
Related Factors with Type 2 Diabetes Mellitus in Sumatera Island

Adelia Debora Siagian^{1*}, Rd. Halim², Adelina Fitri³

^{1,2,3} Public Health Science Study Program , Faculty of Medicine and Health Sciences ,
University of Jambi, Jambi, Indonesia

*Corresponding Author

Email : adeliasiangandebora@gmail.com

Abstract

Type 2 Diabetes Mellitus (DM) is one of the disease No infectious with continuing prevalence increasing in Indonesia, including in the Sumatra region. Identification factor risk in a way accuracy is very important For support effort prevention and control disease This .This study aiming For analyze connection between a number of factor risks , such as age , type gender , hypertension , and smoking , with incidence of type 2 diabetes mellitus in the population aged ≥ 15 years in Sumatra Island based on data from the 2023 Indonesian Health Survey (SKI) . This study use design cut cross -sectional with secondary data analysis from SKI 2023. Population study covering 198,687 respondents age ≥ 15 years in the Sumatra region. Data analysis was carried out in a way univariate and bivariate using the chi-square test and Prevalence Odds Ratio (POR) calculation with 95% confidence interval. Prevalence of type 2 DM in the population studies by 1.8%. Age ≥ 45 years proven as related factors with to the occurrence of DM is age (POR = 14.5; 95% CI: 12.6–16.7), hypertension (POR = 9.2; 95% CI: 8.2–10.3). Gender . (POR = 1.5 ; 95% CI: 1.4–1.6) Smoking status show connection negative with incidence of DM (POR = 0.7; 95% CI: 0.6–0.8), although allegedly strong influenced by factors confounding. Age factor, hypertension, and types sex is a related factor with The incidence of type 2 diabetes mellitus in the Sumatra region. Findings This confirm importance improvement screening , education style life healthy , and intervention group oriented risk tall in effort DM control in Indonesia.

Keywords: Related Factor, Type 2 Diabetes Mellitus , SKI 2023

INTRODUCTION

Diabetes mellitus Type 2 (DM Type 2) is one of the disease No continuing contagious increase globally and nationally . Diseases This caused by interference metabolic chronic consequence combination factor genetics and style life No healthy . WHO (2021) calls DM one of the reason main death in the world.

In Indonesia, the 2018 Riskesdas data recorded DM prevalence of 2.0% in the population age ≥ 15 years , and increasing to 2.6% according to Indonesian Health Survey (SKI) 2023 (Ministry of Health of the Republic of Indonesia, 2018; 2023). In fact , 6.5% of the population experience disturbance blood sugar levels without realize it . This is show height amount DM sufferers who have not diagnosed.

Improvement DM related cases close with various factor risk like obesity, lack of activity physical, pattern Eat No healthy, hypertension, stress, and habits smoking (Khan et al., 2020; Ley et al., 2014; Pan et al., 2015). The 2018 Riskesdas data showed that 33.5% of the population not enough activity physical and 95.5% not Enough consume fruits and vegetables. In addition the prevalence obesity in Indonesia reached 25.5% in 2023 (SKI, 2023).

Condition This exacerbated by still low awareness public to factor risk of type 2 DM . Various studies show that type 2 DM is multifactorial, which means caused by a combination factor genetics style life and the environment. Some factor risk the main thing that has been proven in a way scientific contribute to Type 2 DM incidents include: history family, pattern Eat high sugar and low fiber , less activity physical, obesity, hypertension, habits smoking, consumption alcohol excessive and stress chronic (Ley et al., 2014; Khan et al., 2020; Colberg et al., 2016).

Sumatra Island shows enough numbers tall in a number of indicator DM risk. Based on SKI 2023 data: Prevalence obesity in Sumatra south such as Lampung and South Sumatra $>30\%$, more tall from the national average (25.5%). The figure is less activity physical in the West Sumatra and Jambi

regions >35%. Consumption vegetables and fruits low Still dominate >90% throughout Sumatra province, shows lack of habit pattern Eat healthy. Prevalence hypertension and smoking are also high in Sumatra , which contributes become factor DM risk.

Important done analysis understand factor risk based on regional data, especially on the island of Sumatra with using SKI 2023 Secondary data, so effort prevention and promotion health can done more appropriate target and contextual, appropriate with pattern life public local

RESEARCH METHODS

This research is studies quantitative with design cross-sectional (cut latitude) using secondary data from Indonesian Health Survey (SKI) 2023. The research aims For analyze connection between a number of factor risk with incident Type 2 Diabetes Mellitus in the population age ≥ 15 years in the Sumatra Island region. Population and Sample Target population : All over registered Indonesian population in SKI 2023. Population affordable : All Respondent aged ≥ 15 years who are domiciled on Sumatra Island and have complete data related to DM diagnosis and variables the risk . The amount sample : 198,687 people (respondents) age ≥ 15 years in Sumatra Island, based on SKI 2023 data) . . Source Data Which used is SKI 2023 secondary data obtained from Health Development Policy Agency (BKPK) of the Indonesian Ministry of Health . This data is results merger Risesdas and SSGI which have been published in a way national . . Variables Study : Variables dependent Type 2 Diabetes Mellitus Status based on doctor's diagnosis , Variables independent : Age , Gender , Hypertension status , Smoking status , Place stay . Data Processing and Analysis Analysis univariate done For describe distribution frequency and percentage each Variables . Analysis bivariate using the Chi-Square test and calculations Prevalence Odds Ratio (POR) and 95% Confidence Interval (CI) For evaluate connection between each factor risks and events DM.Value $p < 0.05$ considered significant in a way statistics . This research using existing secondary data anonymized by the Ministry of Health. There is no intervention direct to respondents . Data is accessed and analyzed For interest scientific and educational. This research get permission utilization of data from source official (SKI 2023 BKPK Ministry of Health of the Republic of Indonesia).

RESULTS AND DISCUSSION

Table 1 Proportion of Diabetes Mellitus in the population ≥ 15 years (n=198,687)

Characteristics	Frequency	Percentage (95%CI)
Diabetes Mellitus Disease		
Yes	3,600	1.8 (1.9 – 1.7)
No	195,086	98.2 (98.3 – 98.1)

Table 2 Proportion of Diabetes Mellitus Risk Factors in the Population ≥ 15 Years (n=198,687)

Characteristics	Frequency	Percentage
Age		
≥ 45 years	70,927	35.7 (36.0 – 35.4)
< 45 years	127,759	64.3 (64.6 – 64.0)
Gender		
Woman	98,334	49.5 (49.8 – 49.2)

Man	100,352	50.5 (50.8 – 50.2)
Residence		
Urban	92,254	46.4 (47.0 – 45.9)
Rural	106,432	53.6 (54.1 – 53.0)
Hypertension		
Yes	12,797	6.4 (6.6 – 6.3)
No	185,889	93.6 (93.7 – 93.4)
Smoke		
Yes	60,257	30.3 (30.7 – 30.0)
No	138,429	69.7 (70.0 – 69.3)

Table 3. Relationship between Risk Factors and Diabetes Mellitus Disease (n=19 8,687)

Variables	Diabetes Mellitus		No	%	POR (95%CI)	P-Value
	Yes	No				
	N	%	N	%		
Age Group						
≥45 years	3,188	4.5%	67,739	95.5%	14.5 (12.6 – 16.7)	0,000
<45 years	412	0.3%	127,346	99.7%		
Gender						
Woman	2,145	2.2%	96,188	97.8%	1.5 (1.4 – 1.6)	0,000
Man	1,454	1.4%	98,897	98.6%		
Residence						
Urban	2,121	2.3%	90,132	97.7%	1.6 (1.5 – 1.8)	0,000
Rural	1,478	1.4%	104,953	98.6%		
Hypertension						
Yes	1,319	10.3%	11,478	89.7%	9.2 (8.2 – 10.3)	0,000
No	2,281	1.2%	183,607	98.8%		
Smoke						
Yes	897	1.5%	59,377	98.5%	0.7 (0.6 – 0.8)	0,000
No	2,720	2.0%	135,709	98.0%		

1. Age

Prevalence of DM in groups age ≥45 years by 4.5%, far more tall compared to age ≤44 years (0.3%). POR value = 14.5 (95% CI: 12.6 – 16.7; p < 0.05). Age is one of factor risk main in development of type 2 DM. As the disease increases age, decreased insulin sensitivity and function pancreatic beta cells experience decline, so that increase risk hyperglycemia (WHO, 2021). Based on SKI 2023 data, the prevalence of DM increased sharp on the group age ≥45 years, with peak at age 55–64 years. Research by Khan et al. (2020) shows that group age over 45 years own 2–4 times greater risk big experiencing type 2 DM compared to group age more young. In Indonesia, the pattern this is also visible in the 2018 Riskesdas and 2023 SKI data , where almost 60% of DM sufferers are in the group age >45 years (Ministry of Health of the Republic of Indonesia, 2018; 2023). Therefore that , effort detection early and screening need focused on groups age productive upper and elderly.

2. Gender

Analysis results show that proportion DM sufferers in women is 2.2%, more tall compared to man by 1.4%, with POR of 1.5 (95% CI: 1.4–1.6); p<0.001). indicating Woman own trend higher risk of DM tall compared to with man man.Difference This can explained by hormonal factors, changes

metabolism during pregnancy, and menopause which contribute to insulin resistance (Kautzky-Willer et al., 2016). In addition, women are also more Possible experience abdominal obesity, one of the factor risk of type 2 DM (Peters et al., 2014). Studies in Indonesia also show that Woman tend own level activity physique more low compared to men, which has an impact on control glucose (Rahmah & Suryanto , 2021).

3. Hypertension

The prevalence of DM is higher high in the group experiencing hypertension, namely by 10.3%, compared to those who did not hypertension by 1.2%, with a POR of **9.2** (95% CI: 8.2–10.3; $p<0.001$). This indicates that sufferer hypertension own risk almost 9 times more big For experiencing DM compared to non- hypertension. The relationship between hypertension and DM have supported by many studies that show that second condition This share mechanism the same pathophysiology, such as insulin resistance, inflammation chronic s , and dysfunction endothelium (Cheung & Li, 2012). Hypertension speed up damage vessels blood and increase risk complications vascular in DM patients (Sowers et al., 2001). In Indonesia, the prevalence of DM is also increasing significant in the group with pressure blood high (Utami et al., 2020).

4. Place of Residence

The prevalence of DM is higher high in groups living in urban areas, namely by 2.3%, compared to rural 1.4 %, with a POR of 1.6 (95% CI: 1.5–1.8; $p<0.005$). that resident urban own 1.6 times greater risk big For suffering from DM compared to with resident rural. Differences This reflect existence influence environment and style life in touch close with place reside. Residents urban tend own style a better life sedentary, level more stress high, and more access big to food processed and high calories all of which is factor risk of type 2 DM (Kharroubi & Darwish, 2015). In addition, the community urban often have limitations in do activity physique Because environment work that tends to passive limitations room open green, and use vehicle motorized For mobility (Ogurtsova et al., 2017). This compared to backwards with community in the area the countryside that is still Lots do activity physique in life everyday, such as farming or walk in sufficient distance far (Utami et al., 2020). Studies in Indonesia also show that urbanization increase prevalence disease No infectious like DM because existence shift pattern eating and habits life (Putra & Setiawan, 2021). Therefore Therefore , DM prevention strategies must be notice factor place stay , with focus intervention in change style life healthy in urban areas.

5. Smoking

Prevalence of DM in smokers is 1.5% , while those who don't smoke is 2.0% , with a POR of 0.7 (95% CI: 0.6–0.8; $p<0.005$) . Although results This show that smoker own risk relatively more low affected by DM compared to non- smokers , findings This need interpreted be careful. Other studies show that smoke still is factor risk strong against DM Because nicotine can lower insulin sensitivity , improving stress oxidative , and disruptive metabolism glucose (Pan et al., 2015). The difference results in study This can influenced by confounding factors , such as age , nutritional status , or duration smoking . Studies in Indonesia also found that DM risk increases in former smoker weight (Putri et al., 2022). Smoking is factor the risks that have been proven increase risk of type 2 DM. Substances nicotine in cigarette to worsen insulin resistance , increasing stress oxidative , and damaging function pancreatic beta cells (Pan et al., 2015). Meta- analysis international show that smoker active own improvement DM risk is 30–40% compared to No smokers . In Indonesia, SKI 2023 recorded 28.6% of men mature Still become smoker active , with number the highest in the Sumatra region such as Aceh, South Sumatra, and Lampung. This is become attention Serious Because majority Male DM sufferers in this area are also smoker active .

CONCLUSION

Age factor advanced , hypertension , and types sex is determinant main The incidence of type 2 diabetes mellitus in the Sumatra region. Findings This confirm importance improvement screening , education style life healthy , and intervention group oriented risk tall in effort DM control in Indonesia.

REFERENCES

- Cheung, BMY, & Li, C. (2012). Diabetes and hypertension: Is there a common metabolic pathway? *Current Atherosclerosis Reports*, 14 (2), 160–166. <https://doi.org/10.1007/s11883-012-0227-2>
- Colberg, S.R., Sigal, R.J., Fernhall , B., Regensteiner , J.G., Blissmer , B.J., Rubin, R.R., ... & Braun, B. (2016). Exercise and type 2 diabetes: The American College of Sports Medicine and the American Diabetes Association: Joint position statement. *Diabetes Care*, 39 (11), 2065–2079. <https://doi.org/10.2337/dc16-1728>
- Kautzky-Willer, A., Harreiter , J., & Pacini, G. (2016). Sex and gender differences in risk, pathophysiology and complications of type 2 diabetes mellitus. *Endocrine Reviews*, 37 (3), 278–316. <https://doi.org/10.1210/er.2015-1137>
- Ministry of Health of the Republic of Indonesia. (2018). *Risikedas 2018: National Report* . Jakarta: Health Research and Development Agency , Ministry of Health of the Republic of Indonesia.
- Ministry of Health of the Republic of Indonesia. (2023). *Indonesian Health Survey (SKI) 2023: National Report* . Jakarta: Health Development Policy Agency , Ministry of Health of the Republic of Indonesia.
- Khan, MAB, Hashim, MJ, King, JK, Govender, R.D., Mustafa, H., & Al Kaabi , J. (2020). Epidemiology of type 2 diabetes – Global burden of disease and predicted trends. *Journal of Epidemiology and Global Health*, 10 (1), 107–111. <https://doi.org/10.2991/jegh.k.191028.001>
- Kharroubi , A.T., & Darwish, H.M. (2015). Diabetes mellitus: The epidemic of the century. *World Journal of Diabetes*, 6 (6), 850–867. <https://doi.org/10.4239/wjd.v6.i6.850>
- Ley, S.H., Hamdy, O., Mohan, V., & Hu, F.B. (2014). Prevention and management of type 2 diabetes: Dietary components and nutritional strategies. *The Lancet*, 383 (9933), 1999–2007. [https://doi.org/10.1016/S0140-6736\(14\)60613-9](https://doi.org/10.1016/S0140-6736(14)60613-9)
- Ogurtsova , K., da Rocha Fernandes, J.D., Huang, Y., Linnenkamp, U., Guariguata , L., Cho, N.H., ... & Makaroff , L.E. (2017). IDF Diabetes Atlas: Global estimates for the prevalence of diabetes for 2015 and 2040. *Diabetes Research and Clinical Practice*, 128 , 40–50. <https://doi.org/10.1016/j.diabres.2017.03.024>
- Pan, A., Wang, Y., Talaei, M., Hu, F.B., & Wu, T. (2015). Relation of smoking with total mortality and cardiovascular events among patients with diabetes mellitus: A meta-analysis and systematic review. *Circulation*, 132 (19), 1795–1804. <https://doi.org/10.1161/CIRCULATIONAHA.115.017926>
- Peters, S.A.E., Huxley, R.R., & Woodward, M. (2014). Diabetes as risk factor for incident coronary heart disease in women compared with men: A systematic review and meta-analysis of 64 cohorts including 858,507 individuals and 28,203 coronary events. *Diabetologia* , 57 , 1542–1551. <https://doi.org/10.1007/s00125-014-3260-6>
- Putra, RE, & Setiawan, E. (2021). Urbanization and increasing disease No contagious : Impact study style living in urban areas . *Journal of Public Health*, 17 (2), 55–62.
- Putri, SR, Dewi, EY, & Arifin, H. (2022). Relationship between habit smoke with risk of diabetes mellitus type 2 in men adults in Indonesia. *National Health Journal* , 14 (3), 142–150.

- Rahmah, A., & Suryanto , S. (2021). Activity level physical and control glucose in diabetes mellitus patients type 2 in Indonesia. *Indonesian Health Journal* , 10 (1), 22–29.
- Sowers, J.R., Epstein, M., & Frohlich, E.D. (2001). Diabetes, hypertension, and cardiovascular disease: An update. *Hypertension*, 37 (4), 1053–1059. <https://doi.org/10.1161/01.HYP.37.4.1053>
- World Health Organization. (2021). *Diabetes* . <https://www.who.int/news-room/fact-sheets/detail/diabetes>