

Advances in Psychological and Social Aetiology of Patients with Diabetes

Xianyuan Liu^{1,2}

¹General Practice Ward/International Medical Center Ward, West China Hospital, Sichuan University, Chengdu, Sichuan Province, People's Republic of China; ²General Practice Medical Center, West China Hospital, Sichuan University, Chengdu, Sichuan Province, People's Republic of China

Correspondence: Xianyuan Liu, General Practice Ward/International Medical Center Ward, General Practice Medical Center, West China Hospital, Sichuan University, No. 37, Guoxue Lane, Chengdu, Sichuan Province, 610041, People's Republic of China, Tel +86-15882279982, Email Xianyuan_liu@yeah.net

Abstract: Diabetes is a metabolic disease that is affected by internal and external factors. Its prevalence is rising, and it is characterized by a continuous increase in blood glucose levels. With the deepening understanding of diabetes, it is not only necessary to explore its physiological basis, but also to explore the complex interaction between social and psychological factors. In addition to traditional risk factors, the article also highlights the psychological and social aspects of the patient's impact on the development of diabetes. Because diabetes is not only the result of metabolic imbalances, but also the product of broader background factors, the importance of psychosocial interventions is particularly important. By examining psychosocial dimensions, this review aims to provide a comprehensive understanding of the causes of diabetes. It deeply studies the complex relationship between psychosocial factors and diabetes, and recognizes the complexity of this metabolic disorder. In addition, the article discussed interventions designed to address the psychosocial problems of diabetes, emphasizing the need to take a holistic approach to care for patients. This review explores the impact of psychological and social factors on the incidence, progression and outcome of diabetes, complementing traditional considerations such as obesity, genetic and physiological factors. Recognizing the multifaceted nature of diabetes, this article uses a social etiology perspective to emphasize the important role of social psychological factors. In the process, it has contributed to the ongoing discussion on diabetes management by incorporating a broader social context into the understanding and treatment of this general health problem.

Keywords: diabetes, psychosocial factors, therapy and intervention

Overview of Diabetes Research

Diabetes is a metabolic disease caused by the dysfunction of islet B cell secretion, which leads to the disorder of fat, protein and carbohydrate metabolism in the human body, subsequently causing chronic damage and functional disorder in human organs.¹ With the development of society, the improvement of people's material living standards and the change in lifestyles, the number of elderly people in China has increased dramatically, and the incidence of diabetes in the nation has increased year on year. It has become a major chronic non-communicable disease that poses a serious threat to people's health alongside tumours and cardiovascular and cerebrovascular diseases. An epidemiological survey showed that the prevalence of diabetes in adults was as high as 11.6%, with type 2 diabetes accounting for over 95% of this figure.² As a chronic lifelong disease, diabetes often recurs and aggravates, affecting the physical and mental health of patients. Studies have reported that patients with diabetes are prone to psychological disorders such as anxiety, depression and maladjustment, and, in severe cases, even mental disorders.³⁻⁵ The psychological problems of patients with diabetes will have an impact on their treatment compliance and health self-management. At the same time, due to the impact of psychological problems on the blood vessels, microcirculation disorders or damage to organ functioning can emerge, resulting in increased risk of diabetic complications, thus aggravating the patient's condition.^{6,7}

Modern medicine defines diabetes as a psychosomatic disease, with somatic symptoms as the main manifestation; however, its occurrence, development and outcome are closely related to psychosocial factors.⁸ At present, the clinical

treatment of patients with diabetes is increasingly focused on the potential impact of psychological issues on all stages of the disease progression. It is crucial to study the psychosocial factors of diabetes because diabetes is not only a physical disease, but also a chronic disease closely related to psychological and social factors. Patients with diabetes often face psychological problems such as anxiety, depression, and adjustment difficulties, which may directly affect the development of the disease and the effectiveness of treatment. In addition, social factors, including family support, social relationships, and education level, may also have a profound impact on the development and management of diabetes. Therefore, in-depth research on the impact of psychosocial factors on diabetes and the adoption of corresponding psychosocial intervention measures have important clinical and public health significance for improving patients' quality of life, improving treatment compliance, and even preventing and alleviating diabetes-related complications. This study is to comprehensively understand the role of psychosocial factors in diabetes and provide scientific basis for future clinical practice and policy formulation to more effectively deal with this increasingly serious chronic disease.^{9–12} Therefore, this article reviews the influence of patients' psychological and social factors on diabetes and the psychosocial interventions for diabetes to provide a scientific basis for the comprehensive prevention and treatment of the disease.

The Influence of Psychological and Social Factors on Diabetes Mellitus

Sociological Factors

Demographic and sociological factors, such as gender, age, marital status and education level, have different associations with diabetic complications. Among individuals with diabetes, the impact of psychosocial stress on women is greater than that on men,¹³ and the proportion of women with depression is higher.¹⁴ This may be related to women's emotional delicacy and sensitivity, which means they are more likely to experience emotional stress than men. In addition, it may also be related to women's specific social and familial responsibilities. A study by Rossi et al¹⁵ randomly selected 700 Lithuanian adult patients with type 1 diabetes and found that the women had poorer mental health, more diabetes-related pain, less satisfaction with the treatment and more depressive symptoms compared with the men. Studies¹⁴ have also shown that the incidence of diabetes increases with age, while the prevalence among young people has increased in recent years. Fan et al¹⁶ found that age is a risk factor for diabetes mellitus complicated with depression, with the proportion of such patients aged >65 years reaching 74.42%. This is likely because, with the decline in physical functioning, complications associated with age gradually appear and the blood glucose level becomes more difficult to control. In addition, the fear of losing the care of family members and friends exacerbates the feelings of depression and disappointment. However, foreign studies have shown that children with type 1 diabetes experience higher diabetes-related distress and emotional burden than those in adulthood.¹⁷ Meanwhile, Pereira et al¹⁸ reported that the medication, diet compliance and blood glucose monitoring were closest to the ideal among patients in high-quality marriages. In short, spouses participate in diabetes-related care in terms of diet, exercise, drug treatment and blood glucose monitoring, and they can effectively help each other, all of which is conducive to the management of the disease. In addition, the spouse can provide emotional support and encouragement, enhancing the patient's confidence in the treatment of the disease. It is clear that a high-quality marriage is conducive to the establishment of positive emotions in the patient, prompting them to better adapt to and respond to the disease, thus presenting a protective factor. Foreign studies have shown that, compared with patients with lower education levels, those with a higher education level better adapt to the disease and score higher in terms of family support and social environment.¹⁹ The management of diabetes is complex and involves a great deal of medical knowledge. Patients with higher education may better understand the related conditions of the disease and respond to it accordingly.

Psychological Factors

Studies have shown that patients with diabetes with psychological problems may be reluctant to develop new social relations due to specific psychological factors, resulting in reduced social skills and fewer friends, meaning they have less support from family members and friends in the management of the disease and weak social relations.²⁰ However, the related studies have drawn different conclusions. Kozel et al²¹ used the centre for epidemiological studies depression (CESD) scale to investigate the depressive symptoms and social relationships of patients with diabetes. The study

showed that patients with diabetes with depressive symptoms had more material and informational support than those without depressive symptoms and had a closer relationship with the social network that provides support. In short, there are fewer conflicts. The reason for this may be that patients with diabetes with depressive symptoms receive more attention from family members and friends due to their psychological problems, meaning they are more closely related to them and are provided with more material and informational support.

Disease Factors

With the progression of the disease, patients with diabetes gradually develop various complications. These complications not only seriously affect the quality of life of the patient but also increase the self-management, economic and emotional burden of both the patient and the family. Foreign studies have shown that patients with diabetes-related complications, especially kidney disease and stroke, have poor mental health and bear greater psychological pressure.²² For patients with type 1 diabetes, their psychological pain and poor mood increase significantly after the advent of complications, especially neuropathy.²³ The emergence of these complications increases the treatment costs and the uncertainty of the treatment effect, which, in turn, increases both the economic burden and the psychological pressure for the patient. The further development of complications brings more adverse consequences, which will cast a heavy shadow over the patient's psychological state, leading to a huge psychological burden and adversely affecting the patient's disease adaptation.

Self-Management

Diabetes self-management (DSM) refers to the ability of patients with diabetes to effectively manage their own behaviour under the guidance of professionals and the support of other personnel. Self-management behaviours for diabetes include diet control, physical exercise, drug therapy and the self-monitoring of blood glucose levels. Of these four behaviours, diet control is considered to be the most critical DSM behaviour.²⁴ With the expansion of research, countries have also incorporated stress and emotional management into the self-management approach. This pertains to the patient's appropriate handling of and response to various emotional changes brought about by the disease, such as depression, anxiety and fear.²⁵ Barlow et al²⁶ reported that the prognosis and quality of life of patients depend on the quality of their self-management. The patient's good compliance with self-management behaviours can help maintain their good health for a long time. However, DSM is a long-term, often lifelong process, and the biggest challenge is the patient's compliance with self-management behaviours. In addition, a number of studies^{27–29} have shown that there is a correlation between the self-management behaviour of patients and their social relations with family members and friends. Vassilev et al²⁷ investigated patients with type 2 diabetes, and the results showed that people with poor self-management behaviours often had limited social relations and were weaker. Elsewhere, Reeves et al²⁸ randomly selected 300 patients with diabetes and coronary heart disease to conduct a survey of social relations and self-management behaviours. The results indicated that the quality of the patients' social relations was correlated with their self-management behaviours. Patients with a wider social interaction group have a higher level of personal self-management. Therefore, whether patients can adhere to long-term continuous self-management not only depends on their self-management knowledge and skills but also on professional guidance from professionals and emotional and psychological support from peers, friends and family members.

Social Support

As a scientific research object and professional concept, the notion of social support was put forward in the 1970s; however, the connotations have not been unified due to the different research perspectives. Foreign scholars believe that social support refers to the individual obtaining all aspects of material, emotional and informational support.³⁰ Meanwhile, the Chinese scholar, Cheng Hongjuan,³¹ defined social support from the perspectives of social interaction, the nature of social behaviour and the role of social resources. Subsequently, the domestic scholar, Xiao Shuiyuan,³² divided social support into three dimensions: objective support, subjective support and the utilisation of the support. Objective support is essentially visible and practical support, an objective reality that includes direct material assistance and social networks, ie the existence and participation of group relations. Subjective support refers to the emotional

experience and perception of being respected, understood and supported in society, which further enriches the theory of social support. NiNomiya et al³³ used a questionnaire survey to investigate the social support indicators of patients with type 2 diabetes. The results showed that the relationship between family members and friends was significantly related to social support. Patients with good social relations had a high level of social support, while on the contrary, the level of social support was low among those with poor social relations. Newton-John et al³⁴ used semi-structured interviews to examine the social relations and social support of patients with type 2 diabetes. The results showed that broader social relations can increase patients' social support and ultimately promote the formation of good health-related behaviours.

Psychotherapy and Behaviour Intervention for Patients with Diabetes

Health Education

The psychological resistance to insulin presents a psychological barrier to insulin therapy and is caused by various misconceptions. Strengthening health education knowledge is one of the important measures for reducing the insulin resistance among patients with diabetes. Wang et al³⁵ reported that following health education, patients not only better understand the disease but also pay more attention to exercise, treatment and diet. The fasting insulin, fasting blood glucose and insulin sensitivity index of patients have been shown to be significantly improved. The study by Liu et al³⁶ showed that the health education strategy based on behavioural change for patients with type 2 diabetes can promote the recovery of blood glucose, blood lipid and other related indicators and improve the coping style of the patients. Ye et al³⁷ discussed and analysed the effect of mental health education on the treatment compliance and quality of life among patients with type 2 diabetes mellitus. The results showed that the application of mental health education as part of the treatment of such patients could reduce the occurrence of adverse reactions, promote the continuous reduction of blood glucose levels and improve the treatment compliance and quality of life of the patients. Huang et al³⁸ observed the intervention effect of whole-course health education and nursing on the physiology, psychology, cognition and behaviour of patients with diabetes undergoing clinical treatment. The results indicated that this form of health education is not only beneficial in terms of effective control of the blood glucose levels but also in terms of enhancing patients' disease and health knowledge, resulting in them actively implementing good health behaviour, thus improving their physical health and quality of life. It is clear that health education helps patients to adopt good living habits and also effectively improves their blood glucose levels, which will have a profound impact on the long-term quality of life of the patients.

Psychological and Behavioural Intervention

Many people believe that the treatment of diabetes mainly relates to diet, exercise and drug treatment. In fact, psychotherapy is very important for the control of the disease. Optimistic and stable emotions are conducive to maintaining the stability of the patient's internal environment, while anxious emotions can cause the secretion of stress hormones such as growth hormone, adrenocortical hormone and glucagon, thereby antagonising insulin action, causing blood sugar levels to rise and aggravating the condition.³⁹ An appropriate mental state and attitude towards the disease should be achieved under the guidance of a doctor. This involves gaining knowledge regarding the prevention and treatment of diabetes, actively cooperating with the doctor's treatment, adhering to a reasonable diet and physical exercise regime and achieving a good work–rest balance. When infection, surgery or a major mental burden is involved, it is necessary to correctly address this in a timely manner and effectively control the condition through psychotherapy.

Psychotherapy is also called Spiritual therapy approach. It refers to the use of language, attitude, expression and behaviour by medical staff, as well as mutual communication, to improve the patient's psychology in the process of diagnosis and treatment. The aim is to change the patient's cognition, emotion and behaviour, which subsequently helps them establish the confidence to overcome the disease and reduce or eliminate the various tensions, negative emotions and abnormal behaviours that cause pain and the resulting physical characteristics. Many studies have confirmed that psychotherapy can not only improve the patient's mental and physical condition and quality of life but can also promote a reduction in blood glucose levels.⁴⁰

Cognitive Behavioural Therapy

Cognitive Behavioral Therapy (CBT) was first proposed by Aaron T. Beck, a professor of psychiatry in the United States, in the 1960s as a talking therapy for patients with irrational cognition such as depression and anxiety. Characterized by no pain but lasting effects, CBT can not only effectively alleviate the depression and other adverse emotions of diabetic patients and change their irrational cognition of diabetes, but also assist in lowering their blood glucose level and reducing the incidence of complications. Thus, CBT can improve the prognosis of diabetes, reduce the pain of treatment, increase the comfort of treatment, and enhance the quality of life.^{41–45}

Patients with diabetes and depression can be diagnosed using various cognitive behavioural techniques. If poor cognition is diagnosed, health education can be applied to allow the patient to deal with family, marriage, work, social intercourse and other aspects of daily life, encouraging them to adjust their behavioural patterns in terms of, for example, activity training and eating habits in view of improving their poor cognition.^{46,47} Zhang et al⁴⁸ selected 84 type 1 diabetic patients as research objects and randomly divided them into an experimental group and a control group with 42 patients respectively. The control group was given conventional treatment and nursing care, and the experimental group was given CBT on the basis of conventional treatment and nursing care. Through the cognitive restructuring model, medical staff jointly found and corrected the cognition that caused negative emotions of diabetic patients while rebuilding their rational knowledge of the disease. After 6 months, the experimental group obviously scored lower on the Self-rating Anxiety Scale (SAS) and the Self-rating Depression Scale (SDS), which indicated that CBT could help type 1 diabetic patients alleviate negative emotions such as depression and anxiety and improve mental health of diabetic patients. Xiao et al⁴⁹ carried out a combined intervention of escitalopram and CBT in type 2 diabetic patients, who were divided into a control group and an experimental group with 30 and 60 patients respectively. The control group was treated with conventional hypoglycemic therapy, while the experimental group was treated with CBT on this basis for 12 weeks, once a week and 45 min each time. Specific measures included: ① establishing a good doctor-patient relationship; ② understanding the root cause of a patient's symptoms, and correcting wrong cognition; ③ identifying dysfunctional assumptions, establishing correct cognition and administering antidepressive treatment. Results showed that the combined application of CBT was more effective in controlling the blood glucose levels of patients than the application of hypoglycemic drugs alone. Hu et al⁵⁰ studied the effect of CBT on diabetic complications and adopted a nutritional diet combined with CBT to intervene in patients with diabetic nephropathy, mainly by changing their irrational cognition and instructing them to carry out progressive muscle relaxation training. After treatment, the ALB and Hb levels of the subjects were higher than those of the control group, which indicated that CBT not only effectively improved the nutritional status of the patients, but also improved their prognosis in multiple aspects. In addition, CBT can also reduce the incidence of complications in patients with gestational diabetes. Zou et al⁵¹ divided patients with gestational diabetes into a control group and an experimental group. The control group was given basic nursing care and exercise therapy for intervention, while the experimental group conducted self-intervention of CBT based on treatment for the control group. Results showed that the incidence of complications in the experimental group was significantly lower than that of the control group, the incidence of adverse pregnancy outcomes decreased, and satisfaction with nursing services increased, which is consistent with the research findings of Liu Guimei et al.⁵² Thus, it can be seen that CBT can effectively reduce the incidence of complications of gestational diabetes, reduce mental pressure on patients, and establish confidence in safe delivery.

Psychosocial Support and Intervention

Numerous studies show that a patient's social support system is related to his metabolic control and complications, so medical staff need to provide guidance on both internal and external factors to reassure patients about their treatment. Gilden et al⁵³ conducted a 2-month educational and training program for elderly men with diabetes and diabetic couples, and found that those with spouses had evidently better knowledge of diabetes, quality of life, and metabolic control than the latter. Hu et al⁵⁴ chose to give group psychotherapy to 35 diabetic patients with the method of reasonable emotional treatment and concluded after 35 days of treatment that the glycemic control of patients who selected group psychotherapy was significantly more satisfactory than those who accepted normal treatment. These studies show that families and

groups have a great influence on diabetic patients. Therefore, during comprehensive treatment for diabetes, we should pay attention to health education about diabetes for both patients themselves and their families and others, as this can also create a good living environment for diabetic patients in their families and society. Huang et al⁵⁵ divided type 2 diabetic patients into an experimental group and a control group to explore the effect of systematic psychological and behavioral interventions. Based on conventional drug therapy and routine diabetic care, the experimental group accepted systematic psychological and behavioral interventions, while the control group was only given conventional drug therapy and routine diabetic care; systematic psychological and behavioral interventions included individual psychological counseling, behavioral modification, exercise therapy, mental health education, family therapy, etc. The study revealed that there were significant differences in the indicators, and the use of psychological and behavioral interventions for the treatment of anxiety and depression can reduce the length of stay, costs and rate of hospitalization, improve the living quality of patients, and maintain the stability of blood glucose.

Summary

While scholars globally acknowledge the significant role of psychosocial factors in the onset and progression of diabetes, the majority of related research relies on retrospective and cross-sectional surveys, lacking prospective and controlled studies. The complexity of psychosocial factors often results in non-targeted investigations that insufficiently consider patients' social and cultural backgrounds, leading to one-sided conclusions. The physiological and psychological intermediary mechanisms of psychosocial factors remain unclear, necessitating further prospective clinical studies complemented by animal experiments to validate their impact on diabetes. Despite these challenges, it is crucial for medical professionals to remain attentive to the psychosocial aspects of diabetes patients. In light of the discussed psychosocial interventions, it is imperative to formulate effective treatment plans aimed at boosting patients' confidence, aiding in disease management, and actively preventing its occurrence. Such strategies aim to alleviate the negative emotional states and cognitive aspects of diabetes patients, ultimately contributing to an enhanced quality of life. This underscores the ultimate goal of diabetes treatment.

Data Sharing Statement

Data not directly reported in this publication can be obtained from the corresponding author upon reasonable request.

Ethics Approval and Consent to Participate

An ethics statement is not applicable because this study is based exclusively on published literature.

Funding

There is no funding to report.

Disclosure

The author reports no conflicts of interest related to this study.

References

1. Zhang J, Li L, Deng Y, et al. Analysis of the prevalence and risk factors of diabetes in China. *World Latest Med Inform.* 2018;18(16):94–96.
2. Xu Y, Wang L, He J, et al. Prevalence and control of diabetes in Chinese adults. *JAMA.* 2013;310(9):948–959. doi:10.1001/jama.2013.168118
3. Gao X, Gao J, Jia C. Study on anxiety and depression status and its influencing factors in hospitalized patients with type 2 diabetes mellitus. *Prevent Med Tribune.* 2021;27(02):98–102.
4. Zhang H, Zhang J, Li X, et al. Research progress on the treatment of type 2 diabetes mellitus complicated with emotional disorders. *Med Recapitulate.* 2017;23(10):2002–2006.
5. Li M, Li X, Liang B. Analysis of the status quo and influencing factors of anxiety and depression in patients with type 2 diabetes mellitus. *Chin J Gen Pract.* 2021;19(07):1135–1137+1146.
6. Gonzalez JS, Safren SA, Cagliero E, et al. Depression, self-care, and medication adherence in type 2 diabetes: relationships across the full range of symptom severity. *Diabetes Care.* 2007;30(9):2222–2227. doi:10.2337/dc07-0158
7. Lin EH, Rutter CM, Katon W, et al. Depression and advanced complications of diabetes: a prospective cohort study. *Diabetes Care.* 2010;33(2):264–269. doi:10.2337/dc09-1068

8. Wan J, Feng A. Study on the treatment of diabetes based on psychosomatic medicine. professional committee of psychosomatic medicine, china association of integrated traditional Chinese and western medicine. proceedings of the 6th general assembly of psychosomatic medicine committee of China association of integrated traditional Chinese and western medicine and the 12th academic exchange meeting of psychosomatic medicine of integrated traditional Chinese and western medicine in China. Psychosomatic Medicine Committee of China Association of Integrated Traditional Chinese and Western Medicine: China Association of Integrated Traditional Chinese and Western Medicine; 2019:63–65.
9. Finch LE, Hawkey LC, Schumm LP, Iveniuk J, McClintock MK, Huang ES. Moderation of associations between weight discrimination and diabetes status by psychosocial factors. *J Behav Med*. 2023. PMID: 37946026. doi:10.1007/s10865-023-00454-2
10. Trief PM, Uschner D, Anderson BJ, Wen H, Bulger JD, Weinstock RS. Psychosocial factors predicting healthcare usage in young adults with youth-onset type 2 diabetes: the TODAY2 iCount observational study. *J Gen Intern Med*. 2023;38(14):3152–3161. PMID: 37507549. doi:10.1007/s11606-023-08305-1
11. Verdecias N, McQueen A, Von Nordheim DA, Broussard DJ, Smith RE, Kreuter MW. Diabetes distress in a Medicaid sample: the role of psychosocial and health-related factors. *J Diabetes Complications*. 2023;37(7):108495. PMID: 37156052; PMCID: PMC10330688. doi:10.1016/j.jdiacomp.2023.108495
12. Sifunda S, Mbewu AD, Mabaso M, et al. Prevalence and psychosocial correlates of diabetes mellitus in South Africa: results from the South African National Health and Nutrition Examination Survey (SANHANES-1). *Int J Environ Res Public Health*. 2023;20(10):5798. PMID: 37239526; PMCID: PMC10218408. doi:10.3390/ijerph20105798
13. Kautzky-Willer A, Harreiter J, Pacini G. Sex and gender differences in risk, pathophysiology and complications of type 2 diabetes mellitus. *Endocr Rev*. 2016;37(3):278–316. doi:10.1210/er.2015-1137
14. Zhang Z. Study on the age distribution characteristics of diabetes and the related factors of younger onset. *Med Forum*. 2018;22(10):1304–1305.
15. Rossi MC, Lucisano G, Pintaudi B, et al. The complex interplay between clinical and person-centered diabetes the two genders. *Health Qual Life Outcomes*. 2017;15(1):41. doi:10.1186/s12955-017-0613-0
16. Fan G, Ma Y, Xiao Y, et al. Analysis of risk factors for depression in diabetic patients. *China Mod Med*. 2017;36:42–44.
17. Lasaitte L, Ostrauskas R, Zalinkevicius R, et al. Diabetes distress in adult type 1 diabetes mellitus men and women with disease onset in childhood and in adulthood. *J Diabetes Complicat*. 2015;28(3–4):279–285.
18. Pereira MG, Pedras S, Ferreira G, et al. Family and couple variables regarding adherence in type 2 diabetes patients in the initial stages of the disease. *J Marit Fam Ther*. 2019;45(1):134–148. doi:10.1111/jmft.12281
19. Feghhi H, Alireza SS, Dastjerdi R. Psychosocial adaptation in patients with type 2 diabetes referring to diabetes research center of birjand in 2013. *Mod Care J*. 2013;10(4):256.
20. Crotty MM, Henderson J, Ward PR, et al. Analysis of social networks supporting the self-management of type 2 diabetes for people with mental illness. *BMC Health Serv Res*. 2015;15(1):257. doi:10.1186/s12913-015-0897-x
21. Kozel D, Marusić A. Individuals with diabetes mellitus with and without depressive symptoms: could social network explain the comorbidity? *Psychiatry Danub*. 2006;18(1–2):12–18.
22. Guo H, Wang X, Mao T, et al. How psychosocial outcomes impact on the self-reported health status in type 2 diabetes patients: findings from the diabetes attitudes, wishes and needs(Dawn)study in eastern China. *PLoS One*. 2018;13(1):e0190484. doi:10.1371/journal.pone.0190484
23. Bai JW, Lovblom LE, Cardinez M, et al. Neuropathy and presence of emotional distress and depression in longstanding diabetes: results from the Canadian study of longevity in type 1 diabetes. *J diabet complicat*. 2017;31(8):1318–1324. doi:10.1016/j.jdiacomp.2017.05.002
24. Norris SL, Engelgau MM, Venkat Narayan KM. Effectiveness of self-management training in type 2 diabetes: a systematic review of randomized controlled trials. *Diabetes Care*. 2001;24(3):561–587. doi:10.2337/diacare.24.3.561
25. Boger E, Ellis J, Latter S. Self-management and self-management support outcomes: a systematic review and mixed research synthesis of stakeholder views. *PLoS One*. 2015;10(7):e0130990. doi:10.1371/journal.pone.0130990
26. Barlow J, Wright C, Shabby J, et al. Self-management approaches for people with chronic conditions: a review. *Patient Educ Couns*. 2002;48(2):177–187. doi:10.1016/S0738-3991(02)00032-0
27. Vassilev I, Rogers A, Kennedy A, et al. Social network type and long-term condition management support: a cross-sectional study in six European countries. *PLoS One*. 2016;11(8):e0161027. doi:10.1371/journal.pone.0161027
28. Reeves D, Blickem C, Vassilev I, et al. The contribution of social networks to the health and self-managements of patients with long-term conditions: a longitudinal study. *PLoS One*. 2014;9(6):e98340. doi:10.1371/journal.pone.0098340
29. Pesantes MA, Del Valle A, Diez-Canseco F, et al. Family support and diabetes: patient's experiences from a public hospital in Peru. *Qual Health Res*. 2018;28(12):1871–1882. doi:10.1177/1049732318784906
30. Gorfeson MA, Luanna Alexandra C, Edilanea Nunes M, et al. Physical activity and social support in adolescents: a systematic review. *Health Educ Res*. 2014;29(5):822–839. doi:10.1093/her/cyu017
31. Cheng H, Zhang C, Gong Y. Research review of college students' social support. *J Chengdu Univ Technol*. 2004;12(01):88–91.
32. Xiao S. Theoretical basis and research application of "Social Support Rating Scale". *J Clin Psychiatry*. 1994;4(02):98–100.
33. Ninomiya H, Katakami N, Matsuoka TA, et al. Association between poor psychosocial conditions and diabetic nephropathy in Japanese type 2 diabetes patients: a cross-sectional study. *J Diabetes Investig*. 2018;9(1):162–172. doi:10.1111/jdi.12641
34. Newton-John TR, Ventura AD, Mosely K, et al. 'Are you sure you're going to have another one of those?': a qualitative analysis of the social context and social support models in type 2 diabetes. *J Health Psychol*. 2017;22(14):1819–1829. doi:10.1177/1359105316642005
35. Wang X, He L, Fan Z, et al. Influence of health education on patients with type 2 diabetes mellitus. *Mod Clin Nurs*. 2006;5:12–14.
36. Liu Y, Fang J. Effect of health education strategy based on behavior change theory on patients with type 2 diabetes mellitus. *Hebei Med J*. 2022;44(16):2549–2552.
37. Ye X. Effect of mental health education on treatment compliance and quality of life in patients with type 2 diabetes mellitus. *Med Diet Health*. 2022;20(12):190–193.
38. Huang X. Application of whole course health education in diabetes care. *Chin J Urban Rural Industr Hygiene*. 2023;38(07):123–125.
39. Yan Y, Li F, Yu M, et al. Effect of psychological nursing intervention on elderly patients with diabetes mellitus. *Psychol Monthly*. 2020;15(20):140–141.
40. Wu Y, Lin K, Chen R. Study on the effect of Baduanjin exercise combined with health education on blood glucose intervention in 175 patients with diabetic sub-health state. *Chin Prim Health Care*. 2008;22(2):80–82.

41. Duan H, Cao M, Yao Q. Current status of cognitive behavioral therapy among diabetic patients in China. *Nurs Pract Res*. 2022;19(11):1658–1662.
42. Li Y, Storch EA, Ferguson S, Li L, Buys N, Sun J. The efficacy of cognitive behavioral therapy-based intervention on patients with diabetes: a meta-analysis. *Diabet Res Clin Pract*. 2022;189:109965. doi:10.1016/j.diabres.2022.109965
43. Rechenberg K, Koerner R. Cognitive behavioral therapy in adolescents with type 1 diabetes: an integrative review. *J Pediatr Nurs*. 2021;60:190–197. doi:10.1016/j.pedn.2021.06.019
44. Welschen LM, van Oppen P, Dekker JM, Bouter LM, Stalman WA, Nijpels G. The effectiveness of adding cognitive behavioural therapy aimed at changing lifestyle to managed diabetes care for patients with type 2 diabetes: design of a randomised controlled trial. *BMC Public Health*. 2007;7(1):74. doi:10.1186/1471-2458-7-74
45. An Q, Yu Z, Sun F, Chen J, Zhang A. The effectiveness of cognitive behavioral therapy for depression among individuals with diabetes: a systematic review and meta-analysis. *Curr Diab Rep*. 2023;23(9):245–252. doi:10.1007/s11892-023-01517-z
46. Lu X. Investigation and analysis of general comprehensive management on psychological behavior of patients with type 2 diabetes mellitus. *Pract J Cardiac Cereb Pneum Vasc Dis*. 2012;20(2):288.
47. Zhang W, Hu S, Liu Y, et al Investigation on quality of life, psychological and social support of elderly patients with type 2 diabetes in Shenzhen community. *Chin General Pract*. 2009;12(1):166.
48. Zhang B, Qiu Q, Liu J. Effect of cognitive behavioral therapy on the depression, anxiety and Quality of life of type 1 diabetic patients. *Chin J Gerontol*. 2020;40(19):4081–4084.
49. Xiao Y, Zhang Y, Zhou R. Efficacy of citalopram combined with cognitive therapy in the treatment of type 2 diabetic patients with depression. *Chin J Pract Med*. 2020;47(11):83–87.
50. Hu X, Liu S, Liu Y, et al. Effect of nutritional diet therapy combined with cognitive behavioral therapy on anxiety, depression, nutritional status and cognitive function in elderly diabetic nephropathy. *Int j Psychiat*. 2020;47(02):373–375+378. doi:10.13479/j.cnki.jip.2020.02.052
51. Zou D, Wang F, Gong L. Effect of self-intervention combined with exercise therapy based on cognitive behavioral therapy on maternal gestational diabetes. *J Baotou Med Coll*. 2019;35(8):94–97.
52. Liu G, Lv F, Chen X. Effect of self-intervention based on cognitive behavioral therapy on self-nursing ability and adverse pregnancy outcomes of gestational diabetes mellitus pregnant women. *Nurs Pract Res*. 2019;6(1):101–103.
53. Gilden JL, Hendryx M, Casia C, Singh SP. The effectiveness of diabetes education programs for older patients and their spouses. *J Am Geriatr Soc*. 1989;37(11):1023–1030. doi:10.1111/j.1532-5415.1989.tb06915.x
54. Hu P, Shen Y, Li Y, et al. Clinical observation of group psychotherapy for diabetes. *Chin J Clin Psychol*. 1996;4(4):229–231. Chinese.
55. Huang Z, Tao J. Effects of integrative psychological and behavior intervention on patients with type 2 diabetes. *J Nurs Sci*. 2006;21(7):7–9.

Diabetes, Metabolic Syndrome and Obesity

Dovepress

Publish your work in this journal

Diabetes, Metabolic Syndrome and Obesity is an international, peer-reviewed open-access journal committed to the rapid publication of the latest laboratory and clinical findings in the fields of diabetes, metabolic syndrome and obesity research. Original research, review, case reports, hypothesis formation, expert opinion and commentaries are all considered for publication. The manuscript management system is completely online and includes a very quick and fair peer-review system, which is all easy to use. Visit <http://www.dovepress.com/testimonials.php> to read real quotes from published authors.

Submit your manuscript here: <https://www.dovepress.com/diabetes-metabolic-syndrome-and-obesity-journal>