VOL. 41, No. 3, Juli 2021

p-ISSN 0853-7704
e-ISSN 2620-3162

JURNAL RESPIROLOGI INDONESIA

Majalah Resmi Perhimpunan Dokter Paru Indonesia
Official Journal of The Indonesian Society of Respirology

Akreditasi RISTEKDIKTI
Surat Keputusan Menteri Riset dan Teknologi Nomor: 200/M/KPT/2020 Tanggal 23 Desember 2020, Peringkat 2
Website: http://www.jurnalrespirologi.org

JURNAL
RESPIROLOGI INDONESIA

Majalah Resmi Perhimpunan Dokter Paru Indonesia
Official Journal of The Indonesian Society of Respirology

SST : Surat Keputusan Menteri Penerangan RI
No.715/SK/DitjenPPG/SST/1980 Tanggal 9 Mei 1980

Alamat Redaksi
PDPI Jl. Cipinang Bunder, No. 19, Cipinang Pulo Gadung
Jakarta Timur 13240 Telp: 02122474845
Email : editor@jurnalrespirologi.org
Website : http://www.jurnalrespirologi.org

Diterbitkan Oleh
Perhimpunan Dokter Paru Indonesia (PDPI)
Terbit setiap 3 bulan (Januari, April, Juli & Oktober)

Jurnal Respirologi Indonesia
Akreditasi Peringkat 2
Sesuai Keputusan Menteri Riset dan Teknologi/Kepala Badan
Riset dan Inovasi Nasional Republik Indonesia
Nomor: 200/M/KPT/2020 Tanggal 23 Desember 2020

JURNAL
RESPIROLOGI INDONESIA

Majalah Resmi Perhimpunan Dokter Paru Indonesia
Official Journal of The Indonesian Society of Respirology

VOLUME 41, NOMOR 3, Juli 2021

DAFTAR ISI

Artikel Penelitian

Tinjauan Pustaka

Correlation Between Type 2 Diabetes Mellitus and Pulmonary Tuberculosis at Atma Jaya Hospital

Mario Steffanus[1], Anastasia Pratiwi Fodianto[2], Jessica Novia Hadiyanto[2]

[1]Departement of Internal Medicine, Faculty of Medicine and Health Sciences, Universitas Katolik Indonesia Atma Jaya, Jakarta
[2]General Doctor, Faculty of Medicine and Health Sciences, Universitas Katolik Indonesia Atma Jaya, Jakarta

Abstract

Background: *Diabetes Mellitus (DM) is considered one of the factors that increase the risk of pulmonary tuberculosis (TB). Tuberculosis in Indonesia is severe and ranked second in the world after India. Previous studies suggested that DM increased the risk of developing pulmonary TB by 2–5 times. This study was conducted to determine the effect of type 2 DM on the incidence of pulmonary TB at Atma Jaya Hospital.*
Methods: *This was a case-control study conducted at Atma Jaya Hospital from December 2016 to April 2017 using medical records. Data were further processed by pairing gender and age between case and control groups. A total of 121 samples were obtained and tested using McNemar paired correlation non-parametric analysis.*
Results: *The incidence of pulmonary TB was higher in men than women with a ratio of 2.1:1 and within the productive age range of 27–46 years. The percentage of type 2 DM in pulmonary TB cases was 70% (35 samples) compared to 30% (15 samples) without DM with a total of 50 samples in the case group. The percentage of type 2 DM in the control group without pulmonary TB was 46.5% (33 samples) compared to 53.5% (38 samples) without DM with a total of 71 samples in the control group. Based on the statistical analysis, the P=0.013 and the OR (odds ratio) was 2.20.*
Conclusion: *There was a significant correlation between type 2 DM and the incidence of pulmonary TB in Atma Jaya Hospital with the risk of pulmonary TB 2.20 times higher than those without type 2 DM.* ***(J Respirol Indones 2021; 41(3): 170–3)***
Keyword: *type 2 diabetes mellitus; pulmonary tuberculosis*

Pengaruh Diabetes Mellitus Tipe 2 terhadap Kejadian Tuberkulosis Paru di Rumah Sakit Atma Jaya

Abstrak

Latar Belakang: *Diabetes mellitus (DM) merupakan salah satu faktor risiko terjadinya tuberkulosis (TB) paru. Angka kejadian TB paru pada tahun 2019 di Indonesia berada di posisi kedua setelah India. Angka kejadian TB paru di Indonesia berada di posisi keempat setelah India, Cina dan Afrika Selatan. Berdasarkan penelitian yang ada, DM meningkatkan risiko terjadinya TB paru sebesar 2–5 kali. Kondisi DM memberikan dampak manifestasi TB yang lebih buruk. Penelitian ini dilaksanakan dilakukan untuk mengetahui pengaruh DM tipe 2 terhadap kejadian TB paru di RS Atma Jaya.*
Metode: *Penelitian ini menggunakan studi kasus kontrol yang dilakukan di Rumah Sakit Atma Jaya pada Desember 2016 sampai April 2017 menggunakan data rekam medik. Dilakukan* pairing *jenis kelamin dan usia antara kelompok kasus dengan kontrol. Jumlah sampel yang diperoleh121 pasien dan diuji menggunakan uji analisis non parametrik korelasi berpasangan McNemar.*
Hasil: *Tuberkulosis paru lebih sering terjadi pada laki-laki dengan perbandingan 2,1:1 dan pada rentang usia produktif, yaitu 27–46 tahun. Persentase DM tipe 2 pada kasus TB paru didapatkan sebesar 70% (35 sampel) dibandingkan 30% (15 sampel) yang tidak DM dengan total kasus sebanyak 50 sampel. Persentase DM tipe 2 pada kontrol yang tidak menderita TB paru sebesar 46,5% (33 sampel) dibandingkan 53,5% (38 sampel) yang tidak DM dengan total kontrol sebanyak 71. Berdasarkan hasil analisis statistik didapatkan nilai P=0,013 dan OR (*odds *ratio) sebesar 2,20.*
Kesimpulan: *Terdapat hubungan bermakna antara DM tipe 2 dan kejadian TB paru di RS Atma Jaya dengan risiko TB paru 2,20 kali lebih tinggi dibandingkan yang tidak menderita DM tipe 2.* ***(J Respirol Indones 2021; 41(3): 170–3)***
Kata kunci: *diabetes mellitus tipe 2; tuberkulosis paru*

Correspondence: Mario Steffanus
Email: mario.steffanus@atmajaya.ac.id

INTRODUCTION

Tuberculosis (TB) is an infectious disease that affects one-third of the population worldwide. Estimated every year, the death rate due to *Mycobacterium tuberculosis* (MTB) reaches two million people. In 2019, eight countries account for two-thirds of the total cases of TB, with India leading the count, followed by Indonesia, China, Philippines, Pakistan, Nigeria, Bangladesh and South Africa.[1]

Diabetes Mellitus (DM) is one of the risk factors for developing TB. Diabetes Mellitus is a group of metabolic diseases with a characteristic of hyperglycemia.[2] Patients of this chronic disease increased from 108 million people in 1980 to 422 million people in 2014.[3]

In Indonesia, based on Basic Health Research 2018 (Riskesdas 2018), the prevalence of Diabetes Mellitus (DM) among population ≥15-year-olds increased from 6.9% in 2013 to 10.9% in 2018.[4] Subjects with DM were more susceptible to infection than those without DM. This was due to a defect in immunity that resulted in susceptibility to infection.[5] Patients with DM have a higher risk of active TB than those without DM by 3.11 times.[6]

As DM interferes with the patient's immunity, it becomes a risk factor for infections such as TB.[5,7,8] In DM, there is an increase in blood glucose or hyperglycemia which causes the impaired function of neutrophils and monocyte so that chemotactic, phagocytosis and bacterial killing ability are attenuated. This reduced function of monocytes and chemotactic were not improved by insulin administration. Diabetes is associated with decreased cellular immunity, especially cytokine T-helper (Th1), which leads the subject to be more prone to developing TB.[6,8,9]

Several epidemiological studies had explained the correlation between DM and TB. Data from WHO showed that DM escalated the risk of TB infection three times greater than the normal population.[6,10] There is no precise data in Indonesia, therefore, this study aimed to determine the correlation of DM and pulmonary TB, mainly in Atma Jaya Hospital.

METHOD

This study was conducted from December 2016 to April 2017 at Atma Jaya Hospital Jakarta using an analytical design with a case-control approach, retrospectively. A total of 121 study samples were obtained using medical record data. The control group was paired to the case group on age and gender. The inclusion criteria were samples more than or equal to 17 years old with or without pulmonary TB. Exclusion criteria were subjects with malnutrition status, HIV, malignancy, chronic kidney disease, using immunosuppressant drugs, history of alcohol consumption or smoking habits.

Data analysis was carried out univariately looking at the distribution of the essential characteristics of the study and bivariate samples to obtain the importance and magnitude of the correlation between type 2 DM and the incidence of pulmonary TB. The analysis of the meaning and magnitude of the correlation between variables was performed using the McNemar test, while the relationship between risk factors and influence factors was observed through the value of odds ratio (OR). The *P*-value used in this study was 0.05 with a confidence interval (CI) of 95%.

RESULT

Our study obtained 121 medical record data consisting of 50 cases of pulmonary TB and 71 controls without pulmonary TB. Table 1 describes the characteristics of the subjects.

Table 1. Characteristics of the subjects

Characteristic		Pulmonary TB	
		Positive	Negative
Gender	Male	34	45
	Female	16	26
Age	17–26	8	12
	27–36	14	17
	37–46	14	24
	47–56	4	7
	57–66	7	7
	67–76	3	4

In table 2, the statistical analysis of the correlation between type 2 DM and pulmonary TB obtained *P*=0.013. These results showed a significant

correlation between type 2 DM and pulmonary TB among patients at Atma Jaya Hospital. The study results achieved OR of 2.20, which means patients with type 2 DM have 2.2 times higher risk of developing pulmonary TB.

Table 2 Correlation between type 2 DM and pulmonary TB

Characteristic		Pulmonary TB		Total	*P*	OR
		Yes	No			
Type 2 DM	Yes	35	33	68	0,013	2,20
	No	15	38	53		
Total		50	71	121		

DISCUSSION

Out of 50 cases of pulmonary TB, there were 35 people (70%) with a history of type 2 DM. This result was similar to a study from Balakrishnan in India which stated that among 552 pulmonary TB patients, type 2 DM was observed in 243 patients (44%).[11] In addition to the correlation of pulmonary TB incidence and history of type 2 DM, according to a meta-analysis conducted by Jeon and Murray, type 2 DM was at risk of pulmonary TB with OR=3.11.[6]

Our study stated comparison of pulmonary TB cases in male and female by a ratio of 2.1:1. This result was supported by a study from Harianto conducted at Atma Jaya Hospital, which also acquired that TB patients were more common in men.[12] A study from Alisjahbana et al. in Indonesia, pointed out that men were more easily infected with MTB than women.[13] In addition, TB notification data worldwide in 2012 determined the comparison of TB occurrences between men and women was 1.9:1.19. These were in line with WHO that showed more men than women in Asia were diagnosed with TB at a ratio of 3:1. The incidence among adult men is more prevalent which accounted 56% of all cases in 2019 compared with 32% of cases in adult women and 12% in children.[10]

Pulmonary TB in our study occurred at the age of 27–46 years as many as more than half the case group, (28 patients). This result corresponded with a study from Dotulong et al. in Sulawesi, where TB was found in the productive age group (25–54 years).[14] In addition, Dobler et al. stated that DM and TB correlation were more common in the population under 40 years than those above.[15] In the literature, it was mentioned that in industrialized or developed countries, 80% of TB was observed in the age group above 50 years, whilst in developing countries, 75% of TB was inspected in the age group below 50 years.[16] In accordance to Begum and Chan-Yeung, the productive age group was more at risk of infection due to the work environment, such as physical or mental stress factors due to workloads which could trigger a decrement of the immune system.[17,18]

The McNemar test showed a significant correlation between type 2 DM and pulmonary TB with *P*=0.013 and OR=2.20. This data was similar to a study conducted by Alisjahbana et al. in Indonesia.[13] Patients with pulmonary TB were more likely to have a history of type 2 DM than non-TB. The prevalence of such infectious diseases was 2–5 times higher in patients with DM than in non-DM controls. According to Cahyadi et al. DM was the most common risk factor in culture-confirmed TB patients.[19]

This study obtained OR 2.20, which means patients with type 2 DM were more susceptible to pulmonary TB as much as two times than those non-DM. This OR was slightly lower than in previous studies. A meta-analysis conducted by Jeon and Murray found that DM increased the risk of TB infection by 3.11 times compared to those without DM.[6] In a longitudinal study conducted by Dooley and Chaisson for 3 years in Korea, DM was 3 times more likely to develop pulmonary TB infection.[7]

CONCLUSION

Patients with type 2 DM had 2.2 times higher risk of developing pulmonary TB infection compared to those without DM.

REFERENCE

1. World Health Organization. Tuberculosis [Internet]. 2020 [cited 2021 Jul 20]. Available from: https://www.who.int/news-room/fact-sheets/detail/tuberculosis
2. American Diabetes Association. Classification and Diagnosis of Diabetes: Standards of

Medical Care in Diabetes—2020. Diabetes Care. 2020;43(1):14–31.

3. World Health Organization. Diabetes [Internet]. 2021 [cited 2021 Jul 20]. Available from: https://www.who.int/news-room/fact-sheets/detail/diabetes
4. Badan Penelitian dan Pengembangan Kesehatan. Hasil Utama Riskesdas 2018 [Internet]. Kementerian Kesehatan Republik Indonesia; 2018. Available from: https://www.kemkes.go.id/resources/download/info-terkini/hasil-riskesdas-2018.pdf
5. Harries AD, Lin Y, Satyanarayana S, Lönnroth K, Li L, Wilson N, et al. The looming epidemic of diabetes-associated tuberculosis: learning lessons from HIV-associated tuberculosis. Int J Tuberc Lung Dis Off J Int Union Tuberc Lung Dis. 2011;15(11):1436–44, i.
6. Jeon CY, Murray MB. Diabetes mellitus increases the risk of active tuberculosis: A systematic review of 13 observational studies. PLoS Med. 2008;5(7).
7. Dooley KE, Chaisson RE. Tuberculosis and diabetes mellitus: convergence of two epidemics. Lancet Infect Dis. 2009;9(12):737–46.
8. Moutschen MP, Scheen AJ, Lefebvre PJ. Impaired immune responses in diabetes mellitus: analysis of the factors and mechanisms involved. Relevance to the increased susceptibility of diabetic patients to specific infections. Diabète Métabolisme. 1992;18(3):187–201.
9. Koo BK. Diabetes mellitus and tuberculosis. Diabetes Metab J. 2013;37(4):249–51.
10. World Health Organization. Global tuberculosis report 2020. Geneva: World Health Organization; 2020.
11. Balakrishnan S, Vijayan S, Nair S, Subramoniapillai J, Mrithyunjayan S, Wilson N, et al. High diabetes prevalence among tuberculosis cases in Kerala, India: e46502. PLoS One. 2012;7(10).
12. Harianto Y, Tenggara R, Maslin Y, Sahusilawane IG. Lamanya perawatan pasien tuberkulosis paru disertai diabetes melitus tipe 2 dan pasien tuberkulosis paru tanpa diabetes melitus tipe 2 di rumah sakit. [Jakarta]: Universitas Katolik Indonesia Atma Jaya; 2016.
13. 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;45(4):428–35.
14. Dotulong JFJ, Sapulete MR, Kandou GD. Hubungan faktor risiko umur, jenis kelamin, dan kepadatan hunia dengan kejadian penyakit TB paru di desa wori kecamatan wori. J Kedokt Komunitas Dan Trop. 2015;III(2).
15. Dobler CC, Flack JR, Marks GB. Risk of tuberculosis among people with diabetes mellitus: an Australian nationwide cohort study. BMJ Open. 2012;2(1).
16. Snider D, Onorato I. Tuberculosis. Clinical management and new challenges. In New York: McGraw-Hill Inc; 1995. p. 3–17.
17. Begum V, de Colombani P, Das Gupta S, Salim AH, Hussain H, Pietroni M, et al. Tuberculosis and patient gender in bangladesh: sex differences in diagnosis and treatment outcome. Int J Tuberc Lung Dis Off J Int Union Tuberc Lung Dis. 2001;5(7):604–10.
18. Chan-Yeung M, Noertjojo K, Chan SL, Tam CM. Sex differences in tuberculosis in hong kong. Int J Tuberc Lung Dis Off J Int Union Tuberc Lung Dis. 2002;6(1):11–8.
19. Cahyadi A, Venty. Tuberkulosis paru pada pasien diabetes melitus. J Indon Med Assoc. 2011;61(4):173–8.