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Social network interventions for dietary adherence among adults with type 2 diabetes: a systematic review and meta-analysis protocol

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ABSTRACT

Introduction Optimal adherence to recommended diets is crucial to achieving long-term glycaemic control among individuals with type 2 diabetes (T2D) individuals. However, there is limited evidence on the effectiveness of interventions that target dietary adherence through social networks. Since social networks can influence individuals' health behaviours, it is important to thoroughly evaluate the impact of social network interventions on dietary adherence in adults with T2D. This systematic review protocol aimed to provide insights into future interventions and improve diabetes management strategies.

Method and analysis PubMed, Embase, CINAHL Complete, Cochrane Central Register of Controlled Trials, ProQuest Dissertations and Theses and Google Scholar will be searched from inception to December 2023 for relevant randomised and non-randomised controlled trials of at least 3 months' duration. In addition, studies that compared interventions involving the social networks (families, friends and peers) of adults with T2D with usual care, no intervention or an intervention with no explicit social network component will be included. Two reviewers will independently screen search outputs according to inclusion and exclusion criteria, critically evaluate the selected literature and extract data on the study setting, design, participants' characteristics, interventions, controls, social network functions and duration of follow-up, using a standard data extraction form. Quantitative data analysis will be performed where studies are homogeneous in characteristics and provide adequate outcome data for meta-analysis. Otherwise, data will be synthesised using narrative synthesis. Finally, trials will be assessed for bias risk and overall evidence certainty using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) system.

Ethics and dissemination Ethical approval is not required for literature-based studies. The results will be disseminated through peer-reviewed publications.

PROSPERO registration number CRD42023441223.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ This review will provide the most comprehensive systematic review of the effectiveness of social network interventions on dietary adherence to date among adults with type 2 diabetes.
⇒ We will use the rigorous methodology in accordance with the Cochrane Handbook and the results will be reported as stated by Preferred Reporting Items for Systematic Reviews and Meta-Analyses statement.
⇒ Studies conducted in languages other than English, including French and Spanish, will be included if available, which may limit language bias.
⇒ High-quality intervention studies may not be widely available, which may limit the contribution of the review to policy and practice.

INTRODUCTION

Type 2 diabetes (T2D) presents a significant challenge to public health, burdening individuals, communities, healthcare systems and societies worldwide.[1–4] Despite medical treatments, poor dietary intake remains critical to unfavourable outcomes for patients with T2D, affecting sustained glycaemic control and long-term health outcomes.[5–7] A healthy diet is crucial for adults with T2D as it contributes to optimal weight control, body mass index (BMI) and haemoglobin A1c (HbA1c), which indicate long-term glycaemic conditions.[8–10]

Although adherence to dietary recommendations plays a crucial role in sustained dietary control and long-term diabetes outcomes, dietary adherence among patients with T2D is disconcertingly low, with only 25% of patients with T2D following their recommended dietary plans.[11 12] Factors such as competing demands, emotional distress, low self-commitment, low self-efficacy and insufficient social support contribute to this challenge.[13 14] Therefore, achieving a healthy diet and maintaining a sustainable lifestyle necessitate significant resources and individual commitment. In addition, social support is crucial in helping individuals manage the self-management workload associated with these efforts.[15 16] In this context,

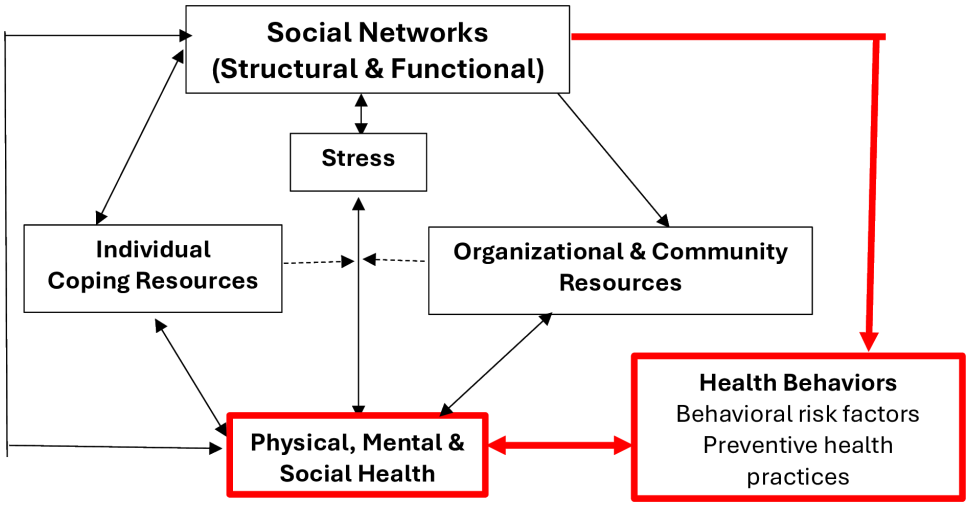

Figure 1 Conceptual framework for the relationship of social networks to health.[22 25]

social networks have emerged as an opportunity for innovative interventions to catalyse and sustain behavioural changes in individuals with T2D.[17]

Social networks encompass the intricate web of social relationships surrounding individuals, connecting them with family, friends, coworkers and neighbours. For patients with T2D, these networks are critical for social, psychological and behavioural support.[17 18] According to Koetsenruijter *et al*,[19] having a comprehensive informational and emotional support network can significantly enhance their self-management abilities. Social networks often provide functional and structural support that aids decision-making and strengthens mental and physical resilience, enabling individuals to better cope with diabetes lifelong challenges.[20–23] When it comes to making behavioural changes, social networks serve as a source of encouragement, reducing the likelihood of relapse and maintaining healthy lifestyles.[23 24]

Previous studies have explored the connection between social networks and health, suggesting two main hypotheses (figure 1): the stress-buffering or stress-exacerbating hypothesis and the social contagion or behavioural hypothesis.[22 25 26] Among patients with T2D, social network interventions have proven effective in promoting immediate self-management behaviours.[17 23 27–30] In a meta-analysis of 19 randomised controlled trials (RCTs) conducted by Spencer-Bonilla *et al*,[30] social networks were linked to enhanced social support and lower levels of HbA1c after 3 months. Additionally, other studies have shown that social support positively increases self-efficacy for diabetes management, such as maintaining healthy diets and regular physical exercise.[31–33] Finally, patients with T2D with supportive families are more likely to adhere to dietary recommendations[27 28 34] and have greater self-efficacy, leading to improved adherence to diet recommendations.[29]

Unfortunately, previous systematic reviews and meta-analyses focused on glycaemic control but did not thoroughly investigate the effectiveness of social network interventions for dietary adherence despite its social nature and importance in maintaining glycaemic control.[17 30 35 36] There is also a need to explore the impact of different network intervention approaches, which these reviews have not covered. Additionally, while increasing evidence supports the role of non-healthcare professionals such as peers in diabetes management and education,[37] these reviews did not explore the impact of informal and interpersonal relationships on diabetes care. To address these gaps, this review aims to assess the effectiveness of social network interventions, such as engaging families, friends and peers, in improving dietary adherence among patients with T2D. We will include randomised trials (RCTs), non-randomised trials (NRTs) and controlled before-and-after (CBAs) studies that compared a social network intervention against the following comparators: usual care, no intervention or an intervention with no explicit social network component. We will also examine whether different network interventions approaches—individual, segmentation, induction or alteration—vary in their effectiveness.[38] As a result, this review will provide a better understanding of how network interventions can improve health behaviours and outcomes among patients with T2D.

METHODS AND ANALYSIS

Our review will follow the guidelines outlined in the Cochrane Handbook while adhering to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Checklist, which is provided as an additional file (see online supplemental file S1).[39] In addition, this protocol was registered in the International Prospective Register of Systematic Reviews (PROSPERO; CRD42023441223).

Criteria for considering studies for this review

Types of studies

Studies that used experimental and quasi-experimental study designs, including RCTs and non-rNRTs, will be selected for the systematic review. In the absence of RCTs

and NRTs, we will consider CBA studies. We will exclude observational studies, reviews, cross-sectional studies, qualitative studies, conference proceedings, studies with incomplete data and authors who cannot be contacted.

Participants

The study population will be adults aged ≥18 years, with a diagnosis of T2D, as defined by the WHO (HbA1c ≥6.5% or fasting blood glucose ≥1.26 g/L or an oral glucose tolerance test (OGTT) 2-hour blood glucose ≥2 g/L or a random plasma glucose test ≥2 g/L),[40] or American Diabetes Association (ADA) (fasting blood glucose ≥7.0 mmol/L (whole blood ≥6.1 mmol/L) or an OGTT 2-hour blood glucose ≥11.1 mmol/L or a random plasma glucose test ≥11.1 mmol/L).[41] We will exclude studies of individuals with pre-diabetes, and metabolic syndrome without a definitive diagnosis of T2D, type 1 diabetes and gestational diabetes.

Interventions

The intervention must include a social network component. 'Social network components' (or parts of interventions) that engage participants' social networks to facilitate diet and behaviour change. This could include advising, arranging or providing social support through the participant's existing social network (like partners, family and friends) or creating new social networks (like other intervention participants or peer mentors). The social network support interventions can be direct, that is, directly involving networks (eg, partners attending classes) or indirect (eg, participants are told to enlist relatives' support for healthy eating). Diet, or diet and physical activity components, must be a part of the intervention, and diet change or dietary adherence must be one of the outcomes. Interventions may be individualised or group based.

The intervention must be conducted for at least 3 months. Since the long-term diabetes biomarker, HbA1c is only sensitive over 2–3 months.[42] Studies with intervention less than a 12-week follow-up period will be excluded. Also, studies involving support solely from staff or health professionals or looking at group-based interventions without explicit mention of social support or social networks will be excluded. Finally, studies with pharmacological and medical interventions devoid of diet modification as a critical component will be excluded.

Comparators

Comparators will include no intervention, standard management for T2D or other interventions with no explicit social network component.

Outcome measures

This review will consider studies that include the following primary outcomes: (1) documented and evaluated dietary changes, including adherence to dietary recommendations or prescribed diet plans. Dietary adherence can reflect selective and predefine diets, for example, Mediterranean or vegetarian diets, or focused on single calorific attributes (such as foods or food groups—carbohydrates, fruit, vegetables, fibre, sugar-free, oils or fats).[43–45] (2) Glycaemic control is assessed using haemoglobin A1c (HbA1c), fasting blood glucose or random plasma glucose test.

Secondary outcomes will include (1) physical measures (body mass index (BMI, kg/m^2), weight (kg), blood pressure (systolic and diastolic (mm Hg)); (2) diet and diabetes knowledge; (3) symptoms, for example, reduction in polyuria, polydipsia, fatigue; (4) diabetic complications, for example, cardiovascular events, retinopathy, diabetic foot, nephropathy, neuropathy, hypoglycaemia and hyperglycaemia; (5) psychological effects including quality of life; and (6) metabolic outcomes (lipids—total cholesterol (mmol/L), High-density Lipoprotein (HDL) cholesterol (mmol/L), Low-density Lipoprotein (LDL) cholesterol (mmol/L), triglycerides (mmol/L)).

Search methods for identification of studies

Electronic searches

We will search the following databases from inception to December 2023. The Cochrane Library—Central Register of Controlled Trials (CENTRAL) and Cochrane Database of Systematic Reviews; PUBMED, EMBASE, EPOC (Effective Practice and Organization of Care), LILACS, Open Grey, ProQuest Dissertations and Theses, and Google Scholar. We will also check the reference lists of retrieved studies for additional reports of relevant studies. There will be no language restrictions. We will use the PRISMA-P (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guideline and flow diagram to report the search and selection of studies.[46]

Search strategy

Our search strategy aims to identify published and unpublished studies and will consist of three steps. First, working with a librarian, an initial limited search using PubMed will be undertaken, followed by an analysis of the text in the title and abstract and the index terms used to describe the articles. Search terms will be classified into four categories: (1) T2D, (2) social network intervention(s), (3) diet change or adherence, and (4) study design. Then, with the strategy developed using PubMed, a second search will be conducted using all identified keywords and index terms across all included databases. The specific terms and concepts that will be searched are shown in box 1. Examples of the search strategy for all databases were also provided in online supplemental file S2 table.

Study selection

After the search, all identified records will be retrieved and uploaded to Covidence, and duplicate references and abstracts will be deleted. Two reviewers will independently screen titles and abstracts to assess the inclusion criteria for the review. Potentially relevant studies will be retrieved for full-text review and will undergo critical approval using the checklist of eligibility

Box 1 PubMed search strategy

('social support'[mesh] OR 'social support'[tiab] OR ((social[tiab] OR famil*[tiab] OR parent*[tiab] OR OR peer[tiab] OR spous*[tiab] OR neighbor*[tiab] OR friend*[tiab] OR child*[tiab] OR coworker*[tiab] OR co-worker*[tiab] OR colleague*[tiab]) AND (support*[tiab] OR network*[-tiab] OR encourage*[tiab])))
AND
('Diet, Food, and Nutrition'[Mesh] OR diet*[tiab] OR nutrition*[tiab] OR alimentary[tiab] OR meal*[tiab] OR food*[tiab] OR eating[tiab])
AND
('Diabetes Mellitus, Type 2'[mesh] OR diabet*[tiab])
AND
(control*[tiab] OR cohort[tiab] OR "interrupted time-series"[tiab])

characteristics (participants, intervention, comparators, outcomes and study design (PICOS) (table 1). Full-text articles that meet the inclusion criteria will undergo a full-text review. For excluded studies, reasons for exclusion will be provided in an appendix to the final systematic review report. Search results will be fully reported in the final review and presented in the PRISMA flow chart.[46] Any reviewers' disagreements regarding study eligibility will be resolved through discussion with a third reviewer.

Data extraction

Two reviewers will independently extract data from each eligible study using the Cochrane Collaboration's standard data extraction form.[47] We will resolve differences through discussion and consensus among all reviewers. We will extract data on the study setting, design, participants' characteristics, interventions, controls and follow-up duration. We will also extract data on sample size, age and social network functions. Whenever possible, we will retrieve qualitative information on the context and potential confounding factors that can explain contradictory outcome results. As indicated earlier, we will collect data on the primary (diet changes or dietary adherence and glycaemic control) and secondary outcomes (physical measures, blood pressure, diet and diabetes knowledge, symptoms, diabetic complications and metabolic outcomes). Where necessary, we will contact the authors of the included studies for additional information or missing data. This review will not require Internal Review Board approval as no human subjects will be directly involved.

The umbrella term 'Social Network Functions' will be used to describe the core elements of the intervention approaches, including the network intervention strategy used, the underlying theoretical mechanisms, the definition of the social network, network recruitment methods (if applicable), training methods and any details about the structure and characteristics of the social network, or changes in the social network described using network parameters.

Assessment of risk of bias in included studies

Two review authors will independently assess the risk of bias of each included study, using a 'Risk of bias' form. We will attempt to contact the study authors if the necessary information is not specified or is unclear. We will resolve any disagreements by discussion between review authors. For RCTs or quasi-RCTs, we will use the Cochrane Risk of Bias tool for RCTs.[48] For NRTs and controlled before-after studies (CBAs), we will use the Cochrane Risk Of Bias In Non-randomised Studies–of Interventions (ROBINS-I).[49]

We will assess whether the study authors have employed methods to control selection bias at the design stage (eg, matching or restriction to subgroups) and their analysis methods (eg, stratification or regression modelling). For studies with a separate control group (RCTs, NRTs, controlled before-after studies), we will assess eight components: generation of the randomisation sequence; allocation concealment; blinding (performance and detection bias); baseline outcome measurement; similarity in baseline characteristics; incomplete outcome data; selective outcome reporting; and other biases. Judgements of 'yes', 'no' and 'unclear' will indicate a low, high or unclear risk of bias. We will present the assessment results in a 'Risk of bias' graph, Risk of bias tables and a summary. Finally, the risk of bias in systematic reviews will be assessed using the ROBIS tool.[50]

Data synthesis and analysis

We will perform quantitative data synthesis where studies are homogeneous in social network characteristics (family, friends or peer) and study design (RCTs, NRTs and CBAS) and provide adequate outcome data for meta-analysis. Review Manager (V.5.4) will be used to perform fixed or random effect model meta-analysis.[51] Intervention effects will be presented as ORs (for categorical outcomes) or mean differences (for continuous outcomes) with 95% CIs.

Assessment of heterogeneity

Heterogeneity will be assessed using Cochran's Q test and quantified with the I^2 statistics. A p value <0.1 will be considered to suggest statically significant heterogeneity, considering a category of a small number of studies and their heterogeneity in design.[52] Heterogeneity will take low, moderate and high categories when the I^2 values are below 25%, between 25% and 75%, and above 75%, respectively.[53–55]

We will examine sources of heterogeneity using subgroup analysis. If sufficient data are available, subgroup analyses will be performed for interventions involving different social network members such family members, friends or peers of patients, or intervention approach such individual, segmentation, induction, alteration or intervention length (≤3, 3–6, 6–12, >12 months) or type of control group (usual care, no intervention or intervention with no explicit social network component).[56 57]

Table 1 Eligibility screening form

Study characteristics	Yes	No	Unclear
1. Study design			
(A) Randomised controlled trial			
(B) Non-randomised comparative trial			
(C) Observational studies			
2. Study participants			
(A) Adults ≥18 years? (and/or)			
(B) Diagnosis of T2D based on WHO criteria			
(C) Diagnosis of T2D based on ADA criteria			
3. Intervention			
(A) Intervention involving social networks duration ≥3 months			
(B) Did the intervention include?			
family (spouses, children, parents, etc)			
laypersons (friends, coworkers, neighbours)			
peers (with type 2 diabetes)			
4. Control			
(A) No intervention			
(B) Usual treatment and care			
(C) Intervention without social networks			
5. Outcome measures*			
(A) Were any of the following outcomes reported?			
Diet changes or dietary adherence.			
Glycaemic control (HbA1c, fasting blood glucose, OGTT or a random plasma glucose test)			
Physical measures (BMI and blood pressure),			
Diet and diabetes knowledge.			
Symptoms (reduction in polyuria, polydipsia, fatigue)			
Diabetic complications (cardiovascular disease (CVD), retinopathy, diabetic foot, nephropathy, neuropathy and hyperglycaemia)			
Psychological and adverse effects (quality of life)			
Metabolic outcomes (lipids)			
6. Decision			
(A) Include?			
(B) Exclude?			
(C) UNCLEAR?			
7. Comments/reasons for exclusion			

(A) Include if all is 'YES'. (B) Exclude if 2A, 2B, 3A, 3B, 5A are 'NO'. (C) Otherwise 'UNCLEAR'.
*Note that the absence of outcome measure is not an exclusion criterion at this stage of eligibility screening; simply indicate outcomes assessed in each included study.
ADA, American Diabetes Association; BMI, body mass index; HbA1c, haemoglobin A1c; OGTT, oral glucose tolerance test; T2D, type 2 diabetes.

Narrative synthesis

If meta-analysis is not possible due to insufficient numbers of studies for accuracy, we will conduct a narrative synthesis using the framework developed by the Economic and Social Research Council.[57] This approach includes four stages: (1) developing a theory of how the interventions work, (2) conducting a preliminary synthesis of included studies, (3) exploring the relationships in the data and (4) assessing the robustness of the synthesis. We will also use text and tables to summarise and group findings by population characteristics (eg, region), intervention approach (eg, individual vs segmentation), intervention characteristics (eg, duration of intervention) and outcome measures (eg, diet changes, dietary adherence, glycaemic control).

Publication bias assessment

Publication bias will be assessed by visual inspection of funnel plots based on the shape of the graph (subjective assessment). The symmetrical graph will be interpreted to suggest an absence of publication bias, whereas an asymmetrical one indicates the presence of publication bias.

On the other hand, qualitatively (objective evaluation), Egger's weighted regression tests will be used to assess publication bias, and a p value <0.1 considered indicative of a statistically significant publication bias.[58]

Sensitivity analysis

A sensitivity analysis will be done to estimate whether the pooled effect size was affected by single studies. A leave-one-out sensitivity analysis will be performed by removing studies with a 'high risk of bias' and by removing outliers contributing to statistical heterogeneity. We will also assess evidence of publication bias.

Assessment of quality of evidence

The Grading of Recommendations Assessment, Development and Evaluation (GRADE) method for assessing confidence in the quality of the evidence will be used for this review, and the results will be displayed in the Summary of Findings created using GRADEpro (McMaster University, ON, Canada).[59] The Summary of Findings will present the following information, where appropriate: absolute risks for the treatment and control, estimates of relative risk, and a ranking of the quality of the evidence based on the risk of bias, directness, heterogeneity, precision and risk of publication bias of the review results.

DISCUSSION

This review will highlight the extent to which interventions involving social networks that have a significant effect on health behaviours and outcomes can improve dietary adherence among patients with T2D. Increasing understanding of the structure, characteristics and functions of social networks and their impact on health behaviours will provide structured evaluation and information on effective interventions to improve dietary adherence.[17] Where data permits, this review will summarise how to effectively apply social network intervention approaches to increase dietary adherence. As a result, this review will strengthen the knowledge base on dietary adherence, a topic of critical importance for patients, dietitians and other healthcare professionals. The findings of this review will also provide directions for future research and provide practitioners with a better understanding of social networks. Since dietary adherence is considered a mediating factor in long-term diabetes management, results from this proposed study will be useful for developing interventions that leverage individuals' social networks for long-term benefits, potentially preventing further T2D complications.

Patient and public involvement

Since this study is a secondary study based on other studies, there will be no direct patient or public involvement in this study.

ETHICS AND DISSEMINATION

Because no patients were involved, ethical approval was not required. The final results of this research will be submitted to a peer-reviewed journal or presented at relevant conferences, and any deviations from this protocol will be recorded and explained in the final report.

Contributors The original idea was conceived by HA. HA and AO drafted the manuscript for this protocol. HA, AO, SY, JDM and JE participated in the design of the study and the setting of the inclusion and exclusion criteria. AO and SY will perform the literature screening and data extraction. WAH and JE will review and provide critical input to all drafts of the review, including the final version. HA is the guarantor.

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Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting or dissemination plans of this research.

Patient consent for publication Not applicable.

Provenance and peer review Not commissioned; externally peer reviewed.

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REFERENCES

1 Singer ME, Dorrance KA, Oxenreiter MM, *et al*. The type 2 diabetes "modern preventable pandemic" and replicable lessons from the COVID-19 crisis. *Prev Med Rep* 2022;25:101636.
2 International Diabetes Federation. IDF diabetes atlas 9th edition 2019. Diabetesatlas; 2019. Available: https://www.diabetesatlas.org
3 Saeedi P, Petersohn I, Salpea P, *et al*. Global and regional diabetes prevalence estimates for 2019 and projections for 2030 and 2045: Results from the International Diabetes Federation Diabetes Atlas, 9th edition. *Diabetes Res Clin Pract* 2019;157:107843.
4 Khan MAB, Hashim MJ, King JK, *et al*. Epidemiology of Type 2 Diabetes - Global Burden of Disease and Forecasted Trends. *J Epidemiol Glob Health* 2020;10:107–11.
5 D'Souza MS, Karkada SN, Parahoo K, *et al*. Self-efficacy and self-care behaviours among adults with type 2 diabetes. *Appl Nurs Res* 2017;36:25–32.
6 Raj GD, Hashemi Z, Soria Contreras DC, *et al*. Adherence to Diabetes Dietary Guidelines Assessed Using a Validated Questionnaire Predicts Glucose Control in Adults With Type 2 Diabetes. *Can J Diabetes* 2018;42:78–87.
7 Al-Salmi N, Cook P, D'Souza MS. Diet Adherence among Adults with Type 2 Diabetes Mellitus: A Concept Analysis. *Oman Med J* 2022;37:e361.
8 Asaad G, Soria-Contreras DC, Bell RC, *et al*. Effectiveness of a Lifestyle Intervention in Patients with Type 2 Diabetes: The Physical Activity and Nutrition for Diabetes in Alberta (PANDA) Trial. *Healthcare (Basel)* 2016;4:73.
9 Milenkovic T, Bozhinovska N, Macut D, *et al*. Mediterranean Diet and Type 2 Diabetes Mellitus: A Perpetual Inspiration for the Scientific World. A Review. *Nutrients* 2021;13:1307.

10 Antoniotti V, Spadaccini D, Ricotti R, *et al*. Adherence to the Mediterranean Diet Is Associated with Better Metabolic Features in Youths with Type 1 Diabetes. *Nutrients* 2022;14:596.
11 Dansinger ML, Gleason JA, Griffith JL, *et al*. Comparison of the Atkins, Ornish, Weight Watchers, and Zone diets for weight loss and heart disease risk reduction: a randomized trial. *JAMA* 2005;293:43–53.
12 Desroches S, Lapointe A, Ratté S, *et al*. Interventions to enhance adherence to dietary advice for preventing and managing chronic diseases in adults. *Cochrane Database Syst Rev* 2013;CD008722.
13 Tong WT, Vethakkan SR, Ng CJ. Why do some people with type 2 diabetes who are using insulin have poor glycaemic control? A qualitative study. *BMJ Open* 2015;5:e006407.
14 Miller TA, Dimatteo MR. Importance of family/social support and impact on adherence to diabetic therapy. *Diabetes Metab Syndr Obes* 2013;6:421–6.
15 Shippee ND, Shah ND, May CR, *et al*. Cumulative complexity: a functional, patient-centered model of patient complexity can improve research and practice. *J Clin Epidemiol* 2012;65:1041–51.
16 Eton DT, Yost KJ, Lai J-S, *et al*. Development and validation of the Patient Experience with Treatment and Self-management (PETS): a patient-reported measure of treatment burden. *Qual Life Res* 2017;26:489–503.
17 Hunter RF, de la Haye K, Murray JM, *et al*. Social network interventions for health behaviours and outcomes: A systematic review and meta-analysis. *PLoS Med* 2019;16:e1002890.
18 Kelly ME, Duff H, Kelly S, *et al*. The impact of social activities, social networks, social support and social relationships on the cognitive functioning of healthy older adults: a systematic review. *Syst Rev* 2017;6:259.
19 Koetsenruijter J, van Eikelenboom N, van Lieshout J, *et al*. Social support and self-management capabilities in diabetes patients: An international observational study. *Pat Educ Couns* 2016;99:638–43.
20 Ozbay F, Johnson DC, Dimoulas E, *et al*. Social support and resilience to stress: from neurobiology to clinical practice. *Psychiatry (Edgmont)* 2007;4:35–40.
21 Ashida S, Heaney CA. Differential associations of social support and social connectedness with structural features of social networks and the health status of older adults. *J Aging Health* 2008;20:872–93.
22 Glanz K, Rimer BK, Viswanath K. *Health Behavior and Health Education: Theory, Research, and Practice*. 4th Ed. Jossey-Bass, 2008.
23 Schram MT, Assendelft WJJ, van Tilburg TG, *et al*. Social networks and type 2 diabetes: a narrative review. *Diabetologia* 2021;64:1905–16.
24 Ida S, Murata K. Social Isolation of Older Adults With Diabetes. *Gerontol Geriatr Med* 2022;8:23337214221116232.
25 Cohen S. Social relationships and health. *Am Psychol* 2004;59:676–84.
26 Berkman LF, Kawachi I, Glymour MM. *Social Epidemiology*. Oxford University Press, 2014.
27 Albanese AM, Huffman JC, Celano CM, *et al*. The role of spousal support for dietary adherence among type 2 diabetes patients: a narrative review. *Soc Work Health Care* 2019;58:304–23.
28 Ranjbaran S, Shojaeizadeh D, Dehdari T, *et al*. The effectiveness of an intervention designed based on health action process approach on diet and medication adherence among patients with type 2 diabetes: a randomized controlled trial. *Diabetol Metab Syndr* 2022;14:3.
29 Shao Y, Liang L, Shi L, *et al*. The Effect of Social Support on Glycemic Control in Patients with Type 2 Diabetes Mellitus: The Mediating Roles of Self-Efficacy and Adherence. *J Diabetes Res* 2017;2017:2804178.
30 Spencer-Bonilla G, Ponce OJ, Rodriguez-Gutierrez R, *et al*. A systematic review and meta-analysis of trials of social network interventions in type 2 diabetes. *BMJ Open* 2017;7:e016506.
31 Koetsenruijter J, van Lieshout J, Lionis C, *et al*. Social Support and Health in Diabetes Patients: An Observational Study in Six European Countries in an Era of Austerity. *PLoS ONE* 2015;10:e0135079.
32 Park H, Kim MT. Impact of social role strain, depression, social support and age on diabetes self-efficacy in Korean women with type 2 diabetes. *J Cardiovasc Nurs* 2012;27:76–83.
33 Maeda U, Shen B-J, Schwarz ER, *et al*. Self-efficacy mediates the associations of social support and depression with treatment adherence in heart failure patients. *Int J Behav Med* 2013;20:88–96.
34 DiMatteo MR. Social support and patient adherence to medical treatment: a meta-analysis. *Health Psychol* 2004;23:207–18.
35 van Dam HA, van der Horst FG, Knoops L, *et al*. Social support in diabetes: a systematic review of controlled intervention studies. *Patient Educ Couns* 2005;59:1–12.
36 Stopford R, Winkley K, Ismail K. Social support and glycemic control in type 2 diabetes: a systematic review of observational studies. *Pat Educ Couns* 2013;93:549–58.
37 Valente TW. *Social Networks and Health*. New York: Oxford University Press, 2010.
38 Valente TW. Network interventions. *Science* 2012;337:49–53.
39 Cochrane Collaboration. *Cochrane Handbook for Systematic Reviews of Interventions*. 2021.
40 Fleming S. Type 2 diabetes: diagnosis and management. American Medical Publishers; 2021.
41 American Diabetes Association Professional Practice Committee. 2. Classification and Diagnosis of Diabetes: *Standards of Medical Care in Diabetes—2022*. *Diabetes Care* 2022;45:S17–38.
42 Sherwani SI, Khan HA, Ekhzaimy A, *et al*. Significance of HbA1c Test in Diagnosis and Prognosis of Diabetic Patients. *Biomark Insights* 2016;11:95–104.
43 Mohammed AS, Adem F, Tadiwos Y, *et al*. Level of Adherence to the Dietary Recommendation and Glycemic Control Among Patients with Type 2 Diabetes Mellitus in Eastern Ethiopia: A Cross-Sectional Study. *Diabetes Metab Syndr Obes* 2020;13:2605–12.
44 O'Reilly H, Panizza CE, Lim U, *et al*. Utility of self-rated adherence for monitoring dietary and physical activity compliance and assessment of participant feedback of the Healthy Diet and Lifestyle Study pilot. *Pilot Feasibility Stud* 2021;7:48.
45 Machado P, McNaughton SA, Livingstone KM, *et al*. Measuring Adherence to Sustainable Healthy Diets: A Scoping Review of Dietary Metrics. *Adv Nutr* 2023;14:147–60.
46 Moher D, Liberati A, Tetzlaff J, *et al*. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *PLoS Med* 2009;6:e1000097.
47 Cochrane Collaboration. Data collection forms for intervention reviews. London Cochrane Collaboration; 2014. Available: http://training.cochrane. org/resource/data-collection-forms-intervention-reviews
48 Higgins JPT, Altman DG, Gøtzsche PC, *et al*. The Cochrane Collaboration's tool for assessing risk of bias in randomised trials. *BMJ* 2011;343:d5928.
49 Sterne JA, Hernán MA, Reeves BC, *et al*. ROBINS-I: a tool for assessing risk of bias in non-randomised studies of interventions. *BMJ* 2016;355:i4919.
50 Whiting P, Savović J, Higgins JPT, *et al*. ROBIS: A new tool to assess risk of bias in systematic reviews was developed. *J Clin Epidemiol* 2016;69:225–34.
51 Review manager (RevMan) version 5.3. Copenhagen The Nordic Cochrane Centre, The Cochrane Collaboration; 2014.
52 Higgins JPT, Thompson SG, Deeks JJ, *et al*. Measuring inconsistency in meta-analyses. *BMJ* 2003;327:557–60.
53 Cumpston M, Li T, Page MJ, *et al*. Updated guidance for trusted systematic reviews: a new edition of the Cochrane Handbook for Systematic Reviews of Interventions. *Cochrane Database Syst Rev* 2019;10:ED000142.
54 Huedo-Medina TB, Sánchez-Meca J, Marín-Martínez F, *et al*. Assessing heterogeneity in meta-analysis: Q statistic or I2 index? *Psychol Methods* 2006;11:193–206.
55 Borenstein M, Hedges LV, Higgins JPT, *et al*. A basic introduction to fixed-effect and random-effects models for meta-analysis. *Res Synth Methods* 2010;1:97–111.
56 Spineli LM, Pandis N. Exploring heterogeneity in meta-analysis: Subgroup analysis. Part 1. *Am J Orthod Dentofacial Orthop* 2020;158:302–4.
57 Popay J, Roberts H, Sowden A, *et al*. Guidance on the conduct of narrative synthesis in systematic reviews. 2006. Available: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.178.3100&rep=rep1&type=pdf
58 Lin L, Chu H. Quantifying publication bias in meta-analysis. *Biometrics* 2018;74:785–94.
59 Gradepro. GRADE handbook. 2013. Available: https://gdt.gradepro.org/app/handbook/handbook.html