Self-Efficacy and Adherence to Self-Care Among Patients With Type 2 Diabetes: A Systematic Review

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Abstract

Highly prevalent chronic illnesses such as type 2 diabetes can be effectively managed by adhering to certain health behaviors. As such, self-efficacy is a vital factor in this adherence process. This systematic review of cross-sectional studies aims to outline and evaluate the characteristics of the literature investigating self-efficacy and adherence to self-care in the type 2 diabetes population. Eleven eligible studies were identified based on the inclusion criteria after conducting a primary and secondary screening of three major databases (ProQuest, Scopus, and EBSCOhost) from inception to April 2022, along with manual searching from other sources. A narrative synthesis was used to analyze this review. The findings indicated that self-efficacy is significantly correlated with self-care adherence in persons with type 2 diabetes and that higher self-efficacy leads to better self-care behaviors. The selected studies failed to fulfill the quality criteria for identifying and measuring the confounding variables; therefore, future studies should focus on rigorous research design. A more sophisticated approach to elucidate phase-specific self-efficacy and its influence on health behavior among the type 2 diabetic population may be required in the future to design and test theoretical frameworks and intervention studies.

Keywords

Adherence to self-care; diabetes management; self-efficacy; systematic review; type 2 diabetes

Background

Type 2 diabetes (T2D), known for its progressive insidious nature, accounts for 90–95% of all diabetes cases and poses an invisible threat to human society (Centers for Disease Control and Prevention, 2022). Globally, the prevalence of T2D is escalating continuously (Khan et al., 2020), indicating the burden of this metabolic disorder on healthcare systems. Recent reports have suggested that diabetes has become a major challenge worldwide at the individual, familial, and societal levels, threatening the health and well-being of the human population (International Diabetes Federation, 2021). Diabetes is considered life-threatening due to serious complications, especially in the absence of proper management (International Diabetes Federation, 2015). Therefore, the most significant strategy for curbing the damage caused by this relentlessly progressive chronic disorder is its efficient and lifelong management.

Previous studies have suggested that medication along with engagement in long-term diabetes-related self-care behaviors, such as following recommended diet, exercise, blood sugar monitoring, foot care, and smoking cessation is among the most effective management strategies for this condition (American Diabetes Association, 2010, 2022; McCollum et al., 2005; Mende Sorato et al., 2016; Mohebi et al., 2013). It has been reported that outcomes of diabetes management are determined mainly by self-care behaviors (Funnell & Anderson, 2005; Karimy et al., 2018), and approximately 95% of these behaviors are the responsibility of the patient (Bonger et al., 2018; Zhou et al., 2013). Supporting these findings, certain studies suggest that essential self-care practices such as healthy eating, regular blood glucose monitoring, adherence to medication, being physically active, and healthy coping predict good health outcomes in people with diabetes (Gurmu et al., 2018; Shrivastava et al., 2013). Thus, adhering to self-care behaviors is the cornerstone of diabetes management.

Nonetheless, these self-care behaviors are influenced by various personal, social, and environmental factors along with illness and treatment characteristics. Some of these determinant factors are self-care skills, diabetes knowledge, psychological distress, self-efficacy, stress, social support, patient-provider communication, high-risk situations, and environmental systems (Gurmu et al., 2018; Luo et al., 2015; World Health Organization, 2003). The interplay between these factors provides the basis for adherence among people with diabetes and plays a fundamental role in diabetes self-management.

Despite this understanding, lifelong adherence to healthy lifestyle routines remains the most challenging endeavor for people with this chronic condition. Evidence suggests that people with diabetes are unable to be voluntarily involved in their self-management activities and report a high non-adherence to treatment regimens compared to people with other non-communicable chronic diseases (Hla et al., 2018; Rolnick et al., 2013). The World Health Organization (2003) also reported the problem of poor adherence among people with diabetes and described the variables considered to be correlated with adherence to diabetes self-care behaviors. One such variable is self-efficacy, which has been found to be a strong predictor of adherence (Karimy et al., 2018; Reisi et al., 2021; Świątoniowska-Lonc et al., 2021; Yao et al., 2019).

The concept of self-efficacy has strong theoretical and empirical underpinnings, showing that a person with high self-efficacy exhibits more persistence toward achieving a goal by withstanding setbacks (Bandura, 1986, 2004). This attribute of self-efficacy has been associated

with improved adherence behavior among individuals with T2D who strongly believe in their capability to complete a task. Thus, self-efficacy is a key psychosocial factor that seems to lead to better adherence in diabetes management. Supporting this view, several studies have reported a significant relationship between self-efficacy and self-care behaviors influencing glycemic control in the T2D population (Al-Khawaldeh et al., 2012; Amer et al., 2018; Brown et al., 2016; Saleh et al., 2021; Sharoni & Wu, 2012).

As adherence is not a unidimensional construct (World Health Organization, 2003) and self-care encompasses a complex set of activities recommended for T2D management, a thorough understanding of their association with self-efficacy is essential for planning future interventions to sustain long-term adherence, a pressing need at present. Several previous studies have explored the association between the study variables but have adopted different methodologies to measure and analyze the variables. However, to our knowledge, no systematic review of cross-sectional studies has explored the correlation between self-efficacy and self-care adherence among patients with type 2 diabetes. Hence, this study aims to recapitulate and evaluate the accessible evidence on the relationship between the proposed study variables in the T2D population and thereby provide a better insight into this relationship. Such insights may help generate evidence-based recommendations for exploring and enhancing self-efficacy, specifically addressing the barriers to self-care behaviors that may differ for the same individual or different individuals.

Method

This review paper was conducted using the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (Page et al., 2021). Initially, a scoping search was conducted (from August 2021 to March 2022) to investigate studies that explored the relationship between self-efficacy and adherence to self-care in T2D patients. This scoping search was run on ProQuest, Scopus, EBSCOhost, Google Scholar, and PROSPERO using the search terms "self-efficacy," "adherence to self-care behavior," "type 2 diabetes," and "systematic review." The search results could not identify any existing or ongoing systematic reviews describing a correlational study between the proposed study variables among persons with T2D.

Eligibility criteria

The inclusion criteria for the eligible studies were (1) peer-reviewed articles in English, (2) studies based on a cross-sectional design, (3) studies including patients with type 2 diabetes (T2D)/studies including other types but with a separate analysis conducted for each, and (4) studies quantitatively measuring (using standardized tools) the relationship/association between participants' self-efficacy/perceived self-efficacy and adherence to one or more of the following self-care behaviors involved in T2D management, such as (a) adherence to medication, (b) adherence to diet, (c) adherence to physical activity/exercise, (d) adherence to self-monitoring of glucose in the blood (SMBG), (e) foot care adherence, and (f) cessation of smoking; (5) studies providing only r-values, excluding other values indicating associations.

The exclusion criteria covered (1) studies having a longitudinal design, (2) studies based on randomized control trial (RCT) or intervention/program-evaluation, (3) studies including samples from RCT, (4) studies focused on tool development, (5) studies including insufficient

measurements of variables, (6) studies using structural equational modeling (SEM)/other multivariate analysis, (7) studies including only patients with type 1 diabetes (T1D) and women with gestational diabetes, (8) studies including patients with T2D and its related specific complications as well as other comorbidities/chronic illnesses (physical and mental illnesses such as hypertension, cardiovascular disorders, chronic kidney diseases, depression, and anxiety), (9) qualitative studies (measuring study variables qualitatively), (10) non-research items, including editorials, commentaries, letters, and descriptive articles, (11) conference abstracts; (12) studies not in English, and (13) review papers (systematic reviews and meta-analyses).

Information sources

The search was conducted using ProQuest, Scopus, and EBSCOhost databases from inception to April 2022. This search was undertaken on April 1 and 7, 2022. All the included studies' reference lists and individual studies found through Google searches were manually searched to find relevant studies. The authors of the studies were contacted if additional details were required.

Search strategy

The search strategy was formulated based on database-specific headings, Medical Subject Headings (MeSH) combined with terms identified through free-text search, and synonyms for "adherence to self-care behavior," "type 2 diabetes," and "self-efficacy." All the terms were combined using Boolean logic commands appropriate for each database.

ProQuest Search string (April 1, 2022)

("self-efficacy" OR "perceived self-efficacy" OR AB, TI("self-efficacy")) AND ("patient adherence" OR "patient compliance" OR "treatment adherence" OR "treatment compliance" OR "therap* adherence" OR "therap* compliance" OR "non-adherent patient" OR "patient non-adherence" OR "patient nonadherence" OR "patient non-compliance" OR "patient noncompliance" OR "treatment non-adherence" OR "therap* non-adherence" OR "self-care" OR "medication adherence" OR "blood glucose self-monitoring" OR "diet therapy" OR "diet diabetic" OR AB, TI("adherence to self-care behav*" OR "self-care adherence" OR "diabet* self-care adherence" OR "self-care activities adherence" OR "self-care practices" OR "health self-care" OR "medical complian*" OR "medication intake adherence" OR "blood sugar monitoring" OR "patient self-monitoring" OR "glycemic control" OR "drug monitoring" OR "exercise adherence" OR "self manag*" OR "treatment non-compliance" OR "therap* non-compliance")) AND ("diabet* mellitus, Adult-Onset" OR "diabet* mellitus, maturity-onset" OR "maturity-onset diabet*" OR "maturity-onset diabet* mellitus" OR "diabet* mellitus, non insulin dependen*" OR "diabet* mellitus, non-insulin-dependent" OR "diabet* mellitus, noninsulin dependent" OR "diabet* mellitus, noninsulin-dependent" OR "NIDDM" OR "noninsulin-dependent diabet* mellitus" OR "diabet* mellitus, slow-onset" OR "diabet* mellitus, stable" OR "diabet* mellitus, type II" OR AB, TI("type 2 diabet* mellitus" OR "type 2 diabet*" OR "diabet* mellitus, type 2" OR "diabet* type 2" OR "type II diabet*" OR "adult onset diabet*" OR "insulin resist*" OR "glucose intolerance" OR "late onset diabet*" OR "type 2 DM" OR "t2 dm" OR "t2d" OR "T2DM" OR "type two diabetes mellitus" OR "DM type 2")) AND (at.exact("Article") AND stype.exact("Scholarly Journals") AND subt.exact("diabetes

mellitus (non-insulin dependent)" OR "health behavior" OR "diabetes mellitus, type 2") AND la.exact("ENG") AND pd(19800101-20220331) AND PEER(yes))

Scopus Search string (April 1, 2022)

TITLE-ABS-KEY(("self-efficacy" OR "perceived self-efficacy") AND ("adherence to self-care behav*" OR "self-care adherence" OR "diabet* self-care adherence" OR "self-care activities adherence" OR "self-care practices" OR "health self-care" OR "medical complian*" OR "medication intake adherence" OR "blood sugar monitoring" OR "patient self-monitoring" OR "glycemic control" OR "drug monitoring" OR "exercise adherence" OR "self manag*" OR "patient adherence" OR "patient compliance" OR "treatment adherence" OR "treatment compliance" OR "therap* adherence" OR "therap* compliance" OR "non-adherent patient" OR "patient non-adherence" OR "patient nonadherence" OR "patient non-compliance" OR "patient noncompliance" OR "treatment non-adherence" OR "therap* non-adherence" OR "self-care" OR "medication adherence" OR "blood glucose self-monitoring" OR "diet therapy" OR "diet diabetic" OR "treatment non-compliance" OR "therap* non-compliance") AND ("type 2 diabet* mellitus" OR "type 2 diabet*" OR "diabet* mellitus, type 2" OR "diabet* type 2" OR "type II diabet*" OR "adult onset diabet*" OR "insulin resist*" OR "glucose intolerance" OR "late onset diabet*" OR "type 2 DM" OR "t2 dm" OR "t2d" OR "T2DM" OR "type two diabetes mellitus" OR "DM type 2" OR "diabet* mellitus, Adult-Onset" OR "diabet* mellitus, maturity-onset" OR "maturity-onset diabet*" OR "maturity-onset diabet* mellitus" OR "diabet* mellitus, non insulin dependen*" OR "diabet* mellitus, non-insulin-dependent" OR "diabet* mellitus, noninsulin dependent" OR "diabet* mellitus, noninsulin-dependent" OR "NIDDM" OR "noninsulin-dependent diabet* mellitus" OR "diabet* mellitus, slow-onset" OR "diabet* mellitus, stable" OR "diabet* mellitus, type II")) AND (LIMIT-TO (PUBSTAGE, "final")) AND (LIMIT-TO (OA, "all")) AND (LIMIT-TO (DOCTYPE, "ar")) AND (LIMIT-TO (SUBJAREA, "PSYC") OR LIMIT-TO (SUBJAREA, "SOCI") OR LIMIT-TO (SUBJAREA, "MULT")) AND (LIMIT-TO (LANGUAGE, "English")) AND (LIMIT-TO (SRCTYPE, "j"))

EBSCOhost Academic Search Complete Search string (April 7, 2022)

((MH "self-efficacy" OR "perceived self-efficacy" OR AB ("self-efficacy"))) AND ((MH "patient adherence" OR "patient compliance" OR "treatment adherence" OR "treatment compliance" OR "therap* adherence" OR "therap* compliance" OR "non-adherent patient" OR "patient non-adherence" OR "patient nonadherence" OR "patient non-compliance" OR "patient noncompliance" OR "treatment non-adherence" OR "therap* non-adherence" OR "self-care" OR "medication adherence" OR "blood glucose self-monitoring" OR "diet therapy" OR "diet diabetic" OR AB ("adherence to self-care behav*" OR "self-care adherence" OR "diabet* self-care adherence" OR "self-care activities adherence" OR "self-care practices" OR "health self-care" OR "medical complian*" OR "medication intake adherence" OR "blood sugar monitoring" OR "patient self-monitoring" OR "glycemic control" OR "drug monitoring" OR "exercise adherence" OR "self manag*" OR "treatment non-compliance" OR "therap* non-compliance"))) AND ((MH "diabet* mellitus, Adult-Onset" OR "diabet* mellitus, maturity-onset" OR "maturity-onset diabet*" OR "maturity-onset diabet* mellitus" OR "diabet* mellitus, non insulin dependen*" OR "diabet* mellitus, non-insulin-dependent" OR "diabet* mellitus, noninsulin dependent" OR "diabet* mellitus, noninsulin-dependent" OR "NIDDM" OR "noninsulin-dependent diabet* mellitus" OR "diabet* mellitus, slow-onset" OR "diabet* mellitus, stable" OR "diabet* mellitus, type II" OR AB ("type 2 diabet* mellitus" OR "type 2 diabet*" OR "diabet* mellitus, type 2" OR "diabet* type 2" OR "type II

diabet*" OR "adult onset diabet*" OR "insulin resist*" OR "glucose intolerance" OR "late onset diabet*" OR "type 2 DM" OR "t2 dm" OR "t2d" OR "T2DM" OR "type two diabetes mellitus" OR "DM type 2")))

Study selection

Two reviewers independently assessed the article titles and abstracts found using search databases and other additional sources mentioned and read the full text based on the criteria for inclusion. For screening, data were extracted using Microsoft Excel. Any differences between the reviewers were deliberated during the screening process until a consensus was reached.

Quality assessment

The quality of the included studies was evaluated using the relevant checklist from the Joanna Briggs Institute (Moola et al., 2020). The reviewers independently appraised the quality of the included studies and discussed their findings to resolve disagreements. Quality appraisal was used to identify the methodological strengths and weaknesses of the selected studies and not for their exclusion.

Data extraction and synthesis

The selected studies were reviewed based on the author of the study, publication year, population (number and characteristics of the study group), study setting, variables measured/instruments used, and study outcomes. The included studies were synthesized using a narrative approach, and meta-analyses were excluded because of heterogeneity among the selected studies.

Results

Study selection

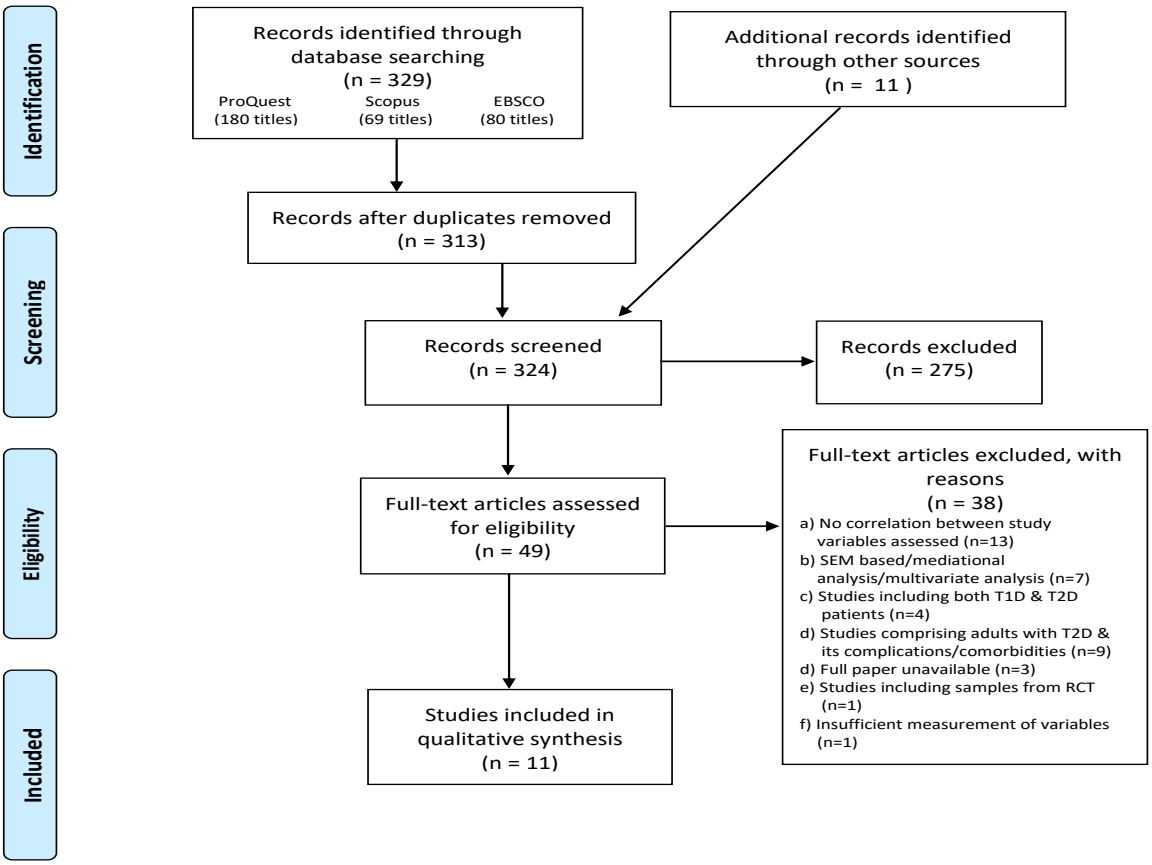
The search identified 329 papers (180 from ProQuest, 69 from Scopus, and 80 from EBSCOhost). Additionally, 11 papers were found through other sources (lists of references of included studies and Google searches). After removing duplicates, 324 papers were included in the title and abstract screening. From the title and abstract reviews, 49 studies were deemed eligible for full-text reading. The remaining 275 papers were found to be irrelevant to the review objective.

Based on the decided eligibility criteria, 11 of the 49 initially qualifying studies were selected for review. The remaining 38 studies were found to be ineligible. Of these, 13 studies did not assess the correlation between the study variables; seven studies were based on SEM or mediational analysis or multivariate analysis; four studies included samples with both T1D and T2D; nine studies included samples with T2D having complications or comorbidities (physical or mental illnesses such as hypertension, cardiovascular disorders, chronic kidney diseases, depression, and anxiety). The full papers of three studies were unavailable despite

communicating with the authors; one included RCT samples; and one involved insufficient variable measurement.

Figure 1 summarizes the PRISMA flowchart (Moher et al., 2009) used for the screening and selection processes.

Figure 1: The PRISMA Flowchart



Note: Adapted from Moher et al. (2009)

Study characteristics and results of individual studies

The study characteristics described in Table 1 provided details about the study aim, population, study setting, instruments used for measurement, and outcomes related to the study variables. All the included studies used a cross-sectional design and comprised persons with T2D. Of these, one study included only female participants (Didarloo et al., 2012), and another study (Chan et al., 2020) included adults with T2D stratified based on treatment (non-insulin and insulin-treated).

The included studies consisted of 3,260 participants aged between 18 to 84 years. The number of samples in the included studies ranged from 50 to 917. Wainwright et al. (2022) included adults with prediabetes and T2D but conducted a separate analysis for both groups. Four studies recruited the participants from diabetes clinics (Bohanny et al., 2013; Dao-Tran et al., 2018; Didarloo et al., 2012; Reisi et al., 2016), two from primary care clinics (Tharek et al., 2018; Walker et al., 2014), one from primary health centers (Kurnia et al., 2017), one from the medical center and hospitals (Lee & Lin, 2009), and one from internist outpatient hospitals (Wahyuni

& Ramayani, 2020). Moreover, Chan et al. (2020) used a subsample of the MILES-2 study online survey (Australia), and Wainwright et al. (2022) recruited participants through Qualtrics (an Internet-based survey company).

Table 1: Characteristics of Included Studies

No.	Authors (year)	Study Aim	Population	Study setting	Variables measured/instruments used	Outcome
1	Bohanny et al. (2013)	To explore the relationships among health literacy, self-efficacy, and self-care behaviors	150 adults with T2D	Public diabetes clinic on Majuro Atoll, the Marshall Islands	i) Diabetes Management Self-Efficacy Scale (DMSES) (Stanford Patient Education Research Center, 2008) (Marshallese version) ii) The Summary of Diabetes Self-Care Activities (SDSCA) (Toobert et al., 2000) (Marshallese version)	A significant positive correlation exists between self-efficacy (SE) and self-care behaviors (r = .39, p < .001)
2	Chan et al. (2020)	To assess the cross-sectional mediation of social support through self-efficacy and diabetes distress for self-care and clinical outcomes	917 adults with T2D	A subsample of the MILES-2 study residing in Australia and accessible to an online survey	i) The Self-care scale (insulin-treated T2D): Confidence in Diabetes Self-Care Scale (CIDS-1) (van der Ven et al., 2003) ii) Self-care scale (non-insulin-treated T2D): Confidence in Diabetes Self-Care Type-2 Scale (CIDS-2) (Polonsky, 2009) iii) Subscales of the SDSCA—healthy diet and exercise (Toobert et al., 2000) iv) Daily frequency of self-monitored blood glucose (SMBG), assessed by asking all participants to respond on a scale ranging from 0 to 8, where 0 indicates "I do not check it every day" and 8 indicates "more than seven times per day."	Positive correlation between (SE) and self-care behaviors (diet, physical activity, and SMBG) for i) T2D non-insulin-treated (r = .543, r = .271, r = .222, p < .05) ii) T2D insulin-treated (r = .532, r = .280, r = .239, p < .05)
3	Dao-Tran et al. (2018)	To study Diabetes Self-Management (DSM), diabetes knowledge, family and friends' support, healthcare providers' support, belief in treatment effectiveness, and	198 adults with T2D	OP clinic for diabetes (tertiary practice) and training hospital in South Vietnam	i) DMSES developed by Sturt et al. (2010) (Vietnamese version) ii) The Diabetes Self-Management Instrument (DSM) (Lin et al., 2008) (Vietnamese version)	Significant positive correlation between SE and DSM (r = .66 p < .01; Spearman's rank correlation)

No.	Authors (year)	Study Aim	Population	Study setting	Variables measured/instruments used	Outcome
		diabetes management self-efficacy and to find DSM's associations				
4	Didarloo et al. (2012)	To find the predictors of self-care behavior	352 adults (only women) with T2D	Diabetic clinic in Khoy, Iran	i) The Self-efficacy of diabetics—subscale of the Extended Theory of Reasoned Action (ETRA) developed by Francis et al. (2004) (Persian version) ii) The SDSCA (Toobert et al., 2000) (Persian version)	A significant association was reported between SE and self-care behaviors (r = .338, p < .05)
5	Kurnia et al. (2017)	To investigate the factors predicting diabetes self-management	127 adults with T2D	Primary health centers (5)—Malang City (East Java, Indonesia)	i) The Self-Efficacy for Diabetes Scale (SED) (Stanford Patient Education Research Center, 2009) (Indonesian version) ii) SDSCA (Toobert et al., 2000) (Indonesian version)	A significant positive correlation exists between SE and self-care behaviors (r = .308, p < .01)
6	Lee & Lin (2009)	To test a theoretical model of variables influencing the relations of trust to both objective and self-rated health	480 adults with T2D	Medical center (1), regional hospital (1), and district hospital (1) (Taiwan)	i) SE: Multidimensional Diabetes Questionnaire (Talbot et al., 1997) (Chinese version) ii) Disease-Specific Adherence Scale developed by Kravitz et al. (1993)	A significant positive correlation exists between SE and Adherence (r = .56, p < .01)
7	Reisi et al. (2016)	To study the relationship between health literacy, self-efficacy, outcome expectations, and diabetes self-care	187 adults with T2D	Diabetes clinic: Hazrat-Ali Health Center (Iran)	i) DMSES developed by Haghayegh et al. (2010) (Persian version) ii) The SDSCA (Toobert et al., 2000)	Significant positive correlation between SE and self-care behaviors (r = .512, p < .01)
8	Tharek et al. (2018)	To find the relationship between self-efficacy,	340 adults with T2D	Public primary care clinics (2) (Malaysia)	i) The DMSES developed by van der Bijl et al. (1999) (Malay version)	A moderate positive correlation was reported between SE and self-care

No.	Authors (year)	Study Aim	Population	Study setting	Variables measured/instruments used	Outcome
		self-care behavior, and glycemic control			ii) The SDSCA (Toobert et al., 2000) (Malaya version)	behaviors (r = .538, p < .001)
9	Wahyuni and Ramayani (2020)	To examine the relationship between self-efficacy and self-care	81 adults with T2D	Internist outpatient hospitals (Bukittinggi West Sumatera, Indonesia)	i) The DMSES (Sturt et al., 2010) (Indonesian version) ii) The SDSCA (Toobert et al., 2000) translated (Indonesian version)	A strong relationship exists between SE and self-care behaviors (r = .731, p < .001)
10	Wainwright et al. (2022)	To explore the relationship between impulsivity and diabetes self-care	50 adults with T2D	Recruited through Qualtrics (an Internet-based survey company)	i) The SED—The Stanford Patient Education Research Center (2016) ii) The SDSCA (Toobert et al., 2000) iii) Three subscales of the Diabetes Care Profile (DCP) (Fitzgerald et al., 1998)	A significant positive correlation exists between SE and SDSCA-blood testing (r = .307, p < .05), SE and SDSCA-diet (r = .646, p < .05), and SE and SDSCA-exercise (r = .742, p < .05) No significant correlation was reported between SE and SDSCA-medication (r = .022)
11	Walker et al. (2014)	To study the effect of self-efficacy on glycemic control, self-care behaviors, and quality of life	378 adults with T2D	Primary care clinics (2) (Southeastern United States)	i) The Perceived Diabetes Self-Management Scale (PDSMS) (Wallston et al., 2007) ii) The Morisky Adherence Scale (Morisky et al., 1986) iii) The SDSCA (Toobert et al., 2000)	Modest correlations exist between SE and medication adherence (r = -.352, p < .001), SE and diet (r = .420, p < .001), SE and exercise (r = .220, p < .001), SE and blood sugar testing (r = .213, p < .001), and SE and foot care (r = .121, p = .032; Spearman's rank correlation)

All included studies used self-report questionnaires to measure the proposed variables. For the "self-efficacy" variable, two studies (Dao-Tran et al., 2018; Wahyuni & Ramayani, 2020) used the Diabetes Management Self-Efficacy Scale (DMSES) developed by Sturt et al. (2010), and three studies (Bohanny et al., 2013; Kurnia et al., 2017; Wainwright et al., 2022) employed scale measuring self-efficacy for diabetes (Stanford Patient Education Research Center, 2008, 2009, 2016).

The remaining six studies used various instruments, namely, the Confidence in Diabetes Self-Care Scale (CIDS-1) and the Confidence in Diabetes Self-Care Type-2 Scale (CIDS-2) developed by van der Ven et al. (2003) and Polonsky (2009), respectively (Chan et al., 2020), a subscale of the Extended Theory of Reasoned Action (ETRA) developed by Francis et al. (2004) to measure the self-efficacy of people with diabetes (Didarloo et al., 2012), the Multidimensional Diabetes Questionnaire by Talbot et al. (1997) (Lee & Lin, 2009), the DMSES Persian version given by Haghayegh et al. (2010) (Reisi et al., 2016), the DMSES developed by van der Bijl et al. (1999) (Tharek et al., 2018), and the Perceived Diabetes Self-Management Scale (PDSMS) by Wallston et al. (2007) (Walker et al., 2014).

To measure adherence to diabetes self-care behaviors, nine studies (Bohanny et al., 2013; Chan et al., 2020; Didarloo et al., 2012; Kurnia et al., 2017; Reisi et al., 2016; Tharek et al., 2018; Wahyuni & Ramayani, 2020; Wainwright et al., 2022; Walker et al., 2014) used either the full scale, subscales, or revised versions of the Summary of Diabetes Self-Care Activities (SDSCA) scale (Toobert et al., 2000). The studies conducted by Chan et al. (2020), Walker et al. (2014), and Wainwright et al. (2022) measured the daily frequency of blood glucose testing, the Morisky Adherence Scale (MAS) (Morisky et al., 1986), and three subscales of the Diabetes Care Profile (Fitzgerald et al., 1996), respectively, along with the SDSCA scale. The remaining two studies (Dao-Tran et al., 2018; Lee & Lin, 2009) used the Diabetes Self-Management Instrument (DSM) by Lin et al. (2008) and the disease-specific adherence scale developed by Kravitz et al. (1993), respectively.

All the included studies provided a correlation between the proposed study variables among adults with T2D. In Wahyuni and Ramayani (2020), the investigation of this association was the main objective, whereas in other studies (Bohanny et al., 2013; Chan et al., 2020; Dao-Tran et al., 2018; Didarloo et al., 2012; Kurnia et al., 2017; Lee & Lin, 2009; Reisi et al., 2016; Tharek et al., 2018; Wainwright et al., 2022; Walker et al., 2014), this correlation was an additional consideration as part of examining the hypothesized model or regression analysis. Two studies used Spearman's correlation to assess the relationship (Dao-Tran et al., 2018; Walker et al., 2014), whereas the other nine studies used Pearson's correlation (Bohanny et al., 2013; Chan et al., 2020; Didarloo et al., 2012; Kurnia et al., 2017; Lee & Lin, 2009; Reisi et al., 2016; Tharek et al., 2018; Wahyuni & Ramayani, 2020; Wainwright et al., 2022).

The included studies reported a significant positive correlation ranging from modest to a strong association between self-efficacy and self-care behaviors (all or at least one). One study assessed the correlation between self-efficacy and the subscales of the SDSCA scale, namely diet and physical activity (exercise), and another scale measured the daily frequency of blood sugar testing (Chan et al., 2020), providing a separate analysis for non-insulin-treated and insulin-treated T2D patients. One study used the subscales of SDSCA, such as diet, physical activity, blood glucose testing, and foot care, along with the MAS (Walker et al., 2014) for correlational analysis. Another study (Wainwright et al., 2022) dropped the foot care subscale of the SDSCA scale from the analysis. Only the medication subscale showed no significant correlation with self-efficacy among the remaining subscales. This study also used three subscales of the DCP (control problem scale, barriers to testing scale, and understanding scale)

in the correlational analysis and reported that increased self-efficacy led to better self-care adherence.

Six studies used the entire SDSCA scale score for the correlational analysis. The remaining two studies used different scales for measuring diabetes self-care behaviors, and both reported a significant positive correlation between the study variables (Dao-Tran et al., 2018; Lee & Lin, 2009). The correlation values (r) of the included studies varied from 0.121 to 0.742. Wahyuni and Ramayani (2020), which exclusively focused on the association between self-efficacy and self-care behaviors, reported a high correlation value ($r = .731$, $p < .001$), indicating a strong positive correlation. Similarly, Wainwright et al. (2022) reported a high correlation value ($r = .742$, $p < .05$) between the self-efficacy and exercise subscales. In contrast, Walker et al. (2014) reported the least correlational value ($r = .121$, $p = .032$) between the self-efficacy and foot care subscale.

The major findings of all the included studies showed that higher self-efficacy led to better adherence to self-care behaviors (all or at least one) among adults with T2D, except for one study (Wainwright et al., 2022), in which the association between self-efficacy and medication adherence (subscale of SDSCA) was not significant. Chan et al. (2020) reported a significant positive correlation between the study variables among adults with non-insulin-treated T2D and insulin-treated T2D. In Walker et al. (2014), the r-value obtained for self-efficacy and medication adherence (MAS) was -.352 ($p < .001$). As a higher score on the MAS indicated poorer adherence, this value indicated higher self-efficacy and better adherence.

Quality appraisal

The strengths and weaknesses of the methodologies of the eleven studies were appraised using the checklist developed by the Joanna Briggs Institute (Moola et al., 2020), as summarized in Table 2. Ten of the selected studies clearly stated the inclusion criteria, study subjects, settings, and methods of measurement (Bohanny et al., 2013; Chan et al., 2020; Dao-Tran et al., 2018; Didarloo et al., 2012; Kurnia et al., 2017; Lee & Lin, 2009; Reisi et al., 2016; Tharek et al., 2018; Wahyuni & Ramayani, 2020; Walker et al., 2014), whereas one study did not (Wainwright et al., 2022). Most of the studies employed objective and standard criteria for the inclusion of participants, except that by Wainwright et al. (2022), which collected data online. The authors of this study mentioned that obtaining glycated hemoglobin (HbA1C) values was logistically difficult for an Internet-based sample. However, the study did not fulfill the objective and standard criteria employed for measurement as per the quality criteria.

All included studies measured the variables validly and reliably and used relevant statistical analyses. Ten studies failed to identify and measure the confounding variables. In one study (Walker et al., 2014), the details provided were unclear. Overall, ten included studies fulfilled six of the eight criteria given in the checklist (Bohanny et al., 2013; Chan et al., 2020; Dao-Tran et al., 2018; Didarloo et al., 2012; Kurnia et al., 2017; Lee & Lin, 2009; Reisi et al., 2016; Tharek et al., 2018; Wahyuni & Ramayani, 2020; Walker et al., 2014), whereas one study (Wainwright et al., 2022) satisfied only two criteria, indicating a lack of strength in its study methodology.

Table 2: Quality Appraisal Using the Joanna Briggs Institute—Appraisal Checklist for Analytical, Cross-Sectional Studies

Quality Criteria	Bohanny et al. (2013)	Chan et al. (2020)	Dao-Tran et al. (2018)	Didarloo et al. (2012)	Kurnia et al. (2017)	Lee and Lin (2009)	Reisi et al. (2016)	Tharek et al. (2018)	Wahyuni and Ramayani (2020)	Wainwright et al. (2022)	Walker et al. (2014)
1. Were the criteria for inclusion in the sample clearly defined?	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y
2. Were the study subjects and the setting described in detail?	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y
3. Was the exposure measured validly and reliably?	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y
4. Were objective, standard criteria used for measurement of the condition?	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y
5. Were the confounding factors identified?	N	N	N	N	N	N	N	N	N	N	U
6. Were strategies stated to deal with the confounding factors?	N	N	N	N	N	N	N	N	N	N	U
7. Were the outcomes measured validly and reliably?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
8. Was appropriate statistical analysis used?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Note: Y = Yes; N = No; U = Unclear; NA = Not Applicable

Discussion

Summary

This analysis primarily aimed to summarize and assess studies that analyzed the relationship between self-efficacy and self-care adherence among persons with type 2 diabetes. Diabetes self-care behaviors are complex and involve different aspects, such as following a recommended diet, medication, physical activity, blood glucose checking, and foot care. Owing to its complexity, adherence to self-care behaviors is a challenging and pivotal aspect of long-term T2D management. The review findings suggest that self-efficacy is positively correlated with self-care behaviors (all or at least one), indicating that adults with higher self-efficacy show better adherence to diabetes self-care behaviors. These findings support earlier studies that demonstrated a significant relationship between the proposed study variables among individuals with T2D and highlight the crucial role played by self-efficacy in the long-term management of T2D (Amer et al., 2018; Karimy et al., 2018; Sharoni & Wu, 2012; Wang & Shiu, 2004).

All the reviewed studies used a self-efficacy scale specific to diabetes management; therefore, their consistent outcomes supported Bandura's (1997) concept of self-efficacy, which states that people perform a task they feel capable of and avoid tasks that tax their capabilities. This result signifies the necessity of understanding self-efficacy from the standpoint of a specific task to address the possibilities of adherence to that task. Thus, the review findings provided better insights into the specificity aspect of self-efficacy but lacked a subtle exploration of this variable for the T2D population. Hence, in the future, approaches such as the "Health Action Process Approach (HAPA)," which emphasizes the crucial role of phase-specific self-efficacy in the process of adoption, initiation, and continuation of healthy behaviors, may emerge useful for better self-care adherence (Schwarzer, 2008; Schwarzer et al., 2011).

Only Wahyuni and Ramayani (2020) explored the relationship between self-efficacy and T2D diabetes self-care behaviors as its main objective; the remaining studies included self-efficacy and various other psychosocial factors influencing diabetes self-management. This finding indicates that although several studies revealed the vital role of self-efficacy in the management of T2D, few studies focused exclusively on these study variables and the need for more empirical data on their association. More studies elucidating the association between the proposed study variables will provide a stronger basis for developing efficacious interventions addressing the specific aspect of self-efficacy among persons with T2D, the necessity of which is highlighted in this review.

Limitations

This analysis was subject to several limitations. The study variables were measured using self-report questionnaires, which may have led to the problems of desirability and recall bias—especially for self-care behaviors that change daily. The inquiry, therefore, posed challenges to obtaining objective measurements, ultimately influencing the study outcome. Only three of the included studies also provided an association between individual self-care activities and self-efficacy. In contrast, the remaining eight studies analyzed self-care behaviors as a total score.

The limitations of the review process are as follows. As the data of the included studies were heterogeneous owing to the use of different instruments for measuring the study variables and the heterogeneous methodologies adopted, a meta-analysis could not be conducted. Additionally, this review only included articles published in English and identified through three specific search databases. Therefore, studies addressing this review's objective but published in other languages or journals not included in the selected databases could have been missed during the search process.

Moreover, this review has three important delimitations. First, it included only cross-sectional studies and was thus unable to establish a causal relationship between the study variables. Next, it lacked data over a period, which is essential to understand the nature of the long-term association between the study variables, especially because T2D is a chronic illness. Finally, this review assessed the association between the proposed study variables using only the correlation coefficient (r). Moreover, evidence from the other analyses of this association, which could have had different outcomes, was not considered.

Strengths

This review executed a comprehensive search following the PRISMA guidelines (Page et al., 2021) and synthesized the literature assessing the association between self-efficacy and adherence to self-care in T2D patients. Most of the included studies were published recently (from 2009 to 2022), providing an overview of the latest developments in the field. While most other studies have investigated only as an additional outcome, this review attempted to exclusively explore the correlation between the study variables as the primary outcome. Thus, the summary of the studies selected for this review is useful in assessing the present scenario in terms of the study variables and highlights the necessity of planning interventions addressing self-efficacy and self-care adherence among individuals with T2D.

Implications

Type 2 diabetes is a lifestyle disorder, and its management involves adherence to recommended health behaviors. The review findings provide insights into the essentiality of considering the role played by self-efficacy in the long-term engagement of diabetes self-care behaviors. Continuous motivation to follow a disciplined routine of T2D management is pivotal in avoiding diabetes-related complications. This motivation greatly depends on an individual's confidence in their capacity to accomplish a particular task, known as self-efficacy. Although this understanding has gained importance, it is essential to highlight the significance of maintaining and initiating health behaviors. Most studies measured self-efficacy as a global score, undermining the need to gauge phase-specific self-efficacy to improve self-care adherence.

Moreover, only a few studies formulated on the HAPA model have attempted to explore self-efficacy by functionally categorizing the concept (Rodgers & Sullivan, 2001; Scholz et al., 2005; Schwarzer, 2008; Schwarzer et al., 2011; Schwarzer & Renner, 2000). Thus, exploring such subtle understandings of self-efficacy and adherence to health behaviors is necessary using empirical evidence and clinical trials based on the T2D population. It is essential to give prominence to maintenance and recovery self-efficacy rather than focusing only on task self-efficacy as, for this chronic illness, non-adherence is a major issue faced by the health system.

Therefore, future research must develop interventions to enhance the different aspects of self-efficacy required for specific health outcomes among this population.

Psychosocial interventions targeting self-efficacy should be an inseparable component of diabetes control treatment regimens. Although several past and recent studies based on autonomy motivation and support have shown the importance of promoting self-efficacy for the long-term maintenance of diabetes management (Anderson et al., 2009; Chen et al., 2022; Funnell et al., 2007; Lee et al., 2019; Sallay et al., 2021; Tang et al., 2005), few studies have explored the nuances of phase-specific self-efficacy and their influence on self-care behaviors among the T2D population. Recently, Ranjbaran et al. (2020) reported a significant association between task self-efficacy, maintenance self-efficacy, and medication adherence among individuals with T2D, reflecting the need for more studies to examine the various facets of self-efficacy and predict different self-care activities involved in diabetes management.

A systematic review by Jiang et al. (2019) revealed the utility of self-efficacy-based interventions in improving adherence to health behaviors in the diabetic population. Similarly, behavioral and motivational interventions have been found to increase self-efficacy, resulting in improved health behavior adherence among T2D patients (Ali Morowatisharifabad et al., 2018; Rollnick et al., 2008; Selçuk-Tosun & Zincir, 2019; World Health Organization, 2003). Thus, clinical trials focusing on interventions designed to address the functionally distinct self-efficacy required for performing and maintaining specific diabetes self-care behaviors may become inevitable in the coming years, considering its disease burden.

Another approach that can be considered is peer-based intervention. A recent meta-analysis by Liang et al. (2021) provided strong evidence for this approach in a population with T2D. Peer-based interventions effectively enhance self-efficacy and self-care adherence using vicarious learning, verbal persuasion (Cai & Hu, 2016; Shi et al., 2010; Wichit et al., 2017), and goal setting (Lakerveld et al., 2020; Miller & Bauman, 2014) as major strategies. Therefore, in the future, more such group interventions must be developed by incorporating the participants' active involvement in the process of sharing experiences and strategies used to overcome non-adherence, as well as goal setting, thereby leading to enhanced self-efficacy and improved health behavior adherence.

All these approaches may provide an answer to the question of how overall adherence to a complex set of self-care activities can be accomplished by addressing self-efficacy for diabetes management among T2D patients. Considering the global relevance of diabetes management and the significant role played by self-efficacy in the process of adherence to self-care, it may be necessary to conceptualize future interventions for the specific self-efficacies in the performance and maintenance of self-care activities that an individual finds it challenging to adhere to on a long-term basis. Therefore, it is necessary to design and test individually tailored approaches that work better with certain self-care activities and develop a combination of interventions specific to each person's needs, capacities, and illness conditions.

Conclusions

The reviewed studies provide evidence supporting a significant association between self-efficacy and self-care adherence among the T2D population. However, they also demonstrate the need for more evidence-based studies with a high-quality methodology involving the

standardized measurement of the study variables, well-designed and theoretically strong interventions, identification and measurement of confounding variables, and an in-depth assessment of personal and cultural aspects specifically influencing the different phase-specific self-efficacy and adherence to diabetes self-care activities. Thus, they prove that enhanced self-efficacy is a crucial component of prolonged self-care adherence in this population.

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