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Effectiveness of Instant Messaging-Based Digital Health Interventions for Type 2 Diabetes Management in Low- and Middle-Income Countries: A Systematic Review and Meta-Analysis of Randomised Controlled Trials

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ADMINISTRATIVE INFORMATION

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Review stage at the time of initial registration - Completed but not published.

Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 23 November 2026 and was last updated on 23 November 2026.

INTRODUCTION

Review question / Objective To evaluate the effectiveness of instant messaging-based digital health interventions for patients with type 2 diabetes mellitus (T2DM) in low- and middle-income countries (LMICs).

Condition being studied Type 2 diabetes mellitus (T2DM) is the condition of interest in this systematic review and meta-analysis. The review focuses on glycaemic control and cardiometabolic risk indicators in patients with T2DM residing in low- and middle-income countries (LMICs).
Glycated haemoglobin (HbA1c) is the primary indicator used to assess long-term glycaemic control. Other relevant clinical indicators include fasting blood glucose (FBG), systolic and diastolic blood pressure, lipid profile, body weight, and body mass index (BMI).
This review aims to evaluate whether instant messaging-based digital health interventions can improve diabetes management and associated metabolic indicators in this population.

METHODS

Participant or population Patients diagnosed with type 2 diabetes mellitus (T2DM), regardless of age, currently residing in countries classified as low- and middle-income countries (LMICs) according to the 2025 World Bank economic classification.
Studies involving patients with concurrent type 1 diabetes, gestational diabetes, or prediabetes will be excluded. Studies in which patients with T2DM account for less than 80% of the total sample will also be excluded unless independent subgroup data for patients with T2DM are available.

Intervention Mobile instant messaging-based digital health interventions for T2DM management, using SMS or instant messaging software to deliver personalised or standardised disease management information.

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Eligible intervention formats include one-way reminders for medication adherence and blood glucose monitoring, two-way patient-provider interactions, peer support, and clinical decision feedback. Interventions may be administered independently or in combination with usual clinical care.
Eligible platforms include pre-existing communication platforms, such as SMS, WeChat, and WhatsApp, as well as proprietary mobile health applications, custom software, or clinical portals specifically designed for chronic disease management.

Comparator The comparator groups include usual clinical care, routine face-to-face follow-ups, paper-based health education materials, or no digital intervention.

Study designs to be included Randomised controlled trials published in peer-reviewed journals.

Eligibility criteria Studies will be included if they meet the following criteria:
1. Participants are diagnosed with T2DM and reside in countries classified as LMICs according to the 2025 World Bank economic classification.
2. The intervention involves mobile instant messaging-based digital health interventions using SMS or instant messaging software.
3. The comparator consists of usual clinical care, routine face-to-face follow-ups, paper-based health education materials, or no digital intervention.
4. Studies report quantitative data for at least one prespecified outcome, including HbA1c, FBG, blood pressure, lipid profile, body weight, or BMI.
5. Studies are randomised controlled trials published in peer-reviewed journals.
Studies will be excluded if they involve type 1 diabetes, gestational diabetes, or prediabetes; if T2DM patients account for less than 80% of the sample without available independent subgroup data; if instant messaging is not the core interaction medium; if conducted in high-income countries; if geographical and economic classifications are unclear; if they are duplicate publications; or if full-text articles are unavailable.

Information sources A systematic literature search will be conducted in the following four electronic databases: PubMed, Embase, Cochrane Library, and Web of Science, from their inception to 10 July 2026.
The search strategy will combine medical subject headings and free-text terms related to type 2 diabetes mellitus, instant messaging-based digital health interventions, and randomised controlled trials. Search terms include "diabetes mellitus, type 2", "type 2 diabetes", "T2DM", "non-insulin-dependent diabetes", "text messaging", "instant messaging", "SMS", "WeChat", "WhatsApp", "Viber", "LINE app", "interactive messaging", "randomised controlled trial", "randomised", and "RCT".
Additionally, the reference lists of the finally included articles will be manually searched to identify potentially eligible randomised controlled trials.
The detailed search strategies for each database are provided in the supplementary file.

Main outcome(s) The primary outcome is the change in glycated haemoglobin (HbA1c, %) from baseline to endpoint.
Secondary outcomes include changes from baseline to endpoint in fasting blood glucose (FBG), systolic blood pressure (SBP), diastolic blood pressure (DBP), lipid profile (including low-density lipoprotein, high-density lipoprotein, and triglycerides), body weight, and body mass index (BMI).
Studies reporting quantitative data for at least one of these prespecified outcomes will be eligible.
Continuous outcomes will be expressed as mean differences (MDs) when identical measurement units or scales are used, or standardised mean differences (SMDs) when different measurement units or scales are applied. All effect estimates will be reported with 95% confidence intervals (CIs).The primary outcome is the change in glycated haemoglobin (HbA1c, %) from baseline to endpoint.

Quality assessment / Risk of bias analysis The methodological quality and risk of bias of the included randomised controlled trials will be assessed using the revised Cochrane risk-of-bias tool for randomised trials (RoB 2).
The tool evaluates five domains: (1) bias arising from the randomisation process; (2) bias due to deviations from intended interventions; (3) bias due to missing outcome data; (4) bias in measurement of the outcome; and (5) bias in selection of the reported result.
The overall risk of bias will be classified as low risk, some concerns, or high risk. An overall judgement of low risk will be assigned only when all domains are rated as low risk. Some concerns will be assigned when at least one domain raises some concerns but none is rated as high risk. High risk will be assigned when any single domain is rated as high risk.

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Strategy of data synthesis Statistical analyses will be performed using Stata version 18.0.
Continuous outcomes will be expressed as mean differences (MDs) when studies use identical measurement units or scales, and standardised mean differences (SMDs) when different measurement units or scales are used. All effect estimates will be presented with corresponding 95% confidence intervals (CIs).
Statistical heterogeneity will be assessed using the I^2 statistic, Cochran's Q test, and between-study variance (τ^2), estimated using the DerSimonian–Laird method.
Random-effects models will be applied uniformly across all pooled analyses to account for anticipated clinical and methodological diversity among interventions and study settings.
Between-study differences will be evaluated, and subgroup analyses will be conducted according to intervention platform type and intervention duration.
Publication bias will be assessed using funnel plots, Egger's test, and Begg's test when at least 10 trials report the outcome.
The certainty of evidence for each outcome will be evaluated using the GRADE approach across five domains: risk of bias, inconsistency, indirectness, imprecision, and publication bias. Evidence certainty will be classified as high, moderate, low, or very low.
The statistical significance level will be set at 0.05 unless otherwise specified.

Subgroup analysis Subgroup analyses will be performed according to the following characteristics:
1. Intervention platform type: Pre-existing platforms versus proprietary platforms. Pre-existing platforms refer to patients' habitual communication tools operating independently of the clinical trial, such as standard SMS, WeChat, or WhatsApp, without requiring additional dedicated health software downloads. Proprietary platforms refer to purpose-built standalone mobile health applications, custom software, or clinical portals specifically designed for chronic disease management.
2. Intervention duration: For the primary outcome (HbA1c), subgroup analyses will be conducted according to intervention duration: ≤3 months, 6 months, and ≥12 months.
Between-subgroup differences will be assessed using Cochran's Q test.

Sensitivity analysis Sensitivity analyses will be conducted to evaluate the robustness of the pooled effect estimates.
First, a leave-one-out sensitivity analysis will be performed by sequentially excluding one study at a time to assess the potential influence of individual studies on the overall results.
Second, sensitivity analyses will be conducted by excluding studies rated as having a high risk of bias according to the RoB 2 assessment.
The consistency of pooled effect estimates, including their direction and statistical significance, will be examined to determine the robustness of the findings.

Country(ies) involved China; Democratic Republic of Congo, Cambodia, and the Philippines; Egypt; India; Iran.

Keywords digital health, instant messaging, low- and middle-income countries, type 2 diabetes, meta-analysis.

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