

Paper Een

by Dwi Wahyu Indriati

Submission date: 10-Aug-2023 02:46PM (UTC+0800)

Submission ID: 2143857770

File name: 2020011612194635_MJMHS_0388.pdf (198.41K)

Word count: 3648

Character count: 18654

ORIGINAL ARTICLE

The Prevalence of Diabetes Mellitus among Hospitalized Tuberculosis Positive Case Admitted in Hajj Hospital, Surabaya, Indonesia

Een Ika Syah Putri¹, Dwi Wahyu Indriati¹, Manik Retno Wahyunitisari²

¹ Division of Medical Technology, Department of Health, Faculty of Vocational Studies, Universitas Airlangga, Surabaya 60286, East Java, Indonesia

² Department of Medicine Microbiology, Faculty of Medicine, Universitas Airlangga, Surabaya 60132, East Java, Indonesia

ABSTRACT

Introduction: Tuberculosis (TB) is the cause of significant health and death problems worldwide. Indonesia is known as the second highest country with TB burden in the world after India. The incident of TB is further increasing in diabetes mellitus patients. Diabetes mellitus disrupts the body's immune function; thus, patients are more susceptible to infection, including TB. The purpose of this study was to determine the prevalence of diabetes mellitus history (DM) among newly diagnosed TB patients in Surabaya. **Methods:** 160 patients were grouped into two groups; the first group (67 patients) was positive for TB and diabetes mellitus, and the second group (93 patients) was positive for TB only. Data were collected from TB patients based on acid-fast bacilli stain (AFB) and positive Xpert MTB/RIF. Blood glucose level was collected from 2hrPPG, and glycated hemoglobin (HbA1c). **Results:** The prevalence of TB related with DM history was 42% from 55 ± 9.52 years old. Patients with TB-DM showed poor glucose blood level, their 2hrPPG was 301.43 ± 126.80 mg/dl, and the HbA1c result (> 6.5%) was 82%. The rifampicin resistant level result was not significantly different between TB and TB-DM (4.4% and 3% respectively). **Conclusions:** Our results highlight the incidence of DM history in TB positive patient that was hospitalized in Hajj Hospital. Therefore, it is important to monitor the prevalence of DM in TB newly diagnosed cases to assist practitioner to choose better treatment while considering the risk of DM interference.

Keywords: Tuberculosis, DM, rifampicin sensitive

Corresponding Author:

Dwi Wahyu Indriati, PhD

Email: dwiwahyu.indriati@vokasi.unair.ac.id

Tel: + 62315033869

INTRODUCTION

Tuberculosis has remained a cause of global health problem. Tuberculosis is caused by *Mycobacterium tuberculosis*. This bacterium is known as a slow-growing bacterium, which is also known as a single infectious agent that can be included as one of the ten highest causes of death in the world. In 2017, it was estimated around 10 million patients infected with TB and 1.6 million patients have died (1). Indonesia has ranked second in the highest burden of TB, and TB cases in Indonesia have never reduced since many cases were undetected. Based on data by the Ministry of Health in 2017, 360.700 cases were found to be TB positive, and among them, 168.412 cases were acid-fast bacilli smear-positive (2). At the same time, Indonesia also has a high burden for diabetes. According to Ministry of Health, diabetes prevalence in adult (2013) is

around 6.9%. These numbers reduce to 6.3% in 2017. Indonesia has been ranked in the seventh position for diabetes prevalence in the world (3). The bidirectional association between TB and DM is one of the significant concerns worldwide with the correlation between diabetes and tuberculosis which is increasingly being recognized and managed (4).

Diabetes mellitus (DM) is categorized as a metabolic disease which is caused by abnormalities in insulin secretion, insulin action or both; thus, it will lead to high blood glucose levels (hyperglycemia). Patient with diabetes showed impaired innate immune system caused by the high level of blood glucose (5). Diabetes can disrupt the activation and function of macrophages, monocytes, lymphocytes, pulmonary microangiopathy, renal dysfunction and vitamin deficiency. Patient with poor control of hyperglycemia is more susceptible to TB infection compared to a patient with good control of hyperglycemia (6). Prevalence of TB was increased threefold in people with diabetes (7). Thus, it is necessary to monitor the prevalence of TB infection in DM patients in Surabaya.

The objective of the present study is to describe the prevalence of DM history in patients with TB positive cases. These data are necessary to raise awareness in an attempt to reduce the susceptibility of TB from DM patient and reduce the mortality rate caused by these dual epidemics. Tuberculosis infection among diabetes mellitus patients in Indonesia is still interested since now Indonesia has faced a double threat not only from TB but also from DM.

MATERIALS AND METHODS

A cross sectional study was conducted at General Hospital Hajj, Surabaya between January to December 2017. All patients were TB positive. Inclusion criteria were set; patients with all gender and all age, positive TB which were confirmed by sputum smears positive for Acid Fast Bacteria (AFB), or were confirmed by rapid diagnostic tests such as Xpert MTB/RIF only or sputum smears positive for AFB and positive with a rapid diagnostic test such as Xpert MTB/RIF. All patients were verified with DM history. Diabetes positive was confirmed with a random blood sugar of greater than 200mg/dl, fasting plasma glucose higher than 126 mg/dl and glycated hemoglobin (HbA1c) of greater than 6.5% before taking anti-tuberculosis therapy. All data were statistically analyzed (descriptive and analytical statistics) using Microsoft Excel for Mac version 16.25. Correlation analysis were performed using Chi-Square Test and difference among samples were analyzed with t-test.

RESULTS

Sputum Smear and Xpert MTB/RIF Combination Method Result in Higher Detection of Patient with Positive Tuberculosis

Among 160 patients, combinations method by using sputum smear and Xpert MTB/RIF yield a higher result in detecting tuberculosis positive (Table I). However, our statistical analysis failed to detect any significant difference among those three methods in detecting TB positive regarding patients' gender. Though it was noticed that there was male predominance in TB and TB-DM infection (86 male patients and 74 female patients), but this was not significant between female and male patients ($\chi^2 = 1, p = 0.75$, Table I).

The prevalence of DM among patient with TB positive

From 160 patients with TB positive cases, it was found later from medical record that 67 patients (42%) were known to have been diagnosed with DM. Meanwhile, 93 patients (58%) did not have DM history. Table I shows that smear sputum result showed positive results in 47 patients (45.6%) with DM and other 56 patients (54.4%) without DM. Smear sputum result showed that both TB and TB-DM patients were predominantly positive 1 according to International Union Against Tuberculosis and Lung Disease (IUATLD) scale (Figure 1). From Xpert

Table I: Distribution of TB positive cases as regards different methods of identification

	Sputum Smear	Xpert MTB/RIF	Sputum Smear & Xpert MTB/RIF	Total	Chi Square	p-value
Gender					0.7	0.70
Female	13 (8.1)	23 (14.4)	38 (23.8)	74 (46.25)		
Male	11 (6.9)	28 (17.5)	47 (29.4)	86 (53.75)		
Total	24	51	85	160		

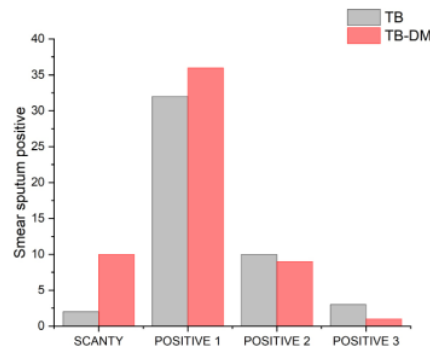


Figure 1: Distribtuion of smear sputum result based on IUATLD scale. TB and TB-DM patient were categorized as positive one was found significantly higher as compared to other scales. Scanty means 1 to 9 AFB in 100 fields; Positive 1 means 10 to 99 AFB in 100 fields; Positive 2 means 1 to 10 AFB per field in at least 50 fields; Positive 3 means > 10 AFB per field in at least 20 fields.

MTB/RIF result (Xpert MTB/RIF only or Xpert MTB/RIF and smear sputum) showed that 53 patients (39%) with DM and other 83 patients (61%) without DM showed a positive result for TB.

We want to check whether prevalence of DM history in TB positive cases were affected by different in gender, ages or rifampicin resistance. Our results showed gender did not contribute in the prevalence of DM history in TB positive cases ($\chi^2 (1,160) = 1$ with $p = 0.75$). Meanwhile, different in ages showed a correlation with the prevalence of TB-DM ($\chi^2 (2, 157) = 26.60$; $p < 0.001$, Table II). Mean age of TB and TB-DM patients was significantly different ($p < 0.05$) Figure 2) since patient age variance among TB was greater compared to those data from TB-DM patients.

DM patient has poor diabetes control

Diabetes mellitus patients were presented with 2-hour post-prandial blood glucose (2hrPPG) control of glucose blood level ≥ 200 mg/dL dan HbA1C $> 6.5\%$ (8,9). Post prandial blood glucose (2hrPPG) in TB-DM patients was 301.43 ± 126.80 mg/dl (N=54). Among 54 TB patients, 83.3% of the patients (N=45) were categorized as patients with poor glycemic control (2hrPPG ≥ 200 mg/dL). Meanwhile, 7.04% of the patients (N=4) were categorized as impaired or poor glucose tolerance (2hrPPG from 140 to < 200 mg/dL) and 9.3% of the

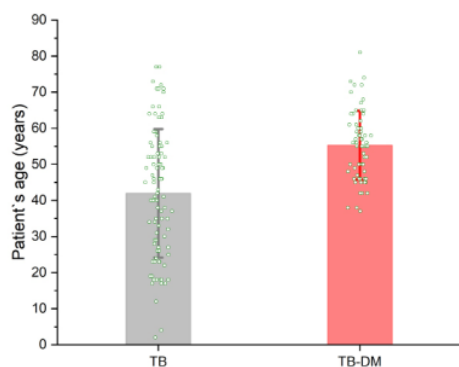


Figure 2: . Distribution of TB and TB-DM as regards of patient age. Scatter plot showed all data. The bars showed mean for each group meanwhile the error bar represent +/- standard deviation

Table II: Distribution of TB and TB-DM cases as regards patient gender, age and Xpert MTB/RIF

	TB (%)	TB-DM (%)	Total (%)	Chi Square	#p
Gender				0.11	0.75
Female	42 (56.8)	32 (43.2)	74 (100)		
Male	51 (59.3)	35 (40.7)	86 (100)		
Total	93 (58.1)	67 (41.9)	160 (100)		
Age				26.60	1.66E-06
< 40 years	38 (24.2)	3 (1.9)	41 (26.1)		
40-60	40 (25.5)	45 (28.7)	85 (54.1)		
>60	14 (8.9)	17 (10.8)	31 (19.7)		
Total	92 (58.6)	65(41.4)	157 (100)		
Xpert MTB/RIF				0.005	0.95
MTB/RIF SENSITIVE	77 (56.6)	49 (36)	126		
MTB/RIF RESISTANCE	6 (4.4)	4 (3)	10 (7.4)		
Total	83 (61)	53 (39)	136 (100)		

*2 patients age was unknown The data showed number of cases (%)

patients were normal. According to HbA1C level, 86.7% of the patients showed poor glycemic control (N=13) with HbA1C >6.5% bad control of glucose blood level.

Rifampicin resistance among TB and TB-DM patients

Rifampicin resistance/sensitive test showed that among 136 patients who were diagnosed with Xpert MTB/RIF method, 10 patients (7.4%) showed resistance to rifampicin. Group of TB-DM patient and TB patient showed 3% and 4.4% resistance to rifampicin respectively. The pattern of rifampicin resistance does not have any correlation with the prevalence of TB-DM since the number of rifampicin sensitivity in both cases (TB and TB-DM) were high ($\chi^2(1,136) = 0.005, p > 0.05$, Table II).

DISCUSSION

The prevalence of DM in TB positive case is high considering the previous studies showed that the prevalence of DM among TB patients was 13.2% (14) and 14.8% (12). These discrepancies are probably due to the different sample size from the previous studies (400-600 patients while our samples 160 patients).

The comparison between gender showed that there was no correlation between the difference in gender and the prevalence of TB-DM although it is often observed that the rate of TB infection is high in men compared to women. It is believed that male dominance in TB infection is caused by the underdiagnosis of TB cases in women (12). One may suggest that female exhibits more-robust immune response to antigenic challenges than man (13). Thus, it is convinced that those rules are also accounted for TB infection.

In age comparison, we showed that TB-DM was more frequently found in 40-60 years range. Similar results also showed TB-DM patients mean age was 53 years vs TB patient was 44 years (14). These results were often seen as DM type 2 is more prevalent in older age.

The previous study by Alisjhabana et al. in 2007 stated that DM was associated with more symptoms but not with the increased severity of TB. Our recent study did not address this issue. However, our study wants to show that DM patients with poor control of their diabetes can be infected with TB. Other studies showed that DM patients had three times chance of developing TB compared to the non-DM population (15-17). Although TB is believed to be strongly associated with immune deficiency disease such as HIV, but the number of people infected with DM is much higher than that of immunocompromised states which make it prominent factor associated with TB at the population level (18). In Asian countries in which TB and DM have coexisted as a dual burden, these dual diseases can exist probably as a result of external (poor glycemic control) and internal factors (specific mechanisms of insulin resistance, genetic susceptibility to DM (19).

Our 2 hrPPG level and HbA1C level results showed similarities with other results ³ from Diabcare-Asia project which conducted the cross-sectional survey from 24,317 patients from Bangladesh, China, India, Indonesia, Malaysia, Philippines, Singapore, South Korea, Sri Lanka, Taiwan, Thailand and Vietnam. The study found that, among diabetic patients, 55% of them had HbA1C level exceeding 8% (20). Persistent hyperglycemia in DM patients can alter the immune response to *Mycobacterium tuberculosis* (Mtb). This alteration was associated with changes in the innate and cellular cytokine response to Mtb (21). Thus, DM patients have a reasonable reason in increasing their

risk to TB infection. But from our present data, we need to elaborate a greater number of patients with TB and patients with TB-DM in order to give a good clinical picture of DM relation with TB infection in Surabaya.

Other concerns arise from multiple drug resistance-tuberculosis (MDR-TB) cases to rifampicin. Rifampicin resistant TB (RR-TB) can be defined as resistance to rifampicin with or without resistance to other first-line anti TB drugs using genotypic or phenotypic methods. Multidrug resistance TB (MDR-TB) can be caused by Mycobacterium tuberculosis that is resistant to isoniazid (H) and rifampicin (R) with or without resistance to other drugs. MDR-TB is treatable but costly and it requires long time treatment with potential toxic drug (22). The data from WHO estimates that 3.5% of all new TB cases had MDR-TB or rifampicin-resistant TB (23). Our result also showed similar trend with this report. Several studies also showed patients with DM and patients that recently were diagnosed positive for TB had an increased risk of MDR-TB cases (24-26).

Most cases of MDR-TB are emerged from a mixture of physician error, inadequate and incomplete treatment and patient non-compliance during the treatment of susceptible Tb (27-28). Meanwhile, the correlation between increasing number of MDR strains of Mtb in a TB-DM patients can be explained by the association of poor glucose control and dysfunction of phagocytosis, reactive oxygen species (ROS) production, chemotaxis and T-cell reaction in DM patients (29). The other reasons seem caused by less virulent MDR strain of Mtb which is more likely to flourish in an immunocompromised patient with DM (30-31).

Our results suggest that the initial screening for the newly diagnosed patients with TB for its correlation with DM history is important. Our plan will include more patients from another hospital in Surabaya to get a better understanding of the real correlation between DM and TB positive cases in Surabaya. Thus, that information will be useful in choosing TB treatment while considering the risk of DM interference in TB therapy. Patients with DM were also encouraged to control their diabetic level to avoid another infection such as TB.

CONCLUSION

This study showed 42% of the prevalence of Diabetes Mellitus history in recently diagnosed TB patients in Surabaya. Indonesia is widely recognized to have the dual epidemic burden; TB and DM. Therefore, a concerted effort is needed to monitor the prevalence of this dual epidemic for a better outcome.

ACKNOWLEDGMENTS

We thank our colleagues from Hajj General Hospital Surabaya, Indonesia, for providing us with precious patients' data. This work is also supported by research

grant (Penelitian Dosen Pemula) from Universitas Airlangga, Surabaya, Indonesia.

REFERENCES

1. Organization WH. Global Tuberculosis Report [Internet]. Geneva; 2018. Available from: http://www.who.int/tb/publications/global_report/en/.
2. RI KK. Data dan Informasi Profil Kesehatan Indonesia 2017. Jakarta; 2017.
3. Federation ID. IDF Diabetes Atlas [Internet]. Brussels, Belgium; 2017. Available from: <https://diabetesatlas.org/resources/2017-atlas.html>
4. Niazi, A. K KS. Diabetes and tuberculosis: a review of the role of optimal glycemic control. *J Diabetes Metab Disord.* 2012;11(28).
5. Peleg AY, Weerathna T, McCarthy JS, Davis TME. Common infections in diabetes: pathogenesis, management and relationship to glycaemic control. *Diabetes Metab Res Rev.* 2007 Jan;23(1):3–13.
6. Harries, A. D., Satyanarayana S. KAM. et al. Epidemiology and Interaction of Diabetes Mellitus and Tuberculosis and Challenges for Care : A Review. *Public Heal Action.* 2013;3(Suppl 1):S3–9.
7. Jeon CY MM. Diabetes mellitus increases the risk of active tuberculosis : a systematic review of 13 observational studies. *PLoS Med.* 2008;5(7):1091–101.
8. Mayfield J. Diagnosis and Classification of Diabetes Mellitus: New Criteria. *Am Fam Physician.* 1998;58(6):1355–62.
9. Organization WH. Use of glycated haemoglobin (HbA1c) in the diagnosis of diabetes mellitus. *Diabetes Res Clin Pract [Internet].* 2011;93(3):299–309. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S0168822711001318>
10. Alisjahbana B, van Crevel R, Sahiratmadja E, den Heijer M, Maya A, Istriana E, et al. Diabetes mellitus is strongly associated with tuberculosis in Indonesia. *Int J Tuberc Lung Dis.* 2006 Jun;10(6):696–700.
11. Alisjahbana B, Sahiratmadja E, Nelwan EJ, Purwa AM, Ahmad Y, Ottenhoff THM, et al. The effect of type 2 diabetes mellitus on the presentation and treatment response of pulmonary tuberculosis. *Clin Infect Dis.* 2007 Aug;45(4):428–35.
12. Nhamoyebonde S, Leslie A. Biological differences between the sexes and susceptibility to tuberculosis. *J Infect Dis.* 2014 Jul;209 Suppl:S100-6.
13. Fish EN. The X-files in immunity: sex-based differences predispose immune responses. *Nat Rev Immunol.* 2008 Sep;8(9):737–44.
14. Nissapatorn V, Kuppusamy I, Jamaiah I, Fong MY, Rohela M, Anuar AK. Tuberculosis in diabetic patients: a clinical perspective. *Southeast Asian J Trop Med Public Health.* 2005;36 Suppl 4:213–20.

15. Ruslami R, Aarnoutse RE, Alisjahbana B, van der Ven AJAM, van Crevel R. Implications of the global increase of diabetes for tuberculosis control and patient care. *Trop Med Int Health*. 2010 Nov;15(11):1289–99.
16. Pablos-Miñdez A, Blustein J, Knirsch CA. The role of diabetes mellitus in the higher prevalence of tuberculosis among Hispanics. *Am J Public Health [Internet]*. 1997 Apr;87(4):574–9. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/9146434>
17. Stevenson CR, Forouhi NG, Roglic G, Williams BG, Lauer JA, Dye C, et al. Diabetes and tuberculosis: the impact of the diabetes epidemic on tuberculosis incidence. *BMC Public Health*. 2007 Sep;7:234.
18. Restrepo BI. Convergence of the tuberculosis and diabetes epidemics: renewal of old acquaintances. *Clin Infect Dis [Internet]*. 2007/07/05. 2007 Aug 15;45(4):436–8. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/17638190>
19. Zheng C, Hu M, Gao F. Diabetes and pulmonary tuberculosis: a global overview with special focus on the situation in Asian countries with high TB-DM burden. *Glob Health Action*. 2017;10(1):1–11.
20. Chuang LM, Tsai ST, Huang BY, Tai TY. The status of diabetes control in Asia--a cross-sectional survey of 24 317 patients with diabetes mellitus in 1998. *Diabet Med*. 2002 Dec;19(12):978–85.
21. Restrepo BI, Fisher-Hoch SP, Pino PA, Salinas A, Rahbar MH, Mora F, et al. Tuberculosis in poorly controlled type 2 diabetes: altered cytokine expression in peripheral white blood cells. *Clin Infect Dis [Internet]*. 2008 Sep 1;47(5):634–41. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/18652554>
22. Prasad R, Gupta N, Banka A. Multidrug-resistant tuberculosis/rifampicin-resistant tuberculosis: Principles of management. *Lung India*. 2018;35(1):78–81.
23. Organization WH. Global Tuberculosis Report 2018. 2018.
24. Baghaei P, Tabarsi P, Javanmard P, Farnia P. Journal of Global Antimicrobial Resistance Impact of diabetes mellitus on tuberculosis drug resistance in new cases of tuberculosis. 2016;4:1–4.
25. Chang J-T, Dou H-Y, Yen C-L, Wu Y-H, Huang R-M, Lin H-J, et al. Effect of type 2 diabetes mellitus on the clinical severity and treatment outcome in patients with pulmonary tuberculosis: a potential role in the emergence of multidrug-resistance. *J Formos Med Assoc*. 2011 Jun;110(6):372–81.
26. Singla R, Khan N, Al-Sharif N, Ai-Sayegh MO, Shaikh MA, Osman MM. Influence of diabetes on manifestations and treatment outcome of pulmonary TB patients. *Int J Tuberc Lung Dis*. 2006 Jan;10(1):74–9.
27. Jain A, Dixit P. Multidrug-resistant to extensively drug resistant tuberculosis: what is next? *J Biosci*. 2008 Nov;33(4):605–16.
28. Nijland HMJ, Ruslami R, Stalenhoef JE, Nelwan EJ, Alisjahbana B, Nelwan RHH, et al. Exposure to rifampicin is strongly reduced in patients with tuberculosis and type 2 diabetes. *Clin Infect Dis*. 2006 Oct;43(7):848–54.
29. Cohen T, Murray M. Modeling epidemics of multidrug-resistant tuberculosis of heterogeneous fitness. *Nat Med*. 2004 Oct;10(10):1117–21.
30. Burgos M, DeRiemer K, Small PM, Hopewell PC, Daley CL. Effect of drug resistance on the generation of secondary cases of tuberculosis. *J Infect Dis*. 2003 Dec;188(12):1878–84.
31. Gagneux S, Burgos M V, DeRiemer K, Encisco A, Mucoz S, Hopewell PC, et al. Impact of bacterial genetics on the transmission of isoniazid-resistant *Mycobacterium tuberculosis*. *PLoS Pathog [Internet]*. 2006/06/16. 2006 Jun;2(6):e61–e61. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/16789833>

Paper Een

ORIGINALITY REPORT

14%

SIMILARITY INDEX

11%

INTERNET SOURCES

13%

PUBLICATIONS

6%

STUDENT PAPERS

PRIMARY SOURCES

- | | | |
|---|---|----|
| 1 | hdl.handle.net
Internet Source | 2% |
| 2 | journals.lww.com
Internet Source | 1% |
| 3 | eprints.lse.ac.uk
Internet Source | 1% |
| 4 | www.cdc.gov
Internet Source | 1% |
| 5 | Roger K. Verbeeck, Gunar Günther, Dan Kibuule, Christian Hunter, Tim W. Rennie. "Optimizing treatment outcome of first-line anti-tuberculosis drugs: the role of therapeutic drug monitoring", European Journal of Clinical Pharmacology, 2016
Publication | 1% |
| 6 | Amanda de Farias Gabriel, Laura Borges Kirschnick, Bruna Barcelos Só, Lauren Frenzel Schuch et al. "Oral and maxillofacial tuberculosis: a systematic review", Oral Diseases, 2022
Publication | 1% |

7	Romain Ragonnet, James M. Trauer, Justin T. Denholm, Ben J. Marais, Emma S. McBryde. "High rates of multidrug-resistant and rifampicin-resistant tuberculosis among re-treatment cases: where do they come from?", BMC Infectious Diseases, 2017 Publication	1 %
8	tbassnindia.org Internet Source	1 %
9	Submitted to Intercollege Student Paper	1 %
10	www.scielo.br Internet Source	1 %
11	Prabhakar Kuruva, Shravika Reddy Kandi, Subhakar Kandi. "Clinico-radiological profile and treatment outcome of pulmonary tuberculosis with and without type 2 diabetes mellitus", Indian Journal of Tuberculosis, 2021 Publication	<1 %
12	Submitted to University of Sheffield Student Paper	<1 %
13	e-epih.org Internet Source	<1 %
14	goums.ac.ir Internet Source	<1 %

15	www.nepjol.info Internet Source	<1 %
16	A. Leegaard, A. Riis, J. B. Kornum, J. B. Prahl, V. O. Thomsen, H. T. Sorensen, C. R. Horsburgh, R. W. Thomsen. "Diabetes, Glycemic Control, and Risk of Tuberculosis: A population-based case-control study", <i>Diabetes Care</i> , 2011 Publication	<1 %
17	e-mfp.org Internet Source	<1 %
18	eurchembull.com Internet Source	<1 %
19	slideheaven.com Internet Source	<1 %
20	www.researchgate.net Internet Source	<1 %
21	www.scienceopen.com Internet Source	<1 %
22	www.studymode.com Internet Source	<1 %
23	Lee, Mei-Yueh, Kun-Der Lin, Wei-Hao Hsu, Hsiu-Ling Chang, Yi-Hsin Yang, Pi-Jung Hsiao, and Shyi-Jang Shin. "Statin, Calcium Channel Blocker and Beta Blocker Therapy May	<1 %

Decrease the Incidence of Tuberculosis Infection in Elderly Taiwanese Patients with Type 2 Diabetes", International Journal of Molecular Sciences, 2015.

Publication

24

escholarship.mcgill.ca

Internet Source

<1 %

25

ijmsph.com

Internet Source

<1 %

26

www.ncbi.nlm.nih.gov

Internet Source

<1 %

27

Theron, G., J. Peter, R. van Zyl-Smit, H. Mishra, E. Streicher, S. Murray, R. Dawson, A. Whitelaw, M. Hoelscher, S. Sharma, M. Pai, R. Warren, and K. Dheda. "Evaluation of the Xpert MTB/RIF Assay for the Diagnosis of Pulmonary Tuberculosis in a High HIV Prevalence Setting", American Journal of Respiratory and Critical Care Medicine, 2011.

Publication

<1 %

28

balimedicaljournal.org

Internet Source

<1 %

29

ijisrt.com

Internet Source

<1 %

30

journal.fk.unpad.ac.id

Internet Source

<1 %

31

On behalf of the International Diabetes Federation Western Pacific Region Steering Committee.. "Diabetes care, glycemic control, and complications in children with type 1 diabetes from Asia and the Western Pacific Region", Journal of Diabetes and Its Complications, 200709/10

Publication

<1 %

32

Qianqian Liu, Wenzhang Li, Miao Xue, Yunfeng Chen et al. "Diabetes mellitus and the risk of multidrug resistant tuberculosis: a meta-analysis", Scientific Reports, 2017

Publication

<1 %

Exclude quotes On

Exclude matches < 5 words

Exclude bibliography On

Paper Een

GRADEMARK REPORT

FINAL GRADE

GENERAL COMMENTS

/0

PAGE 1

PAGE 2

PAGE 3

PAGE 4

PAGE 5
