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# Association Between Anxiety Levels and Fasting Blood Glucose in Patients with Type 2 Diabetes Mellitus

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**ABSTRACT**

**Background:** Anxiety may worsen glycemic control in patients with type 2 diabetes mellitus (T2DM). However, evidence among Prolanis participants in primary care remains limited. This study examined the association between anxiety levels and fasting blood glucose (FBG) in Prolanis T2DM patients at Iman Clinic.
**Objectives:** To determine the association between anxiety levels and fasting blood glucose among Prolanis patients with type 2 diabetes mellitus at Iman Clinic.
**Methods:** A cross-sectional study was conducted among 37 Prolanis T2DM patients selected through purposive sampling. Anxiety was measured using the Hamilton Anxiety Rating Scale (HARS), and FBG was assessed after 8-12 hours of fasting. Data were analyzed using Spearman Rank correlation ($\alpha = 0.05$), including subgroup analyses by gender, age, and education level.
**Results**: Most respondents were female (70.3%) and elderly (59.5%), with a mean FBG of 151.05 mg/dL; 59.5% had uncontrolled FBG. Severe anxiety was found in 32.4% of patients. A strong and significant positive correlation was observed between anxiety and FBG ($r = 0.686$; $p < 0.001$). Significant associations were identified in women, pre-elderly and elderly groups, and patients with secondary education.
**Conclusion:** Higher anxiety levels are associated with increased FBG.

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## INTRODUCTION

Blood sugar imbalances in people with diabetes mellitus occur as a result of insulin resistance or decreased insulin secretion by the pancreas. Therefore, diabetes mellitus is categorized as a chronic disease related to glucose metabolism disorders (1). Persistent hyperglycemia can damage vital organs and reduce patients' quality of life (2). Diabetes can also cause anxiety and stress due to its physical and emotional impact. (3).

Diabetes mellitus is a health problem whose prevalence continues to increase in Indonesia. Data from the Indonesian Health Survey (SKI) 2023 showed that the prevalence of diabetes mellitus based on blood glucose examination among individuals aged ≥15 years reached 11.7%, an increase compared with 10.9% reported in Riskesdas 2018 (4). In low and middle-income countries, many people with diabetes do not have access to adequate treatment due to unequal health services (5,6).

Most people with diabetes tend to experience disorders that are often associated with anxiety, depression, and a decline in quality of life related to various aspects of their health condition, such as concerns about high blood sugar levels or the onset of complications due to diabetes (7,8).

A study conducted in Fayoum, Egypt, on 679 diabetic patients showed that 38% experienced anxiety (9). Psychological aspects, particularly anxiety, have been shown to play a role in increasing blood glucose levels in diabetic patients, as reported by Ariadi. The study found a statistically significant association, whereby an escalation in anxiety levels was followed by an increase in blood sugar levels (10).

People with diabetes often experience stress due to lifestyle changes and the demands of long-term treatment to maintain blood glucose control (11). If anxiety in diabetic patients goes undetected, treatment for both conditions may be delayed. This can also make patients feel hopeless, thereby interfering with the overall success of therapy (12). Anxiety experienced by diabetics is a fairly complex problem, as it is influenced by various aspects of the individual's life (7).

The assocoation between anxiety levels and blood glucose levels has been widely reported in previous studies, showing a significant correlation between psychological factors and glycemic control. However, studies specifically examining the association between anxiety and fasting blood glucose levels among patients with type 2 diabetes participating in the Chronic Disease Management Program (Prolanis) remain limited. In particular, evidence from primary healthcare settings, such as clinics, is still scarce, despite these facilities playing an important role in long-term diabetes management in Indonesia. This gap highlights the need for further research focusing on psychological factors and glycemic control among Prolanis participants in primary care settings.

## METHOD

### Study design

This study used a quantitative observational correlational design with a cross-sectional approach. Data were collected at a single point in time without intervention. Respondents were selected through purposive sampling based on predetermined criteria to ensure relevance to the research objectives. The study was conducted at Klinik Iman, Martubung, Medan Labuhan District, from August to September 2025.

### Population and sample

The study population comprised all Prolanis patients diagnosed with type 2 diabetes mellitus at the Klinik Iman. Samples were selected using inclusion and exclusion criteria. Inclusion criteria included cooperative Prolanis patients with type 2 DM who consented to participate, while exclusion criteria involved non-Prolanis patients, patients with anemia, chronic kidney disease, pregnancy, and malignant diseases. Based on the minimum sample size calculation, a total of 37 respondents were included in the study.

### Data collection

Data were collected using questionnaires and clinical examinations. Anxiety levels were assessed using the Indonesian version of the Hamilton Anxiety Rating Scale (HARS), which has been translated into Bahasa Indonesia and validated for use in the Indonesian population. The questionnaire consists of 14 items, each scored on a scale of 0-4, with a total score ranging from 0-56. Anxiety severity was categorized based on the total score as follows: no anxiety (<14), mild anxiety (14-20), moderate anxiety (21-27), severe anxiety (28-41), and very severe anxiety (42-56). The assessment was conducted directly by the researcher through interviews with the participants and fasting blood glucose levels were measured using an Accu-Chek glucometer with capillary blood samples obtained after 8-12 hours of fasting. The glucometer was calibrated according to the manufacturer's instructions prior to use, and quality control procedures were performed regularly using standard control solutions to ensure the accuracy and reliability of the measurements. Blood glucose examination procedures were conducted in accordance with standard laboratory protocols and

operating procedures. Based on the Indonesian Society of Endocrinology (PERKENI) guidelines, fasting blood glucose levels of 80-130 mg/dL were categorized as controlled, while levels >130 mg/dL were categorized as uncontrolled.

**Data analysis**
Data analysis was performed using IBM SPSS Statistics version 26.0. Data analysis consisted of univariate analysis to describe respondent characteristics and bivariate analysis using the Spearman Rank Correlation test with a significance level of $\alpha = 0,05$ to evaluate the association between anxiety levels and fasting blood glucose. In addition, stratified analyses were performed by applying the Spearman Rank Correlation test separately according to gender, age group, and education level to identify potential differences in the strength and direction of the correlation among these subgroups (13).

**Ethical statement**
Prior to data collection, all respondents provided written informed consent to participate in the study. This research had received ethical approval from the Ethics Committee of the Faculty of Medicine, Universitas Muhammadiyah Sumatera Utara, with Ethical Approval No. 1597/KEPK/FKUMSU/2025.

## RESULTS

**Characteristics of Respondents**
The majority of respondents were female (70.3%) and elderly (59.5%). The characteristics of the respondents are presented in Table 1.

Table 1. Distribution of Respondent Based on Gender

| Gender | Frequency (N) | Percentage (%) |
|---|---|---|
| Male | 11 | 29.7 |
| Female | 26 | 70.3 |
| Total | 37 | 100 |

The information presented in Table 2 shows that the age of Prolanis patients with diabetes mellitus at Iman Clinic ranged from 42 to 81 years, with a mean age of 62 years. The elderly group (≥60 years) was the most dominant category, comprising 22 of 37 respondents (59.5%), followed by the pre-elderly group aged 45–59 years, comprising 13 respondents (35.1%), and the adult group aged <45 years, comprising 2 respondents (5.4%).

Table 2. Distribution of Respondent Based on Age

| Age (years) | Frequency (N) | Percentage (%) | Min | Max | Mean |
|---|---|---|---|---|---|
| < 45 | 2 | 5.4 | | | |
| 45 – 59 | 13 | 35.1 | 42 | 81 | 62 |
| ≥ 60 | 22 | 59.5 | | | |
| Total | 37 | 100 | | | |

Table 3 shows that the majority of Prolanis patients with diabetes mellitus at Iman Clinic had a secondary education level, including junior high school and high school graduates, with 25 respondents (67.57%). This was followed by 8 respondents (21.62%) with higher education (university) and 4 respondents (10.81%) with low education (elementary school).

Table 3. Distribution of Respondent Based on Levels of Education

| Education Level | Frequency (N) | Percentage (%) |
|---|---|---|
| Low | 4 | 10.81 |

| | | |
|---|---|---|
| Intermediate | 25 | 67.57 |
| High | 8 | 21.62 |
| Total | 37 | 100 |

The results presented in Table 4 show that among the 37 respondents with diabetes mellitus, the majority had uncontrolled fasting blood glucose levels. This group comprised 22 respondents (59.5%), with a mean fasting blood glucose level of 179.32 mg/dL. In contrast, 15 respondents (40.5%) had controlled fasting blood glucose levels, with a mean of 109.60 mg/dL.

Table 4. Distribution of Respondent based on Fasting Blood Sugar Level Status

| Blood Sugar Level Status | Frequency (N) | Percentage (%) | Mean |
|---|---|---|---|
| Controlled | 15 | 40.5 | 109.6 |
| Uncontrolled | 22 | 59.5 | 179.3 |
| Total | 37 | 100 | 151 |

The data presented in Table 5 show that the majority of respondents with diabetes mellitus had severe anxiety. Among the 37 respondents, 12 (32.4%) had severe anxiety, followed by 9 respondents (24.3%) with moderate anxiety, 7 respondents (18.9%) with no anxiety, 7 respondents (18.9%) with mild anxiety, and 2 respondents (5.4%) with very severe anxiety.

Table 5. Distribution of Respondent based on Anxiety Level Status

| Anxiety | Frequency (N) | Percentage (%) |
|---|---|---|
| Non-anxiety | 7 | 18.9 |
| Mild | 7 | 18.9 |
| Moderate | 9 | 24.4 |
| Severe | 12 | 32.4 |
| Very severe | 2 | 5.4 |
| Total | 37 | 100 |

**Association Between Anxiety and Fasting Blood Glucose**

The results presented in Table 6 demonstrate a strong and statistically significant positive correlation between anxiety levels and fasting blood glucose levels among patients with type 2 diabetes mellitus. Spearman's correlation analysis yielded a correlation coefficient of r = 0.686, indicating a strong positive association between anxiety scores and fasting blood glucose levels. The association was statistically significant ($p < 0.001$). These findings indicate that higher anxiety levels were associated with higher fasting blood glucose levels.

Table 6. Statistical Test Analysis of Anxiety Levels with Fasting Blood Sugar Level Status

| Variable | Statistical Test | Sig. 2-tailed | r |
|---|---|---|---|
| Anxiety level – Fasting blood sugar level | Spearman Rank Correlation | 0.000 | 0.686 |

**Stratified Analysis by Gender, Age, and Education Level**

Stratified analysis by gender showed that among male respondents, there was a moderate positive correlation between anxiety levels and fasting blood glucose levels (r = 0.511), although the association was not statistically significant (p = 0.108). In contrast, among female respondents, a strong positive correlation was observed (r = 0.688), which was statistically significant ($p < 0.001$).

Stratified analysis by age showed that the adult group consisted of only two respondents, and therefore correlation analysis was not performed. Among pre-elderly respondents, a strong positive correlation was observed between anxiety levels and fasting blood glucose levels ($r = 0.711$; $p = 0.006$). Similarly, a strong positive and statistically significant correlation was found among elderly respondents ($r = 0.752$; $p < 0.001$).

Stratified analysis by education level showed that respondents with low education had a strong positive correlation between anxiety levels and fasting blood glucose levels ($r = 0.800$), although the association was not statistically significant ($p = 0.200$). Among respondents with secondary education, a strong positive and statistically significant correlation was observed ($r = 0.733$; $p < 0.001$). Meanwhile, respondents with higher education showed a weak positive correlation, which was not statistically significant ($r = 0.193$; $p = 0.647$).

**DISCUSSION**

Based on the information presented in Table 1, the proportion of respondents with DM was dominated by women, namely 26 people (70.3%). This finding is in line with the results of a study by Aminudin et al. (2024) where the majority of respondents were also women (68.9%). The consistency of these results indicates that, both in this study and in previous studies, women tend to be more commonly found as sufferers of type 2 diabetes mellitus compared to men (14).

The data listed in Table 2 shows that most respondents with diabetes mellitus were in the elderly age category (≥ 60 years), with a total of 22 people or 59.5%. The increase in the incidence of diabetes in this elderly age group may be due to the aging process that affects the body's metabolic functions, including decreased insulin sensitivity and glucose tolerance, thereby increasing the risk of diabetes with age (15).

Based on the data in Table 3, most respondents with diabetes mellitus had a secondary education level, namely junior high school and high school graduates, with a total of 25 people (67.57%). Previous studies have shown that most patients with diabetes mellitus have a high school education level. A higher level of education plays a role in improving an individual's ability to manage emotions and anxiety related to the disease, so that education can affect the level of anxiety in patients with type 2 diabetes mellitus (16).

Based on the results in Table 4, most diabetic patients, namely 22 respondents (59.5%), had uncontrolled fasting blood sugar levels. The uncontrolled blood glucose levels observed in some respondents may be associated with poor adherence to recommended dietary management and low participation in Prolanis Program activities, which can increase the risk of diabetes-related complications and comorbidities (17). In addition, the association between anxiety and blood glucose levels may also involve reverse causality, where uncontrolled blood glucose itself can contribute to increased anxiety (18). Persistent hyperglycemia may cause physical symptoms such as fatigue, dizziness, palpitations, sleep disturbances, and fear of developing complications, which can negatively affect psychological well-being and increase emotional distress in patients with diabetes mellitus. Therefore, anxiety and uncontrolled blood glucose levels may influence each other bidirectionally, creating a cycle that complicates diabetes management and glycemic control (10).

The data in Table 5 shows that the largest proportion of diabetic patients were in the severe anxiety category, namely 12 people (32,4%). The high level of anxiety in diabetic patients is thought to be related to the patients limited understanding of the potential complications that can occur as the disease progresses. This condition is exacerbated by low awareness of the importance of maintaining health and an indifferent attitude towards disease management. In addition, the presence of complications, infrequent routine hospital check-ups, and a lack of support from family members in helping patients control their health condition may also have an impact (19).

Based on the results of the analysis in Table 6, Spearman's correlation test shows a strong and statistically significant positive association between anxiety levels and fasting blood glucose levels in Prolanis type 2 diabetes mellitus patients. Chronic anxiety affects the body through hormonal, metabolic, and immunological changes that can worsen diabetes mellitus. One of the main mechanisms involves activation of the hypothalamic–pituitary–adrenal (HPA) axis, the body’s primary stress response system, in which psychological stress stimulates the release of corticotropin-releasing hormone (CRH), adrenocorticotropic

hormone (ACTH), and ultimately cortisol. Persistent elevation of cortisol increases hepatic gluconeogenesis, decreases peripheral glucose uptake, and impairs insulin sensitivity, resulting in insulin resistance and elevated blood glucose levels. Chronic anxiety also activates the sympathetic nervous system, increasing adrenaline and noradrenaline secretion, which further promotes glycogen breakdown and rapid increases in blood glucose concentrations. In addition, diabetes distress, characterized by emotional stress and excessive worry related to diabetes management, may reduce adherence to medication, dietary regulation, physical activity, and blood glucose monitoring, thereby contributing to poor glycemic control. Chronic anxiety is also associated with chronic low-grade inflammation marked by increased levels of pro-inflammatory cytokines such as interleukin-6 (IL-6), tumor necrosis factor-alpha (TNF-α), and C-reactive protein (CRP), which contribute to endothelial dysfunction, impaired insulin signaling, vascular damage, and progression of diabetic complications. The combined effects of HPA axis activation, cortisol excess, sympathetic stimulation, diabetes distress, and chronic inflammation ultimately lead to persistent hyperglycemia and difficulty achieving optimal blood glucose control in patients with diabetes mellitus (20–22).

Based on stratified analysis by gender, the Spearman rank correlation test results show that there is a significant correlation between anxiety levels and fasting blood glucose levels in female patients with type 2 diabetes mellitus compared to males. This is related to women's vulnerability to emotional stress, which is influenced by biological factors, hormonal fluctuations, and psychosocial aspects, such as dual role demands and women's tendency to express feelings of anxiety and sadness. These factors have the potential to increase the risk of depression in women compared to men (23).

Based on stratified analysis by age, the Spearman rank correlation test results for the pre-elderly and elderly groups show a significant association, with a stronger association among the elderly. As we age, the body's sensitivity to insulin decreases and the ability of pancreatic cells to produce insulin also decreases. As a result, glucose becomes more difficult for cells to absorb, causing blood sugar levels to rise. Therefore, the older a person is, the higher their risk of developing diabetes (24).

Based on stratified analysis by education level using Spearman's correlation test, a strong and significant association was found at the secondary education level. Patients with a low educational background generally have limited knowledge about how to maintain blood sugar levels and manage stress. These limitations make it more difficult for them to understand medical information, follow treatment recommendations, and adopt a healthy lifestyle. This condition can increase stress levels due to a lack of understanding of the disease, which in turn affects blood sugar levels, which tend to be uncontrolled (25).

## CONCLUSION

Based on the results of the study, there is a strong and significant association between anxiety levels and fasting blood sugar levels in Prolanis type 2 diabetes mellitus patients at the Iman Clinic, where higher anxiety is associated with higher fasting blood sugar levels. The association was significant in women, pre-elderly and elderly groups, and patients with secondary education, but not significant in men or those with low and high education levels.

## CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest related to this study. No financial or other arrangements with any company or organization influenced the conduct, analysis, or reporting of this research.

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## DATA AVAILABILITY

The data supporting the findings of this study are not publicly available due to privacy and confidentiality considerations regarding the study participants. The data may be made available from the corresponding author upon reasonable request, subject to appropriate ethical and confidentiality requirements.

## SUPPLEMENTAL DATA

The Indonesian version of the Hamilton Anxiety Rating Scale (HARS) questionnaire used to assess anxiety levels in this study is provided as supplementary material. The supplementary file contains the questionnaire items and scoring information used in the assessment of anxiety among the study participants.

## AUTHOR CONTRIBUTIONS

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| Ren Astrid Allail Siregar | ✓ | ✓ | | ✓ | | | | | | ✓ | | ✓ | | |

C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

## DECLARATION OF USING AI IN THE WRITING PROCESS

The authors used AI-assisted tools solely for language support, including English grammar checking, translation, and improvement of language clarity. The scientific content, interpretation of the results, and conclusions were developed and verified by the authors.

## LIST OF ABBREVIATIONS

T2DM: Type 2 Diabetes Mellitus; FBG: Fasting Blood Glucose; SKI: Indonesian Health Survey; HARS: Hamilton Anxiety Rating Scale; DM: Diabetes Mellitus; PERKENI: Indonesian Society of Endocrinology; HPA: hypothalamic-pituitary-adrenal; CRH: corticotropin-releasing hormone; ACTH: adrenocorticotropic hormone; IL-6: interleukin-6; TNF-α: tumor necrosis factor-alpha; CRP: C-reactive protein.

## ETHICAL APPROVAL

The research involving human participants complied with all relevant national regulations and institutional policies and was conducted in accordance with the ethical principles of the Declaration of Helsinki. The study was approved by the Ethics Committee of the Faculty of Medicine, Universitas Muhammadiyah Sumatera Utara, with Ethical Approval No. 1597/KEPK/FKUMSU/2025. Written informed consent was obtained from all participants prior to their participation in the study.

## REFERENCES

1. Magliano DJ BE. Komite ilmiah IDF Diabetes Atlas edisi ke-10. Brussels: Federasi Diabetes Internasional; 2021.
2. Heryn Tywa Novelin Tambunan MYP. Implementasi Buerger Allen Exercise (BAE) untuk Meningkatkan Sirkulasi dan Angka Ankle Brachial Index (ABI) pada Pasien Diabetes Mellitus Type II di Rumah Sakit Tk II Putri Hijau Medan. 2024.
3. Febriawati H, Yanuarti R, Oktavidiati E, Wati N, Angraini W. Pelaksanaan Program Pengelolaan Penyakit Kronis (Prolanis). CITRA DELIMA : Jurnal Ilmiah STIKES Citra Delima Bangka Belitung. 2022;6(2):2023. doi:10.33862/citradelima
4. Kemeskes. Survei Kesehatan Indonesia (SKI). 2023.

5. Institute for Health Metrics and Evaluation. VizHub - GBD Results [Internet]. 2025 [cited 2025 May 10]. Available from: https://vizhub.healthdata.org/gbd-results/
6. World Health Organization(WHO). Diabetes [Internet]. 2025 [cited 2025 May 10]. Available from: https://www.who.int/news-room/fact-sheets/detail/diabetes
7. Arifin NAW. Hubungan Kecemasan dengan Hasil Kadar Gula Darah Sewaktu pada Pasien Diabetes Mellitus Tipe 2 di Posbindu Sehati Cengkareng Jakarta Barat. JURNAL NURSE. 2022;5(Januari).
8. American Diabetes Association. Classification and diagnosis of diabetes: Standards of Medical Care in Diabetes-2020. Diabetes Care. 2020 Jan 1;43:S14–31. doi:10.2337/dc20-S002 PubMed PMID: 31862745.
9. Abd-Elgawad M, Abdelsattar NK, Genedy GT, Madeeh AK, Khamis M, Ryaad M, et al. Prevalence of depression and anxiety among diabetic patients in Egypt: A cross-sectional study. Medicine (United States). 2023 Nov 17;102(46):E35988. doi:10.1097/MD.0000000000035988 PubMed PMID: 37986306.
10. Ariyadi AS, Septiawan T. Hubungan antara Tingkat Kecemasan dengan Kadar Gula Darah pada Penderita Diabetes Mellitus Tipe 2 di Wilayah Kerja Puskesmas Pasundan Samarinda Ulu. JPP (Jurnal Kesehatan Poltekkes Palembang). 2024 Jun 29;19(1):1–7. doi:10.36086/jpp.v19i1.1903
11. Sari SM, Hersianda. Hubungan Tingkat Stres dengan Kadar Gula Darah pada Pasien Diabetes Melitus di Poli Penyakit Dalam Rumah Sakit Bhayangkara Palembang Tahun 2019. STIK Khadijah Palembang. 2019.
12. Basiri R, Seidu B, Rudich M. Exploring the Interrelationships between Diabetes, Nutrition, Anxiety, and Depression: Implications for Treatment and Prevention Strategies. Nutrients. Multidisciplinary Digital Publishing Institute (MDPI); 2023. doi:10.3390/nu15194226 PubMed PMID: 37836510.
13. Trianto Syahbannu Prayoga, Suliadi. Korelasi Rank-Spearman pada Hubungan Beberapa Variabel Produk Domestik Regional Bruto. Jurnal Riset Statistika. 2024 Dec 31;137–44. doi:10.29313/jrs.v4i2.5162
14. Aminudin Putra I, Fuad W. Hubungan Diabetes Mellitus (DM) Tipe 2 dengan Kejadian Cemas pada Peserta Prolanis Puskesmas Limpung Kabupaten Batang. Jurnal Ilmu Kedokteran dan Kesehatan [Internet]. 2024. Available from: http://ejurnalmalahayati.ac.id/index.php/kesehatan
15. Anida, Istanti N, Muryani. Pengaruh Program Diabetes Self-Management Education Terhadap Tingkat Kecemasan Penderita Diabetes Melitus Tipe 2 di Dusun Sinduadi Wilayah Kerja Puskesmas Mlati I [Internet]. 2022 [cited 2025 Oct 12]. Available from: Mikki Maj. Ilmu Keperawatan dan Kesehat. Indones., vol. 11, no. 2, pp. 106– 116,2022,doi:10.47317/mikki.v11i2.4 89.
16. Br. karo M, Sigalingging YV, Saragih YK. Pengaruh Edukasi Terhadap Penurunan Kecemasan Pada Pasien Diabetes Melitus di Rumah Sakit Santa Elisabeth Batam Kota Tahun 2022. INNOVATIVE: Journal Of Social Science Research Volume 4 Nomor 1 Tahun 2024 Page 10531-10543 E-ISSN 2807-4238 and P-ISSN 2807-4246. 2024.
17. Reynald Susilo L, Sari Tetra Dewi F, Huriyati E. Family support, diabetes self-management behavior, and HbA1c levels in Manggarai Regency, East Nusa Tenggara. BKM Public Health & Community Medicine. 2022;38:305–12. doi:10.22146/bkm.v38i8.5073
18. Kivimäki M, Bartolomucci A, Kawachi I. The multiple roles of life stress in metabolic disorders. Nature Reviews Endocrinology. Nature Research; 2023. p. 10–27. doi:10.1038/s41574-022-00746-8 PubMed PMID: 36224493.
19. Wijaya H, Pertiwi AD, Hardani H, Utami EF. Hubungan Lama Menderita Diabetes Melitus Tipe 2 Terhadap Tingkat Kecemasan pada Pasien di Rumah Sakit Universitas Mataram. Pharmaceutical and Traditional Medicine. 2023 Apr 30;7(1):1–11. doi:10.33651/ptm.v7i1.637
20. Bansod A, Pisulkar SG, Dubey SA, Sathe S, Beri A, Dahihandekar C. Association of Salivary Cortisol With Anxiety in Type 2 Diabetes Mellitus Patients Before and After Complete Denture Rehabilitation: An In-Vivo Analysis. Cureus. 2024 Jan 9. doi:10.7759/cureus.51953
21. Merabet N, Lucassen PJ, Crielaard L, Stronks K, Quax R, Sloot PMA, et al. How exposure to chronic stress contributes to the development of type 2 diabetes: A complexity science approach. Frontiers in Neuroendocrinology. Academic Press Inc.; 2022. doi:10.1016/j.yfrne.2021.100972 PubMed PMID: 34929260.

22. Elsayed NA, Aleppo G, Aroda VR, Bannuru RR, Brown FM, Bruemmer D, et al. Facilitating Positive Health Behaviors and Well-being to Improve Health Outcomes: Standards of Care in Diabetes—2023. Diabetes Care. 2023 Jan 1;46:S68–96. doi:10.2337/dc23-S005 PubMed PMID: 36507648.
23. Efendi achmad, Supriyanto, Anitarini F. Depresi dan Pengaruhnya terhadap Kadar Glukosa Darah Pasien Diabetes Melitus Tipe II di Wilayah Kerja Puskesmas Klatak Banyuwangi. HEALTHY 66 Volume 12 No 1 Desember 2024. 2024.
24. Ratnata GA, Gede D, Kusuma MA, Made N, Pratiwi S. Tingkat Kecemasan dengan Kadar Gula Darah Penderita Diabetes Mellitus Tipe II di Puskesmas Kerabitan I. Vol. 3. ; 2023.
25. Mawadah N, Rahman S, Tasalim R, Mahmudah R. Hubungan Tingkat Stres dengan Kadar Gula Darah pada Pasien Diabetes Melitus Tipe 2. Journal of Language and Health [Internet]. 2025;6(2). Available from: http://jurnal.globalhealthsciencegroup.com/index.php/JLH