

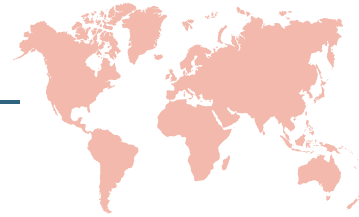
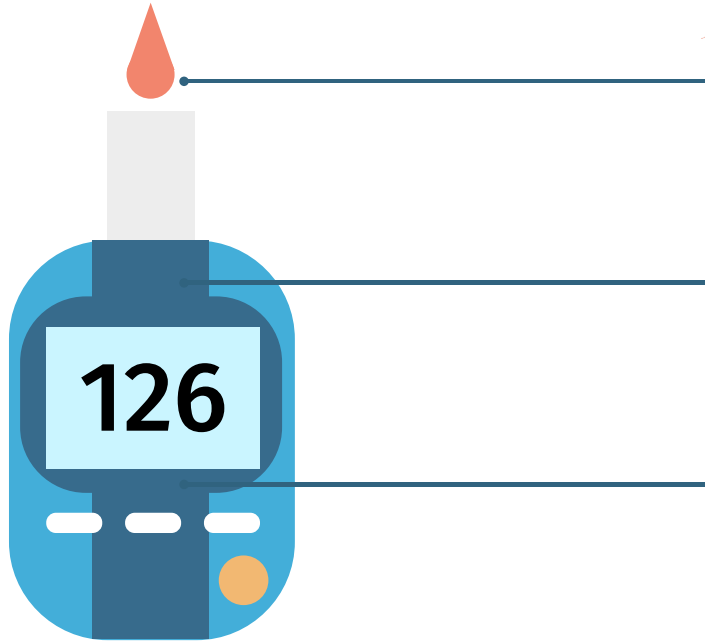
■ The Long-Term Effect of Bariatric/Metabolic Surgery Versus Pharmacologic Therapy in Type 2 Diabetes Mellitus Patients

A Systematic Review and Meta-Analysis

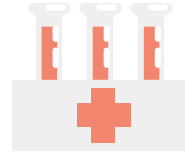
Presented by: Zahra Karimi Zadeh



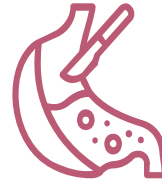
Background on Type 2 Diabetes Mellitus (T2DM)



Prevalence
Over 420 million
people worldwide



Standard Treatment
Pharmacologic therapy and
lifestyle changes



**Rising interest in
metabolic/bariatric
surgery**

Objective of the Study



Objective

Compare long-term outcomes of bariatric surgery vs. pharmacologic therapy



Outcomes

- Diabetes remission
- Complications (microvascular, macrovascular)
- Mortality

Study Design & Methodology



Systematic Review & Meta-analysis

PRISMA guidelines



Databases

PubMed
Embase
Cochrane
Web of Science



Number of Studies and cases

13 eligible studies
(RCTs and cohort studies)

From 2014 to 2021

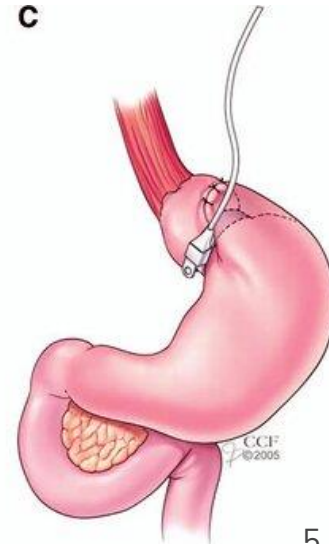
n = 68,280 patients

Bariatric Surgery Procedures Reviewed

Common procedures:

- Roux-en-Y gastric bypass
- Sleeve gastrectomy
- Gastric banding

Bariatric surgery recognized for treating obesity and T2DM



Characteristics for included studies

Author, year	Countries	Ethnicity	Study design	Surgery types	Outcomes	Follow-up (years)	Sample size	BMI baseline (kg/m ²)	Age baseline (years)
Sjöström L, 2014(28)	Swedish	NA	Prospective cohort	AGB or NGB or VBG or GB	Diabetes remission, microvascular complications, macrovascular complications	15	603	40(C) 42.1(S)	50.4(C) 48.7(S)
Hsu CC, 2015(29)	Taiwan	Asian	Retrospective cohort	LSG or GB	Diabetes remission	5	351	29.1(C), 31.0(S)	51.2(C) 44.2(S)
Schauer PR, 2017(30)	US	Mixed	RCT	RYGB or LSG	Diabetes remission	5	150	36.4(C) 36.5 (S)	49.7(C) 48.1(S)
Adams TD , 2017(31)	US	NA	Prospective cohort	RYGB	Diabetes remission	12	212	>=35(all)	-
Ikramuddin S, 2018(32)	US and Taiwan	Mixed	RCT	GB	Diabetes remission	5	120	34.4(C) 34.9(S)	48(C) 49(S)
Mingrone G, 2021(33)	Italy	NA	RCT	RYGB or BPD	Diabetes remission	10	60	>=35(all) 45.4(C) (S)	44.4 43.3(S)

Author, year	Countries	Ethnicity	Study design	Surgery types	Outcomes	Follow-up (years)	Sample size	BMI baseline (kg/m ²)	at baseline (years)	at
Johnson, BL. MS, 2013(34)	US	Mixed	Retrospective cohort	RYGB or AGB or VBG or BPD or SG	Microvascular complications, macrovascular complications	5	15951	≥ 35(all)	52.1(C) 47.5(s)	
O'Brien R, 2018(35)	US	Mixed	Retrospective cohort	RYGB or SG or AGB	Microvascular complications	5	15083	43.8 (C) 44.9 (S)	48.7(C) 47.6(S)	
Madsen LR, 2019(36)	Danish	NA	Retrospective cohort	RYGB	Microvascular complications, macrovascular complications	5.3	2185	>35	47.1(C) 46.8(S)	
Fisher DP, 2018(37)	US	Mixed	Retrospective cohort	RYGB or SG or AGB	Macrovascular complications, mortality	5	20235	43.8(C) 44.7(S)	50.2(C) 49.5(S)	
Aminian A, 2019(38)	US	Mixed	Retrospective cohort	RYGB or SG or AGB or DS	Macrovascular complications, mortality	8	13722	42.6(C) 45.1(S)	54.8(C) 52.5(S)	
Pontioli, A. E., 2016(39)	Italy	NA	Retrospective cohort	LAGB	Mortality	15	1066	> 35(all) 51.9(C) 49.9(S)	41.9(C) 43.0(S)	
Eliasson B, 2015(40)	Sweden	NA	Retrospective cohort	RYGB	Mortality	8	12264	41.4(C) 42.0(S)	50.5(C) 48.5(S)	

Diabetes Remission – Definition



HbA1c

HbA1c < 6.5% without medication

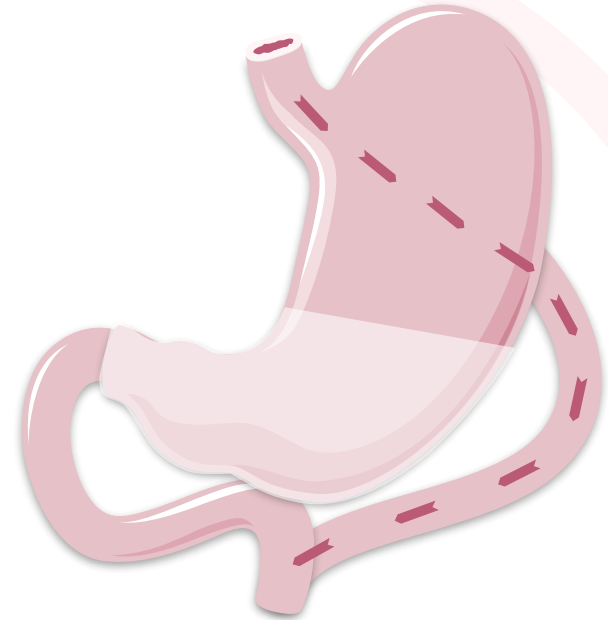


FBS

Fasting Plasma Glucose < 100-125
mg/dL without medication

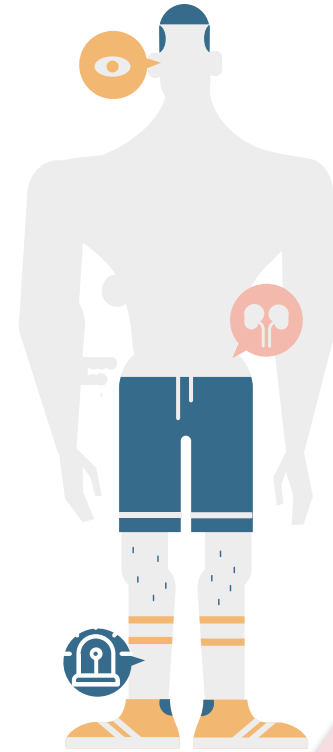
Long-Term Diabetes Remission Rates

- Bariatric surgery significantly improves remission
(OR = 8.39, 95% CI: 3.58-19.67, $P < 0.001$)
- Subgroup analysis:
 - RCTs: OR = 4.02, 95% CI: 1.80-8.96
 - Cohort studies: OR = 13.62, 95% CI: 3.95-46.99



Microvascular Complications Overview

- Includes nephropathy, retinopathy, and neuropathy
- Strong correlation between glycemic control and incidence

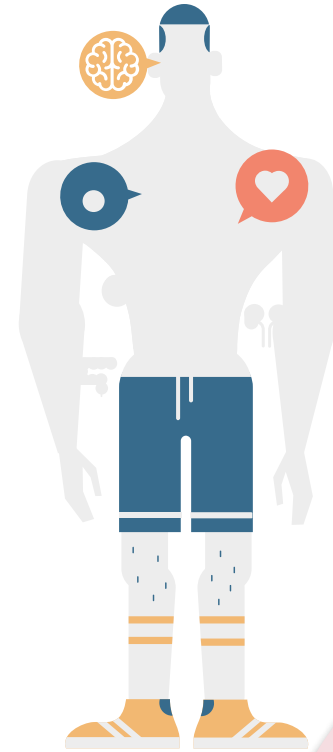


Impact on Microvascular Complications

- Bariatric surgery reduced microvascular complications (HR = 0.43, 95% CI: 0.37-0.49, $P < 0.001$)
- Fixed-effects model due to low heterogeneity

Macrovascular Complications Overview

- Includes coronary artery disease (CHD), peripheral artery disease (PAD), and cerebrovascular disease
- Leading cause of death in T2DM patients



Impact on Macrovascular Complications



- Reduced incidence of macrovascular complications after surgery (HR = 0.60, 95% CI: 0.48-0.75, P<0.001)



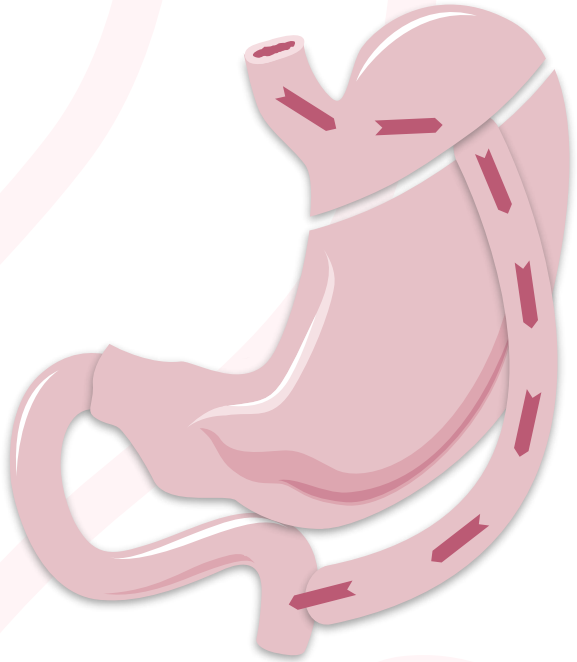
All-Cause Mortality in T2DM Patients

- Long-term mortality reduced significantly in surgery patients (HR = 0.44, 95% CI: 0.37-0.49, $P < 0.001$)

Publication Bias & Sensitivity Analysis

- Funnel plots show no significant bias in diabetes remission, microvascular complications, macrovascular complications, or mortality

Bariatric Surgery Mechanisms



- • Improves glucose metabolism by altering gut hormones (GLP-1, GIP)
- Weight loss-independent effects, including changes in bile acids, gut microbiota

Challenges and Relapses

- Diabetes remission may relapse over time (19% relapse after 3 years)
- Adverse effects: anemia, hypoglycemia, perioperative complications



Limitations of the Study

- Most included studies were observational (potential biases)
- Small sample sizes in RCTs
- Lack of uniformity in defining diabetes remission

■ **Future Research Recommendations**

- Need for more high-quality RCTs with long-term follow-ups
- Evaluate mechanisms behind metabolic surgery impact on T2DM

Key Takeaways and Conclusion



Diabetes Remission: Surgery is 8 times more likely to result in long-term remission than medication.



Complications:

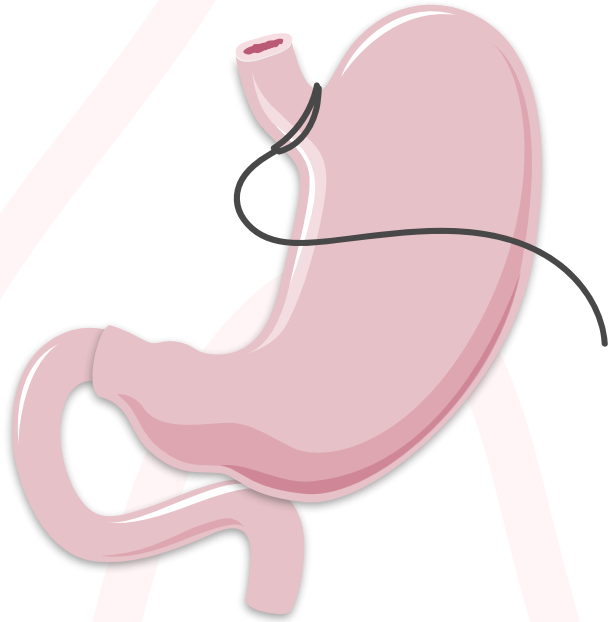
57% lower risk of microvascular complications

40% lower risk of macrovascular complications

Mortality:

56% lower risk of death with bariatric surgery.

Key Takeaways and Conclusion



- Bariatric surgery is highly effective for long-term diabetes management, especially for people with obesity and uncontrolled diabetes.
- Surgery should be considered earlier in treatment plans for severe cases.
- Guidelines might need to be updated to include bariatric surgery as a key option.