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Chapter

Psychotherapeutic Interventions for Type 2 Diabetes Mellitus

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Abstract

This chapter explores the efficacy of psychotherapeutic interventions for patients with type 2 diabetes mellitus (T2DM). This condition can lead to serious adverse health outcomes (e.g., cardiovascular disease, blindness, loss of limbs, etc.). Medical interventions alone are often not sufficient to manage the disease. Psychotherapy can promote behavioral change that improves medication adherence, dietary choices, exercise, stress, and other variables that affect blood sugar levels. The current chapter summarizes the trends in recent research for psychotherapeutic interventions for the management of T2DM. The results from 16 randomized controlled trials on cognitive-behavioral therapy, motivational interviewing, counseling, and mindfulness-based therapies are discussed. These interventions varied in length (3 to 18 months) and were conducted in many geographic regions (e.g., Australia, Netherlands, Saudi Arabia, Thailand, and more). Changes in biological health outcomes (i.e., HbA1c levels) were the primary focus of this chapter, but diabetes-related behavioral changes (e.g., diet and exercise) and psychological variables (e.g., stress, depression, and well-being) are also discussed. This chapter highlights that recent research has provided the most support for mindfulness-based therapies for improving blood sugar levels in patients with T2DM.

Keywords: Type 2 diabetes mellitus, psychotherapy, intervention, diet, exercise

1. Introduction

Diabetes mellitus is a condition marked by an inability to produce or properly use insulin, a hormone that allows cells to use glucose for energy [1]. Approximately 3 million Canadians, or 8% of the general population, are living with diabetes, with the prevalence increasing with age [1]. The condition usually develops in middle aged or older adults, and men are slightly more likely to be diagnosed with this condition (8.7%) than are women (7.6%) [1]. There are two types of diabetes mellitus: type 1, where the body cannot produce a sufficient amount of insulin, and type 2, where the body cannot use the insulin it produces effectively, resulting in high blood sugar levels [1]. Accordingly, blood glucose levels are the most reliable physiological marker by which to diagnose diabetes mellitus [2] and are also used to monitor patients' management of their condition. The main criterion for a diagnosis of diabetes mellitus is a hemoglobin A1c [HbA1c] level above 6.4%, indicating above-average blood sugar levels, for the past 2–3 months. Interventions that produce lower HbA1c levels indicate efficacy at improving patient self-management of their diabetes mellitus. If left untreated or if poorly managed, diabetes mellitus can

lead to serious health conditions such as heart disease and stroke, blindness, nerve damage, and loss of limbs [1].

About 90% of people with diabetes mellitus have type 2 (T2DM). This is a chronic disease, which must be carefully managed on an ongoing basis by the patient and/or their caregivers. The biopsychosocial approach combines the use of medication and insulin with self-management behaviors for the purpose of regulating blood glucose levels. Lifestyle changes that are generally recommended for people at higher risk of diabetes and those who are newly diagnosed include sufficient moderate to high intensity exercise, and dietary considerations such as increased intake of fiber and reduced intake of fats (especially saturated fat). As well, overweight individuals are advised to lose weight gradually to achieve a body mass index in the healthy range. Health care professionals working with patients with T2DM aim to teach and encourage appropriate eating habits and physical activity to help patients achieve better glycemic control. However, implementing and adhering to these lifestyle changes is often difficult. Many individuals with T2DM do not adhere to the recommended nutrition and physical activity guidelines. Specifically, many patients exceed the recommended fat and sodium intake, and do not consume enough grains, dairy, fruits and vegetables [3]. Stress is also recognized as a variable that can exacerbate T2DM. Stress triggers the release of hormones that produce a surge in blood glucose levels. For this reason, stress management is considered to be part of a biopsychosocial approach to the management of T2DM. Due to the prevalence and manageability of this type of diabetes mellitus through lifestyle modifications alone, this chapter will focus solely on T2DM.

In addition to pharmacological interventions, various psychotherapeutic interventions are used and have been studied to help people with T2DM achieve better glycemic control. In theory, psychotherapy can promote behavioral changes that would improve medication adherence, dietary choices, exercise, stress levels, and other variables that affect blood sugar levels. Within this chapter, we review various psychotherapeutic interventions that are commonly used for the management of T2DM, including cognitive-behavioral therapy, motivational interviewing, counseling, and mindfulness-based therapies. This chapter explores the trends in recent research to understand the evidence base for various psychotherapeutic interventions in the management of T2DM. Change in HbA1c level is the primary focus of this chapter, since HbA1c is commonly measured and is the most objective and standardized outcome measure across studies. However, trends in diabetes-related behavioral changes (e.g., diet and exercise) and psychological variables (e.g., coping, stress, depression, and well-being) are also discussed.

2. Psychotherapeutic interventions for type 2 diabetes mellitus

Previous review papers have demonstrated that psychotherapeutic interventions in general are effective at improving health outcomes for individuals with T2DM. A 2004 meta-analysis of 12 randomized control trials (RCT) of psychological interventions (i.e., cognitive behavior therapy, counseling, or psychodynamic therapy) found lower HbA1c levels and psychological distress compared to different control groups (i.e., treatment as usual, an education group, attentional control, or waitlist control) [4]. There was no difference between treatment groups on weight gain and blood glucose concentration, suggesting that there was no clearly superior psychological intervention for the management of T2DM. A 2013 systematic review similarly concluded that psychotherapy is effective in supporting healthy coping among individuals with diabetes mellitus [5]. More recently, a 2020 meta-analysis of 70

RCTs found that psychological interventions, such as cognitive behavioral therapy, self-help materials, and counseling, were generally effective in reducing HbA1c levels over and above usual care [6].

These research findings cited above support the general use of psychotherapeutic interventions in the management of diabetes mellitus. However, it would be helpful to know whether and how specific interventions can enhance care for patients with T2DM so as to assist with treatment planning. In this chapter we analyze the recent literature on the efficacy of psychotherapeutic interventions for the care of T2DM. There have been 16 relevant RCTs published within the past 8 years (see Appendix A for details of the search strategy), which represent the most up-to-date published scientific findings on the topic. These studies and time period were deemed to give a valid snapshot of the recent literature. The results of specific studies are discussed, and we summarize the most noteworthy findings within each type of psychotherapeutic intervention. The effects of specific interventions on various outcomes relevant to patients with T2DM are discussed in detail. See **Table 1** for a summary of the reviewed studies.

2.1 Cognitive-behavioral therapy

Cognitive-behavioral therapy (CBT) is an umbrella term that encompasses various cognitive and behavioral techniques to identify and transform negative thinking patterns. CBT has been used to promote behavioral change in patients with diabetes mellitus [7]. A goal of CBT is to help individuals understand barriers to their own diabetes mellitus self-management and to provide them with the skills necessary to cope with these barriers. For example, a patient with diabetes mellitus may think, "I have a terrible chronic condition and there is nothing I can do about it." This type of cognition can lead to poor treatment adherence, low confidence, and/or high levels of stress. Within a CBT protocol, the therapist helps the patient to identify thinking errors or "cognitive distortions" (e.g., anticipating the worst outcome, focusing on the negative, and thinking in all-or-nothing terms) and to use strategies to challenge these beliefs (e.g., "what evidence is there for and against this thought?"). In addition to developing more balanced or rational thoughts, the therapist and the patient can also work on behavioral changes. They may engage in gradual exposure to challenging activities (e.g., walking for 5 minutes a day, then 10 minutes, then 20 minutes, until they can walk for one hour) or behavioral experiments (e.g., writing down how they feel before and after taking medication in order to help identify that anticipatory anxiety is often worse than any discomfort they feel during or after the avoided task). In CBT, patients receive emotional and psychological support while learning strategies to overcome avoidance and to adhere to their medication, dietary intake, and physical activity goals. CBT for the management of T2DM can be done in weekly individual or group sessions, and is traditionally done in-person with a therapist and over the span of several weeks to months.

For many years, CBT was the most commonly investigated form of psychotherapy for T2DM (for example, see [4–6]) and results confirmed its efficacy in increasing positive outcomes. In recent years, the literature has shifted away from investigating CBT in its traditional application. Instead, new research has begun to examine CBT in alternative delivery formats in an effort to boost accessibility. For instance, a 6-month web-based CBT intervention was found to be more effective than a control group in lowering HbA1c levels ($p = .002$) among T2DM patients in Saudi Arabia [8]. It also resulted in better diabetes mellitus knowledge ($p = .004$) and self-efficacy ($p < .001$) relative to a control group, suggesting that CBT can produce a meaningful change in cognitions that are related to successful self-

Author (Year)	N	Age	Sex (M, F)	Ethnicity	Country	Intervention	Duration	Outcome	p-value
Abu-Saad, Murad, Barid, Olmer, Ziv, Younis-Zeidan, & Kalter- Leibovici (2019)	50	53	21,29	Arab	Israel	Interactive lifestyle assessment, counseling and education (motivational interviewing) Standard lifestyle advice	6 months	**Biological**	
								HbA1c	.400
								Diabetes-related	
								Diabetes Knowledge – 3 months	.023
								Added sugar[a]	.050
								Dietary fiber[a]	.578
								Fruit[a]	.203
								Vegetables[a]	.172
								Whole grains[a]	.325
								Physical Activity	
Alanzi, Alanzi, Istepan i-an, & Philip (2018)	20	NA	15,5	NA	Saudi Arabia	Mobile CBT	6 months	**Biological**	
						Conventional diabetes treatment		HbA1c	.002
								Diabetes-related	
								Diabetes Knowledge Test	.004
								Psychological	
								Self-Efficacy Scale	<.001
Armani, Vahdani, Noorbala, Nejatisafa, Arbabi, Zenoozian & Nakhjavani (2018)	60	56	11, 49,	NA	Iran	Mindfulness-based stress reduction	3 months	**Biological**	
								HbA1c	.01
								Fasting blood sugar	.001
						Usual care		**Psychological**	
								Overall mental health	.001
								Depression	.01
								Anxiety	.01

Author (Year)	N	Age	Sex (M, F)	Ethnicity	Country	Intervention	Duration	Outcome	p-value
Chee, Gilcha-ran Singh, Hamdy, Mechanick, Lee, Barua, Ali & Hussein (2017)	230	55	85, 145	Indian (58%)	Malaysia	Motivational interviewing (Trans-cultural diabetes-specific nutrition algorithm+MI)	6 months	**Intervention Phase**	
				Chinese (28%)			6 month follow-up	**Biological**	
				Malaysian (14%)				HbA1c	< .001
								Weight loss	< .001
								Body Mass Index	< .001
						Conventional counselling (Trans-cultural diabetes-specific nutrition algorithm+CC)		Waist circumference	< .001
								Body fat	< .001
								Fasting plasma glucose	.027
								Systolic blood pressure	.003
								Diastolic blood pressure	.013
								Total	
						Usual Care		Cholesterol	.741
								Low-density lipoproteins	.565
								High-density lipoproteins	.484
								Triglyceride high sensitivity	.855
								C-reactive protein	.092
								Follow up	
								Biological	
								HbA1c	.006
								Weight loss	< .001
								Diabetes-	

Author (Year)	N	Age	Sex (M, F)	Ethnicity	Country	Intervention	Duration	Outcome	p-value
								related	
								Energy	< .001
								Carbohydrate	< .001
								Protein	< .001
								Fat	< .001
								Exercise	< .001
Dobler, Herbeck Belnap, Pollmann, Fairn, Raspe & Mittag (2018)	199	52	140, 59	NA	Germany	Telephone follow-up motivational interviewing	12 months	**Biological**	
								HbA1c	.006
								Body mass index	.218
						Usual care		Cardiovascular risk	.011
								Diabetes-related	
								Exercise index	.006
								Dietary index	.633
								Medication adherence	.633
								Psychological	
								Illness burden	.069
								Well-being	.044
								Depression	.057

Author (Year)	N	Age	Sex (M, F)	Ethnicity	Country	Intervention	Duration	Outcome	p-value
Friis, Johnson, Cutfield, & Consedine (2016)	63	43	20, 43	New Zealand European (73%)	New Zealand	Mindful self-compassion program	3 months	**Biological**	
								HbA1c	.05
						Usual Care		**Psychological**	
				Maori (2%)				Self-Compassion	.05
								Depression	.001
				Asian (8%)				Diabetes Distress	.05
				Other Pacific (5%)					
				Other European (13%)					
Gainey, Himathongkam, Tanaka & Suksom (2016)	23	60	4, 19	NA	Thailand	Traditional walking	3 months	**Biological**	
						Walking meditation		HbA1c	<.05
								Fasting blood glucose	>.05
								Insulin resistance	>.05
								Total	
								Cholesterol	>.05
								High-density lipoproteins	>.05
								Low-density lipoproteins	>.05
								Triglycerides	>.05
								Cortisol	<.05

Author (Year)	N	Age	Sex (M, F)	Ethnicity	Country	Intervention	Duration	Outcome	p-value
Holmen, Torbjornsen, Wahl, Jenum, Smastuen, Arsand, & Ribu (2014)	151	57	89, 62	NA	Norway	Few Touch Application (FTA)	12 months	**Biological**	
						Few Touch Application—Health Counseling (FTA-HC)→Motivational interviewing		HbA1c (FTA x control)	.42
						Control		HbA1c (FTA-HC x control)	.97
								Diabetes-related	
								Self-management skill and technique acquisition (FTA x control)	.79
								Self-management skill and technique acquisition (FTA-HC x control)	.04
								Health service navigation (FTA x control)	.06
								Health service navigation (FTA-HC x control)	.97
Jansink, Braspenning, Keizer, van der Weijden, Elwyn & Grol (2013)	521	64	285, 236	NA	Netherlands	Nurse motivational interviewing program	14 months	**Biological**	
								HbA1c	.221
								Systolic blood pressure	.279
						Usual care		Diastolic blood pressure	.294
								Low-density lipoproteins	.081
								Total	
								Cholesterol	.051
								Body mass index	.198
								Diabetes-related	
								Alcohol consumption	.647

Author (Year)	N	Age	Sex (M, F)	Ethnicity	Country	Intervention	Duration	Outcome	p-value
								Fat score	.708
								Vegetables	.518
								Fruit	.884
								Physical activity	.839
								Low activity	.498
								Medium activity	.592
								High activity	.669
								Diary activity	.066
								VAS score	.441
Juul, Maindal, Zoffmann, Frydenberg & Sandbaek (2014)	4034	60	2279, 1755	NA	Denmark	Nurse motivational interviewing program	18 months	**Biological**	
								HbA1c	.67
								HbA1c ≥8%	.59
						Usual care		Total cholesterol (mmol/l)	.02
								Total cholesterol ≥5 mmol/l	.07
								Diabetes-related	
								Medication –controlled motivation	1.00
								Medication –autonomous motivation	1.00
								Diet and physical activity – controlled motivation	0.70
								Diet and physical activity – autonomous motivation	0.98
								Perceived Competence for Diabetes Scale	0.97

Author (Year)	N	Age	Sex (M, F)	Ethnicity	Country	Intervention	Duration	Outcome	p-value
Mohamed, Al-Lenjawi, Amuna, Zotor, & Elmahdi (2013)	430	53.5	NA	Arab	Qatar	Culturally sensitive structured education program	12 months	**Psychological**	
								Problem Areas in Diabetes	.31
						Control		Mental component of the impact of health on daily living (SF-12)	.15
								Health Care	.43
								Climate	
								Questionnaire	
								Biological	
								HbA1c	.012
								Fasting plasma glucose	.022
								Total cholesterol	.204
								High-density lipoproteins	<.001
								Low-density lipoproteins	.203
								Triglyceride	.200
								Albumin/creatinine ratio	<.001
								Systolic blood pressure	.631
								Diastolic blood pressure	.421
								Body mass index	.001
								Diabetes-related	
								Knowledge	<.001
								Attitude	<.001
								Practice	<.001
								Overall	<.001

Author (Year)	N	Age	Sex (M, F)	Ethnicity	Country	Intervention	Duration	Outcome	p-value
Pearson, Wills, Woods, & Warnecke (2018)	67	59	36, 31	NA	Australia	Mindfulness practice	3 months	**Biological**	
						Usual care		HbA1c	.02
								Monitoring Blood Glucose	. 06
								Systolic blood pressure	.78
								Diastolic blood pressure	. 28
								Diabetes-related	
								Diet	.31
								Exercise	.12
								Foot care	.25
								Psychological	
								Depression	.02
								Anxiety	.18
								Stress	.03
								Problem Areas in Diabetes	.78
Tovote, Fleer, Snippe, Peeters, Emmelkamp, Sanderman ... Schroevers (2014)	94	53	48, 46	NA	Netherland	Mindfulness-based cognitive therapy (MBCT)	3 months	**Biological**	
								HbA1c (MBCT)	.92
						Cognitive behaviour therapy (CBT)		HbA1c (CBT)	.72
								Psychological	
						Control		Depression -BDI-II (MBCT x Control)	.004
								Depression -BDI-II (CBT x Control)	.001
								Depression -HAM-D7 (MBCT x Control)	.001
								Depression -HAM-D7 (CBT x Control)	.001

Author (Year)	N	Age	Sex (M, F)	Ethnicity	Country	Intervention	Duration	Outcome	p-value
								Well-being -WHO-5 (MBCT x Control)	.001
								Well-being -WHO-5 (CBT x Control)	.001
								Anxiety - GAD-7 (MBCT x Control)	.004
								Anxiety - GAD-7 (CBT x Control)	.01
								Diabetes Distress (MBCT x Control)	.02
								Diabetes Distress (CBT x Control)	.04
van Son, Nyklicek, Pop, Blonk, Erdtsieck, Spooren, … Pouwer (2013)	139	56.5	70, 69	NA	Netherland	Mindfulness-based cognitive therapy	3 months	**Biological**	
								HbA1c	.35
						Usual care		**Diabetes-related**	
								Physical Health Status	.03
								Psychological	
								Perceived Stress Scale	.001
								Anxiety (HADS)	.02
								Anxiety (POMS)	.001
								Depression (HADS)	.01
								Depression (POMS)	.001
								Diabetes distress	.49
								Fatigue (POMS)	.01
								Mental Health Status	.01

Author (Year)	N	Age	Sex (M, F)	Ethnicity	Country	Intervention	Duration	Outcome	p-value
van Son, Nyklicek, Pop, Blonk, Erdtsieck, & Pouwer (2014)	139	56.5	70, 69	NA	Netherland	Mindfulness-based cognitive therapy	6 months	**Biological**	
						Usual care		HbA1c	.816
								Diabetes-related	
								Physical Health Status	.034
								Diabetes acceptance	.105
								Psychological	
								Perceived Stress	.001
								Anxiety (HADS)	.001
								Anxiety (POMS)	.001
								Depression (HADS)	.004
								Depression (POMS)	.16
								Diabetes distress	.034
								Mental Health Status	.001
								Mindfulness	.001
								Self-Esteem	.597
Varming, Rasmussen, Husted, Olesen, Grønnegaard, & Willaing, (2019)	97	64.3	64, 33	Danish	Denmark	Empowerment, motivation, and medical adherence (EMMA)	3.5 months	**Intervention phase**	
							6-month follow up	**Biological**	
						Usual care		HbA1c	>.05
								Blood sugar	>.05
								Body mass index	>.05
								Systolic blood pressure	>.05

Author (Year)	N	Age	Sex (M, F)	Ethnicity	Country	Intervention	Duration	Outcome	p-value
								Diastolic blood pressure	>.05
								Diabetes-related	
								Problem areas in diabetes	>.05
								Diabetes self-care activities	>.05
								Healthy diet	<.05
								Physical activity	>.05
								Diabetes medication	>.05
								Foot care	>.05
								Diabetes competence	>.05
								Psychological	
								Well-being	>.05
								Healthcare support	<.05
								Follow-up	
								Biological	
								HbA1c	>.05
								Blood sugar	>.05
								Body mass index	>.05
								Systolic blood pressure	>.05
								Diastolic blood pressure	>.05
								Diabetes-related	
								Problem areas in diabetes	>.05

Author (Year)	N	Age	Sex (M, F)	Ethnicity	Country	Intervention	Duration	Outcome	p-value
								Diabetes self-care activities	>.05
								Healthy diet	>.05
								Physical activity	>.05
								Diabetes medication	<.01
								Foot care	<.05
								Diabetes competence	>.05
								Psychological	
								Well-being	>.05
								Healthcare support	>.05

Note. *NA = Not available within the article.*
[a]*Within group differences*

Table 1.
Summary of reviewed randomized controlled trials.

management of the condition. Internet-based CBT protocols offer a promising and accessible psychotherapeutic intervention for T2DM patients, but more randomized controlled trials are needed to further elucidate their efficacy. It is also possible that certain patients will do better than others with web-based CBT interventions. Therefore, treatment matching trials are needed to identify the personal characteristics that best predict positive outcomes with non-traditional formats of CBT for T2DM.

2.2 Motivational interviewing

Motivational interviewing (MI) is a collaborative and goal-oriented therapy that focuses on resolving ambivalence toward change [9]. Suggestions or instructions for diabetes mellitus self-management may be met with resistance and non-compliance by patients. MI counters these responses by promoting self-efficacy. The therapist helps the patient to determine what is important to their own well-being and how to achieve that goal [10]. For example, a therapist may explore what the patient likes and does not like about their current behaviors to determine the costs and benefits of behavior change. By putting the patient in the 'driver's seat', intrinsic motivation is developed (e.g., "I will change my diet and exercise because I want to live a long and healthy life"). The therapeutic alliance is seen as fundamental to facilitating positive behavior change. From this starting point, the therapist and patient can work together to set an agenda for items they would like to change (e.g., medication, diet, exercise, and regular monitoring of blood sugar levels) and check in frequently about the patient's perceived importance and confidence regarding the target behavior [10].

Although MI has garnered a lot of research interest, the results of recent studies examining its utility in the management of T2DM have been mixed. In support of this intervention in the care of T2DM, Chee and colleagues (2017) found that patients who received MI for 6 months, in addition to diet and exercise planning, reported greater reductions in HbA1c ($p = .006$) and weight loss ($p < .001$) than a control group at 6 month follow up [11]. This study took place in Malaysia with a sample of 230 Indian (58%), Chinese (28%), and Malaysian (14%) participants, aged 30–65 years ($M = 55$, $SD = 8$). However, a number of recent studies have not found support for MI over treatment as usual. For example, patients treated by nurses trained in MI in the Netherlands and Denmark had similar HbA1c levels, diet, physical activity, and well-being as those treated by nurses trained in standard care. This pattern of results was found in both 14- and 18-month trials [12, 13]. Notably, the competency of the nurses trained in psychological skills for that study was below beginner-level proficiency and was similar to the standard-care nurses. In other words, it may require extensive training among therapists in order to demonstrate the superiority of MI over control groups.

Recent findings for MI in the management of T2DM are also mixed when MI examined in alternative delivery formats. A 12-month telephone-based delivery of MI in Germany was found to reduce patients' HbA1c levels to a greater extent than usual care (i.e., informational pamphlets; $p = .006$). It also improved to a greater extent patients' physical activity ($p = .006$), cardiovascular health ($p = .011$), psychological well-being ($p = .044$), illness burden ($p = .069$), and depression ($p = .057$) [14]. In another study from Norway, telephone-based MI was provided for 4 months in addition to an interactive mobile self-monitoring application that tracks diet, fitness, and diabetes-related goals. There were no differences in patients' HbA1c levels between app users with and without MI, or those who received usual care (i.e., no psychotherapeutic intervention) [15], suggesting that neither the app nor the MI produced a better health outcome than standard, non-

psychotherapeutic care. Similarly, a 6-month web-based counseling software delivery of MI was equivalent to standard lifestyle advice in resulting HbA1c levels among Arab participants [16]. The MI-based intervention was, however, superior to the control group at increasing short-term diabetes-related knowledge (p = .023) among patients and trended toward within group improvements in dietary habits (p = .050). The discrepancy between the findings within that study further highlight that all MI delivery formats are not equal; long-term direct therapist contact may be an essential component of MI in order to elicit sufficient behavior change that manifests in reductions in HbA1c levels. Further research would be necessary to confirm this hypothesis.

2.3 Counseling

Another category of psychological interventions for T2DM involves counseling interventions which tend to provide non-specific support for diabetes mellitus management. Counseling typically promotes self-awareness and self-determination which, in the context of diabetes mellitus, can aid in improving self-management behaviors [17]. Counseling can also provide emotional and psychological support to individuals who are dealing with the stress of living with a chronic disease. In other words, although behavior change is not the focus of counseling interventions, they may, in theory, be helpful for reducing stress and increasing adherence among patients.

RCTs of counseling interventions for T2DM are scarce [4–6], but there have been two recent studies on this modality. One study examined a culturally sensitive 12-month counseling program for T2DM patients in Qatar (i.e., using Arabic language and referencing culturally specific food habits and health beliefs). Within this program, patients were provided with information about diabetes and related complications, how to incorporate a healthy lifestyle and eating habits, the benefits of exercise, and how to use counseling techniques at home. The researchers found that this program led to significant reductions in patients' HbA1c levels (p = .012) and BMI ($p < .001$), as well as improved diabetes-related knowledge ($p < .001$), attitudes ($p < .001$), and practices ($p < .001$) over the standard practice of distributing informational booklets [18]. However, in another study of counseling, patients in Denmark who were offered short-term empowerment, motivation and medical adherence (EMMA) therapy, which focuses on goal setting and autonomy support, did not report improvements in HbA1c levels over and above treatment as usual. Individuals who received counseling did, however, demonstrated increases in frequency of healthy eating ($p < .05$) [19].

Based on these findings, counseling may have benefits for improving HbA1c levels in specific cultural contexts, but these therapies may have to be long-term (one year or longer) and follow a structured format to be beneficial for glycemic control.

2.4 Mindfulness-based therapies

Mindfulness-based therapies teach meditative practices and promote a non-judgmental awareness of the present moment, including noticing thoughts, emotions, and bodily sensations. In the context of T2DM, noticing negative diabetes-related thoughts can help promote passive observation of the experience and allow the individual to be present in their everyday life without an unhelpful behavioral reaction. For example, noticing internal hunger or satiety cues can influence dietary choices and help patients regulate blood sugar levels. Mindfulness can, in theory, help patients become better attuned to their physiological state, including blood

sugar levels. Or a patient who experiences anxiety about increasing their physical activity may learn to nonjudgmentally notice their anxious thoughts and urges to avoid exercise, but intentionally choose to exercise nonetheless. Regular mindfulness practice trains the mind to be less reactive and more intentional in one's choices and experiences.

Mindfulness interventions have increased in popularity in the past decade and there have been a number of recent RCTs that indicate the applicability of mindfulness-based therapies for the treatment of diabetes mellitus. The outcomes are mixed in regard to changes in HbA1c levels. In support of the efficacy of mindfulness programs, an 8-week mindfulness-based stress reduction program in Iran was found to improve HbA1c levels ($p = .010$), fasting blood sugar ($p < .001$), depression ($p = .010$), anxiety ($p = .010$), and overall mental health ($p = .001$) compared to a control group [20]. In another study from New Zealand, an 8-week program based in mindful self-compassion led to greater decreases in HbA1c ($p = .050$) than a waitlist control, as well as reductions in depression ($p = .001$) and diabetes-related distress ($p = .050$) [21]. Even when the 8-week program was self-directed, mindfulness practice has been found to improve HbA1c levels ($p = .020$), stress ($p = .030$), and depression symptoms ($p = .020$) compared to a control condition in Australia [22]. Specific techniques within a mindfulness-based practice have been found to be effective. For instance, Thai patients with T2DM who engaged in mindful walking for 3 months demonstrated greater decreases in HbA1c ($p < .050$) relative to walking alone [23].

A relatively recent variation of mindfulness therapy, mindfulness-based cognitive therapy, involves training patients in both meditation and cognitive therapy (i.e., identifying and challenging cognitive distortions). A series of studies in the Netherlands were recently conducted to investigate the effects of this intervention on the care of patients with T2DM, but none showed any benefit for HbA1c levels. For instance, although van Son and colleagues [24, 25] found improvements in self-reported stress ($p = .001$), anxiety ($p = .020$), depression ($p = .010$), and improved quality of life ($p = .010$) following mindfulness-based cognitive therapy and that were maintained at 6-month follow-up, they did not find a difference on HbA1c levels when compared to usual care. Another study also did not find differences in glycemic control between mindfulness-based cognitive therapy and a control group, but did report changes in diabetes-related distress ($p = .020$) and well-being ($p = .001$) [26]. Within these studies, poor glycemic control was not an inclusion criterion, which may have resulted in a floor effect due to generally low levels among patients regardless of treatment condition. It may be that mindfulness-based cognitive therapy, which was originally developed to treat depression, is less effective at reducing HbA1c levels than traditional mindfulness training practices that do not incorporate cognitive therapy but focus instead on meditation. In other words, the cognitive therapy addition may dilute the efficacy of mindfulness training, which, at this point in time, has more support for it in the care of T2DM. Research designs that compare mindfulness-based cognitive therapy to other mindfulness interventions in patients with poor glycemic control would be necessary to confirm this hypothesis.

3. Summary

T2DM is a serious disease with significant morbidity which, if poorly managed, can lead to short- and long-term complications including cardiovascular disease, blindness, nerve damage, and loss of limbs [1]. There has been interest among researchers to examine whether psychotherapeutic interventions aimed at changing

thoughts, feelings, and/or behaviors among patients with T2DM have any significant benefit. Recent randomized controlled trials suggest that psychotherapy for T2DM may be an effective treatment option for certain outcomes, but that not all therapies have an evidence base for use with patients with T2DM.

Research from the past 8 years has provided the most support for mindfulness-based therapies at improving health outcomes for patients with T2DM. Numerous studies with different samples have demonstrated statistically significant reductions in HbA1c levels and fasting blood sugar, as well as improvements in psychological variables such as depression, anxiety, stress, diabetes-related distress, and overall mental health. These findings were demonstrated in various geographical regions (including Iran, New Zealand, and Australia) among middle-aged (average age ranged from 23 to 59 years old) men (n = 67) and women (n = 123). Notably, however, mindfulness-based cognitive therapy was only superior to a control group for psychological outcomes, not HbA1c levels. In other words, mindfulness-based therapies that emphasize meditative practices, but not mindfulness-based cognitive therapy, have evidence to support their use in the management of T2DM. Of note, the existing studies on mindfulness-based cognitive therapy that did not show its benefit for glycemic control were conducted with middle-aged (53 to 56.5 years old) men (n = 118) and women (n = 115) from the Netherlands. As such, this form of therapy may not be effective within this relatively young sample. More research is needed to understand whether mindfulness-based cognitive therapy is as good or better than mindfulness therapy.

While research interest in traditional-delivery CBT has declined in recent years, one recent study expanded upon existing literature to demonstrate the effectiveness of CBT in a web-based format in diabetic patients from Saudi Arabia. This program improved HbA1c levels, as well as diabetes mellitus knowledge and self-efficacy, to a greater extent than the control group. The research results are more divided for MI and counseling interventions. In regard to the former, MI was typically found to be as effective as standard care on HbA1c levels and diabetes-related behaviors such as diet and physical activity in patients from Malaysia and parts of Europe (average ages 55 to 64 years old). However, when delivered in a telephone- or web-based format, MI had the added benefits of improving diabetes-related behaviors, such as dietary changes and physical activity, as well as psychological variables, including lowering depression and increasing well-being and diabetes-related knowledge. Notably, this was true in both men and women from diverse backgrounds (i.e., Arab and German). Recent findings for counseling intervention have been mixed whereby culture-specific counseling appears to be more effective at reducing HbA1c levels than informational booklets for middle-aged (M = 53.5 years old) Arab patients. But counseling was no more effective than usual care for diabetes mellitus self-management in older (M = 64.5 years old) Danish patients on improving HbA1c levels.

Commonly used psychotherapeutic interventions, such as mindfulness-based therapies and CBT, have empirical support in recent studies for use in the management of T2DM. This provides an evidence base for the widespread implementation of these treatments by healthcare professionals in their care of patients with T2DM. Training in both of these psychotherapy approaches for health professionals is widely available through professional development workshops or training manuals, and many workshops have been offered remotely during the COVID-19 pandemic. In addition, the recent promising findings from a study of self-directed mindfulness therapy suggests that healthcare professionals can recommend these programs to patients to pursue as a self-help resource, which reduces the potential obstacles of cost and geographic accessibility. Additional research is necessary to understand the efficacy of counseling and alternative-format CBT before practitioners should recommend these interventions in the management of T2DM.

This chapter reveals that psychotherapeutic interventions are an appropriate treatment modality for patients with T2DM and some have support from recent studies in improving health outcomes. These interventions extend beyond treating the physiological concerns of this disorder and can address other psychosocial variables, such as thoughts, feelings, and behaviors related to diabetes mellitus care. As such, not only did HbA1c levels improve in a number of treatments, research has supported changes in diet, physical activity, diabetes-related knowledge, and, in some cases, mood. There are no known negative effects of psychotherapeutic interventions on the health or well-being of patients with T2DM. The evidence for these interventions should be considered in regard to the sample population and size, comparison group, length of intervention, and geographic region.

There are still many gaps in the literature regarding which groups of individuals benefit the most from psychotherapy for T2DM and from which approach. Future research should continue to explore psychotherapeutic interventions especially in the areas of counseling and new delivery formats of CBT to expand treatment options. Of note, a recent RCT of Acceptance and Commitment Therapy for patients with T2DM has demonstrated preliminary success in improving HbA1c levels compared to education alone [27], but more research is needed on this intervention strategy before drawing generalized conclusions. In addition, more attention in future research studies needs to be paid to how different types of patients respond to psychotherapy and whether variables such as age, sex, and ethnicity interact with intervention type to produce different outcomes. Across all psychotherapeutic treatment modalities under investigation for use in the management of T2DM, treatment matching research is warranted to determine which patients may be able to benefit from modified, more accessible and cost-effective (self-help, web-based) formats. With that more targeted research in future research, healthcare professionals can feel even more confident implementing some therapies, such as mindfulness-based therapies, CBT, and some formats of MI, to promote better glycemic control and psychological well-being in their patients with T2DM.

4. Conclusions

Psychological interventions can lower HbA1c levels, improve psychological distress, and support healthy coping among patients with T2DM. There is recent and reliable research support for mindfulness-based therapies at improving HbA1c levels, blood sugar, and psychosocial variables. Results are promising, but more research is needed on the efficacy of longer-term culture-sensitive counseling as well as alternative delivery formats of cognitive-behavioral therapy on health outcomes among patients with T2DM.

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Conflict of interest

The authors have no conflicts of interest to declare.

Appendix: Search Strategy

To identify relevant studies, the authors used the same search terms as two previously published systematic reviews of psychotherapy for T2DM [4, 5]. The search was conducted by pairing relevant search terms, including "psychotherapy", "cognitive-behavioral therapy", "motivational interviewing", "counseling", "supportive therapy", and "mindfulness-based therapy", with "type 2 diabetes" and "randomized controlled trial" on PsycINFO, PubMed, and Medline using a Boolean "AND". The search was limited to articles published after December 2012 since this was the end of the period reviewed since the last review paper [5]. The original search was conducted on January 24th, 2019, then repeated at each revision, on March 24th, 2019, October 28th, 2019, and November 12th, 2020, to be thorough. The initial search identified 268 articles. After duplicates across search engines were removed, articles were screened by the primary author based on titles and abstracts. For the screening process, full articles were retrieved and reviewed to confirm relevance and eligibility. The primary author extracted data on intervention type, methods, and outcomes. To be included in this review, the article must have been an RCT that examined a psychotherapeutic intervention for participants who met criteria for T2DM at the time of recruitment and must have changes in HbA1c levels as a health outcome. Only RCT's were reviewed so as to include only the most scientifically rigorous research on this topic. Studies that used only pharmacological interventions were not included. In addition, interventions that specifically targeted comorbid disorders (e.g., depression in individuals with T2DM) and studies that were not reported in English were also excluded from this review. In the end, 16 articles remained and were reviewed.

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