Method S1. Search strategy

CENTRAL

#1 [mh "Diabetes Mellitus, Type 2"]

#2 diabet*:ti,ab,kw

#3 #1 OR #2

#4 [mh "Gastric Emptying"]

#5 [mh "Postprandial Period"]

#6 "intake sequence*":ti,ab,kw

#7 "meal sequence*":ti,ab,kw

#8 ("meal adj order*"):ti,ab,kw

#9 ("meal adj pattern*"):ti,ab,kw

#10 "postprandial insulin":ti,ab,kw

#11 "postprandial glycemia":ti,ab,kw

#12 "postprandial glucose":ti,ab,kw

#13 "postprandial rise":ti,ab,kw

#14 "dietary instruction*":ti,ab,kw

#15 ("Before adj Carbohydrate*"):ti,ab,kw

#16 #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15

#17 [mh "Dietary Carbohydrates"]

#18 [mh starch]

#19 [mh "Glycemic Index"]

#20 [mh "Glycemic Load"]

#21 [mh meals]

#22 [mh eating]

#23 carbohydrate*:ti,ab,kw

#24 starch*:ti,ab,kw

#25 "Glycemic Index":ti,ab,kw

Okami Y, *et al. BMJ Open Diab Res Care* 2022; 10:e002534. doi: 10.1136/bmjdrc-2021-002534

#26 "Glycemic load":ti,ab,kw

#27 glycemia:ti,ab,kw

#28 #17 OR #18 OR #19 OR #20 OR #21 OR #22 OR #23 OR #24 OR #25 OR #26 OR #27

#29 #3 AND #16 AND #28

MEDLINE (via Ovid)

#1 exp Diabetes Mellitus, Type 2/

#2 diabet*.mp.

#3 1 or 2

#4 exp Gastric Emptying/

#5 exp Postprandial Period/

#6 intake sequence*.mp.

#7 meal sequence*.mp.

#8 (meal adj order*).mp.

#9 (meal adj pattern*).mp.

#10 postprandial insulin.mp.

#11 postprandial glycemia.mp.

#12 postprandial glucose.mp.

#13 postprandial rise.mp.

#14 dietary instruction*.mp.

#15 (Before adj Carbohydrate*).mp.

#16 or/4-15

#17 exp Dietary Carbohydrates/

#18 exp starch/

#19 exp Glycemic Index/

#20 exp Glycemic Load/

#21 exp meals/

#22 exp eating/

#23 carbohydrate*.mp.

#24 starch*.mp.

#25 Glycemic Index.mp.

#26 Glycemic load.mp.

#27 glycemia.mp.

#28 or/17-27

#29 (randomized controlled trial or controlled clinical trial).pt. or randomized.ab. or placebo.ab. or drug therapy.fs. or random*.ab. or trial.ab. or groups.ab.

#30 exp animals/ not humans.sh.

#31 29 not 30

#32 3 and 16 and 28

#33 31 and 32

EMBASE (via ProQuest)

S1 (EMB.EXACT.EXPLODE("non insulin dependent diabetes mellitus"))

S2 (ab(diabet*) OR ti(diabet*))

S3 (S1 OR S2)

S4 (EMB.EXACT.EXPLODE("stomach emptying"))

S5 (EMB.EXACT.EXPLODE("postprandial state"))

S6 (ab(intake sequence*) OR ti(intake sequence*))

S7 (ab(meal sequence*) OR ti(meal sequence*))

S8 (ab(meal NEAR order*) OR ti(meal NEAR order*))

S9 (ab(meal NEAR pattern*) OR ti(meal NEAR pattern*))

S10 (ab(postprandial insulin) OR ti(postprandial insulin))

S11 ((ab(postprandial glycemia) OR ti(postprandial glycemia)))

S12 ((ab(postprandial glucose) OR ti(postprandial glucose)))

S13 ((ab(postprandial rise) OR ti(postprandial rise)))

S14 ((ab(dietary instruction*) OR ti(dietary instruction*)))

S15 ((ab(Before NEAR Carbohydrate*) OR ti(Before NEAR Carbohydrate*)))

S16 (S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10 OR S11 OR S12 OR S13 OR S14 OR S15)

S17 (EMB.EXACT("carbohydrate intake"))

S18 EMB.EXACT.EXPLODE("starch")

S19 (EMB.EXACT.EXPLODE("glycemic index"))

S20 (EMB.EXACT.EXPLODE("glycemic load"))

S21 EMB.EXACT.EXPLODE("meal")

S22 EMB.EXACT.EXPLODE("eating")

S23 ((ab(carbohydrate*) OR ti(carbohydrate*)))

S24 ((ab(starch*) OR ti(starch*)))

S25 ((ab(Glycemic Index) OR ti(Glycemic Index)))

S26 ((ab(Glycemic load) OR ti(Glycemic load)))

S27 ((ab(glycemia) OR ti(glycemia)))

S28 (S17 OR S18 OR S19 OR S20 OR S21 OR S22 OR S23 OR S24 OR S25 OR S26 OR S27)

S29 (S3 AND S16 AND S28)

S30 ((ab(random*) OR ti(random*)) OR (ab(placebo*) OR ti(placebo*)) OR (ab(double NEAR/1 blind*) OR ti(double NEAR/1 blind*)))

S31 S30 AND S29

ICTRP

Advanced search

#1 Conditions: ("Diabetes Mellitus" OR diabet*)

AND

#2 Intervention: (((intake OR meal) AND (sequence OR order OR pattern)) OR (postprandial AND (insulin OR glycemia OR glucose OR rise)) OR "dietary instruction") AND (carbohydrate OR starch OR "Glycemic Index" OR "Glycemic load" OR glycemia)

#3 #1 AND #2

Recruitment status is ALL.

clinicaltrials.gov

Advanced search

(((intake OR meal) AND (sequence OR order OR pattern)) OR (postprandial AND (insulin OR glycemia OR glucose OR rise)) OR "dietary instruction") AND (carbohydrate OR starch OR "Glycemic Index " OR "Glycemic load" OR glycemia) | Interventional Studies | Diabetes Mellitus, Type 2

Method S2. Information extracted from included studies

1) General information

Author, Year of publication, Title, Journal (title, volume, pages), Language, Country, Publication status, Country, Protocol, Funding

2) Trial design

Type of randomization (crossover or parallel), Blindness, Date of study initiation

3) Participants

Inclusion criteria, Exclusion criteria, Definition of type 2 diabetes, Total sample size, Age, Sex, Body mass index, Diabetes history, HbA1c levels.

4) Intervention

Number in the intervention group, Number in the control group, Type of intervention (e.g. eat vegetable salad first, then rice 10 minutes later), Type of control (e.g. eat rice first, then vegetable salad 10 minutes later), Other rules for diet (e.g. participants were seated for two hours during the test and were not allowed to exercise), Follow-up duration

5) Outcomes

Methods of assessment, Number of missing participants, Type of analysis (e.g. intention to treat, per-protocol), Pre-test and post-test means or change values and standard deviations or standard errors for all groups for all outcomes specified above

Table S1. PRISMA 2009 checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	1
ABSTRACT			
Structured summary	2	Provide a structured summary including, where applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	4
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and the study design (PICOS).	4
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it may be accessed (e.g., Web address), and, where available, provide registration information including the registration number.	4
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of the follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	4-5

Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	5
Search	8	Present the full electronic search strategy for at least one database, including any limits used, such that it may be repeated.	Method S1
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in a systematic review, and, where applicable, included in the meta-analysis).	5-6
Data collection process	10	Describe the method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	6
Data items	11	List and define all variables for which data were sought (e.g., PICOS and funding sources) and any assumptions and simplifications made.	Method S2
Risk of bias in individual studies	12	Describe methods used for assessing the risk of bias of individual studies (including the specification of whether this was performed at the study or outcome level), and how this information is to be used in any data synthesis.	6
Summary measures	13	State the principal summary measures (e.g., risk ratio and difference in means).	6
Synthesis of results	14	Describe the methods of handling data and combining the results of studies, if performed, including measures of consistency (e.g., I^2) for each meta-analysis.	7
Risk of bias across studies	15	Specify any assessment of the risk of bias that may affect cumulative evidence (e.g., publication bias and selective reporting within studies).	7
Additional analyses	16	Describe the methods of additional analyses (e.g., sensitivity or subgroup analyses and meta-regression), if performed, indicating which were pre-specified.	7
RESULTS			
Study selection	17	Give the numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow	8,

		diagram.	Figure 1
Study characteristics	18	Regarding each study, present characteristics for which data were extracted (e.g., study size, PICOS, and the follow-up period) and provide citations.	Table 1, Table S2
Risk of bias within studies	19	Present data on the risk of bias of each study and, where available, any outcome level assessment (see item 12).	Figure 2, Figure S3-5
Results of individual studies	20	Regarding all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group and (b) effect estimates and confidence intervals, ideally with a forest plot.	Table 2, Figure 3, Figure S2
Synthesis of results	21	Present results of each meta-analysis performed, including confidence intervals and measures of consistency.	Table 2, Figure 3, Figure S2
Risk of bias across studies	22	Present results of any assessment of the risk of bias across studies (see Item 15).	Figure 2, Figure S3-5
Additional analysis	23	Give results of additional analyses, if performed (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	Figure S2
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	13
Limitations	25	Discuss limitations at the study and outcome levels (e.g., the risk of bias), and at the review-level (e.g., incomplete retrieval of identified research, reporting bias).	15

Conclusions	26	Provide a general interpretation of results in the context of other evidence, and implications for future research.	15
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	16

From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(7): e1000097.

doi:10.1371/journal.pmed1000097

For more information, visit: **www.prisma-statement.org**.

Table S2. Summary of published studies including a qualitative synthesis (Other than Table 1).

Source	Inclusion criteria	Exclusion criteria	Intervention	Control	Other rules for both groups
Bae et al. (2018)	Patients aged 18–80 years with BMI of 18.5–35.0 kg/m^2, an estimated glomerular filtration rate of ≥30 mL/min/1.73 m^2, and aspartate aminotransferase and alanine aminotransferase levels of no more than 2.5-fold the upper limit of the normal range.	Participants diagnosed with type 1 diabetes mellitus or diabetic ketoacidosis; undergoing insulin therapy; with a history of allergies to flour, nuts, legumes, and milk; a history of gastrointestinal surgery (except for hemorrhoidectomy, hernia repair surgery, and appendectomy); and women who were pregnant or lactating.	Started to eat a protein-enriched, dietary fiber-fortified bar (PFB) -30 min (08.30 hours) before the test meal breakfast (09.00 hours).	Started to eat the test meal breakfast at 0 min (09.00 hours) and consumed PFB at the end of the test meal.	Visited the hospital at 08.30 hours after an overnight (10 h) fast on 2 separate days 1 week apart and underwent the mixed meal tolerance test. Participants stopped taking metformin or sulfonylurea the day before the first visit, and dipeptidyl peptidase-4 inhibitor 1 week before the first visit. A PFB was provided with 150 mL of water. Participants were instructed to eat the test meals and PFB, both within 15 min.
Imai et al. (2010)	Outpatients diagnosed with type 2 diabetes and being treated with diet alone	Patients whose average HbA1c exceeded 6.9% in the past 6 months, patients with a hepatic disorder, renal disorder, neurological disorder, or cardiovascular disease, smokers who smoke more than 40 cigarettes a day or drink more than 50 grams of alcohol equivalent per day.	Eat vegetable salad first, then rice 10 minutes later.	Eat vice versa.	After 12 hours of fasting, participants came to the center at 8:45. They chewed 20 times per mouthful and took 15 minutes to consume the test meal. Participants were seated for two hours during the test and were not allowed to exercise.

Source	Inclusion criteria	Exclusion criteria	Intervention	Control	Other rules for both groups
Imai et al. (2011)	Outpatients diagnosed with type 2 diabetes, aged between 20 and 90 years.	Patients with chronic liver disease or a clinical history and/or signs of cardiovascular disease, cerebrovascular disease, or peripheral arterial disease, heavy smoking (more than 40 cigarettes a day), and drinking (more than 50 g alcohol a day), patients with psychiatric disease.	Received instructions on a simple meal plan that involved eating vegetables before carbohydrates without taking energy intake into account.	Received instructions on a traditional exchange-based meal plan that used the food exchange system to focus on energy intake.	Detailed written instructions for the completion of food diaries were provided and participants were encouraged to contact the dietitian if they had any questions regarding this procedure. Physical activity involving moderate exercise, such as walking 30 to 40 min each day, was recommended
Imai et al. (2012) *	Outpatients diagnosed with type 2 diabetes	-	Ate the first dish of vegetables for 5 min, then the main dish, and consumed rice or bread with a 10-min interval between vegetables and carbohydrates in each test meal.	Eat vice versa.	Participants consumed each test meal at a fixed time on the 2nd and 3rd day.
Imai et al. (2013)	Outpatients diagnosed with type 2 diabetes, aged between 20 and 80 years.	Patients with type I diabetes, serious comorbidities, psychiatric disorders, and taking steroids or other drugs that affect blood glucose levels.	Ate the first dish of vegetables for 5 min, then the main dish, followed by rice or bread with a 10-min interval between vegetables and carbohydrates in each test meal.	Eat vice versa.	Participants consumed each test meal at a fixed time on the 2nd and 3rd day.

Source	Inclusion criteria	Exclusion criteria	Intervention	Control	Other rules for both groups
Imai et al. (2014) *	Outpatients diagnosed with type 2 diabetes, HbA1c less than 9%	Patients with liver disease, any life-threatening disease, severe complications of diabetes, nephropathy, history of cerebral or myocardial infarction, treatment with steroidal anti-inflammatory drugs, and drug or alcohol abuse.	Ate the first dish of vegetables for 5 min, then the main dish for 5 min, followed by rice or bread for 5 min of the test meal.	Eat vice versa.	At 12:00 on the 1st day, each participant wore a continuous glucose monitoring system (CGMS) at the clinic, consumed the test meals at 7:00, 12:00, and 19:00 at home on the 2nd and 3rd days, and the CGMS was removed at the clinic at noon on the 4th day.
Kuwata et al. (2016) *	Individuals with untreated type 2 diabetes aged 30–75 years, HbA1c 9.0% or less, and BMI 35 kg/m^2 or less	Participants with type 1 diabetes, gastrointestinal tract disease including gastroparesis, a history of gastrointestinal surgery, cardiac disease, pulmonary disease, pancreatic disease, liver disease, renal disease, alcohol or drug abuse, glucose-lowering medication, diabetogenic medication, or malignancy, or pregnancy, and individuals allergic to mackerel.	First ingested 920 kJ of boiled mackerel and, 15 min later, 1,004 kJ of steamed rice.	Eat vice versa.	Participants were subjected to meal sequence tests in the morning after an overnight fast on two separate days.

Source	Inclusion criteria	Exclusion criteria	Intervention	Control	Other rules for both groups
Shukla et al. (2017)	Male and female participants aged 35-65 years of age, BMI 25–40 kg/m^2, and metformin-treated type 2 diabetes of less than 10 years duration with HbA1c less than or equal to 8%.	Patients taking corticosteroids, antidiabetic medication other than metformin, and patients with chronic renal or hepatic disease or a previous history of bariatric surgery	Protein (skinless grilled chicken breast) and vegetables (lettuce, tomatoes, and cucumber with Italian vinaigrette) first over 10 min, a 10-min rest interval, and then carbohydrates (ciabatta bread and orange juice) over 10 min.	Eat vice versa.	All participants consumed isocaloric meals of the same composition on three separate days, 1 week apart, after a 12-hour overnight fast. Participants were instructed to maintain their usual level of physical activity and diet throughout the study period, particularly on the day prior to each test session.
Shukla et al. (2018) *	Male and female participants aged 35-65 years of age, BMI 25–40 kg/m^2, and metformin-treated type 2 diabetes of less than 10 years duration with HbA1c less than or equal to 8%.	Patients taking corticosteroids, antidiabetic medication other than metformin, and patients with chronic renal or hepatic disease or a previous history of bariatric surgery	Protein (skinless grilled chicken breast) and vegetables (lettuce, tomatoes, and cucumber with Italian vinaigrette) first over 10 min, a 10-min rest interval, and then carbohydrates (ciabatta bread and orange juice) over 10 min.	Eat vice versa.	All participants consumed isocaloric meals of the same composition on three separate days, 1 week apart, after a 12-hour overnight fast. Participants were instructed to maintain their usual level of physical activity and diet throughout the study period, particularly on the day prior to each test session.
Shukla et al. (2019)	Male and female participants aged 30-65 years of age, BMI 25-40 kg/m^2, and with prediabetes (HbA1c 5.7-6.4%)	Patients taking corticosteroids, antidiabetic medication, and those with chronic renal or hepatic disease or a previous history of bariatric surgery and pertinent food allergies	Protein (skinless grilled chicken breast) and vegetables (lettuce, tomatoes, bell peppers, and red cabbage with balsamic vinegar and olive oil) first over 10 minutes, a 10-minute rest	Eat vice versa.	All participants consumed isocaloric meals with exactly the same composition, on three separate days, 1 week apart, after a 12-hour overnight fast. Participants were counselled to maintain their usual level of physical activity and diet throughout the study period, particularly on the day prior to each study visit.

Source	Inclusion criteria	Exclusion criteria	Intervention	Control	Other rules for both groups
			interval, and then carbohydrates (ciabatta bread) over 10 minutes.		
Trico et al. (2016)	Patients aged 40-80 years, BMI: <35 kg/m^2, HbA1c of 48-58 mmol/mol, duration of diabetes <5 years, stable antidiabetic therapy with metformin only (>6 months).	Serious disability, dietary or pharmacological therapy for obesity, women with gestational diabetes, breastfeeding women, a history of cancer, heart failure, or other systemic diseases of a severity that compromises patient compliance and changes their life expectancy, uncontrolled hypothyroidism, a history of alcohol abuse, liver disease, chronic kidney disease, participation in another clinical study in the four weeks preceding enrollment, endocrinological diseases, previous gastrointestinal interventions.	Received indications on the macronutrient composition of foods and were strongly recommended to fix the sequence of macronutrient ingestion at each main meal (lunch and dinner) in order to eat high carbohydrate-containing foods (e.g., bread, pasta, and potatoes) preferably after the ingestion of high-protein and high-fat foods (e.g., meat, cheese, and fish).	Were asked to follow a standard balanced mild-hypocaloric diet.	Received a dietary plan with the food composition of three typical meals (breakfast, lunch, and dinner) and a table of possible substitutions with variable equicaloric amounts of different foods. Meals and variants were pondered to yield a caloric deficit of ~ 200 kcal per day with respect to the total daily caloric need, to produce an expected weight loss of ~ 1 kilogram a month. All participants were asked to report their overall compliance to the caloric content and to the sequence of nutrients of the prescribed diet by checking on an *ad hoc* designed form at each meal.

Source	Inclusion criteria	Exclusion criteria	Intervention	Control	Other rules for both groups
Yabe et al. (2019)	Male and female participants aged 40–60 years and no history of diabetes, fasting plasma glucose levels ≤126 mg/dL, HbA1c ≥5.6%(=prediabetes), and BMI 18–30 kg/m^2	Individuals with renal impairment, hepatic impairment, heart failure, a history of cerebrocardiovascular disease, or gastrointestinal surgery as well as those receiving glucose-lowering, blood pressure-lowering, or lipid-lowering drugs. Subjects diagnosed with diabetes in their health check-up within 3 months.	Received dietary instructions including meal sequencing (participants were asked to ingest only foods without carbohydrates (i.e., salad, meat, and fish) during the first 5 min, and were allowed to ingest foods with carbohydrates, such as rice, after a 5-min interval)	Received conventional dietary instructions (received dietary instructions with a focus on energy expenditure).	They received health guidance education on weeks 1–2. Individuals received a 6-month personalized lifestyle modification program, in which they were asked to adjust energy intake to balance the total energy expenditure and were encouraged to walk.

*Studies included in the qualitative synthesis.

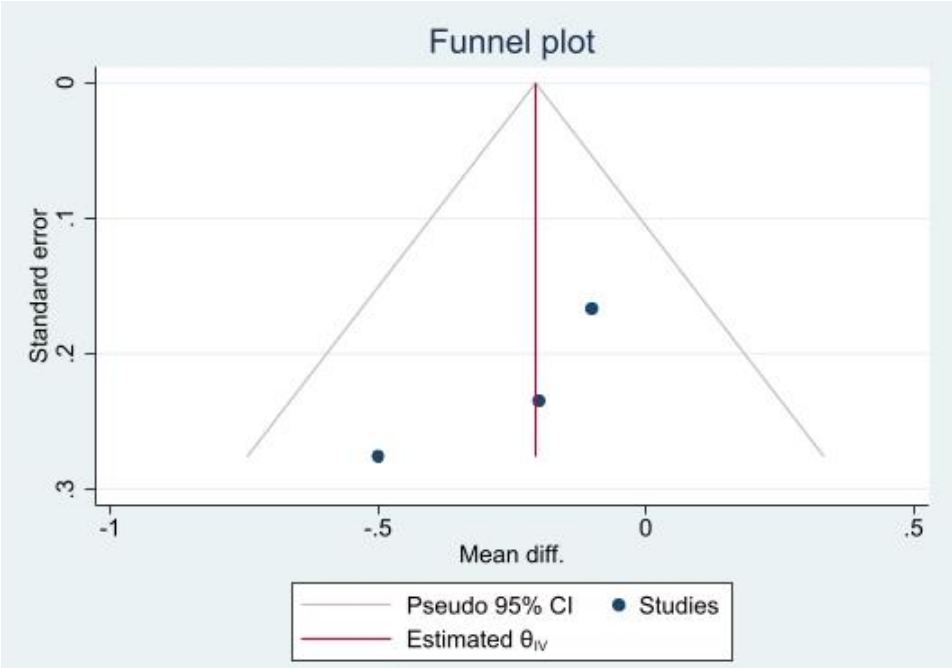
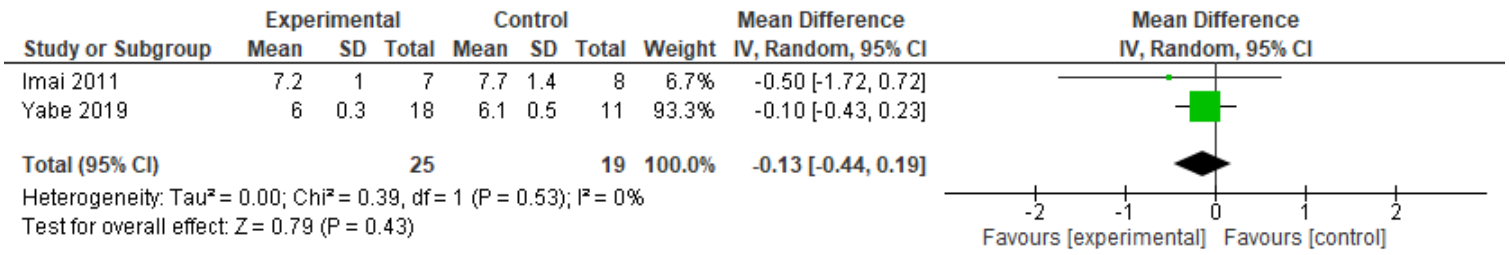
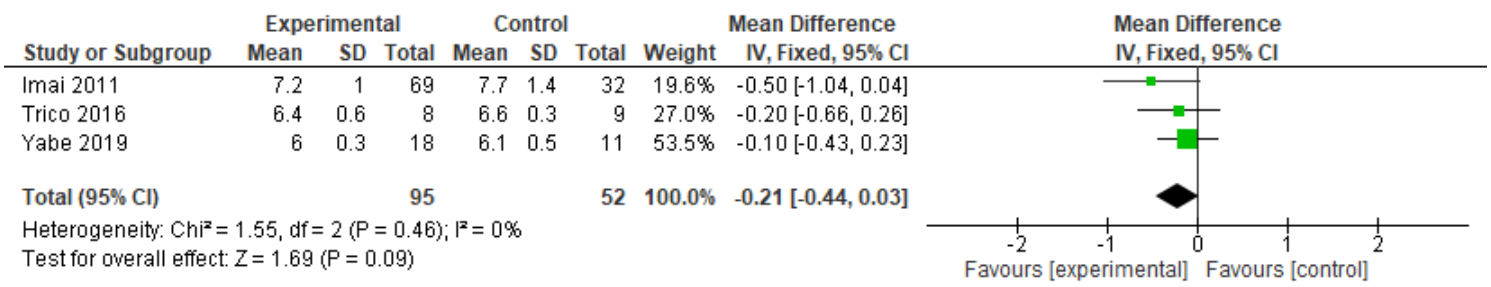


Figure S1. Funnel plot for HbA1c (Random effect model)

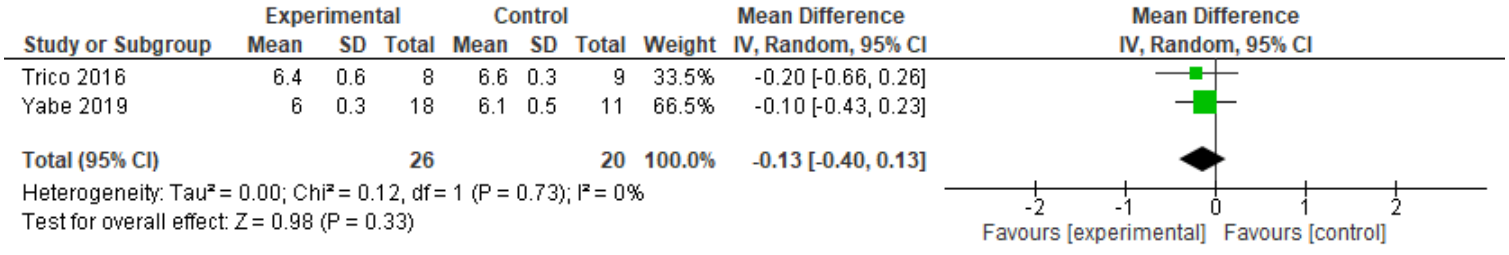
A. HbA1c (NGSP) (%) from 2 months to 2 years (rice only)



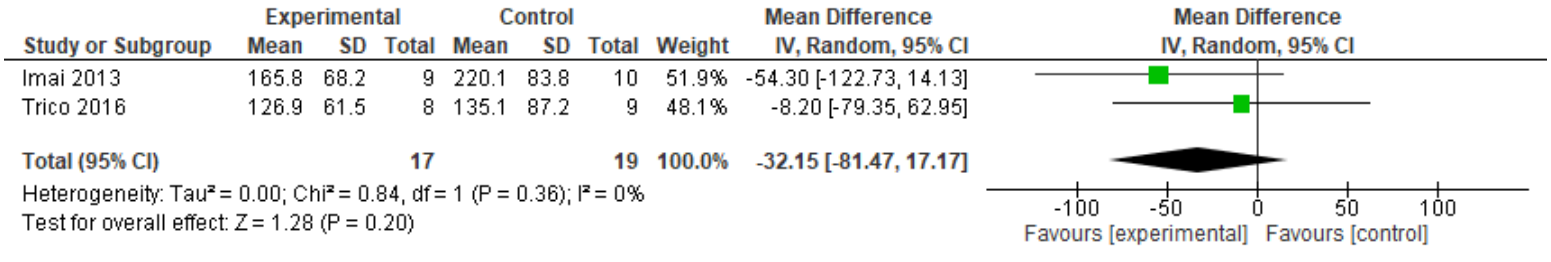
B. HbA1c (NGSP) (%) from 2 months to 2 years (fixed effect model)



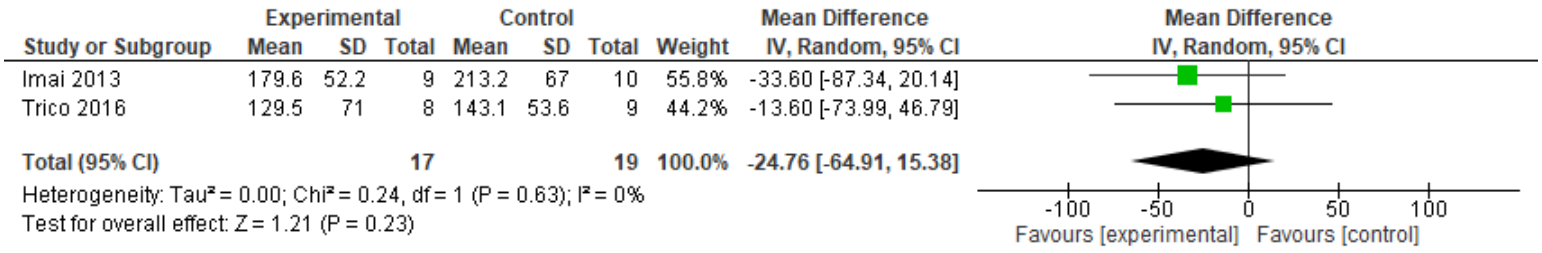
C. HbA1c (NGSP) (%) from 2 months to 2 years (Exclusion of studies using imputed statistics)



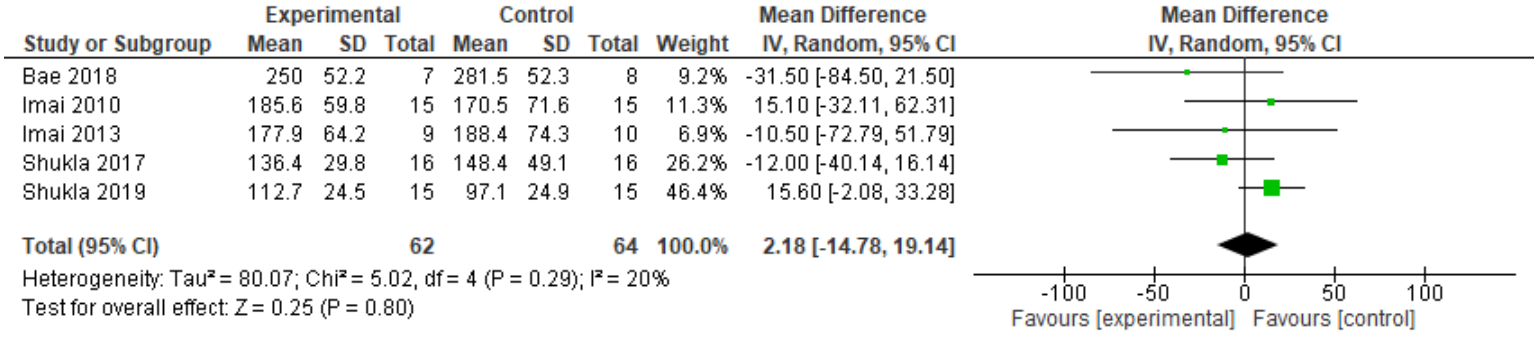
D. Plasma glucose (mg/dL) 120 min after lunch



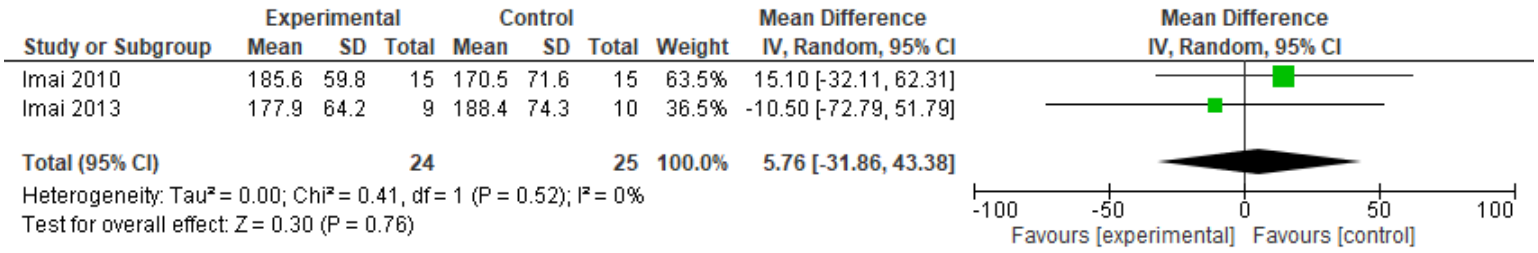
E. Plasma glucose (mg/dL) 120 min after dinner



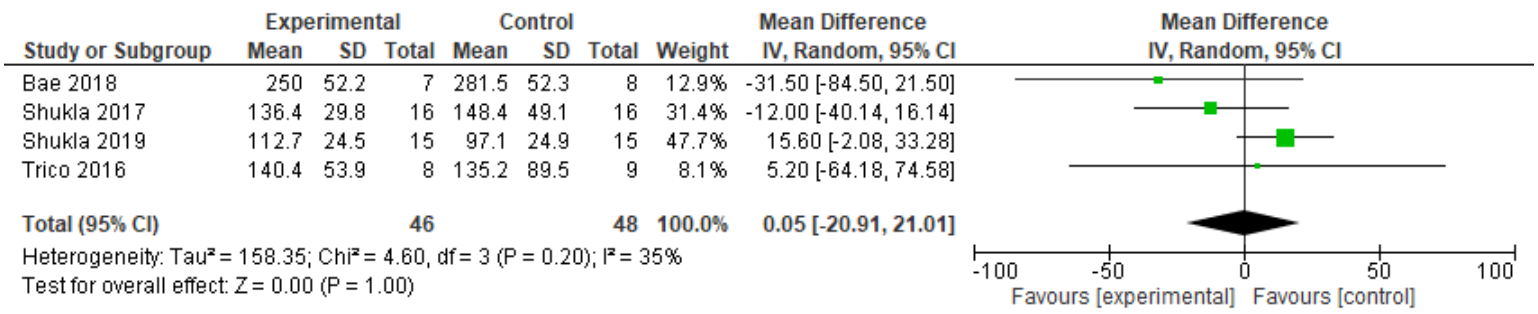
F. Plasma glucose (mg/dL) 120 min after meals (short-term only)



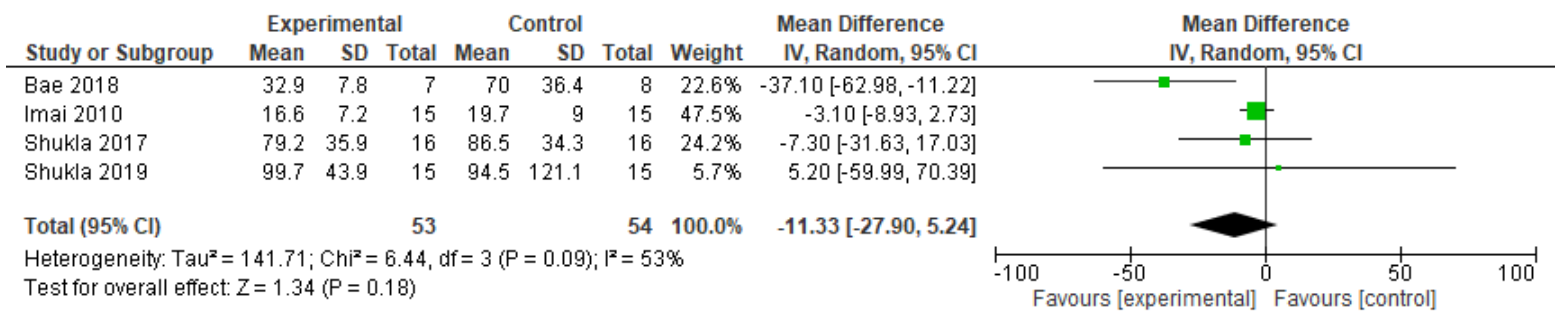
G. Plasma glucose (mg/dL) 120 min after meals (rice only) (=vegetable only)



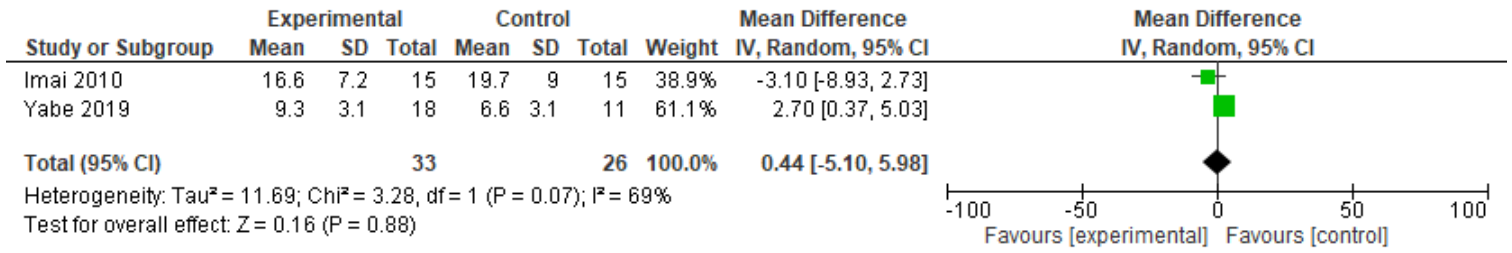
H. Plasma glucose (mg/dL) 120 min after meals (except for rice)



I. Plasma insulin (μIU/mL) 120 min after meals (short-term only)



J. Plasma insulin (μIU/mL) 120 min after meals (rice only)



K. Plasma insulin (μIU/mL) 120 min after meals (except for rice)

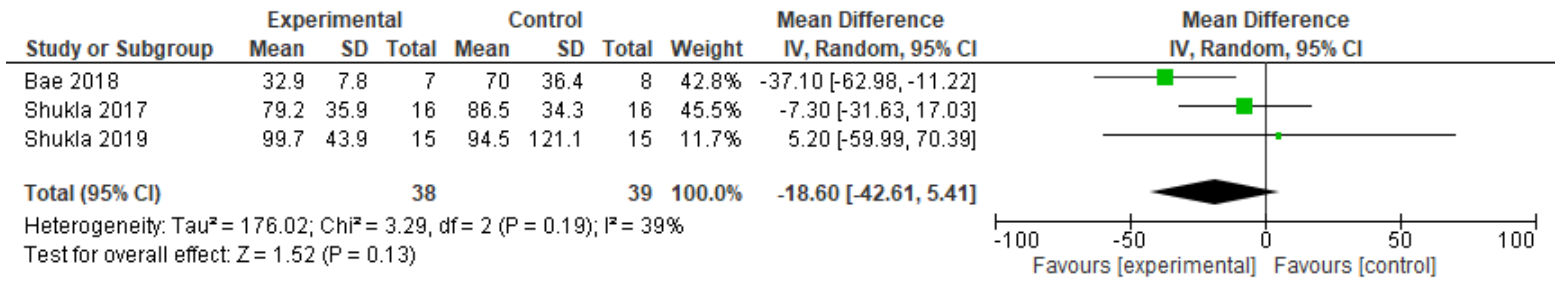
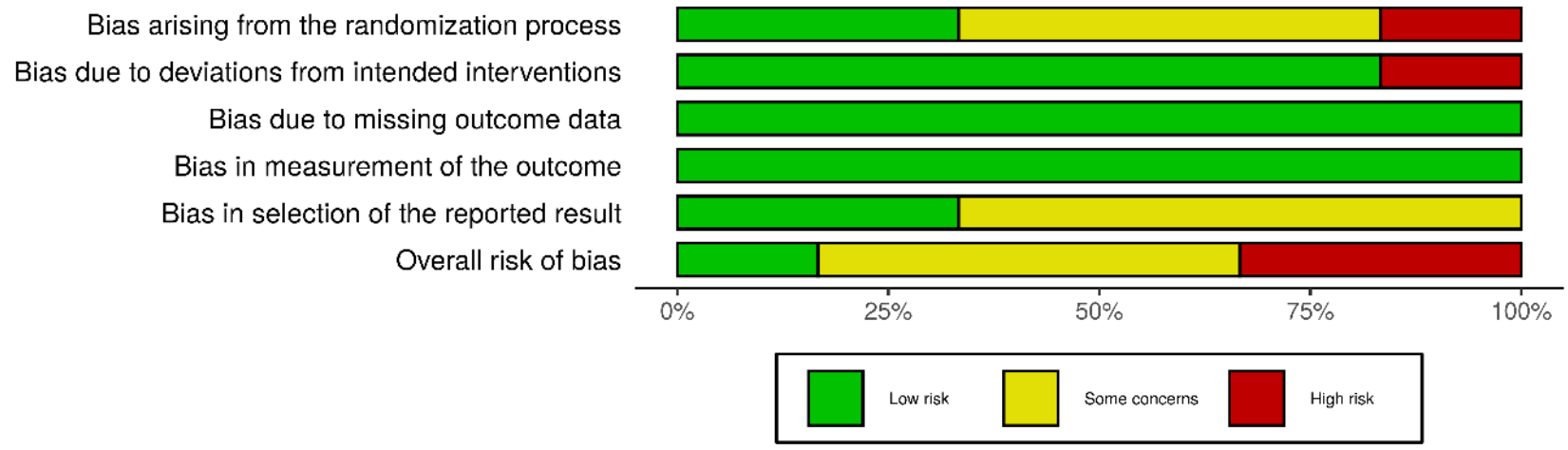


Figure S2. Forest plot of comparisons

IV, inverse variance; HbA1c, Hemoglobin A1c; NGSP, national glycohemoglobin standardization program.

NGSP (%) = 1.02*JDS (%) + 0.25.

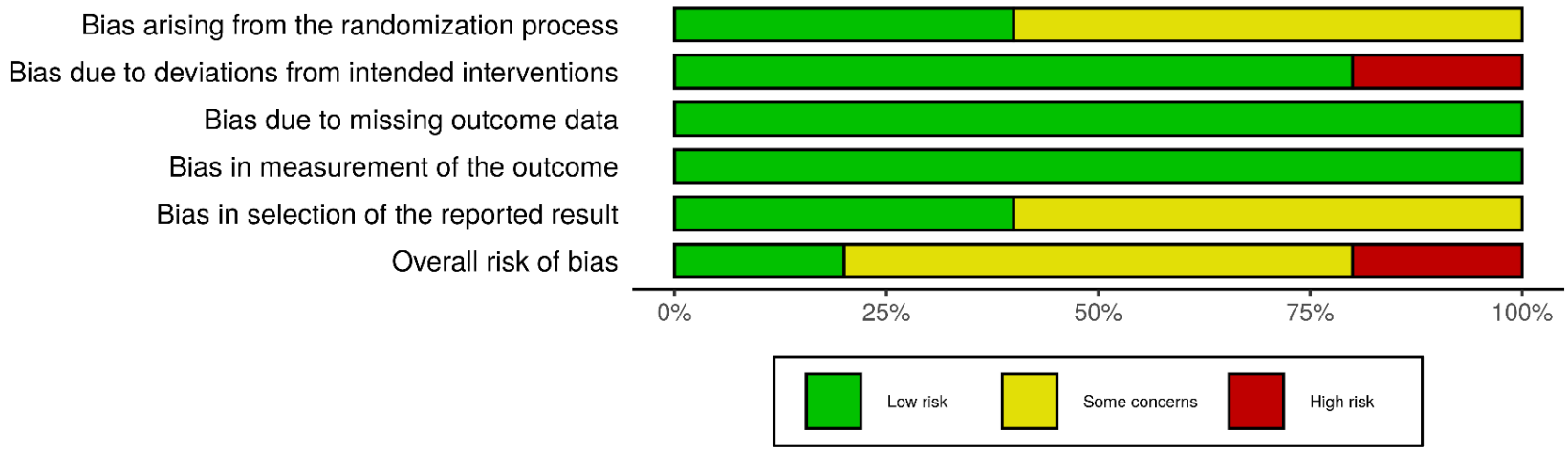
A



B

Figure S3. (A) Risk of bias graph for plasma glucose (B) Risk of bias summary for plasma glucose.

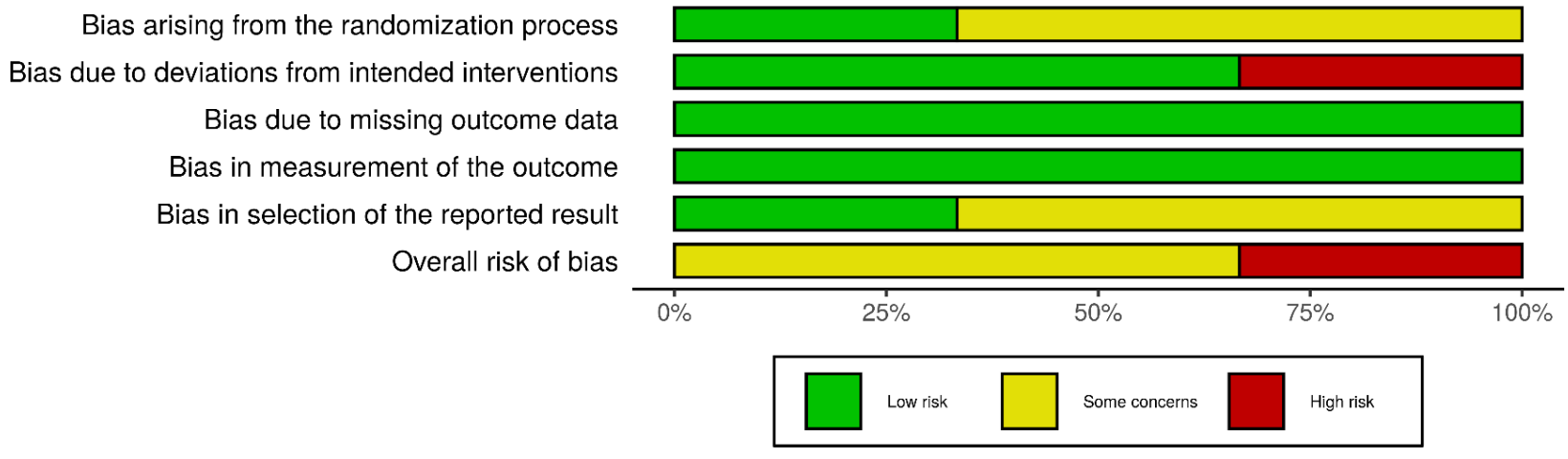
A



B

Figure S4. (A) Risk of bias graph for plasma insulin (B) Risk of bias summary for plasma insulin.

A



B

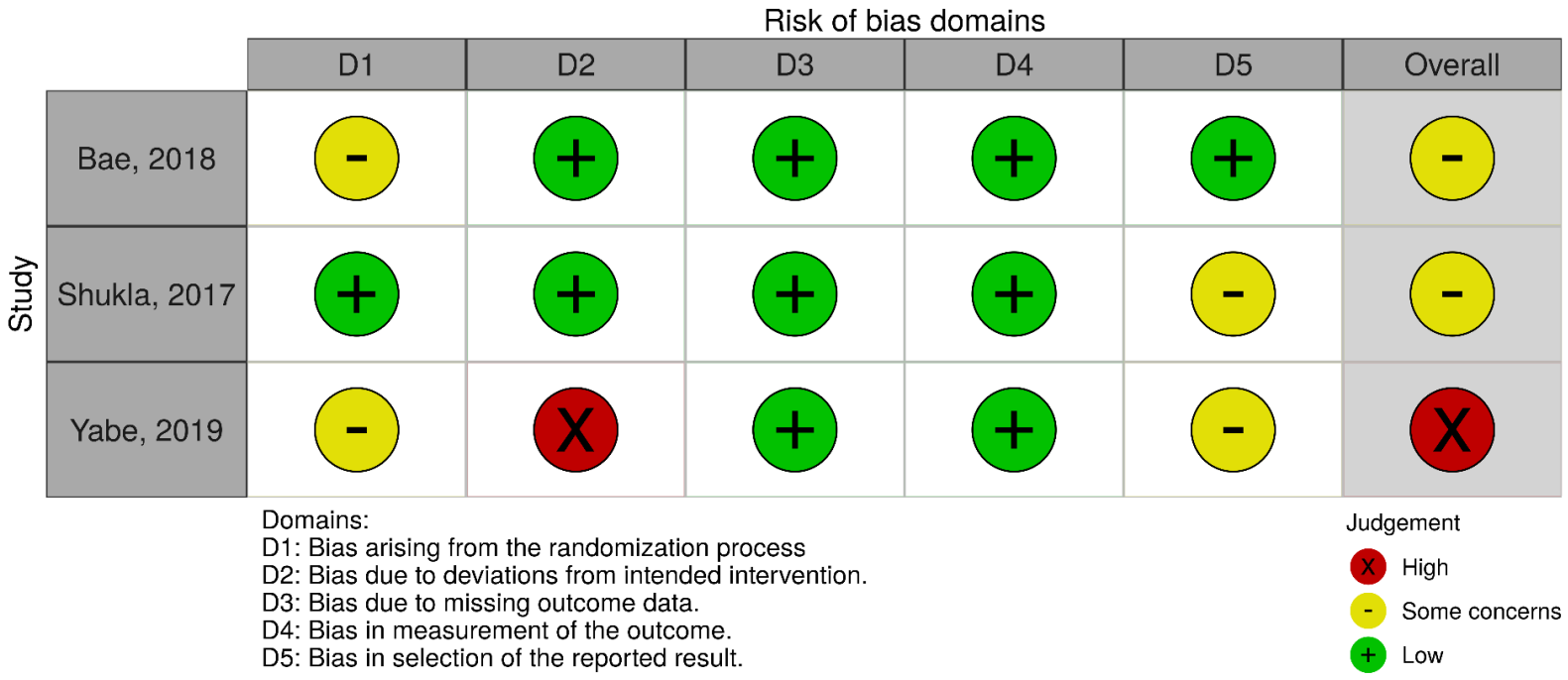


Figure S5. (A) Risk of bias graph for plasma incretin (B) Risk of bias summary for plasma incretin.