

INPLASY

Effect of Intensive Lifestyle Intervention on Remission and Metabolic Outcomes in Patients with Type 2 Diabetes

INPLASY2026100081

doi: 10.37766/inplasy2026.10.0081

Received: 18 October 2026

Published: 19 October 2026

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ADMINISTRATIVE INFORMATION

Support - This study was supported by the project "A Systematically Developed, Integrated Intra- and Extra-Institutional Intervention Model Featuring Companion-Based Intelligent Support for Type 2 Diabetes Management".

Review Stage at time of this submission - Data extraction.

Conflicts of interest - None declared.

INPLASY registration number: INPLASY2026100081

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 19 October 2026 and was last updated on 19 October 2026.

INTRODUCTION

Review question / Objective To evaluate, through a meta-analysis, the effects of intensive lifestyle intervention (ILI) on the remission of type 2 diabetes mellitus (T2DM) and further assess its impacts on blood glucose, lipid profile, blood pressure, and body weight.

Condition being studied Some findings indicate that both obese and non-obese T2DM patients can potentially achieve remission through ILI, possibly due to the close association of reduced fasting blood glucose and visceral fat index with decreased HbA1c levels [20]. However, a UK study found that ILI moderately improved glycemic control but did not result in diabetes remission [21]. Additionally, other studies suggest that adding supervised exercise to strict dietary control improves blood glucose

management but does not reduce dependence on glucose-lowering medications [22]. Although numerous randomized controlled trials (RCTs) have examined the effects of lifestyle interventions on clinical outcomes in T2DM patients, individual studies are constrained by relatively small sample sizes, and substantial heterogeneity exists across trials with respect to intervention modality, duration of follow-up, operational definition of diabetes remission, baseline body mass index (BMI), and duration of disease. Meta-analyses, which systematically integrate data from multiple studies, provide higher-quality and statistically robust evidence. Therefore, to further evaluate the impact of ILI on glycemic control in T2DM patients and assess associated metabolic indicators such as blood lipids, blood pressure, and body weight, we conducted a meta-analysis of relevant RCTs to offer stronger evidence for the efficacy and safety of intensive lifestyle interventions in this patient population.

METHODS

Participant or population Type 2 diabetes.

Intervention Intensive lifestyle intervention.

Comparator Regular lifestyle.

Study designs to be included Randomized controlled trial.

Eligibility criteria Studies were eligible for inclusion if they met the following criteria: (1) Participants: diagnosed with T2DM or impaired glucose tolerance (IGT); (2) Study design: RCTs; (3) Interventions: lifestyle interventions, including diet, exercise, behavioral modifications, or combined strategies; (4) Control group: routine care; (5) Outcome measures: reported at least one clinical outcome of interest, including diabetes remission, HbA1c, body weight, BMI, lipid profile, or blood pressure. Exclusion criteria were as follows: (1) non-RCTs, including reviews, commentaries, and letters; (2) studies reporting insufficient outcome measures; (3) studies lacking a control group or containing incomplete data;

Information sources The databases PubMed, EMBASE, the Cochrane Library, China National Knowledge Infrastructure (CNKI), WanFang, and WeiPu.

Main outcome(s) ILI improves the remission rate in T2DM patients and reduces HbA1c, body weight, BMI, and triglycerides, although it does not affect SBP. High heterogeneity among indicators suggests considerable variation in intervention regimens and follow-up durations across studies.

Quality assessment / Risk of bias analysis The methodological quality of included studies was evaluated using the Cochrane Collaboration's risk of bias assessment tool (version 5.1.0), covering the following domains: (1) random sequence generation, (2) allocation concealment, (3) blinding of participants and intervention providers, (4) blinding of outcome assessment, (5) completeness of outcome data, (6) selective outcome reporting, and (7) other sources of bias. Disagreements were resolved by open discussion. Studies were categorized into three groups according to bias risk: (1) low risk: low risk of bias in all key domains; (2) unclear risk: unclear risk of bias in one or more key domains; and (3) high risk: high risk of bias in one or more key domains.

Strategy of data synthesis Statistical analyses were performed using the meta package (version 8.2.1) in R software (version 4.5.1). Odds ratios (ORs) were calculated as effect sizes for binary data, combined using the Mantel-Haenszel (M-H) method. For continuous data, the mean difference (MD) was calculated and combined using the inverse variance method. Cochran's Q test and I² statistics were employed to assess heterogeneity among studies. The I²

statistic was interpreted as follows: 75% high heterogeneity. Due to anticipated heterogeneity, all analyses utilized a random-effects model, with τ^2 estimated using the REML method. Confidence intervals (CIs) were adjusted using the Hartung-Knapp (HK) method to control for type I errors. Publication bias was visually assessed using funnel plots. For analyses involving ≥ 10 studies, Egger's linear regression test was additionally performed, with a p-value < 0.05 indicating significant publication bias.

Subgroup analysis No.

Sensitivity analysis No.

Country(ies) involved China.

Keywords Intensive lifestyle intervention; Type 2 diabetes; Diabetes remission or reversal; Metabolic indicators.

Contributions of each author

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