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Integrating Theory and Research: Directions for Promoting Mental Health for Managing Diabetes Distress

Dr. Sudha Rathore, Dr. Sankul Sethia, Manvee Goyal, and Tavishi Limaye

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Abstract

Diabetes, a common chronic illness, witnessed a sharp increase in its prevalence globally after COVID 19. Presently, about 20 million people in India and 537 million globally are suffering from diabetes. Factors to be inculpated for the illness include biological, social, environmental and psychological factors, along with lifestyle. Thus, the treatment should focus on all the aspects for a fully functioning individual. Further, the diabetes care regimen may become overwhelming resulting in diabetes distress and interfering with diabetes management. Interventions tailored for diabetics have been suggested as a solution to increase adherence to medications and diabetes care regimen, while improving physical and mental health. This systematic review examined intervention-based studies on Gratitude, Hope, Humor and Mindfulness, from 2000 to July 2023, having effects on psychological, medical, behavioural and psycho-social outcomes in diabetics. The review followed PRISMA (2020) guidelines; 15 studies were extracted according to set PICOS framework which supported significance of positive psychological interventions in diabetes care. Quality of studies were determined using "Quality Assessment Tool for Quantitative Studies" developed by Effective Public Health Practice Project (EPHPP, 1998). Results indicate improvement in psychological outcomes, most commonly stress, anxiety and depression. Medical outcomes such as glycaemic control, cortisol levels and glucose monitoring approached close to optimum levels. Behavioural outcomes including diabetes self-management, adherence and diabetes-care, and psycho-social outcomes enhanced after interventions. Significant results in diverse outcomes indicates importance of interventions while guiding for development of more specific diabetes-tailored interventions to manage diabetes distress and promote overall health.

PUBLIC SIGNIFICANCE STATEMENT

The review suggest the effectiveness of psychological interventions, based on Gratitude, Hope, Humor and Mindfulness, in improving psychological, medical, behavioural and psycho-social outcomes in diabetics. It presents the need for development of diabetes-specific interventions which will benefit health practitioners, healthcare organizations and social workers to take better care of people's health. The policy makers get support towards implementation of interdisciplinary modules for treatment to enhance healthcare system.

Keywords: Diabetes, Well-being, Interventions

INTRODUCTION

Diabetes is one of the common chronic illnesses. Diabetes (Type 2), also known as Non-insulin-dependent diabetes or Adult-onset diabetes, is the most prevalent form of diabetes. It can begin during childhood or adulthood, but is more common in adults. The symptoms of Type 2 diabetes often develop slowly; therefore, people can remain undiagnosed for years. It occurs due to problematic way of usage and regulation of sugar (glucose) by the body. In long-term, this result in increased level of sugar circulating in the blood, which in turn leads to dysfunction of the circulatory, nervous and immune systems.

After COVID 19, there has been a sharp increase in the prevalence of diabetes globally. According to Diabetes Atlas (10th ed.) 2021, by the International Diabetes Federation (IDF), 10.5 % of world adult population (20-79 years) has diabetes, i.e., 1 in 10 Adults (537 million people), and Type 2 diabetes accounts for 90% of all diabetes. Around 11.5% of global health expenditure is spent on diabetes. In South-East Asian Region, there has been 68 % increase in diabetes prevalence recently – which includes India, Bangladesh, and others. India has more than 20 million people with diabetes.

Causal factors of Type 2 diabetes include socio-economic, demographic, environmental, and genetic factors (IDF, 2021). Apart from biological factors such as family history of diabetes, high blood pressure, ageing, increasing weight and obesity prevalence, many lifestyle factors such as sedentary lifestyle, unattended food consumption, disturbed sleep, physical inactivity and others, contribute to the diabetic condition. Further unsuitable socio-economic and environmental conditions adds up to it. Consequently, it is necessary to focus on the psychological contributors of the disease, such as stress, fear, anxiety and emotional arousal, caused by these factors in combination and due to additional burden of COVID-19 during recent years. Medical professionals deal with the physical/biological aspects, while psychological aspects are generally left unattended. In this context, World Health Organization (WHO, 2006) states that health comprises of physical, mental and social wellbeing and not merely the absence of disease and infirmity. Therefore, it is imperative that focus should not be limited to physical imbalances, but mental balance and promoting positive mental state is given equal importance for a fully functioning individual.

Tracking blood sugar levels, dosing insulin, planning meals, staying physically active — becomes a lot to care about. It can leave the person with diabetes feeling burdened, emotionally drained, completely overwhelmed and exhausted. It has been called “diabetes burnout.” Further, this burnout may result in anger, denial, depression and other mental health issues, commonly found in diabetics. Most of the researches done in this context are quantitative in nature. Studies suggest that diabetes related distress is a major barrier to optimal diabetes management that clinicians can identify and improve. Thus, researches need to study various psychological factors that can manage diabetes distress and strengthen diabetes management.

IDF has also emphasized the need for effective interventions to stall the increase in diabetic population. However, so far little is known about the efficacy of interventions specifically targeted to treat elevated diabetes distress. Researches show that medications alone are not enough to control the diabetes complications and better therapies are required to adjunct medication procedures for better adherence to medical prescriptions and handling the side effects of medicines. Internationally, there is dearth of studies which proposes mental health promotion factors and their interventions among patients with diabetes to reduce distress. Further, intervention schemes thus proposed are not suitable in Indian context due to cultural variations. It is imperative to formulate researches which can cater to the psychological needs of global as well as Indian diabetic population.

IDF suggested that psychological and behavioural interventions can help to reduce diabetes distress. They can be helpful in increasing adherence to the complex and demanding diabetes care regimen, with the goals of promoting high quality of life, achieving optimal glycemic control and further preventing disease related complications. Review in the concerned field suggests that specifically diabetes tailored psychological interventions are needed to reduce diabetes distress and promote enhanced health beliefs and self-management skills.

Considering the positive effects, present study aims to synthesize a systematic review of interventions on mental health promoting factors that can manage diabetes distress. The mental health promoting factors or positive psychological variables considered for this review are Gratitude, Hope, Humor and Mindfulness. The study will contribute to the understanding of the available literature and will provide guidelines for further researches.

METHODS

The systematic review was conducted and reported according to the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA, 2020) (Page et al., 2021) guidelines.

Eligibility Criteria

Inclusion Criteria for review studies:

- Studies in English language.
- Studies on participants with diabetes (Type 1 and Type 2).
- Intervention given for mental health promoting factor(s)– Gratitude, Hope, Humor and Mindfulness
- Outcome-based studies (having either psychological, medical, behavioural or psycho-social outcomes)

Exclusion criteria for review studies:

- Studies in languages other than English
- Studies without full-text (having only abstract)
- Case studies and case reports

The method used to establish the eligibility criteria for the review studies was PICOS (Participants, Interventions, Comparators, Outcomes, and Study design) framework (Amir-Behghadami & Janati, 2020). The set criteria are depicted in Table 1.

Table 1: PICOS framework for this review

Participants	Individuals with Diabetes (Both Type 1 and Type 2)
Interventions	Interventions given for enhancing Gratitude, Hope, Humor and Mindfulness
Comparators	Baseline, No treatment, Other treatment
Outcomes	Psychological, Medical, Behavioural or Psycho-social outcomes (any of these)
Study design	Randomized Controlled Trial, One group pretest-posttest, Non-equivalent control group pretest-posttest, Prospective observational study, Quasi experimental study

Flexibility was maintained in intervention duration, follow-up periods, facilitators of interventions and methods/statistics used to calculate the effects of interventions. Studies with either category of outcomes (Psychological, Medical, Behavioural and/or Psycho-social) were considered. Two authors reviewed each study independently for quality and relevance.

Information Sources

Systematic search was conducted using electronic databases in July 2023. The data was extracted from Google Scholar, PubMed, ProQuest and Research Gate.

Selection process

Systematic searches were done in electronic databases using keywords. Duplicate studies were removed. Studies were screened for matching inclusion criteria, English language, and full-text availability. Irrelevant studies were eliminated. Full-text articles/studies were assessed for eligibility in terms of population, type of intervention and study design. The studies which fulfilled all the set criteria were included in the review by the authors. Figure 1 shows the summary of the selection process for studies.

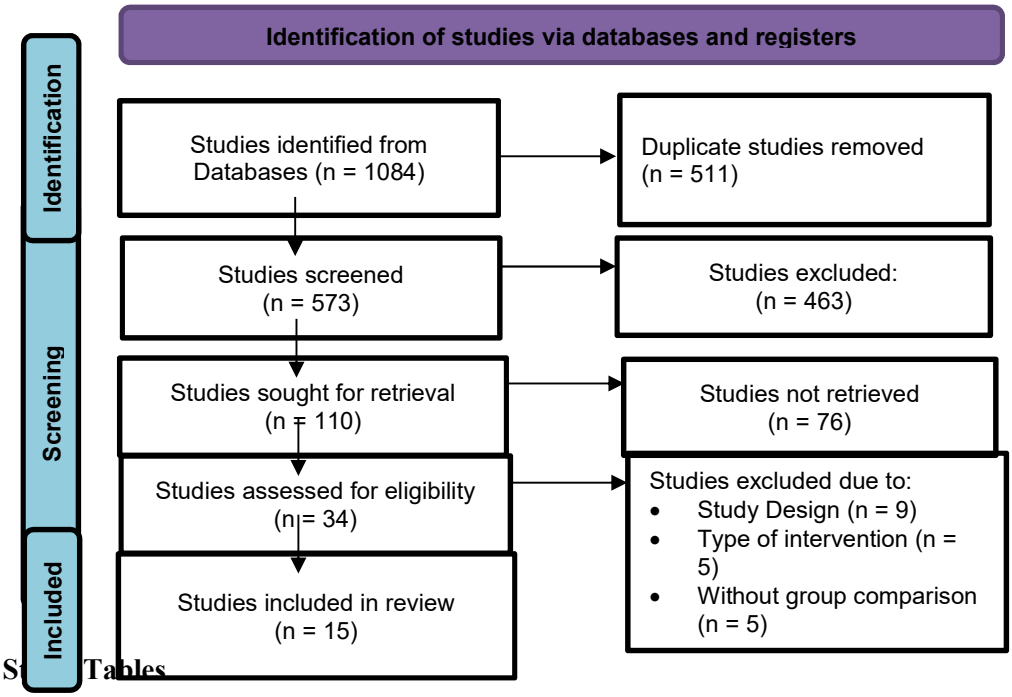
Quality Assessment

The quality of studies was assessed using “Quality Assessment Tool for Quantitative Studies” developed by Effective Public Health Practice Project (EPHPP, 1998). The overall assessment of 15 studies turned out to be strong. This suggests good quality of studies included in the review and gives credibility to the findings and

conclusions drawn from these studies.

RESULTS

Figure 1: Study Selection Process (PRISMA, 2020)



St Tables

Table 2: Studies with Gratitude Interventions

Author & Year	Sample size	Sample Characteristics	Study Design	Intervention	Psychological Outcomes	Medical Outcomes	Behavioural Outcomes	Psycho-social Outcomes
Schache, K. R., Hofman, P. L., & Serlachius, A. S. (2020)	60 (Intervention= 31, control= 29)	Adolescents (10–16 years) with Type 1 diabetes (Auckland, New Zealand)	Randomized controlled trial	Gratitude journalling (8 weeks)	Stress (P= 0.999), Depression (P= 0.600), Gratitude (P= 0.530), Impact of diabetes (P= 0.585)	**Glycaemic control (*P= 0.048)**	Self-care (P= 0.591)	N.A.
DuBois, C. M., Millstein, R. A., Celano, C. M., Wexler, D. J., & Huffman, J. C. (2016)	12	English-speaking adults with type 2 diabetes and suboptimal adherence	Pre-post study	Gratitude for positive events, Writing gratitude letter (12 weeks)	**Self-reported Optimism (d=0.48, P= 0.035), Self-reported Happiness/positive affect**	**Glucose monitoring (d=0.29)**	**Function/ health-related quality of life (d=0.28), Diabetes self-care (d=1.00),**	N.A.

					(d=0.80, P= .002) Optimism (d=0.56), Gratitude (d=0.27), Anxiety (d=0.68), Depression (d=0.56), Diabetes-related distress (d=0.40)		**Health behaviour adherence (d=0.72), General diet (d=0.29), Specific diet: fruits and vegetables (d=0.68), Specific diet: high-fat foods (d=0.53), Specific diet: carbohydrates (d=0.19), Exercise (d=1.01), Foot care (d=0.94)**	
Cohn, M. A., Pietrucha, M. E., Saslow, L. R., Hult, J. R., & Moskowitz, J. T. (2014)	42 (Intervention = 25, control= 17)	Adults with type 2 diabetes	Randomized controlled trial	Self-paced online DAHLIA intervention course including gratitude exercise (5 weeks)	**Depression (β= −.21, P=0.05)**, Perceived Stress (β= −.13, P=0.31), Daily positive affect (β = −0.09, P=0.46), Daily negative affect (β = −0.15, P=0.32), diabetes self-efficacy (β<	N.A.	Health behaviour (|β| < 0.19, P >0.20)	N.A.

					0.09, P > 0.20), Diabetes distress (β< -0.09, P >0.20)			
Jaser, S. S., Patel, N., Rothman, R. L., Choi, L., & Whittemore, R. (2014)	39 (Intervention = 20, control= 19)	Adolescents (13–17 years) with type 1 diabetes & their caregivers	Randomized controlled trial	Gratitude, self-affirmation, small gifts, and parental affirmations (8 weeks)	Diabetes quality of life (P= 0.336),	Glycaemic control (P= 0.472), Daily blood glucose monitoring (P= 0.324)	Adherence (P= 0.193)	Diabetes-related family conflict (P= 0.924)

N.A. = Not Applicable

Table 3: Studies with Hope Interventions

Author & Year	**Sample size**	**Sample Characteristics**	**Study Design**	**Intervention**	**Psychological Outcomes**	**Medical Outcomes**	**Behavioural Outcomes**	**Psycho-social Outcomes**
Winarsunu, T., Utami, L. A., Fasikhah, S. S., & Anwar, Z. (2023)	10 (Intervention = 5, control= 5)	Participants (30-50 years) with diabetes mellitus (Malang, Indonesia)	Randomized controlled trial	Hope therapy (12 intervention sessions for 30–45 minutes)	**Internal locus of control (P= 0.008), Hopelessness (P= 0.008)**	N.A.	N.A.	N.A.
Esfahani, N. N., Talakoub, S., Jafari-Mianaei, S., & Mostofizadeh, N. (2021)	46 (Intervention = 23, control= 23)	Adolescents (13–19 years) with type 1 diabetes (Iran)	Randomized controlled trial	Group Hope therapy using Snyder's method (8 sessions)	**Child & teenager self-efficacy (P=0.004)**	**Drug administration (P<0.001),** Glucometry (P=0.800)	**Diabetes management self-efficacy (P= 0.002), Physical activity (P= 0.009), Diet (P=0.001)**	N.A.
Khaledi-Sardashti, F., Ghazavi, Z., Keshani, F., &	38 (Intervention = 19, control = 19)	Patients (30-50 years) with diabetes	Quasi-experimental study	Group Hope therapy (8 sessions)	**Depression (P= 0.001 immediately after, P=**	N.A.	N.A.	N.A.

Smaeilzadeh, M. (2018)		mellitus (Iran)			**0.004 at 1 month)**			
Ilaghi, T., Pouraboli, B., Abazari, F., & Kazemi, M. (2017)	40 (Intervention = 20, control= 20)	Patients with type 2 diabetes (Iran)	Quasi-experimental study	Group Hope therapy (8 sessions)	**Happiness (P < 0.001)**	N.A.	N.A.	N.A.
Ghazavi, Z., Khaledi-Sardashti, F., Kajbaf, M. B., & Esmaielzadeh, M. (2015)	38 (Intervention = 19, control= 19)	Muslim diabetic patients (30-50 years) (Iran)	Quasi-experimental study	Hope therapy (4 weeks)	**Hope (P< 0.001 immediately after, P< 0.001 at 1 month)**	N.A.	N.A.	N.A.

N.A. = Not Applicable

Table 4: Studies with Humor Interventions

Author & Year	**Sample size**	**Sample Characteristics**	**Study Design**	**Intervention**	**Psychological Outcomes**	**Medical Outcomes**	**Behavioural Outcomes**	**Psycho-social Outcomes**
Ahmadi, Z., Bazzazian, S., Tajeri, B., & Rajab, A. (2021)	36 (Intervention = 18, control= 18)	Patients (60-75 years) with type 2 diabetes (Tehran, Iran)	Quasi-experimental study	Laughter therapy	**Self-compassion (P <0.001), Meaningfulness (P<0.001), Hopefulness (P <0.001),**	**Glycaemic Control (P<0.001)**	N.A.	N.A.
Bains, G. S., Berk, L. S., Lohman, E., Daher, N., Petrofsky, J., Schwab, E., & Deshpande, P. (2015)	30 (intervention 1/ humor group = 10 healthy adults, intervention 2/ diabetic group = 10 diabetics, control group= 10 healthy adults)	30 older adults (20 healthy, 10 type 2 diabetics)	Randomized controlled trial	Humor Videos (20 minutes)	**Learning ability improvement (P=.025)** (Humor = 38.5%, Diabetic = 33.4%, Control = 24.0%), Delayed recall improvement (P = .064)	**Cortisol levels** {humor group- (1) post-RAVLT1 (**P = .047**), (2) **post-video (P=.046**), (3) post-RAVLT2 (P=.062);	N.A.	N.A.

					(Humor = 43.6%, Diabetic = 48.1%, Control = 20.3%), Visual recognition (P = 0.321) (Humor = 12.6%, Diabetic = 16.7%, Control = 8.3%)	**Diabetic group- (1) post-RAVLT 1 (P=.047), (2) post-video (P=.025), (3) post-RAVLT 2 (P=.034)** }		
Sim, I. O. (2015)	33 (Intervention = 17, control= 16)	33 children (9-12 years) with atopic dermatitis and type 1 diabetes (Seoul, Korea)	Non-equivalent control group pre- and post-intervention test design	Humor intervention (6 weeks; 60-minute session)	**Resilience (P= 0.005); Positive self-understanding (P=0.005);** Self-confidence (P= 0.127); Self-reliance (P =0.235); **Anxiety (P= 0.020);**	Cortisol (stress hormone) level (P = .589)	**Behavioural problems (P = 0.004)**; **Hyperactivity (P= 0.006)**; Withdrawal (0.294); Aggression (P = 0.677); **Immaturity (P = 0.014)**	Positive family relationship (P= 0.263); **Intimacy (P= 0.037); Resource mobilization (P= 0.005)**

*RAVLT - Rey Auditory Verbal Learning Test
N.A. = Not Applicable

Table 5: Studies with Mindfulness Interventions

Author & Year	**Sample size**	**Sample Characteristics**	**Study Design**	**Intervention**	**Psychological Outcomes**	**Medical Outcomes**	**Behavioural Outcomes**	**Psycho-social Outcomes**
van Son, J., Nyklíček, I., Pop, V. J., et. al (2013)	139 (Intervention = 70, control = 69)	Adult outpatients with diabetes (type 1 or 2)	Randomized Controlled Trial	Mindfulness-Based Cognitive Therapy (MBCT)	**Stress (P<0.001, d=0.70), Depression (P < 0.01, d**	Glycaemic control (P= 0.35, d= 0.14)	**Physical quality of life (P= 0.032, d= 0.40)**	N.A.

		and low levels of emotional well-being		program (8 weeks)	**= 0.59, 0.71), Anxiety (P< 0.02, d=0.44, 0.82), Mental quality of life (P = 0.003, d = 0.55),** Diabetes distress (P= 0.49, d=0.21)**, Fatigue (P=0.01, d = 0.58)**			
Rosenzweig, S., Reibel, D. K., Greeson, J. M., et. al (2007)	11	Adult patients (30-75 years) with type 2 diabetes	Prospective observational study	Mindfulness-Based Stress Reduction (MBSR) group intervention (8 weeks)	**Depression (P=0.03, d=0.86**), **Anxiety** (P=0.33, **d=0.43), General severity index (P=0.07, d=0.60**)	**Glycaemic control (d= 0.46, 0.88)** (P=0.14, **0.03),** Weight (d= 0.04, 0.09), **Arterial pressure (d= 0.27, 0.48) (P=** 0.07**, 0.009)**	NA	N.A.
Gregg, J. A., Callaghan, G. M., Hayes, S. C., & Glenn-Lawson, J. L. (2007)	81 (Intervention = 43, control= 38)	Type 2 diabetics from low-income community health center (San Francisco)	Randomized Controlled Trial	Education + mindfulness and acceptance training (1 day)	**Acceptance, Mindfulness, and Values (d=0.78), Treatment Satisfaction (P= 0.68)**	**Diabetic Control (d=0.61), Glycaemic Control (d=0.35)**	**Self-management (d=0.68), Understanding of Diabetes (d=0.30)**	N.A.

N.A. = Not Applicable

Study Characteristics

The present review by the authors encompassed a total of 15 studies that conformed to the specified inclusion criteria. These studies were categorized into distinct intervention types, namely, gratitude-based interventions (comprising 4 studies), hope-based interventions (comprising 5 studies), humor-based interventions (comprising 3 studies), and mindfulness-based interventions (comprising 3 studies). The aggregate sample size across all identified studies amounted to 672 participants, with a demographic breakdown revealing 495 adults, 144 adolescents, and 33 children among the study populations. Further delineation of the participant distribution within the intervention categories demonstrated the following figures: 153 individuals in the gratitude-based interventions, 171 individuals in the hope-based interventions, 117 individuals in the humor-based interventions, and 231 individuals in the mindfulness-based interventions.

The outcomes of the studies are given in the Tables (6,7,8,9):

Table 6: ***Psychological outcomes***

Outcome	Significant*	Non- Significant**	Total no. of studies^
1. Depression	5	1	6
2. Anxiety	4	0	4
3. Stress	1	2	3
4. Diabetes distress	1	2	3
5. Gratitude	1	1	2
6. Hope	2	0	2
7. Hopelessness	1	0	1
8. Happiness	2	0	2
9. Positive affect	1	1	2
10. Negative affect	0	1	1
11. Optimism	1	0	1
12. Resilience	1	0	1
13. Positive self-understanding	1	0	1
14. Internal locus of control	1	0	1
15. Self- compassion	1	0	1
16. Meaningfulness	1	0	1
17. Learning ability improvement	1	0	1
18. Delayed recall improvement	0	1	1
19. Visual recognition	0	1	1
20. Self-confidence	0	1	1
21. Self-reliance	0	1	1
22. Mental quality of life	1	0	1
23. Fatigue	1	0	1
24. General severity index	1	0	1
25. Acceptance, mindfulness & values	1	0	1

26. Treatment satisfaction	1	0	1

Table 7: ***Medical outcomes***

Outcome	Significant*	Non- Significant**	Total no. of studies^
1. Glycaemic control	5	2	7
2. Glucose monitoring	2	2	4
3. Quality of Life (Physical, Diabetic)	2	3	5
4. Cortisol levels (Stress hormone)	1	1	2
5. Arterial pressure	1	0	1
6. Drug administration	1	0	1
7. Weight	0	1	1

Table 8: ***Behavioural outcomes***

Outcome	Significant*	Non- Significant**	Total no. of studies^
1. Diabetic Self-efficacy	1	1	2
2. Diabetic Self-care	1	1	2
3. Adherence	1	1	2
4. Diet	2	0	2
5. Exercise/Physical activity	2	0	2
6. Self-management	1	0	1
7. Health behaviour	0	1	1
8. Diabetes management self-efficacy	1	0	1
9. Behavioural problems	1	0	1
10. Hyperactivity	1	0	1
11. Withdrawl	0	1	1
12. Aggression	0	1	1
13. Immaturity	1	0	1
14. Understanding of diabetes	1	0	1

Table 9: ***Psycho-social outcomes***

Outcome	Significant*	Non- Significant**	Total no. of studies^
1. Positive family relationship	0	1	1
2. Diabetes-related Family conflict	0	1	1
3. Intimacy	1	0	1
4. Resource mobilization	1	0	1

* The number of studies in which outcome was significant.

** The number of studies in which outcome was non-significant.

^ The total number of studies in which outcome was assessed.

DISCUSSION

The review yielded 15 studies delineating interventions based on Gratitude, Hope, Humor and Mindfulness for managing distress in diabetic patients and improving mental health. The studies put forward an array of *psychological, medical, behavioural and psycho-social outcomes* assessed for improvement after interventions. Amongst the *psychological outcomes*, depression, anxiety and stress were common which were seen to decrease significantly after interventions. 5 out of 6 studies (which assessed the outcome) indicated significant improvement in depression, while all 4 studies assessing anxiety as an outcome showed its significant reduction post-intervention. 3 studies assessed stress, while 3 studies evaluated diabetes distress specifically. Out of these 6 studies, significant improvement in stress and diabetes distress was seen in 1 study each while in others the improvement was not significant. Gratitude was enhanced significantly in 1 out of 2 studies and insignificantly in other study. Hope was significantly inculcated through intervention in 2 out of 2 studies, while another study depicted significant reduction in hopelessness. One study showed significant enhancement in Acceptance, mindfulness & values after intervention. Other psychological outcomes with significant improvements include Happiness, Optimism, Positive affect, Internal locus of control, Self-compassion, Meaningfulness, Resilience, Positive self-understanding, Mental quality of life, Fatigue, General severity index. Learning ability improvement was also found post-humor-intervention, evidencing capability of intervention in enhancing cognitive abilities in diabetics. Improvements in some of the psychological outcomes, such as Negative affect, Self-confidence, Self-reliance, Delayed recall improvement, and Visual recognition, was not found to be significant. This evidenced the role of positive psychological interventions towards improvements but calls for further researches to establish such relationships.

Glycaemic control (HbA1c) was the most assessed amongst the *medical outcomes*, and it was significantly improved post-intervention in 5 out of 7 studies, while in other two the improvement was not significant. Glycaemic control is one of the most important medical aspect which needs to be controlled in diabetics. The review suggests effectiveness of hope, humor and mindfulness based interventions in improving glycaemic control. Consequently, glucose monitoring is next to glycaemic control in importance. Diabetics need to appropriately space the intervals of glucose measurement. The improvement in glucose monitoring was significant in 2 out of 4 studies and insignificant in another 2 studies. Next, the Quality of life (Physical & Diabetic) was enhanced significantly in 2 out of 5 studies, whereas the improvement was not significant in other 3 studies. Other medical outcomes with significant improvements include cortisol levels (stress hormone), drug administration and Arterial pressure. Weight was also assessed as an outcome in 1 study but the change was insignificant.

Numerous *behavioural outcomes* were analyzed in the studies. Adherence to medicines and diabetes-care regimen is pre-requisite for diabetics. Adherence was found to improve significantly in 1 out of 2 studies, while insignificantly in the other. Diet and exercise are considered indispensable part of diabetes-care regimen. Review studies suggest that diet and exercise were significantly improved in diabetics after gratitude and hope based interventions in 2 out of 2 studies. Diabetic Self-efficacy and Diabetic Self-care were also enhanced significantly in 1 out of two studies each and insignificantly in the other. Other behavioural outcomes that were found to improve significantly, in one study each, include Self-management, Diabetes management self-efficacy, Behavioural problems (Hyperactivity and Immaturity) and understanding of diabetes. Some other behavioural outcomes improved non-significantly, which include Health behaviour, Aggression and Withdrawl. 2 out of 15 studies gives account of *psycho-social outcomes*. Intimacy and resource mobilization were enhanced significantly in one (out of one) study where they were assessed. Whereas, improvements in Diabetes-related Family conflict and Positive family relationship were not found to be significant (1/1 study each).

The review has several *limitations* related to the study evidences and review process. Flexibility is maintained in study statistics to be included in the review. Post-intervention assessment intervals/follow-up ranged from immediately after intervention to 6 months after intervention. In case of two or more interventions in a single study, intervention related to review is presented only. The studies/articles only in English language are considered. Studies in other databases and those without full-text are not included. Further, limitations of individual studies impact the general conclusions about effectiveness of interventions.

Despite the limitations, the review provided a comprehensive framework of psychological interventions on selected mental health promoting factors, with a wide range of outcomes in different population sample in different parts of world. The review successfully suggests the effectiveness of interventions in diabetics to alleviate distress and enhance overall health and well-being. It points to the need for development of specific diabetes-tailored interventions with the help of further researches for increased effectiveness of these interventions. Such interventions will benefit health practitioners, healthcare organizations and social workers to take better care of people's health. The policy makers may get support towards elaborating and enhancing the healthcare system by developing interdisciplinary modules for treatment.

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CONFLICT OF INTEREST

There are no conflicts of interest amongst the authors and others to report.

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