JKM (Jurnal Kebidanan Malahayati), Vol 11, No. 7. July 2025,
ISSN (Print) 2476-8944 ISSN (Online) 2579-762X, Hal 607-616

ANALYSIS OF FACTORS OF DIABETES MELLITUS TYPE 2 INCIDENCE

Henri Setiawan[1], Devita Febriani Putri[2], Khoidar Amirus[3]

Fakultas Ilmu Kesehatan Masyarakat, Universitas Malahayati, Bandar Lampung
e-mail : devita@malahayati.ac.id

ABSTRAK : ANALISIS FAKTOR KEJADIAN DIABETES MELLITUS TIPE 2

Latar Belakang: Prevalensi DM tipe 2 terus mengalami peningkatan setiap tahun. Menurut WHO jumlah penderita di Indonesia akan menglami peningkatan dari 8,4 juta pada tahun 2000 menjadi 21,3 juta ditahun 2030. Provinsi Lampung tahun 2021 belum mencapai target yang telah ditetapkan dalam penurunan kasus DM. Pada tahun 2020 capaian sebesar 68,32%. Puskesmas Gedong Air pada tahun 2022 kejadian DM sebanyak 1768 penderita dan tahun 2023 sebanyak 1126 penderita. Tujuan penelitian untuk Analisis Faktor Kejadian Diabetes Melitus TIPE 2 Di Wilayah Puskesmas Gedong Air Bandar Lampung.

Metode: Jenis penelitian kuantitatif dengan rancangan *cross sectional.* Populasi seluruh masyarakat yang berobat yang berusia ≥ 25 tahun sampai usia ≤ 40 tahun pada bulan mei- juni tahun 2024. Sampel berjumlah 180 orang dengan teknik *purposive sampling.* Analisis data dengan univariat, bivariat (*chi-square*), dan multivariat (*regresi logistic berganda*).

Hasil: Penelitian ini menunjukkan bahwa Responden yang mengalami diabetes mellitus tipe 2 sebanyak 67.7%, yang memiliki aktifitas fisik sedang sebanyak 63.3%, yang memiliki pola makan baik sebanyak 59.6%, yang menderita obesitas sebanyak 56.9% dan tidak menderita obesitas sebanyak 43.1% serta yang menderita hipertensi sebanyak 47.9% dan tidak hipertensi 52.1%. Terdapat hubungan pola makan (p-value 0.010), aktivitas fisik (p-value 0.026), obesitas (p-value 0.000) hipertensi (p-value 0.000) dengan kejadian diabetes mellitus tipe 2. Variabel yang paling mendominan kejadian Diabetes Mellitus Tipe 2 yaitu variable obesitas (p-value 0.000) OR 5.366.

Saran: Diharapkan masyarakat menerapkan gaya hidup yang lebih baik dengan memperbaiki pola makan dan meningkatkan aktivitas fisik.

Kata kunci : Diabetes Mellitus, Pola Makan, Aktifitas Fisik, Hipertensi, Obesitas

ABSTRACT

Background: The prevalence of type 2 DM continues to increase every year. According to WHO, the number of sufferers in Indonesia will increase from 8.4 million in 2000 to 21.3 million in 2030. Lampung Province in 2021 has not reached the target that has been set in reducing DM cases. In 2020 the achievement was 68.32%. In 2022, the Gedong Air Health Center had 1768 DM sufferers and in 2023 there were 1126 sufferers. The purpose of the study was to Analyze Factors for the Incidence of Type 2 Diabetes Mellitus in the Gedong Air Health Center Area, Bandar Lampung.

Method: Quantitative research type with a cross-sectional design. The population of all people who seek treatment aged ≥ 25 years to ≤ 40 years in May-June 2024. The sample was 180 people with a purposive sampling technique. Data analysis with univariate, bivariate (chi-square), and multivariate (multiple logistic regression).

Results: This study shows that respondents who experience type 2 diabetes mellitus are 67.7%, who have moderate physical activity are 63.3%, who have a good diet are 59.6%, who suffer from obesity are 56.9% and do not suffer from obesity are 43.1% and who suffer from hypertension are 47.9% and do not have hypertension 52.1%. There is a relationship between diet (p-value 0.010), physical activity (p-value 0.026), obesity (p-value 0.000) hypertension (p-value 0.000) with the incidence of type 2 diabetes mellitus. The most dominant variable in the incidence of Type 2 Diabetes Mellitus is the obesity variable (p-value 0.000) OR 5.366.

Suggestion: It is expected that the community will implement a better lifestyle by improving diet and increasing physical activity

Keywords: Diabetes Mellitus, Diet, Physical Activity, Hypertension, Obesity.

INTRODUCTION

Type 2 Diabetes Mellitus (T2DM) is a chronic metabolic disease characterized by hyperglycemia due to impaired insulin secretion and/or action. This disease is one of the four priority non-communicable diseases (NCDs) globally and is included in the 2030 Sustainable Development Goals (SDGs) agenda. The prevalence of T2DM has significantly increased from 151 million (2000) to 537 million (2021), and is projected to reach 643 million by 2030 (IDF, 2021). In Indonesia, the number of people with diabetes is estimated to rise from 8.4 million (2000) to 21.3 million (2030) (WHO, 2021).

This increase poses a risk of chronic complications such as neuropathy (51.4%), sexual dysfunction (50.9%), and cataracts (16%) (PERKENI, 2021). In Lampung Province, the service coverage for T2DM remains low (68.32%) due to limited screening and service outreach (Lampung Provincial Health Office, 2021). Data from the Gedong Air Health Center recorded 1,768 T2DM cases in 2022 and 126 cases up to March 2023.

Major risk factors for T2DM include poor diet, lack of physical activity, obesity, and hypertension (Ministry of Health RI, 2010). A study by Fharitz et al. (2018) found a significant correlation between dietary patterns and T2DM (p = 0.001). Physical inactivity disrupts glucose metabolism, and obesity increases the workload of the pancreas. Hypertension further inhibits glucose distribution to cells.

Complications from T2DM impose a heavy economic and social burden. Therefore, it is important to analyze local risk factors. This study aims to identify the risk factors affecting the incidence of T2DM in the Gedong Air Health Center working area in Bandar Lampung in 2023.

RESEARCH METHODS

This research is an observational quantitative analytic study, conducted by collecting observational data and analyzing it to determine the relationship between variables—in this case, analyzing the association of dietary patterns, physical activity, obesity, and hypertension with the incidence of type 2 diabetes mellitus in the Gedong Air Health Center area, Bandar Lampung, in 2023.The tests used in this study include validity and reliability tests. Data processing was carried out in four stages (Notoatmodjo, 2018): (1) Editing, to check completeness and consistency of data;(2) Coding, converting qualitative data into quantitative data in numerical form; (3) Processing, entering the data into SPSS version 23 software; and (4) Cleaning, reviewing data to ensure no errors before analysis. Data analysis was carried out in stages: univariate, bivariate, and multivariate analysis. Univariate analysis was used to describe the frequency distribution of each variable using relative frequency distribution. Bivariate analysis was conducted to examine the relationship between two variables using the Chi-Square test with a 95% confidence level and 5% significance level ($p < 0.05$). This test also produces an Odds Ratio (OR) value to assess the strength of the association. Multivariate analysis was performed using multiple logistic regression to identify the most dominant risk factors. Variables with $p < 0.25$ in the bivariate test were included in the multivariate model. Variables that remained significant in the final model were considered as influential factors on the dependent variable (Sugiyono, 2019).

CONCLUSION

Respondent Characteristics

Table 1
Respondent Characteristics

Variable	Frequency	Percentage (%)
Usia		
20-35 Years	33	17.6
>35 Years	155	82.4
Education		
Junior High School/Equivalent	17	9
Senior High School /Equivalent	154	82
Higher Educarion	17	9
Gender		
Male	43	22.9
Female	145	77.1

Based on the analysis results, the majority of respondents were aged >35 years (82.4%), had a high school education/equivalent (81.9%), and were female (77.1%).

Univariate Analysis

Mellitus 2 Incidence of Type 2 Diabetes Mellitus

Table 2
Incidence of Type 2 Diabetes Mellitus

Blood Sugar Test	Frequency	Percentage (%)
osed with DM	127	67.6
agnosed with DM	61	32.4

Based on the analysis results, the majority of respondents suffered from diabetes mellitus,

 DOI 10.33024, http://ejurnalmalahayati.ac.id/index.php/kebidanan

namely 67.6%, while 32.4% did not experience this condition.

Physical Activity

Table 3
Physical Aktivity

Pshyical Aktivity	Frequency	Percentage (%)
Light	69	36.7
Moderate	119	63.3

Most respondents had moderate physical activity, namely 63.3%, while the light category was smaller.

Dietary Pattern

Table 4
Dietary Pattern

Dietary Pattern	Frequency	Percentage (%)
Poor	76	40.4
Good	112	59.6

The frequency of good eating patterns was greater than that of poor eating patterns, namely 112 respondents or 59.6%.

Obesity Status

Table 5
Obesity Status

Obesity Status	Frequency	Percentage (%)
Obese	107	56.9
Not obese	81	43.1

He frequency of obesity incidents was greater than those who did not experience obesity, namely 107 respondents or 56.9%.

Hypertension Status

Table 6
Hypertension Status

Hypertension Status	Frequency	Percentage (%)
Hypertensive	90	47.9
Not Hypertensive	98	52.1

The frequency of events for those who did not experience hypertension was greater than for those who experienced hypertension, namely 98 respondents or 52.1%.

Bivariate Analysis

Association Betwen Physical Activity and Type 2 Diabetes Mellitus Incodence

Table 7
Association Betwen Physical Activity and Type 2 Diabetes Mellitus Incodence

Physical Activity	Diabetes Mellitus 2 Status		Total	P value	OR 95% CI
	DM (+)	DM (-)			
	n (%)	n (%)	N (%)		
Light	54 (78.3)	15 (21.7)	69 (100)	0.026	2.268 (1.148-4.481)
Moderate	73 (61.3)	46 (38.7)	119 (100)		

The analysis results showed a significant association between physical activity and the incidence of type 2 diabetes mellitus (p = 0.026; OR = 2.268; 95% CI: 1.148–4.481). Respondents with light physical activity had a 2.3 times greater risk of developing type 2 diabetes mellitus compared to those with moderate physical activity.

Association Betwen Dietary Pattern and Type 2 Diabetes Mellitus

Based on the analysis results, there was a significant association between dietary patterns and the incidence of type 2 diabetes mellitus (p = 0.010; OR = 2.519; 95% CI: 1.291–4.914). Respondents with poor dietary patterns were 2.5 times more likely to suffer from type 2 diabetes mellitus than those with good dietary patterns.

Table 8
Association Betwen Dietary Pattern and Typer 2 Diabetes Mellitus

Dietary Pattern	Diabetes Mellitus 2 Status		Total	P value	OR 95% CI
	DM (+)	DM (-)			
	n (%)	n (%)	N (%)		
Poor	60 (78.9)	16 (21.1)	76 (100)	0.010	2.519 (1.291-4.914)
Good	67 (59.8)	45 (40.2)	112 (100)		

Association Betwen Obesity and Type 2 Diabetes Mellitus

There was a significant association between obesity status and the incidence of type 2 diabetes mellitus (p = 0.000; OR = 4.988; 95% CI: 2.578–9.652). Respondents with obesity had a 4.9 times greater risk of developing type 2 diabetes mellitus compared to those who were not obese.

Table 9
Association Betwen Obesity and Type 2 Diabetes Mellitus

Obesity Status	Diabetes Mellitus 2 Status		Total	P value	OR 95% CI
	DM (+)	DM(-)			
	n (%)	n (%)	N (%)		
Obese	88 (82.2)	19 (17.8)	107 (100)	0.000	4.988 (2.578-9.652)
Not obese	39 (48.1)	42 (51.9)	81 (100)		

Association Betwen Hypertensi and Type 2 Diabetes Mellitus

Table 10
Association Betwen Hypertensi and Type 2 Diabetes Mellitus

Status Hipertensi	Diabetes Mellitus 2 Status		Total	P value	OR 95% CI
	DM (+)	DM (-)			
	n (%)	n (%)	N (%)		
Hypertensive	73 (81.1)	17 (18.9)	90 (100)	0.000	3.499 (1.806-6.777)
Not Hypertensive	54 (55.1)	44 (44.9)	98 (100)		

Multivariate Analysis

Bivariate selection

Table 11
Bivariate Selection Using Simple Logostic

Variable	*p-value*	Description
Physical Activity	0.018	Candidate for modelling
Dietary Pattern	0.007	Candidate for modelling
Obesity Status	0.000	Candidate for modelling
Hypertension	0.000	Candidate for modelling

Based on the results of bivariate selection, all variables have a p-value < 0.25 so they are worthy of being candidates in multivariate modeling.

Multivariate Modeling Stage 1

Based on Table 12, there is a variable with a p-value >0.05, namely the physical activity variable (0.090). Next, a confounding test was conducted by removing this variable.

 DOI 10.33024, http://ejurnalmalahayati.ac.id/index.php/kebidanan

Table 12
Multivariate Modeling Stage 1

Variable	B	*p-value*	Crude OR	CI 95% (min-max)	
Physical Activity	0.671	0.090	1.957	0.901	4.253
Dietary Pattern	1.159	0.003	3.188	1.482	6.857
Obesity Status	1.637	0.000	5.141	2.499	10.575
Hypertension	1.383	0.000	3.988	1.899	8.374

Multivariate Modeling Stage 2 : Confounding test (Physical Activity Removed)

Table 13
Multivariate Modeling Stage 2

Variable	B	*p-value*	OR Crude	CI 95% (min-max)	
Dietary Pattern	1.219	0.002	3.384	1.586	7.220
Obesity Status	1.680	0.000	5.366	2.623	10.979
Hypertension	1.371	0.000	3.938	1.891	8.200

Table 14
Change in OR After Removing Physical Activity

Independent Variable	Crude OR	Adjusted OR	% OR Change (Delta OR)
Physical Activity	1.957	-	-
Dietary Pattern	3.188	3.384	6.138
Obesity Status	5.141	5.366	4.378
Hypertension	3.988	3.938	-1.267

Based on the results in the table above, there was no change in the OR value >10%, so the physical activity variable was removed from the multivariate modeling and the analysis was continued.

Multivariate Modeling Stage 3: Interaction Test Between Dietary Pattern and Obesity Status

Table 15
Interaction Test Between Dietary Pattern and Obesity Status

Variable	p-value
Dietary Pattern	0.202
Obesity Status	0.068
Hypertension	0.000
Dietary Pattern x Obesity	0.233

Based on Table 15, the interaction p-value for the dietary pattern and obesity status variables is 0.233 (>0.05), indicating no moderating relationship. Thus, the multivariate modeling is complete.

Final Multivariate Model

Based on Table 16, the most dominant variable influencing the incidence of type 2 diabetes mellitus was obesity status (p = 0.000; OR = 5.366; 95% CI: 2.623–10.979) after accounting for hypertension and diet. This means that obese respondents had a 5.366 times greater risk of developing type 2 diabetes mellitus.

Table 16
Final Multivariate Model

Variabel	B	P-value	OR	95% CI
Dietary Pattern	1.219	0.002	3.384	1.586-7.220
Obesity Status	1.680	0.000	5.366	2.623-10.979
Hypertension	1.371	0.000	3.938	1.891-8.200

DISSCUSION

Univariat Analysis

Type 2 Diabetes Mellitus Incidence

The majority of respondents in this study were diagnosed with type 2 diabetes mellitus (67.6%). T2DM is a metabolic disorder caused by impaired insulin secretion or insulin resistance, characterized by chronic hyperglycemia and potential damage to organs such as the eyes, kidneys, and heart. Common symptoms include polyuria, polydipsia, polyphagia, weight loss, fatigue, and drowsiness.

Dietary Patterns

Most respondents had good dietary patterns (59.6%). A proper diet plays an essential role in the prevention of diabetes mellitus, considering factors such as circadian rhythms, meal frequency, portion size, and food types. A balanced diet is recommended, consisting of 45–60% carbohydrates, 10–20% protein, and 20–25% fat, divided into three main meals and 2–3 snacks per day.

Physical Activity

Most respondents engaged in moderate physical activity (63.3%). Physical activity includes any body movement requiring energy expenditure, differing from structured and planned exercise. Lack of physical activity may increase the risk of prediabetes by up to 23% due to decreased insulin sensitivity. Regular physical activity helps regulate blood glucose levels and burn fat. The American Diabetes Association recommends at least 150 minutes of physical activity per week for individuals with diabetes.

Obesity

A total of 56.9% of respondents were obese. Obesity is closely linked to increased blood glucose levels due to the production of adipocytokines from visceral fat, contributing to insulin resistance. Abdominal circumference is a major indicator of diabetes risk. More than 90% of people with type 2 diabetes are overweight. Therefore, weight management through reduced fat intake and increased fiber consumption is strongly recommended to prevent complications.

Hypertension

Although 52.1% of respondents did not have hypertension, obesity remains a key risk factor. An increase in fat tissue leads to higher blood supply demands, resulting in greater arterial pressure. Excess body weight can also increase insulin levels, leading to sodium and water retention and increased blood volume, contributing to higher blood pressure.

Bivariate Analysis

Dietary Pattern and Type 2 Diabetes Mellitus

The study found a significant relationship between dietary patterns and T2DM incidence ($p < 0.010$; OR = 2.519; 95% CI: 1.291–4.914). Respondents with poor dietary patterns were 2.5 times more likely to have T2DM than those with healthy eating habits. This is consistent with previous studies (Juripah et al., 2019; Amirah et al., 2022; Hariawan et al., 2019). Nevertheless, a healthy diet alone does not entirely prevent diabetes, as other factors like obesity, physical inactivity, and family history also play roles. Thus, adopting a healthy lifestyle, balanced diet, and regular blood sugar monitoring is important.

Activity and Type 2 Diabetes Mellitus

There was a significant relationship between physical activity and T2DM ($p < 0.026$; OR = 2.268; 95% CI: 1.148–4.481). Respondents with light physical activity were 2.3 times more likely to develop T2DM compared to those with moderate activity levels. These findings are supported by other studies (Cicilia et al., 2018; Dewi et al., 2022; Purnama & Sari, 2019). A sedentary lifestyle and lack of exercise increase the risk of diabetes. Regular physical activity helps maintain weight, control blood sugar, and improve insulin effectiveness.

Obesity and Type 2 Diabetes Mellitus

There was a strong association between obesity and T2DM ($p < 0.001$; OR = 4.988; 95% CI: 2.578–9.652). Obese respondents were nearly 5 times more likely to have diabetes than non-obese individuals. These results align with other studies

 DOI 10.33024, http://ejurnalmalahayati.ac.id/index.php/kebidanan

(Masi & Oroh, 2018; Handayani et al., 2018; Nasution et al., 2018). However, some non-obese individuals also developed diabetes, indicating other contributing factors such as poor diet, lack of exercise, genetic predisposition, or stress.

Hypertension and Type 2 Diabetes Mellitus

A significant association was found between hypertension and T2DM ($p < 0.001$; OR = 3.499; 95% CI: 1.806–6.777). Hypertensive individuals had a 3.5 times higher risk of developing T2DM compared to non-hypertensives. This finding is consistent with studies by Julianti (2021), Pratama Putra et al. (2019), and Rediningsih & Lestari (2022), which showed a correlation between high blood pressure and elevated glucose levels. Effective control of both conditions is essential to prevent complications and improve quality of life.

Analysis / Multiple Logistic Regression

The study found that obesity was the most dominant risk factor for type 2 diabetes mellitus ($p < 0.000$; OR = 5.366; 95% CI: 2.623–10.979). Obese respondents had a 5.4 times higher risk of developing T2DM. These findings are supported by Guyton's theory and previous research (Nasution et al., 2020; Masi & Oroh, 2018; Handayani et al., 2018), which suggest that obesity plays a crucial role in insulin resistance and elevated blood sugar. An unhealthy lifestyle, lack of physical activity, and excessive food intake increase the risk of diabetes among obese individuals.

CONCLUSION

Based on the research findings, it can be concluded that the prevalence of type 2 diabetes mellitus among respondents was 67.7%. There were significant associations between dietary patterns ($p = 0.010$), physical activity ($p = 0.026$), obesity ($p = 0.000$), and hypertension ($p = 0.000$) with the incidence of type 2 diabetes mellitus in the working area of Gedong Air Health Center, Bandar Lampung, in 2024. Obesity was identified as the most dominant factor ($p = 0.000$; OR = 5.366), indicating that obese respondents had a 5.4 times greater risk of developing type 2 diabetes mellitus compared to non-obese respondents.

SUGGESTION

Raise awareness of the importance of maintaining an ideal body weight through a healthy diet and regular physical activity. Research shows that obesity is the most dominant factor in the incidence of type 2 diabetes mellitus, so obesity prevention must be a top priority.Adopt a balanced diet, including reducing consumption of foods high in sugar and fat, and increasing fiber from vegetables and fruits. Education about nutrition and proper portion sizes needs to be continuously promoted. Perform at least 150 minutes of physical activity per week, as recommended by the American Diabetes Association, to help reduce insulin resistance and maintain normal blood sugar levels.

REFERENCES

Alfian R. and Putra A.M.P. (2017). Uji Validitas dan Reliabilitas Kuesioner Medication Adherence Report Scale (MARS) Terhadap Pasien Diabetes Mellitus, Jurnal Ilmiah Ibnu Sina, 2 (2), 176–183

Alfiyah, S.W. (2011). Faktor Risiko yang Berhubungan dengan Kejadian Penyakit Diabetes Melitus Pada Pasien Rawat Jalan di Rumah Sakit Umum Pusat Dr. Kariadi Semarang Tahun 2010. Skripsi. Jurusan Ilmu Kesehatan Masyarakat. Universitas Negeri Semaran

Aryaldy Zulkarnaini.(2022). Aktivitas Fisik, Pola Makan, dan Konsumsi Makanan Glikemik Tinggi Meningkatkan Risiko Kejadian Diabetes Mellitus Tipe 2.JKM. Vol. 15, No. 2,

Affisa, Shinta Nuur. (2018). Faktor- Faktor Risiko Diabetes Melitus Tipe 2 Pada Laki-Laki Di Kelurahan Demangan Kota Madiun. Sekolah Tinggi Ilmu Kesehatan Bhakti Husada Mulia. Diakses melalui http://repository.stikesbhm.ac.id

Arikunto.(2013). Prosedur Penelitian Suatu Pendekatan Praktik. Jakarta: Rineka Cipta

American Diabetes Association (ADA). (2012). Medical advice for people with diabetes in emergency situations. American Diabetes Association Journal

ADA (American Diabetes Association). (2018). Diagnosis and Classification of Diabetes Mellitus.

American Diabetes Association.(2018).Nutrition Recommendations and Interventions for Diabetes. Diabetes Care, vol. 41, no. 2, pp. S14-S80, , doi:10.2337/dc17-2305.

American Diabetes Association. (2023). Diabetes Care: A Clinical Practice Guide. 2023 Edition. Alexandria, VA: American Diabetes Association.

Almatsier S. (2009). Prinsip Dasar Ilmu Gizi. Jakarta: PT. Gramedia Pustaka Utama

AHA (american Heart Association). (2017). Hypertension : The Silent Killer : Updated

JNC-8 Guideline Recommendations. Alabama Pharmacy Association.

Anri.(2022). Pengaruh Indeks Massa Tubuh, Pola Makan, Dan Aktivitas Fisik Terhadap Kejadian Diabetes Melitus Tipe 2. Journal of Nursing and Public Health Vol. 10 No. 1

BALITBANGKES. 2013. Riset Kesehatan Dasar. Jakarta : Kementrian Kesehatan

Dinkes, L. (2021). profil kesehatan provinsi lampung 2021. Germas, 44Dinas Kesehatan Kota Bandar Lampung. (2023). Profil Kesehatan Kota Bandar Lampung Tahun 2023. https://dinkes.lampungprov.go.id/2023/

Diabetes UK (2010). Diabetes in the UK: Key Statistics on Diabetes

Dipiro J.T., Talbert R.L., Yee G.C., Matzke G.R., Wells B.G. and Posey L.M.. (2017)\ Pharmacotherapy A Pathophysiologic Approach, 10th ed., McGraw-Hill EducationCompanies,

Inggris.Dewi Prasetyani.(2017). Analisis Faktor Yang Mempengaruhi Kejadian Diabetes Melitus (Dm) Tipe 2. Jurnal Kesehatan Al Irsyad (JKA).Vol.X.No.2

Dwi Ario, M. (2014). Effect of Nicotine in Cigarette for Type 2 Diabetes Mellitus. J Majority, 3(7), 75-80

Fatimah, R.N. (2015). Diabetes Melitus Tipe 2. Jakarta: J MAJORITY. Vol. 4, No. 5:93-99

Guyton AC, Hall JE. (2014). Buku Ajar Fisiologi Kedokteran. Indonesia: Penerbit Elsevier (Singapore).

Hadi Maksum, Y., Kebidanan, J., & Kemenkes Tanjungkarang, P. (2018). Obesitas Sebagai Faktor Risiko yang Paling Berpengaruh terhadap Kejadian Diabetes Mellitus Tipe 2 (Studi Kasus Kontrol) Obesity as the Dominant Risk Factor Influence on the Incidence of Type 2 Diabetes Mellitus (Case Control Study). Jurnal Kesehatan Metro Sai Wawai, 11(2), 83–91.

Hidayah. (2012). Kesalahan-kesalahan Pola Makan Pemicu Seabrek Penyakit Mematikan.Jogjakarta :BukuBiru

Halim, Chintya. (2017). Pengaruh Perilaku Merokok terhadap Kadar Glukosa Darah: Tinjauan Jumlah Batang Rokok yang Dihisap Pada Pria Perokok Bersuku Tionghoa Indonesia. Diakses melalui https://repository.usd.ac.id

IDF. (2021). International Diabetes Federation. In Diabetes Research and Clinical Practice (Vol. 102, Issue 2). https://doi.org/10.1016/j.diabres.2013.10.013

IDF. (2013). Diabetes Atlas, Sixth Edition. Retrieved from International Diabetes Federation: www.eatlas.idf.org.com.

Irawan, Dedi.(2010). Prevalensi dan faktor resiko kejadian diabetes mellitus tipe 2 di daerah urban Indonesia (Analisa data sekunder Riskesdas @007). Thesis Universitas Indonesia.

Kemenkes RI. (2010). Petunjuk Teknis Pengukuran Faktor Risiko Diabetes Melitus. Kementerian Kesehatan Republik Indonesia. Jakarta

Kementerian Kesehatan Republik Indonesia.(2013). Diabetes melitus penyebab kematian nomor 6 di dunia: kemenkes tawarkan solusi cerdik melalui Posbindu. Jakarta: Kementerian Kesehatan RI. P4-5

Kementerian Kesehatan Republik Indonesia. (2013). Pedoman Pelayanan Gizi Rumah Sakit. Jakarta : Departemen Kesehatan Republik Indonesia Direktrat Jendral Bina Kesehatan Masyarakat Direktorat Gizi Masyarakat.

Kemenkes RI. (2014). Hipertensi. Infodatin Pusat Data dan Informasi Kementrian kesehatan RI.; (Hipertensi):1-7

Kementerian Kesehatan RI .(2016). Pedoman Umum Pencegahan dan Pengendalian DM Tipe 2. 1sedn. Jakarta : Direktorat Jenderal Pencegahan dan Pengendalian Penyakit

Kementerian Kesehatan Repubelik Indonesia. (2018). Data dan Informasi Profil Kesehatan Indonesia 2018

Kementerian Kesehatan Republik Indonesia. (2018). Pedoman Gizi Seimbang. Jakarta: Kementerian Kesehatan Republik Indonesia.

Khadziyatul Fildah Rusdina.(2017).Hubungan merokok dengan kejadian toleransi glukosa terganggu di Indonesia tahun 2013.Skripsi. FK UIN syarif Hidayatulah

Lorita Doru.(2023). Hubungan Pola Makan Dan Aktivitas Fisik Dengan Kejadian Diabetes Melitus Di Wilayah Kerja UPTD Puskesmas Birobuli Kota Palu. JURNAL Kolaboratif Sains. Volume 6.2

Lemesshow, S., Hosmer, D.W., Klar, J&Lwanga, S.K.(1997). Besar sample dalam penelitian kesehatan. Jogjakarta : Gajahmada University Press

Lia Amalia.(2022). Hubungan Overweight Dengan Kejadian Diabetes Mellitus Tipe 2 Di Wilayah Kerja Puskesmas Bulango Utara. Jambura Journal of Epidemiology

Masi, Gresty N. M., and Ns Mulyadi. (2017). Hubungan Pola Aktivitas Fisik an Pola Makan Dengan Kadar Gula Darah Pada Pasien Diabetes Melitus Tipe II Di Poli

Penyakit Dalam Rumah Sakit Pancaran Kasih GMIM Manado.Jurnal Keperawatan5(1)

Musyayadah Ramadhan.(2017). Faktor yang Berhubungan dengan Kejadian Diabetes Mellitus di RSUP Dr. Wahidin Sudirohusodo dan Rumah Sakit Unhas. Skripsi. Fakultas Kesehatan. Masyarakat

Misnadierly. (2007). Obesitas Sebagai Faktor Resiko Berbagai penyakit. Jakarta: Pustaka Obor Populer

Maynardo Innocencio Aethelstone.(2017). Pola Makan Dan Aktivitas Fisik Terkait Faktor Risiko Diabetes Melitus Tipe 2 Pada Remaja Di Kecamatan Gedongtengen Yogyakarta.Fakultas Farmasi. Universitas Sanata Dharma

Nabil. (2012). Panduan Hidup Sehat Mencegah dan Mengobati Diabetes Mellitus. Yogyakarta: Solusi Distribusi

Notoadmodjo. (2018). Metodologi penelitian kesehatan. Jakarta: Rineka Cipta

Nurwijayanti. (2018).Pola Makan,Kebiasaan Sarapan dan Status Gizi Berhubungan Dengan Prestasi Belajar Siswa SMK di Kota Kediri. J Care.;6(1):54–63

Nasekhah Et Al.(2016). Hubungan Kelelahan Dengan Kualitas Hidup Penderita Diabetes Melitus Tipe 2 Di Persadia Salatiga.Skripsi. Fakultas Kedokteran Universitas Diponegoro Semarang

Oktaviani Wati. (2011). Hubungan Pola Makan dengan Gastritis Pada Mahasiswa S.1 Keperawatan Program A Fikes UPN Veteran. Jakarta : Skripsi, FKIK UPN Veteran

Oktarida Syam, Avina,., dkk. (2014). Hubungan Kondisi Stres Dengan Kejadian DM Pada Anggota Polri Di Polresta Bandar Lampung. Jurnal Keperawatan x(2)1907-0357

Paulus, (2012). Gambaran Tingkat Pengetahuan Faktor Risiko Diabetes Melitus Pada Mahasiswa Fakultas Ekonomi Universitas Indonesia, Skripsi, Sarjana Keperawatan, Universitas Indonesia, Depok

PERKENI. (2021). Konsensus Pengelolaan dan Pencegahan Diabetes Melitus Tipe 2 di Indonesia 2021. Endokrinologi Indonesia, vol. 47, no. 1, pp. 1-52, 2021.

Pratiwi, P. D., I. G. A. D. Sarihati, dan I. G. A. A. P. Swastini. (2021). Gambaran Kadar Glukosa Darah Sewaktu Pada Penderita Hipertensi di Puskesmas II Mendoyo. Jurnal Kesehatan Teknologi Laboratorium Medis Poltekkes Denpasar, 10(1), 75–82

Patien, S. (2016). Diabetes Melitus (Kencing Manis). Hospitals Authority: Departemen Kedokteran dan Terapi.

Purwati, S. (2010). Perencanaan Menu untuk Penderita Kegemukan. Jakarta: PT. Penebar Swadaya

Puput Puspitawati. (2016). Kajian Ketepatan Pemilihan dan Dosis Obat Antihipertensi Pada Penderita Hipertensi. J Farm.;1:1–22

Potter, A & Perry, A. (2014). Buku ajar fundamental keperawatan; konsep, proses, dan praktik, vol.2, edisi keempat, EGC, Jakarta

Peraturan Pemerintah Republik Indonesia .(2012).Nomor 109 Tahun 2012 tentang Pengamanan Bahan yang Mengandung Zat Adiktif Berupa Produk Tembakau bagi Kesehatan,

Rumiyati. (2008). Hubungan Aktivitas Fisik dengan Kejadian Diabetes Melitus Tipe 2 di Lima Wilayah DKI Jakarta Tahun 2006. Tesis. Depok: FKMUI

Restyana N.R. (2015). Diabetes Melitus Tipe 2. Artikel. Medical Faculty. Lampung University

Ronika Sipayung.(2018). Hubungan Aktivitas Fisik Dengan Kejadian Diabetes Melitus Tipe 2 Pada Perempuan Usia Lanjut Di Wilayah Kerja Puskesmas Padang Bulan Medan Tahun 2017. Jurnal Muara Sains, Teknologi, Kedokteran, dan Ilmu Kesehatan Vol. 2, No. 1

Rahma, N.(2013). Hubungan Antara Pola Makan Dan Stres Dengan Kejadian Penyakit Gastritis Di Rumah Sakit Umum Massenrempulu Enrekang. Jurnal STIKES NaniH asanudin.Vol 1 No. 6

Susilawati dan Rahmawati, R. (2021).Hubungan Usia, Jenis Kelamin dan Hipertensi dengan Kejadian Diabetes Mellitus Tipe 2 di Puskesmas Tugu Kecamatan Cimanggis Kota Depok Tahun 2019, ARKESMAS (Arsip Kesehatan Masyarakat), 6(1), hal. 15–22. doi: 10.22236/arkesmas.v6i1.5829

Shinta Nuur Affisa.(2018). Faktor- Faktor Risiko Diabetes Melitus Tipe 2 Pada Laki-Laki Di Kelurahan Demangan Kota Madiun.

Suryanti.(2021). Hubungan Gaya Hidup Dan Pola Makan Dengan Kejadian Diabetes Mellitus Di Rumah Sakit Bhayangkara Kota Makasar. Jurnal Promotif Preventif. Vol. 4 No. 1

Sudarsono NC. (2015). Indikator Keberhasilan Pengelolaan Aktivitas Fisik Pada Penyandang Diabetes Melitus Tipe 2. EJKI, Vol 3 (1): 70-76

Soegondo, S., (2011). Diagnosis dan Klasifikasi Diabetes Melitus Terkini dalam: Soegondo,

S., Soewondo, P., Subekti, I., Editor. Penatalaksanaan Diabetes Melitus Terpadu bagi dokter maupun edukator diabetes. Jakarta: Fakultas Kedokteran Universitas Indonesia

Soewondo,P., dan Pramono, A.L.(2011). Prevalence, craracteristic and predictors of pre diabetes mellitus in Indonesia . Vol20.no.4

Sulistyoningsih. H. (2012). Ilmu Gizi Untuk Kesehatan Ibu Dan Anak. Jakarta: Graha Ilmu

Sheps, SG. (2005). Mayo Clinic Hipertensi, Mengatasi Tekanan Darah Tinggi. PT Intisari Mediatama. Jakarta. 26,158

Sarasaty, R. F., (2012). Faktor-Faktor Yang Berhubungan Dengan Hipertensi Pada Kelompok Lanjut Usia Di Kelurahan Sawah Baru Kecamatan Ciputat, Kota Tangerang Selatan Tahun 2011

Timah, Stefanus. (2019). Hubungan Pola Makan Dengan Kejadian Diabetes Mellitus Di Rumah Sakit Islam Sitty Maryam Kecamatan Tuminting Kota Manado. Jurnal Ilmiah Kesehatan Diagnosis14(3):209–13.

Ugahari, L. E., Mewo, Y. M., & Kaligis, S. H. M. (2016). Gambaran Kadar Glukosa Darah Puasa Pada Pekerja Kantor. Jurnal E-Biomedik, 4(2), 1–6

Usman, J., D. Rahman, and N. Sulaiman. (2020). Faktor Yang Berhubungan Dengan Kejadian Diabetes Mellitus Pada Pasien Di RSUD Haji Makassar. Jurnal Komunitas Kesehatan Masyarakat 2(1):16–22

Venkatachhalam, J.Rajesh, M.Singsh, et al. (2012).Smoking and diabetes.: A case control study in a Rural Area Of Kancheepuram Ditrict of Tamil Nadu. IOSR J. Dent. Med. Sci. JDMS Vol. 3.8-21

WHO. (2000). Obesity: Preventing and managing the global epidemic. Report of a WHO Consultation. Geneva: World Health Organization

World Health Organization. (2004). Appropriate body mass index for Asian populations: Report of a WHO Expert Consultation. Geneva: World Health Organization

World Health Organization. (2023). Obesity and overweight. Fact sheets. Retrieved from https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight

WHO.(2003). Adherence To Long-Term Therapies, WHO Library Cataloguing, Switzerland

Wan Rizky Chairunnisa .(2020). Faktor Risiko Diabetes Melitus Tipe Ii Di Wilayah Kerja Puskesmas Glugur Darat Kota Medan Tahun 2020. Fakultas Kesehatan Masyarakat Universitas Islam Negeri Sumatera Utara Medan

Widayatun, Tri. R. (2018). Ilmu Prilaku. Jakarta: CV. Sagung Seto Walls, A. C., Park, Y. J., Tortorici, M. A., Wall, A., Mcguire, A. T. & Veesler, D. (2020). Structure, Function, and Antigenicity of the SARS-CoV-2 Spike Glycoprotein. Cell, 181, 281-292.e6

Xi-tao Xie, Liu,Q, Jie Wu, Makoto W. (2009) Impact of cigarette smoking in type 2 diabetes development. 30 (6). 784–787

Yohana Alpionita.(2017). pengaruh perilkau merokok terhadap kadar gula drah: ditinjau lamanya merokok pada perokok pria Ras kulit hitam di Papua Indonesia.Skripsi. Universitas Sanata Dharma