulmonary TB at General Hospital

Information	Total	%
Gender		
- Male	40	65,6
- Female	21	34,4
Age group		
- 17-25	11	18
- 26-34	12	19,7
- 35-43	6	9,8
- 44-52	13	21,3
- 53-61	9	14,8
- 62-70	8	13,1
- ≥ 71	2	3,3

Table 3 shows that patients with a primary diagnosis of pulmonary tuberculosis who underwent hospitalization were 65.5% more males than 34.4% females. The higher percentage of male patients can be caused by a lifestyle that mainly was smoking and consuming alcohol which can lower the body's defense system, causing the body to be more easily susceptible to exposure to the causative agent of pulmonary TB [21]. The Indonesian Ministry of Health through Riskesdas 2013 reported that the prevalence of pulmonary TB in males was 0.4% and in females was 0.3% [11]. WHO says the majority of pulmonary TB is 2.3 times more in men than women, especially in developing countries, because men are more likely to engage in social activities.

The age of most patients was in the range of 44-52 years, namely 13 people (21.3%). It happens because a person's immune system declines at that age. Based on the 2013 Riskesdas report published by the Ministry of Health of the Republic of Indonesia, it was found that the prevalence of pulmonary TB by age increases with the age of a person [11].

Table 4. Distribution of Research Subjects Who Perform AFB Examination

Description	Total	%
ARB	13	21,3
NO ARB	48	78,7

Table 4 shows that only 13 patients (21.3%). According to the 2015 Indonesian Ministry of Health, the number of case finding with AFB examination decreased from 2013 to 2014 from 81 points per 100,000 populations to 70 issues per 100,000 populations. Based on this, it can be seen that the quality of finding cases of pulmonary TB with AFB is not a priority [6].

Table 5. Distribution of Research Subjects in Getting a Diagnosis of Pulmonary TB Based on the Examinations Performed

Description	Total	%
ARB	0	0
Thoracic Photos	13	21,3
LED	8	13,1
ARB Chest X-ray LED	8	13,1
ARB Thoracic Photo	2	3,3

LED ARB	3	5
LED Chest Photo	27	44,2

Based on the characteristics of the examinations carried out to establish the diagnosis of pulmonary TB in table 5 and the ARB examination, which is the gold standard, other supporting examinations can also be carried out. The supporting examinations used are chest x-ray examination and blood examination to see the erythrocyte sedimentation rate (ESR) value. Table 3 shows that diagnosing pulmonary tuberculosis at most is only based on chest x-ray and ESR examination, which is 27 people (44.2%). In addition, 13 people (21.3%). The Ministry of Health of the Republic of Indonesia does not confirm that the diagnosis of pulmonary TB is only based on a chest X-ray examination because the chest X-ray does not provide a specific picture of pulmonary TB. It can lead to underdiagnosis or overdiagnosis unless the smear examination gives a negative result. So it is better to do a bacteriological test in the form of a smear examination before performing a chest x-ray test [7].

The subsequent examination is a blood test to see the ESR. ESR is not the gold standard for finding TB cases, but by looking at the increased ESR value, it can be a marker of the active process of TB bacteria, although finding a normal ESR does not mean that the diagnosis of TB is excluded [19]. Table 3 shows that the diagnosis was confirmed by an LED examination of as many as 13 people (13.3%).

Conclusion

Based on the results of this study, 2 (two) conclusions were obtained, namely: a) Enforcement of the diagnosis of pulmonary TB in patients undergoing inpatient treatment at the Indonesian Christian University General Hospital in the period 1 January 2015 to 31 January 2015 did not meet the criteria issued by the Ministry of Health. RI and WHO, resulting in inaccuracies in the diagnosis of pulmonary TB; and b) Enforcement of the diagnosis of pulmonary TB in patients undergoing inpatient treatment at the Indonesian Christian University General Hospital, which complies with the criteria from the Indonesian Ministry of Health and WHO, namely 13 people (21.3%), while 48 people who do not meet the requirements people (78.7%). Inaccuracy in establishing this diagnosis can increase the rate of disease transmission and reduce the success rate in treatment. Thus, it is necessary to increase the discipline of the hospital in carrying out the Standard Operating Procedure (SOP) for establishing a current diagnosis of pulmonary tuberculosis. Establishing a diagnosis of pulmonary tuberculosis based solely on a chest X-ray can lead to underdiagnoses or over-diagnosis because the chest X-ray results do not give a specific picture.

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