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Factors affecting complementary and alternative medicine (CAM) use in adult diabetic patients: A systematic review using the theoretical domains framework

Background

Current evidence-based recommendations for the management of diabetes include prescribed medicines including oral hypoglycaemic agents such as metformin and pioglitazone as well as insulin therapy. When used in appropriate patients following individual tailored made treatment these medicines are beneficial for controlling blood glucose levels and preventing future complications.[1] In addition to these recommendations, patients often use additional self-care measures which include the use of complementary and alternative medicines (CAM).[2] The World Health Organization (WHO) defines CAM as a "broad set of health care practices that are not part of that country's own tradition or conventional medicine and are not fully integrated into the dominant health-care system".[3] A recent systematic review showed that up to 51% of diabetic patients worldwide use CAM either in conjunction with or as a replacement for orthodox treatments.[4]

The evidence base in relation to the effectiveness of CAM in diabetes is limited. Herbal and Dietary Supplements (HDS) such as fenugreek and ginseng have been identified to decrease carbohydrate absorption and increased insulin secretion and to lower blood glucose levels by acting similarly to insulin or by altering hepatic glucose metabolism respectively.[5] CAM also includes the application of non-HDS products and practices such as Yoga, Homeopathy, Acupuncture and Ayurveda. Yoga has been shown to improve glycaemic control in adults with type 2 diabetes mellitus.[6] However, currently there is a lack of research in relation to effectiveness and safety (particularly in relation to drug-CAM and CAM disease interactions) of over 35 CAM types reported to be used by diabetic patients.[4]

It is important for healthcare professionals to be familiar with the factors that influence diabetic patients to use CAM in order to understand patient perspectives on its use. This will enable healthcare professionals to better advice patients, support adherence to their prescribed medicines and identify the risks of interactions and adverse effects with prescribed treatments. Current international guidelines around diabetes management do not explicitly recommend that healthcare professionals should discuss CAM use with patients.[1, 7] Consideration of wider self-care measures in clinical consultations allows shared decision making, promotes patient involvement as partners in their care and avoids adverse outcomes from the treatments.[7]

The Theoretical Domains Framework (TDF) is an integrative framework that was developed for the purpose of implementing new practices that requires changes in the behaviour of the parties involved. Currently, there is a lack of theory based research that aims to identify factors related to CAM use by diabetic patients. Theoretical perspectives are important for identifying determinants of a behaviour and developing effective behaviour change interventions. The TDF has been previously used in systematic reviews to synthesise data from primary research to apply theoretical perspectives into understanding factors associated with a particular behaviour. For example, in a recent systematic review, authors used TDF to understand the constructs that influence referral of people with chronic obstructive pulmonary disease (COPD) to pulmonary rehabilitation.[8] In another recent review, TDF was used to identify the barriers and enablers for a triage, treatment, and transfer of clinical intervention to manage acute stroke patients in the emergency department.[9]

A previous systematic review and meta-analysis of CAM use in diabetes suggested that up to 67% of patients do not disclose their CAM use to healthcare professionals.[4] Healthcare professionals' awareness of diabetic patients' CAM use

and associated factors can inform effective counselling and communication practices during clinical consultations. For example, addressing patient fears, concerns about prescribed treatments which can be important factors in regards to patient use of CAM can enable promotion of treatment optimisation and adherence to prescribed treatments, and patient safety through avoidance of any drug-CAM interactions. The aim of this systematic review was to identify factors reported in the published literature in regards to CAM use by diabetic patients using the TDF.

Method

This systematic review was informed by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines and checklist.[10] A protocol was developed as per the PRISMA protocol guideline (protocol ID CRD42019125036).

Data Sources and Searches

Cochrane Library, MEDLINE, Embase, CINAHL, AMED, Web of Science, and Google Scholar databases were searched from the year 2010 to March 2021. Open Grey was searched for grey literature. Search terms are listed in Supplementary Table 1. The review was restricted to studies published in English.

Study Selection

Screening and selection was performed independently by two review authors (AA, VP) and was carried out in three phases. Titles and abstracts were screened for inclusion of possible relevant studies followed by assessment of full texts for eligibility. Reference lists of included studies were screened. If a title was considered relevant; the study was manually searched and the abstract examined.

Studies which included data on factors that influence CAM usage by adult diabetic patients 18 years of age and older were included. The review included studies that discussed partially or exclusively the factors that influence diabetic patients to use CAM. We included studies conducted with patients as well as healthcare professionals. In the latter case, factors associated with patient use of CAM from healthcare professionals' perspectives were included. All study designs were considered for inclusion.

Data Extraction and Quality Assessment

Data on study characteristics, influencing factors for CAM use as well as types of CAM used by diabetic patients were extracted. Two review authors (AA, VP) independently assessed the quality of included studies using the critical appraisal tool from the Joanna Briggs Institute (JBI) checklist.[11] The quality assessment for included studies was focused on three fields: clarity of participants' inclusion criteria, study setting and sampling, appropriateness of data collection and analysis methods. Included studies were judged to be of 'high quality' if quality criteria were satisfied by at least 7 items, 'moderate quality' for scores of 3-6 and 'low quality' for scores ≤ 2.[12] All studies were included regardless of their quality (table 1).

Data Synthesis and Analysis

The factors reported to be relevant to participants' use of CAM in diabetes were extracted from the included studies as reported by the study authors and listed. These factors could relate to those that positively or negatively influence a diabetic patients' use of CAM. Each of the extracted factors were then classified according to the Theoretical Domain Framework (TDF) into one of its 14 domains. TDF was developed

through a collaboration of behavioural scientists and new health practices implementation researchers identified theories related to behaviours and includes 14 domains related to goals, intentions, social and environmental influences on behaviour .[13] The use of the TDF can help to restructure and simplify data concerning a certain behaviour into a set of theoretical domains which would make it more useful for further applications. In order to achieve this, information relating to a specific behavioural determinant is categorised into any relevant domain(s) of TDF. Descriptions of TDF domains are provided in (supplementary table 2).

Results

A total of 3554 unique titles were screened of which 43 articles met the inclusion criteria (figure 1).[14-56] Table 3 shows that included studies were conducted between 2010 and March 2021 and originated from 28 different countries. Participants were mostly recruited from healthcare centres. Eighteen of the included studies enrolled participants either with type 1 diabetes (T1D) or type 2 diabetes and twenty-four studies included only patients with T2D, one also included traditional healers, and another study also enrolled doctors (Table 3).[19, 25] One of the included studies enrolled only healthcare professionals. Out of the 43 studies included, 40 were cross-sectional surveys (39 on diabetic patients and 1 on healthcare professionals) and two studies were qualitative interviews, one used mixed methods and one analysed data from a cohort study. Studies utilising a survey design mainly aimed to identify the prevalence of use with factors associated with use reported as secondary outcomes. Questionnaire administration methods for cross-sectional studies varied between self-administration, interviewer assisted administration and telephone administration (Table 3).

The two qualitative studies included in the review used in-depth interviews with patients.[21, 31] One study was conducted in Akhuwat Diabetes Clinic Lahore and Awan Medical Complex Lahore Pakistan [31]. The participants were interviewed using semi-structured and open-ended interviews. The study was focused on spiritual practices and homeopathic, herbal and home remedies for diabetes management, side effects and poor control. The second qualitative study was conducted in Edinburgh, United Kingdom.[21] It consisted of an ethnographic study conducted among Indian and Pakistani migrants living in Edinburgh. The study was conducted using unstructured interviews and was focused on the use of CAM for diabetes control.

Only one study investigated the perspectives of healthcare professionals regarding their patients' use of CAM. This study was conducted in Uganda and was qualitative in design, in addition to another study that enrolled both T2D patients and physicians and this study was cross-sectional in design.[25, 43] One of the studies that enrolled patients with both T1D and T2D also enrolled local herbalists and another study enrolled health promoters and traditional healers in addition to T2D patients, both were cross-sectional studies.[19, 52]

Factors affecting the use of CAM among diabetic patients

A total of 84 factors in relation to patient use of CAM were identified and extracted from the included studies. Domains were arranged in descending order based on the number of studies which reported factors associated with each domain (Table 2).

Intentions

Factors related to intentions either with stability or stages of change in intention fall under this domain.[13] Treating diabetes, or other medical problems, lowering blood glucose levels, prevention or management of diabetic complications, relieving

symptoms of the diabetes as well as preventing progression of diabetes by using CAM were the intentions described in the included literature.[14-18, 21-29, 33, 34, 36-38, 41, 42, 47-53] Other factors included potentiating the effect of conventional treatments, treating side effects of prescribed diabetic medications and non-diabetic medications, and perceived positive effects on general health and well-being.[14, 16-18, 21-29, 33, 34, 36-38, 41, 42, 47, 48, 50, 51]

Beliefs about consequences

Beliefs about consequences, outcome expectancies and anticipated regret played an important role in influencing diabetic patients to use CAM as reported in 21 studies.[16, 19, 23-26, 30, 32-45] Study participants were aware of the consequences of unmanaged diabetes and that awareness was a motivation to use CAM. Study participants in these studies chose CAM because they believed that CAM was more effective and safer than conventional medicines with fewer side effects and was free from adverse effects.

Optimism

Optimism was perceived as important in 13 studies.[17, 18, 21, 24-31] For example, study participants in some of the studies were optimistic that CAM could completely cure diabetes. They were also optimistic that CAM could slow diabetes progression as well as being able to cure the cause of the diabetes. Diabetic patients perceived conventional treatments as an approach that only focused on treating symptoms and not treating the disease itself. Moreover, patients were optimistic that they would not have to use conventional medicine if they use CAM, therefore patients rejected orthodox treatment and used CAM instead.[14, 17, 18, 21, 23-29, 31]

Environmental context and resources

Factors in this domain played an important role in influencing diabetic patients to use CAM. Long waiting times between clinic appointments and lack of access to and effective communication with doctors were among the reported factors.[30, 31, 34] Moreover, studies reported that patients living in villages use CAM more often than patients living in urban areas due to limited access to healthcare services in the former areas.[14, 25, 46] In general, participants said they used CAM as it is more accessible and affordable.[17, 24-27, 29, 30, 33, 34, 36, 37, 40, 45, 46, 49, 52-54]

Memory and decision processes

Memory, attention, decision making, cognitive overload or tiredness contributed to diabetic patients' use of CAM as reported in 12 studies.[19, 21, 25, 26, 30, 34, 35, 37, 40, 41, 44, 52] Many diabetic patients described using CAM due to lack of trust in conventional medicine.[34, 40] Many study participants deemed that plants that tasted bitter like medications were effective.[19] For some study participants the decision making process leading to CAM use was mostly about experimenting with new approaches for diabetes management or as a break from conventional medicine.[25, 26, 44] Experience of discomfort or poor glycaemic control when taking diabetes medications also led to some patients actively seeking and using CAM.[21, 25, 35, 37, 41]

Social influences

Factors under this domain were reported by 29 studies.[14, 16-19, 21, 23-29, 33-40, 44-46, 48, 50, 54-56] These factors could be categorized into four subgroups including a) cultural and religious beliefs, b) healthcare professionals' encouragement including pharmacists, herbalists or dieticians, c) family members, friends and d) media and internet advertisements.

Reinforcement

Patients might use CAM due to a positive influence by religious scholars on their CAM use; healthcare professionals' recommendations and the portrayal of a positive experience of CAM use by other users were reported as factors influencing diabetic patients to use CAM.[17, 21, 25, 29, 31, 33, 35, 37, 43, 44, 46]

Emotion

Emotions such as anxiety, fear, stress, depression, or burn-out have been associated with diabetic patients' CAM use. Factors related to this domain were reported in 12 studies.[15, 16, 19, 21, 25, 26, 29, 31, 33, 35, 40, 47] For example, participants in one study reported that CAM use made patients feel more in control over their health and made it easier to cope and made them feel better emotionally.[47] Dissatisfaction and 'loss of hope' with conventional therapy, satisfaction with the use of CAM, and patients' unwillingness to accept their illness and its treatment were reported.

Goals

The main goals of using CAM by diabetic patients were either to cure diabetes or to manage diabetes.[14, 16-18, 21-27, 33, 34, 37, 38, 42, 47-51]

Behavioural regulation

Factors in this domain were associated with self-monitoring, breaking habits or action planning.[13] These factors were reported in 6 studies.[21, 25, 31, 33, 39, 56] Diabetic patients turned to using CAM as a result of being exhausted by insulin therapy or a too frequent daily dosage of diabetic medications because they perceived CAM as 'user friendly'. The included studies also reported that diabetic patients who are unable to keep up with regular follow-up with their healthcare professionals usually resort to traditional healers, spiritual healers and home-self-medication.

Knowledge

Patient knowledge about CAM was a key factor associated with CAM use in five studies (Table 2). One study reported that herbal medicine use was popular because patients were aware of the uses of the existing various natural flora in their local environment.[18] Level of knowledge about interaction between conventional medicine and CAM was reported as a reason for using or not using CAM by patients with diabetes in two studies.[16, 17]

Social/professional role and identity

One study reported that there was a relationship between profession and CAM use. Occupation was shown to be an important factor in CAM use. For example, the unemployed and housewives were more likely to use CAM than other occupations, followed by farmers or retired people.[20]

Beliefs about capabilities

One study reported that patients perceived themselves to be capable of weighing up effectiveness with side effects in their decision making process around their use of CAM.[21]

Skills

Health promoters, individuals who work to treat diabetic patients in rural areas in Guatemala without undertaking any medical education or training, used skills in relation to CAM use for treating their diabetic patients as they learned about the most popular plants used for diabetes from working with people with diabetes.[19]

Discussion

Factors most commonly reported across the included studies related to the optimism, beliefs about consequences and social influences domains of the TDF. Key factors were related to the domains of TDF intentions and goals which were to treat and relieve symptoms. The environmental context and resources domain was populated by factors related to accessibility and affordability of CAM compared to physician visits and conventional medicines, factors such as influences by family members, friends, religious and spiritual scholars fell under the social influences domain of the TDF.

Behavioural interventions could be a helpful tool for healthcare professionals including pharmacists to help integrate CAM with prescribed medicines to guide patients through their diabetes management routine to ensure treatment optimization and medication adherence. Some of the factors identified in this review such as those related to the behavioural regulations domain including the factor of discontinuation of insulin therapy due to exhaustion or the factor of too frequent daily dosage of diabetic medications. Exhaustion that diabetic patients experience as a result of these factors could be mitigated by dose simplification.[57]

Diabetic patients seek information from pharmacists in diverse settings. Recent COVID-19 pandemic has also shown pharmacy staff increasing involvement in CAM related advice and support to patients.[58] Awareness of the factors as reported in this study that influence diabetic patients to use CAM would assist pharmacists to offer evidence based advice around the use of CAM along with prescribed treatments, promote medicines adherence and consider CAM-drug interactions where applicable. For example, patients' emotions such as frustrations or tiredness resulting from lack

of treatment optimisation that in turn lead to patients resorting to CAM use instead of prescribed medicines could be addressed as part of medication reviews.

Barriers to accessibility and affordability of modern treatments led many participants in the included studies to resort to CAM. Improving access to diabetes care and treatment could address some of the barriers to access or use of evidenced-based treatment approaches.

Most of the included studies in this review used a survey as a data collection tool often restricting participants in relation to the range of potential influences they could mention. Moreover, participants' answers to interview questions might be influenced by social desirability bias i.e. when participants answer questions in a way they think acceptable to others.[59]

Implications for practice and research

A previous systematic review has shown that up to 51% of diabetic patients use some forms of CAM for the management of diabetes and approximately 2/3rd of diabetic patients using CAM do not disclose their use to their healthcare providers.[4] Therefore, CAM use should be proactively explored as part of diabetes communication and counselling. Healthcare professionals should take into consideration the factors that increase the likelihood of CAM use by diabetic patients. The more of these factors that apply to a patient the more likely it is that the patient might resort to CAM use. By anticipating diabetic patients might use CAM, healthcare professionals could help to minimise any possible interactions between CAM and other medications. Moreover, it could also help healthcare professionals to address medication adherence by encouraging their patient to discuss their CAM use and offers the opportunity to provide better advice for them. Many CAM products are supplied through pharmacy

alongside many over-the-counter products.[58] It is imperative that education of healthcare professionals should include CAM use by patients with long term health conditions.[60, 61]

In light of this, research that provides evidence-based information about CAM is crucial because of the large number of factors that increase the likelihood of CAM use amongst diabetic patients. Safety and efficacy studies as well as studies on herb-drug interactions, the mechanism and impact on patients of commonly used CAM as identified in our previous prevalence systematic review are vital to ensure patients benefit the most from both prescribed drugs and CAM.[4]

Included studies did not distinguish between different types of CAM such as HDS and non-HDS. Further qualitative studies that focused on specific types of CAM would be helpful to examine HDS or non-HDS specific patient perspectives.

Study limitation

This review only included studies which are published in English language. In recent years, the term 'integrative medicine' is being increasingly used to refer to CAM which was not captured in the search strategy used by this systematic review. Views expressed by patients other than in formal research settings such as in patient online forums have not been captured in this study. Such forums can also offer valuable data.

Conclusion

Decisions to use CAM in diabetes can be multifactorial. Healthcare professionals' awareness of diabetic patients' use of CAM can inform effective advice to promote optimisation of and adherence to prescribed treatments, and promotion of patient safety through avoidance of drug-CAM interactions. Alleviating patients'

concerns, and reluctance to use prescribed treatments are imperative to achieve therapeutic goals.

Declaration

Ethics approval and consent to participate: Not applicable

Consent for publication: Not applicable

Availability of data and materials: All data generated or analysed during this study are included in this published article [and its supplementary information files].

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References

1. NICE. NICE Guidance, Diabetes and other endocrinal, nutritional and metabolic conditions 2019 [Available from: https://www.nice.org.uk/guidance/conditions-and-diseases/diabetes-and-other-endocrinal--nutritional-and-metabolic-conditions/diabetes#panel-pathways.
2. Chang H, Wallis M, Tiralongo E. Use of Complementary and Alternative Medicine Among People Living with Diabetes: Literature Review. J Adv Nurs. 2007;58(4):307-19. https://doi.org/10.1111/j.1365-2648.2007.04291.x
3. World_Health_Orgnization. Traditional, Complementary and Integrative Medicine 2018 [Available from: https://www.who.int/health-topics/traditional-complementary-and-integrative-medicine#tab=tab_1.
4. Alzahrani A, Price M, Greenfield S, Paudyal V. Global prevalence and types of complementary and alternative medicines use amongst adults with diabetes: systematic review and meta-analysis. Eur J Clin Pharmacol. 2021;https://doi.org/10.1007/s00228-021-03097-x
5. Gurjeet S. Birdee, Gloria Y. Complementary and Alternative Medicine Therapies for Diabetes: A Clinical Review. Clin Diabetes. 2010; 28(4):147-55.https://doi.org/10.2337/diaclin.28.4.147
6. Thind. H, Lantini. R, Balletto. BL, Donahue. ML, Salmoirago-Blotcher. E, Bock. BC, et al. The effects of yoga among adults with type 2 diabetes: A systematic review and meta-analysis. Prev Med. 2017;105:116-26.https://doi.org/10.1016/j.ypmed.2017.08.017
7. American_Diabetes_Association. Practice Guidelines Resources 2021 [Available from: https://professional.diabetes.org/content-page/practice-guidelines-resources.
8. Cox NS, Oliveira CC, Lahham A, Holland AE. Pulmonary rehabilitation referral and participation are commonly influenced by environment, knowledge, and beliefs about consequences: a systematic review using the Theoretical Domains Framework. J Physiother. 2017;63(2):84-93.https://doi.org/10.1016/j.jphys.2017.02.002
9. Craig LE, McInnes E, Taylor N, Grimley R, Cadilhac DA, Considine J, et al. Identifying the barriers and enablers for a triage, treatment, and transfer clinical intervention to manage acute stroke patients in the emergency department: a systematic review using the theoretical domains framework (TDF). Implement Sci. 2016;11(1):157.https://doi.org/10.1186/s13012-016-0524-1
10. Moher D, Liberati A, Tetzlaff J, Altman DG. The PRISMA Group, Preferred Reporting Items for Systematic Reviews and Meta-Analyses: ThePRISMA Statement. Ann Intern Med. 2009;151(4).https://doi.org/10.1136/bmj.b2535
11. Joannabriggs.org. Critical Appraisal Tools, The Joanna Briggs Institute The University of Adelaide AUSTRALIA 2019 [Available from: https://joannabriggs.org/critical-appraisal-tools.
12. Aromataris E, Munn ZE. Joanna Briggs Institute Reviewer's Manual. The Joanna Briggs Institute 2017 [Available from: https://reviewersmanual.joannabriggs.org/
13. Atkins L, Francis J, Islam R, O'Connor D, Patey A, Ivers N, et al. A guide to using the Theoretical Domains Framework of behavior change to investigate implementation problems. Implement Sci. 2017;12(1).https://doi.org/10.1186/s13012-017-0605-9
14. Yildirim DI, Marakoglu K. Complementary and alternative medicine use amongst Turkish type 2 diabetic patients: A cross-sectional study. Complement Ther Med. 2018;41:41-6.https://doi.org/10.1016/j.ctim.2018.08.008
15. Radwan H, Hasan H, Hamadeh R, Hashim M, AbdulWahid Z, Hassanzadeh Gerashi M, et al. Complementary and alternative medicine use among patients with type 2 diabetes living in the United Arab Emirates. BMC Complement Med Ther. 2020;20(1):216.https://doi.org/10.1186/s12906-020-03011-5
16. Putthapiban P, Sukhumthammarat W, Sriphrapradang C. Concealed use of herbal and dietary supplements among Thai patients with type 2 diabetes mellitus. J Diabetes Metab Disord. 2017;16(36).https://doi.org/10.1186/s40200-017-0317-3

17. Kamel FO, Magadmi RM, Hagras MM, Magadmi B, AlAhmad RA. Knowledge, attitude, and beliefs toward traditional herbal medicine use among diabetics in Jeddah Saudi Arabia. Complement Ther Clin Pract. 2017;29:207-12.https://doi.org/10.1016/j.ctcp.2017.10.007
18. Mekuria AB, Belachew SA, Tegegn HG, Ali DS, Netere AK, Lemlemu E, et al. Prevalence and correlates of herbal medicine use among type 2 diabetic patients in Teaching Hospital in Ethiopia: a cross-sectional study. BMC Complement Med Ther. 2018;18(1):85.https://doi.org/10.1186/s12906-018-2147-3
19. Andrews CM, Wyne K, Svenson JE. The Use of Traditional and Complementary Medicine for Diabetes in Rural Guatemala. J Health Care Poor Underserved. 2018;29(4):1188-208.doi:10.1353/hpu.2018.0092
20. Wanchai A, Phrompayak D. Use of complementary and alternative medicine among Thai patients with type 2 diabetes mellitus. J Integr Med. 2016;14(4):297-305.https://doi.org/10.1016/S2095-4964(16)60263-7
21. Porqueddu T. Herbal medicines for diabetes control among Indian and Pakistani migrants with diabetes. Anthropol Med. 2017;24(1):17-31.https://doi.org/10.1080/13648470.2016.1249338
22. Bradley R, Sherman K, Catz S, Calabrese C, Oberg E, Cherkin D. Self-care, use of CAM and satisfaction with health care in people with inadequately controlled Type 2 diabetes. BMC Complement Med Ther. 2012;12(SUPPL. 1).https://doi.org/10.1186/1472-6882-12-S1-O28
23. Ali-Shtayeh MS, Jamous RM, Jamous RM. Complementary and alternative medicine use amongst Palestinian diabetic patients. Complement Ther Clin Pract. 2012;18(1):16-21.https://doi.org/10.1016/j.ctcp.2011.09.001
24. Amaeze OU, Aderemi-Williams RI, Ayo-Vaughan MA, Ogundemuren DA, Ogunmola DS, Anyika EN. Herbal medicine use among Type 2 diabetes mellitus patients in Nigeria: understanding the magnitude and predictors of use. Int J Clin Pharm. 2018;40(3):580-8.https://doi.org/10.1007/s11096-018-0648-2
25. Atwine F, Hjelm K. Health professionals' knowledge and attitudes to healthcare-seeking practices and complementary alternative medicine usage in Ugandans with diabetes: a cross-sectional survey. Pan Afr Med J. 2017;28:256.doi:10.11604/pamj.2017.28.256.11615
26. Naja F, Alameddine M, Mousa D, Alameddine M, Shoaib H, Itani L, et al. Prevalence and correlates of complementary and alternative medicine use among diabetic patients in Lebanon: A cross sectional study. BMC Complement Altern Med. 2014;14:185.https://doi.org/10.1186/1472-6882-14-185
27. Wazaify M, Afifi FU, El-Khateeb M, Ajlouni K. Complementary and alternative medicine use among Jordanian patients with diabetes. Complement Ther Clin Pract. 2011;17(2):71-5.https://doi.org/10.1016/j.ctcp.2011.02.002
28. Sethi A, Srivastava S, Madhu SV. Prevalence and pattern of use of indigenous medicines in diabetic patients attending a tertiary care centre. J Indian Med Assoc. 2011;109(7):469-71.https://pubmed.ncbi.nlm.nih.gov/22315837/
29. Fan PE, Chan MF, Chan YL, Koh SL. Patterns of complementary and alternative medicine use among a group of patients with type 2 diabetes receiving outpatient care in Singapore. Int J Nurs Pract. 2013;19 Suppl 3:44-55. https://doi.org/10.1111/ijn.12173
30. Raja R, Kumar V, Khan MA, Sayeed KA, Hussain SZM, Rizwan A. Knowledge, Attitude, and Practices of Complementary and Alternative Medication Usage in Patients of Type II Diabetes Mellitus. Cureus. 2019;11(8):e5357.doi:10.7759/cureus.5357
31. Bukhsh A, Gan SH, Goh BH, Khan TM. Complementary and alternative medicine practices among type 2 diabetes patients in Pakistan: A qualitative insight. Eur J Integr Med. 2018;23:43-9.https://doi.org/10.1016/j.eujim.2018.09.003
32. Owusu S, Gaye Y-E, Hall S, Junkins A, Sohail M, Franklin S, et al. Factors associated with the use of complementary and alternative therapies among patients with hypertension and type 2 diabetes mellitus in Western Jamaica: a cross-sectional study. BMC Complement Med Ther. 2020;20(1):314.https://doi.org/10.1186/s12906-020-03109-w

33. Vishnu N, Mini GK, Thankappan KR. Complementary and alternative medicine use by diabetes patients in Kerala, India. Glob Health Epidemiol Genom. 2017;2(e6):1-7.https://doi.org/10.1017/gheg.2017.6
34. Al-Eidi S, Tayel S, Al-Slail F, Qureshi NA, Sohaibani I, Khalil M, et al. Knowledge, attitude and practice of patients with type 2 diabetes mellitus towards complementary and alternative medicine. J Integr Med. 2016;14(3):187-96.https://doi.org/10.1016/S2095-4964(16)60244-3
35. Devi K, Santhini E, Manikandan R, Prabhu NM. The prevalence, awareness and potential of complementary alternative medicine in type 2 diabetics living in Madurai, India. Eur J Integr Med. 2015;7(5):469-73.https://doi.org/10.1016/j.eujim.2015.04.003
36. Lunyera J, Wang D, Maro V, Karia F, Boyd D, Omolo J, et al. Traditional medicine practices among community members with diabetes mellitus in Northern Tanzania: an ethnomedical survey. BMC Complement Med Ther. 2016;16:1-12.https://doi.org/10.1186/s12906-016-1262-2
37. Baharom N, Rotina A B, Shamsul Azhar S. Prevalence of Complementary Alternative Medicine Use among Patients With Type II Diabetes in Negeri Sembilan, Malaysia. Medicine & Health (Universiti Kebangsaan Malaysia). 2016;11(2):257-66.https://doi.org/10.17576/MH.2016.1102.14
38. Khalil SH, Zaki A, Ibrahim AM, El-Moughazi AM, Khater AM, Youssef AM, et al. Pattern of use of complementary and alternative medicine among type 2 diabetes mellitus patients in Alexandria, Egypt. J Egypt Public Health Assoc. 2013;88(3):137-42.doi: 10.1097/01.EPX.0000440994.89503.45
39. Hashempur MH, Heydari M, Mosavat SH, Heydari ST, Shams M. Complementary and alternative medicine use in Iranian patients with diabetes mellitus. J Integr Med. 2015;13(5):319-25.https://doi.org/10.1016/S2095-4964(15)60196-0
40. Alami Z, Aynaou H, Alami B, Hdidou Y, Latrech H. Herbal medicines use among diabetic patients in Oriental Morocco. J Pharmacognosy and Phytotherapy. 2015;7(2):9-17.https://doi.org/10.5897/JPP2014.0338
41. Lui CW, Dower J, Donald M, Coll JR. Patterns and determinants of complementary and alternative medicine practitioner use among adults with diabetes in Queensland, Australia. Evid Based Complement Alternat Med. 2012;2012 (no pagination)(659419).https://doi.org/10.1155/2012/659419
42. Khalaf AJ, Whitford DL. The use of complementary and alternative medicine by patients with diabetes mellitus in Bahrain: a cross-sectional study. BMC Complement Med Ther. 2010;10:35.https://doi.org/10.1186/1472-6882-10-35
43. Alqathama A, Alluhiabi G, Baghdadi H, Aljahani L, Khan O, Jabal S, et al. Herbal medicine from the perspective of type II diabetic patients and physicians: what is the relationship? BMC Complement Med Ther. 2020;20(1):65.https://doi.org/10.1186/s12906-020-2854-4
44. Fabian E, Toscher S, Elmadfa I, Pieber TR. Use of complementary and alternative medicine supplements in patients with diabetes mellitus. Ann Nutr Metab. 2011;58(2):101-8.https://doi.org/10.1159/000326765
45. Nguyen H, Sorkin DH, Billimek J, Kaplan SH, Greenfield S, Ngo-Metzger Q. Complementary and alternative medicine (CAM) use among non-Hispanic white, Mexican American, and Vietnamese American patients with type 2 diabetes. J Health Care Poor Underserved. 2014;25(4):1941-55.doi:10.1353/hpu.2014.0178
46. Mohamed Ali BA, Mahfouz MS. Herbal Medicine Use among Patients with Type 2 Diabetes in North Sudan. Annu Res Rev Biol. 2014;4(11):1827-38.https://doi.org/10.9734/ARRB/2014/8015
47. Rhee TG, Westberg SM, Harris IM. Complementary and alternative medicine in US adults with diabetes: Reasons for use and perceived benefits. J Diabetes. 2018;10(4):310-9.https://doi.org/10.1111/1753-0407.12607
48. Karaman E, Erkin O, Senman S, Yildirim Y. The use of herbal supplements by individuals with diabetes mellitus. J Pak Med Assoc. 2018;68(4):587-94.https://www.jpma.org.pk/article-details/8648

49. Cengiz Z, Budak F. Use of complementary medicine among people with diabetes in eastern Turkey: A descriptive study. Complement Ther Clin Pract. 2019;36:120-4.https://doi.org/10.1016/j.ctcp.2019.06.007
50. Azizi-Fini I, Adib-Hajbaghery M, Gharehboghlou Z. Herbal medicine use among patients with type 2 diabetes in Kashan, Iran, 2015. Eur J Integr Med. 2016;8(4):570-5.https://doi.org/10.1016/j.eujim.2016.04.003
51. Koren R, Lerner A, Koren S, Zaidenstein R, Ziv-Baran T, Golik A. The use of complementary and alternative medicine in hospitalized patients with type 2 diabetes mellitus In Israel. Clin Ther. 2015;1):e155.https://doi.org/10.1089/acm.2015.0019
52. Kasole R, Martin HD, Kimiywe J. Traditional Medicine and Its Role in the Management of Diabetes Mellitus: "Patients' and Herbalists' Perspectives". Evid Based Complement Alternat Med. 2019:1-12.https://doi.org/10.1155/2019/2835691
53. Meshesha SG, Yeshak MY, Gebretekle GB, Tilahun Z, Fenta TG. Concomitant Use of Herbal and Conventional Medicines among Patients with Diabetes Mellitus in Public Hospitals of Addis Ababa, Ethiopia: A Cross-Sectional Study. Evid Based Complement Alternat Med. 2020;2020:4871459.https://doi.org/10.1155/2020/4871459
54. Avci DK. The use of traditional and complementary medicine among diabetes patients, and the awareness and attitudes of physicians. J Pak Med Assoc. 2018;68(11):1650-4.https://pubmed.ncbi.nlm.nih.gov/30410144/
55. Damnjanovic I, Kitic D, Stefanovic N, Zlatkovic-Guberinic S, Catic-Djordjevic A, Velickovic-Radovanovic R. Herbal self-medication use in patients with diabetes mellitus type 2. Turk J Med Sci. 2015;45(4):964-71.doi: 10.3906/sag-1410-60
56. Ching SM, Zakaria ZA, Paimin F, Jalalian M. Complementary alternative medicine use among patients with type 2 diabetes mellitus in the primary care setting: a cross-sectional study in Malaysia. BMC Complement Med Ther. 2013;13:148.https://doi.org/10.1186/1472-6882-13-148
57. Anderson LJ, Nuckols TK, Coles C, Le MM, Schnipper JL, Shane R, et al. A systematic overview of systematic reviews evaluating medication adherence interventions. Am J Health Syst Pharm. 2020;77(2):138-47.https://doi.org/10.1093/ajhp/zxz284
58. Paudyal V, Sun S, Hussain R, Abutaleb MH, Hedima EW. Complementary and alternative medicines use in COVID-19: A global perspective on practice, policy and research. Res Social Adm Pharm. 2021:S1551-7411(21)00170-4.https://doi.org/10.1016/j.sapharm.2021.05.004
59. Bergen N, Labonté R. “Everything Is Perfect, and We Have No Problems”: Detecting and Limiting Social Desirability Bias in Qualitative Research. Qual Health Res. 2019:0-.https://doi.org/10.1177/1049732319889354
60. Paudyal V, Cunningham S, Gibson Smith K, MacLure K, Ryan C, Cordina M. Methodological considerations in clinical outcomes assessment of pharmacy-based minor ailments management: A systematic review. PLoS One. 2018;13(10):e0205087-e.doi: 10.1371/journal.pone.0205087
61. Paudyal V, Hansford D, Cunningham S, Stewart D. Pharmacists' perceived integration into practice of over-the-counter simvastatin five years post reclassification. Int J Clin Pharm. 2012;34(5):733-8.https://doi.org/10.1007/s11096-012-9668-5

Table 1: Critical Appraisal Summary using Joanna Briggs Institute Critical Appraisal tools (JBI) for quality assessment.

No.	Author and date	Study design	Number of critical appraisal tool questions that were answered Yes, No, Unclear, or Not applicable (N/A)			
			Yes	No	Unclear	N/A
1	Yildirim & Marakoglu, 2018	*CS*	6	0	2	0
2	Rhee, Westberg, & Harris, 2018	CS	7	0	1	0
3	Mekuria et al., 2018	CS	7	1	0	0
4	Karaman et al., 2018	CS	6	1	0	1
5	Bukhsh et al., 2018	Q	8	1	1	0
6	Avci., 2018	CS	6	1	1	0
7	Andrews, Wyne, & Svenson, 2018	CS	5	2	1	0
8	Amaeze et al., 2018	CS	5	2	1	0
9	Mohamed Ali, & Mahfouz, 2014	CS	5	2	1	0
10	Vishnu, Mini & Thankappan, 2017	CS	5	2	1	0
11	Putthapiban, et.al., 2017	CS	6	1	1	0
12	Kamel et al., 2017	CS	4	3	1	0
13	Porqueddu, 2017	Q	8	1	1	0
14	Atwine & Hjelm, 2018	CS	5	1	0	2
15	Wanchai & Phrompayak, 2016	CS	5	2	1	0
16	Lunyera et al., 2016	CS	5	2	1	0
17	Bahroom, Shamsul & Rotina, 2016	CS	7	1	0	0
18	Azizi-Fini, et. al, 2016	CS	7	1	0	0
19	Al-Eidi et al., 2016	CS	6	2	0	0
20	Koren et al., 2015	CS	5	2	1	0
21	Hashempur et al., 2015	CS	7	1	0	0
22	Devi et al., 2015	CS	5	2	1	0
23	Damnjanovic et al., 2015	CS	5	2	1	0
24	Alami et al., 2015	CS	6	2	0	0
25	Nguyen et al., 2014	CS	6	2	0	0
26	Naja et al., 2014	CS	7	1	0	0
27	Khalil et al., 2013	CS	3	2	3	0
28	Fan et al., 2013	CS	6	0	2	0
29	Ching et al., 2013	CS	7	1	0	0
30	Lui et al., 2012	DC	6	0	5	0
31	Ali-Shtayehet et al., 2012	CS	5	2	1	0
32	Wazaify et al., 2011	CS	6	2	0	0
33	Sethi, Srivastava & Madhu, 2011	CS	5	2	1	0
34	Fabian et al., 2011	CS	7	1	0	0
35	Bradley et al., 2011	CS	6	1	1	0
36	Khalaf & Whitford, 2010	CS	5	1	2	0
37	Alqathama et al., 2020	CS	5	1	2	0
38	Cengiz & Budak, 2019	CS	5	0	3	0
39	Kasole & Kimiywe, 2019	CS	5	0	3	0
40	Meshesha, Gebretekle, & Fenta, 2020	CS	4	1	3	0
41	Owusu et al., 2020	CS	6	0	2	0
42	Radwan et al., 2020	CS	5	0	3	0
43	Raja et al., 2019	CS	3	2	3	0

CS= Cross-Sectional DC= data obtained from cohort study Q= Qualitative

Table 2: Factors for using CAM distributed to the TDF domains

TDF domains and descriptions	Factors	Studies citing the domain
1. Knowledge	CAM user's knowledge about CAM benefits including the effect on blood glucose	14, 15
	Patients' unfamiliarity with interaction between conventional medicine and herbs	16, 17
	Herbal medicine use is popular because of the existence of various natural flora for which patients are aware of its uses.	18
2. Skills	Health promoters learned the most popular plants used from working with people with diabetes.	19
3. Social/ Professional Role and Identity	There is a relationship between occupation and CAM use. Unemployed and housewives are more likely to use CAM followed by farmers, retired and lastly officers.	20
	Patients' belief that herbal products are natural	21
4. Beliefs about Capabilities	Patients tried several treatments by weighing out effectiveness with side effects, as they belief that they are capable to find the best treatment	21
	Patients thought that they are able to improve the control of blood glucose levels.	22
5. Optimism	Patients' belief in benefits of CAM including that CAM can treat diabetes, help the diabetes control and slow diabetes progression	14, 17, 18, 23, 29, 30
	Patients' belief CAM can cures all kinds of illnesses including diabetes	24-28
	Patients' belief CAM cure the cause of diabetes not like conventional treatments that focused on 'manifestations and symptoms'	21
	Patients' belief in God and use prayers for good health	31
	Patients rejected first treatment and used CAM instead	21
6. Beliefs about Consequences	Patient lack of knowledge about long-term consequence of diabetes	19
	Herbal medicines are safe because they are natural	24, 32
	Patients' belief conventional treatment was not effective and are harmful	33
	Patients perceived threat of their illness	25, 34, 35
	Patient's belief that CAM is more effective than conventional medicines	26, 32-34, 36-38
	Patients' belief that they have obtained the wanted result from CAM	17, 41-43
	Patients aware of the importance of self-care	23
	High motivation to self-care including CAM use	44
	Patients' belief that CAM is safer with fewer side effects	16, 30, 36, 43, 45
	Patients' belief that CAM is free from adverse effects	33
7. Reinforcement	Influence of religious scholar/spiritual person.	31
	Experience of CAM use considered positive by others	46

	Patients who used CAM recommended CAM for someone with diabetes.	17, 33, 44
	Family and friends made patients try CAM.	21, 31, 43
	Healthcare providers stated giving recommendations for using CAM therapies but to a limited extent	25
	Patients knew someone who uses / practice this CAM	37
	CAM use was suggested by other CAM users	35
	Having good example from the other user of CAM	29
	CAM recommendations by healthcare professionals	17, 23, 27, 30, 33-35, 43, 44, 50, 55
	Patients received information about CAM from pharmacist	23, 27, 34, 38, 44, 55
	Patients received information about CAM from Herbalist	27, 34
	Patients received information about CAM from Dietician	34, 44
	Patients received information about CAM from Traditional healers	17, 34
8. Intentions	Treating diabetes	16, 18, 21, 23, 24, 27, 29, 33, 34, 36-38, 41, 42, 47-49
	Treating other medical problems	16, 18, 24, 29, 36, 37, 41, 47, 50, 51
	Lowering blood glucose level	22, 28, 48, 50-52
	General health and well-being	16, 26, 36, 37, 50
	Treating side effects of prescribed diabetic medications	21, 23, 25, 27
	Patients' use of CAM to control the side effects of non-diabetic medications	21, 25, 53
	Prevent or manage diabetic complications	17, 25, 48, 50
	Increase the drug's effect	17
	Prevent progression of diabetes	15, 23, 26, 27
	Relieving symptoms of diabetes	14, 15, 23, 27, 49
9. Goals	Cure of Diabetes	15, 23, 27, 32, 53
	Management of Diabetes	14, 16-18, 21, 22, 24-26, 33, 34, 37, 38, 42, 47-51
10. Memory, Attention and Decision Processes	Patients think that plants that tasted bitter like medications do were effective	19
	Patients experienced discomfort when taking diabetes medications	21, 37
	Patients use home-self-medication or traditional healers before they turn to conventional treatments	25
	Patients know CAM therapist with good reputation	25
	Signs and symptoms attributed to poor glycaemic control that were not controlled by conventional medicine led patients to try CAM.	25, 35, 37, 41
	Patients used CAM to have a break from conventional medicine	25

	Patients' lack of trust on conventional medicine	30, 34, 40
	Trying CAM as an experiment as patients look for other solutions	26, 44, 52
11. Environmental Context and Resources	CAM is more affordable	17, 24-27, 29, 30, 33, 34, 36, 37, 40, 45, 49, 52-54
	CAM is easily accessible	24-27, 29, 30, 33, 34, 36, 37, 46, 52, 53
	Patients living in villages use CAM more often than patients living in cities.	14
	Long waiting time between clinics' appointments	30, 34
	Inefficient communication with doctors.	34
	Limited access to remotely located healthcare services from patients	25
	Lack of qualified and specialized doctors	31
	Convenience of using CAM, as neither a prescription nor a physician visit is required.	46
12. Social influences	Cultural beliefs encourage the use of CAM.	18, 36, 46
	The type of herbal products used is related to cultural beliefs	17, 37, 45
	Recommendations from herbal companies selling medicinal plants in the market	19
	Recommendations from CAM practitioners or herbalists	33, 39, 46
	Used for religious reasons	36
	Family members, friends, Internet, TV and/or advertisement	14-16, 18, 19, 21, 23-29, 33-35, 39, 40, 43, 44, 46, 48, 50, 52, 54-56
13. Emotion	CAM use made patients feel that they are in control over their health	47
	CAM made patients to feel better emotionally	47
	CAM made it easier to cope with the illness	47
	Dissatisfaction with conventional therapy	15, 47
	Satisfaction with the use of CAM	21, 25, 33, 35
	Spiritual Healing	31
	Patients' unwillingness to accept their illness and its treatment	19
	Lost hope with conventional therapy	16, 25, 26, 29, 40
14. Behavioural Regulation	Discontinuation of insulin therapy due to exhaustion	31
	CAM was user friendly	33
	Too frequent daily dosage of diabetic medications	21
	Patients fail to do regular follow-up often resort to (Traditional healers)(Spiritual healers)(Home-self-medication)	25

	Patients who are on external insulin were 2 times less likely to use CAM compared to other diabetic patients.	[39]
	Patients who performed self-monitoring blood glucose (SMBG) monthly more likely to use CAM compared to patients who do not perform SMBG or do it less often than monthly.	[56]

Table 3: Study characteristics.

Author and date	Country of study	Aim of the study	Research focus of the study	Study settings and recruitment of participants	Study design	Data collection method	Study participants
Yildirim & Marakoglu, 2018 [14]	Turkey	Prevalence of CAM use	CAM use	Outpatient diabetes education clinic in Turkey	cross-sectional	Face-to-face interview using a structured questionnaire	T2D patients
Rhee, Westberg, & Harris, 2018 [47]	USA	Prevalence of CAM use	CAM use	Data were from the 2012 NHIS, which was administrated by the National Centre for Health Statistics of the Centres for Disease Control and Prevention (CDC)	cross-sectional	Data were from the 2012 NHIS, which was administrated by the National Centre for Health Statistics of the Centres for Disease Control and Prevention (CDC)	T1D and T2D patients
Mekuria et al., 2018 [18]	Ethiopia	Prevalence of Herbal supplements use	Herbal supplements use	Diabetes care clinic Gondar town, north-western Ethiopia	cross-sectional	Interviewer-administered questionnaires	T1D and T2D patients
Karaman et al., 2018 [48]	Turkey	Prevalence of Herbal supplements use	Herbal supplements use	Endocrinology clinics of two hospitals in Izmir	cross-sectional	Face-to-face interview using a structured questionnaire	T1D and T2D patients
Bukhsh et al., 2018 [31]	Pakistan	Patients' perspectives towards CAM	Trends in CAM use	Akhuwat Diabetes Clinic Lahore and Awan Medical Complex Lahore	Qualitative	Semi-structured one to one in-depth interviews	T2D patients

Avci., 2018 [54]	Turkey	Prevalence of CAM use	CAM use	Van Yuzuncu Yil University, Van	cross-sectional	Semi-structured questionnaires	T1D and T2D patients
Andrews, Wyne, & Svenson, 2018 [19]	Guatemala	Prevalence of CAM use	CAM use	interview three groups in the San Lucas Tolimán area: people with diabetes, health promoters, and traditional healers/naturalists	cross-sectional	Semi-structured questionnaires	T2D patients Health promoters Traditional healers
Amaeze et al., 2018 [24]	Nigeria	Prevalence of Herbal supplements use	Herbal supplements use	5 secondary health care facilities across Lagos State	cross-sectional	Interviewer-administered questionnaires	T2D patients
Mohamed Ali, & Mahfouz, 2014 [46]	Sudan	Prevalence of Herbal supplements use	Herbal supplements use	Primary health care centres in Khartoum. The total number of PHCCs is 125. The number of patients in daily attendance at each of those centres is approximately qual. Most of the patients attended for primary health care on an appointment basis	cross-sectional	Interviewer-administered questionnaires	T2D patients
Vishnu, Mini & Thankappan, 2017 [33]	India	Prevalence of CAM use	CAM use	Rural Kollam district of the Indian state of Kerala (community based)	cross-sectional	Interviewer-administered structured questionnaires	T1D and T2D patients
Putthapiban, Sukhumthammarat & Sriphrapradang, 2017 [16]	Thailand	Prevalence of Herbal supplements use	Herbal supplements use	At the Endocrine Clinic in Ramathibodi Hospital, Bangkok	cross-sectional	Face-to-face interview using a structured questionnaire	T2D patients

Porqueddu, 2017 [21]	United Kingdom	Use of herbal supplements	Use of herbal supplements for diabetes control	Ethnographic study conducted among Indian and Pakistani migrants living in Edinburgh.	Qualitative	unstructured Interviews	T2D patients
Kamel et al., 2017 [17]	Saudi	Prevalence of Herbal supplements use	Herbal supplements use	King Abdul-Aziz University and King Fahad General Hospitals in Jeddah	cross-sectional	Interviewer-administered structured questionnaires	T1D and T2D patients
Atwine & Hjelm, 2017 [25]	Uganda	Professionals' perspective	Healthcare professionals' knowledge, attitudes and practice the use of CAM among persons with diabetes	Healthcare providers working with management of diabetes in a certain region of south-western Uganda, including rural and urban areas	cross-sectional	self-administered structured questionnaire	Healthcare professionals
Wanchai & Phrompayak, 2016 [20]	Thailand	Prevalence of CAM use	CAM use	Four primary healthcare units and two secondary hospitals in the north of Thailand	cross-sectional	Semi-structured questionnaire	T2D patients
Lunyera et al., 2016 [36]	Tanzania	Prevalence of Herbal supplements use	Herbal supplements use	Kilimanjaro Region of Tanzania	cross-sectional	Verbally administered structured questionnaire	T1D and T2D patients
Bahroom, Shamsul & Rotina, 2016 [37]	Malaysia	Prevalence of CAM use	CAM use	45 government health clinics across Negeri Sembilan	cross-sectional	Interviewer-administered structured questionnaires	T2D patients
Azizi-Fini, Adib-Hajbaghery & Gharehboghlou, 2016 [50]	Iran	Prevalence of Herbal supplements use	Herbal supplements use	Golabchi and Naqavi diabetes clinics in the Kashan city	cross-sectional	Interviewer-administered structured questionnaires	T2D patients

Al-Eidi et al., 2016 [34]	Saudi	Prevalence of CAM use	CAM use	Diabetic Centre of King Salman bin Abdul-Aziz Hospital, in Riyadh city	cross-sectional	Face-to-face interview using a structured questionnaire	T2D patients
Koren et al., 2015 [51]	Israel	Prevalence of Herbal supplements use	Herbal supplements use	Internal medicine department at Assaf Harofeh Medical Centre, Zerifin	cross-sectional	Interviewer-administered structured questionnaires	T2D patients
Hashempur et al., 2015 [39]	Iran	Prevalence of CAM use	CAM use	Two outpatient diabetes clinics affiliated with the Shiraz University of Medical Sciences, Shiraz	cross-sectional	Face-to-face interview using semi-structured questionnaire	T1D and T2D patients
Devi et al., 2015 [35]	India	Prevalence of CAM use	CAM use	Diabetes Health camp conducted by VS micro lab, Madurai	cross-sectional	structured questionnaires	T2D patients
Damnjanovic et al., 2015 [55]	Serbia	Prevalence of Herbal supplements use	Herbal supplements use	6 Remedia Pharmacy Health Facilities in the territory of Nis	cross-sectional	structured questionnaires	T2D patients
Alami et al., 2015 [40]	Morocco	Prevalence of Herbal supplements use	Herbal supplements use	Mohammad VI university hospital ,Oujda	cross-sectional	Face-to-face interview using a Semi-structured questionnaire	T1D and T2D patients
Nguyen et al., 2014 [45]	USA	Prevalence of CAM use	CAM use	Patients were recruited from seven primary care or endocrinology clinics affiliated with an academic medical centre in Southern California	cross-sectional	self-administered structured questionnaire	T2D patients
Naja et al., 2014 [26]	Lebanon	Prevalence of CAM use	CAM use	Ppatients recruited from two major referral centres in Beirut- a public hospital and a	cross-sectional	Face-to-face interview using a structured questionnaire	T2D patients

				private academic medical centre			
Khalil et al., 2013 [38]	Egypt	Prevalence of Herbal supplements use	Herbal supplements use	Outpatient clinics of Alexandria University Hospital, from seven health insurance centres, six hospitals, and one private healthcare facility.	cross-sectional	Questionnaires (administration method not reported)	T2D patients
Fan et al., 2013 [29]	Singapore	Prevalence and Factors for CAM use	CAM use	Single centre study conducted in an outpatient diabetes Centre in Singapore with an average load of 2500 patients a month	cross-sectional	Self-administered questionnaires.	T2D patients
Ching et al., 2013 [56]	Malaysia	Prevalence of CAM use	CAM use	primary health care clinic at Salak in Sepang	cross-sectional	Face-to-face interview using a structured questionnaire	T2D patients
Lui et al., 2012 [41]	Australia	Prevalence of CAM practitioner use	CAM practitioner use	Data reported here are taken from the Living with Diabetes Study (LWDS), a five-year, prospective cohort study being conducted in the State of Queensland	Data from cohort study	Questionnaires	T1D and T2D patients
Ali-Shtayehet et al., 2012 [23]	Palestine	Prevalence of CAM use	CAM use	Patients attending outpatient departments at Governmental Hospitals in 7 towns in the Palestinian territories (Jenin, Nablus, Tulkarm, Qalqilia, Tubas, Ramalla, and Hebron)	cross-sectional	structured questionnaires	T1D and T2D patients

Wazaify et al., 2011 [27]	Jordan	Prevalence of Herbal supplements use	Herbal supplements use	Outpatient departments at The National Centre for Diabetes, Endocrine and Genetics (NCDEG), a specialized centre in Jordan to which most DM cases are referred.	cross-sectional	Face-to-face interview using a Semi-structured questionnaire	T1D and T2D patients
Sethi, Srivastava & Madhu, 2011 [28]	India	Prevalence of CAM use	CAM use	Tertiary care centre in Delhi	cross-sectional	Face-to-face interview using a Semi-structured questionnaire	T1D and T2D patients
Fabian et al., 2011 [44]	Austria	Prevalence of Herbal supplements use	Herbal supplements use	Diabetes Centre of the Division of Endocrinology and Metabolism, Department of Internal Medicine, Medical University of Graz	cross-sectional	Face-to-face interview using a structured questionnaire	T1D and T2D patients
Bradley et al., 2011 [22]	USA	Prevalence of CAM use	CAM use	Patients with moderately to poorly controlled type 2 diabetes who receive care from Group Health Cooperative (GHC), a large non-profit, integrated health care system in Washington State.	cross-sectional	Telephone-administered questionnaires.	T2D patients
Khalaf & Whitford, 2010 [42]	Bahrain	Prevalence of CAM use	CAM use	Patients attending two hospital diabetes clinics	cross-sectional	questionnaires	T1D and T2D patients

Alqathama et al., 2020 [43]	Saudi	Prevalence of herbal supplements use	knowledge and beliefs about herbal use	13 medical centres in Makkah	cross-sectional	Structured questionnaire	T2D patients and doctors
Cengiz & Budak, 2019 [49]	Turkey	Prevalence of CAM use	CAM use	Patients hospitalized at endocrine clinics in university hospital in eastern region.	cross-sectional	Face-to-face interview using a structured questionnaire	T1D and T2D patients
Kasole & Kimiywe, 2019 [52]	Tanzania	Patients' and herbalists' practices and perspectives	CAM use	Kilimanjaro Christian Medical Centre (KCMC) in Kilimanjaro, and Mount Meru Hospital in Arusha	Cross-sectional	Mixed-methods design which included a quantitative and a qualitative component	T1D and T2D patients and local herbalists
Meshesha, Gebretekle, & Fenta, 2020 [53]	Ethiopia	Prevalence of herbal supplements use	Kowledge and beliefs about herbal use	Health facility-based in Addis Ababa	Cross-sectional and qualitative	Mixed-methods design which included a quantitative and a qualitative component	T1D and T2D patients
Owusu et al., 2020 [32]	Jamaica	Prevalence of CAM use	CAM use	Seven chronic disease clinics in western region	cross-sectional	Investigator-administered questionnaire	T2D patients
Radwan et al., 2020 [15]	United Arab Emirates	Prevalence of CAM use	CAM use	Outpatient clinics in the two governmental hospitals in Dubai and Sharjah	cross-sectional	Face-to-face interviews	T2D patients

Raja et al., 2019 [30]	Pakistan	Knowledge and attitude toward CAM	CAM use	Institute of diabetology in a tertiary care hospital	cross-sectional	Face-to-face interviews	T2D patients