LUX MENSANA

Volume 3, Nomor 4, 2024
Hal. 410-420

Original Research Article

THE RELATIONSHIP BETWEEN ENVIRONMENTAL FACTORS AND QUALITY OF LIFE OF TYPE 2 DIABETES MELLITUS

Abigail Sharon Kusuma[1)], Ismonah[1)*], Mugi Hartoyo[2)]
[1)]STIKES Telogorejo Semarang, [2)]Poltekkes Kemenkes Semarang
*Corresponding Author, E-mail: ismonah@stikestelogorejo.ac.id

ABSTRACT

Introduction. Type 2 diabetes mellitus (DM) is a group of metabolic diseases characterized by hyperglycemia, which causes complications and affects quality of life. Environmental factors influence the quality of life of DM patients. This study aimed to determine the relationship between environmental factors and the quality of life of type 2 DM patients at the Manyaran Public Health Center, Semarang City. **Methods.** This research was quantitative study with a cross-sectional approach. Sixty-three respondents were involved in this study, which was determined using a simple random sampling technique. The Perceived Neighborhood Environment questionnaire measures environmental factors, and DQOL measures quality of life. **Result&Analysis.** The analysis results showed that most respondents were >65 years old at 42.9%, 61.9% were female, and 38.1% had primary school as their last education. The analysis results also showed that most respondents have good environmental factors (98.4%) and a high quality of life (79.4%). **Discussion.** The results of the Spearman Rank test stated that there was a significant relationship between environmental factors and the quality of life of type 2 DM patients at the Manyaran Public Health Center (p-value 0.000), with the strength of moderate and positive (r = 0.467), where the better the environment, the higher the quality of life.

Keywords: diabetes mellitus type 2, environmental factors, quality of life

INTRODUCTION

Type 2 diabetes mellitus is a group of metabolic diseases characterized by hyperglycemia/high blood sugar levels (Murtiningsih, Pandelaki and Sedli, 2021). Most (90-95%) of the Indonesian population suffers from type 2 diabetes mellitus due to insulin retention or metabolic disorders in the pancreas in secreting insulin so that the insulin produced is inadequate and insulin work is ineffective (Kemenkes RI, 2020; Setia *et al.*, 2021; Lestari, Zulkarnain and Sijid, 2021). IDF Diabetes Atlas 10th Edition Committee (2021) states that in 2030 an estimated 643 million people aged 20-79 years worldwide will suffer from diabetes and this number is projected to increase to 783 million in 2045 with a percentage of 90-95% being sufferers of type 2 diabetes mellitus.

The 2023 Indonesian Health Survey recorded that at least 877 thousand people in Indonesia suffer from diabetes mellitus (Munira *et al.*, 2023). Central Java ranks 3rd highest in patients with the most diabetes in Indonesia, amounting to 13.5% of all cases of diabetes mellitus in Indonesia in 2023 (Munira *et al.*, 2023).

Data from Dinkes Kota Semarang (2022) reported that the prevalence of type 2 diabetes mellitus patients at the Manyaran Health Center reached 838 cases, which ranked first in the West Semarang District. In addition, data from a preliminary study on December 15-20, 2023 showed that the number of type 2 diabetes mellitus patients at the Manyaran Health Center increased by 16.4% with a total of 838 patients in 2022 to 1,002 patients in 2023.

The results of the 2020 RISKESDAS stated that 25% of type 2 diabetes mellitus sufferers had just found out that they had DM (Wijayanti *et al.*, 2022). This shows that often people with diabetes mellitus, especially type 2, are initially unaware that they have diabetes, they usually only realize it after they experience various complications and are diagnosed by a doctor as having diabetes (Maruf and Palupi, 2021). Complications of type 2 diabetes can cause patients to experience disability or decreased function both physically, mentally, and socially which are domains of quality of life (Maruf and Palupi, 2021). Quality of life is influenced by four dimensions, namely physical, psychological, social, and environmental (Purba, 2016).

Aspects in the domain of environment include financial resources, freedom, physical safety and security, health and social care: accessibility and quality, home environment, opportunities to obtain new information and skills, participation and opportunities for recreation / leisure and physical environment (pollution / noise / traffic / climate) (Purba, 2016). The environmental domain also classified into two, namely physical and social environments. The physical environment is related to physical aspects including air pollution, food and water contamination, radiation, toxic compounds, waste or garbage and habitat changes, while the social environment includes socio-economic, socio-political and socio-cultural (Islam *et al.*, 2021).

Environmental factors, both physical and social, have an impact/influence on the lives of type 2 diabetes mellitus patients (Irawan, Al Fatih and Faishal, 2021). Sepriani (2022) conducted a study on the relationship between physical environmental factors, namely temperature, light, and distance from home to road with the quality of life of type 2 diabetes mellitus patients with the results that there was a relationship between bedroom temperature, light, and distance from home to road with the quality of life of type 2 DM sufferers with p-value (0.000, 0.005, and 0.018). Research by Umam, Solehati and Purnama (2020) at the Wanaraja Health Center, Garut Regency on 91 respondents with type 2 diabetes mellitus illustrated that 10 (11%) of 91 respondents had very good social relationships and 23 (25%) of 91 respondents had good social relationships with good quality of life, while 5 (5.5%) of 91 respondents had poor social relationships with poor quality of life.

Based on the phenomena and results of previous studies, environmental

factors have a close relationship with the quality of life of type 2 diabetes mellitus patients. Both good and bad environments will have an impact on the quality of life of type 2 diabetes mellitus patients. Therefore, this study aims to examine the "Relationship between Environmental Factors and the Quality of Life of Type 2 Diabetes Mellitus Patients at the Manyaran Health Center, Semarang City".

METHOD AND ANALYSIS

The design of this study is a quantitative method with a cross-sectional approach. In this study, the Perceived Neighborhood Environment and Diabetes Quality of Life (DQOL) questionnaires are used to measure the environment factors and quality of life. Data collection was carried out once during the March DM Prolanis activity at the Manyaran Health Center on 63 respondents of type 2 DM patients. The sampling technique is simple random sampling by randomizing the names of prospective respondents using a spinwheel. The data analysis used was univariate analysis with frequency distribution for respondent characteristics, environmental factors, and quality of life of type 2 DM patients and bivariate analysis with Spearman rank to determine the relationship between environmental factors and quality of life of type 2 DM.

RESULT

Table 1. Frequency Distribution of Respondent Characteristics Based on Age, Gender, and Last Education of Type 2 Diabetes Mellitus Patients at Manyaran Health Center March 6, 2024 (n=63)

Characteristics	F	%
Age		
Early Adulthood (26-35 years)	1	1.6
Late Adulthood (36-45 years)	2	3.2
Early Elderly (46-55 years)	13	20.6
Late Elderly (56-65 years)	20	31.7
Seniors (>65 years)	27	42.9
Genders		
Men	24	38.1
Women	39	61.9
Last Education		
Elementary School	24	38.1
Junior High School	9	14.3
Senior High School	13	20.6
Bachelor Degree	10	15.9
Not Schooling	7	11.1
Total	63	100

Table 1 show that from 63 respondents, most are seniors (age >65 years) (27 people, 42.9%), women (39 people, 61.9%), and elementary school educated (24 people, 38.1%).

Table 2. Frequency Distribution of Environmental Factors and Quality of Life of Type 2 Diabetes Mellitus Patients at Manyaran Health Center March 6, 2024 (n=63)

Characteristics	F	%
Environmental Factors		
Bad Environment	0	0
Medium Environment	1	1.6
Good Environment	62	98.4
Quality of Life		
Low Quality of Life	0	0
Medium Quality of Life	13	20.6
High Quality of Life	50	79.4
Total	63	100

Based on table 2, shown that most respondents (98.4%) have a good

environment and 50 out of 63 (79.4%) respondents have a high quality of life.

Table 3. Relationship between Environmental Factors and Quality of Life of Type 2 Diabetes Mellitus Patients at Manyaran Health Center

Variables	mean	n	r	p-value
Environmental Factors	81,84	63	0.467	0.000
Quality of Life	69.75			

Table 3 show that that the mean value of environmental factors is 81.84 and the mean value of the quality of life of type 2 diabetes mellitus patients is 69.75. The results of the Spearman Rank test state that there is a significant relationship between environmental factors and the quality of life of type 2 diabetes patients at the Manyaran Health Center with a p-value of 0.000 < 0.05 with a moderate positive direction and strength of the relationship (r = 0.467) where the better the environment, the higher the quality of life.

DISCUSSION

a. Univariate Analysis

The results of the study stated that the majority of respondents with type 2 diabetes at the Manyaran Health Center were in the elderly age group (>65 years) with a total of 27 (42.9%) out of 63 respondents. This study is in line with research conducted by Milita, Handayani and Setiaji (2021) in analyzing type 2 diabetes mellitus patients in Indonesia which stated that 38,695 (67%) of 57,793 type 2 diabetes mellitus patients were over 65 years old. Age factors influence the incidence of type 2 diabetes mellitus, this is because many changes occur during old age, including decreased insulin production by pancreatic beta cells, lack of muscle mass, vascular changes, obesity caused by lack of physical activity and unbalanced food intake, frequent use of drugs, and genetic factors which causes increased glucose intolerance (Kurdi *et al.*, 2021; Fatria, Maidar and Arifin, 2022).

From the results of the study, it can be seen that the majority of type 2 diabetes mellitus patients at the Manyaran Health Center were women with a total of 39 (61.9%) out of 63 respondents. This is in line with the research of Milita, Handayani and Setiaji (2021) in analyzing type 2 diabetes mellitus patients in Indonesia which stated that 31,998 (55.4%) out of 57,793 were women. In this study, the majority of respondents were women with an advanced age of > 65 years so that they had experienced menopause. Women are more at risk of developing type 2 diabetes mellitus than men because during menopause, the production of estrogen and progesterone hormones decreases, where both of these hormones have the ability to increase the insulin response in the blood, so that when estrogen and progesterone hormones decrease, the insulin response in the blood also decreases, and glucose levels increase (Soelistijo *et al.*, 2021). In addition, women have a fat content of 20-25% of their body weight, women's higher fat content compared to men can cause

insulin resistance so that women are 3-7 times more at risk of developing type 2 diabetes mellitus than men (Imelda, 2018).

The results of the study stated that most type 2 diabetes mellitus patients at the Manyaran Health Center with a total of 24 (38.1%) of 63 respondents had low education (elementary school). This is in line with the research of Milita, Handayani and Setiaji (2021) in analyzing type 2 diabetes mellitus patients in Indonesia which stated that 48,824 (84.5%) of 57,793 had low education (did not attend school up to junior high school). When viewed from gender and age, most are women and elderly (>65 years) so that at that time they had not received enough support to obtain a good education. Sari and Khoiri (2023) in their research revealed that compulsory education was only echoed by the Indonesian government 40 years ago during the New Order era, where the government promised to provide facilities and infrastructure for learning but education costs were not free, so that various obstacles occurred in the field which caused this compulsory education program to not be implemented properly. During the New Order era, women tended to be looked down upon and were not allowed to pursue higher education (Aliyah, Komariah and Chotim, 2018).

From the results of the study, it can be seen that most of the 62 (98.4%) of the 63 respondents of type 2 diabetes mellitus patients at the Manyaran Health Center have a good environment. This is in line with the research of Marsitha, Syarif and Sofia (2023) on type 2 diabetes mellitus patients at the General Hospital in Aceh Province which stated that 190 (66.4%) of the 286 respondents had a good environment. Respondents in this study were spread across 3 sub-districts that were under the guidance of the Manyaran Health Center, namely Kembangarum Sub-district, Manyaran Sub-district, and Krapyak Sub-district which are included in the West Semarang District. These three sub-districts are urban areas with good environmental conditions. Kembangarum and Manyaran Sub-districts are lowland areas with hills so that access roads to residents' houses must pass through hills, but most of the roads are relatively good, paved, and easy for vehicles to pass, while Krapyak Sub-district is a lowland area without hills so that access roads to residents' houses are mostly flat, paved, and also easy for vehicles to pass (Dinkes Kota Semarang, 2022b).

A good environment for type 2 diabetes mellitus patients is influenced by the environmental conditions of the diabetes mellitus patient's residence which can improve their health conditions including the availability of places to exercise, the availability of parks/places with beautiful green plants, the availability of restaurants/eating places with healthy food that is suitable for a diabetes mellitus diet, minimal environmental noise levels, minimal environmental pollution levels, the existence of a supportive community in providing motivation / psychological support to diabetes mellitus patients to stay

healthy, enthusiastic, and avoid complications / diabetes mellitus that is getting worse (Gariepy, 2014; Dendup *et al.*, 2018; Wong *et al.*, 2018; Beulens *et al.*, 2022).

The results of the study stated that most of the 50 (79.4%) of the 63 respondents of type 2 diabetes mellitus patients at the Manyaran Health Center had a high quality of life. This is in line with the research of Manurung and Darungan (2021) on diabetes mellitus patients at the Teladan Health Center, Medan, North Sumatra Province, which stated that 59 (72.2%) of the 81 respondents had a good quality of life. A high quality of life is obtained when diabetes mellitus patients are satisfied with health services, treatment, family support, and general life satisfaction, and are not worried about work, social activities, success of actions, and other things (Bujang *et al.*, 2018). Good quality of life includes subjective and objective aspects, subjective good quality of life is a person's perception that their life has meaning, is happy, satisfied, and prosperous, while objective good quality of life is when biological needs and basic needs can be met, and self-potential can be developed in accordance with the cultural norms of the place where a person lives (Jamaruddin and Sudirman, 2022).

b. Bivariate Analysis

The test results stated that there was a significant relationship between environmental factors and the quality of life of type 2 diabetes patients at the Manyaran Health Center with a p-value of 0.000 <0.05. The relationship between the two variables was positive with a moderate relationship strength with an r value of 0.467 where the better the environment, the higher the quality of life.

This is in line with the research of Haerani *et al.* (2023) on 138 type 2 diabetes patients at the Barombong Health Center, Makassar City which stated that there was a significant relationship between house temperature and noise in the home environment with the quality of life of type 2 diabetes mellitus patients with a p-value of 0.000. In addition, Komaratat, Auemaneekul and Kittipichai (2021) in their study on 188 type 2 diabetes mellitus patients at a tertiary hospital in Thailand stated that there was a significant relationship between social support from the surrounding environment and the quality of life of type 2 diabetes mellitus patients with a p-value of 0.002. Luo *et al.* (2023) on their study stated that there was a significant relationship between social support from the surrounding environment and the quality of life of patients with type 2 diabetes mellitus with a moderate positive relationship strength of 0.542.

In this study, the environmental factors studied in relation to the quality of life of patients with diabetes mellitus were divided into 5 domains, namely physical conditions, land use and quality of service, values and norms in society, social capital, and social order. Physical conditions related to the quality of life of patients with type 2 diabetes mellitus include

environmental beauty, the level of crowds and noise in the environment, the presence of garbage around the environment, environmental damage, and the attractiveness of the residential environment. According to Pramithasari (2019) the presence of green plants around the environment creates beauty and beauty that can improve a person's psychological health which also affects the improvement of their quality of life. Noise and crowds can trigger stress where the production of the hormone cortisol increases causing the body's sensitivity to insulin to decrease which can eventually cause insulin resistance so that blood glucose increases, if stress is prolonged, it can affect the quality of life of patients with type 2 diabetes mellitus (Ohlwein *et al.*, 2019).

Utami, Pane and Hasibuan (2023) stated that garbage scattered in the environment can cause unpleasant odors and create negative visuals, besides that it can also contaminate clean water sources, soil, and air which can be risky to public health and disrupt the lives and social welfare of the community and their quality of life. In addition, environmental damage caused by irresponsible human actions causes pollutants to increase so that acid rain can occur, damage to the ozone layer, increased UV rays that affect the environmental aspects of the quality of life (Zairin, 2021).

The domain of land use and service quality includes the availability of open spaces such as parks, sports venues, and places to relax, public facilities such as bus stops, stations, motorcycle taxi bases, shopping centers, health service centers, and the security of the surrounding environment. Open spaces such as parks, sports venues, and places to relax can be a place to relieve stress from busyness to take a break with loved ones or with neighbors that have an impact on a person's psychological health and improve their quality of life (Pramithasari, 2019).

The availability of health service centers coupled with high quality health services including reliability, responsiveness, confidence, tangibles, and empathy can increase individual satisfaction which affects their quality of life (Yunike *et al.*, 2023). Good, conducive, and safe living conditions help individuals create a perception of a good life, and will encourage activities in it, create positive feelings, and have an impact on improving the quality of life (Kiling and Bunga, 2019).

The domain of values and norms in society, social capital, and social order are related to the social environment around where they live. Leuwol *et al.* (2023) stated that environmental factors such as good community culture, maintained social interactions, and strong togetherness can reduce stress levels so that they can increase quality of life. Social support is also one of the most potential resources in the treatment process for chronic diseases such as type 2 diabetes mellitus, which can increase patient compliance and improve their quality of life (Li, Wang and Shan, 2016).

In this study, most of the environmental factors studied were related to the psychological domain, social domain, and environmental domain of quality of life. In addition to environmental factors, there are other factors that are thought to have a stronger relationship with the quality of life of type 2 diabetes mellitus patients such as age, gender, treatment, complications, family support, physical health, psychological health, health services, marital status, economic level, education, and spirituality (Purwaningsih, 2018; Destriande *et al.*, 2021).

CONCLUSION

Based on the results of the study, it can be concluded that the majority of respondents were aged >65 years as many as 42.9%, female gender as many as 61.9%, and the last education was elementary school as many as 38.1%. Most (98.4%) of type 2 diabetes mellitus patients at Manyaran Health Center have a good environment and 1.6% have a moderate environment. Most (79.4%) of type 2 diabetes mellitus patients at Manyaran Health Center have a high quality of life and 20.6% have a moderate quality of life. There is a significant relationship between environmental factors and the quality of life of type 2 diabetes patients at Manyaran Health Center with a p-value of 0.000 <0.05 with a moderate positive direction and strength of 0.467 where the better the environment, the higher the quality of life. It is recommended that further research conduct direct observations to assess environmental factors in type 2 diabetes mellitus patients and develop a questionnaire to measure neighborhood living area in type 2 diabetes mellitus patients which are related to all domains of quality of life.

REFERENCES

Aliyah, I.H., Komariah, S. and Chotim, E.R. (2018) 'Feminisme Indonesia dalam Lintasan Sejarah', *TEMALI : Jurnal Pembangunan Sosial*, 1(2), pp. 140–153. Available at: https://doi.org/10.15575/jt.v1i2.3296.

Beulens, J.W.J. *et al.* (2022) 'Environmental risk factors of type 2 diabetes—an exposome approach', *Diabetologia*, 65(2), pp. 263–274. Available at: https://doi.org/10.1007/s00125-021-05618-w.

Bujang, M.A. *et al.* (2018) 'A Revised Version of Diabetes Quality of Life Instrument Maintaining Domains for Satisfaction, Impact, and Worry', *Journal of Diabetes Research*, 2018. Available at: https://doi.org/10.1155/2018/5804687.

Dendup, T. *et al.* (2018) 'Environmental Risk Factors for Developing Type 2 Diabetes Mellitus: A Systematic Review', *International Journal of Environmental Research and Public Health*, 15(1). Available at: https://doi.org/10.3390/ijerph15010078.

Destriande, I.M. *et al.* (2021) 'Faktor Yang Mempengaruhi Kualitas Hidup Pada Lanjut Usia', *PSIKOWIPA (Psikologi Wijaya Putra)*, 2(1), pp. 1–9. Available at: https://doi.org/10.38156/psikowipa.v2i1.41.

Dinkes Kota Semarang (2022a) 'Profil Kesehatan 2022 Dinas Kesehatan Kota Semarang', *Dinas Kesehatan Kota Semarang*, 6(1), pp. 1–6. Available at: https://dinkes.semarangkota.go.id/co

ntent/menu/7.

Dinkes Kota Semarang (2022b) *Profil Puskesmas Manyaran*. Available at: https://dinkes.semarangkota.go.id/manyaran/page/31.

Fatria, I., Maidar and Arifin, V.N. (2022) 'Faktor-Faktor yang Berhubungan dengan Penyakit Diabetes Mellitus pada Lansia di Wilayah Kerja Puskesmas Kecamatan Sukakarya Kota Sabang Tahun 2022', *Journal of Health and Medical Science*, 1(4), pp. 29–40. Available at: https://pusdikra-publishing.com/index.php/jkes/article/view/883/767.

Gariepy, G. (2014) 'Neighbourhood Characteristics and Depression in Community-Dwellers with and without a Chronic Condition', (December). Available at: https://doi.org/10.13140/RG.2.2.14490.44488.

Haerani, H. *et al.* (2023) 'The Relationship Between The Physical Environment and Quality of Life for Patients With Type 2 Diabetes Mellitus', *International Journal of Statistics in Medical Research*, 12, pp. 275–282. Available at: https://doi.org/10.6000/1929-6029.2023.12.32.

IDF Diabetes Atlas 10th Edition Committee (2021) *International Diabetes Federation, Diabetes Research and Clinical Practice*. Available at: https://doi.org/10.1016/j.diabres.2013.10.013.

Imelda, S. (2018) 'Faktor-Faktor Yang Mempengaruhi Terjadinya diabetes Melitus di Puskesmas Harapan Raya Tahun 2018', *Scientia Journal*, 8(1), pp. 28–39. Available at: https://doi.org/10.35141/scj.v8i1.406.

Irawan, E., Al Fatih, H. and Faishal (2021) 'Faktor Faktor Yang Mempengaruhi Kualitas Hidup Pasien Diabetes Mellitus Tipe Ii Di Puskesmas Babakan Sari', *Jurnal Keperawatan BSI*, 9(1), pp. 74–81. Available at: http://ejurnal.ars.ac.id/index.php/keperawatan/article/view/483.

Islam, F. *et al.* (2021) *Dasar-Dasar Kesehatan Lingkungan, Yayasan Kita Menulis*. Medan: Yayasan Kita Menulis.

Jamaruddin, J. and Sudirman, S. (2022) 'Dimensi Pengukuran Kualitas Hidup Di Beberapa Negara', *Jurnal Pallangga Praja (JPP)*, 4(1), pp. 51–63. Available at: https://doi.org/10.61076/jpp.v4i1.2640.

Kemenkes RI (2020) 'Hasil Riset Kesehatan Dasar Tahun 2020', *Kementrian Kesehatan RI*, 53(9), pp. 1689–1699. Available at: https://www.badankebijakan.kemkes.go.id/laporan-hasil-survei/.

Kiling, I.Y. and Bunga, B.N.K. (2019) 'Pengukuran dan Faktor Kualitas Hidup pada Orang Usia Lanjut', *Journal of Health and Behavioral Science*, 1(3), pp. 149–165. Available at: https://doi.org/10.35508/jhbs.v1i3.2095.

Komaratat, C., Auemaneekul, N. and Kittipichai, W. (2021) 'Quality Of Life for Type II Diabetes Mellitus Patients in a Suburban Tertiary Hospital in Thailand', *Journal of Health Research*, 35(1), pp. 3–14. Available at: https://doi.org/10.1108/JHR-05-2019-0100.

Kurdi, F. *et al.* (2021) 'Angka Kejadian Diabetes Mellitus Pada Lansia Middle Age Di Masa Pandemi Covid-19', *Jurnal Ilmiah Keperawatan (Scientific Journal of Nursing)*, 7(2), pp. 282–288. Available at: https://doi.org/10.33023/jikep.v7i2.834.

Lestari, Zulkarnain and Sijid, S.A. (2021) 'Diabetes Melitus: Review Etiologi, Patofisiologi, Gejala, Penyebab, Cara Pemeriksaan, Cara Pengobatan Dan Cara Pencegahan', *UIN Alauddin Makassar*, (November), pp. 237–241. Available at: http://journal.uin-alauddin.ac.id/index.php/psb.

Leuwol, F.S. *et al.* (2023) 'Pengaruh Kualitas Lingkungan Terhadap Kesejahteraan Psikologis Individu di Kota Metropolitan', *Jurnal Multidisiplin West Science*, 2(08), pp. 714–720. Available at: https://doi.org/10.58812/jmws.v2i08.592.

Li, S., Wang, Q. and Shan, C. (2016) 'Inspirations to chronic diseases

prevention in China from disease preventive system in Australian', *Chin J PHM* [Preprint].

Luo, R. *et al.* (2023) 'Relationships among social support, coping style, self-stigma, and quality of life in patients with diabetic foot ulcer: A multicentre, cross-sectional study', *International Wound Journal*, 20(3), pp. 716–724. Available at: https://doi.org/10.1111/iwj.13914.

Manurung, R.F. and Darungan, T.S. (2021) 'Gambaran Kualitas Hidup Pasien Diabetes Melitus Tipe 2 Pada Di Puskesmas Teladan Kota Medan', *Jurnal Kedokteran Ibnu Nafis*, 10(2), pp. 154–159. Available at: https://doi.org/10.30743/jkin.v10i2.200.

Marsitha, L., Syarif, H. and Sofia, S. (2023) 'Kualitas Hidup Pasien Dengan Diabetes Melitus Tipe 2', *Journal of Telenursing*, 5, pp. 3410–3417. Available at: https://doi.org/10.31539/joting.v5i2.8093.

Maruf, M.A. and Palupi, D.L.M. (2021) 'Hubungan Antara Tingkat Stres Dengan Kualitas Hidup Penderita Diabetes Melitus Di Wilayah Kerja Rumah Sakit Umum Surakarta', *Prosiding Seminar Informasi Kesehatan Nasional*, 2(1), pp. 400–410. Available at: https://doi.org/10.47701/sikenas.v0i0.1279.

Milita, F., Handayani, S. and Setiaji, B. (2021) 'Kejadian Diabetes Mellitus Tipe II pada Lanjut Usia di Indonesia (Analisis Riskesdas 2018)', *Jurnal Kedokteran dan Kesehatan*, 17(1), p. 9. Available at: https://doi.org/10.24853/jkk.17.1.9-20.

Munira, S.L. *et al.* (2023) 'Survei Kesehatan Indonesia (SKI)', *KEMENTERIAN KESEHATAN REPUBLIK INDONESIA BADAN KEBIJAKAN PEMBANGUNAN KESEHATAN*, pp. 1–68.

Murtiningsih, M.K., Pandelaki, K. and Sedli, B.P. (2021) 'Gaya Hidup Sebagai Faktor Risiko Diabetes Melitus Tipe 2', *e-CliniC*, 9(2), p. 328. Available at: https://doi.org/10.35790/ecl.v9i2.32852.

Ohlwein, S. *et al.* (2019) 'Indoor and outdoor road traffic noise and incident diabetes mellitus: Results from a longitudinal German cohort study', *Environmental Epidemiology*, 3(1). Available at: https://doi.org/10.1097/EE9.0000000000000037.

Pramithasari, M. (2019) 'Pengaruh Kualitas Taman Slamet Kota Malang terhadap Kualitas Hidup Masyarakat Sekitar', *Repository Universitas Brawijaya* [Preprint]. Available at: http://repository.ub.ac.id/id/eprint/176527.

Purba, F.D. (2016) 'The World Health Organization Quality Of Life (WHOQOL)-Bref', *World Health Organization* [Preprint]. Available at: https://journal.fk.unpad.ac.id/index.php/mkb/article/download/1792/pdf.

Purwaningsih, N. (2018) 'Analisis Faktor-Faktor Yang Mempengaruhi Kualitas Hidup Pasien Diabetes Melitus Tipe 2 di Instalasi Rawat Jalan RSUD Dr. Moewardi Periode Februari-Maret 2018', *Jurnal Kesehatan*, pp. 1–17. Available at: http://eprints.ums.ac.id/id/eprint/66401.

Sari, D.W. and Khoiri, Q. (2023) 'Pendidikan untuk Semua: Studi pada Kebijakan Wajib Belajar 9 Tahun', *Journal on Education*, 5(3), pp. 9441–9450. Available at: https://doi.org/10.31004/joe.v5i3.1757.

Sepriani, T. (2022) 'Hubungan Faktor Lingkungan Fisik Dengan Kualitas Hidup Penderita Diabetes Mellitus', *COMSERVA : Jurnal Penelitian dan Pengabdian Masyarakat*, 2(7), pp. 1097–1108. Available at: https://doi.org/10.59141/comserva.v2i7.421.

Setia, I.M.A. *et al.* (2021) 'Hubungan Usia Dengan Nilai Tes Toleransi Glukosa Oral (TTGO) Pada Generasi Pertama Penderita Diabetes Melitus (DM) Tipe 2', *Jurnal Medula*, 11(1), pp. 100–106. Available at: https://doi.org/10.53089/medula.v11i1.199.

Soelistijo, S.A. *et al.* (2021) *Pedoman Pengelolaan dan Pencegahan Diabetes Melitus Tipe 2 Dewasa di Indonesia 2021*, *PERKENI*.

Available at: www.ginasthma.org.
Umam, M.H., Solehati, T. and Purnama, D. (2020) ‘Gambaran Kualitas Hidup Pasien Dengan Diabetes Melitus Di Puskesmas Wanaraja’, *Jurnal Kesehatan Kusuma Husada*, pp. 70–80. Available at: https://doi.org/10.34035/jk.v11i1.419.
Utami, A.P., Pane, N.N.A. and Hasibuan, A. (2023) ‘Analisis Dampak Limbah/Sampah Rumah Tangga Terhadap Pencemaran Lingkungan Hidup’, *Cross-border*, 6(2), pp. 1107–1112. Available at: https://journal.iaisambas.ac.id/index.php/Cross-Border/article/view/2138.
Wijayanti, R.A. *et al.* (2022) ‘Pendampingan Pengelolaan Kadar Gula Darah Kelompok Penderita Diabetes Mellitus Usia Produktif Melalui Budidaya Dan Olahan Tanaman Stevia Di Desa Kemuning Lor’, pp. 159–165. Available at: https://proceedings.polije.ac.id/index.php/ppm/article/view/388.
Wong, F.Y. *et al.* (2018) ‘Assessing quality of life using WHOQOL-BREF: A cross-sectional study on the association between quality of life and neighborhood environmental satisfaction, and the mediating effect of health-related behaviors’, *BMC Public Health*, 18(1), pp. 1–14. Available at: https://doi.org/10.1186/s12889-018-5942-3.
Yunike, Y. *et al.* (2023) ‘Quality of Health Services to the Level of Patient Satisfaction’, *Jurnal Ilmiah Kesehatan Sandi Husada*, 12(1), pp. 183–189. Available at: https://doi.org/10.35816/jiskh.v12i1.990.
Zairin, Z. (2021) ‘Kerusakan Lingkungan Dan Jasa Ekosistem’, *Jurnal Ilmu Komunikasi*, 1(1), pp. 12–13. Available at: https://journals.unihaz.ac.id/index.php/georafflesia/article/view/148.