Comparison of Chest X-Ray of Pulmonary TB Patients with DM and Non DM at Anutapura Palu Hospital in 2020

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ARTICLE INFO	ABSTRACT
Keywords: Tuberculosis, Diabetes Mellitus, Chest X-ray	The incidence of Diabetes Mellitus (DM) in the world is rising particularly in developing countries where Pulmonary Tuberculosis (TB) is the most common. Diabetes Mellitus will increase the risk of Pulmonary Tuberculosis 1.5-7.8 times. The relationship between DM and TB has been proven that DM is a risk factor for TB. It affects the presence of Pulmonary Tuberculosis itself and the response to the treatment of Pulmonary Tuberculosis. Pulmonary Tuberculosis can cause glucose intolerance and worsen glycemic control in Diabetes Mellitus patients. Although Pulmonary Tuberculosis is more closely related to another immune-deficiency disease such as HIV, the number of people with diabetes is much greater. Therefore, DM is a more significant risk factor for the incidence of TB. Research Objective to find out the comparison of the characteristics of chest x- rays on Pulmonary Tuberculosis patients with Diabetes Mellitus and Non-Diabetes Mellitus at Anutapura Hospital in 2020. Research Method in this research applied an analytic observational study towards a cross sectional design. Sampling was selected through total sampling technique using inclusion and exclusion criteria. The research instrument was the patient's medical record. The results show that the most chest X-ray images on TB patients with DM are cavity images (53%) and TB patients with non-DM, the most features are fibrosis (35%). The result of the extensive description of the lesion indicatse that the extensive lesions is (15%) on TB patients with DM and (85%) on TB patients with non-DM and it is obtained that the minimal lesion is (1%) in both TB patients with DM and Non-DM. Research conclusion: There is no difference between chest X-Rays on Pulmonary Tuberculosis patients with Diabetes Mellitus and Non-Diabetes Mellitus.
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1. INTRODUCTION

WHO (World Health Organization) reported that there were 1.3 million deaths caused by pulmonary tuberculosis in 2017. Indonesia became the 3rd country in cases of pulmonary tuberculosis after India and China. From 2/3 of the total number of TB cases in the world, 8 countries occupied it. among them are India 27%, China 9%, Indonesia 8%, Philippines 6%, Pakistan 5%, Nigeria and Bangladesh 4% and South Africa 3%. The prevalence areas of pulmonary tuberculosis in Indonesia are divided into three regions, namely Sumatra 33%, Java and Bali 23% and eastern Indonesia 44%[1].

TB cases in Central Sulawesi increased in 2018-2019, where in 2018 the CDR (case detection rate) case detection rate for TB was 59% and in 2019 it increased by 62%. In the city of Palu itself, the CDR of TB cases in 2018-2019 decreased where in 2018 it was 60% and in 2019 it decreased by 55%, but this has not reached the target case detection rate of 80%. Case finding was obtained from reporting TB case sweeping activities in hospitals and also from routine reporting by health facilities through the SITT (Integrated Tuberculosis Information System) application [2].

The incidence of DM in the world is increasing, especially in developing countries where TB is most common. It is estimated that DM will increase the risk of TB 1.5-7.8 times. The relationship between DM and TB has been proven where DM is a risk factor for TB so that it influences the presence of TB itself and the response to TB treatment. TB can also cause glucose intolerance and worsen glycemic control in DM patients. Although TB is more closely related to other immune

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deficiency diseases such as HIV, the number of people with diabetes is much greater. Therefore, at the population level, DM is a more significant risk factor for the incidence of TB [3].

The natural course of TB disease begins with exposure to tuberculosis bacteria. Patients whose sputum contains the bacteria Mycobacterium tuberculosis (MTB) are a source of TB transmission. When coughing or sneezing, through droplets of phlegm or droplets, the germs will spread into the air so that infection can occur if someone breathes air that contains this infectious phlegm. Sneezing and coughing can expel a lot of MTB bacteria where, when coughing can expel up to 3500 MTB and when sneezing can expel as many as 4500-1,000,000 MTB bacteria [4].

A chest photo is a radiological examination using x-rays to diagnose disease/abnormalities in a person's lungs, one of which is to diagnose pulmonary TB [5].

In the study of Alkabab et al, it was found that patients with pulmonary TB infection with DM had more pulmonary cavities compared to patients without DM. If the HbA1c level in diabetics is >6.5%, then the lungs are significantly more likely to develop cavity lesions compared to all patients with or without DM who have HbA1c levels <6.4% and RBS (random blood sugar) <200 mg/day. dl [6].

2. METHODS

This research is a quantitative study using an analytic observational approach regarding the differences in the characteristics of the chest X-ray images of pulmonary TB patients with DM and non-DM at Anutapura Hospital, Palu in 2020. The research design used in this study was cross sectional. The population in this study were all Bacteriological Pulmonary TB patients with DM and non-DM who were treated at Anutapura Hospital in Palu on 1 January 2020-31 December 2020. The sampling technique used was total sampling. Total sampling is a sampling technique by taking all members of the population who meet the inclusion and exclusion criteria. The process of collecting research data is to use secondary data. The research instrument used medical records and the research results were processed using SPSS with Fisher's test.

3. RESULTS AND DISCUSSION
Results

Table 1. Frequency Distribution by Gender

Gender	N	Percentage (%)
Woman	29	31%
Man	65	69%
Total	94	100%

Based on Table 1, the total number of pulmonary tuberculosis patients who were male and female was 94. A total of 29 people (31%) were female and 85 people (69%) were male. So from the data it can be stated that the majority of tuberculosis patients are dominated by men.

Table 2. Distribution of Sample Frequency by Age

Age	N	Percentage (%)
Teenager (12-25 years)	8	9%
Mature (26-45 years)	38	40%
Elderly (46-65 years)	39	41%
Seniors (>65)	9	10%
Total	94	100%

Based on table 2, the total number of pulmonary tuberculosis patients is 94, based on the age of the patients divided into adolescents (12-25 years), adults (26-45 years), elderly (46-65 years) and seniors (> 65 years). So from the data obtained the highest percentage of TB patients was in the elderly, namely 39 people (41%) and the second most were adult patients, namely 38 people (40%).

Table 3. Sample Frequency Distribution Based on Comorbidities

Comorbid	N	Percentage (%)
DM	15	16%
Non DM	79	84%
Total	94	100%

Based on table 3, pulmonary tuberculosis patients are divided into TB DM and non DM. TB DM totaled 15 people (16%) and TB Non DM totaled 79 people (84%). From these data it can be concluded that there are more non-DM TB patients compared to DM TB patients.

Table 4. Frequency Distribution Based on Lesion Area

Lesion Side	N	Percentage (%)
Wide	92	98%
Minimum	2	2%
Total	94	100%

Based on table 4, the description of the extent of the TB patient's lesions is divided into extensive lesions and minimal lesions. So from the data it was found that the most TB patients had extensive lesions, namely 92 people (98%).

Table 5. Frequency Distribution of Chest Photographs in TB DM Patients

Description	TB DM	
	Amount	Percentage
Infiltrate		
Positive	3	20%
Negative	12	80%
Total	15	100%
Cavity		
Positive	8	53%
Negative	7	47%
Total	15	100%
Fibrosis		
Positive	3	20%
Negative	12	80%
Total	15	100%
Atelectasis		
Positive	1	7%
Negative	14	93%
Total	15	100%

Based on table 5, the most frequent distribution of chest x-ray images is a cavity view in 8 patients (53%) in TB DM patients. The second most common chest X-ray features in TB DM patients were infiltrates and fibrosis, which were in 3 patients each (20%), while lymphadenopathy and pleural effusion in TB DM were not found (0%).

Table 6. Frequency Distribution of Chest Photographs in Non-DM TB Patients

Description	TB Non DM	
	Amount	Percentage
Infiltrate		
Positive	11	14%
Negative	68	86%

Total	79	100%
Cavity		
Positive	21	27%
Negative	58	73%
Total	79	100%
Fibrosis		
Positive	28	35%
Negative	51	65%
Total	79	100%
Atelectasis		
Positive	2	3%
Negative	77	97%
Total	79	100%
Lymphadenopathy		
Positive	1	1%
Negative	78	99%
Total	79	100%
Pleural Effusion		
Positive	16	20%
Negative	63	80%
Total	79	100%

Based on table 6, it was found that the most common chest X-ray picture in non-DM TB patients was a picture of fibrosis in 28 patients (35%) and the second most common feature was cavity in 21 patients (27%). Pleural effusion was found in 16 patients (20%) and infiltrates in 11 patients (14%) and lymphadenopathy in only 1 patient (1%).

Table 7. Comparison of the features of TB patients with DM and non-DM based on the area of the chest X-ray lesion

Lesion Wide	DM Status						P value
	DM	%	Non DM	%	Total	%	
Wide	14	15%	78	83%	92	100%	
Minimum	1	1%	1	1%	2	100%	0.295
Total	15	16%	79	84%	94	100%	

Based on the above data analysis, it was found that the largest lesion area in TB DM and Non DM patients was a large lesion of 92 people (98%) and a minimum lesion of 2 people (2%). From the table above, the results show that there is no difference in the picture of the chest X-ray, especially in the area of lesions in pulmonary TB patients with DM and Non-DM at Anutapura Hospital, Palu in 2020 because the P value is $0.295 > 0.05$.

Table 8. Comparison of chest X-ray images of TB DM and non DM patients

	TB DM		TB NON DM		*p* value
	amount	percentage	amount	percentage	
Infiltrate					
Positive	3	20%	11	14%	
Negative	12	80%	68	86%	0.691
Total	15	100%	79	100%	
Cavity					
Positive	8	53%	21	27%	
Negative	7	47%	58	73%	0.064
Total	15	100%	79	100%	

Fibrosis					
Positive	3	20%	28	35%	0.370
Negative	12	80%	51	65%	
Total	15	100%	79	100%	
Atelectasis					
Positive	1	7%	2	3%	0.410
Negative	14	93%	77	97%	
Total	15	100%	79	100%	
Lymphadenopathy					
Positive	0	0%	1	1%	1,000
Negative	15	100%	78	99%	
Total	15	100%	79	100%	
Pleural Effusion					
Positive	0	0%	16	20%	0.066
Negative	15	100%	63	80%	
Total	15	100%	79	100%	

Table 8 above shows a chest X-ray picture of TB DM patients with cavities in 8 patients (53%), fibrosis in 3 patients (20%), infiltrates in 3 patients (20%), atelectasis in 1 patient (1%) and no lymphadenopathy and pleural effusion were found in TB DM while in non DM TB patients there were fibrosis in 28 patients (35%), cavities in 21 patients (27%), infiltrates in 11 patients (14%), atelectasis in 2 patients (3%), lymphadenopathy in 1 patient (1%) and pleural effusion in 16 patients (20%).

Discussion

Based on the results of this study, it was found that the sex of the patients who predominated were male, namely 65 people (69%) and women as many as 29 people (31%). This is in accordance with a study conducted by Siane et al where the number of male patients (75%) was greater than the number of female patients (25%). This is also in accordance with WHO report data for 2018 which states that the majority of TB sufferers are male[7].

In this study, it was found that the first most common age was patient age 46-65 years or elderly, namely 39 people (41%) and the second most patients aged 26-45 years or adults, namely 38 people (40%), then patients aged> 65 years or seniors as many as 9 people (10%) and ages 12- 25 years or adolescence as many as 8 people. 25 years or adolescence as many as 8 people (9%). This is also in accordance with Siane et al's research where the highest number of patients was aged 46-65 years, namely 30 people (69.8%), age 26-45 as many as 9 people (20.9%), age> 65 years as many as 4 people (9.3%) and no one aged 18-25 years (Siane, 2020). However, this is different with the research of Asrianto et al where in 2017 the highest TB sufferers were at the age of 25-34 years, namely 12 people (37.5%) and the lowest TB sufferers at the age of 45-54 years and the lowest TB sufferers at the age of 45-54 years. patients at the age of 45-54 years and patients aged> 65 years, each of which there was only 1 person (3.1%).

In general, TB DM sufferers occur in old age (> 45 years), this is influenced by physiological systems that have decreased so that someone who is elderly is more susceptible to infection with M. tuberculosis. This decreased physiological system will affect and can damage the barrier system and microbial clearance mechanism in a person's respiratory system[8].

In table 3, the results of the study showed that TB patients with DM were fewer than TB patients without DM out of all patients. There were 15 TB DM patients (16%) and 79 TB non DM patients (84%). This is in line with Hidayah et al's research where out of 83 cases of pulmonary TB patients, 26 (31.33%) of them were pulmonary TB patients with type 2 DM and 57 people (68.67%) non DM TB patients (Hidayah, 2019) . This is also in line with Novita et al's study where the incidence rate of TB with DM was found to be 13% and the incidence rate of Non-DM TB was 88%[9] .

In table 4 the results of this study found the total lesion area of the TB patients, as many as 92 people (98%) with extensive lesions and 2 people (2%) with minimal lesions. So that most TB patients have extensive lesions. This is in accordance with the study of Layali et al where there were 42 patients with extensive lesions and 14 patients with minimal lesions[10]. This is also in line with Hardiyanti's research in 2017 where it was found that there were more pulmonary TB patients with extensive lesions than those with minimal lesions, namely 64 cases (97%) of pulmonary TB patients with extensive lesions and 2 cases (3%) of pulmonary TB with minimal lesions. out of a total of 66 cases.

Based on table 5, the results of this study indicate that the most common chest X-ray picture found in TB DM patients is cavity in 8 patients (53%) of a total of 15 patients and in non DM TB patients there is fibrosis in 28 patients (35%) followed by a picture cavity in 21 patients (27%) of a total of 79 patients. The features of the chest X-ray that were not found in TB DM patients were pleural effusion and lymphadenopathy while the X-ray images of lymphadenopathy were found only in 1 patient (1%) in non DM TB patients. The results of this study are different from the study of Mood et al in 2021[11] where the appearance of infiltrates in TB patients with DM (82%) is more common than non-DM TB patients (62%) and is followed by more cavities in TB DM (66%) compared to non DM TB (54%). In a previous study by Soerono et al in 2019[12], the results of a cavity description were 46.9% of a total of 32 research subjects. This is consistent with previous studies which found that the frequency of cavities in diabetics remains high regardless of age.

Based on the analysis of bivariate data in table 7, a P value of 0.295 > 0.05 was obtained, which means that there was no difference in the extent of the lesions in pulmonary TB patients with DM and non-DM at Anutapura Hospital, Palu in 2020. The results of this study were supported by the research of Husein et al. in 2014 which stated that There is no relationship between the description of the level of chest X-ray lesions in pulmonary TB patients with DM compared to non-DM. However, this is different from the results of a study by Layali et al in 2019[10] which stated that there was a relationship between DM and radiological features of pulmonary TB seen from the number of cavities, lesion area and location of the lesions[13].

Decreased body immunity, both natural and artificial immunity is the cause of increased TB severity (extensive lesions, multiple cavities and large cavities). In addition, impaired epithelial cell function, respiratory respiratory epithelial cell function and ciliary motility also influence lesion expansion. The increased incidence of pulmonary TB in diabetic patients is also caused by defect in low alveolar macrophages, resulting in widespread pulmonary TB lesions and TB bacteria in the sputum of diabetic patients. and TB bacteria in the sputum of patients with DM TB are also increasing[10].

The results of data analysis in table 4.8 showed that the P values of each chest X-ray were infiltrates (p-value = 0.691), cavities (p-value = 0.064), fibrosis (p-value = 0.370), atelectasis (p-value = 0.410), lymphadenopathy (p-value = 1.000) and pleural effusion (p-value = 0.066). So from these results it was concluded that there was no significant difference between TB DM and non DM patients in the appearance of infiltrates, fibrosis, atelectasis, lymphadenopathy and pleural effusion because the p value > α value. This is in line with Kim et al's study in 2017[14] where the results of their study showed that there was no significant difference in the appearance of pleural effusion and lymphadenopathy between TB DM and TB non DM patients (p value > α value). The results of this study are also in line with the results of Ramadhanty et al's 2020 study, namely that there is no difference in the appearance of chest X-rays in adult TB patients who have a history of DM and adult TB patients who do not have a history of DM. The results of this study were also supported by Husein et al's 2014 study which stated that pulmonary TB patients with DM had no relationship with radiological features.

The results of data analysis in Table 4.8 showed that there was no difference in the chest X-ray images of TB DM and TB Non DM patients in the cavitary view (p-value = 0.064). This is different from the study by Alkabab et al in 2018[6] where the results showed that pulmonary TB patients with DM had more cavities compared to non-DM TB patients (p-value = 0.02).

Previous research by Zang et al showed that hyperglycemia increases the risk of pulmonary TB and is also strongly associated with worsening of radiographic manifestations in TB patients. HbA1c

as well as fasting blood sugar are often used as an index to control glycemic conditions so that multiple cavity findings are often associated with changes in these two indices. Conditions of hyperglycemia followed by oxidative stress can induce higher levels of IL-17A, IL-8 and IL-10 cytokines in the lungs thereby contributing to a worsening inflammatory response. Several other immune systems such as neutrophils, macrophages, dendritic cells and NK cells will decrease drastically in patients with DM so that antigen presentation and microbial activity are disrupted[15].

4. CONCLUSION

From the resultsThe research conducted regarding the comparison of chest X-ray images of pulmonary TB patients with DM and Non-DM at Anutapura Hospital in Palu in 2020 concluded that: (1) There is no difference in the X-ray images of TB DM and Non-DM patients with details of infiltrates (p=0.691), cavities (p=0.064), fibrosis (p=0.370), atelectasis (p=0.410), lymphadenopathy (p=1.000) and pleural effusion (p=0.066). (2) Characteristics of lung lesion area in the chest X-ray picture of TB DM patients, which is the most extensive lesion in 14 patients (15%) and minimal lesions in only 1 patient (1%). (3) Characteristics of lung lesion area on chest radiographs of non-DM TB patients with the most extensive lesions in 78 patients (85%) and lesions in at least 1 patient (1%). (4) There is no difference in the description of the extent of lung lesions in the chest X-ray images of TB DM and non DM patients.

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