

# **The Effect of Instructional WhatsApp App Group on Self-Care and HbA1c for Female Patients with Type 2 Diabetes: Scoping Review**

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## Abstract

**Background and Aim:** Diabetes is one of the most common diseases cause of mortality and morbidity worldwide, if inadequately treated, multiple chronic complications leading to disability and death will be developed. The critical element to keeping diabetes under control is patients' self-care management practice. Health education should be targeted toward improvement in the patients' health through the use of different health education measures like WhatsApp and social media. The main aim of this paper is to identify the effect of the instructional WhatsApp group on self-care and HbA1c for female patients with type 2 diabetes in the light of previous studies.

**Methods:** Studies published in the years 2018 - 2022 were evaluated. PubMed, CINAHL, and MEDLINE were explored to find articles written in the English language using relevant keywords. All quantitative studies which focused on the specific topic have been searched as well.

**Findings:** In this paper, 496 articles were searched. After checking for duplicates and clarity, 239 were excluded and 257 papers were left for evaluation of titles and abstracts. Then, 47 articles were left for full texts. Of these, 15 report was removed due to poor quality, and 12 did not correspond with this study. Hence, 14 studies were included in the present review.

**Conclusion:** The use of the WhatsApp group with patients who have diabetes mellitus led to improvement in their self-care and glycosylated hemoglobin. It is recommended to adopt the method of WhatsApp groups and different social media to enhance self-care and improve the level of HbA1c.

**Keywords:** *Diabetes, WhatsApp app, educational, self-care, HbA1c.*

## 1. Introduction

Diabetes mellitus (DM) is a chronic disease affecting millions of individuals worldwide and impacting patients' quality of life, often leading to morbidity and mortality (Kitsiou et al., 2017). According to International Diabetes Federation Atlas (2021), the incidence of diabetes mellites is increased worldwide in the last few decades, diabetes is responsible for 6.7million death in 2021, one every five seconds(Sun et al., 2022). The change in lifestyle and economic growth negatively affect the population, contributing to decreased physical activity and increased obesity, the main factor for increasing diabetes worldwide (Alanzi, 2018).

Globally, previous studies reported that diabetes self-management education improves glycosylated hemoglobin (HbA1c) levels and reduces the risk of life-threatening complications (Quinn et al., 2018). Diabetes self-management education(DSME) reinforces lifestyle modification as part of diabetes management (Powers et al., 2020). However, patients with diabetes face many obstacles adhering to traditional self-management education protocols, such as lack of information about potential benefits of education, absence of personalized instruction, diabetes education costs, and time limitations (Kitsiou et al., 2017).

The frequent use of Information and Communication Technologies presents an excellent capacity for promoting self-care in diabetes, such as mobile phones, which offer a Short Message Service (SMS); this service provides individuals with constant reminders about self-care practices from the health care providers. The growing interest in SMS as an educational methodological strategy has improved self-care through ease of communication (Abaza & Marschollek, 2017; Fortmann et al., 2017). Despite the expanding use of mobile text messaging, there is still a lack of knowledge on the optimal way to create and deliver mobile text messages that could stimulate behavior change (Muench & Baumel, 2017). Previous research so far provided mixed evidence for the moderators of the influential text messaging interventions such as frequent messaging, infrequent messaging, one-way messaging, two-way messaging<sup>8</sup>, and using multimodalities [text messaging, WEB portal, assessment devices, etc.] (Kitsiou et al., 2017).

## Aim of the review

This scoping review aims to identify the recent relevant evidence related to the effect of the instructional WhatsApp group on self-care and HbA1c for female patients with type 2 diabetes.

## 1.2. Methodology

The review was guided by (Arksey & O'Malley, 2005) which consists of five stages as follows: stage one: Identifying the research question, stage two: Identifying relevant studies, stage three: study selection, stage four: Charting the data, stage five: collating, summarizing and reporting the results.

### 1.2.1. PICO Question

The PICO question format was used to identify the research question. The question was as follows "Among female patients with type 2 diabetes, how does the instructional WhatsApp group affect self-care and HbA1c?"

PICOT	CONTENT
<b>P</b>	Female patients with type 2 diabetes
<b>I</b>	The instructional through WhatsApp
<b>C</b>	Usual care
<b>O</b>	Self-care and HbA1c

### 1.2.2. Search Strategy

Different electronic databases were searched, including PubMed, CINAHL, and MEDLINE using the following keywords: diabetes mellitus, type 2 diabetes, instructional, education, impact, effect, WhatsApp, social media, mobile applications, text message, self-care, self-management, HbA1c, glycemic control, with further developed grouping and combining terms using Boolean operators (and, or, not).

## **Inclusion and exclusion criteria**

Studies were reviewed against pre-determined inclusion and exclusion criteria for eligibility in the final analysis. The inclusion criteria include:

- Articles available in the English language, published between the period 2018 to 2022.
- Articles that focus on education for patients with type two diabetes.
- The studies which evaluate the effect of education on self-care and/or HbA1c.

Exclusion Criteria include:

- Articles that focus on gestational diabetes and type one diabetes.
- Articles that are not in full text.

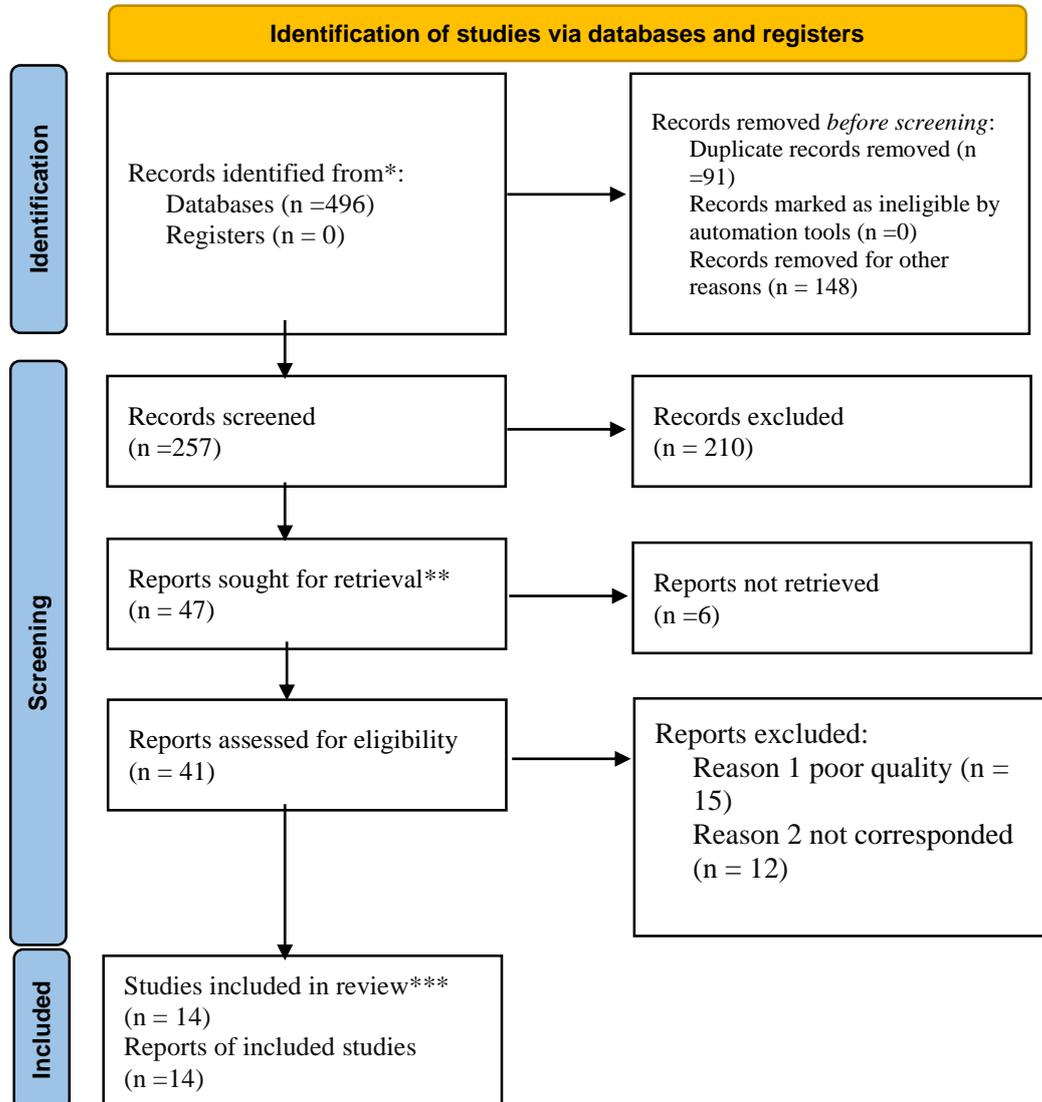
### **1.2.3 Study selection process:**

Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA 2020 flow diagram) screened the identified literature. In PRISMA, there are three phases: identification, screening, and inclusion. Inclusion and exclusion criteria were developed to guide the study selection and screening process.

A total of 496 articles from different electronic databases were retrieved, CINAHL=180, PubMed = 188, MEDLINE = 121; additionally, seven articles were founded in Google Scholar. Each database produces different results, due to the various research techniques and protocols required for a focused literature search.

First, a 91-duplicate record was removed using the electronic reference management software (EndNote), also, 148 articles were removed due to lack of clarity. The title and abstracts of 257 articles were reviewed, and 210 articles were excluded as they did not answer the research question. Then, six articles were not founded in the full text and excluded and the reviewers assessed 41 full-text reports for eligibility. In that phase, multi reports were excluded due to two reasons: 15 report was removed due to poor quality, and 12 did not correspond with this study. Only 14 journal articles met the inclusion and exclusion criteria and those articles were presented in the data extraction table and used to synthesize in the scoping review (Figure 1.2.3.1).

Figure 1.2.3.1: PRISMA2020 Flow Diagram.



\*Record—The title or abstract (or both) of a report indexed in a database or website

\*\*Report—A document (paper or electronic) supplying information about a particular study.

\*\*\*Study—An investigation, such as a clinical trial, that includes a defined group of participants and one or more interventions and outcomes.

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### 1.3. Finding and Results:

Thematic analysis categorizes retrieved articles into two themes and two sub-themes. The first theme is the effect of patient education on self-care, with the sub-theme: the effect of WhatsApp group on self-care, and the second theme is the effect of patient education on HbA1c, with the sub-theme: the effect of WhatsApp group on HbA1c. All themes and sub-themes are illustrated in table 1.3.1.

**Table 1.3.1:** scoping review theme and sub-theme

Themes/Sub Themes	Author
<b>Theme 1: The effect of patient education on self-care.</b>	(Chawla et al., 2019) (Dinar et al., 2019) (ElGerges, 2020) (Fikadu Balcha Hailu et al., 2019) (Fan Zheng et al., 2019) (Karen Waller et al., 2021)
<b>Sub Theme 1: The effect of WhatsApp group on self-care.</b>	(Jeihooni et al., 2019) (Sartori et al., 2020)
<b>Theme 2: The effect of patient education on HbA1c.</b>	(A. Alibrahim et al., 2021) (Chawla et al., 2019) (Dinar et al., 2019) (ElGerges, 2020) (Emara et al., 2021) (Fan Zheng et al., 2019) (Jeihooni et al., 2019) (Karen Waller et al., 2021) (Rusdiana et al., 2018) (Sanaeinasab et al., 2021) (Tavakol Moghadam et al., 2018)
<b>Sub Theme 2: The effect of the WhatsApp group on HbA1c.</b>	(Al Omar et al., 2020a)

The data extraction revealed the different study designs applied by researchers in the 14 journal articles. Eight studies used randomized control trials (Al Omar et al., 2020a; A. Alibrahim et al., 2021; F. B. Hailu et al., 2019; Sanaeinasab et al., 2021; Sartori et al., 2020; Tavakol Moghadam et al., 2018; K. Waller et al., 2021; F. Zheng et al., 2019) and one used experimental design before and after randomization (ElGerges, 2020).

Three studies used quasi-experimental design pre and post-test (Dinar et al., 2019; Emara et al., 2021; Rusdiana et al., 2018), whereas (Jeihooni et al., 2019) used a controlled semi-experimental design; one study used case-control design (Chawla et al., 2019).

All studies were conducted between 2018 and 2022. The researchers used various sample methods and sizes. The total sample size of the 14 studies was 2272 adult patients. The largest sample size was 403 patients, performed by Sartori et al., (2020) and the smallest sample was 48 patients (Tavakol Moghadam et al., 2018). The review findings were from different geographical locations including Asia, Africa, South America, and Australia. The majority of studies were conducted in Asia. One study in Saudi Arabia (Dinar et al., 2019). Two studies were in the Gulf countries, one in the United Arab Emirates (Al Omar et al., 2020a) and another in Kuwait (Abdullah Alibrahim et al., 2021). One study in Lebanon (ElGerges, 2020). Another in South Asia, specifically India (Chawla et al., 2019), while there are three studies in southwest Asia, specifically in Iran (Jeihooni et al., 2019; Sanaeinasab et al., 2021; Tavakol Moghadam et al., 2018). There is one study in China (Fan Zheng et al., 2019), while there is another in Indonesia (Rusdiana et al., 2018). In Africa, one study was performed in Egypt (Emara et al., 2021), and the other in Ethiopia (Fikadu Balcha Hailu et al., 2019). One study was conducted in South America, specifically Brazil (Sartori et al., 2020), and another study was carried out in Australia (Karen Waller et al., 2021).

### **Theme 1: The effect of patient education on self-care.**

Self-care is the main objective in treating patients with diabetes (Dinar et al., 2019). Effective DSME can improve self-care and therefore reduce the risk of complications (Chawla et al., 2019). Some articles were found in the literature examining the effect of patient education on self-care. The interventions differed in their design, strategies, delivery mode, and duration.

Two studies in which the duration of the intervention was three months (ElGerges, 2020; F. Zheng et al., 2019). In an experimental study by ElGerges, (2020) on 100 patients with type two diabetes (T2DM), the duration of the study was three months (six hours of educational session) concerning self-care parameters and other topics related to the disease and a phone call every two weeks. The interventions were

delivered by a multidisciplinary team including a medical physician, nurse, psychologist, and dietitian. The study revealed that the patients who participated in educational intervention improved their diabetes self-care activity compared with a control group who received usual care. The previous result is consistent with the result of Zheng et al., (2019). They conducted a study on 60 T2DM patients, for three months. The research aimed to investigate the effectiveness of a simple outpatient diabetes self-management education program. The program consists of two sessions of DSME besides regular education. The course was divided into two-part theory and practical, in the practical part they provided one-on-one nutrition guidance and individualized exercise guidance. the study revealed an improvement in self-care activities including dietary control, physical activity, medication adherence, blood glucose monitoring, and foot care compared with the control group.

Four studies in which the duration of the intervention was six months (Chawla et al., 2019; Dinar et al., 2019; F. B. Hailu et al., 2019; K. Waller et al., 2021). A case-control study conducted in India on 100 T2DM patients, the study aimed to assess the impact of health education on knowledge, attitude, practices, and glycemic control in T2DM patients. The investigator used face-to-face education regarding self-care; in addition to counseling and two follow up were made within intervals of two months. Also, they provided patients with a health leaflet at baseline. The study revealed that effective health education improves knowledge, attitude, and practices, particularly regarding lifestyle modifications (Chawla et al., 2019). On the other hand, Hailu et al., (2019) prepared a DSME intervention to assess how it will affect knowledge, self-care behavior, and self-efficacy for 116 T2DM patients. The program consists of six educational sessions (approximately 90 minutes for each session); in addition to home activities, handbooks, and fliers. The study showed significant improvement in diabetes knowledge scores, and some domains of self-care behaviors (Dietary control and foot care), and no significant differences within or between the groups in other self-care behavior or diabetes self-efficacy.

A quasi-experimental study by Dinar et al., (2019), was performed in Saudi Arabia, on 61 T2DM patients. The purpose of the study is to investigate the impact of diabetes educational intervention for patients with type 2 diabetes on self-care and diabetes

control. The intervention was delivered to the patients through lectures, and brochures, in addition, to follow-ups (every two months). Regarding self-care, the researcher gave a comprehensive education in all self-care domains and more attention to the dietary control part. The findings show that patients' self-care improved in general, whereas dietary control improve in some participants despite an emphasis on that part.

Another study in which the duration of intervention was six months(K. Waller et al., 2021). Aimed to assess the impact and acceptability of text message interventions on self-care behavior for T2DM, in 395 patients. The result showed that education was effective in improving self-care behaviors in general and suggest use the of text message to support diabetes care.

### **Sub Theme 1: The effect of WhatsApp group on self-care.**

The current study looks at major health issues affecting the general public and diabetic patients in Saudi Arabia and around the world. Health education is considered a very critical point for diabetic patients. Within the current development, especially in social media, it has become easier to deliver and provide patients with information in need, as these technologies have provided us with a modern and innovative way of education. Despite this development, limited studies found in literature considered that issue and used social media, especially WhatsApp in patients' education.

A study performed by Jeihooni et al., (2019) on 100 women with T2DM, explored the impact of educational programs based on the extended theory of reasoned action on self-care. The researcher educated the patients through ten lectures (55-60 min for each), in addition to monthly follow-up sessions. Also, they created a WhatsApp group to provide participants with daily instructions and answer their questions. A booklet was provided to the experimental group. After three months, the self-care in the intervention group improved significantly. This is consistent with the results obtained from Sartori et al. (2020), which showed that health instructions via WhatsApp led to an increase in compliance with medications and diet among diabetic patients.

## **Theme 2: The effect of patient education on HbA1c.**

Hemoglobin A1C (HbA1c) is one of the standard tools for the measurement of self-care quality among diabetic patients (Moghadam et al., 2018). Several studies have tried to explore the effect of patient education on HbA1c. The studies differed in methods of education, duration, and the model; the majority of studies were implemented in three months and few studies lasted from four to six months, regardless of the duration, the model of transition the information plays a vital role in patients' improvement.

A randomized control trial was conducted by Waller et al., (2021) on 395 T2DM patients for six months to investigate the effectiveness and acceptability of a text message intervention on HbA1c and self-management behaviors. They used text messages to deliver the information to patients. A daily message was sent to the patients for the first three months. Then, four messages for a week for the next three months. The study showed no improvement in the HbA1c in all groups. On the other hand, an experimental study uses a phone call in addition to traditional education (ElGerges, 2020). The researcher uses different teaching methodologies such as lectures, workshops, demonstrations, and role-play in one educational program lasting for 6 hours. After completing the program, the participants received a phone call every two weeks. Then, after three months, the HbA1c in the intervention group and control group was measured again. The study revealed that the use of therapeutic education had significantly improved the HbA1c.

Several studies used only face-to-face intervention. A quasi-experimental study on 116 diabetic patients assessed the effect of a diabetes self-management education program on glycemic control. The program duration was three months and consisted of weekly sessions. The HbA1c was assessed pre and post interventional program. The improvement was modest but significant, also the result showed that 21% of participants reached the American Diabetes Association goal for HbA1c below 7. Likewise, the quasi-experimental study was implemented by (Rusdiana et al., 2018), in four primary health care centers, on 80 T2DM patients. It aimed to evaluate the effect of short-term DSME on HbA1c. The patients received one lesson per week (120

minutes per lesson) for eight weeks, then practiced for four weeks. The study showed that the mean score of HbA1c had changed significantly, which indicates that well-designed DSME programs have a positive impact on the health status of T2DM patients.

In another study by Moghadam et al., (2018), on 48 T2DM patients, the purpose of the study was to investigate the effect of self-care education on HbA1c in T2DM patients. The intervention group received one group class session (60-90 minutes sessions) per week for eight weeks, while the control group received routine care. The investigator made a comparison between the mean of HbA1c before the intervention, immediately after the intervention, and two months after interventions. The repeated measures test revealed significant differences before the intervention, immediately after the intervention, and two months after interventions; Also, there were significant differences between the groups regardless of the study interval.

In the study conducted by Sanaeinasab et al., (2021) on 80 T2DM patients, using systematic health education and promotion model. The investigator implements DSME over 45 days, six sessions (90-minute sessions), and the HbA1c is measured at baseline and after three months of interventions. They emphasized nutrition and physical activity domains that had a great impact on improving the HbA1c. Likewise, Zheng et al., (2019) assessed the effect of a two-session diabetes education program on HbA1c and other parameters. The researcher provided one-on-one nutrition guidance and individualized exercise guidance which led to significant enhancement of patients' HbA1c, fasting blood glucose, and postprandial 2h blood glucose.

The case-control study conducted by Chawla et al., (2019) assessed the effect of health education on glycemic control in T2DM patients which revealed that HbA1c had significantly improved in the case group compared with the control group. The research suggested increasing the duration of education to have long-term glycemic control which can help to avoid the disease complications. These results are consistent with the results of Dinar et al., (2019) which revealed that the education of patients with diabetes led to significant enhancement of patients' HbA1c, and led to improving the metabolic status of diabetic patients and reduction in the level of their triglyceride.

Moreover, a controlled study by Alibrahim et al., (2021), was conducted in a single center for twelve months, on 291 T2DM patients. The purpose of that study was to compare the effect of DSME sessions on HbA1c level as a measure of metabolic control of diabetes mellitus. The study revealed that the intervention group that received DSME sessions demonstrated improvement in the HbA1c compared with the control group. The study suggested using a cost-effective approach that is suitable for the unique demographic characteristics in the region.

### **Sub Theme 2: The effect of the WhatsApp group on HbA1c.**

Most people now have smartphones, which enhance their capacity to communicate in a simple, effective, and timely manner. Furthermore, patients benefit more from self-management regimens if they are carried out in a comfortable and familiar setting, such as their own homes (Al Omar et al., 2020b). Few studies use a WhatsApp group as an inventive teaching method. A study performed by Al Omar et al., (2020) on 218 diabetic patients, assessed the impact of a diabetes education program administered through WhatsApp on glycosylated hemoglobin values. The duration of the interventions was six months. Daily messages about self-care behaviors were sent to the intervention group. After six months a significant drop in HbA1c value was noticed in the intervention group, with no significance in the control group; Al Omar et al., (2020) also reported that the strategy could potentially motivate people to adopt a healthy lifestyle and improve their diabetic self-management habits with little cost and effort.

In another study that used WhatsApp group besides the sessions by Jeihooni et al., (2019). It was reported that the mean score of HbA1c improved significantly three months after the intervention, unlike the control group which showed no significant difference before and after the intervention.

#### **1.4. Knowledge gap**

After reviewing the relevant literature in different databases and analyzing it, it is clear that there are very limited studies related to the effect of the instructional WhatsApp group on self-care and HbA1c for female patients with type 2 diabetes, especially in Saudi Arabia. This creates a significant gap in knowledge in terms of evidence-based practice.

#### **1.5. Summary and Conclusion**

The use of education for patients with DM including education through WhatsApp led to improvement in their self-care, especially medication adherence and improve HbA1c level.

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