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Pulmonary Tuberculosis Incidence Rate with Genexpert Examination Method at Mlati II Public Health Center, Sleman In 2020-2023

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Article Info	ABSTRACT
	Tuberculosis cases in adults in the Special Region of Yogyakarta are still quite high. In 2019, data was obtained that the number of Tuberculosis cases in the Special Region of Yogyakarta in adults was 2,974 cases. The results of the GeneXpert examination showed that the most positive cases of Tuberculosis were found in Yogyakarta City, reaching 1,946 people, then followed by Sleman Regency 1,604 cases, Yogyakarta City 986 cases, Bantul Regency 643 cases, Kulonprogo Regency 177 cases, Gunugkidul Regency 422 cases, Sleman Regency 746 cases. The purpose of this study was to determine the incidence of pulmonary Tuberculosis using the Genexpert examination method at the Mlati II Health Center in 2020-2023. This type of research is a descriptive analytical study with a cross-sectional approach using secondary data at the Mlati II Sleman Health Center in 2020-2023. Based on the results of the study, the incidence of pulmonary tuberculosis was obtained using the Genexpert examination method at the Mlati II Sleman Health Center in 2020 to 2023 from 587 pulmonary tuberculosis patients, 89 patients were positive and 498 patients were negative. Meanwhile, of the 89 positive patients, 52 were male positive patients and 37 were female positive patients. Based on the characteristics of patients with pulmonary tuberculosis at the Mlati II Sleman Health Center, totaling 89 people, including 4 patients aged 1-5 years, 4 patients aged 6-11 years, 20 patients aged 12-25 years, 27 patients aged 26-45 years, 27 patients aged 46-65 years and 7 patients aged >65 years. The results of the study showed that the lowest number of patients diagnosed with tuberculosis was in 2021 with 17 positive patients and 40 negative patients. The Genexpert examination in 2020 was 18 positive patients (24%). In addition, The results of the study showed that the percentage of tuberculosis cases from 2020 to 2023 decreased, but the number of cases increased, this was due to the increasing population of suspected tuberculosis in 2022 and 2023. The number of suspected tuberculosis patients in 2020 was 75 cases and in 2021 decreased by 57 cases. The increase occurred in 2022 with the number of suspected tuberculosis cases of 200 and in 2023 there were 255 cases.

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INTRODUCTION

Tuberculosis is one of the important health problems in Indonesia. Tuberculosis is a disease caused by the bacteria Mycobacterium tuberculosis which can be transmitted through airborne transmission from sputum droplets of positive Tuberculosis sufferers (13). According to WHO in the Global Tuberculosis Report 2021, in 2020 the most cases of Tuberculosis were in Southeast Asia (43%), Africa (25%), West Pacific (18%), East Mediterranean (8.3%), America (3.0%), and Europe (2.3%) (13). Indonesia is ranked 3rd

in the world for the number of pulmonary Tuberculosis sufferers after India and China. The number of pulmonary Tuberculosis patients in Indonesia is around 5.8% of the total number of Tuberculosis patients in the world. There are 8 countries that contribute two-thirds of the global total, namely India (26%), China (8.5%), Indonesia (8.4%), Philippines (6.0%), Pakistan (5.8%), Nigeria (4.5%), Bangladesh (3.6%), and South Africa (3.3%) (13). The percentage of incidents in Indonesia, it is estimated that every year there are 528,000 new cases of Tuberculosis with around 91,000 deaths (Ministry of Health of the Republic of Indonesia, 2017). Data from the Health Profile of the Special Region of Yogyakarta (DIY), that cases of tuberculosis in adults in DIY are still quite high. In 2019, data was obtained that the number of tuberculosis cases in DIY in adults was 2,974 cases. Tuberculosis in the city of Yogyakarta was the most cases found reaching 1,946 people, then followed by Sleman Regency 1,604 cases, Yogyakarta City 986 cases, Bantul Regency 643 cases, Kulonprogo Regency 177 cases, Gunugkidul Regency 422 cases, Sleman Regency 746 cases (4). Based on the results of the data collection of the Healthy Indonesia Program with a Family Approach (PIS PK) implemented in the Mlati II Health Center work area in 2019, the Healthy Family Index (IKS) value was (0.19%), where there were (76.7%) residents who were screened for tuberculosis who had not received standard examinations. Based on the results of the achievement of the minimum service standards (SPM) in the Health sector in 2020, as many as 23% of suspected tuberculosis at the Mlati II Health Center have not received services according to standards, this innovation activity supports the achievement of the Minimum Service Standards (SPM) indicators in the health sector, namely suspected tuberculosis patients receive services according to standards so that the sustainability of this program can be ensured to continue to run by increasing early detection of suspected tuberculosis patients in the community along with the health transformation agenda in primary services and increasing the findings of tuberculosis cases so that treatment can be carried out faster, it is hoped that tuberculosis will be eliminated in 2030.

Risk factors that can cause Tuberculosis are genetic factors, malnutrition, vaccination, poverty and population density. Tuberculosis is especially common in populations experiencing stress, poor nutrition, substandard home ventilation, inadequate health care. Home environmental factors play a major role in the incidence of Tuberculosis. The environment is inseparable from human life activities. The environment, both physically and biologically, plays a very important role in the process of public health disorders, including health disorders in the form of Tuberculosis (9).

GeneXpert is a development of current technology that can quickly identify the presence of Mycobacterium tuberculosis and resistance to rifampicin simultaneously, so that early initiation of accurate therapy can be given and can reduce the incidence of tuberculosis, in general The working principle of the GeneXpert tool is an examination that uses an automated system that integrates the process of specimen purification, nucleic acid amplification, and target sequence detection. The system consists of the GeneXpert tool, computer and software. Each examination uses a disposable cartridge and is designed to minimize cross-contamination. The Xpert MTB / RIF cartridge also has Sample Processing Control (SPC) and Probe Check Control (PCC). SPC functions as a strong process control for target bacteria to monitor the presence of PCR reaction inhibitors while PCC functions to ensure the reagent rehydration process, filling the PCR tube in the cartridge, probe integrity, and dye stability. This examination can detect tuberculosis bacteria and detect tuberculosis bacteria resistance to rifampicin accurately and has a sensitivity of 96% and a specificity of 98%. This examination only takes 2 hours from sample to print and this tool is suitable for endemic areas and can be done even if the sputum sample is only 1ml. GeneXpert examination is able to qualitatively detect complex MTB DNA from direct specimens, both from sputum and non-sputum, and can also detect mutations in the rpoB gene that cause resistance to rifampicin (10).

Boehme's research conducted in 2010 stated that GeneXpert can diagnose Multi Drug Resistant Tuberculosis (MDR TB). This examination also obtained sensitivity in detecting rifampicin resistance (1). Tuberculosis tests using GeneXpert are currently being developed and used in several health facilities to screen for pulmonary tuberculosis. To detect pulmonary tuberculosis, a pulmonary tuberculosis examination must be carried out at the Mlati II Sleman Health Center so that initial results can be obtained from pulmonary tuberculosis patients and treatment can be given in the form of medication or referral to sick patients.

METHODOLOGY

This study is a type of analytical descriptive research with a cross-sectional approach. The study uses secondary data with medical record data at the Mlati II Sleman Health Center in 2020-2023 and meets the inclusion and exclusion criteria. The inclusion criteria in this study are individuals who have been diagnosed with tuberculosis who have been examined using the Genexpert tool at the Mlati II Sleman Health Center in 2020-2023, cases of suspected tuberculosis patients that occurred at the Mlati II Sleman Health Center in 2020-2023, cases of suspected tuberculosis patients with complete and verifiable data. The exclusion criteria in this study were cases of suspected tuberculosis patients who were not diagnosed at the Mlati II Health Center in 2020-2023, cases of suspected tuberculosis patients with incomplete or unclear data at the Mlati II Health Center in 2020-2023. The analysis in this study was carried out using descriptive statistical tests.

RESULTS

<p align="center">**Table 1.** Characteristics of Suspected Tuberculosis Patients</p>

variabel	f	%
Positif	89	15
Negatif	498	85
Total	587	100

Source: Secondary Data 2020-2023

Table 1. Shows the results of GeneXpert examination in suspected tuberculosis patients, 89 positive patients (15%) and 498 negative patients (85%).

<p align="center">**Table 2.** Number of Positive GeneXpert Examination Patients by Gender in 2020-2023</p>

variabel	F	%
Laki-laki	52	58
prempuan	37	42
Total	89	100

Source: Secondary Data 2020-2023

In table 2, it is known that in 2020, there were 52 male tuberculosis patients (58%), while there were 37 female patients (42%).

<p align="center">**Table 3.** Number of Positive GeneXpert Examination Patients by Age 2020-2023</p>

Usia Varibel	1-5 th f	%	6-11 th f	%	12-25 th f	%	26-45 th f	%	46-65th f	%	>65 th F	%	total
Tahun 2020	-	0%	-	0%	5	28%	6	33%	6	33%	1	6%	18
2021	-	0%	-	0%	5	29%	9	53%	2	12%	1	6%	17
2022	3	12%	-	0%	7	27%	8	31%	5	19%	3	12%	26
2023	1	4%	4	14%	3	11%	4	14%	14	50%	2	7%	28
Total	4	4%	4	4%	20	22%	27	30%	27	30%	7	8%	89

Source: Secondary Data 2020-2023

It is known in table 3 that in 2020 the majority of patients diagnosed with tuberculosis were patients aged 26 to 65 years with a total of 12 patients (66%). In 2021, the most patients diagnosed with tuberculosis were aged 26-45 years with a total of 9 patients (53%). In 2022, the most patients diagnosed with tuberculosis were aged 26-45 years with a total of 8 patients (31%). In 2023, the most patients diagnosed with tuberculosis were aged 46-65 years with a total of 14 patients (50%).
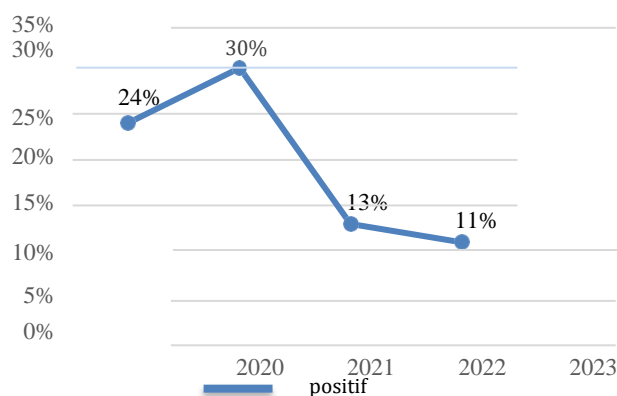

<p align="center">**Figure 1.** Number of positive GeneXpert test results in 2020-2023</p>

In Figure 1, it is known that there were 18 positive patients with GeneXpert examination in 2020 (24%). In addition, the lowest number of tuberculosis cases was in 2021 with 17 positive patients (30%), an increase in patients occurred in 2022 to 26 positive patients (13%) and a spike in the increase in patients in 2023,

namely with 28 positive patients (11%). The number of suspected tuberculosis patients in 2020 to 2023 was 587 patients.

DISCUSSION

Gender Characteristics of Patients Diagnosed with Tuberculosis at the Mlati II Sleman Health Center

The results of the study in table 1 show that men experience tuberculosis more than women, the number of male patients is 52 patients (58%) and female patients 37 patients (42%). This is in line with the research of (12) the results of the chi square statistical test obtained a p-value = 0.030 (p <0.10) meaning Ho is rejected. This shows that there is a statistically significant relationship between gender and the incidence of Pulmonary Tuberculosis.

Another study conducted by (11) found that respondents who experienced pulmonary tuberculosis and were male were 26 people (92.9%) more than respondents who experienced pulmonary tuberculosis and were female as many as 9 people (33.3%). With the results of p value = 0.047 greater than a = 0.05 indicating that there is a significant relationship between gender and the incidence of Pulmonary Tuberculosis.

There is a relationship between gender and tuberculosis incidence, where no relationship was found between gender and tuberculosis incidence because the proportion of male and female tuberculosis sufferers based on RISKESDAS 2013 was almost the same, although differences in the number of tuberculosis sufferers were found. These results are in line with research conducted by(11), where the study stated that tuberculosis does not choose to attack a particular gender.This is related to men having jobs that require them to meet other people and also having high mobility. In addition, the behavior of smoking and drinking alcohol often makes it easier to be infected with pulmonary tuberculosis (5).

In 2011, it was stated that 67% of men smoked and 87% of adults were exposed to cigarette smoke at home, this is one of the causes of men being more susceptible to being diagnosed with tuberculosis. While in women, the percentage of smokers in this type is less, namely 2.7%, but the risk factors are higher due to exposure to cigarette smoke, air pollution and so on.

The risk of progression from exposure to tubercle bacilli to active disease is a two-stage process governed by exogenous and endogenous risk factors. Exogenous factors play a major role in the progression from exposure to infection, of which the number of bacilli in the sputum and proximity to an infectious tuberculosis case are major factors. Similarly, endogenous factors contribute to the progression from infection to active tuberculosis disease. Along with established risk factors (such as human immunodeficiency virus (HIV), malnutrition, and young age), emerging variables such as diabetes, indoor air pollution, alcohol, use of immunosuppressive drugs, and tobacco smoke play important roles at both the individual and population levels (8).

Age Characteristics of Patients Diagnosed with Tuberculosis at the Mlati II Sleman Health Center

The results of the study showed that the age category of patients was dominated by 26-45 years and 46-65 years with a total of 54 patients. This age is a productive age as explained in the study by (6) which explained that the majority of respondents in this study came from the productive age group, namely 20-30 years as many as 89 people, 31-40 years as many as 34 people, 41-50 years as many as 19 people. The productive age group is a period that plays an important role in earning a living outside the home and often leaving the house which makes the process of pulmonary TB transmission easy. The group of pulmonary tuberculosis sufferers is mostly aged 15-55 years (productive age) because at this age people spend time and energy working where energy is drained, reduced rest time so that the immune system decreases, while in the group not suffering from pulmonary tuberculosis, the most are aged > 55 years. Based on the results of research and existing and related theories, the researcher argues that there is a significant relationship between age and the incidence of pulmonary tuberculosis. The researcher concluded that old age is more susceptible to pulmonary tuberculosis because old age has decreased in body organs (12). Age is one of the factors that can affect the completion of treatment where tuberculosis, where the older a person is, it can affect the production of lymphocyte cells, the lower the lymphocyte cells produced, the more it will affect the immune system. A low immune system can result in the resulting resistance to infection being less responsive (6). Tuberculosis Cases from 2020 to 2023 at the Mlati II Sleman Health Center

The results of the study showed that the lowest number of patients diagnosed with tuberculosis was in 2021 with 17 positive patients and 40 negative patients. An increase in patients occurred in 2022 to 26 positive patients and 174 negative patients. The spike in patient increases in 2023 was 28 positive patients and 227 negative patients. The number of suspected tuberculosis patients from 2020 to 2023 was 587 patients.

The results of the study showed that the percentage of tuberculosis cases from 2020 to 2023 decreased, but the number of cases increased, this was due to the increasing population of suspected tuberculosis in 2022 and 2023. The number of suspected tuberculosis patients in 2020 was 75 cases and in 2021 decreased by 57 cases. The increase occurred in 2022 with the number of suspected tuberculosis cases of 200 and in 2023 there were 255 cases.

The increase in unexpected tuberculosis patients was also caused by the Indonesian Ministry of Health program, namely transformational large-scale screening to provide faster and more efficient tuberculosis diagnosis results, so that they can get tuberculosis treatment as early as possible. Active Case Finding (ACF) as one of the accelerations of the tuberculosis (TB) control program to increase the discovery of undetected tuberculosis cases through active efforts to find people who are at risk, symptomatic and carry out detection.

ACF activities in the Special Region of Yogyakarta have been carried out since 2020 with the support of Zero tuberculosis Yogyakarta with a screening model in at-risk groups using GeneXpert which is a new breakthrough for tuberculosis diagnosis based on molecular examination using the Real Time Polymerase Chain Reaction Assay (RTPCR) method which targets the hotspot region of the rpoB gene in MTB which is integrated and automatically processes the preparation with Deoxyribo Nucleic Acid (DNA) extraction in disposable cartridges (2).

However, the occurrence of the Covid-19 pandemic in 2020 has hampered this program. Efforts to combat tuberculosis in Indonesia can be said to have encountered many challenges, including the emergence of the COVID-19 pandemic so that the focus of health programs has been diverted to combating the pandemic. This condition makes them vulnerable to contracting tuberculosis, this of course risks increasing the number of cases and sources of TB transmission.

CONCLUSIONS

Based on the results of the study on the incidence of pulmonary tuberculosis patients using the GeneXpert method at the Mlati II Sleman Health Center in 2020 to 2023, there were 587 patients examined for pulmonary tuberculosis, 89 positive patients (15%) and 498 negative patients (85%) were found, so the following conclusions can be drawn: 1) Based on gender, 52 male patients were positive (58%) and 37 female patients were positive (42%). 2) Based on the characteristics of pulmonary tuberculosis patients at the Mlati II Sleman Health Center, totaling 89 people, including 4 patients aged 1-5 years (4%), 4 patients aged 6-11 years (4%), 20 patients aged 12-25 years (20%), 27 patients aged 26-45 years (30%), 27 patients aged 46-65 years (30%) and 7 patients aged >65 years (8%). 3) The results of the study showed that the percentage of tuberculosis cases from 2020 to 2023 decreased, but the number of cases increased, this was due to the increasing population of suspected tuberculosis in 2022 and 2023. The number of suspected tuberculosis patients in 2020 was 75 cases and in 2021 decreased by 57 cases. The increase occurred in 2022 with the number of suspected tuberculosis cases of 200 and in 2023 there were 255 cases.

REFERENCES

Budiarti Retno, Ediono, Ni Made Mertaniasih, Soedarsono.(2022).Adenosine Deaminase Detection in Serum of Pulmonary Tuberculosis and Extra Pulmonary Tuberculosis patients at Dr. Ramelan Hospital Surabaya. Research Journal of Pharmacy and Technology.15(7):2987-1.Doi:10.52711/0974-360X.2022.00498 Available on:https://rjptonline.org/AbstractView.aspx?PID=2022-15-7-20

Blackmore, N. J., Reichau, S., Jiao, W., Hutton, R. D., Baker, E. N., Jameson, G. B., & Parker, E. J. (2013). Three sites and you are out: ternary synergistic allostery controls aromatic amino acid biosynthesis in Mycobacterium tuberculosis. Journal of molecular biology, 425(9), 1582-1592.

Depkes RI. (2017). Profil Kesehatan Indonesia Tahun 2017. Jakarta: Kementerian Kesehatan Republik Indonesia.

Dinkes DIY. (2017). Profil Kesehatan Daerah Istimewa Yogyakarta 2017.Yogyakarta:Dinas Kesehatan Daerah Istimewa Yogyakarta.

Dotulong, J., Sapulete, M. R., & Kandou, G. D. (2015). Hubungan faktor risiko umur, jenis kelamin dan kepadatan hunian dengan kejadian penyakit TB Paru di Desa Wori Kecamatan Wori. Jurnal Kedokteran Komunitas dan Tropik, 3(2).

Lestari, N. P. W. A., Dedy, M. A. E., Artawan,I. M., & Buntoro, I. F. (2022). Perbedaan usia dan jenis Kelamin Terhadap Ketuntasan Pengobatan TB Paru di Puskesmas di kota kupang. Cendana Medical Journal, 10(1), 24-31.

Marleni, L., Syafei, A., & Saputra, A. D. (2020). Hubungan antara Pengetahuan dan Jenis Kelamin dengan Kejadian tuberculosis Paru. Babul Ilmi Jurnal Ilmiah Multi Science Kesehatan, 12(1).

Narasimhan, P., Wood, J., Macintyre, C. R., & Mathai, D. (2013). Risk factors for tuberculosis. Pulmonary medicine, 2013,828939. https://doi.org/10.1155/2013/828939

Rahman, A. (2005). Faktor-faktor yang Berhubungan dengan Kepatuhan Berobat Pasien TB Paru Di Puskesmas Cempae Kota Pare-Pare, hlm 71.

Saeed, M., Ahmad, M., Iram, S., Riaz,S.,Akhtar, M., & Aslam, M. (2017). GeneXpert technology: A breakthrough for the diagnosis of tuberculous pericarditis and pleuritis in less than 2 hours. Saudi Medical Journal, 38(7), 699–705. https://doi.org/10.15537/smj.2017.7.7694

Simbolon, D. (2007). Faktor risiko tuberculosis paru di Kabupaten Rejang Lebong. Kesmas, 2(3), 112-119.

Sumarni, S., & Kurniawaty, K. (2022). hubungan karakteristik pasien TB Paru dengankejadiantuberculosis. Jurnal'Aisyiyah Medika, 7(2).

Utami, P. R., Indrayati, S., & Hayatang, N.(2021). Ability of Ethanol Extract from Ajwa and Sukkari Dates (Phoenix dactylifera L.) in Inhibiting the Growth of Methicillin-Resistant Staphylococcus aureus (MRSA). Indonesian Journal of Medical Laboratory Science and Technology, 3(1), 1–8. https://doi.org/10.33086/ijmlst.v3i1.1848

WHO. (2018). Global Tuberculosis Report 2018. (http://www.who.int/tb/publica tions/global report/e