

Determinant Factors of Type 2 Diabetes Mellitus of Visitors in the Integrated Guidance Posts of Jambi's Kenali Besar Community Health Center

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ABSTRACT

The study aims to discover the proportion and determinants of type-2 DM cases in the Integrated Guidance Posts of Kenali Besar Community Health Center in 2019. The study was a quantitative analysis with cross sectional design, the sample amounted to 278 ≥ 15 years old individuals. Study results indicated that 21.9% visitors of Integrated Guidance Posts suffered from type-2 diabetes mellitus, 18% with low education, 21.2% with family history of DM, 26.6% were smoking, 47.1% fell in the obese category of BMI, 55.8% were lacking physical activities, 23.7% with hypertension, and 64.4% fell in the central obesity category. Family history of DM, lack of physical activities, and hypertension were correlated with type-2DM cases in visitors of the Integrated Guidance Posts of Kenali Besar Community Health Center's.

INTRODUCTION

People's lifestyle and behaviors are changing due to the flow of globalization and the current epidemiological transition from communicable diseases to non-communicable diseases as the effect of changing people's lifestyle and behaviors, such as consuming fast food and junk food, high-calorie food, high-fat food, smoking and drinking alcohol, low consumption of fruits and vegetables and lack of physical activities. One of the concerning non-communicable diseases is diabetes. The classifications of diabetes mellitus are type-1 diabetes mellitus, type-2 diabetes mellitus, gestational diabetes, and other types of diabetes mellitus. Type-2 diabetes mellitus is a metabolic disease characterized by hyperglycemia that is caused by insulin secretion disorder or actions of insulin, or both. The current 90% of diabetes mellitus cases are type-2 diabetes mellitus that is characterized by insulin secretion disorders and/or insulin sensitivity disorders.

Diabetes mellitus becomes a vast issue due to its increasing prevalence and the great cost resulted from it, therefore, people's productivity and quality are decreasing. People earn low incomes because they can not work properly as a result of suffering from diabetes mellitus. According to International Diabetes Federation (IDF) in 2019, currently, diabetes mellitus is one of the fastest-growing global health emergencies in the 21st century in which 463 million people all over the world live with diabetes mellitus in 2019, and it is estimated to increase to 578 million people in 2030 and 700 million people in 2045. The global number of deaths in 2019 reached 55.4 million people in which more than half or 55% were caused by the 10 highest diseases. One of those is diabetes mellitus. Diabetes mellitus had killed one million people around the globe in 2000 that increased to 4.2 million people in 2019.

Aside from being a global health issue, diabetes mellitus also causes health issues in Indonesia. According to the Basic Health Research of the Republic of Indonesia, there was an increase of diabetes mellitus' prevalence that went up from 6.9% in 2013 to 8.5% in 2018. According to the Basic Health Research of the Republic of Indonesia, the prevalence of diabetes mellitus in Jambi Province was 1.20% in 2013, which has increased to 1.41% in 2018. According to Jambi's Basic Health Research in 2018, three regencies or cities with the highest prevalence of diabetes mellitus were Jambi City (2.93%), Batanghari (2.06%), and Sungai Penuh City (2.02%).

According to the 2019 data of Jambi's Health Office, of all Community Health Centers in Jambi, Kenali Besar Community Health Center is the Community Health Center with the highest cases of diabetes mellitus with a prevalence of 12.04% that constantly increased in the past three years, namely 2.62% in 2017, 6.41% in 2018, and 12.04% in 2019. One of the programs implemented in Community Health Centers for early detection of non-communicable diseases is Integrated Guidance Posts (Posbindu). Integrated Guidance Posts are developed by the Ministry of Health of the Republic of Indonesia that is strongly related to the effort of managing non-communicable diseases. Integrated Guidance Posts are the measure to control the risk of non-

communicable diseases in the form of continuous and independent community's participation.

According to the theory of HL. Blum (1974), there are four factors that affect the health of individuals, groups, or communities based on their degrees at affecting one's health, namely environment, behavior, health service, and heredity. Environmental factor encompasses urbanization; behavioral factors include smoking habit, body mass index, lack of physical activities, hypertension, and central obesity; health service factor includes promotional and preventive; and heredity factors, such as gender, age, family history of diabetes mellitus. Determinants of type-2 diabetes mellitus cases on visitors of the Integrated Guidance Posts of Jambi City's Kenali Besar Community Health Center have not been certainly found, and similar studies are yet to be done. Therefore, to discover the determinants of type-2 diabetes mellitus cases on visitors of the Integrated Guidance Posts of Jambi City's Kenali Besar Community Health Center, an analysis on results of the Integrated Guidance Posts that have been implemented needs to be done, so the prevention effort towards type-2 diabetes mellitus will be effective and efficient.

In view of the above, the researcher was called to conduct a study regarding determinants of type-2 diabetes mellitus cases on visitors of the Integrated Guidance Posts of Jambi City's Kenali Besar Community Health Center in 2019.

METHOD

This study was a quantitative analysis with cross-sectional study design. The study was located in two integrated guidance posts of Kenali Besar Community Health Center's working area. The research sample was the total sample, namely people visited the Integrated Guidance Posts based on the record of reported data of the Integrated Guidance Posts in 2019, which amounted to 278 samples. Data were collected by using secondary data of activity outcome of the Integrated Guidance Posts. Data were analyzed by using the chi-square test for bivariate and regression cox for multivariate analysis.

RESULT AND DISCUSSION

Research Result

Table 1. The Frequency Distribution based on Research Variables in the Working Area of Kenali Besar Community Health Center

Variable	Total (n=278)	Percentage (%)
Type-2 DM		
Yes	61	21.9
No	217	78.1
Education		
Low	50	18
High	228	82
Family History of DM		
Yes	219	78.8
No	59	21.2
Smoking		
Yes	74	26.6
No	204	73.4
BMI		
Obese	131	47.1
Normal	147	52.9
Lacking Physical Activities		
Yes	155	55.8
No	123	44.2
Hypertension		
Yes	66	23.7
No	212	76.3
Central Obesity		
Yes	179	64.4
No	99	35.6

According to Table 1, it is shown that 61 respondents suffer from type-2 DM (21.9%). 228 are highly educated (82%), 219 are without family history of DM (78.8%), 204 are not smoking (73.4%), 157 fall in Normal BMI Category (52.9%), 155 are lacking physical activities (55.8%), 212 do not suffer from hypertension (76.3%), 179 are having central obesity (64.4%).

Bivariate Analysis

Table 2. The Bivariate Analysis of Determinants of Type-2 Diabetes Mellitus Cases

Variable	DM Type 2		Total		PR (95%CI)	p-value		
	n	%	N	%				
Age								
≥40 years	61	34.7	97	61.4	100	-	0.000	
<40 years	0	0	120	100	12	100		
Gender								
Male	20	27	54	73	74	100	1.345 (0.846-2.138)	0.285
Female	41	20.1	163	79.9	20	100		
Education								
Low	18	36	32	64	50	100	1.909 (1.208-3.015)	0.014*
High	43	18.9	185	81.1	22	100		
Family History of DM								
Yes	30	50.8	29	49.2	59	100	3.592 (2.380-5.421)	0.000
No	31	14.2	188	85.8	21	100		
Smoking								
Yes	20	27.0	54	73.0	74	100	1.345 (0.846-2.138)	0.285
No	41	20.1	163	79.9	20	100		
BMI								
Obese	42	32.1	89	67.9	13	100	2.48 (1.523-4.041)	0.000
Normal	19	12.9	128	87.1	14	100		
Lacking Physical Activities								
Yes	48	31.0	107	69.0	15	100	2.930 (1.665-	0.000*
No	13	10.6	110	89.4	12	100		
Hypertension								
Yes	22	33.3	44	66.7	66	100	1.812 (1.163-	0.017*
No	39	18.4	173	81.6	21	100		
Central								
Yes	45	25.1	134	74.9	17	100	1.556 (0.929-	0.114*
No	16	16.2	83	83.8	99	100		

Table 2 shows that the proportion of type-2 diabetes mellitus on visitors of the Integrated Guidance Posts in the working area of Kenali Besar Community Health Center is higher on visitors aged ≥ 40 years compared to those aged < 40 years (0%). The proportion of type-2 diabetes mellitus on visitors of the Integrated Guidance Posts is higher on male, which amounts to 20 visitors (27%) compared to female (20.1%). The results of the statistical test through the application of the chi-square test indicate that there is no significant correlation between gender and type-2 diabetes mellitus cases (p-value = 0.285). The proportion of type-2 diabetes mellitus on visitors of the integrated guidance posts is higher on low education, which amounts to 18 visitors (36%) compared to high education (18.9%). The results of the statistical test through the application of the chi-square test indicate that family history of diabetes mellitus is significantly

correlated with type-2 diabetes mellitus cases on visitors of the Integrated Guidance Posts in the working area of Kenali Besar Community Health Center in 2019 (P-value = 0.014) in which low educated visitors are 1.909 times riskier to suffer from type-2 diabetes mellitus compared to those with high education (95% CI: 1.208 - 3.015).

The proportion of type-2 diabetes mellitus on visitors of the Integrated Guidance Posts in the working area of Kenali Besar Community Health Center is higher on visitors with family history of diabetes mellitus, which amounts to 30 visitors (50.8%) compared to visitors without family history of diabetes mellitus (14.2%). The results of the statistical test through the application of the chi-square test indicate that family history of diabetes mellitus is correlated significantly with type-2 diabetes mellitus cases on visitors of the Integrated Guidance Posts in the working area of Kenali Besar Community Health Center in 2019 (P-value = 0.000) in which visitors with family history of diabetes mellitus are 3.592 times riskier to suffer from type-2 diabetes mellitus compared to visitors of the Integrated Guidance Posts who have no family history of diabetes mellitus (95% CI: 2.380-5.421).

The proportion of type-2 diabetes mellitus on visitors of the Integrated Guidance Posts in the working area of Kenali Besar Community Health Center is higher on smoking visitors, which amounts to 20 visitors (27%) compared to non-smoking visitors (20.1%). The results of the statistical test through the application of the chi-square test indicate that there is no significant correlation between smoking and type-2 diabetes mellitus cases on visitors of the integrated guidance posts in 2019 (P-value = 0.285). This condition is consistent with the PR value of 1.345 (95% 0.846-2.138) which shows that smoking and type-2 diabetes mellitus cases are not correlated.

The proportion of type-2 diabetes mellitus on visitors of the integrated guidance posts is more occurring on visitors in the obese category of BMI, which amounts to 42 visitors (32.1%) compared to visitors in the normal BMI category (12.9%). The results of the statistical test through the application of the chi-square test indicate that BMI is correlated significantly with type-2 diabetes mellitus cases on visitors of the integrated guidance posts in the working area of Kenali Besar Community Health Center in 2019 (P-value = 0.000) in which visitors of the Integrated Guidance Posts who fall in the obese category are 2.481 times riskier to suffer from type-2 diabetes mellitus compared to visitors of the Integrated Guidance Posts who fall in the normal category (95%CI: 1.523-4.041).

The proportion of type-2 diabetes mellitus on visitors of the Integrated Guidance Posts is more occurring on visitors who lack physical activities, which amounts to 48 visitors (31%) compared to visitors who have enough physical activities (10.6%). The results of the statistical test through the application of the chi-square test indicate that lack of physical activities is correlated significantly with type-2 diabetes mellitus cases on visitors of the Integrated Guidance Posts in the Working Area of Kenali Besar Community Health Center in 2019 (P-value = 0.000) in which visitors that lack physical activities are 2.930 times riskier to suffer from type-2 diabetes mellitus compared to visitors who have enough physical activities (95%CI: 1.665-5.157).

The proportion of type-2 diabetes mellitus on visitors of the Integrated Guidance Posts in the working area of Kenali Besar Community Health Center is more occurring on visitors who suffer from hypertension, which amounts to 22 visitors (33.3%) compared to visitors who do not have hypertension (18.4%). The results of the statistical test through the application of the chi-square test indicate that hypertension is correlated significantly with type-2 diabetes mellitus cases on visitors of the Integrated Guidance Posts in the Working Area of Kenali Besar Community Health Center in 2019 (P-value =0.017) in which visitors that suffer from hypertension are 1.812 times riskier to suffer from type-2 diabetes mellitus compared to visitors who do not have hypertension (95%CI: 1.163-2.824).

The proportion of type-2 diabetes mellitus on visitors of the Integrated Guidance Posts in the working area of Kenali Besar Community Health Center is more occurring on visitors who suffer from central obesity, which amounts to 45 visitors (25.1%) compared to visitors who are not in central obesity category (16.2%). The results of the statistical test through the application of the chi-square test indicate that there is no significant correlation between central obesity and type-2 diabetes mellitus cases on visitors of the Integrated Guidance Posts in the Working Area of Kenali Besar Community Health Center in 2019 (P-value = 0.114). This condition is consistent with the PR value of 1.556 (95% 0.929-2.603) in which there is no correlation between central obesity and type-2 diabetes mellitus cases

Multivariate Analysis

Table 3. The Multivariate Analysis of Risk Factors of Type-2 Analisis DM Cases

Variable	P	aPR	95%CI
Education	0.007	2.162	1.239 – 3.772
Family History	0.000	3.444	2.074 – 5.719
Physical Activities	0.010	2.270	1.216 – 4.236
BMI	0.010	2.067	1.189 – 3.592

Table 3 indicates that level of education, family history, physical activities, and BMI are the risk factors on type-2 DM cases. According to the multivariate analysis, it is also known that family history is the most dominant variable in affecting type-2 DM cases after controlled by level of education, physical activities, and BMI. The prevalence ratio score is 3.444 (95%CI : 2.074 to 5.719), which means that visitors of the Integrated Guidance Posts who have family history of DM are 3.4 times riskier to suffer from type-2 DM cases compared to those without family history of DM after controlled by level of education, physical activities, and BMI.

DISCUSSION

Visitors of the Integrated Guidance Post in the Working Area of Kenali Besar Community Health Center in 2019 who have family history of DM have the chance to suffer from type-2 diabetes mellitus by 3.4 times higher compared visitors without family history of DM after controlled by level of education,

physical activities and BMI. There were 21.2% of respondents with family history of Diabetes. Theoretically, heredity is the causal factor of type-2 diabetes mellitus cases. Having family history of diabetes mellitus will generate more risk to suffer from the disease compared to people without family history of diabetes mellitus. When a parent suffers from DM, there is a 15% chance that it will be passed to the children. If both parents suffer from DM, there is a 75% chance that the children will suffer from the disease. The risk will be greater if it is the mother who suffers from DM (10-30%) compared to the father, because mother has more genes inherited while in the womb. There is a 10-90% risk that siblings will get diabetes mellitus if the sufferers twins.¹⁶

These findings are consistent with Nasution et al. (2021) that studied the working area of Tanjung Rejo Community Health Center, which have proved the correlation between family history of DM and diabetes mellitus cases ($p = 0.032$) with an OR score of 5.6 (95%CI: 1.038-30.204), which means that respondents with family history of DM are having the chance to get diabetes mellitus by 5.6 times than those without family history of DM. ¹⁶ Gayatri (2019) acquired a result that history of DM is correlated with type-2 diabetes mellitus ($p = 0.004$) with PR = 4.688 (95%CI: 0.808-27.181), which means that respondents with history of DM have 4.688 times more risks to get type-2 diabetes mellitus compared to those without diabetes mellitus history.¹⁷ However, these findings are not in line with Usman et al. (2020) who did not find the correlation between family history of DM and diabetes mellitus in RSUD Haji Makassar ($p= 0.938$).

The visitors of the Integrated Guidance Posts in the Working Area of Kenali Besar Community Health Center in 2019 who fell in the obese category have the chance to suffer from type-2 diabetes mellitus by two times higher compared to visitors of the Integrated Guidance Posts in the normal category of BMI. A person with nutritional excess will have increased leptin levels in his body. Leptin has a function as the regulator for the increasing level of fat in the body, turning fat into energy and causing satiety. Increased body weight might cause leptin levels to increase because leptin works in periphery and central neural systems. Leptin might inhibit the phosphorylation of insulin receptor substrate-1 (IRS) which can result in inhibited glucose uptake and increased blood sugar levels.¹⁸

These findings are consistent with Asmarani et al. (2017) who indicated that BMI is correlated with type-2 diabetes mellitus in Kendari City Public Hospital with an OR score of 7.164 (95%CI: 3.365-15.250), which means that obese respondents have the chance to get type-2 diabetes mellitus by 7.164 times compared to non-obese respondents.¹⁹ Mahfudzoh et al (2019) found the correlation between BMI and type-2 diabetes mellitus cases in Janti Community Health Center ($p= 0.000$) with an OR score of 43.240 (95%CI: 11.366-164.503), which means that obese respondents have the chance to suffer from type-2 diabetes mellitus by 43.240 times than non-obese respondents.²⁰

However, these findings are not in line with the results of Rina et al. (2020) which showed that body mass index is not correlated with blood glucose levels of the sufferers of type-2 diabetes mellitus ($p= 0.734$). This condition occurs because a person who is on diet has been given with knowledge regarding the

portion of food to be consumed in a day, therefore, to find out a proper body weight, it must be adjusted with the body height.²¹ Junaidi et al. (2021) acquired that BMI is not correlated with diabetes mellitus cases in Mangasa Community Health Center ($p = 0.065$), OR 0.242 (95%CI: 0.06-0.91).

The visitors of the Integrated Guidance Posts in the Working Area of Kenali Besar Community Health Center in 2019 who lacked physical activities have the chance to suffer from type-2 diabetes mellitus 2.2 times higher compared to visitors of the Integrated Guidance Posts who did not lack physical activities. Physical activities have a massive impact on the increase in muscle glucose. Muscles spend the available glucose during a physical activity or sport; thus, muscles will obtain glucose in blood if the glucose is decreasing. This condition will decrease blood glucose and the control towards blood sugar becomes greater.²²

Doing a proper physical activity might prevent diabetes mellitus. Physical activities with medium intensity improve insulin sensitivity by 51%, while physical activities with high intensity enhance insulin sensitivity by 85%. Physical activities bring massive benefits, namely improving blood circulations, decreasing body weight, and better sensitivity towards insulin, so blood sugar level can be improved. Proper physical activities will improve the metabolism of carbohydrate.²³

These findings are consistent with the result of Trisnadewi et al (2019) who found that physical activities are correlated with type-2 diabetes mellitus cases in North Denpasar III Community Health Center ($p = 0.041$) and R 0.529 with a positive correlation coefficient, which means that the lower physical activities conducted by a person, the higher the risk to get type-2 diabetes mellitus²⁴ Astuti et al. (2020) proved that physical activities are correlated with type-2 diabetes mellitus cases ($p = 0.038$) in Muna Regency Public Hospital. An OR score of 3.00 was acquired (95%CI: 1.046-8.603), which means that respondents with low physical activities have the chance to suffer from type-2 diabetes mellitus by 3.00 times than those with high physical activities.²⁵

The visitors of the Integrated Guidance Posts of Kenali Besar Community Health Center in 2019 who were lacking physical activities have the chance to suffer from type-2 diabetes mellitus by 2.2 times compared to visitors of the Integrated Guidance Posts who did not lack physical activities. Another study in South Korea shows that level of education is the risk factor of DM cases. Multivariate results show that the education level of Elementary school has the highest risk, which is 1.41 compared to those with higher education levels²⁶. High Education allows people to be more concerned towards their health and tend to conceive healthy behaviors. High education allows people to seek more information, including the information associated with health and healthy behaviors. Therefore, this aspect might reduce the risk of type-2 DM incidents.

CONCLUSION AND RECOMENDATION

This study concluded that the visitor distributions of the Integrated Guidance Posts are as follows: 21.9% suffered from type-2 diabetes mellitus, 18% were low educated, 21.2% have family history of DM, 26.6% were smoking, 47.1%

fell in the obese BMI category, 55.8% were lacking physical activities, 23.7% suffered from hypertension, and 64.4% were in the category of central obese. Family history of DM, BMI, lack of physical activities, and hypertension were correlated with type-2 diabetes mellitus cases on visitors of the Integrated Guidance Posts in the Working Area of Jambi City's Kenali Besar Community Health Center.

The dominant risk factor of type-2 DM cases is family history after being controlled by level of education, physical activities, and BMI. Kenali Besar Community Health Center can improve the effectiveness of its existing programs, especially the programs that might reduce the risk factor of type-2 DM, people can implement the healthy and hygiene life pattern, such as improving physical activities and managing dietary habits.

REFERENCES

- Sam N, Lestari H, Afa JR. Analisis Hubungan Activity of Daily Living (ADL), Aktivitas Fisik dan Kepatuhan Diet terhadap Kadar Gula Darah Pasien Diabetes Melitus di Wilayah Kerja Puskesmas Poasia Tahun 2017. *J Ilm Kesehat Masy* [Internet]. 2017;2(4):1-12. Available from: <http://ojs.uho.ac.id/index.php/JIMKESMAS/article/viewFile/3414/2569>
- Decroli E. *Diabetes Melitus Tipe 2*. Padang: Pusat Penerbitan Bagian Ilmu Penyakit Dalam; 2019.
- L C, Kaunang WPJ, Langi FLFG. Hubungan Aktivitas Fisik dengan Kejadian Diabetes Melitus pada Pasien Rawat Jalan di Rumah Sakit Umum Daerah Kota Bitung. *J KESMAS* [Internet]. 2018;7(5). Available from: <https://ejournal.unsrat.ac.id/index.php/kesmas/article/view/22527/22219>
- IDF. *IDF Diabetes Atlas Ninth Edition 2019*. Int Diabetes Fed [Internet]. 2019;1-176. Available from: <https://diabetesatlas.org/en/resources/>
- WHO. *The Top 10 Causes of Death* [Internet]. World Health Organization. 2020. Available from: <https://www.who.int/news-room/fact-sheets/detail/the-top-10-causes-of-death>
- IDF. *Diabetes facts & figures* [Internet]. Internasional Diabetes Federation. 2020. Available from: <https://idf.org/aboutdiabetes/what-is-diabetes/facts-figures.html>
- Riskesdas. *Riset Kesehatan Dasar 2013*. Kementerian Kesehatan Republik Indonesia. Badan Penelitian dan Pengembangan Kesehatan; 2013.
- Kementrian Kesehatan RI. *Laporan Nasional Riskesdas*. 2018.

- Riskesmas. Laporan Riskesdas Provinsi Jambi 2018. Badan Penelitian dan Pengembangan Kesehatan; 2018.
- Dinas Kesehatan Kota Jambi. Profil Kesehatan Kota Jambi Tahun 2019. 2019.
- Mahdur RR, Sulistiadi W. Evaluasi Program Pos Pembinaan Terpadu Penyakit Tidak Menular (Posbindu PTM). J Ilm Kesehat Masy [Internet]. 2020;12(1):43-9. Available from:
<https://jikm.upnvj.ac.id/index.php/home/article/view/55/49>
- Notoatmodjo S. Promosi Kesehatan dan Perilaku Kesehatan. Jakarta: Rineka Cipta; 2012.
- Kurniawaty, Evi; Yanita B. Faktor-Faktor yang Berhubungan dengan Kejadian Diabetes Melitus Tipe II. Med JournalOf Lampung Univ [Internet]. 2016;5(2):27-31. Available from:
<http://juke.kedokteran.unila.ac.id/index.php/majority/article/view/1073>
- Kementerian Kesehatan RI. Pusat Data dan Informasi Kementerian Kesehatan RI [Internet]. 2020. Available from:
[https://www.kemkes.go.id/download.php?file=download/pusdatin/infodatin/Infodatin 2020 Diabetes Melitus.pdf](https://www.kemkes.go.id/download.php?file=download/pusdatin/infodatin/Infodatin%20Diabetes%20Melitus.pdf)
- P2PTM Kemenkes RI. Epidemiologi Dan Kebijakan Pengendalian Diabetes Melitus Di Indonesia [Internet]. Kementerian Kesehatan Republik Indonesia. 2018. Available from:
http://p2ptm.kemkes.go.id/uploads/VHcrbkVobjRzUDN3UCs4eUJ0dVBndz09/2018/11/Paparan_dr_Cut_Putri_Ariane_MH_Kes_Media_briefing_Anak_Juga_Bisa_Diabetes_31_Oktober_2018.pdf
- Nasution F, Andilala, Siregar AA. Faktor Risiko Kejadian Diabetes Mellitus. J Ilmu Kesehat [Internet]. 2021;9(2):99-117. Available from:
<https://ejurnaladhkdr.com/index.php/jik/article/view/304/212>
- Gayatri RW. Hubungan Faktor Riwayat Diabetes Mellitus Dan Kadar Gula Darah Puasa Dengan Kejadian Diabetes Mellitus Tipe 2 Pada Pasien Usia 25-64 Tahun Di Puskesmas Kendal Kerep Kota Malang. Prev Indones J Public Heal [Internet]. 2019;4(1):56. Available from:
<http://journal2.um.ac.id/index.php/preventia/article/view/8331/3978>
- Vitianoza N, Nurmaini N, Ashar T. Hubungan Indeks Massa Tubuh dan Lama Penyemprotan dengan Diabetes Mellitus pada Petani di Desa Juhar Ginting Sadanioga Kabupaten Karo Tahun 2018. Miracle J. 2021;1(1):8-13.

- Asmarani, Tahir AC, Adryani A. Analisis Faktor Risiko Obesitas dan Hipertensi dengan Kejadian Diabetes Melitus Tipe 2 di Rumah Sakit Umum Daerah Kota Kendari. *J Ilm Fak Kedokt Univ Halu Oleo* [Internet]. 2017;4(2):322-31. Available from: <http://ojs.uho.ac.id/index.php/medula/article/view/2807/2096>
- Mahfudzoh BS, Yunus M, Ratih SP. Hubungan Antara Faktor Risiko Diabetes Melitus Yang Dapat Diubah dengan Kejadian DM Tipe 2 di Puskesmas Janti Kota Malang. *Sport Sci Heal* [Internet]. 2019;1(1):59-71. Available from: <http://journal2.um.ac.id/index.php/jfik/article/view/9990/4492>
- Sagita RW, Rusita I, Anto YV. Hubungan Indeks Massa Tubuh (Imt) Dengan Kadar Glukosa Darah Pada Pasien Dengan Diabetes Melitus Tipe 2 Di RSUD Wates. 2020;09(1):14-8.
- Sari N, Purnama A. Aktivitas Fisik dan Hubungannya dengan Kejadian Diabetes Mellitus. *Wind Heal J Kesehat* [Internet]. 2019;2(4):368-81. Available from: <http://jurnal.fkmumi.ac.id/index.php/woh/article/view/213/89>
- Suaidah. Analisis Determinan Kejadian Diabetes Mellitus Tipe 2 Pada Pasien Rawat Inap Di Rsud Deli Serdang Tahun 2018. *Indones J Pharm*. 2019;
- Trisnadewi NW, Widarsih NL, Pramesti TA. Hubungan Obesitas Sentral dan Aktivitas Fisik dengan Kejadian Diabetes Melitus Tipe 2 di Puskesmas III Denpasar Utara. *Bali Med J* [Internet]. 2019;6(2):119-29. Available from: <https://doi.org/10.36376/bmj.v6i2>
- Astuti WOW, Zainuddin A, Lisnawaty. Analisis Faktor Risiko Kejadian Penyakit Diabetes Melitus Tipe 2 Pada Pasien Rawat Inap Di Rumah Sakit Umum Daerah Kabupaten Muna Tahun 2019. *J Gizi dan Kesehat Indones* [Internet]. 2020;1(2):80-6. Available from: <http://ojs.uho.ac.id/index.php/gikes/article/view/17326/11558>
- Kim JH, Noh J, Choi JW, Park EC. Association of education and smoking status on risk of diabetes mellitus: A population-based nationwide cross-sectional study. *Int J Environ Res Public Health*. 2017;14(6):1-9.