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Meta-Analysis

The Role of Knowledge, Self-Efficacy, and Social Support in Self-Care Behaviors among Diabetic Patients: A Meta-Analysis

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ABSTRACT

Background: Diabetes mellitus is recognized as one of the emerging public health problems globally, in which the number of cases and prevalence have been steadily increasing over the past few decades. To reduce the burden posed to health systems and afflicted individuals, patients need to adopt self-care practices. At the same time, some studies found knowledge, self-efficacy, and support were essential. Hence, this meta-analysis aimed to assess these predictors of self-care behaviors among diabetic patients.
Subjects and Method: This meta-analysis followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement. We conducted a systematic search in electronic databases for observational studies about knowledge, self-efficacy, and family or social support for diabetic self-care behaviors published between 2012 and 2022. The Joanna Briggs Institute's Critical Appraisal tool was used. For statistical analysis such as I-squared and Begg and Egger's tests, the Review Manager (RevMan) 5.3 software was employed. Tables and forest plots were presented with 95% confidence intervals (CI). Statistical significance was declared at a p-value < 0.05.
Results: Twelve studies with 5,482 participants were included. Good self-care behaviors were significantly associated with adequate diabetic knowledge (AOR= 2.22; 95% CI= 1.24 to 3.98; p= 0.007) and having family or social support (AOR= 2.5; 95% CI= 1.98 to 3.16; p<0.001), whereas poor self-efficacy was a significant predictor of poor self-care behaviors (AOR= 2.46; 95% CI= 1.66 to 3.65; p<0.001).
Conclusion: Diabetic knowledge, self-efficacy, and family or social support are essential correlates and predictors of self-care behaviors. Researchers, healthcare professionals, third-sector organizations, and policymakers can use these findings to re-evaluate.

Keywords: diabetes, self-care behaviors, knowledge, self-efficacy, social support, meta-analysis

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BACKGROUND

Non-communicable diseases (NCDs) appear to be the world's leading health issue, killing 41 million people each year, accounting for 71% of deaths globally (WHO, 2021a). One of the four significant NCD deaths is diabetes mellitus (DM), a metabolic illness with numerous etiologies that are defined by abnormally increased blood glucose levels due to carbohydrate, lipid, and protein metabolism problems, which leads to severe damage to the heart, blood vessels, eyes,

kidneys, and nerves over time (WHO, 2021b).

Approximately half a billion people worldwide are affected by diabetes, with the vast majority living in low and middle-income countries, and it directly causes 1.5 million deaths each year. Both the number of cases and the prevalence have been steadily increasing over the past few decades (WHO, n.d.) due to environmental and sedentary lifestyle changes, in addition to the aging of populations (Kolb & Martin, 2017).

Diabetes can have a significant impact on an individual's physical, psychological (Lloyd, 2019), and material well-being, as well as on health systems and national economies through direct medical costs and lost earnings. It's also a significant difficulty for healthcare workers (Roglic & World Health Organization, 2016). To reduce the burden posed to health systems and afflicted individuals, patients need to adopt certain diabetes self-care behaviors (Ketema et al., 2020), which in some studies are essential (Bonger et al., 2018).

Diabetes's self-care behaviors are dynamic and cognitive practices that include nutritious food, physical activity, blood glucose monitoring, medication compliance, and healthy coping skills (American Diabetes Association, 2020). A sentimental intervention tries to enhance self-care adherence by offering emotional support and encouragement for recent diet and exercise treatments through a lifestyle "tutor" to help people adhere to the new habits (Bonger et al., 2018).

Perceptions of diabetes and self-care practices affect their adoption and maintenance. A previous study indicated patients' knowledge and longer duration of diabetes, high social support, high perceived severity, and high self-efficacy contributed to good self-care behaviors, whereas comorbidities, high perceived benefit, and high perceived barrier were associated with poor self-care practices (Melkamu et al., 2021).

As a result of the variability of findings across previous studies, a comprehensive pooled perception of diabetes self-care is required. Therefore, this meta-analysis was undertaken to assess the role of knowledge, health belief model constructs (self-efficacy particularly), and social support in describing self-care behaviors among diabetic patients.

SUBJECTS AND METHOD

1. Study Design

This meta-analysis followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement (Page et al., 2021). We did not seek approval from the Institutional Review Board because it only retrieved summary information from previously published studies.

2. Search Strategy

A comprehensive systematic search for all relevant studies was carried out in the Cochrane Library, Google Scholar, PubMed, Research Gate, Science Direct, and Scopus confined to freely available full text and published between 2012 and 2022. The search string used includes "Health Belief Model"[Mesh] OR "health belief model*" [tw] OR "health belief*"[tw] OR self-efficacy [tw] AND "family support"[tw] OR "social support"[tw] AND knowledge [tw] AND "Diabetes Mellitus"[Mesh] OR diabetes[tw] OR diabetic[tw] AND "Self Care"[Mesh] OR "self-care practice*"[tw] OR "self-care behavior*" OR "self-care behaviour*"[tw] OR self-management[tw] AND AOR. The Boolean operators "AND" and "OR" were applied to combine the query terms correctly.

3. Selection of Studies

The titles and abstracts were screened over after removing duplicate citations. We

omitted publications that did not report quantitative observational studies and weren't primary articles. Reviews, guidelines, and conference abstracts were also left out.

The full texts of citations that reviewers thought would be suitable were examined further, with the following qualifications: studies involving all diabetic patients, published and unpublished articles, and observational studies with interventions such as adequate diabetic knowledge, poor self-efficacy, and having family or social support, whereas, for comparison, they were inverted. As an outcome, self-care behaviors or practices have emerged.

Despite the preset eligibility criteria, articles for which we could not access the full-text after email contact with the principal investigator of the particular study were excluded from the final analysis.

4. Study Variables

a. Dependent variable

Diabetes self-care behaviors: Activities that a diabetic patient initiates and performs on their own to control the disease and maintain life, health, and well-being include self-monitoring of blood glucose (SMBG), foot care, dietary management, physical exercise, and medication adherence (Toobert et al., 2000).

b. Independent Variables

Diabetic knowledge: Knowledge about diet, exercise, blood glucose levels, testing, and self-care activities (Fitzgerald et al., 1998).

Perceived self-efficacy: Concerned with people's beliefs in their capabilities to produce given attainments (Bandura, 1997).

Family or social support: Surroundings that provide additional support and potentially reduce complications due to good self-care practice (Wichit et al., 2017).

5. Data Extraction and Quality Assessment

One author (ANS) performed abstraction using a pre-piloted data extraction format generated in Microsoft Excel. The first author's name, publication year, country, study design, DM type, intervention, comparison, sample size, and effect measure reported outcome (95% confidence interval) were all collected from each study.

Then, the quality of each article was assessed by applying the Joanna Briggs Institute Critical Appraisal tool developed by the University of Adelaide (Joanna Briggs Institute, 2017). One author (ANS) identified, retrieved, and checked all eligible articles step-wise based on titles, abstracts, and full texts and evaluated the methodological quality.

6. Statistical Analysis

Articles were processed using the Review Manager (RevMan) 5.3 tool, which calculated effect size and heterogeneity to define the combined research model and conclude the meta-analysis. The I-squared statistic was used to examine heterogeneity in the included publications when its values were 25, 50, or 75%, indicating low, moderate, or high heterogeneity (Rücker et al., 2008). A p-value of less than 0.05 was considered to reveal the significance. In this paper, values of I^2>50% will be adjusted using a random-effects analysis model to account for the observed variability; otherwise, a fixed-effects model was employed (Mourad, 2019). Results were presented using tables and forest plots with 95% confidence intervals (CI). Furthermore, funnel plot visualization was done to investigate possible publication bias. The Begg and Egger weighted regression technique was used to find it (Barendregt et al., 2013).

RESULTS

1. Selection and Identification of Studies

Electronic databases yielded a total of 377 articles. Using Mendeley, titles and abstracts were evaluated and duplicated, or irrelevant articles were removed. As a result, 16 duplicate reports were eliminated from the database. Two hundred twenty-eight publications were rejected from the remaining 361 because their titles and abstracts were irrelevant. As well, 121 articles did not meet our inclusion criteria (full-text assessed). Finally, this meta-analysis contained 12 publications in total. Figure 1 depicts the comprehensive selection procedures.

The characteristics of the studies that were considered are shown in Table 1. They were published from 2018 to 2021 and gathered from all over Ethiopia, with a sample size of 47–392 cases per study.

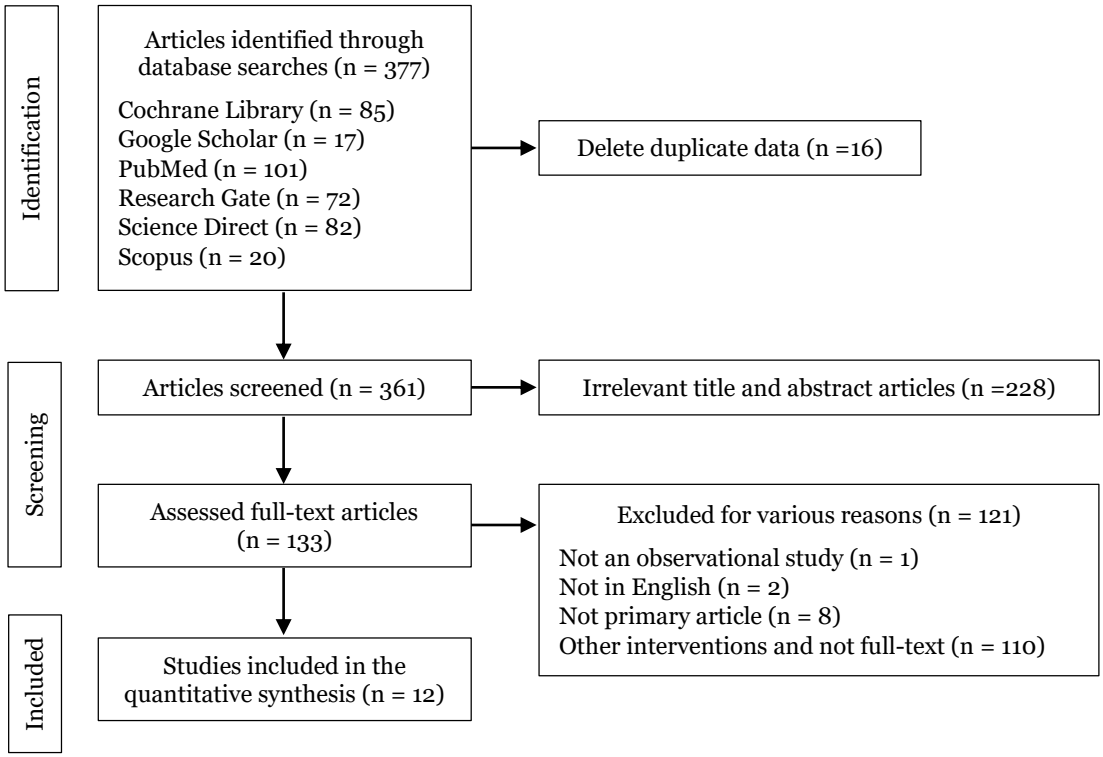

Figure 1. Results of the PRISMA Flow Diagram

2. Quality Assessment

Assessment of the quality of articles using a critical appraisal tool for a cross-sectional study design is shown in Table 2.

3. Results of Meta-Analysis

a. Diabetic Knowledge

In Figure 2, it can be seen that there is significant high heterogeneity (I^2= 75%; p=0.007), so the forest plot data analysis used a random effect model. The results showed that patients with adequate diabetic knowledge had 2.22 times higher self-care behaviors (AOR= 2.22; CI95% 1.24 to 3.98; p=0.007) than patients with inadequate diabetic knowledge.

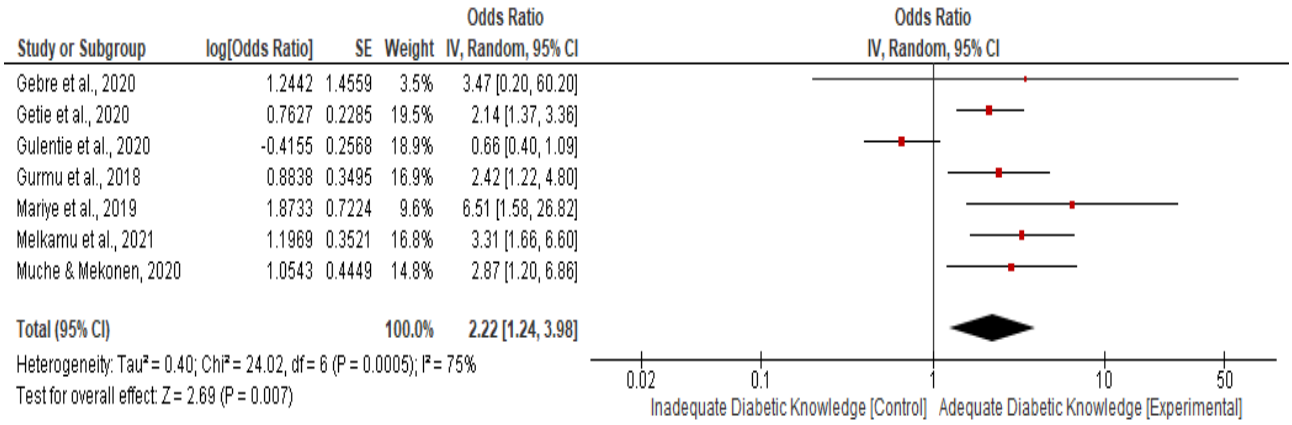

Figure 2. The Forest Plot of Diabetic Knowledge to Good Self-Care Behaviors

Then, Figure 3 shows the funnel plot with a publication bias, characterized by an asymmetric distribution of the estimated results of the preliminary study. The mismatch in the distance between studies on the right and left sides of the funnel plot indicates this.

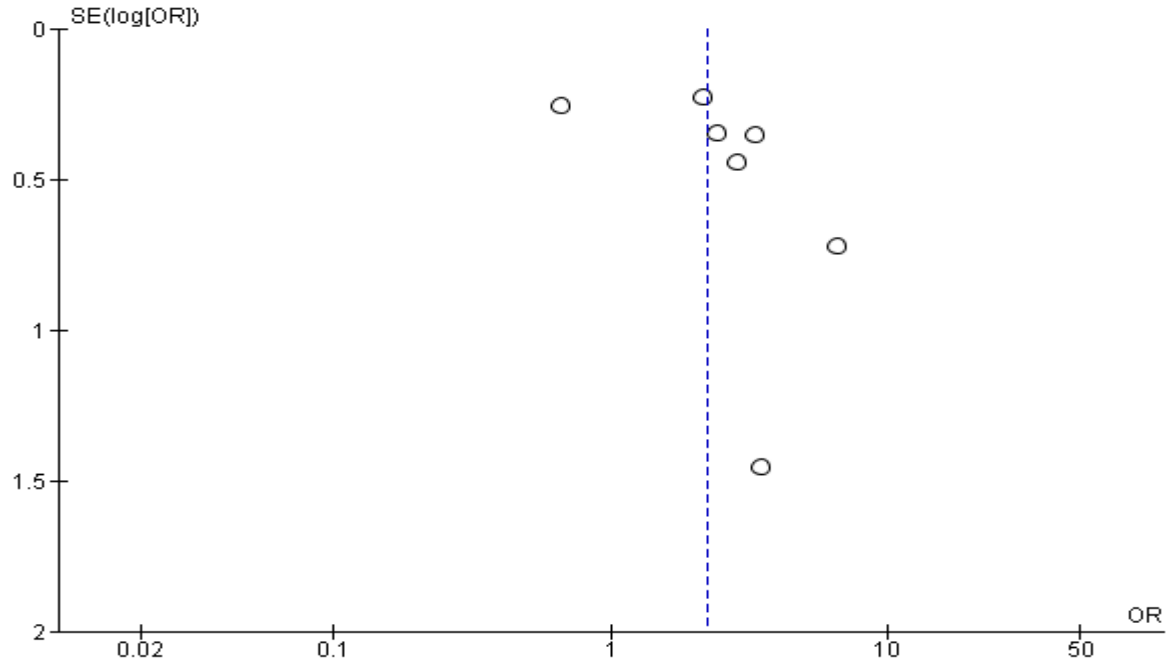

Figure 3. The Funnel Plot of Diabetic Knowledge to Self-Care Behaviors with a Publication Bias

b. Perceived Self-efficacy

As described in the forest plot (Figure 4), significant low heterogeneity was observed (I^2= 16%; p<0.001), and there was no evidence of publication bias that can be seen in Figure 5. For patients who had poor self-efficacy, the odds of poor self-care behaviors were 2.46 times higher (AOR= 2.46; CI95% 1.66 to 3.65; p<0.001) than for those who had good self-efficacy.

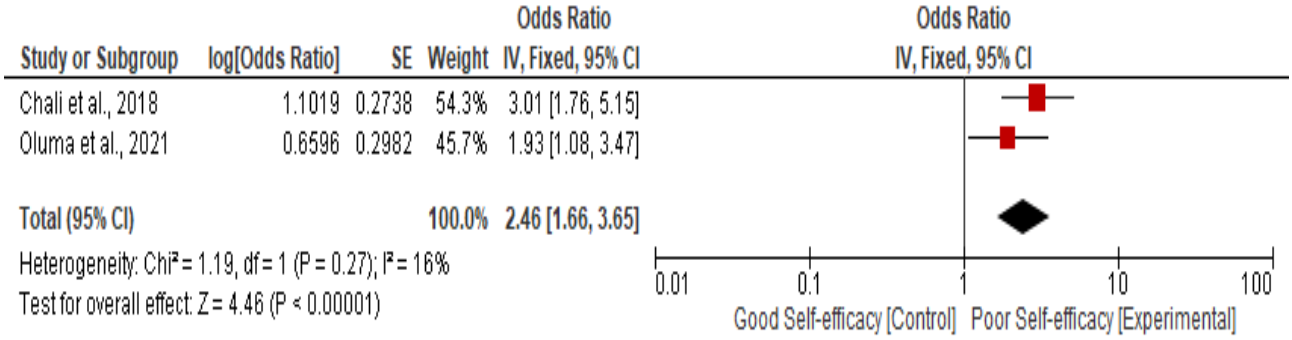

Figure 4. The Forest Plot of Self-Efficacy and Poor Self-Care Behaviors

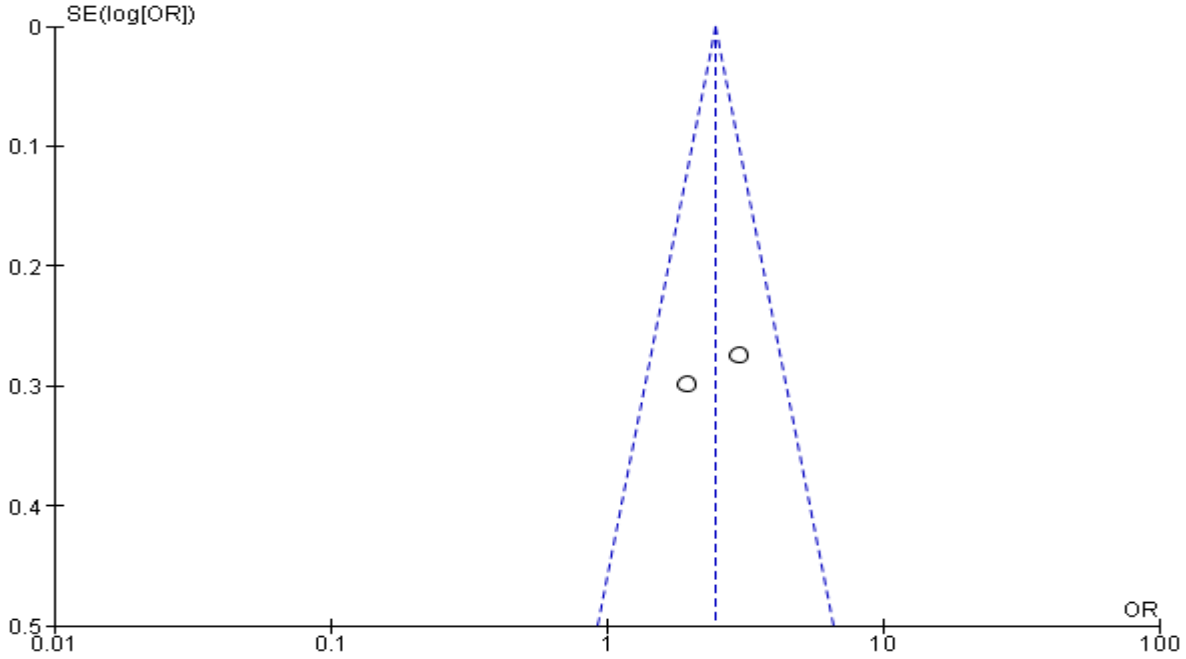

Figure 5. The Funnel Plot of Self-Efficacy to Self-Care Behaviors without a Publication Bias

c. Family or Social Support

A forest plot in Figure 6 indicates significant homogeneity between studies using the fixed-effect model (I^2= 0%; p<0.001), but Figure 7 shows the funnel plot with a publication bias. The result demonstrates that patients with family or social support are 2.5 times more likely than their counterparts to practice good self-care behaviors (AOR= 2.5; CI95% 1.98 to 3.16; p<0.001).

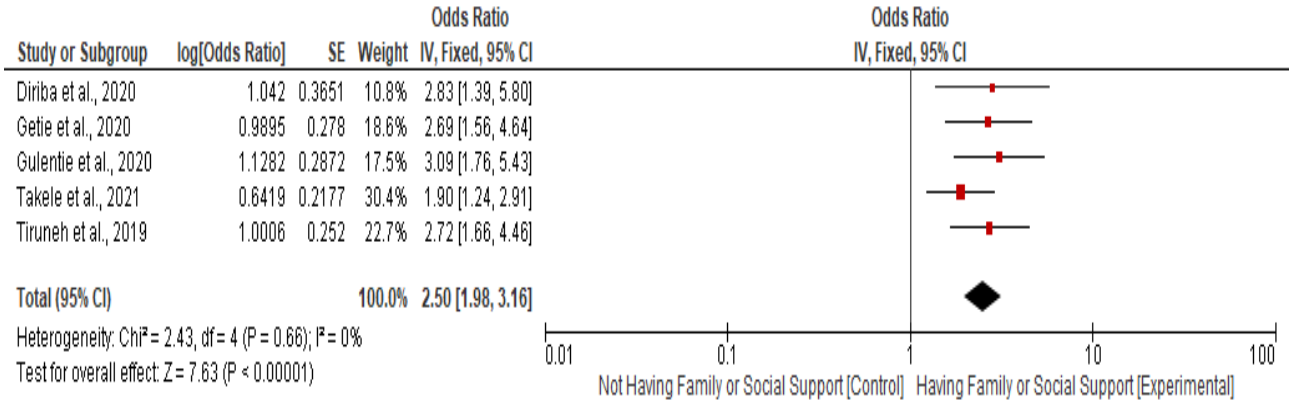

Figure 6. The Forest Plot of Family or Social Support and Good Self-Care Behaviors

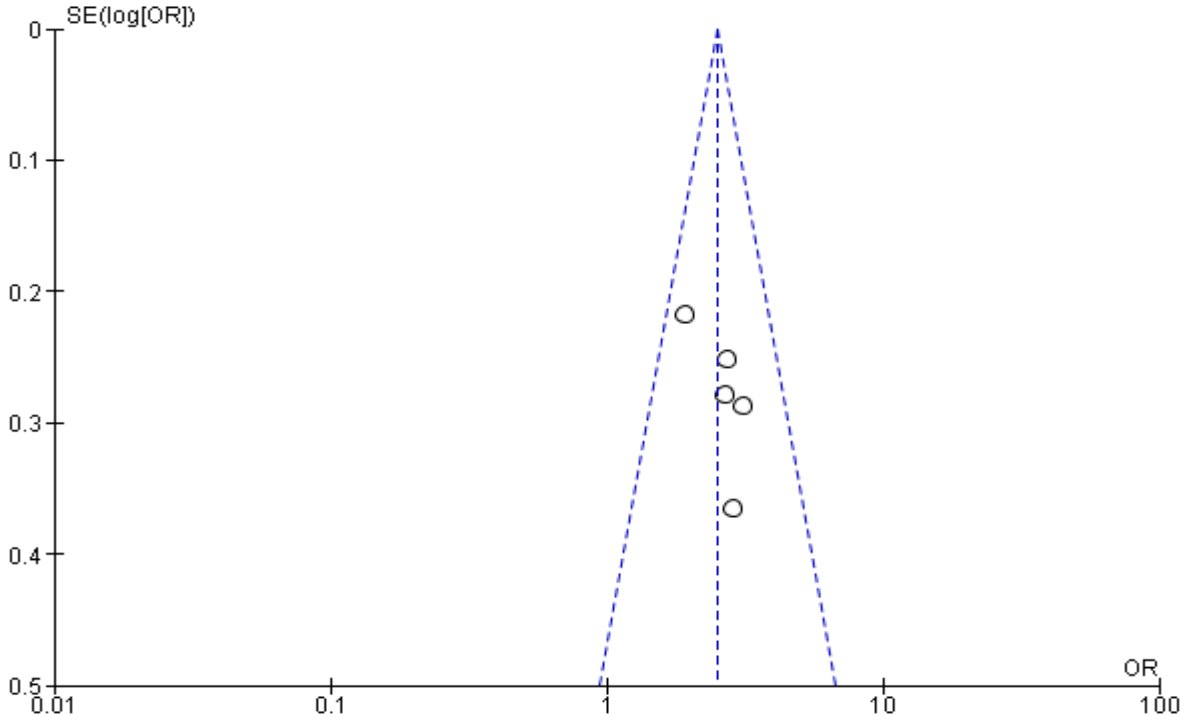

Figure 7. The Funnel Plot of Family or Social Support and Self-Care Behaviors with a Publication Bias

Table 1. A Summary of the Characteristics of the Included Studies on Diabetic Patients' Self-Care Behaviors

No.	Author, Year of Publication, and Country	Study Design	Population	DM Type	Intervention and Comparison	Sample Size	Effect Measure Reported Outcome AOR (95% CI)
1	(Chali et al., 2018) Ethiopia	Cross-sectional	383 diabetic patients who were on diabetic follow-up at Benishangul Gumuz public hospital	I and II	I: Poor self-efficacy C: Good self-efficacy	180 203	3.01 (1.76, 5.12)* 1.00
2	(Diriba et al., 2020) Ethiopia	Cross-sectional	398 diabetic patients attending diabetic centers and wards of the study hospitals	I and II	I: Having family support C: Not having family support	126 58	2.83 (1.38, 5.80)* 1.00
3	(Gebre et al., 2020) Ethiopia	Cross-sectional	405 diabetes mellitus patients at the outpatient DM clinic of Debre Berhan referral hospital (DBRH)	I and II	I: Adequate diabetic knowledge C: Inadequate diabetic knowledge	172 233	3.47 (0.20, 4.29) 1.00
4	(Getie et al., 2020) Ethiopia	Cross-sectional	513 adults with diabetes who had one-year follow-up and came into diabetic clinics	I and II	I: Good knowledge of diabetes C: Poor knowledge of diabetes I: Having family support C: Not having family support	271 235 392 114	2.14 (1.37, 3.34)* 1.00 2.69 (1.56, 4.62)* 1.00
5	(Gulentie et al., 2020) Ethiopia	Cross-sectional	403 type 2 DM patients	II	I: Diabetes knowledgeable C: Less knowledgeable about diabetes I: Having social support C: Not having social support	232 171 252 151	0.66 (0.39, 1.10) 1.00 3.09 (1.76, 5.4)* 1.00
6	(Gurmu et al., 2018) Ethiopia	Cross-sectional	257 adult diabetes patients on follow-up care	I and II	I: Better knowledge about diabetes C: Less knowledge about diabetes	137 120	2.42 (1.22, 4.80)* 1.00
7	(Mariye et al., 2019) Ethiopia	Cross-sectional	273 DM patients who visit general public hospitals in the central zone	I and II	I: Good knowledge regarding DM C: Poor knowledge regarding DM	226 47	6.51 (1.58, 26.72)* 1.00
8	(Melkamu et al., 2021) Ethiopia	Cross-sectional	396 diabetic patients who had at least six months of regular follow-up	I and II	I: Good knowledge of DM C: Poor knowledge of DM	228 159	3.31 (1.66, 6.60)* 1.00
9	(Muche & Mekonen, 2020) Ethiopia	Cross-sectional	422 diabetic patients who were attending chronic outpatient department	I and II	I: Good knowledge of hypoglycemia prevention C: Poor knowledge of hypoglycemia prevention	327 95	2.87 (1.2, 6.8)* 1.00
10	(Oluma et al., 2021) Ethiopia	Cross-sectional	1280 patients with diabetes on follow-up and receiving diabetic medications	Unclear	I: Poor self-efficacy C: High self-efficacy	120 278	1.93 (1.07, 3.46)* 1.00
11	(Takele et al., 2021) Ethiopia	Cross-sectional	570 patients with type 2 diabetes	II	I: Patients with family or social support C: Patients without family or social support	321 249	1.9 (1.24, 2.85)* 1.00
12	(Tiruneh et al., 2019) (Ethiopia	Cross-sectional	405 type 2 diabetes patients who had diabetes follow-up	II	I: Having social support C: Not having social support	229 156	2.72 (1.66, 4.47)* 1.00

Table 2. Quality Assessment of Research

No.	Criteria	Primary Study (Chali et al., 2018)	(Diriba et al., 2020)	(Gebre et al., 2020)	(Getie et al., 2020)	(Gulentie et al., 2020)	(Gurmu et al., 2018)	(Mariye et al., 2019)	(Melkamu et al., 2021)	(Muche & Mekonen, 2020)	(Oluma et al., 2021)	(Takele et al., 2021)	(Tiruneh et al., 2019)
1	Were the criteria for inclusion in the sample clearly defined?	1	1	1	1	1	1	1	1	1	1	1	1
2	Were the study subjects and the setting described in detail?	1	1	1	1	1	0	1	1	1	1	1	1
3	Was the exposure measured in a valid and reliable way?	1	1	1	1	1	1	1	1	1	1	1	1
4	Were objective, standard criteria used for the measurement of the condition?	1	1	1	1	1	1	1	1	1	1	1	1
5	Were confounding factors identified?	1	1	1	1	1	1	1	1	1	1	1	1
6	Were strategies to deal with confounding factors stated?	1	1	1	1	1	1	1	1	1	1	1	1
7	Were the outcomes measured in a valid and reliable way?	1	1	1	1	1	1	1	1	1	1	1	1
8	Was appropriate statistical analysis used?	1	1	1	1	1	1	1	1	1	1	1	1
	Overall Appraisal	**8**	**8**	**8**	**8**	**8**	7	**8**	**8**	**8**	**8**	**8**	**8**
							Include						

DISCUSSION

Although DM is not curable, prevention, delay, and living a healthy life are possible (Ducey et al., 2018). It needs diabetic patients' dedication to recommended self-care behaviors in multiple domains and relevant health services delivered by the healthcare systems (Fink et al., 2019). Therefore, this study provided an insight into the role of knowledge, health belief model constructs (especially self-efficacy), and social support in describing self-management practices among diabetic patients.

The present meta-analysis reports on 12 cross-sectional studies, most of which are potentially powered by good methodological quality. The pooled effect sizes reveal statistically significant differences in two interventions' homogeneity and one intervention's heterogeneity, as well as possible publication bias.

Our results have shown that those predictors are essential and correlate. These findings corroborate previous international primer studies. Evidence suggests that possessing higher diabetes-related knowledge and social support likely improves self-efficacy for self-care behaviors (Gurmu et al., 2018). Recently, the efficacy of care has been understood to be a critical part (Azami et al., 2018) in line with this study. Patients with poor self-efficacy had higher odds of poor self-care practices than those with good self-efficacy.

According to another meta-analysis, providing social support is beneficial for diabetes self-care (Captieux et al., 2018). It gives people the confidence to take an active role in all aspects of their disease management and health behaviors in partnership with their care providers. It is accompanied by providing adequate knowledge regarding diabetes self-care practices. If the barriers exist, diabetes educators should be aware of each subscale of self-care practices and offer their patients choice and support to overcome them (Wolderufael & Dereje, 2021). It can be helpful to achieve better diabetes control.

Implementing an adaptable self-care strategy that provides individualized, long-term self-management assistance for people with diabetes throughout their diabetes journey would necessitate a whole-systems approach involving researchers, healthcare professionals, third-sector organizations, and policymakers. Existing assets must be identified, and new services designed where gaps exist.

This review has several limitations. Our findings might be vulnerable to selective reporting of the outcome because we did not search all available medical journals and, as a result, sourced from only one country. In addition, some studies may be over-represented in the synthesis.

ABBREVIATIONS

AOR, Adjusted Odds Ratio; CI, Confidence Intervals; DM, Diabetes Mellitus; I^2, I-squared; NCD, Non-Communicable Disease; PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses; RevMan, Review Manager; SMBG, Self-Monitoring of Blood Glucose; WHO, World Health Organization.

AUTHOR CONTRIBUTION

ANS initiated the idea for the study, led the development of the protocol, study administration, and systematic reviewer who undertook to search, select papers, and undertake data extraction, data analysis, and interpretation of results. DN also launched the search and selection of documents. All authors had full access to all the data.

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CONFLICT OF INTEREST

The authors declare that they have no competing interests.

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