Ahmad Dahlan Medical Journal
VOL 6, No. 1, 80-93
http:// http://journal2.uad.ac.id/index.php/admj

Case Report

Holistic Management of Tuberculosis in 49 Years Old Woman with Complex Problems through A Family Medicine Approach: Case Report

[1]Aulia Nissa Dewantari, [1]Dewi Yuniasih*, [1]Tira Alfiani Laariya, [2]Hega Fitri Nuraga, [2]Ade Puspa Sari
Email: *dewi.yuniasih@med.uad.ac.id
[1] Faculty of Medicine, Ahmad Dahlan University, Yogyakarta, Indonesia
[2]Sanden Public Health Center, Bantul, Yogyakarta, Indonesia

ARTICLE INFO

Article history
Received 11Mar 25
Revised 16 May 25
Accepted 17 May 25

Keywords:
Tuberculosis
Holistic management
Family medicine approach

ABSTRACT

Tuberculosis (TB) is an infectious disease caused by *Mycobacterium tuberculosis*, transmitted through airborne droplets when an infected person coughs, sneezes, or talks. Environmental conditions, such as poor ventilation and lack of sunlight, can facilitate the persistence of TB bacteria indoors. Sunlight and good air circulation play key roles in reducing bacterial survival. Health cadres are vital in detecting and managing TB cases in their communities. The Sanden Community Health Center runs a TB prevention and control program (P2TB) to help reduce TB incidence. A 49-year-old woman presented with a persistent cough for approximately two months, accompanied by fatigue, significant weight loss, and decreased appetite. The cough was intermittent, sometimes with phlegm, and unresponsive to cough medication. About a month prior, a Rapid Molecular Test (TCM) at a lung hospital in Yogyakarta confirmed TB. She had a history of unhealthy sexual behavior and was previously diagnosed with syphilis but tested negative for HIV. The patient also has metabolic syndrome. On physical examination, she appeared mildly ill but alert (E4M6V5), with a respiratory rate of 16/min. Lung and skin examinations were normal. Abdominal circumference was 112 cm. The patient received education on TB recognition, prevention, and intervention. Interventions were tailored to be patient-centered, family-focused, and community-oriented. She was classified as a bacteriologically confirmed TB case, with no previous history of TB treatment and a negative HIV result..

INTRODUCTION

Tuberculosis (TB) is a contagious disease caused by *Mycobacterium tuberculosis*. Transmission occurs when airborne bacteria are inhaled by individuals, typically following exposure to droplets released into the air when a person with TB coughs or sneezes without covering their mouth.[1] While TB primarily affects the lungs (pulmonary TB), it can also involve other organ systems (extrapulmonary TB). The central nervous system, gastrointestinal system, genitourinary system, pleura, esophagus, bones, and skin are among the areas that may be affected by *Mycobacterium tuberculosis*.[2]

Mycobacterium tuberculosis, which infects the lungs, is a gram-positive, rod-shaped bacterium measuring 1–10 microns in length and 0.2–0.6 microns in width. While pulmonary TB transmission predominantly occurs through community-based transmission, prevention of transmission within the household environment is equally critical. The living environment plays a significant role in the spread of TB. Droplets expelled during coughing or sneezing can remain viable for several hours in dark, humid conditions. Proper ventilation in a room enhances air circulation, while exposure to sunlight can effectively eliminate TB bacteria. These findings highlight the influence of living conditions on the incidence of tuberculosis.[3]

The World Health Organization (WHO) is currently implementing "The End TB Strategy," which is part of the Sustainable Development Goals (SDGs) and aims to eradicate the global TB epidemic.[4] According to data from the Indonesian TB Dashboard, an estimated 1.060.000 TB cases were reported in 2022, with 792.404 cases in 2023.[5] The 2022 Global TB Report indicates that Indonesia ranks second in the world for TB prevalence, following India, with WHO estimating 969.000 cases in the country.[6] Furthermore, TB ranked as the fifth leading cause of disease burden in 2017, with increasing risk factors such as smoking, malnutrition, HIV infection, and excessive alcohol consumption.[7] Individuals with diabetes are three times more likely to develop TB compared to those without diabetes, and 5% of global TB cases are attributed to diabetes mellitus (DM). The prevalence of DM among TB patients ranges from 1.8% to 45% in low- and middle-income countries.[8]

Between 2020 and 2022, 30 tuberculosis (TB) cases were recorded in Sanden Health Center.[9] Effective management of TB cases is a critical responsibility of Health Centers. According to Indonesia's Ministry of Health, the TB treatment success rate in 2022 was 86%, reflecting a slight decrease from 86.4% in 2021.[5] Community health volunteers play a vital role in detecting and managing TB cases within their respective areas. Health Centers, as primary-level healthcare

providers and extensions of the Health Office, deliver both community and individual health services. Their primary objective is to implement preventive and promotive measures to optimize public health in their service areas. Sanden Health Center has undertaken TB prevention and control initiatives aimed at reducing TB incidence. These efforts include early detection through active case finding, particularly among high-risk groups such as malnourished children, health education programs conducted at Integrated Health Posts "Posyandu" and chronic disease clubs "Prolanis", appointing medication supervisors to monitor treatment adherence, and evaluating treatment outcomes.

This case report aims to implement family doctor services in TB management by providing patient-centered, family-focused, and community-oriented interventions.

CASE PRESENTATION

The patient reported experiencing a cough for approximately two months accompanied by generalized weakness. She had purchased over-the-counter cough medicine, but the symptoms persisted. In early November, the patient sought care at a district hospital near her residence, where she was hospitalized for one week and subsequently reported improvement. However, one week after discharge, the cough recurred, though it was mild and did not prompt an immediate follow-up.

The patient eventually sought medical attention due to persistent weakness. Approximately one month before a home visit, she was admitted to a lung specialist hospital in Yogyakarta, where she was hospitalized for three days. During this admission, a GeneXpert (TCM) test confirmed bacteriologically positive TB. The hospital reported the case to the Sanden Health Center for continued treatment, as the hospital had only provided a one-week supply of anti-tuberculosis medication (OAT). However, the patient did not visit the Health Center due to transportation challenges. She commenced the first month of treatment on February 3rd, 2024.

The patient reported a cough without hemoptysis, occasionally producing phlegm, and denied experiencing shortness of breath. Additional complaints included reduced appetite and significant weight loss of approximately 20 kg within one month (from 107 kg to 80 kg). Symptoms such as frequent fever or night sweats were denied. The patient was unsure of the source of TB transmission and reported no similar complaints among family members or coworkers.

During the initial home visit conducted by the Health Center, the patient's random blood sugar (RBS) level was recorded at 200 mg/dL, and her blood pressure was measured at 140 mmHg.

Medical and Socioeconomic History

The patient has a history of diabetes mellitus and hypertension, with irregular medication adherence over the past three months. However, she has resumed regular medication for both conditions since initiating anti-tuberculosis treatment (OAT). Additionally, the patient has a history of syphilis, having tested positive approximately seven months ago. There is no known history of allergies. No family members have reported similar symptoms to those experienced by the patient. She claimed to have a paternal family history of lung disease and denied any history of hypertension or diabetes mellitus in her family.

The patient denied a personal habit of drinking alcohol or being an active smoker. However, according to the local residents' reports, she previously consumed alcohol and smoked more than two packs of cigarettes per day. Since falling ill, she has ceased both alcohol consumption and smoking. Nevertheless, Mrs. S is now exposed to passive smoke, as someone in her household continues to smoke. Mrs. S worked as a commercial sex worker, but she reported discontinuing this occupation since being diagnosed with tuberculosis (TB) and now only operates a guesthouse.

The patient, originally a migrant from Kudus, moved to the Samas area after completing elementary school. Initially, she resided in Samas, albeit in a different neighborhood (*RT*) from her current location. Mrs. S currently lives in a rented house, which she shares with two other individuals. They are her male partner aged approximately 60–70 years, with whom she has no formal marital status, and a 10-year-old child. She has been living with her partner, who is originally from Yogyakarta, for approximately two years. Her partner also experiences a chronic cough but has declined to seek medical evaluation.

Prior to her illness, Mrs. S maintained harmonious relationships with the surrounding community. However, following her diagnosis of tuberculosis (TB), she has reported feelings of social ostracization. On the other hand, several local residents frequently remind the patient to wear a mask when leaving the house, as the patient is considered someone who is difficult to educate regarding disease transmission. This has contributed to the patient's perception of being marginalized by the community due to her illness. Regarding the patient's occupation as a sex worker for approximately 30 years, the local community does not perceive it as an issue, nor is it considered taboo in the area. This is because the region has a significant number of female sex workers, ranging from young to older individuals.

Before falling ill, the patient worked as a sex worker. However, currently, her employment is not stable and consists of tasks such as assisting with ironing clothes for others and running a

guesthouse catering to people seeking personal services. Her life partner works as a scrap dealer, but his income is also inconsistent. When collecting scrap, he typically uses a bicycle, as his previous motorbike was sold. The patient feels that the combined income of her and her life partner is insufficient to meet their daily needs. This financial instability often results in difficulties in paying monthly rent. Consequently, their daily lives, including basic necessities such as clothing, food, and shelter, are managed with significant limitations. The patient faces challenges in accessing healthcare services due to limited transportation options to the nearest facility, the Sanden Health Center.

Physical Examination

A 49-year-old female patient was visited due to a cough lasting more than two months, accompanied by fatigue, significant weight loss, and decreased appetite. A Rapid Molecular Test (TCM) conducted a month earlier showed a positive result for tuberculosis. She had a history of syphilis (positive) and HIV (negative). Her general condition appeared mildly unwell, with a blood pressure of 148/90 mmHg, respiratory rate of 16/min, and abdominal circumference of 112 cm, indicating central obesity. Physical examinations revealed no abnormalities in the lungs or skin. Family history includes diabetes mellitus, hypertension, and lung disease. Most family relationships are reported as good.

Home visite

The house is located 6.2 km from Sanden Health Center, measuring 10 x 7 m^2, with one floor and no ceiling. It has poor ventilation, a leaky roof, and minimal lighting. The living room is multi-functional (used as a dining area, bedroom, and kitchen), cluttered, and poorly ventilated. Guest rooms are not used by household members, lack windows, and have inadequate lighting. The kitchen, integrated with the living room, is in disrepair but benefits from some ventilation. The physical environment of the house supports TB transmission due to poor ventilation, high humidity, and overcrowded spaces. Interventions were carried out using a holistic approach involving patient-centered care, family-focused support, and community-based actions.

Genogram

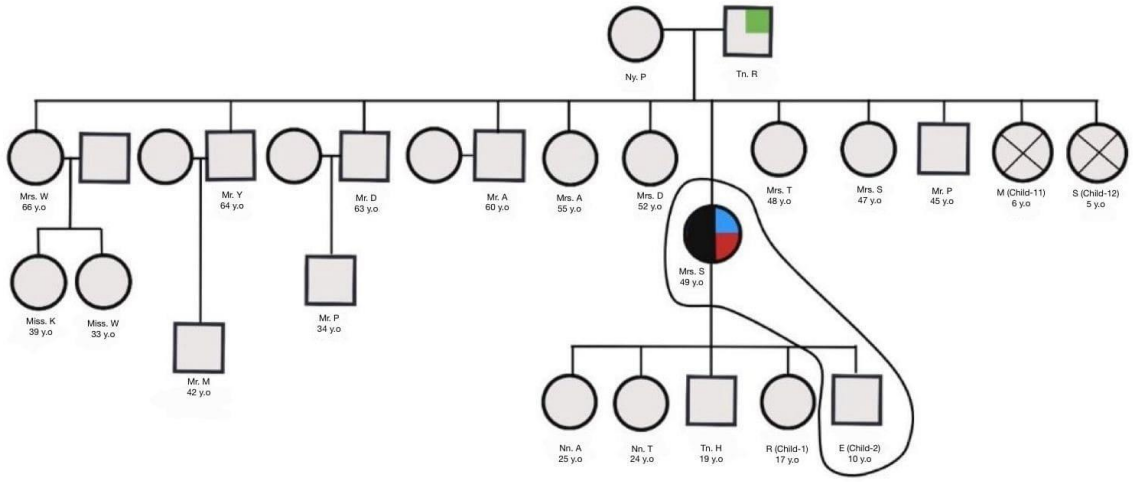
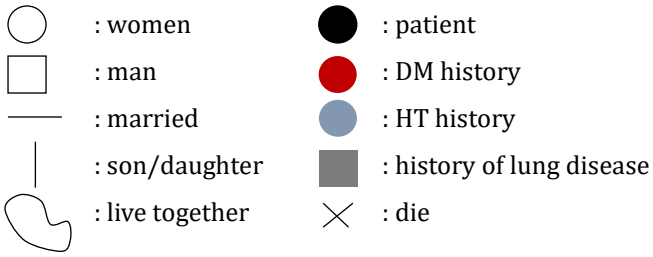


Figure 1. Genogram of Mrs. S's family



The genogram illustrates the family structure of Mrs. S, a 49-year-old woman diagnosed with tuberculosis, who also has a history of diabetes mellitus and hypertension. She is marked in the diagram with symbols indicating her status as a patient and her comorbidities. Her father (Mr. P) had a history of lung disease, suggesting a possible familial risk factor. Mrs. S comes from a large extended family with multiple siblings, some of whom are deceased. She currently lives with her children, including a 10-year-old, but no other family members are known to have tuberculosis. The genogram highlights both genetic and environmental risk factors that may influence Mrs. S's health outcomes, particularly the presence of chronic conditions and a family history of lung disease.

Family Map

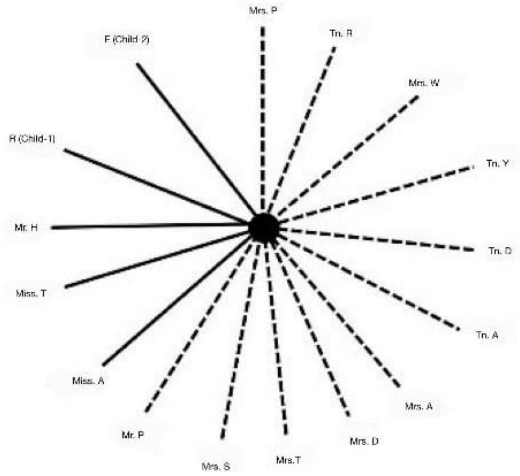


Figure 2. The relationship within Mrs. S's family

---------- : relationship is not good

———— : good relationship

Family Function

The patient express gratitude for the support she receives from her current job and her life partner. Her life partner fulfills the family's financial responsibilities, effectively acting as the primary breadwinner. However, Mrs. S feels that her partner is not entirely supportive of her recovery, as he continues to smoke inside the house. Despite this, they share a loving relationship, although Mrs. S perceives the care provided to their child as less than optimal.

All members of Mrs. S's household are Muslims, however, she acknowledges that she does not consistently perform the five daily prayers. The patient completed her elementary education and, subsequently, was brought to her current location by a friend, where she began working as a sex worker. Mrs. S left her family home in Kudus without their consent and has admitted that her relationship with her family in Kudus has been strained.

Holistic Diagnosis

A15.0 Respiratory tuberculosis, bacteriologically and histologically confirmed
I10 Essential (primary) hypertension
E11.8 Type 2 diabetes mellitus with unspecified complications
A53.0 Latent syphilis, unspecified early or late

Personal Aspect

The patient was referred from Respira Hospital to continue tuberculosis treatment at the Sanden Health Center. However, due to transportation limitations, the patient was unable to visit the Health Center, prompting a home visit by Health Center staff. The patient expresses hope for recovery and demonstrates an acceptance of the illness. The patient is aware of and concerned about her condition, and is willing to seek treatment at the Health Center.

Internal Risk Aspect

The patient's long-standing habits of smoking and alcohol consumption have had a significant impact on her current health condition. Prior to her illness, the patient worked as a sex worker, which involved frequently changing partners.

External Risk Aspect

The behavior of individuals within the household does not foster the patient's recovery. Moreover, the unhealthy living conditions of the home contribute to the risk of disease transmission. The patient's limited education has restricted her understanding of the risks associated with her behaviors. Additionally, the household's low income hampers the ability to meet essential needs such as clothing, food, and shelter, which are crucial for supporting recovery.

Functional Aspect

The patient has begun to reduce her work activities, which she previously engaged in before falling ill, but is still able to perform daily household tasks.

Treatment

The treatment provided includes counseling on medication adherence, education regarding the patient's condition, and guidance on disease recognition, prevention, and intervention. The intervention approach is structured into three components: patient-centered care, family-focused support, and community-oriented approaches.

Non-pharmacological Management

Educate the patient about TB, including its causes, transmission, and prevention. Emphasize the importance of wearing a mask, proper coughing etiquette, and maintaining good ventilation at home. Encourage consistent medication adherence, explain possible side effects, and promote a healthy lifestyle with a balanced diet. Advise regular sputum tests after two and six months to monitor treatment progress.

Pharmacological Management

The first-line anti-tuberculosis regimen is given as Fixed Dose Combination (FDC). The intensive phase uses FDC RHZE (150 mg Rifampicin, 75 mg Isoniazid, 400 mg Pyrazinamide, 275 mg Ethambutol), five tablets once daily for 2 months. The continuation phase uses FDC RH (150 mg Rifampicin, 75 mg Isoniazid), five tablets once daily for 4 months. For an 80 kg patient, four FDC tablets are prescribed. Diabetes is treated with metformin 500 mg once daily, and hypertension with amlodipine 5 mg once daily.

Family and Community Education

Education and motivation should be provided regarding the importance of support from household members in promoting the patient's recovery.[11] Additionally, education should be given on the necessity of early tuberculosis detection among household members who have been in close contact with the patient.

Community-based active case-finding for TB might be effective in changing tuberculosis epidemiology and thereby improving population health.[12] Education should be provided on the prevention and transmission of the disease, as well as the importance of support from the surrounding community in relation to the condition experienced by Mrs. S. so that it does not become a frightening stigma in society.

DISCUSSION

The patient's diagnosis was established based on anamnesis, physical examination, and supporting diagnostic tests. Clinically, the patient exhibited symptoms consistent with tuberculosis (TB), including a persistent cough lasting approximately two months, generalized weakness, weight loss, and decreased appetite. The results of the TCM (Tuberculosis Culture Method) examination were positive, leading to a diagnosis of bacteriologically confirmed TB. Additionally, the patient has employment history as a sex worker and resides in a region with a high HIV prevalence. Consequently, contact tracing was conducted approximately seven months ago, revealing a positive syphilis test result and a negative HIV test result. Despite the positive

syphilis test, the patient did not present with any symptoms or physical examination findings indicative of syphilis.

Since the detection of a positive syphilis test result, Mrs. S has not yet received any treatment. However, as Sanden Health Center lacks the necessary diagnostic equipment, the patient will be referred to Banguntapan I Health Center for further testing. Additionally, as part of the Health Center's program, peer assistance will be provided as a third-party support system to offer guidance and counseling to Mrs. S regarding her sexually transmitted infection (STI). In primary, secondary, or early latent syphilis, the patient is treated with a single dose of intramuscular benzathine penicillin G with doses of 2.4 million IU IM. As an alternative, the patient could be prescribed Ceftriaxone 1-2 grams for 10 days IM/IV.[13] The Health Center has planned to conduct a Venereal Disease Research Laboratory (VDRL) examination to determine the appropriate administration of Benzathine Penicillin G therapy.

A home visit was conducted to Mrs. S's residence in the Samas Beach area. She lives with two people, including her youngest child, aged 10 years, and her life partner, who is approximately 60–70 years old. The household's primary source of income is derived from her life partner, who works as a scrap dealer, while Mrs. S contributes a small supplementary income. Mrs. S's socioeconomic status is relatively low, as reflected in her modest living conditions, including basic clothing, food, and shelter. However, to ensure access to healthcare, she is enrolled in the BPJS PBI (Indonesia's National Health Insurance for underprivileged individuals) and actively utilizes this coverage for medical treatment.

A home visit was conducted to Mrs. S's residence in Samas Beach area. The patient resides with two individuals. They are her youngest child, who is 10 years old, and her life partner, who is approximately 60–70 years old. The household's primary source of income is derived from her life partner, who works as a scrap dealer, while Mrs. S contributes only a minimal supplementary income. The patient's socioeconomic status is relatively low, as evidenced by modest living conditions, including clothing, food, and shelter. However, to facilitate access to medical treatment, Mrs. S is enrolled in the BPJS PBI (Indonesian National Health Insurance for underprivileged individuals) and actively utilizes this coverage for her healthcare needs.

Mrs. S has a history of high-risk behaviors, including multiple sexual partners, alcohol consumption, and smoking, all of which have had a significant impact on her health. However, since being diagnosed with tuberculosis (TB), she has reported ceasing these behaviors and has expressed a willingness to undergo treatment for her condition. Her current actions indicate a level of adherence and awareness regarding the importance of medical treatment. This is particularly

noteworthy given that, within her community, many individuals who receive positive diagnostic results choose not to pursue treatment. The surrounding environment and social influences play a role in shaping lifestyle choices and overall health consciousness within communities. Addressing this widespread issue requires a multi-faceted approach that emphasizes public health education, improves accessibility to healthcare resources, and fosters supportive environments that encourage healthier behaviors.[14]

The limited support for Mrs. S's recovery highlights the necessity of providing education on the impact of certain behaviors, such as smoking, which can exacerbate her condition. Additionally, the household environment presents concerns, as it has inadequate ventilation, insufficient lighting, and a lack of separate living space for the patient. Humidity of the house has a significant relationship with the incidence of pulmonary TB. Residential houses with inadequate housing density have a negative impact on their occupants, the denser the number of people in one room, the higher the humidity caused by human sweat and when humans breathe, they release water vapor.[15]

The factors mentioned above are significantly influenced by Mrs. S's educational background, as she only completed elementary school. A lower level of education may contribute to limited awareness of the risks associated with her past behaviors and a reduced understanding of her illness. Furthermore, stigma surrounding tuberculosis (TB) remains prevalent within the community, and public knowledge about the disease is still limited. The presence of TB disease is often believed to be an event of which one should be ashamed of. Stigmatization of TB patients is found more frequent in rural areas than in urban areas.[16] Mrs. S perceives her diagnosis as a burden she must accept, yet she remains determined to recover. She views TB as a serious illness and fears becoming the subject of gossip within her community, as well as being avoided by others due to concerns about transmission. In response to these challenges, we provided educational outreach on TB to several local residents to enhance awareness and reduce stigma.

Another disease suffered by the patient is diabetes so that more frequent monitoring of blood glucose levels is important, especially when starting tuberculosis (TB) treatment. This is because TB treatment, especially anti-tuberculosis drugs (OAT) such as Isoniazid (INH), can cause changes in blood glucose levels, both in patients who already have diabetes and those who do not. It should also be remembered that rifampicin can reduce the effectiveness of many oral hypoglycemic agents, potentially requiring adjustments in dosage or a switch to insulin therapy. Diabetes mellitus has been shown to adversely affect tuberculosis outcomes, contributing to higher rates of disease recurrence and longer treatment duration, even among patients undergoing DOTS therapy. Specifically, type 2 DM plays a significant role in prolonging TB treatment and increasing the

likelihood of TB reactivation.[17] Nutritional support must also be tailored to meet the dual needs of TB recovery and blood sugar regulation, ensuring adequate caloric and micronutrient intake without compromising glucose levels. Providing nutritional supplementation to patients with active tuberculosis (TB) who are undergoing anti-tubercular drug therapy (ATT) has proven beneficial in enhancing clinical outcomes. Essential micronutrients like zinc, vitamins A, D, E, and C, as well as iron, play a crucial role in strengthening the immune response of individuals affected by TB. Additionally, extended and more intensive follow up is crucial to monitor treatment response, detect potential relapses early, and manage complications arising from either condition.[18]

Apart from that, the patient also suffered from hypertension. In patients with both tuberculosis and hypertension, comprehensive care is necessary to manage potential interactions and complications. Blood pressure should be regularly monitored, as stress from illness and changes in nutrition during TB treatment can affect blood pressure control. Additionally, certain anti-TB medications may interact with antihypertensive drugs, particularly rifampicin, can interact with antihypertensive medications, potentially reducing their effectiveness. Rifampicin is a potent inducer of the liver enzyme CYP450, which metabolizes and excretes many antihypertensive drugs.[19] This can lead to lower blood levels of these drugs, potentially causing blood pressure to rise or become difficult to control. A holistic management approach is essential, incorporating lifestyle guidance such as dietary modifications, reduced salt intake, and stress management techniques to support both TB recovery and cardiovascular health.[20]

The patient is currently receiving outpatient treatment at the Sanden Health Center. Due to difficulties in direct access to the Health Center, the community health worker, called *Ibu Kader*, in the area will collect the prescribed medications on behalf of the patient.

CONCLUSION

Tuberculosis (TB) remains a major public health issue in Indonesia, driven by factors such as smoking, alcohol consumption, weakened immunity, poor nutrition, and environmental conditions. Mrs. S, a newly diagnosed case of bacteriologically confirmed pulmonary TB, also has diabetes, a significant risk factor for TB. The management of her condition follows the guidelines set by the World Health Organization (WHO) and the Indonesian Ministry of Health. The application of the family medicine approach in her case has been particularly effective, as it extends beyond pharmacological treatment to involve her family and social environment. This holistic strategy fosters a deeper understanding of the disease and addresses both medical and

psychosocial aspects of care, ultimately aiming to improve her recovery outcomes while reducing the psychological and social burdens associated with TB.

REFERENCES

1. WHO. Global tubercolosis report 2018 [Internet]. Vol. 63, World Health Organization. 2018. 476 p. Available from: https://apps.who.int/iris/handle/10665/274453
2. Cantres-Fonseca, O. J., Rodriguez-Cintron, W., Olmo-Arroyo, F. D. & BaezCorujo, S., 2019. Extra Pulmonary Tuberculosis: An Overview. In: Role of Microbes in Human Health and Diseases. s.l.:IntechOpen, pp. 1-16.
3. Aja N, Ramli R, Rahman H. Penularan Tuberkulosis Paru dalam Anggota Keluarga di Wilayah Kerja Puskesmas Siko Kota Ternate. J Kedokt dan Kesehat. ;18(1):78. Published online 2022.
4. Kementrian Kesehatan Republik Indonesia. Pedoman Nasional Pelayanan Kedokteran Tata Laksana Tuberkulosis. Duke Law J. 2019;1(1):1–139.
5. Kementrian Kesehatan Republik Indonesia. Dashboard data Kondisi TBC di Indonesia. 2024. Available from: https://tbindonesia.or.id/pustaka-tbc/dashboard/
6. Kementrian Kesehatan Republik Indonesia. Penyelenggaraan 5th Indonesia Tuberkulosis International Research Meeting (INA – TIME) di Yogyakarta. 2022.
7. Kemenkes Republik Indonesia. Strategi Nasional Penanggulangan Tuberkulosis 2020-2024. 2020.
8. World Health Organization. The Dual Epidemic of TB and Diabetes. 2016. Available online: https://www.who.int/tb/publications/diabetes_tb.pdf
9. Rabbani, N. Z., Susilowati, O., Yuniasih, D., Fitriana, F., Laariya, T. A., Suyatmi, S., & Rahmawati, N. F. Prevalensi Kejadian TB Paru di Wilayah Kerja Puskesmas Sanden Tahun 2020-2022: Relationship of Parenting Pattern And Parental Attitude With Acute Respiratory Infections In Children Under 5 Years. Ahmad Dahlan Medical Journal, 4(1), 78-85. Published online 2023.
10. Rabahi MF, Silva Júnior JLRD, Ferreira ACG, Tannus-Silva DGS, Conde MB. Tuberculosis treatment. J Bras Pneumol. 2017 Nov-Dec;43(6):472-486. doi: 10.1590/S1806-37562016000000388. Erratum in: J Bras Pneumol. 2018 Jul-Sep;44(4):340. doi: 10.1590/S1806-37562016000000388errata. PMID: 29340497; PMCID: PMC5792048.
11. Saidi SS, Abdul Manaf R. Effectiveness of family support health education intervention to improve health-related quality of life among pulmonary tuberculosis patients in Melaka, Malaysia. BMC Pulm Med. 2023 Apr 25;23(1):139. doi: 10.1186/s12890-023-02440-5. PMID: 37098515; PMCID: PMC10131462.
12. Burke, Rachael M., et al. Community-based active case-finding interventions for tuberculosis: a systematic review. The Lancet Public Health, 2021, 6.5: e283-e299.
13. Athiyah Amatillah, D., Hidayati, A. N., Alinda, M. D., Reza, N. R., Widia, Y., Nurasifah, D., ... & Rahmadhani, S. D. Secondary syphilis with tuberculosis co-infection: A rare case. Published online 2024
14. Mercadal, T. M. Theories of Health Behavior. 2021. Available on : https://www.ebsco.com/research-starters/consumer-health/theories-health-behavior. Cited 2025 May 7.
15. Faradillah, S., Thohari, I., & Darjati, D. Kondisi Fisik Rumah, Perilaku Keluarga dan Kejadian TB Paru di Wilayah Kerja Puskesmas Bangkalan. *Jurnal Penelitian Kesehatan" SUARA FORIKES"(Journal of Health Research" Forikes Voice")*, *13*(3), 856-860. Published online 2022.
16. Craciun, O. M., Torres, M. D. R., Llanes, A. B., & Romay-Barja, M. Tuberculosis Knowledge, Attitudes, and Practice in Middle-and Low-Income Countries: A Systematic Review. *Journal of tropical Medicine*, *2023*(1), 1014666. Published online 2023.
17. KHATTAK, Mahnoor, et al. Tuberculosis (TB) treatment challenges in TB-diabetes comorbid patients: a systematic review and meta-analysis. Annals of medicine, 2024, 56.1: 2313683.
18. Girishbhai Patel D, Baral T, Jacob Kurian S, Malakapogu P, Saravu K, Sekhar Miraj S. Nutritional status in patients with tuberculosis and diabetes mellitus: A comparative observational study. J Clin Tuberc Other Mycobact Dis. 2024 Mar 12;35:100428. doi: 10.1016/j.jctube.2024.100428. PMID: 38549700; PMCID: PMC10973140.

19. Nugroho, Muhammad Nurhazim; ERI, Rifqi Rizkani. 81. The Intersection of Tuberculosis Treatment and Blood Pressure Control: Insights from Primary Healthcare-A Case Report. Journal of Hypertension, 2024, 42.Suppl 2: e21.
20. Charchar FJ, et al. Lifestyle management of hypertension: International Society of Hypertension position paper endorsed by the World Hypertension League and European Society of Hypertension. J Hypertens. 2024 Jan 1;42(1):23-49. doi: 10.1097/HJH.0000000000003563. Epub 2023 Sep 12. PMID: 37712135; PMCID: PMC10713007. 14];50(1):262–8. Available from: https://www.ncbi.nlm.nih.gov/pmc