Depression in Indonesian Adults with Diabetes Mellitus

A Descriptive Study from The Population-Based Indonesia Family Life Survey (IFLS)

Martaria Rizky Rinaldi[1]*
Kwartarini Wahyu Yuniarti[2]

[1] *Faculty of Psychology, Mercu Buana University, Indonesia*
[2]*Faculty of Psychology, Gadjah Mada University, Indonesia*

*Corresponding author: Martaria Rizky Rinaldi
Faculty of Psychology, Mercu Buana University, Indonesia.
Email: martariarizky@mercubuana-yogya.ac.id

Highlights

- Indonesia is currently among the 10 nations with the greatest number of diabetes cases worldwide.
- Diabetes mellitus patients frequently experience depression, but there are no data available for the Indonesian population.
- The prevalence of depression among individuals with diabetes mellitus.
- The age group that exhibits a higher likelihood of experiencing depression among individuals with diabetes mellitus

Abstract

Background: Indonesia is included in the top ten countries worldwide with the highest prevalence of diabetes cases. Diabetes is a persistent condition that cannot be fully treated and can cause complications, amputations, and mortality. Living with diabetes is associated with negative emotions, including depression. *Study aims*: The primary objective of this research is to detect depression among individuals with diabetes mellitus in Indonesia. *Method:* Data from the 2014 Indonesia Family Life Survey were used in this study. Adults with diabetes mellitus were included in this research, with complete socio-demographic and depression scale data. The 10-item Center for Epidemiologic Studies Depression Scale was used to measure depression symptoms. The data underwent analysis through descriptive analysis, independent sample t-test, and ANOVA. *The Result*: The research included 566 adults with diabetes mellitus, and 114 (20.1%) of them displayed symptoms of depression. The average age of the subjects was 51.97 years, and the average duration of diabetes was 4.17 years, with 309 (54.6%) of them being female. There were no differences in depression levels between gender ($t=0.891$, $p> 0.05$) or in the length of time since diagnosis ($t= 1.023$, $p> 0.05$). In contrast, there were age group differences ($F = 4.950$, $p < 0.01$); these differences were between early adult groups with middle and late adult group, but not between middle and late adults. *Conclusion*: Diabetes mellitus patients frequently experience depression. It is crucial to give equal importance to managing both conditions simultaneously to enhance the overall well-being and health outcomes of these patients.

Keywords: Adult; Depression; Diabetes Mellitus

INTRODUCTION

In a study conducted by the International Diabetes Federation (IDF) in 2021, it was found that Indonesia ranks among the top 10 countries with a high proportion of individuals diagnosed with diabetes (Sun et al., 2022). The study highlighted the alarming prevalence of diabetes in the country.

According to the IDF Diabetes Atlas (2023), the number of adults in Indonesia aged between 20 and 79 who had diabetes in 2021 was approximately 19.5 million. This indicates a significant impact on a considerable segment of the adult population. Regrettably, the future prospects appear worrisome as projections predict a further escalation. By the year 2045, it is estimated that the number of people affected by diabetes in Indonesia will increase to approximately 28.6 million.

Diabetes patients have a high mortality rate and are more likely to have microvascular and macrovascular problems (Li et al., 2019; Twito et al., 2013; Viigimaa et al., 2020). Microvascular complications include retinopathy, neuropathy, and nephropathy (Alberti & Zimet, 1998; Olamoyegun et al., 2015). Systemic hypertension, congestive cardiac dysfunction, strokes of the brain, coronary artery disease acute myocardial infarction (AMI), and peripheral artery disease are examples of macrovascular complications (Dal Canto et al., 2019; Rodríguez-Gutiérrez & Montori, 2016).

Diabetes is a chronic disease that cannot ultimately cure (Jing et al., 2018). People who live with diabetes often experience a variety of negative emotions, including anger, anxiety, disappointment, and depression, as noted by Kalra et al. (2018). Negative emotions patients feel can impact worse health conditions (Coccaro et al., 2021; Yilmaz et al., 2018).

Depression is more likely to occur in diabetics (Zurita-Cruz et al., 2018). Depression is a condition that significantly impacts a person's overall well-being (Ali et al., 2010; Zhang et al., 2016). Studies conducted by Bayani et al. (2022) and Gupta et al. (2021) have found that individuals with diabetes who experience depression generally have a reduced quality of life compared to those without depression.

Research has established a connection between depression and negative consequences among individuals with diabetes. Several studies have revealed that those dealing with both diabetes and depression tend to have higher HbA1c levels, which is a marker indicating long-term blood sugar control. Moreover, they may exhibit reduced adherence to self-care practices, face an increased risk of macrovascular and microvascular complications, experience higher mortality rates, and incur elevated healthcare expenses (de Groot et al., 2001; Lin et al., 2010; Pouwer et al., 2013).

Numerous studies have consistently demonstrated that individuals with diabetes are at a higher risk of developing depression compared to those without diabetes. The prevalence of depression is nearly twice as high in people with diabetes, as evidenced by research conducted by Ali et al. (2006) and Anderson et al. (2001). Moreover, individuals diagnosed with diabetes mellitus have a 24% greater likelihood of experiencing depression when compared to those without diabetes (Nouwen et al., 2010).

Depression affects 28% of diabetes patients worldwide, 29% in Australia, 27% in Africa, 24% in Europe, and 32% in Asia, according to Khaledi et al. (2019). Furthermore, specifically in several countries, such as 15.8% in Thailand (Veerabenjapol et al., 2010), 15.9% in Malaysia (Muthana et al., 2022), 25.9%-56.1% in China (Liu et al., 2022; Sun et al., 2016), and 19.9% in the Philippines (Victoria & Dampil, 2019). However, prevalence data in Indonesia is limited in Tegal City (Ramdani, 2016) and Denpasar City (Handika & Ariani, 2020).

Research results related to gender are inconsistent. Several studies, no gender differences were found in depression in diabetes patients (Alsumry et al., 2022; Ahmadieh et al., 2018). However, according to other research, women experience depression at higher rates than males (Demmer et al., 2015; Lyrakos et al., 2013), and women are more likely to have depression (Esen et al., 2022).

Studies examining the relationship between the duration of diabetes and depression have produced conflicting findings. One study found that a longer duration of diabetes is associated with an increased likelihood of developing depression (Darwish et al., 2018). This suggests that as individuals live with diabetes for an extended period, their risk of experiencing depressive symptoms may rise. However, it is important to note that other studies did not find a significant association between the duration of diabetes and depression (Abuhegazy et al., 2022; Ahmadieh et al., 2018). These studies did not observe a consistent pattern where a longer duration of diabetes led to a higher prevalence of depression. To gain a better understanding of this relationship, further research is needed.

Recent research studies have yielded diverse results regarding the link between age and depression in individuals with diabetes. According to Abuhegazy et al. (2022), diabetic patients aged 50 and above have a reduced risk of developing depression. In other words, older individuals with diabetes are less prone to experiencing depressive symptoms. However, in contrast, Alsumry et al. (2022) reported dissimilar findings, as they did not identify a significant association between age and depression in individuals with diabetes mellitus. This indicates that the relationship between age and depression in people with diabetes remains inconclusive, necessitating further investigation to establish a clearer understanding of this connection.

The Indonesian Family Life Survey (IFLS) is a longitudinal research project that gathers information on a variety of issues that involve family life, health, and economic well-being in Indonesia. The survey's fifth wave, IFLS5, was conducted in 2014 and used information from the survey's fourth wave (Strauss & Witoelar, 2021).

The IFLS data has been utilized in research related to diabetes and depression. One study examined the connection between depression and other chronic diseases using national longitudinal and cross-sectional data from the IFLS-5 (Sinaga et al., 2022). Another study examined the clinical familiarity of primary healthcare professionals with diabetes using information from the 2007 and 2014/2015 waves of the IFLS (Stein et al., 2020). The IFLS was designed to give data for examining behaviors and outcomes. Numerous measures of both economic and non-economic well-being are included in the abundance of data it provides, which was gathered at the individual and household levels (Strauss & Witoelar, 2021).

This study aims to identify depression in diabetes mellitus patients in Indonesia from IFLS5 and to identify socio-demographic factors that may be linked to depression.

METHOD

Study design

For this descriptive cross-sectional population-based nationwide analysis, data from the fifth wave of the Indonesian Family Life Survey (IFLS) conducted between 2014 and 2015 were utilized. The survey covered 13 provinces in Indonesia and employed a sampling method that represented approximately 83% of the country's population. The dataset included a wide range of information, such as socio-demographic details, economic factors, and health-related data. Participants provided self-reported assessments of their overall health, pain, symptoms, and also underwent biomarker measurements.

The IFLS data used in this study is publicly accessible, allowing researchers and other interested individuals to access and analyze the information. The survey and its methodologies underwent a rigorous review process and received approval from the institutional review boards at the RAND Corporation in the United States and the University of Gajah Mada in Indonesia. Prior to participating in the survey, all participants provided written informed consent. The study obtained ethical clearance with the reference number s0064-06-01-CR01 from the RAND Institutional Review Board (IRB).

Participant

There were 34,464 IFLS-5 respondents in total. Adults having a diagnosis of diabetes who were at least 18 years old at the time the survey was completed served as the data source. Those respondents were included who had information on their level of depression accessible, whereas those who had missing values for these variables were eliminated. 566 persons in all took part in the study, with 257 (45.4%) male and 309 (54.6%) female.

Instruments

In the IFLS data survey, information from respondents and their families was collected through in-person interviews. The utilization of computer-assisted personal interviewing (CAPI) tools ensured the efficiency and accuracy of the interview process, recording participants' responses.

In this study, the researchers assessed depression using a measurement tool called the Center for Epidemiological Studies Depression (CES-D-10). The CES-D-10 is a questionnaire consisting of 10 items designed to evaluate recent depressive symptoms. It covers various aspects of depression, including affect, somatic symptoms, and positive affect. Each item provides response options on a Likert scale, ranging from "rarely or never" to "all the time," with corresponding scores assigned to each response.

The CES-D-10 questionnaire calculates a total score ranging from 0 to 30, where higher scores indicate more severe depressive symptoms. The cut-off score for identifying depressive symptoms using the CES-D-10 is set at 10 or higher. The questionnaire has demonstrated good internal consistency and test-retest reliability in previous studies, with high Cronbach's alpha and intraclass correlation coefficient values indicating reliability.

For this particular study, the internal consistency reliability of the CES-D-10 was measured at $\alpha = 0.68$, indicating moderate reliability. While previous studies have reported higher internal consistency for the CES-D-10, this study's measurement still provides valuable insights into depressive symptoms among the participants.

Procedure

The IFLS data is taken from data that has been published online at https://www.rand.org/well-being/social-and-behavioral-policy/data/FLS/IFLS.html. The eligible population for the present study consisted of 778 men and women aged ≥18 years who were diagnosed with diabetes mellitus, among whom 691 had available depression data. We excluded 87 participants with missing data for depression. Next, 125 participants were excluded who had missing data for their first diabetes diagnosis. Thus, a total of 566 participants were analyzed in this study. Figure 1 demonstrates the selection process.

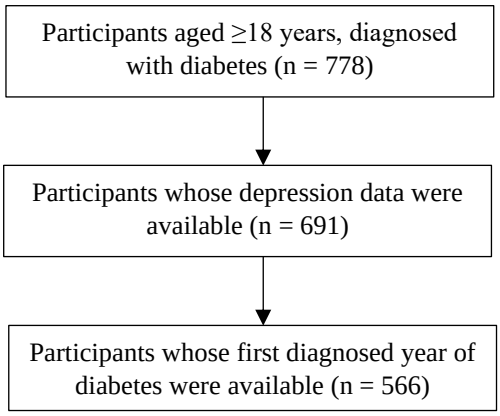

Figure 1. The flowchart in participant selections

Data Analysis

To provide an overview of the participants' characteristics, the researchers used descriptive statistics, which summarize and present the data in a meaningful way. They employed the statistical software SPSS version 25.0, which is specifically designed for analyzing data in the social sciences.

Cross tabulations were used to present the socio-demographic profile of the participants and their depression status. This analysis helps to understand how different factors relate to depression. The researchers utilized the cut-off points mentioned earlier to classify individuals as either having depression or not based on their scores.

To explore any differences related to sex, duration of diabetes, and age ranges, independent sample t-tests and ANOVA (analysis of variance) were conducted. These statistical tests allow for comparisons between groups to identify any significant variations.

RESULT

Participant's characteristics

In Table 1, the data reveals that the sample primarily consisted of females, accounting for 54.6% of the participants. The majority of individuals fell within the age range of 41-60, making up 57.7% of the sample. Regarding the duration of diabetes diagnosis, a significant portion of participants (74.9%) had been diagnosed with diabetes for less than five years. For more comprehensive socio-demographic information about the participants are presented in Table 1.

Table 1.
Distribution of study participants by socio-demographic variables.

Variables	Frequency	Percent
Gender (n=566)		
Male	257	45.4
Female	309	54.6
Age group (n=566)		
Early adulthood (18 - 40)	102	18.02
Middle adulthood (41 - 60)	327	57.7
Late adulthood (> 61)	137	24.2

Duration of diagnosis (n=566)		
Less than five years	424	74.9
More than five years	142	25.1
Depression (n = 566)		
Displayed symptoms of depression	114	20.1
Not depression	452	79.9
Occupations (n=369)		
Self-employed	117	31.3
Private and government worker	136	24.0
Casual worker	17	3.0
Not working	39	6.9
Marital status (n=308)		
Never married	10	3.2
Married	249	80.8
Divorced	49	15.9

Data analysis

According to the study's findings, the participants ranged in age from 19 to 82 and had been diagnosed with diabetes for 1 to 35 years. Scores for depression were between 1 and 27. Table describes the data.

Table 2.

Descriptive statistics

Variables	N	Min	Max	Mean	Standard Deviation
Age	566	19	82	51.97	11.58
Duration of diabetes	566	1	35	4.17	4.92
Depression	566	0	27	6.02	4.74

Our findings indicate that the estimated prevalence of depression among individuals with diabetes was 20.1%. Table 3 illustrates that depression was more commonly observed among females, middle-aged adults, and those with a diabetes duration of less than five years.

Table 3.

Depression status by demographic variables.

Variables	n (%) Depression	
	No	Yes
Total participants (n=566)	452 (79.9%)	114 (20.1%)
Gender		
Male	201 (78.2%)	56 (21.8%)
Female	251 (81.2%)	58 (18.8%)
Age group		
Early adulthood (18 - 40)	74 (16.4%)	28 (24.6%)
Middle adulthood (41 - 60)	263 (58.2%)	64 (56.1%)
Late adulthood (> 61)	115 (25.4%)	22 (19.3%)
Duration of diagnosis		
Less than five years	337 (74.6%)	87 (76.3%)
More than five years	115 (25.4%)	27 (23.7%)

Table 4.
Independent sample t-test result

Variables	t	P-value
Gender	0.891	0.373
Duration of diagnosis	1.043	0.297

In terms of gender differences, the results of Levene's test indicated that the variances in depression scores between male and female groups were similar, as the F-value was 3.155 with a p-value greater than 0.05. This suggests that the data variances in depression were comparable between men and women. Additionally, the independent sample t-test results showed no significant difference in depression scores between men and women, with mean depression scores of 6.01 for men and 6.04 for women.

Regarding disease duration, the results of Levene's test revealed that the variances in depression scores between the two groups (less than five years and more than five years of disease duration) were comparable, with an F-value of 0.021 and a p-value greater than 0.05. This suggests that the data variances in depression were similar between these groups. Furthermore, the t-test results indicated no significant difference in depression scores between patients diagnosed with diabetes for less than five years and those diagnosed for more than five years. The mean depression score was 6.14 for the less than five-year duration group and 5.67 for the more than five-year duration group.

Table 5.
Multiple comparisons using Benferroni

(I) **Age group**	(J) **Age group**	**Mean Difference (I-J)**	**P-value**
Early adult	middle adult	1.58230*	.010
	late adult	1.69601*	.018
Middle adult	early adult	-1.58230*	.010
	late adult	.11371	1.000
Late adult	early adult	-1.69601*	.018
	middle adult	-.11371	1.000

*. The mean difference is significant at the 0.05 level.

The statistical analysis indicated that there were variations in depression levels among different age groups. Specifically, there were significant differences in depression between early adulthood and both middle adulthood and late adulthood. However, there was no significant difference in depression between middle adulthood and late adulthood.

DISCUSSION

The main goal of this study was to determine the frequency of depression among individuals diagnosed with diabetes mellitus by utilizing data from IFLS5. The results revealed that approximately 20.1% of people with diabetes mellitus were affected by depression. This finding aligns with previous research conducted by Ali et al. (2006) and Barnard et al. (2006), who also reported a similar prevalence of depression, indicating that around one-fifth of individuals with diabetes mellitus experience this condition. These consistent findings across multiple studies support the results obtained in this particular study.

In the present study, there were no gender differences in the depressive symptoms of diabetes mellitus patients. Studies conducted in Lebanon and Oman (Ahmadieh et al., 2018;

Alsumry et al., 2022) support this. Both nations are in the process of developing. The features of Indonesia, another growing nation, are the same as these. Depression has been linked to economic development (Wang, 2023).

Male and female diabetics may experience pressure and discomfort as a result of their diagnosis. According to studies, men may worry more about diabetes complications and feel more distress when the condition is severe (Huang et al., 2022). At the time of diagnosis, women may also express greater apprehension about early death and morbidity associated with diabetes (Mathew et al., 2012). Diabetes can cause sexual dysfunction, exhaustion, and other health issues that can lower a person's quality of life in both men and women (Juutilainen et al., 2004; Seghieri et al., 2017).

The study included more middle-aged adults because this age group has a higher incidence of diabetes (Cho et al., 2018). The risk of developing diabetes increases with age, and the overall aging of the population significantly contributes to the diabetes epidemic, as stated by Bai et al. (2021). Furthermore, several risk factors associated with diabetes, such as obesity, impaired glucose tolerance, and unfavorable body fat distribution, are more commonly observed among middle-aged populations, as indicated by Khabazkhoob et al. (2017) and Similä et al. (2018).

Early adulthood had greater rates of depression. These results support earlier research (Riaz et al., 2021) that found a higher prevalence of depression in diabetics who had their condition identified before the age of 40. A greater risk of getting depression may also exist in young adults (Mofatteh, 2020). This could be attributed to the higher levels of stress, anxiety, and depression commonly experienced by younger patients compared to their older counterparts (Poulsen & Pachana, 2012; Simonsen et al., 2021). Thus, the results of this study align with prior research, emphasizing the vulnerability of young adults with diabetes to experiencing depression.

Diabetes management programs should take into account the psychological factors associated with the condition, given the significant prevalence of depression symptoms among individuals with diabetes (Benmaamar et al., 2022). To address this issue, it is crucial for health workers in primary healthcare settings to conduct regular screening for depression among diabetes patients. By identifying individuals who may be experiencing depression, healthcare providers can offer appropriate psychological support and services to help manage their emotional well-being.

The limitation of this study is that it is not known what type of diabetes is experienced, whether diabetes mellitus is type 1 or type 2. Nevertheless, the available data can be used as initial data for further research by extracting data on the type of diabetes experienced. Furthermore, as the data was derived from a national survey, there were instances where participants did not provide complete information for certain demographic variables such as marital status, employment, and educational level. In several studies, it is known that education level is related to depression (Li et al., 2022; Patria, 2022). Therefore, for further research, ensure that participants fill in the data completely.

CONCLUSION

One in five people with diabetes mellitus in Indonesia experience depression, demonstrating this condition's prevalence. In order to successfully manage diabetes, patients with diabetes mellitus should have depression screening if they intend to receive therapy for the condition.

ACKNOWLEDGEMENT

The author expresses gratitude to the RAND Corporation and all those involved in conducting the survey, including the respondents, for granting access to the IFLS data.

CONFLICT OF INTEREST

The authors state that there are no conflicting interests.

REFERENCE

Abuhegazy, H., Mujairi, A., Banah, F., Agdi, Y., Elkeshishi, H., Kamel, A., Abdullah, A., & Elsheikh, M. (2022). Depression and Associated Risk Factors Among Type 2 Diabetic Patients: A Cross Sectional Study on a Convenience Sample from the Diabetic Center, Khamis Mushait; Saudi Arabia. Neuropsychiatric Disease and Treatment, 18, 1975–1984. https://doi.org/10.2147/NDT.S374752

Ahmadieh, H., Itani, H., Itani, S., Sidani, K., Kassem, M., Farhat, K., Jbeily, M., & Itani, A. (2018). Diabetes and depression in Lebanon and association with glycemic control: a cross-sectional study. Diabetes, Metabolic Syndrome and Obesity : Targets and Therapy, 11, 717–728. https://doi.org/10.2147/DMSO.S179153

Alberti, K. G., & Zimmet, P. Z. (1998). Definition, diagnosis and classification of diabetes mellitus and its complications. Part 1: diagnosis and classification of diabetes mellitus provisional report of a WHO consultation. Diabetic Medicine : A Journal of The British Diabetic Association, 15(7), 539–553. https://doi.org/10.1002/(SICI)1096-9136(199807)15:7<539::AID-DIA668>3.0.CO;2-S.

Ali, S., Stone, M. A., Peters, J. L., Davies, M. J., & Khunti, K. (2006). The prevalence of co-morbid depression in adults with Type 2 diabetes: a systematic review and meta-analysis. Diabetic Medicine : A Journal of The British Diabetic Association, 23(11), 1165–1173. https://doi.org/10.1111/j.1464-5491.2006.01943.x

Ali, S., Stone, M., Skinner, T. C., Robertson, N., Davies, M., & Khunti, K. (2010). The association between depression and health-related quality of life in people with type 2 diabetes: a systematic literature review. Diabetes/metabolism Research and Reviews, 26(2), 75–89. https://doi.org/10.1002/dmrr.1065

Alsumry, S. H., Al Ghelani, T., & Jaju, S. (2022). Depression in Urban Omani Adults with Type 2 Diabetes: A cross-sectional study. Sultan Qaboos University Medical Journal, 22(1), 45–50. https://doi.org/10.18295/squmj.4.2021.065

Anderson, R. J., Freedland, K. E., Clouse, R. E., & Lustman, P. J. (2001). The prevalence of comorbid depression in adults with diabetes: a meta-analysis. Diabetes Care, 24(6), 1069–1078. https://doi.org/10.2337/diacare.24.6.1069

Andresen, E. M., Byers, K., Friary, J., Kosloski, K., & Montgomery, R. (2013). Performance of the 10-item Center for Epidemiologic Studies Depression scale for caregiving research. SAGE Open Medicine, 1, 2050312113514576. https://doi.org/10.1177/2050312113514576

Andresen, E. M., Malmgren, J. A., Carter, W. B., & Patrick, D. L. (1994). Screening for depression in well older adults: evaluation of a short form of the CES-D (Center for Epidemiologic Studies Depression Scale). American Journal of Preventive Medicine, 10(2), 77–84.

Bai, A., Tao, J., Tao, L., & Liu, J. (2021). Prevalence and risk factors of diabetes among adults aged 45 years or older in China: A national cross-sectional study. Endocrinology, Diabetes & Metabolism, 4(3). https://doi.org/10.1002/edm2.265

Barnard, K. D., Skinner, T. C., & Peveler, R. (2006). The prevalence of co-morbid depression in adults with Type 1 diabetes: systematic literature review. Diabetic medicine : a journal of the British Diabetic Association, 23(4), 445–448. https://doi.org/10.1111/j.1464-5491.2006.01814.x

Bayani, M. A., Shakiba, N., Bijani, A., & Moudi, S. (2022). Depression and quality of life in patients with type 2 diabetes mellitus. Caspian Journal of Internal Medicine, 13(2), 335–342. https://doi.org/10.22088/cjim.13.2.3

Benmaamar, S., Lazar, N., El Harch, I., Maiouak, M., Qarmiche, N., Otmani, N., Salhi, H., Tachfouti, N., El Ouahabi, H., & El Fakir, S. (2022). Depression and anxiety in patients with diabetes in a Moroccan region. L'Encephale, 48(6), 601–606. https://doi.org/10.1016/j.encep.2021.06.014

Cho, N. H., Shaw, J. E., Karuranga, S., Huang, Y., da Rocha Fernandes, J. D., Ohlrogge, A. W., & Malanda, B. (2018). IDF Diabetes Atlas: Global estimates of diabetes prevalence for 2017 and projections for 2045. Diabetes research and clinical practice, 138, 271–281. https://doi.org/10.1016/j.diabres.2018.02.023

Coccaro, E. F., Joseph, J. J., Wyne, K., Drossos, T., Phillipson, L., & Ye, W. (2021). Emotional Regulation and Diabetes Distress in Adults With Type 1 and Type 2 Diabetes. Diabetes Care, 44(1), 20–25. https://doi.org/10.2337/dc20-1059

Cosco, T. D., Prina, M., Stubbs, B., & Wu, Y. T. (2017). Reliability and Validity of the Center for Epidemiologic Studies Depression Scale in a Population-Based Cohort of Middle-Aged U.S. Adults. Journal of Nursing Measurement, 25(3), 476–485. https://doi.org/10.1891/1061-3749.25.3.476

Dal Canto, E., Ceriello, A., Rydén, L., Ferrini, M., Hansen, T. B., Schnell, O., Standl, E., & Beulens, J. W. (2019). Diabetes as a cardiovascular risk factor: An overview of global trends of macro and micro vascular complications. European Journal of Preventive Cardiology, 26(2_suppl), 25–32. https://doi.org/10.1177/2047487319878371

Darwish, L., Beroncal, E. L., Sison, M. V., & Swardfager, W. (2018). Depression in people with type 2 diabetes: current perspectives. Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy, Volume 11, 333–343. https://doi.org/10.2147/dmso.s106797

de Groot, M., Anderson, R., Freedland, K. E., Clouse, R. E., & Lustman, P. J. (2001). Association of depression and diabetes complications: a meta-analysis. Psychosomatic Medicine, 63(4), 619–630. https://doi.org/10.1097/00006842-200107000-00015

Demmer, R. T., Gelb, S., Suglia, S. F., Keyes, K. M., Aiello, A. E., Colombo, P. C., Galea, S., Uddin, M., Koenen, K. C., & Kubzansky, L. D. (2015). Sex differences in the association between depression, anxiety, and type 2 diabetes mellitus. Psychosomatic Medicine, 77(4), 467–477. https://doi.org/10.1097/PSY.0000000000000169

Egede, L. E., Walker, R. J., Bishu, K., & Dismuke, C. E. (2016). Trends in Costs of Depression in Adults with Diabetes in the United States: Medical Expenditure Panel Survey, 2004-2011. Journal of General Internal Medicine, 31(6), 615–622. https://doi.org/10.1007/s11606-016-3650-1

Esen, I., Akturk Esen, S., & Demirci, H. (2022). Fatigue and depression in elderly patients with poorly controlled diabetes. Medicine, 101(45), e31713. https://doi.org/10.1097/MD.0000000000031713

Fowler, M. J. (2008). Microvascular and Macrovascular Complications of Diabetes. Clinical Diabetes, 26(2), 77–82. https://doi.org/10.2337/diaclin.26.2.77

Gupta, J., Kapoor, D., & Sood, V. (2021). Quality of life and its determinants in patients with diabetes mellitus from two health institutions of sub-himalayan region of India. Indian Journal of Endocrinology and Metabolism, 25(3), 211. https://doi.org/10.4103/ijem.ijem_246_21

Handika, N.J. & Ariani, N.K.P. (2020). Gambaran kejadian depresi pada pasien diabetes mellitus tipe 2 di Rumah Sakit Umum Pusat (RSUP) Sanglah Denpasar Bali. Jurnal Medika Udayana, 9(1), 82-88. https://doi.org/10.24843.MU.2020.V9.i1.P16

Huang, L. C., Lin, C. L., Chang, Y. T., Chen, R. Y., & Bai, C. H. (2022). Gender Impact on Diabetes Distress Focus at Medical Communication Concerns, Life and Interpersonal Stress. International journal of environmental research and public health, 19(23), 15678. https://doi.org/10.3390/ijerph192315678

IDF Diabetes Atlas: Global, regional and country-level diabetes prevalence estimates for 2021 and projections for 2045 » Diabetes Indonesia. (2023, February 27). https://diabetes-indonesia.net/2022/02/idf-diabetes-atlas-global-regional-and-country-level-diabetes-prevalence-estimates-for-2021-and-projections-for-2045

James, C., Powell, M., Seixas, A., Bateman, A., Pengpid, S., & Peltzer, K. (2020). Exploring the psychometric properties of the CES-D-10 and its practicality in detecting depressive symptomatology in 27 low- and middle-income countries. International journal of psychology : Journal International de Psychologie, 55(3), 435–445. https://doi.org/10.1002/ijop.12613

Jing, X., Chen, J., Dong, Y., Han, D., Zhao, H., Wang, X., Gao, F., Li, C., Cui, Z., Liu, Y., & Ma, J. (2018). Related factors of quality of life of type 2 diabetes patients: a systematic review and meta-analysis. Health and Quality of Life Outcomes, 16(1), 189. https://doi.org/10.1186/s12955-018-1021-9

Juutilainen, A., Kortelainen, S., Lehto, S., Rönnemaa, T., Pyörälä, K., & Laakso, M. (2004). Gender Difference in the Impact of Type 2 Diabetes on Coronary Heart Disease Risk. Diabetes Care, 27(12), 2898–2904. https://doi.org/10.2337/diacare.27.12.2898

Kalra, S., Jena, B. N., & Yeravdekar, R. (2018). Emotional and Psychological Needs of People with Diabetes. Indian Journal of Endocrinology and Metabolism, 22(5), 696–704. https://doi.org/10.4103/ijem.IJEM_579_17

Khabazkhoob, M., Emamian, M. H., Hashemi, H., Shariati, M., & Fotouhi, A. (2017). Prevalence of Overweight and Obesity in the Middle-age Population: A Priority for the Health System. Iranian journal of public health, 46(6), 827–834.

Khaledi, M., Haghighatdoost, F., Feizi, A., & Aminorroaya, A. (2019). The prevalence of comorbid depression in patients with type 2 diabetes: an updated systematic review and meta-analysis on huge number of observational studies. Acta Diabetologica, 56(6), 631–650. https://doi.org/10.1007/s00592-019-01295-9

Li, L., Sun, W., Luo, J., & Huang, H. (2022). Associations between education levels and prevalence of depressive symptoms: NHANES (2005-2018). Journal of Affective Disorders, 301, 360–367. https://doi.org/10.1016/j.jad.2022.01.010

Li, S., Wang, J., Zhang, B., Li, X., & Liu, Y. (2019). Diabetes Mellitus and Cause-Specific Mortality: A Population-Based Study. Diabetes & Metabolism Journal, 43(3), 319–341. https://doi.org/10.4093/dmj.2018.0060

Lin, E. H., Rutter, C. M., Katon, W., Heckbert, S. R., Ciechanowski, P., Oliver, M. M., Ludman, E. J., Young, B. A., Williams, L. H., McCulloch, D. K., & Von Korff, M. (2010). Depression and advanced complications of diabetes: a prospective cohort study. Diabetes Care, 33(2), 264–269. https://doi.org/10.2337/dc09-1068

Liu, X., Li, Y., Guan, L., He, X., Zhang, H., Zhang, J., Li, J., Zhong, D., & Jin, R. (2022). A Systematic Review and Meta-Analysis of the Prevalence and Risk Factors of Depression in Type 2 Diabetes Patients in China. Frontiers in Medicine, 9, 759499. https://doi.org/10.3389/fmed.2022.759499

Lyrakos, G. N., Papazafiropoulou, A. K., Batistaki, C., Xatziagelaki, E., Damigos, D., Tinas, C., … Spinaris, V. (2013). 1412 – Differences in depression anxiety and stress among men and women with diabetes mellitus. European Psychiatry, 28, 1. https://doi.org/10.1016/s0924-9338(13)76450-2

Mathew, R., Gucciardi, E., De Melo, M., & Barata, P. C. (2012). Self-management experiences among men and women with type 2 diabetes mellitus: a qualitative analysis. BMC Family Practice, 13(1). https://doi.org/10.1186/1471-2296-13-122

Mofatteh M. (2020). Risk factors associated with stress, anxiety, and depression among university undergraduate students. AIMS Public Health, 8(1), 36–65. https://doi.org/10.3934/publichealth.2021004

Muthana, F.M.S., Abdulrahman, E., Uitrakul, S., & Karuppannan, M. (2022). The Prevalence of Depression among Type 2 Diabetic Patients in Malaysia: A Systematic Review and Meta-Analysis. Journal of Positive School Psychology. 6(4), 11802-11819 .

Nouwen, A., Winkley, K., Twisk, J., Lloyd, C. E., Peyrot, M., Ismail, K., Pouwer, F., & European Depression in Diabetes (EDID) Research Consortium (2010). Type 2 diabetes mellitus as a risk factor for the onset of depression: a systematic review and meta-analysis. Diabetologia, 53(12), 2480–2486. https://doi.org/10.1007/s00125-010-1874-x

Olamoyegun, M., Ibraheem, W., Iwuala, S., Audu, M., & Kolawole, B. (2015). Burden and pattern of micro vascular complications in type 2 diabetes in a tertiary health institution in Nigeria. African Health Sciences, 15(4), 1136–1141. https://doi.org/10.4314/ahs.v15i4.12

Patria B. (2022). The longitudinal effects of education on depression: Finding from the Indonesian national survey. Frontiers in Public Health, 10, 1017995. https://doi.org/10.3389/fpubh.2022.1017995

Poulsen, K. M., & Pachana, N. A. (2012). Depression and Anxiety in Older and Middle-aged Adults With Diabetes. Australian Psychologist, 47(2), 90–97. https://doi.org/10.1111/j.1742-9544.2010.00020.x

Pouwer, F., Nefs, G., & Nouwen, A. (2013). Adverse effects of depression on glycemic control and health outcomes in people with diabetes: a review. Endocrinology and Metabolism clinics of North America, 42(3), 529–544. https://doi.org/10.1016/j.ecl.2013.05.002

Ramdani, M.I. (2016). Gambaran tingkat depresi pada pasien diabetes. Unpublished thesis. Faculty of Medicine and Health Sciences. Universitas Islam Negeri Syarif Hidayatullah Jakarta.

Riaz, B. K., Selim, S., Neo, M., Karim, N., & Zaman, M. (2021). Risk of Depression among Early Onset Type 2 Diabetes Mellitus Patients. Dubai Diabetes and Endocrinology Journal, 27(2), 55–65. https://doi.org/10.1159/000515683

Rodríguez-Gutiérrez, R., & Montori, V. M. (2016). Glycemic Control for Patients With Type 2 Diabetes Mellitus: Our Evolving Faith in the Face of Evidence. Circulation. Cardiovascular Quality and Outcomes, 9(5), 504–512. https://doi.org/10.1161/CIRCOUTCOMES.116.002901

Seghieri, G., Policardo, L., Anichini, R., Franconi, F., Campesi, I., Cherchi, S., & Tonolo, G. (2017). The Effect of Sex and Gender on Diabetic Complications. Current diabetes reviews, 13(2), 148–160. https://doi.org/10.2174/1573399812666160517115756

Similä, T., Auvinen, J., Puukka, K., Keinänen-Kiukaanniemi, S., & Virtanen, J. I. (2018). Impaired glucose metabolism is associated with tooth loss in middle-aged adults: The Northern Finland Birth Cohort Study 1966. Diabetes Research and Clinical Practice, 142, 110–119. https://doi.org/10.1016/j.diabres.2018.05.035

Simonsen, N., Koponen, A. S., & Suominen, S. (2021). Empowerment among adult patients with type 2 diabetes: age differentials in relation to person-centred primary care, community resources, social support and other life-contextual circumstances. BMC Public Health, 21(1). https://doi.org/10.1186/s12889-021-10855-0

Sinaga, I. O. Y., Barliana, M. I., Pradipta, I. S., Iskandarsyah, A., Abdulah, R., & Alfian, S. D. (2022). Depression is Associated with the Increase Risk of Multimorbidity Among the General Population in Indonesia. Journal of Multidisciplinary Healthcare, Volume 15, 1863–1870. https://doi.org/10.2147/jmdh.s372712

Stein, D. T., Sudharsanan, N., Dewi, S., Manne-Goehler, J., Witoelar, F., & Geldsetzer, P. (2020). Change in clinical knowledge of diabetes among primary healthcare providers in Indonesia: repeated cross-sectional survey of 5105

primary healthcare facilities. BMJ Open Diabetes Research & Care, 8(1), e001415. https://doi.org/10.1136/bmjdrc-2020-001415

Strauss, J., & Witoelar, F. (2021). Indonesia Family Life Survey. In Springer eBooks. Springer Nature. https://doi.org/10.1007/978-3-030-22009-9_339

Strauss, J., Witoelar, F., & Sikoki, B. (2016). The Fifth Wave of the Indonesia Family Life Survey: Overview and Field Report: Volume 1. RAND Corporation EBooks. https://doi.org/10.7249/wr1143.1

Sun, H., Saeedi, P., Karuranga, S., Pinkepank, M., Ogurtsova, K., Duncan, B. B., Stein, C., Basit, A., Chan, J. C. N., Mbanya, J. C., Pavkov, M. E., Ramachandaran, A., Wild, S. H., James, S., Herman, W. H., Zhang, P., Bommer, C., Kuo, S., Boyko, E. J., & Magliano, D. J. (2022). IDF Diabetes Atlas: Global, regional and country-level diabetes prevalence estimates for 2021 and projections for 2045. Diabetes Research and Clinical Practice, 183, 109119. https://doi.org/10.1016/j.diabres.2021.109119

Sun, N., Lou, P., Shang, Y., Zhang, P., Wang, J., Chang, G., & Shi, C. (2016). Prevalence and determinants of depressive and anxiety symptoms in adults with type 2 diabetes in China: a cross-sectional study. BMJ Open, 6(8), e012540. https://doi.org/10.1136/bmjopen-2016-012540

Twito, O., Ahron, E., Jaffe, A., Afek, S., Cohen, E., Granek-Catarivas, M., Klein, P., & Hermoni, D. (2013). New-onset diabetes in elderly subjects: association between HbA1c levels, mortality, and coronary revascularization. Diabetes Care, 36(11), 3425–3429. https://doi.org/10.2337/dc12-2503

van Dooren, F. E., Nefs, G., Schram, M. T., Verhey, F. R., Denollet, J., & Pouwer, F. (2013). Depression and risk of mortality in people with diabetes mellitus: a systematic review and meta-analysis. PloS One, 8(3), e57058. https://doi.org/10.1371/journal.pone.0057058

Veerabenjapol, A., Lotrakul, M., & Rattarasarn, C. (2010). Prevalence and Risk Factors of Depression in Thai Diabetic Patients. Ramathibodi Medical Journal, 33(1), 10–18. Retrieved from https://he02.tci-thaijo.org/index.php/ramajournal/article/view/138031

Victoria, G. M. B., & Dampil, A. O. (2019). Prevalence of Depression among Patients with Type 2 Diabetes Mellitus and its associated Clinical Factors. Journal of the ASEAN Federation of Endocrine Societies, 34(2), 197–203. https://doi.org/10.15605/jafes.034.02.11

Viigimaa, M., Sachinidis, A., Toumpourleka, M., Koutsampasopoulos, K., Alliksoo, S., & Titma, T. (2020). Macrovascular Complications of Type 2 Diabetes Mellitus. Current Vascular Pharmacology, 18(2), 110–116. https://doi.org/10.2174/1570161117666190405165151

Wang, J., Zhang, J., Lin, H., Han, Y., Tu, J., & Nie, X. (2023). Economic development, weak ties, and depression: Evidence from China. Journal of Affective Disorders. https://doi.org/10.1016/j.jad.2023.04.097

Wu, C. S., Hsu, L. Y., & Wang, S. H. (2020). Association of depression and diabetes complications and mortality: a population-based cohort study. Epidemiology and Psychiatric Sciences, 29, e96. https://doi.org/10.1017/S2045796020000049

Yilmaz, F.T., KUmsar, A.K., & Yesildag, B. (2018). The Relation between Anger Level and Metabolic Control Variables in Type 2 Diabetes. International Journal of Caring Sciences, 11(1), 502-511 .

Zhang, P., Lou, P., Chang, G., Chen, P., Zhang, L., Li, T., & Qiao, C. (2016). Combined effects of sleep quality and depression on quality of life in patients with type 2 diabetes. BMC Family Practice, 17, 40. https://doi.org/10.1186/s12875-016-0435-x

Zhang, W., O'Brien, N., Forrest, J. I., Salters, K. A., Patterson, T. L., Montaner, J. S., Hogg, R. S., & Lima, V. D. (2012). Validating a shortened depression scale (10 item CES-D) among HIV-positive people in British Columbia, Canada. PloS One, 7(7), e40793. https://doi.org/10.1371/journal.pone.0040793

Zurita-Cruz, J. N., Manuel-Apolinar, L., Arellano-Flores, M. L., Gutierrez-Gonzalez, A., Najera-Ahumada, A. G., & Cisneros-González, N. (2018). Health and quality of life outcomes impairment of quality of life in type 2 diabetes mellitus: a cross-sectional study. Health and Quality of Life Outcomes, 16(1), 94. https://doi.org/10.1186/s12955-018-0906-y