



## Cognitive Behavioral Therapy for Diabetic Patients

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### ABSTRACT

Improving self-care in T2DM patients is critical so that patients can achieve targeted blood glucose levels to prevent complications and independently perform daily tasks to improve their quality of life and life satisfaction. Psychological intervention is believed to be able to change a person's behavior towards a better direction in disease control and prevention. This study measures the impact of cognitive-behavioral therapy (CBT) interventions on the self-care management of T2DM patients. This quasi-experimental study used a pretest-posttest with a control group design. The research subjects were divided into two groups, namely the intervention group (35 people) and the control group (35 people). The study was conducted at the Tello Primary Health Center in April 2021. The data were analyzed using the t-dependent test ( $\alpha=0.05$ ). The results of the study showed that in the intervention group, there were differences in the self-care management of T2DM patients before and after being given CBT, which included eating patterns ( $p < 0.001$ ; 95%CI -6.663-(-4.796)), physical activity ( $p < 0.001$ ; 95%CI -5.344-(-4.370)), and attitude ( $p = < 0.001$ ; 95%CI -13.086-(-10.114)). In the control group, there was no difference in the self-care management of T2DM patients, which included eating patterns ( $p = 0.083$ ; 95%CI -0.183-0.012), physical activity ( $p = 0.058$ ; 95%CI -0.291-0.005), and T2DM patients attitudes ( $p = 0.094$ ; 95%CI -0.225-0.003). This means that CBT is effective in improving the self-care management of T2DM patients.

### ABSTRAK

Peningkatan perawatan diri pada pasien DM tipe 2 sangat penting dilakukan agar pasien dapat mencapai kadar glukosa darah yang ditargetkan untuk mencegah komplikasi dan secara mandiri melakukan tugas sehari-hari sehingga meningkatkan kualitas hidup dan kepuasan hidup mereka. Intervensi psikologis dipercaya mampu mengubah perilaku seseorang ke arah yang lebih baik dalam pengendalian dan pencegahan penyakit. Studi ini bertujuan mengukur dampak intervensi Cognitive-behavioural therapy (CBT) terhadap manajemen perawatan diri pasien DM tipe 2. Quasi-experimental study ini menggunakan desain pretest-posttest with control group design. Subjek penelitian dibagi ke dalam dua kelompok yaitu kelompok intervensi (35 orang) dan kelompok kontrol (35 orang). Penelitian dilakukan di Puskesmas Tello pada bulan April tahun 2021. Data dianalisis menggunakan uji t-dependent ( $\alpha=0,05$ ). Hasil studi menunjukkan bahwa pada kelompok intervensi terdapat perbedaan manajemen perawatan diri pasien DM tipe 2 sebelum dan sesudah diberikan CBT yang meliputi pola makan ( $p < 0,001$ ; 95%CI -6,663-(-4,796)), aktivitas fisik ( $p < 0,001$ ; 95%CI -5,344-(-4,370)), dan sikap ( $p < 0,001$ ; 95%CI -13,086-(-10,114)). Sedangkan pada kelompok kontrol, tidak terdapat perbedaan manajemen perawatan diri pasien DM tipe 2 yang meliputi pola makan ( $p = 0,083$ ; 95%CI -0,183-0,012), aktivitas fisik ( $p = 0,058$ ; 95%CI -0,291-0,005), dan sikap pasien DM ( $p = 0,094$ ; 95%CI -0,225-0,003). Artinya CBT efektif dalam meningkatkan manajemen perawatan diri pasien DM tipe 2.

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## INTRODUCTION

Increasing cases of type 2 diabetes mellitus (T2DM) occur in various countries and in recent decades have infected the adult population. The results of projections on a global scale for T2DM disease show that in 2040, it is estimated that the prevalence of T2DM in adults will increase to 10.4% (Ogurtsova et al., 2017). WHO predicts an increase in the number of people with T2DM in Indonesia from 8.4 million people in 2000 to around 21.3 million people in 2030 (Kementerian Kesehatan, 2018). In Medan City, in 2018, the number of patients with type 2 DM who were recorded to have received treatment was 39,769 people (Dinas Kesehatan Kota Medan, 2019).

The development and prognosis of T2DM is related to a person's lifestyle. Poor diet, lack of physical activity and stress levels contribute to the failure of managing T2DM (Chen et al., 2015). Individual noncompliance in diabetes management makes most of them experience health complications and a huge economic burden (Papatheodorou et al., 2015). Additionally, psychological burdens such as depression can occur after the diagnosis of diabetes in patients and this condition affects all age groups of people with T2DM (Thongsai et al., 2014). Therefore, T2DM sufferers require substantial lifelong self-care management, which is influenced by psychological factors and patient beliefs (Harvey, 2015). Good self-care management is expected to control glycemic and lead to good long-term medical outcomes (Hurst et al., 2021).

Previous literature suggests that consistent self-care behavior by individuals contributes to good glucose control, improved quality of life, reduced risk of complications and death (Chen et al., 2015; International Diabetes Federation, 2017; Bukhsh et al., 2018). Proactive actions by people with T2DM such as healthy eating, being physically active, monitoring blood sugar, medication adherence, problem solving skills, adaptive coping skills and reducing risky behavior are believed to provide good health status (Shrivastava et al., 2013).

Barriers encountered in the application of self-care management of T2DM in the form of a lack of knowledge and understanding, low motivation, difficulty changing old habits, negative perceptions of new things, and social environment (Booth et al., 2013). Several demographic, socio-economic and social support factors are considered contributing factors in encouraging patients to undertake self-care management (Shrivastava et al., 2013). Financial factors have also been reported to be related to patient barriers to accessing diabetes health services and food consumption in accordance with appropriate dietary recommendations (Campbell et al., 2016). The role of health care providers and doctors in promoting self-care is critical (Laranjo et al., 2015).

To overcome the obstacles in implementing self-care management for T2DM, interventions are needed to encourage behavior change in individuals with T2DM. Cognitive-behavioral therapy (CBT) has been widely recognized as an effective psychological therapy to encourage behavior change, but its use is still limited. In patients with T2DM, CBT is a psychiatric therapy that changes the pattern individual thinking (cognitive) and changing individual behavior to be better at conducting certain actions that are the focus of attention (Daniels & Sheils, 2017). Synthesized results from various studies prove that CBT is effective in improving short and medium term glycemic control. Although it has not been proven for the long term, CBT is recommended to form a coping strategy for

better self-care management (Uchendu & Blake, 2017). The effect of CBT intervention is an increase in glycated hemoglobin, an increase in self-efficacy and self-concept related to the success of diabetes management (Kanapathy & Bogle, 2019).

The results of the initial survey conducted by researchers at the Tello Health Center in South Nias Regency by interviewing 10 patients with T2DM. Information was obtained that there was still patients who did not know about routine treatment for T2DM, still thought not to take routine treatment, and did not control their lifestyle. This study intends to further explore the effect of the application of cognitive behavioral therapy (CBT) on the self-care management of T2DM.

## METHOD

### *Research Design*

This study is a quasi-experimental study using a pretest-posttest with control group design. The research subjects were divided into two groups, namely, the experimental and control groups. The study was conducted at the Tello Health Center in April 2021.

### *Sampling Procedures*

The subjects of this study were adults aged >40 years and over who had been diagnosed with diabetes as many as 250 people. The research sample size was obtained from the calculation of the value of  $Z_{\alpha} = 1.64$ ;  $Z_{\beta} = 1.28$ ;  $X_1 - X_2 = 2$ ; and standard deviation = 4, so the value of  $n_1 = n_2$  is 35 people for each intervention and control group.

### *Data Collection*

Data collection was conducted by distributing questionnaires to respondents containing related questions self-care management T2DM patients include eating patterns as many as 14 questions with answer choices, namely agree = 1 and disagree = 0, then the physical activity variable is 14 questions with answer choices agree = 1 and disagree = 0, then the attitude variable of T2DM patients is 14 questionnaire with answer choices strongly agree = 4, agree = 3, disagree = 2 and strongly disagree = 1.

The research was conducted in five stages, namely, pretest, preparation, implementation, posttest and closing. At the pretest stage, T2DM patients who have been diagnosed and have been assigned to be research respondents are measured self care management includes eating patterns, physical activity, and attitudes of T2DM patients with a questionnaire measuring instrument. Furthermore, the researcher explained filling out the questionnaire and distributing questionnaires to be answered by respondents including characteristics such as (age, sex, occupation, education and duration of having T2DM) and a questionnaire containing self care management T2DM patients (diet, physical activity and attitude of T2DM patients). Furthermore, at the preparation stage, the researchers prepared the necessary equipment such as LCD, laptop, and created comfortable conditions for giving the intervention. Then, at the implementation stage, the researcher gave Cognitive behavioral therapy (CBT) exercises directly by the researcher using the SOP guide or module in 4 sessions in 4 weeks. Then, at the posttest stage, the

researcher redistributed the questionnaire to the respondents to be answered by the respondents regarding the questions self care management T2DM patients.

### Data Analysis

Data analysis began by calculating the frequency distribution of the demographic data of T2DM patients including (age, sex, occupation, education and duration of T2DM). Furthermore, analysis of the data normality test was conducted using the Shapiro Wilk test to determine the distribution of data that were normally distributed to self care management before and after giving CBT. Furthermore, descriptive analysis was conducted to determine the mean value and standard deviation of the variable self-care management T2DM. Because the data distribution is normally distributed, it is continued with the t-dependent test ( $\alpha=0.05$ ).

## RESULTS AND DISCUSSION

This study involved 35 diabetes mellitus patients in each intervention and control group at the Tello Health Center, South Nias Regency. During the study, which lasted one

month, all respondents were willing to fill out a consent form and were involved until the data collection was completed. The characteristics of the respondents in the intervention group obtained the results of the calculation of the frequency distribution.

In the intervention group, most of the diabetes mellitus patients aged 51-56 years by 48,6%, followed by T2DM patients aged 46-50 years at 22,9%, 57-62 years old by 20% and age 40-45 years by 8,6%. In the control group, most respondents were 46-50 years old (42,8%), followed by patients aged 51-56 (40%), 57-62 years old (14,3%) and 40-45 years old (2,9%). This prevalence is consistent with previous studies where the population with T2DM was dominated by the age of 45 years and over. Increasing age causes glucose intolerance due to decreased ability of cells in the pancreas (Suastika et al., 2012; Chia et al., 2018). However, it should also be noted that the prevalence of type DM is increasing at a young age due to poor glycemic control (Berkowitz et al., 2013).

Based on gender, the intervention group and control groups were both dominated by women. This result is different from previous studies in which cases of T2DM were more common in men (Nordström et al., 2016). This may be because obesity is more common in women. Obesity is the most prominent risk factor in T2DM (Harreiter & Kautzky-Willer, 2018).

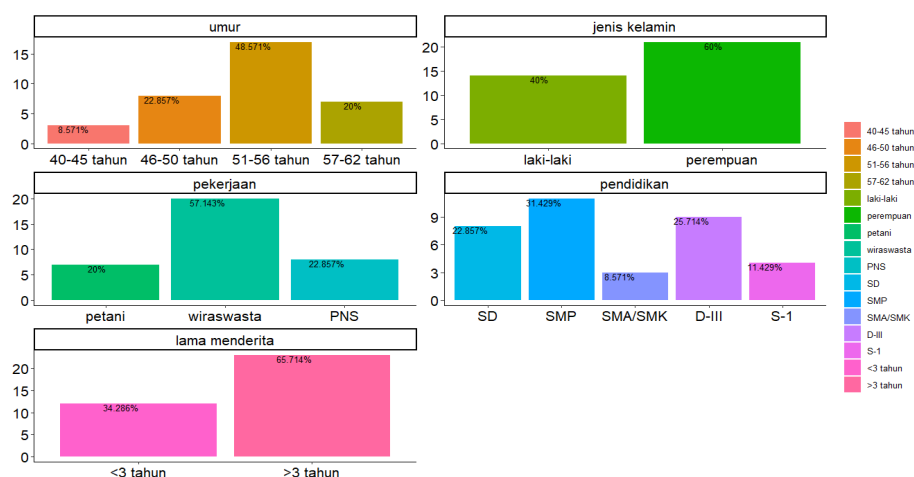


Figure 1. Characteristics of the intervention group

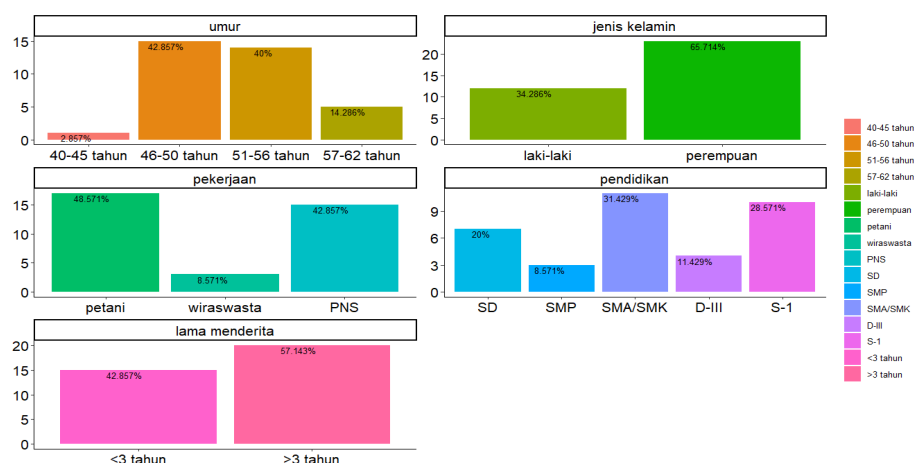


Figure 2. Characteristics of the control group

In the occupational category, most of the subjects in the intervention group worked as entrepreneurs (57.1%) and in the control group worked as farmers (48.6%). This finding may be due to the fact that most of the respondents involved in the study are farmers because the research location is in a rural area. Even though the farmer's physical activity is high, the factor of excessive carbohydrate consumption and lack of fiber can contribute to an increased risk. Previous studies have concluded that the risk factors shown to be associated with the incidence of T2DM in farmers and laborers are family history, BMI, energy intake and thiamin (Kusnadi et al., 2017). Farmers who are exposed to pesticides for a long time at work have a high risk of developing T2DM (Juntarawijit & Juntarawijit, 2018).

From the last education level of T2DM patients in the intervention group, most of the T2DM patients had junior high school education as much as 31.4%, followed by the third diploma level as much as 25.7%, elementary school level as much as 22.9%, undergraduate (bachelor) as many as 4 people and education level of as much as 8.6%. In the control group, most of them have senior high school education as much as 31.4%. Low levels of education are associated with poor health and stress levels (World Health Organization, 2012). Several studies also concluded that the negative effect on glycemic control was due to low levels of education. This is related to the patient's level of awareness of the importance of glycemic control and the dangers of T2DM complications (Khan et al., 2012; Khattab et al., 2010).

Furthermore, judging from the length of treatment, the intervention group and the control group had the most length of stay > 3 years. This shows that most of the respondents have not suffered from T2DM for too long so that rapid and appropriate disease management can prevent the risk of further disease complications. The longer the patient is affected by T2DM, the patient has a higher DM self-care activity than patients who have just been affected by DM. Sufferers better understand self-care behavior based on their experience during the disease so that clients understand better about the best things to do to maintain their health (Bai et al., 2009).

The results of the data normality test by Shapiro Wilk showed that the variables of diet, physical activity and attitudes of T2DM patients before and after being given CBT

in the intervention and control groups were normally distributed. Therefore, the univariate analysis used a measure of concentration (mean value) and a measure of spread (standard deviation) (Table 2). Meanwhile, the bivariate analysis used paired t-statistic test (Table 3).

The researcher analyzed the results of the pretest and posttest that had been filled in by the respondents. The lifestyle behavior of T2DM patients was measured using a nutrition-related diet questionnaire (14 questions), an attitude questionnaire (14 questions) related to how the patient lived as a T2DM patient and drug consumption patterns as well as a physical activity questionnaire (14 questions), related to how the pattern of activities such as sports, daily activities and light.

**Table 1**  
**Data Normality Test with Shapiro Wilk**

Variable	p-value	
	Intervention	Control
<b>Dietary habit</b>		
Pretest	0.073	0.067
Posttest	0.061	0.083
<b>Physical activity</b>		
Pretest	0.092	0.052
Posttest	0.071	0.057
<b>Attitude</b>		
Pretest	0.676	0.273
Posttest	0.123	0.245

Table 2 shows that the average value of eating patterns, physical activity and attitudes of T2DM patients before and after being given CBT in the intervention group each increased with the average difference value, namely, the variable diet of -5,71, physical activity of -5,71 -4,86 and the attitude of T2DM patients were -11,6. While the control group showed that the average value of the diet, physical activity and attitude of T2DM patients, each had an average difference value, namely, diet of 0,08, physical activity of 0,14 and attitude of T2DM patients of - 0,11.

**Table 2**  
**Mean Value of Diet, Physical Activity and Attitude of Type 2 DM Patients in the Intervention and Control Group**

Variable	Intervention (n=35)			Control (n=35)		
	Average	Average difference	SD	Average	Average difference	SD
<b>Dietary habit</b>						
Pretest	6.46	-5.71	2.343	5.89	0,08	1.952
Posttest	12.17		1.224	5.97		1.917
<b>Physical activity</b>						
Pretest	7.63	-4,86	1.262	7.00	0,14	1.645
Posttest	12.49		.919	7.14		1.630
<b>Attitude</b>						
Pretest	29.97	-11,6	3.535	28.09	-0,11	3.071
Posttest	41.57		3.080	28.20		3.095

The results of the analysis in table 3 showed that in the intervention group there were differences in the self-care management of T2DM patients before and after being given CBT which included diet (p= <0.001; 95%CI -6.663-(-4.796)), physical activity (p= <0.001; 95%CI -5.344-(-4.370)), and attitude (p= <0.001; 95%CI -13.086-(-10.114)). While in the control group, there was no difference in the self-care management of T2DM patients which included eating

patterns (p= 0.083; 95%CI -0.183-0.012), physical activity (p= 0.058; 95%CI -0.291-0.005), and attitudes (p= 0.094; 95% CI -0.225-0.003).

In this study it was proven that the improvement in self-care management in the intervention group was better than the control group. A structured program that modifies cognitive to make behavioral changes greatly helps patients improve skills for self-care and control stress due to the

illness that they are experiencing. CBT can change a person's attitudes and behavior by focusing on thoughts, beliefs and attitudes we hold (cognitive processes) and how these relate to the way we behave (Beck, 2011). Behavioral interventions

have a significant impact on changing psychological states regarding glycemic control, thereby strengthening glycemic control skills and leading to healthy outcomes (Huang et al., 2016).

**Table 3**  
**Effect of CBT on Self-Care Management of T2DM Patients**

Variabel	Intervention			Control		
	p	95% CI		p	95% CI	
		Lower	Upper		Lower	Upper
Pretest diet of T2DM patients	<0,001	-	-4.796	0.083	-	0.012
Posttest diet of T2DM patients		6.633			0.183	
Physical activity pretest of T2DM patients	<0,001	-	-4.370	0.058	-	0.005
Posttest physical activity of T2DM patients		5.344			0.291	
Pretest attitude of T2DM patients	<0,001	-	-10.114	0.094	-	-0.003
Posttest attitude of T2DM patients		13.086			0.225	

Studies in Korea concluded that CBT improves glycemic control due to increased motivation and care management skills (Lee, 2015). Shahni et al. (2013) concluded that CBT can significantly improve self-care behavior in patients being affected by chronic diseases. The results showed that the implementation of CBT had a significant effect on improving hypertension in patients. An RCT study concluded that the effectiveness of CBT is enduring in the self-care management intervention of T2DM patients with depression. This method can make patients more obedient in glycemic control (Safren et al., 2014).

During CBT sessions, patients are taught about cognitive distortions and negative thoughts, learn solutions to deal with these thoughts, and by practicing and repeating relaxation techniques. Participants felt more at peace in different situations in life and cope with feelings of stress and anxiety. Chronic diseases such as type 2 diabetes require a patient-centered approach, namely, patient empowerment that emphasizes a collaborative approach to facilitate patients directing themselves in better behavior changes (Othman et al., 2021).

### CONCLUSIONS AND SUGGESTIONS

CBT proved to be effective in improving self-care management of patients with type 2 diabetes. The results of the study showed that in the intervention group, there were differences in self-care management of patients with type 2 diabetes before and after being given CBT, which included eating patterns ( $p < 0.001$ ; 95%CI - 6,663-(-4,796)), physical activity ( $p = <0.001$ ; 95%CI -5,344-(-4,370)), and attitude ( $p = <0.001$ ; 95%CI -13,086-(-10,114)). In the control group, there was no difference in the self-care management of T2DM patients, which included eating patterns ( $p = 0.083$ ; 95%CI - 0.183-0.012), physical activity ( $p = 0.058$ ; 95%CI -0.291-0.005), and attitudes ( $p = 0.094$ ; 95%CI -0.225-0.003). Further studies using larger sample sizes are needed to confirm the association and to identify the more toxic compounds.

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### REFERENCES

- Bai, Y.-L., Chiou, C.-P., & Chang, Y.-Y. (2009). Self-care behaviour and related factors in older people with Type 2 diabetes. *Journal of Clinical Nursing, 18*(23), 3308–3315. <https://doi.org/10.1111/j.1365-2702.2009.02992.x>
- Beck, J. S. (2011). Cognitive behavior therapy: Basics and beyond, 2nd ed. In *Cognitive behavior therapy: Basics and beyond* (pp. xix, 391–xix, 391). Guilford Press.
- Berkowitz, S. A., Meigs, J. B., & Wexler, D. J. (2013). Age at type 2 diabetes onset and glycaemic control: Results from the National Health and Nutrition Examination Survey (NHANES) 2005–2010. *Diabetologia, 56*(12), 2593–2600. <https://doi.org/10.1007/s00125-013-3036-4>
- Booth, A. O., Lowis, C., Dean, M., Hunter, S. J., & McKinley, M. C. (2013). Diet and physical activity in the self-management of type 2 diabetes: barriers and facilitators identified by patients and health professionals. *Primary Health Care Research & Development, 14*(3), 293–306. <https://doi.org/10.1017/S1463423612000412>
- Bukhsh, A., Khan, T. M., Lee, S. W. H., Lee, L.-H., Chan, K.-G., & Goh, B.-H. (2018). Efficacy of Pharmacist Based Diabetes Educational Interventions on Clinical Outcomes of Adults With Type 2 Diabetes Mellitus: A Network Meta-Analysis. In *Frontiers in Pharmacology* (Vol. 9, p. 339). <https://www.frontiersin.org/article/10.3389/fphar.2018.00339>
- Campbell, D. J. T., Manns, B. J., Hemmelgarn, B. R., Sanmartin, C., Edwards, A., & King-Shier, K. (2016). Understanding Financial Barriers to Care in Patients With Diabetes: An Exploratory

- Qualitative Study. *The Diabetes Educator*, 43(1), 78–86. <https://doi.org/10.1177/0145721716679276>
- Chen, L., Pei, J.-H., Kuang, J., Chen, H.-M., Chen, Z., Li, Z.-W., & Yang, H.-Z. (2015). Effect of lifestyle intervention in patients with type 2 diabetes: A meta-analysis. *Metabolism - Clinical and Experimental*, 64(2), 338–347. <https://doi.org/10.1016/j.metabol.2014.10.018>
- Chen, Y., Sloan, F. A., & Yashkin, A. P. (2015). Adherence to diabetes guidelines for screening, physical activity and medication and onset of complications and death. *Journal of Diabetes and Its Complications*, 29(8), 1228–1233. <https://doi.org/10.1016/j.jdiacomp.2015.07.005>
- Chia, C. W., Egan, J. M., & Ferrucci, L. (2018). Age-Related Changes in Glucose Metabolism, Hyperglycemia, and Cardiovascular Risk. *Circulation Research*, 123(7), 886–904. <https://doi.org/10.1161/CIRCRESAHA.118.312806>
- Daniels, J., & Sheils, E. (2017). A Complex Interplay: Cognitive Behavioural Therapy for Severe Health Anxiety in Addison's Disease to Reduce Emergency Department Admissions. *Behavioural and Cognitive Psychotherapy*, 45(4), 419–426. <https://doi.org/10.1017/S1352465817000182>
- Dinas Kesehatan Kota Medan. (2019). *Profil Kesehatan Kota Medan Tahun 2018*.
- Harreiter, J., & Kautzky-Willer, A. (2018). Sex and Gender Differences in Prevention of Type 2 Diabetes. *Frontiers in Endocrinology*, 9(May), 1–15. <https://doi.org/10.3389/fendo.2018.00220>
- Harvey, J. N. (2015). Psychosocial interventions for the diabetic patient. *Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy*, 8, 29–43. <https://doi.org/10.2147/DMSO.S44352>
- Huang, C.-Y., Lai, H.-L., Chen, C.-I., Lu, Y.-C., Li, S.-C., Wang, L.-W., & Su, Y. (2016). Effects of motivational enhancement therapy plus cognitive behaviour therapy on depressive symptoms and health-related quality of life in adults with type II diabetes mellitus: a randomised controlled trial. *Quality of Life Research*, 25(5), 1275–1283. <https://doi.org/10.1007/s11136-015-1165-6>
- Hurst, C. P., Rakkapao, N., & Hay, K. (2021). Impact of diabetes self-management, diabetes management self-efficacy and diabetes knowledge on glycemic control in people with Type 2 Diabetes (T2D): A multi-center study in Thailand. *PLOS ONE*, 15(12), e0244692. <https://doi.org/10.1371/journal.pone.0244692>
- International Diabetes Federation. (2017). *Diabetes Atlas* (8th ed.). International Diabetes Federation. [https://diabetesatlas.org/upload/resources/previous/files/8/1/DF\\_DA\\_8e-EN-final.pdf](https://diabetesatlas.org/upload/resources/previous/files/8/1/DF_DA_8e-EN-final.pdf)
- Juntarawijit, C., & Juntarawijit, Y. (2018). Association between diabetes and pesticides: A case-control study among Thai farmers. *Environmental Health and Preventive Medicine*, 23(1), 1–10. <https://doi.org/10.1186/s12199-018-0692-5>
- Kanopathy, J., & Bogle, V. (2019). The effectiveness of cognitive behavioural therapy for depressed patients with diabetes: A systematic review. *Journal of Health Psychology*, 24(1), 137–149. <https://doi.org/10.1177/1359105317713360>
- Kementerian Kesehatan. (2018). *Riset Kesehatan Dasar*.
- Khan, A., Al-Abdul Lateef, Z., Al Aithan, M., Bu-Khamseen, M., Al Ibrahim, I., & Khan, S. (2012). Factors contributing to non-compliance among diabetics attending primary health centers in the Al Hasa district of Saudi Arabia. *Journal of Family and Community Medicine*, 19(1), 26. <https://doi.org/10.4103/2230-8229.94008>
- Khattab, M., Khader, Y. S., Al-Khawaldeh, A., & Ajlouni, K. (2010). Factors associated with poor glycemic control among patients with Type 2 diabetes. *Journal of Diabetes and Its Complications*, 24(2), 84–89. <https://doi.org/10.1016/j.jdiacomp.2008.12.008>
- Kusnadi, G., Murbawani, E. A., & Fitranti, D. Y. (2017). Faktor risiko diabetes melitus tipe 2 pada petani dan buruh. *Journal of Nutrition College*, 6(2), 138. <https://doi.org/10.14710/jnc.v6i2.16905>
- Laranjo, L., Neves, A. L., Costa, A., Ribeiro, R. T., Couto, L., & Sá, A. B. (2015). Facilitators, barriers and expectations in the self-management of type 2 diabetes—a qualitative study from Portugal. *European Journal of General Practice*, 21(2), 103–110. <https://doi.org/10.3109/13814788.2014.1000855>
- Lee, J. H. (2015). Cognitive Behavioral Therapy for Diabetic Patients. *J Korean Diabetes*, 16(2), 141–147. <https://doi.org/10.4093/jkd.2015.16.2.141>
- Nordström, A., Hadrévi, J., Olsson, T., Franks, P. W., & Nordström, P. (2016). Higher Prevalence of Type 2 Diabetes in Men Than in Women Is Associated With Differences in Visceral Fat Mass. *The Journal of Clinical Endocrinology & Metabolism*, 101(10), 3740–3746. <https://doi.org/10.1210/jc.2016-1915>
- Ogurtsova, K., da Rocha Fernandes, J. D., Huang, Y., Linnenkamp, U., Guariguata, L., Cho, N. H., Cavan, D., Shaw, J. E., & Makaroff, L. E. (2017). IDF Diabetes Atlas: Global estimates for the prevalence of diabetes for 2015 and 2040. *Diabetes Research and Clinical Practice*, 128, 40–50. <https://doi.org/10.1016/j.diabres.2017.03.024>
- Othman, M. M., Khudadad, H., Dughmush, R., Furuya-Kanamori, L., Abou-Samra, A.-B., & Doi, S. A. R. (2021). Towards a better understanding of self-management interventions in type 2 diabetes: A concept analysis. *Primary Care Diabetes*. <https://doi.org/10.1016/j.pcd.2021.09.001>
- Papathodorou, K., Banach, M., Edmonds, M., Papanas, N., & Papazoglou, D. (2015). Complications of Diabetes. *Journal of Diabetes Research*, 2015, 189525. <https://doi.org/10.1155/2015/189525>
- Safren, S. A., Gonzalez, J. S., Wexler, D. J., Psaros, C., Delahanty, L. M., Blashill, A. J., Margolina, A. I., & Cagliero, E. (2014). A Randomized Controlled Trial of Cognitive Behavioral Therapy for Adherence and Depression (CBT-AD) in Patients With Uncontrolled Type 2 Diabetes. *Diabetes Care*, 37(3), 625 LP – 633. <https://doi.org/10.2337/dc13-0816>
- Shahni, R., Shairi, M. R., Asghari Moghaddam, M. A., & zarnaghash, M. (2013). Appointment the Effectiveness of Cognitive-behavioral Treatment of Pain on Increasing of Self-efficacy in Patients with Chronic Pain. *Procedia - Social and Behavioral Sciences*, 84, 225–229. <https://doi.org/10.1016/j.sbspro.2013.06.539>
- Shrivastava, S. R. B. L., Shrivastava, P. S., & Ramasamy, J. (2013). Role of self-care in management of diabetes mellitus. *Journal of Diabetes and Metabolic Disorders*, 12(1), 1. <https://doi.org/10.1186/2251-6581-12-14>
- Suastika, K., Dwipayana, P., Siswadi, M., & Tuty, R. A. (2012). Age is an Important Risk Factor for Type 2 Diabetes Mellitus and Cardiovascular Diseases. In *Glucose Tolerance*. IntechOpen. <https://doi.org/10.5772/52397>
- Thongsai, S., Watanabenjasopa, S., & Youjaiyen, M. (2014). Depression in patients with type II diabetes: case study at diabetic outpatient clinic, in Samut Prakan. *Global Journal of Health Science*, 6(1), 127–134. <https://doi.org/10.5539/gjhs.v6n1p127>

Uchendu, C., & Blake, H. (2017). Effectiveness of cognitive-behavioural therapy on glycaemic control and psychological outcomes in adults with diabetes mellitus: a systematic review and meta-analysis of randomized controlled trials. *Diabetic Medicine*, 34(3), 328–339. <https://doi.org/10.1111/dme.13195>

World Health Organization. (2012). *The determinants of health*.

