MMDA®
Myanmar Diabetes Association

Comprehensive Management of Diabetes

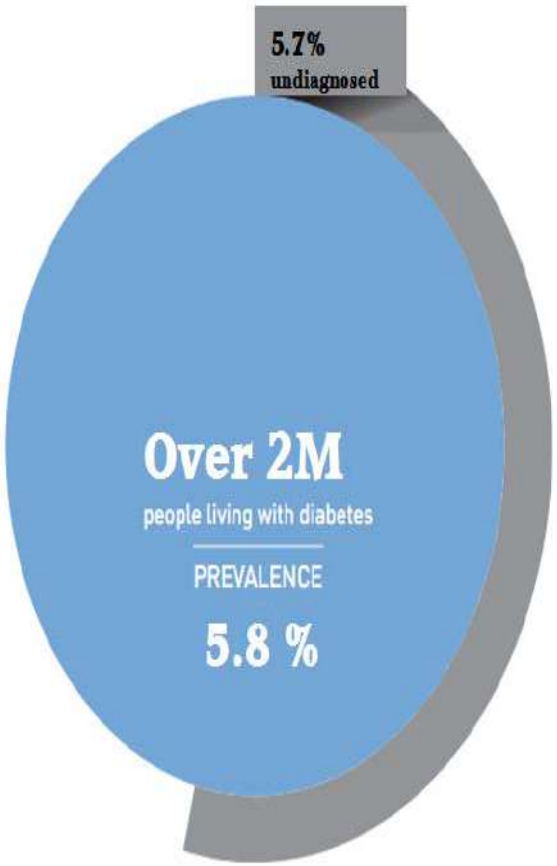
PROFESSOR TINT SWE LATT

PRESIDENT

MYANMAR DIABETES ASSOCIATION

TSL/Sittwe Special CME/Zifam/Dec 18, 2016

Magnitude of problem of Diabetes in MYANMAR

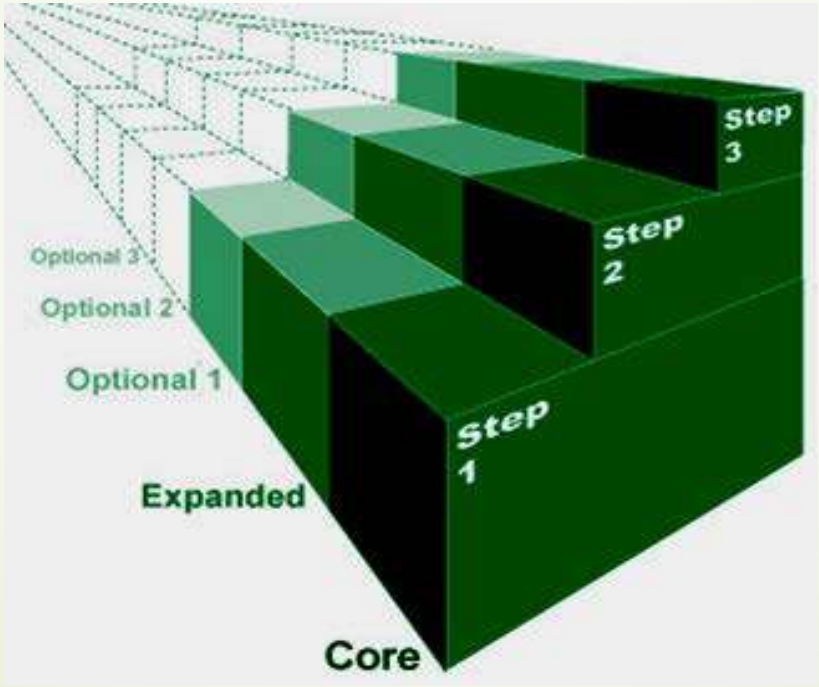


Diabetes in Myanmar [20-79 years]	2014
Adult Population [1000`s]	35,436
Number of People With Diabetes [1000`s]	2,051.0
Regional Prevalence [%]	5.8
Comparative Prevalence [%]	6.1
Undiagnosed Cases [1000`s]	1,292.9
Total diabetes-related deaths	60,518
Deaths under the age of 60 [%]	60.7
Total diabetes-relateed health expenditure [USD]	30.9

International Diabetes Federation: Diabetes Atlas, sixth edition, 2014

STEPS approach to Surveillance

A framework for risk factors, diseases etc sensitive to resource availability



www.who.int/ncd_surveillance/steps

Health Behaviours

- Tobacco use
- Alcohol consumption (heavy)
- Alcohol abstainers
- Physical inactivity
- Fruit/vegetable intake

Physiological Factors

- Obesity/overweight (& mean BMI)
- Raised blood pressure (& mean systolic blood pressure)
- Raised lipid (& mean total cholesterol)
- Diabetes (& mean blood glucose)

Disease outcomes

- Heart disease
- Stroke
- Cancers
- Diabetes

Study area	:	15 townships of Yangon Division (both rural and urban areas)
Study population	:	age 25 – 74 years, both sex
Sample size	:	5000 subjects
Study period	:	July 2003 to June 2004
Methods	:	STEPs Instrument for NCD Risk Factors (Core and Expanded version 1.3)

Diabetes Mellitus detectable by OGTT : Men and Women

Age	Men			Women		
	N	Diabetes n (%) SE	Others n (%) SE	N	Diabetes n (%) SE	Others n (%) SE
25-34	320	2 (0.87),0.68	318 (99.13),0.68	387	8 (2.28), 0.80	379 (97.72), 0.80
35-44	389	29 (8.40),1.34	360 (91.60),1.34	555	40 (7.14), 1.08	515 (92.86), 1.08
45-54	492	62 (15.20),1.94	430 (84.80),1.94	638	96 (15.81), 1.56	542 (84.19), 1.56
55-64	442	59 (14.72),2.61	383 (85.28),2.61	538	101 (19.79), 2.76	437 (80.21), 2.76
65-74	351	47 (15.03),1.40	304 (84.97),1.34	333	45 (15.96), 1.64	288 (84.04), 1.64
25-74	1994	199 (11.51),1.11	1795 (88.49),1.11	2451	290 (12.64), 1.07	2161 (87.36), 1.07

National Prevalence of Diabetes and Prediabetes in Myanmar (2014)

Tint-Swe Latt [1],

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Ei-Sandar Oo [4], Kyaw-Myint-Myat Thein[5]

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Prevalence of diabetes, Myanmar, 2014

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Sex	Age in years	Pop.	Diagnosed diabetes		Undiagnosed diabetes		Total diabetes	
			%	95%CI	%	95%CI	%	95%CI
Men	25-34	616	0.1	[0.0,0.4]	3.5	[1.5,8.0]	3.6	[1.6,8.1]
	35-44	738	1.7	[0.9,3.1]	5.9	[3.7,9.2]	7.6	[5.0,11.2]
	45-54	832	4.8	[2.5,8.9]	7	[5.2,9.4]	11.8	[8.7,15.9]
	55-64	707	3.5	[2.0,6.0]	16	[10.4,23.6]	19.5	[13.4,27.4]
	25-64	***2,893***	***2.1***	***[1.4,3.1]***	***7***	***[5.3,9.1]***	***9.1***	***[6.9,11.8]***
Women	25-34	1,099	0.4	[0.2,1.0]	4.1	[2.7,6.2]	4.5	[3.1,6.6]
	35-44	1,559	2.3	[1.4,3.7]	8.7	[5.6,13.3]	11	[7.9,15.0]
	45-54	1,537	5.3	[3.6,7.7]	10	[8.1,13.1]	15.6	[12.6,19.1]
	55-64	1,236	11	[7.5,15.1]	13	[8.6,19.2]	23.7	[19.2,28.8]
	25-64	***5,431***	***3.7***	***[2.6,5.1]***	***8.2***	***[6.0,11.1]***	***11.8***	***[9.6,14.6]***
Both sexes	25-34	1,715	0.2	[0.1,0.5]	3.8	[2.4,6.0]	4.1	[2.6,6.2]
	35-44	2,297	2	[1.3,3.0]	7.3	[5.0,10.4]	9.3	[6.8,12.4]
	45-54	2,369	5	[3.6,7.0]	8.7	[7.2,10.4]	13.7	[11.3,16.6]
	55-64	1,943	7.1	[5.0,10.1]	15	[9.8,20.9]	21.6	[16.5,27.7]
	25-64	***8,324***	***2.9***	***[2.2,3.8]***	***7.6***	***[5.7,9.9]***	***10.5***	***[8.3,13.1]***

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Urban Rural Difference in Diabetes Prevalence

	Prevalence (%)	95% CI
Urban pop.	14	12 to 13
Rural pop.	9	7 to 12

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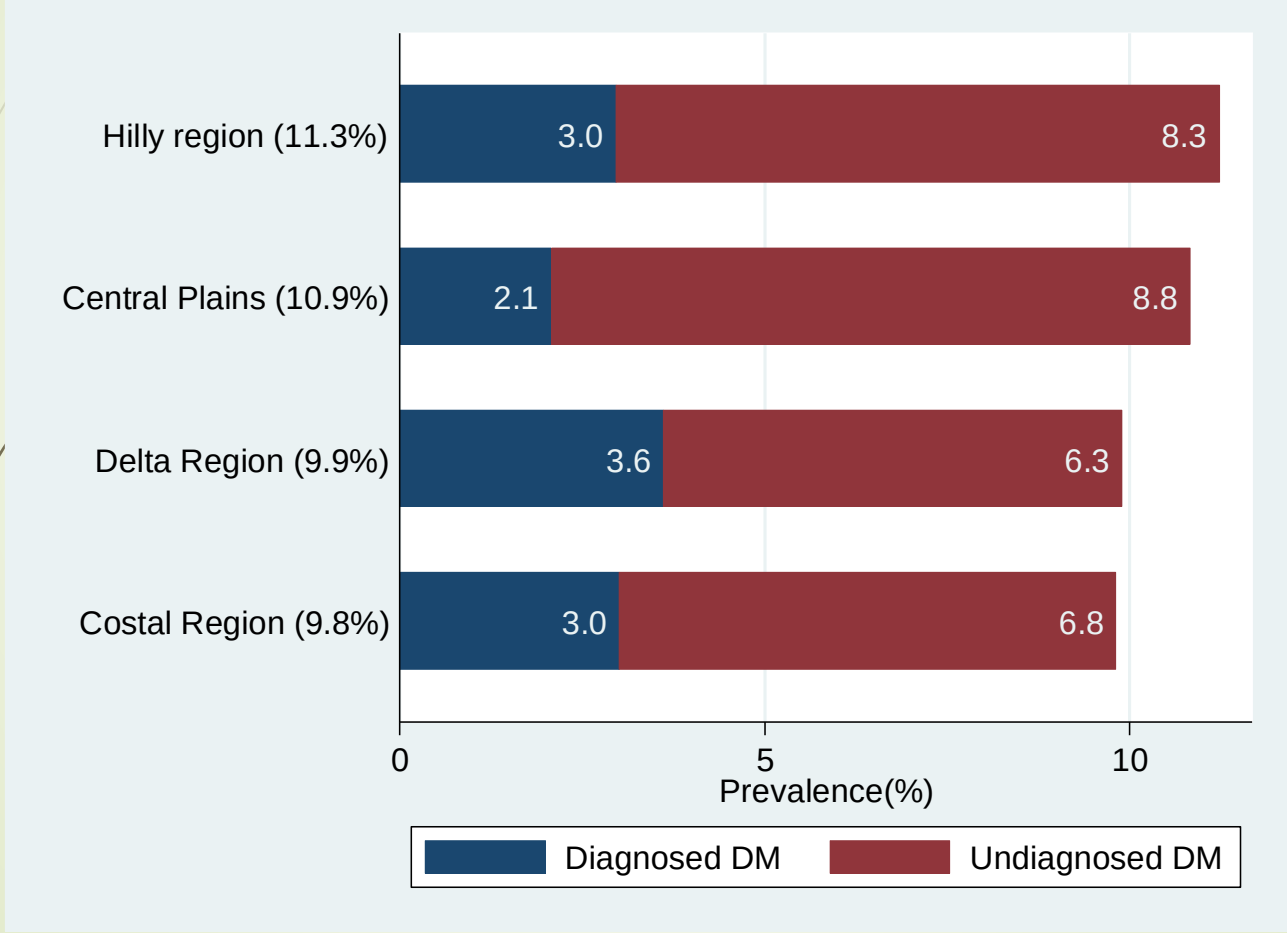
Diabetes prevalence by geographical regions

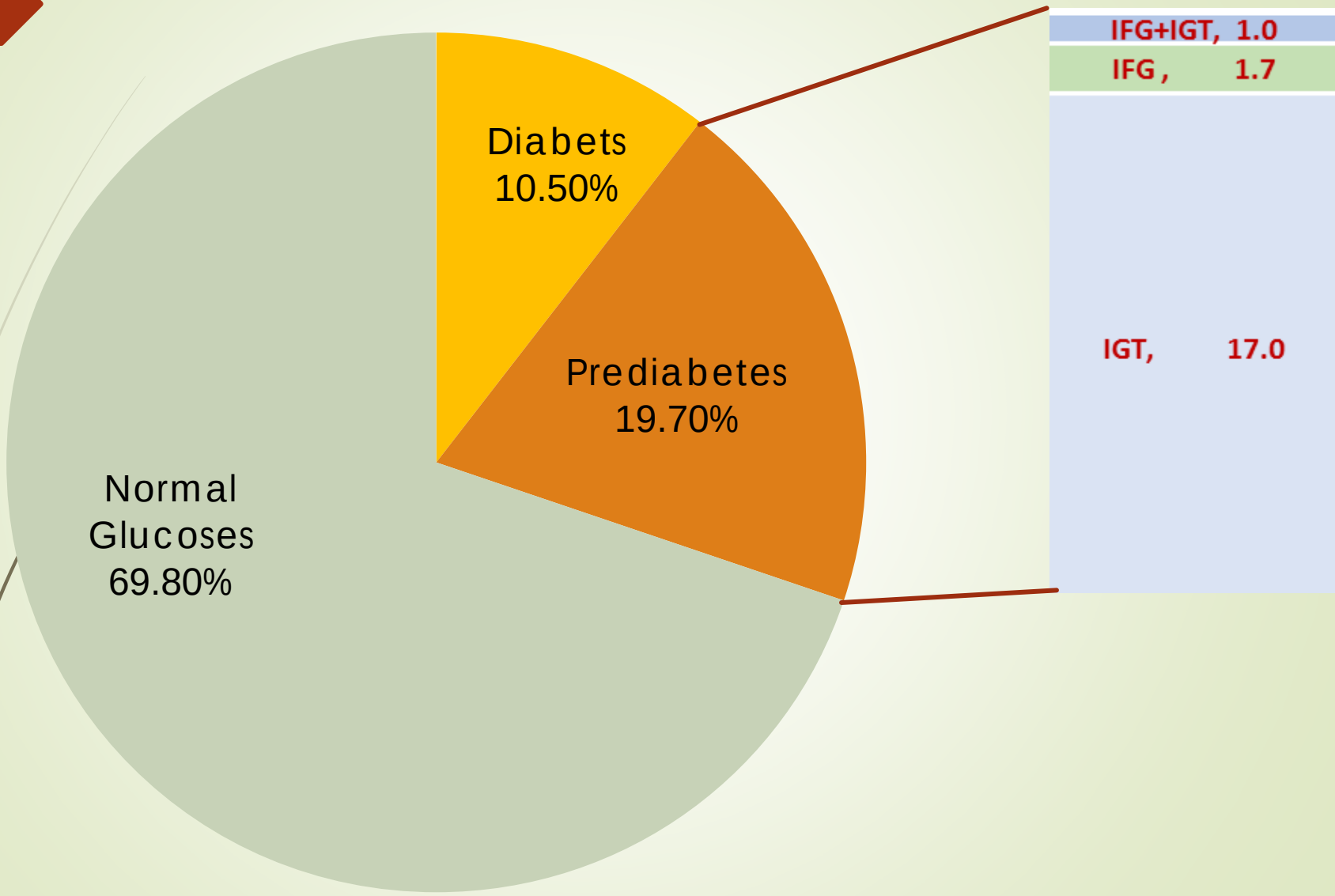


Relative Risk Ratios (RRR) for pre-diabetes and diabetes from multinomial logistic regression

Variable	Prediabetes		Diabetes	
	RRR	95%CI	RRR	95%CI
Sex				
Male (Ref.)	1.0		1.0	
Female	1.5***	[1.2,1.8]	1.3	[1.0,1.8]
Age (in years)				
25-34 (Ref.)	1.0		1.0	
35-44	1.7**	[1.3,2.2]	2.5***	[1.6,4.0]
45-54	2.0***	[1.5,2.7]	3.4***	[2.1,5.3]
55-64	2.7***	[2.0,3.8]	6.4***	[3.9,10.3]
Urban-rural				
Rural (Ref.)	1.0		1.0	
Urban	1.1	[0.8,1.3]	1.5***	[1.3,2.2]
Central obesity				
Absent (Ref.)	1.0		1.0	
Present	1.4**	[1.1,1.8]	3.1**	[2.4,4.2]
Triglycerides(TG)				
Low (Ref.)	1.0		1.0	
High	1.3*	[1.0,1.6]	1.7***	[1.3,2.2]
Observations		6555		
Wald χ^2 (d.f=14)		327		
P value		<0.001		

* p<0.05, ** p<0.01, ***p<0.001

Prevalence of diabetes



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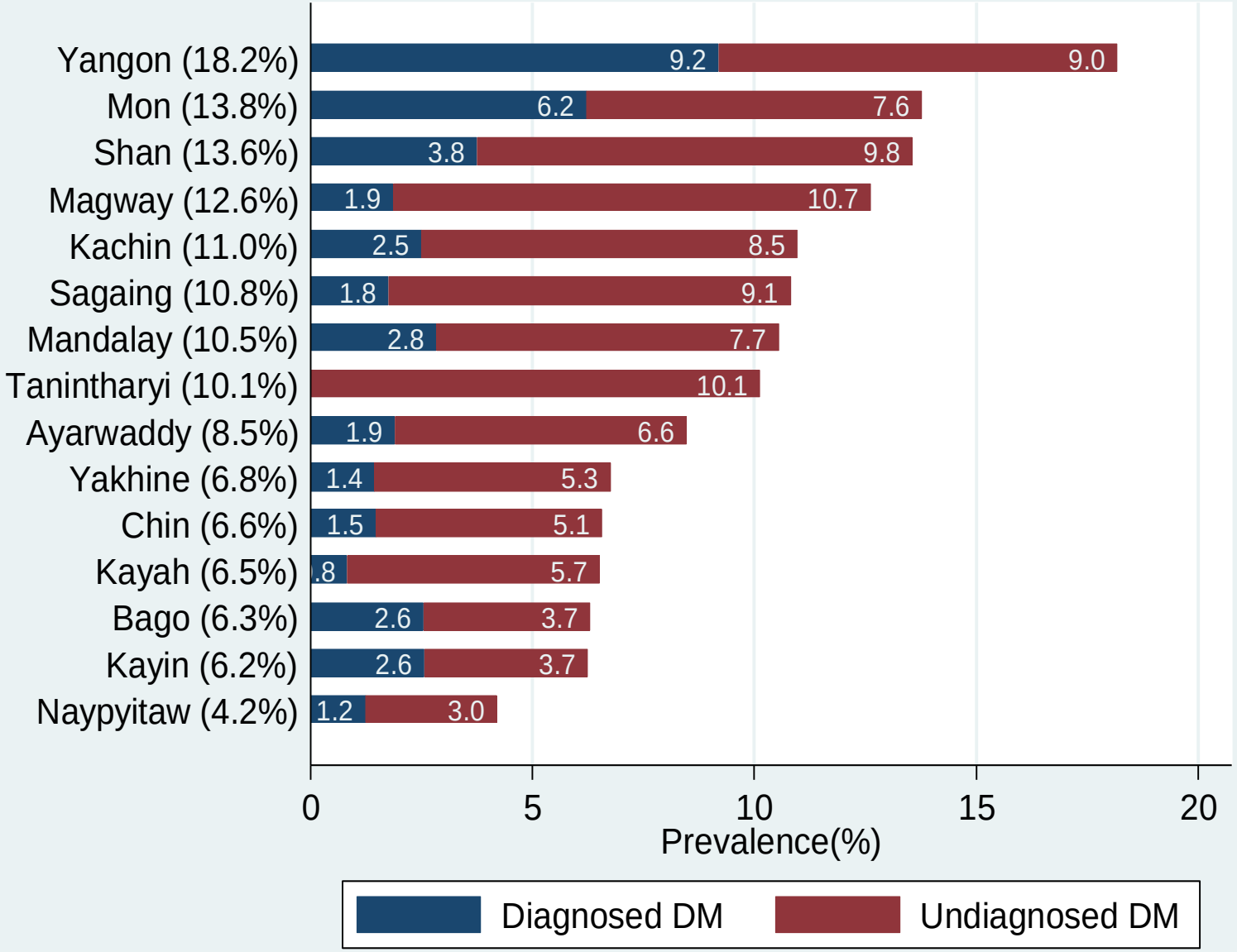
Prevalence according to regions



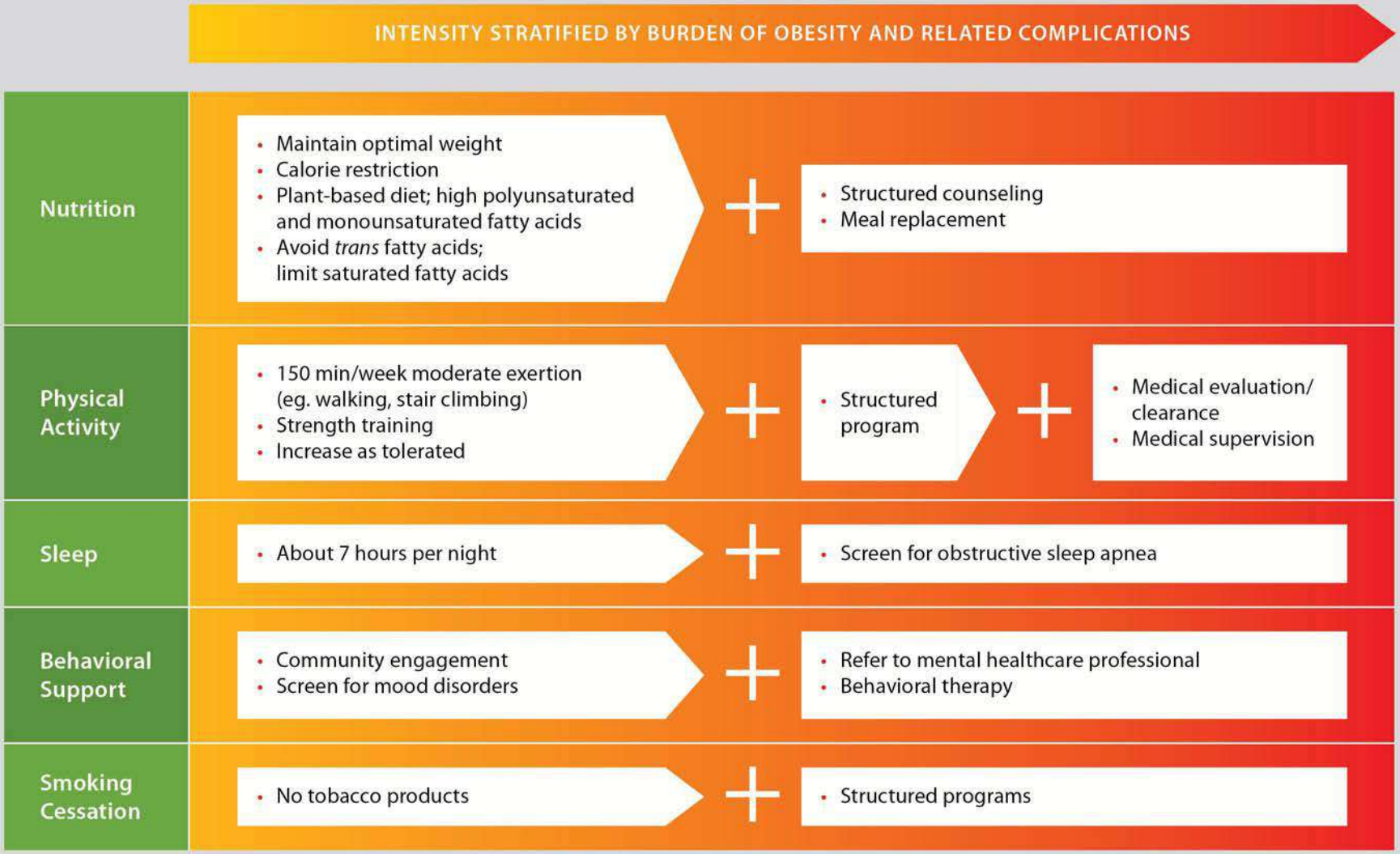
Different level of prevention of Diabetes

1. Primodial prevention(the whole population)
2. Primary prevention (high risk persons)
3. Secondary prevention (diabetes without complications)
4. Tertiary prevention.(Diabetes with complications)

- **All medical doctors should change their attitude toward prevention of diabetes**
- **It is mandatory for all health care providers**
- **It is prevention, not, treatment of diabetes**

LIFESTYLE THERAPY

RISK STRATIFICATION FOR DIABETES COMPLICATIONS



American Association of Clinical Endocrinologists Healthful Eating Recommendations for Patients with Diabetes Mellitus

Topic	Recommendation
General eating habits	Regular meals and snacks; avoid fasting to lose weight Plant-based diet (high in fiber, low calories/glycemic index, and high in phytochemicals/antioxidants) Understand Nutrition Facts Label information Incorporate beliefs and culture into discussions Informal physician-patient discussions Use mild cooking techniques instead of high-heat cooking

American Association of Clinical Endocrinologists Healthful Eating Recommendations for Patients with Diabetes Mellitus

Topic	Recommendation
Carbo-hydrate	Explain the 3 types of carbohydrates: sugars, starch, and fiber and the effects on health for each type Specify healthful carbohydrates (fresh fruits and vegetables, pulses, whole grains); target 7-10 servings per day Lower-glycemic index foods may facilitate glycemic control (glycemic index score <55 out of 100: multigrain bread, pumpernickel bread, whole oats, legumes, apple, lentils, chickpeas, mango, yams, brown rice), but there is insufficient evidence to support a formal recommendation to educate patients that sugars have both positive and negative health effects

American Association of Clinical Endocrinologists Healthful Eating Recommendations for Patients with Diabetes Mellitus

Topic	Recommendation
Fat	Specify healthful fats (low mercury/contaminant-containing nuts, avocado, certain plant oils fish) Limit saturated fats (butter, fatty red meats, tropical plant oils, fast foods) and *trans* fat; no- or low-fat dairy products
Protein	Consume protein in foods preferably with low saturated fats (fish, egg whites, beans); there is no need to avoid animal protein Avoid or limit processed meats

American Association of Clinical Endocrinologists Healthful Eating Recommendations for Patients with Diabetes Mellitus

Topic	Recommendation
Micronutrients	Routine supplementation is not necessary Specifically, chromium, vanadium, magnesium, vitamins A, C, and E, and CoQ10 are not recommended for glycemic control Supplementation to avoid insufficiency or deficiency in at-risk patients A healthful eating meal plan can generally provide sufficient micronutrients

Abbreviations: BEL, best evidence level; CPG, clinical practice guideline; EL, evidence level; MNRCT, meta-analysis of nonrandomized prospective or case-controlled trials; NE, no evidence (theory, opinion, consensus, review, or preclinical study); PCS, prospective cohort study; RCT, randomized controlled trial.

COMPLICATIONS-CENTRIC MODEL FOR CARE OF THE OVERWEIGHT/OBESE PATIENT

STEP 1 — EVALUATION FOR COMPLICATIONS AND STAGING

CARDIOMETABOLIC DISEASE | BIOMECHANICAL COMPLICATIONS

NO COMPLICATIONS	COMPLICATIONS	
BMI ≥25	BMI 25–26.9	BMI ≥ 27: Stage Severity of Complications
	MILD TO MODERATE	SEVERE

STEP 2 — SELECT: Therapeutic targets for improvement in complications + Treatment modality + Treatment intensity based on staging

Lifestyle Therapy:	Physician/RD counseling, web/remote program, structured multidisciplinary program
Medical Therapy (BMI ≥ 27):	Phentermine, orlistat, lorcaserin, phentermine/topiramate ER, naltrexone/bupropion, liraglutide 3 mg
Surgical Therapy (BMI ≥ 35):	Gastric banding, sleeve, or bypass

STEP 3 — If therapeutic targets for complications not met, intensify lifestyle, medical, and/or surgical treatment modalities for greater weight loss.

PREDIABETES ALGORITHM

IFG (100–125) | IGT (140–199) | METABOLIC SYNDROME (NCEP 2001)

LIFESTYLE THERAPY
(Including Medically Assisted Weight Loss)

TREAT ASCVD RISK FACTORS

WEIGHT LOSS THERAPIES

TREAT HYPERGLYCEMIA
FPG > 100 | 2-hour PG > 140

ASCVD RISK FACTOR MODIFICATIONS ALGORITHM

- DYSLIPIDEMIA ROUTE
- HYPERTENSION ROUTE

NORMAL GLYCEMIA

Progression

OVERT DIABETES

PROCEED TO HYPERGLYCEMIA ALGORITHM

1 PRE-DM CRITERION

- Intensify Weight Loss Therapies

MULTIPLE PRE-DM CRITERIA

- Low-risk Medications
  - Metformin
  - Acarbose
- Consider with Caution
  - TZD
  - GLP-1 RA

If glycemia not normalized

LEGEND

Orlistat, lorcaserin, phentermine/topiramate ER, naltrexone/bupropion, liraglutide 3 mg, or bariatric surgery as indicated for obesity treatment

GOALS FOR GLYCEMIC CONTROL

INDIVIDUALIZE GOALS

A1C ≤ 6.5%

For patients without concurrent serious illness and at low hypoglycemic risk

A1C > 6.5%

For patients with concurrent serious illness and at risk for hypoglycemia

Table 5.1—Mean glucose levels for specified A1C levels (24,28)

A1C	Mean plasma glucose*		Mean fasting glucose		Mean premeal glucose		Mean postmeal glucose		Mean bedtime glucose	
% (mmol/mol)	mg/dL	mmol/L	mg/dL	mmol/L	mg/dL	mmol/L	mg/dL	mmol/L	mg/dL	mmol/L
6 (42)	126	7.0								
<6.5 (48)			122	6.8	118	6.5	144	8.0	136	7.5
6.5–6.99 (48–53)			142	7.9	139	7.7	164	9.1	153	8.5
7 (53)	154	8.6								
>7.0–7.49 (53–58)			152	8.4	152	8.4	176	9.8	177	9.8
7.5–7.99 (58–64)			167	9.3	155	8.6	189	10.5	175	9.7
8 (64)	183	10.2								
>8.0–8.5 (64–69)			178	9.9	179	9.9	206	11.4	222	12.3
9 (75)	212	11.8								
10 (86)	240	13.4								
11 (97)	269	14.9								
12 (108)	298	16.5								

A calculator for converting A1C results into eAG, in either mg/dL or mmol/L, is available at http://professional.diabetes.org/eAG.
*These estimates are based on ADAG data of ~2,700 glucose measurements over 3 months per A1C measurement in 507 adults with type 1, type 2, and no diabetes. The correlation between A1C and average glucose was 0.92 (28).

HbA1C and Estimated Average Glucose(eAVG)

HbA1C (%)	eAG (mg/dL)	eAG (mmol/l)
5	97	5.4
6	126	7.0
7	154	8.6
8	183	10.2
9	212	11.8
10	240	13.4
11	269	14.9
12	298	16.5

www.ngsp.org/ Harmonizing HbA1C testing/accessed on 16th September, 2016

GLYCEMIC CONTROL ALGORITHM

LIFESTYLE THERAPY
(Including Medically Assisted Weight Loss)

Entry A1C < 7.5%

MONOTHERAPY*

- ✓ Metformin
- ✓ GLP-1 RA
- ✓ SGLT-2i
- ✓ DPP-4i
- ! TZD
- ✓ AGi
- ! SU/GLN

If not at goal in 3 months proceed to Dual Therapy

Entry A1C ≥ 7.5%

DUAL THERAPY*

MET or other 1st-line agent +

- ✓ GLP-1 RA
- ✓ SGLT-2i
- ✓ DPP-4i
- ! TZD
- ! Basal Insulin
- ✓ Colesevelam
- ✓ Bromocriptine QR
- ✓ AGi
- ! SU/GLN

If not at goal in 3 months proceed to Triple Therapy

TRIPLE THERAPY*

MET or other 1st-line agent + 2nd-line agent +

- ✓ GLP-1 RA
- ✓ SGLT-2i
- ! TZD
- ! Basal insulin
- ✓ DPP-4i
- ✓ Colesevelam
- ✓ Bromocriptine QR
- ✓ AGi
- ! SU/GLN

If not at goal in 3 months proceed to or intensify insulin therapy

Entry A1C > 9.0%

SYMPTOMS

NO	YES
DUAL Therapy OR TRIPLE Therapy	INSULIN ± Other Agents

ADD OR INTENSIFY INSULIN

Refer to Insulin Algorithm

LEGEND

- ✓ Few adverse events and/or possible benefits
- ! Use with caution

* Order of medications represents a suggested hierarchy of usage; length of line reflects strength of recommendation

PROGRESSION OF DISEASE

ALGORITHM FOR ADDING/INTENSIFYING INSULIN

START BASAL (Long-Acting Insulin)

A1C < 8%

TDD 0.1–0.2 U/kg

A1C > 8%

TDD 0.2–0.3 U/kg

Insulin titration every 2–3 days to reach glycemic goal:

- Fixed regimen: Increase TDD by 2 U
- Adjustable regimen:
  - **FBG** > 180 mg/dL: add 20% of TDD
  - **FBG** 140–180 mg/dL: add 10% of TDD
  - **FBG** 110–139 mg/dL: add 1 unit
- If hypoglycemia, reduce TDD by:
  - **BG** < 70 mg/dL: 10% – 20%
  - **BG** < 40 mg/dL: 20% – 40%

Consider discontinuing or reducing sulfonylurea after starting basal insulin (basal analogs preferred to NPH)

***Glycemic Goal:**

- <7% for most patients with T2D; fasting and premeal BG < 110 mg/dL; absence of hypoglycemia
- A1C and FBG targets may be adjusted based on patient's age, duration of diabetes, presence of comorbidities, diabetic complications, and hypoglycemia risk

Glycemic Control Not at Goal*

INTENSIFY (Prandial Control)

Add GLP-1 RA

Or SGLT-2i
Or DPP-4i

Add Prandial Insulin

Basal Plus 1, Plus 2, Plus 3

- Begin prandial insulin before largest meal
- If not at goal, progress to injections before 2 or 3 meals
- Start: 10% of basal dose or 5 units

Basal Bolus

- Begin prandial insulin before each meal
- 50% Basal / 50% Prandial TDD 0.3–0.5 U/kg
- Start: 50% of TDD in three doses before meals

Insulin titration every 2–3 days to reach glycemic goal:

- Increase prandial dose by 10% or 1-2 units if 2-h postprandial or next premeal glucose consistently > 140 mg/dL
- If hypoglycemia, reduce TDD basal and/or prandial insulin by:
  - BG consistently < 70 mg/dL: 10% - 20%
  - Severe hypoglycemia (requiring assistance from another person) or BG < 40 mg/dL: 20% - 40%

ASCVD RISK FACTOR MODIFICATIONS ALGORITHM

DYSLIPIDEMIA

LIFESTYLE THERAPY (Including Medically Assisted Weight Loss)

LIPID PANEL: Assess ASCVD Risk

STATIN THERAPY
If TG > 500 mg/dL, fibrates, Rx-grade omega-3 fatty acids, niacin

If statin-intolerant

Try alternate statin, lower statin dose or frequency, or add nonstatin LDL-C- lowering therapies

Repeat lipid panel; assess adequacy, tolerance of therapy

Intensify therapies to attain goals according to risk levels

RISK LEVELS	HIGH — DM but no other major risk and/or age <40	VERY HIGH — DM + major ASCVD risk(s) (HTN, Fam Hx, low HDL-C, smoking) or ASCVD*
	DESIRABLE LEVELS	DESIRABLE LEVELS
LDL-C (mg/dL)	<100	<70
Non-HDL-C (mg/dL)	<130	<100
TG (mg/dL)	<150	<150
TC/HDL-C	<3.5	<3.0
Apo B (mg/dL)	<90	<80
LDL-P (nmol/L)	<1200	<1000

IF NOT AT DESIRABLE LEVELS: Intensify lifestyle therapy (weight loss, physical activity, dietary changes) and glycemic control; consider additional therapy

TO LOWER LDL-C:	Intensify statin, add ezetimibe, PCSK9i, colesevelam, or niacin
TO LOWER Non-HDL-C, TG:	Intensify statin and/or add Rx-grade OM3 fatty acid, fibrate, and/or niacin
TO LOWER Apo B, LDL-P:	Intensify statin and/or add ezetimibe, PCSK9i, colesevelam, and/or niacin
TO LOWER LDL-C in FH:**	Statin + PCSK9i

Assess adequacy & tolerance of therapy with focused laboratory evaluations and patient follow-up

* EVEN MORE INTENSIVE THERAPY MIGHT BE WARRANTED ** FAMILIAL HYPERCHOLESTEROLEMIA

HYPERTENSION

GOAL: SYSTOLIC <130, DIASTOLIC <80 mm Hg

ACEi or ARB

For initial blood pressure >150/100 mm Hg: DUAL THERAPY

ACEi or ARB + Calcium Channel Blocker ✓ / ß-blocker ✓ / Thiazide ✓

If not at goal (2–3 months)

Add calcium channel blocker, ß-blocker or thiazide diuretic

If not at goal (2–3 months)

Add next agent from the above group, repeat

If not at goal (2–3 months)

Additional choices (α-blockers, central agents, vasodilators, aldosterone antagonist)

Achievement of target blood pressure is critical

PROFILES OF ANTIDIABETIC MEDICATIONS

	MET	GLP-1 RA	SGLT-2i	DPP-4i	AGi	TZD (moderate dose)	SU / GLN	COLSVL	BCR-QR	INSULIN	PRAML
HYPO	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Moderate/Severe / Mild	Neutral	Neutral	Moderate to Severe	Neutral
WEIGHT	Slight Loss	Loss	Loss	Neutral	Neutral	Gain	Gain	Neutral	Neutral	Gain	Loss
RENAL/ GU	Contra-indicated CKD Stage 3B,4,5	Exenatide Not Indicated CrCl < 30	Not Effective with eGFR < 45 / Genital Mycotic Infections	Dose Adjustment Necessary (Except Linagliptin)	Neutral	Neutral	More Hypo Risk	Neutral	Neutral	More Hypo Risk	Neutral
GI Sx	Moderate	Moderate	Neutral	Neutral	Moderate	Neutral	Neutral	Mild	Moderate	Neutral	Moderate
CHF CARDIAC ASCVD	Neutral / Benefit	Neutral	Possible Benefit	Neutral	Neutral	Moderate / Neutral	Neutral / ?	Neutral	Neutral / Safe	Neutral	Neutral
BONE	Neutral	Neutral	Neutral	Neutral	Neutral	Moderate Fracture Risk	Neutral	Neutral	Neutral	Neutral	Neutral

Few adverse events or possible benefits | Use with caution | Likelihood of adverse effects | ? Uncertain effect

PRINCIPLES OF THE AACE/ACE COMPREHENSIVE TYPE 2 DIABETES MANAGEMENT ALGORITHM

1.	Lifestyle therapy, including medically supervised weight loss, is key to managing type 2 diabetes.
2.	The A1C target must be individualized.
3.	Glycemic control targets include fasting and postprandial glucoses.
4.	The choice of therapies must be individualized on basis of patient characteristics, impact of net cost to patient, formulary restrictions, personal preferences, etc.
5.	Minimizing risk of hypoglycemia is a priority.
6.	Minimizing risk of weight gain is a priority.
7.	Initial acquisition cost of medications is only a part of the total cost of care which includes monitoring requirements, risk of hypoglycemia, weight gain, safety, etc.
8.	This algorithm stratifies choice of therapies based on initial A1C.
9.	Combination therapy is usually required and should involve agents with complementary actions.
10.	Comprehensive management includes lipid and blood pressure therapies and related comorbidities.
11.	Therapy must be evaluated frequently until stable (e.g., every 3 months) and then less often.
12.	The therapeutic regimen should be as simple as possible to optimize adherence.
13.	This algorithm includes every FDA-approved class of medications for diabetes.

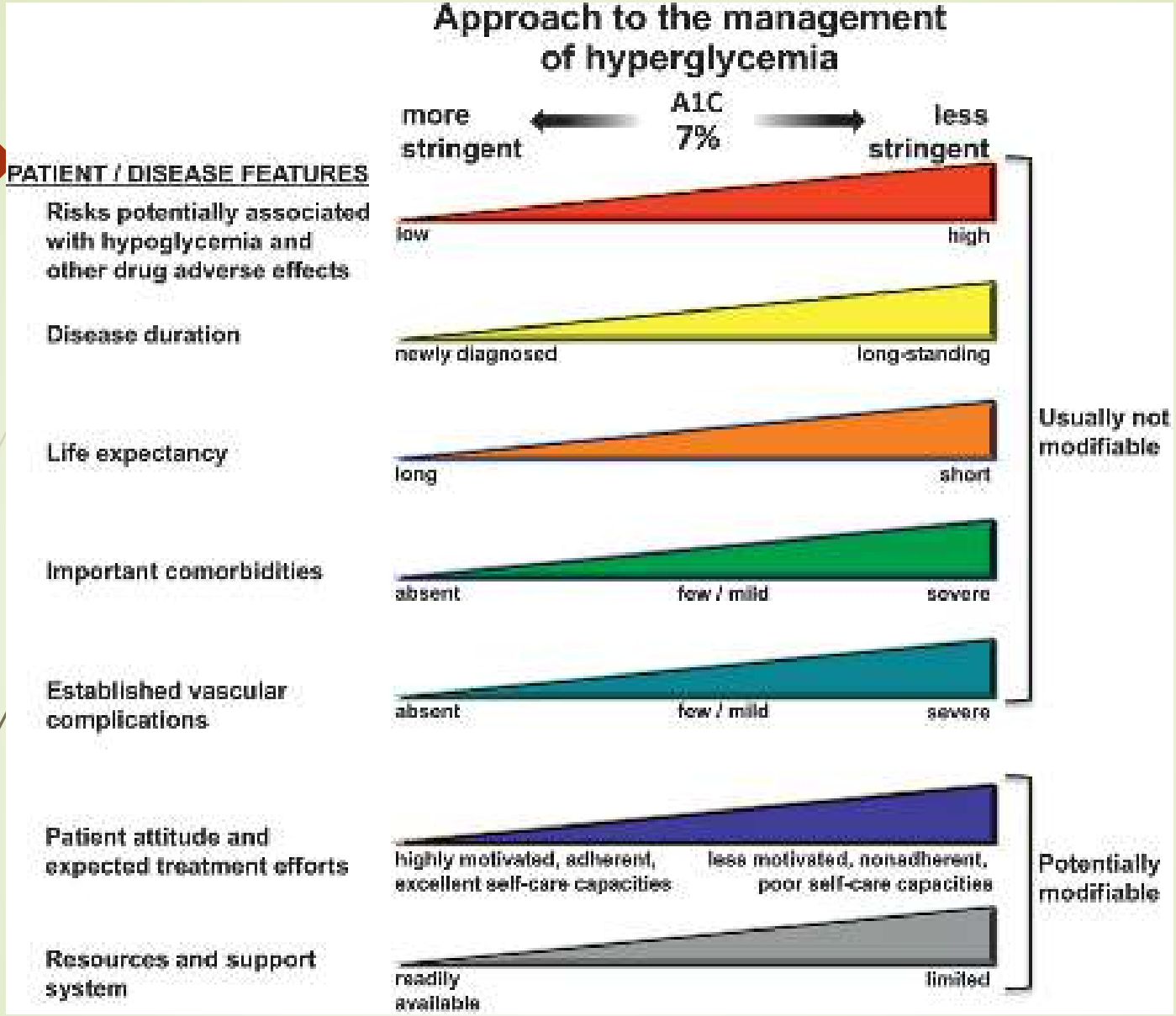


Figure —Depicted are patient and disease factors used to determine optimal A1C targets. Characteristics and predicaments toward the left justify more stringent efforts to lower A1C; those toward the right suggest less stringent efforts. Adapted with permission from Inzucchi et al. (53).

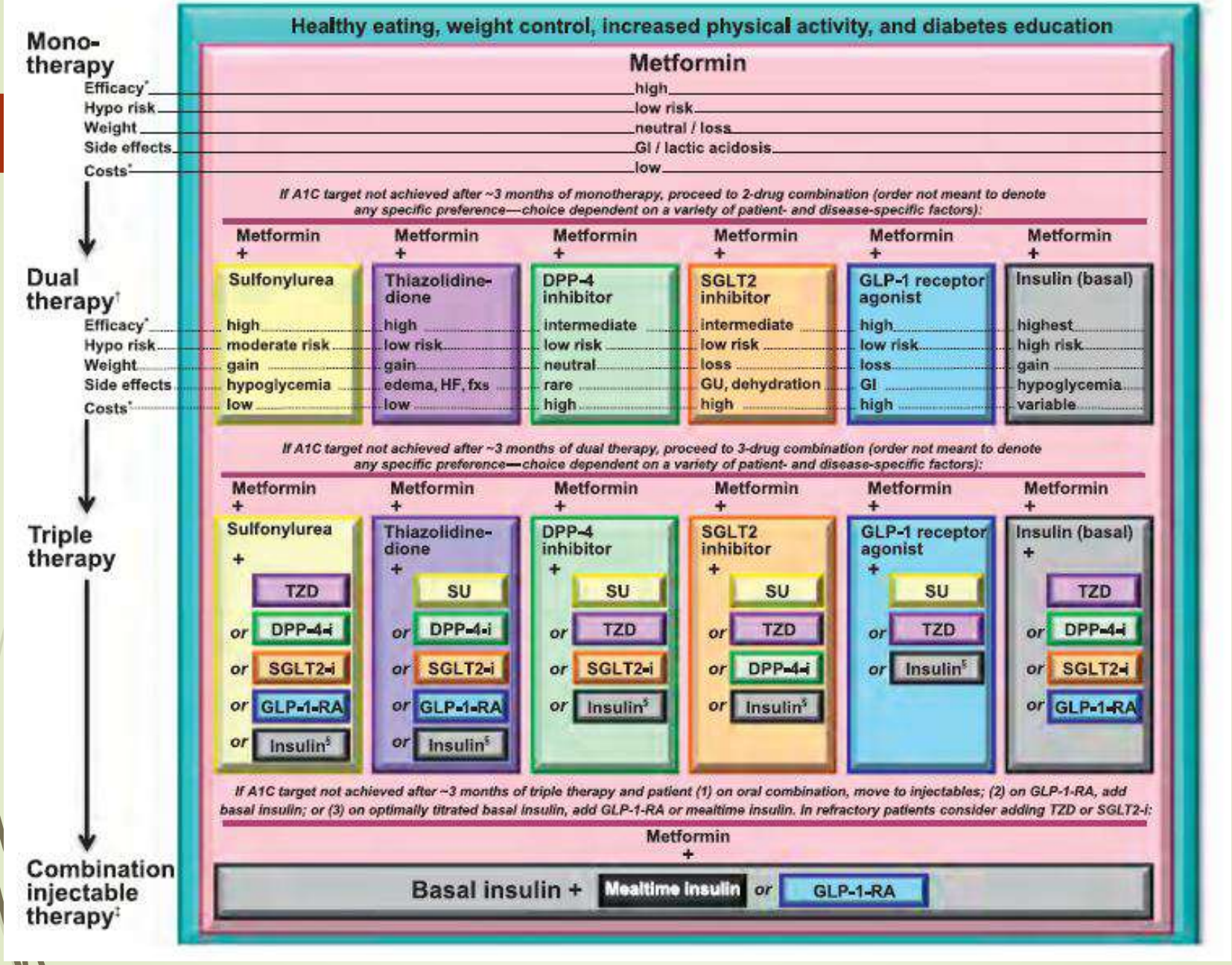


Figure — Antihyperglycemic therapy in type 2 diabetes: general recommendations .

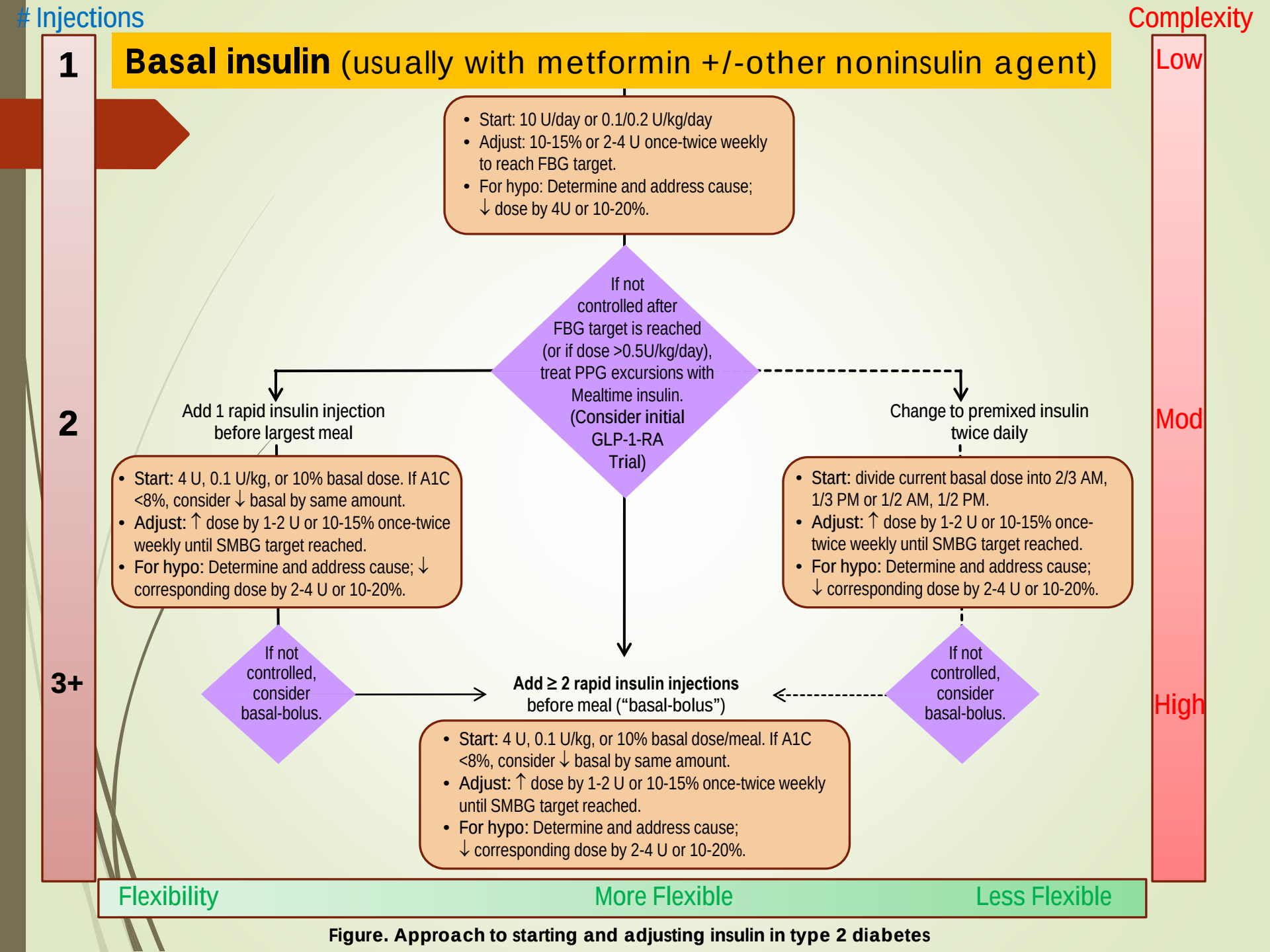


Figure. Approach to starting and adjusting insulin in type 2 diabetes

Diabetes Prevention Programs with Lifestyle Intervention:

	N	Design	Diagnostic test	Mean age ± SD	BMI, kg/m^2 (SD)	Follow-up (yrs)
U.S.DPP 1996 – 2001	3234	RCT 27 sites	IGT & FPG >95 mg/dl	50.6 ± 10.7	34 (6.7)	2.8
Finnish DPS 1993 – 2003	522	RCT 5 sites	IGT	55 ± 7	31.3 (4.6)	3.2
Da Qing China 1986 - 1992	577	RCT, cluster 33 sites	IGT	45 ± 9.1	25.8 (3.8)	4.51 – 4.62
Swedish Malmo 1974 - 1985	415	Nonrando-mized 1 site	IGT	45.9	26.6 (3.1) Intervention; 26.7 (4.0) Control	5.0
Indian DPP 2001 – 2002	531	RCT	IGT	35 – 55	25.8	2.5
Japan Prevention Trial	458 (males)	RCT	IGT	51.5	23.8	3.64

	Interventions	Goal : weight	Goal : diet	Exercise
U.S.DPP 1996 – 2001	• Lifestyle • Metformin • Troglitazone	7% weight loss	500 – 1,000 kcal/day <25% kcal from fat	150 minutes/week
Finnish DPS 1993 - 2003	Lifestyle	>5% weight loss	<30% kcal from fat <10% saturated fat >fiber /1,000 kcal	30 minutes moderate intensity daily
Da Qing China 1986 - 1992	• Diet alone • Exercise alone • Diet and exercise	BMI = 23 kg/m^2	25-30 kcal/kg 55-65% carbohydrate 10-15% protein 25-30% fat lower cal if BMI >25	Increase LTPA by 30 minutes of light or 20 minutes of moderate intensity
Swedish Malmo 1974 - 1985	Lifestyle	Not stated	Decreased simple carbohydrates and saturated fats, substitute PUFAs, increase complex carbohydrates Reduce calories if obese	Not stated
Indian DPP 2001 – 2002	Lifestyle Metformin	Not stated	Portion control, decrease fat, high fruit, vegetable fiber	
Japan Prevention Trial	Lifestyle	BMI < 24 kg/m^2 for control < 22 kg/m^2 for intervention	Portion control, decrease fat, high fruit, vegetable fiber	

	Tracking	Counseling	Risk reduction intervention vs. control
U.S.DPP 1996 – 2001	Goal setting, self-monitoring, food records, exercise logs, weight	16 core curriculum sessions, individual and group first 24 weeks, lifestyle coaches	(3 years) 58% lifestyle
Finnish DPS 1993 - 2003	Goal setting, self-monitoring, food records, exercise logs, weight	Quarterly visits with review of food records and 7 visits per year with nutritionist, 3 in first 6 weeks	(6 years) 58% lifestyle
Da Qing China 1986 - 1992	Goal setting, no self-monitoring or logging	Individual counseling quarterly and group counseling once weekly for 1 month and then quarterly	(6 years) 31% diet 46% exercise 42% diet and exercise
Swedish Malmo 1974 - 1985		Small-group or individual counseling monthly for 6 months, 60-minutes activity sessions twice/week under the glucose of a physiotherapist	(6 years) 63% lifestyle
Indian DPP 2001 – 2002		Individual couseling session at baseline and every 6 months	(3 years) 45.2% lifestyle
Japan Prevention Trial		Detailed instruction on lifestyle every 3-4 months	(4 years) 67.4% lifestyle

	Long-term mean follow-up	Follow-up	Diet and exercise	Outcomes
U.S.DPP 1996 – 2001	(7 years) 34% lifestyle 18% metformin	Every 2 months face-to-face group or individual, phone call in between	Twice-weekly session, including personal training, self-monitoring weight, fat, calories	(3 years) 28.9% controls 14.4% lifestyle 21.7% metformin
Finnish DPS 1993 - 2003	(7 years) 43%	Quarterly	Supervised exercise offered free	(4 years) 23% control 11% lifestyle
Da Qing China 1986 - 1992	(14 years) 14%	One group session quarterly		(6 years) 67.7% control 43.8% diet 41.1% exercise 46.0% diet and exercise
Swedish Malmo 1974 - 1985	N/A			(6 years) 28.6% control 10.6% lifestyle
Indian DPP 2001 – 2002	N/A	Every 6 months, phone contact after 2 weeks then monthly		(3 years) 55% control 39.3% lifestyle 40.5% metformin 39.5% lifestyle and

TABLE 4. SUCCESS IN ACHIEVING THE GOALS OF THE INTERVENTION BY ONE YEAR, ACCORDING TO TREATMENT GROUP.*

GOAL	INTERVENTION GROUP	CONTROL GROUP	P VALUE†
	% of subjects		
Weight reduction >5%	43	13	0.001
Fat intake <30% of energy intake	47	26	0.001
Saturated-fat intake <10% of energy intake	26	11	0.001
Fiber intake ≥15 g/1000 kcal	25	12	0.001
Exercise >4 hr/wk‡	86	71	0.001

*Nutrient intakes were calculated from three-day food records.

†P values were determined by the chi-square test for the difference between the groups.

‡Exercise frequency was reported by the subjects who chose one of the four categories described in Table 3. The goal identified here was a frequency in category 2 or higher.

Diabetes Prevention Trials with Pharmacotherapy: Design and Outcomes

	Design	RRR	Adverse effects
DPP	RCT, Metformin N = 3234	Outcome = 31% Long term = 18%	Mild diarrhea
IDPP	RCT, Metformin N = 532	Outcome = 25.4% Long term = N/A	Not reported
DREAM	RCT, Rosiglitazone Ramipril N = 5269	Outcome = No significant risk reduction Long term = N/A	No significant difference for Ramipril
ACT NOW	RCT, Pioglitazone N = 602	Outcome = 72% Long term = N/A	Edema (12.9 vs. 6.7%)
IDPP	RCT, Pioglitazone N = 401	Outcome = No significant risk reduction Long term = N/A	
STOP-NIDDM	RCT, Acarbose N = 1429	Outcome = 25% Long term = N/A	Flatulence (15.9 vs. 6.1%) Bloating (9.5 vs. 2.3%)

Diabetes Prevention Trials with Pharmacotherapy: Design and Outcomes

	Design	RRR	Adverse effects
Kawamori	RCT, Voglibose N = 1780	Outcome = 40.5% Long term = N/A	Mild gastro-intestinal symptoms
Glipizide	RCT, Glipizide N = 37	Outcome = 80% Long term = N/A	Hypoglycemia symptoms (41 vs. 32%)
NAVIGATOR	Nateglinide N = 9306	Outcome = No significant risk reduction Long term = N/A	Hypoglycemia
NAVIGATOR	Valsartan N = 9306	Outcome = No significant risk reduction Long term = N/A	Nasopharyn gitis, back pain, arthralgia hypotension
Tenenbum	Bezafibrate N = 339	Outcome = 59% Long term = N/A	

Diabetes Prevention Trials with Pharmacotherapy: Design and Outcomes

	Population	Design & Follow-up (years)	RRR	Adverse effects
XENDOS	N = 3277 Age 43 BMI 37.3 kg/m2	RCT Orlistat FU = 4 years	Outcome = 37.3% Long term = N/A	Mild to moderate gastrointe-stinal events
Heyms-field	N = 675 Age 43.9 & 44.3 I/C BMI 35.6 kg/m2, 35 kg/m2 I/C Obese	RCT Orlistat IGT	Outcome = 39% Long term = N/A	

Clinical Outcomes of Metabolic Surgery

- Gastrointestinal procedures intended to yield long-term weight loss in patients with severe obesity, otherwise known as bariatric surgery.
- The original indications for bariatric surgery were based on BMI and were derived from the seminal National Institutes of Health (NIH) Consensus Conference in 1991, which considered surgery an option in patients with BMI $40 kg/m^2 or with BMI $35 kg/m^2 with significant obesity-related comorbidities.

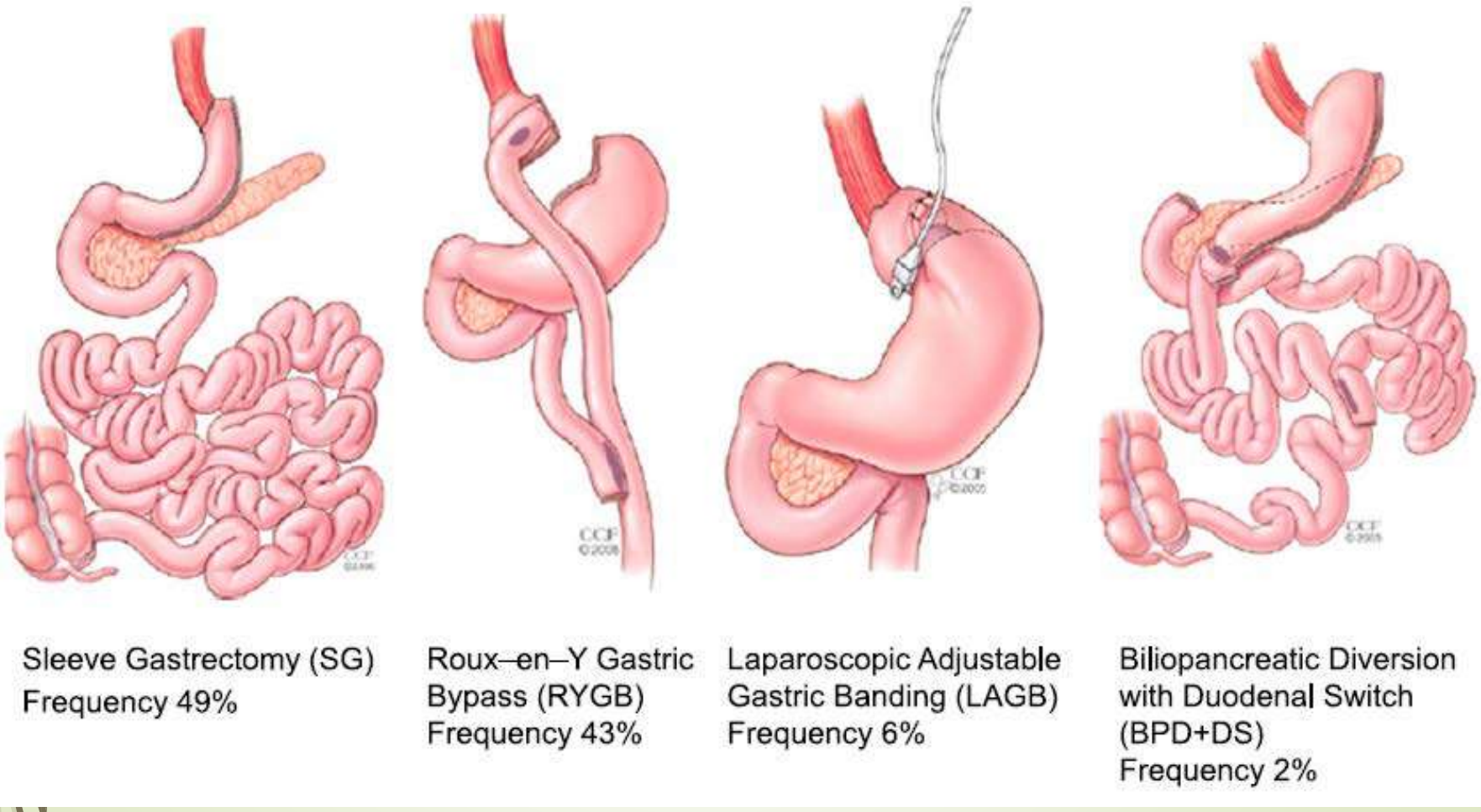


Fig (1): Common Metabolic Procedures and their frequency of use

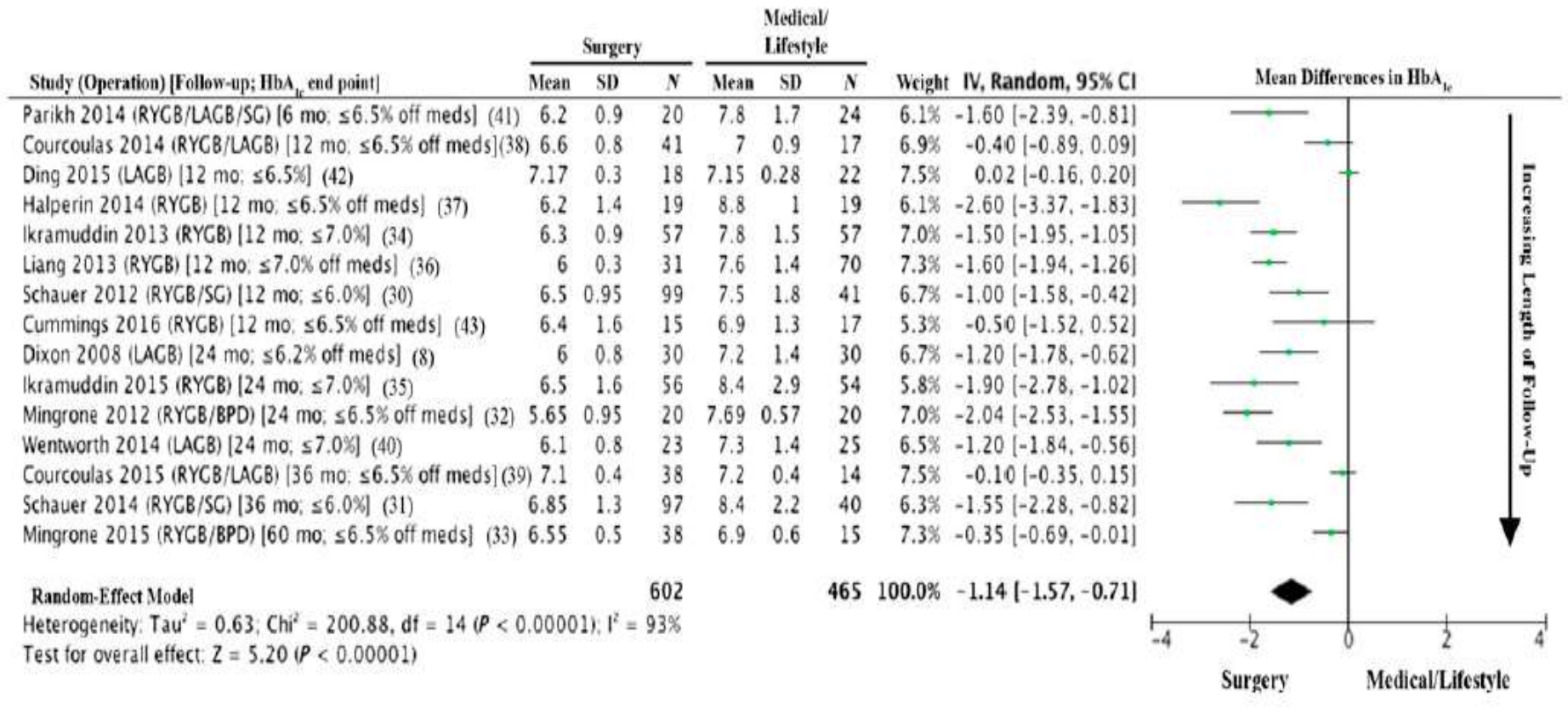


Fig (2): Forest plot of mean differences (MDs) of %HbA1c serum levels after bariatric/metabolic surgery compared with medical/lifestyle treatments in published RCTs.

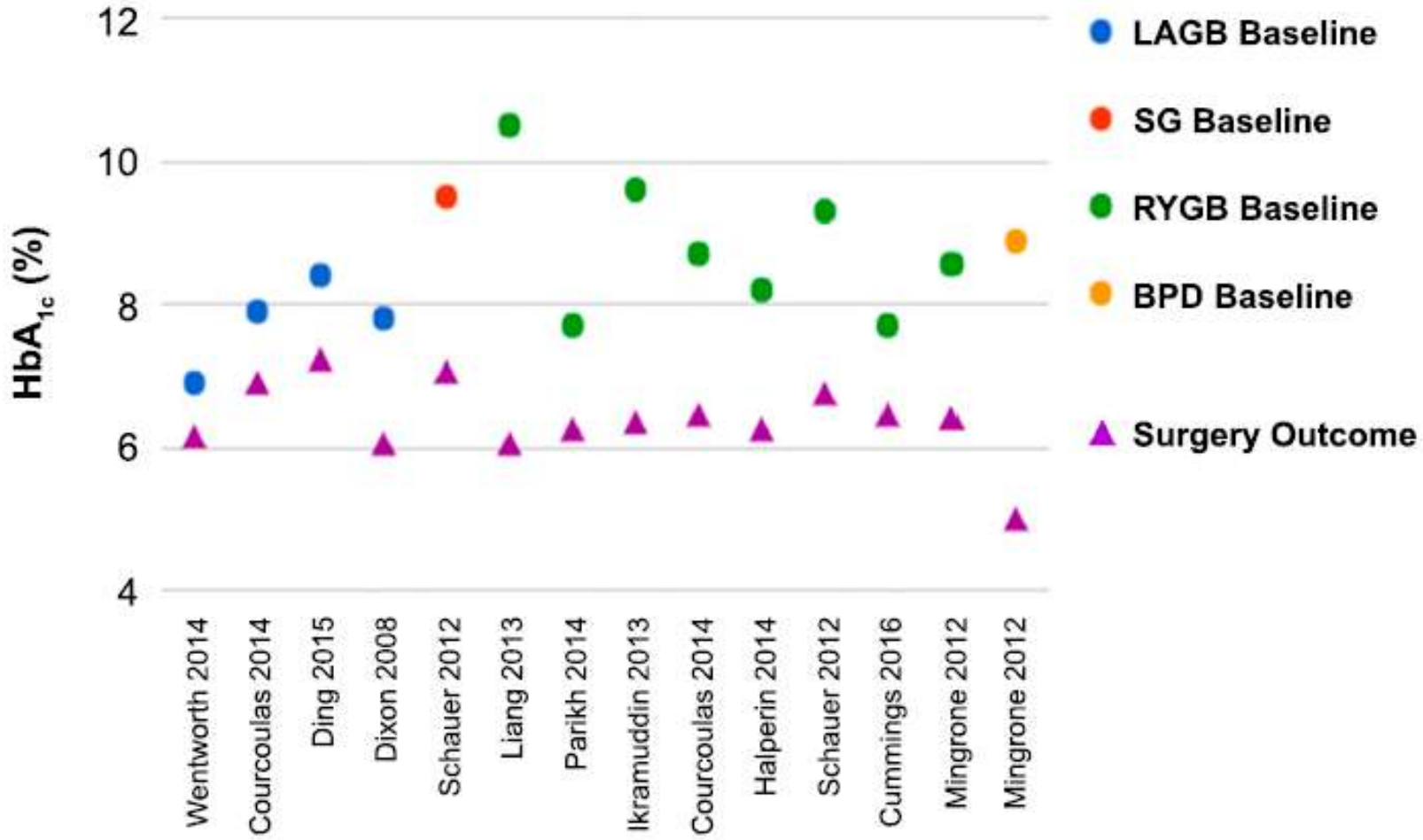
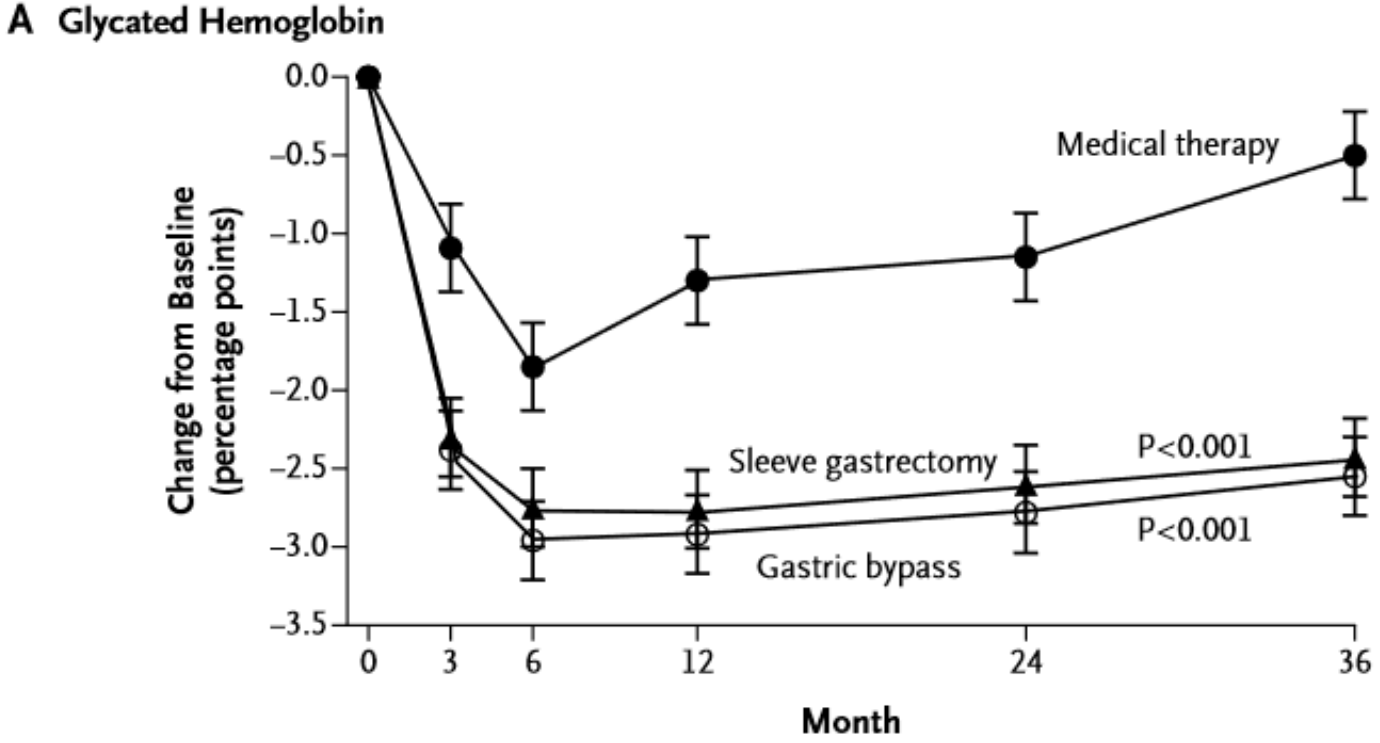


Fig (3) : Change in HbA1C after LAGB, RYGB, SG, and BPD in 11 RCTs.

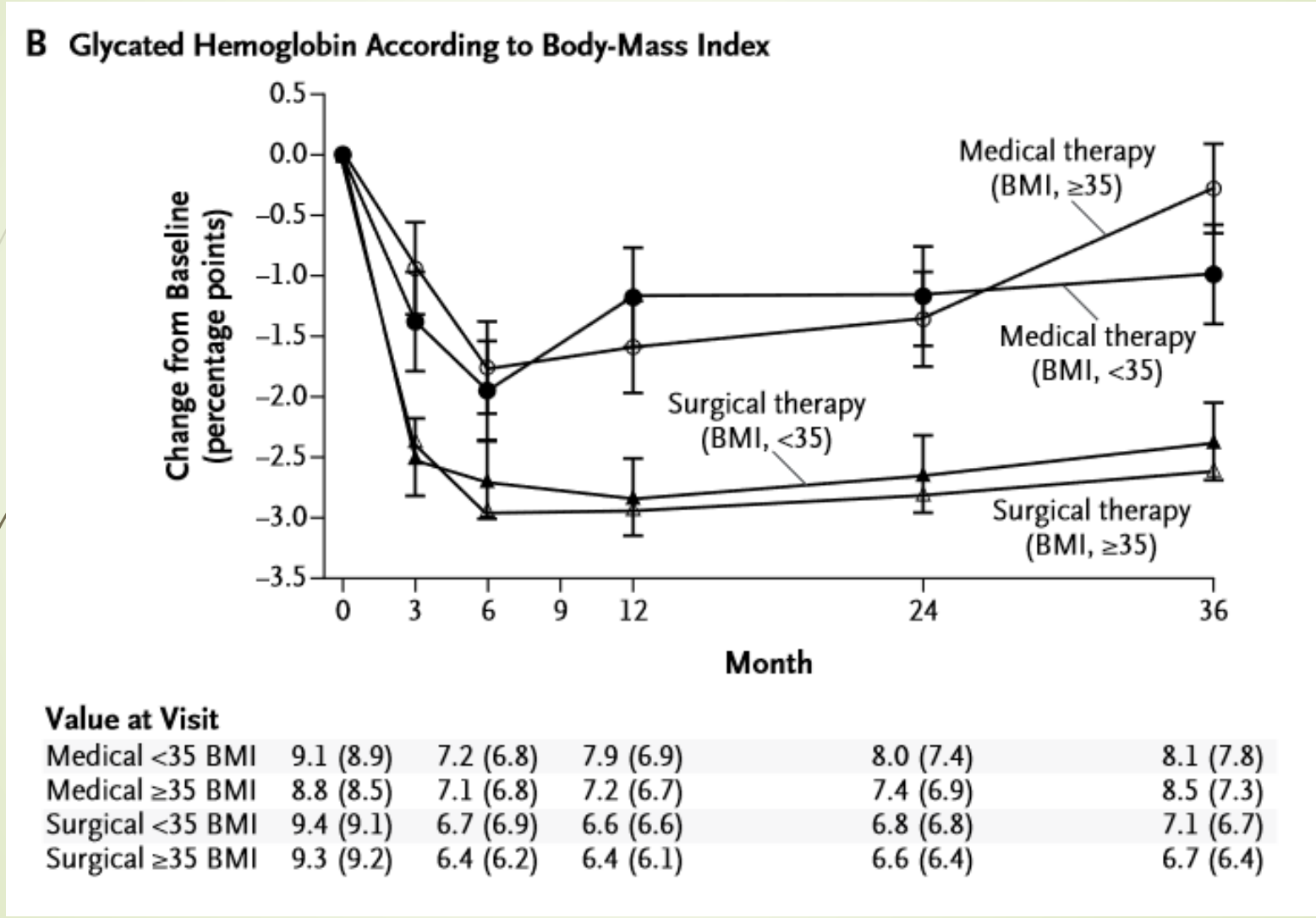
CHANGES IN HAEMOGLOBIN A_1C



Value at Visit					
Medical therapy	9.0 (8.5)	7.1 (6.8)	7.5 (6.9)	7.7 (7.3)	8.4 (7.6)
Sleeve gastrectomy	9.5 (8.9)	6.7 (6.4)	6.6 (6.4)	6.8 (6.8)	7.0 (6.6)
Gastric bypass	9.3 (9.2)	6.3 (6.2)	6.3 (6.1)	6.5 (6.4)	6.7 (6.6)

Fig (4): Change in HbA_1c after surgical vs. medical treatment of T2D in the studies

CHANGES IN HAEMOGLOBIN A_1C



Value at Visit					
Medical <35 BMI	9.1 (8.9)	7.2 (6.8)	7.9 (6.9)	8.0 (7.4)	8.1 (7.8)
Medical ≥35 BMI	8.8 (8.5)	7.1 (6.8)	7.2 (6.7)	7.4 (6.9)	8.5 (7.3)
Surgical <35 BMI	9.4 (9.1)	6.7 (6.9)	6.6 (6.6)	6.8 (6.8)	7.1 (6.7)
Surgical ≥35 BMI	9.3 (9.2)	6.4 (6.2)	6.4 (6.1)	6.6 (6.4)	6.7 (6.4)

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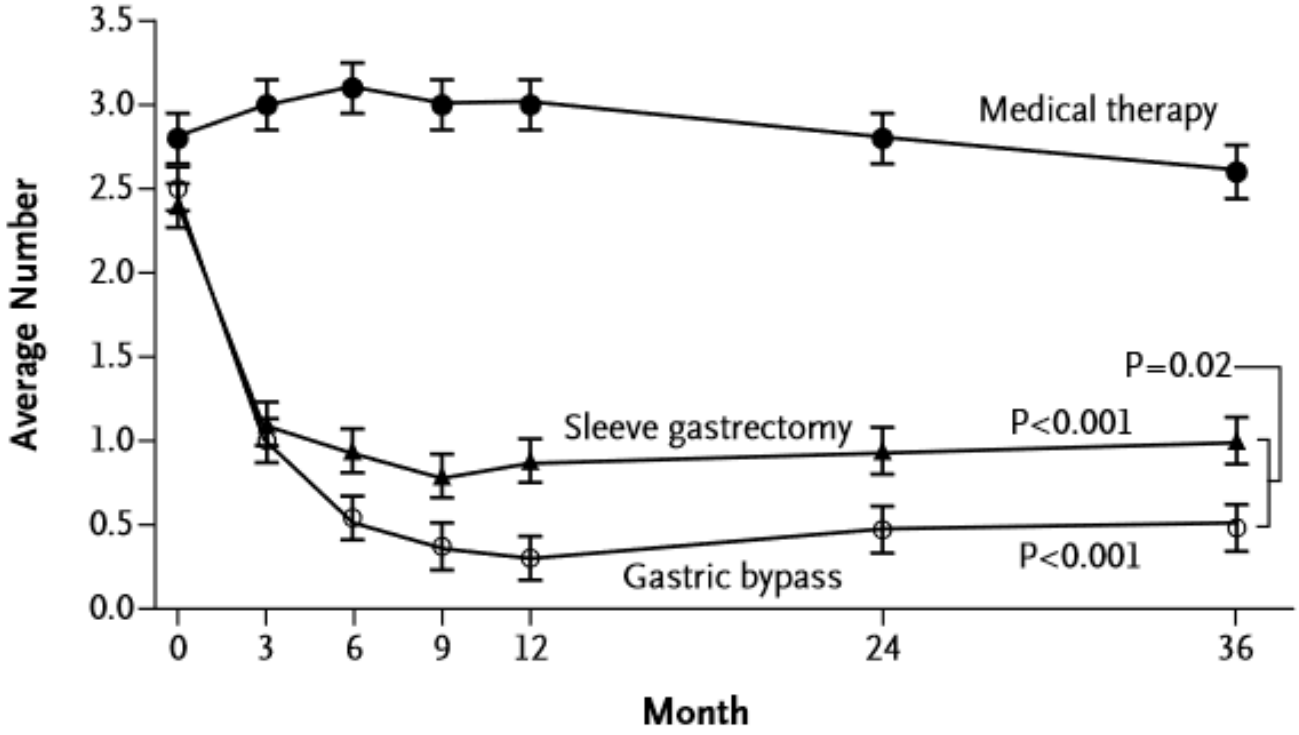
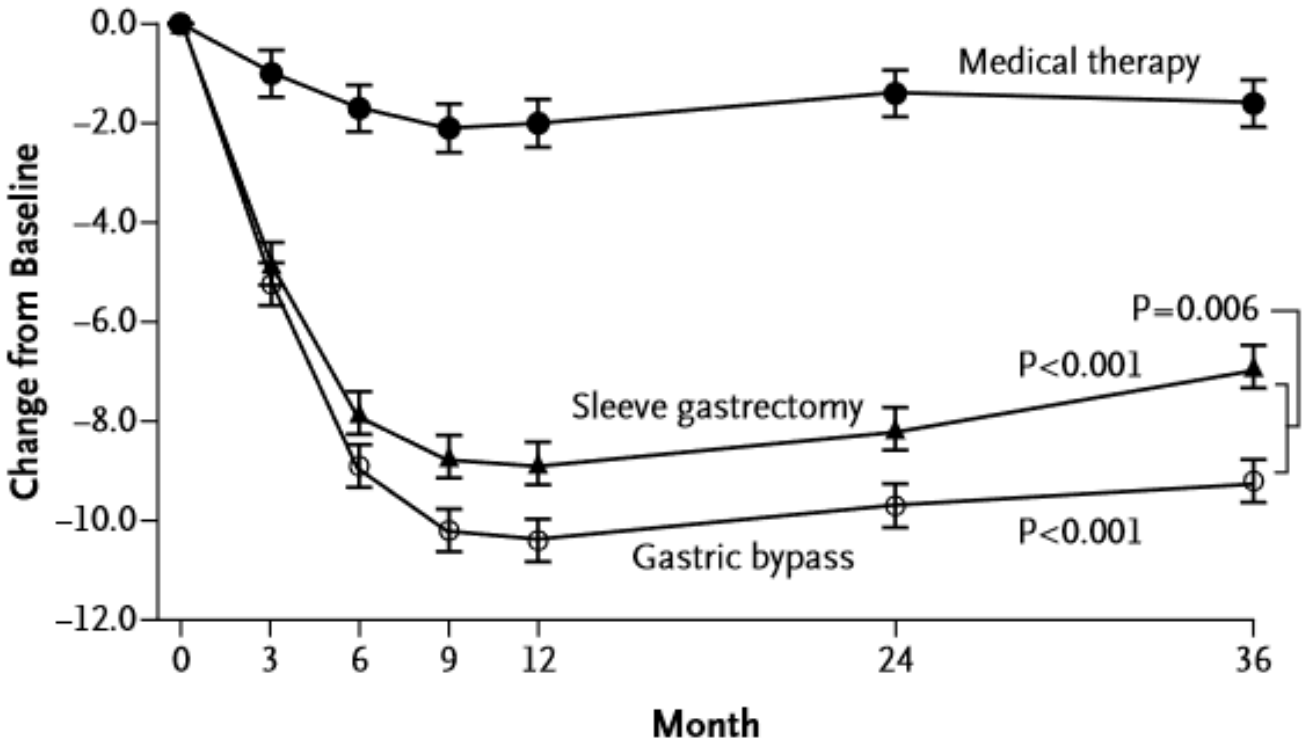


Value at Visit					
Medical therapy	2.8	3.1	3.0	2.8	2.6
Sleeve gastrectomy	2.4	0.94	0.88	0.94	1.0
Gastric bypass	2.5	0.54	0.3	0.47	0.48

Fig (4): Change in HbA_1c after surgical vs. medical treatment of T2D in the studies

CHANGES IN HAEMOGLOBIN A_1C



Value at Visit					
Medical therapy	36.4	34.6	34.2	35.0	34.8
Sleeve gastrectomy	36.1	28.3	27.1	27.9	29.2
Gastric bypass	37.1	28.2	26.7	27.3	27.9

Fig (4): Change in HbA_1c after surgical vs. medical treatment of T2D in the studies

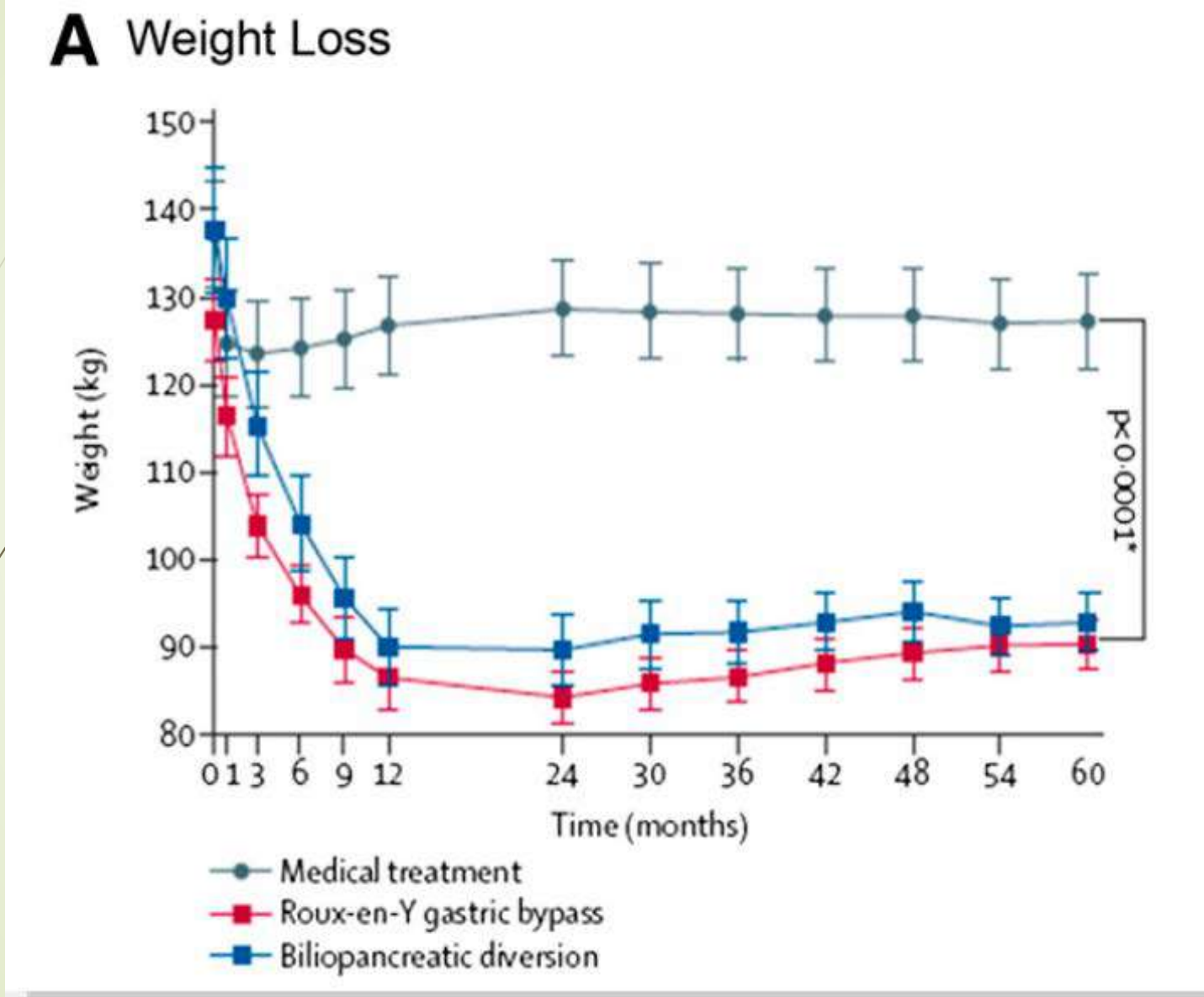
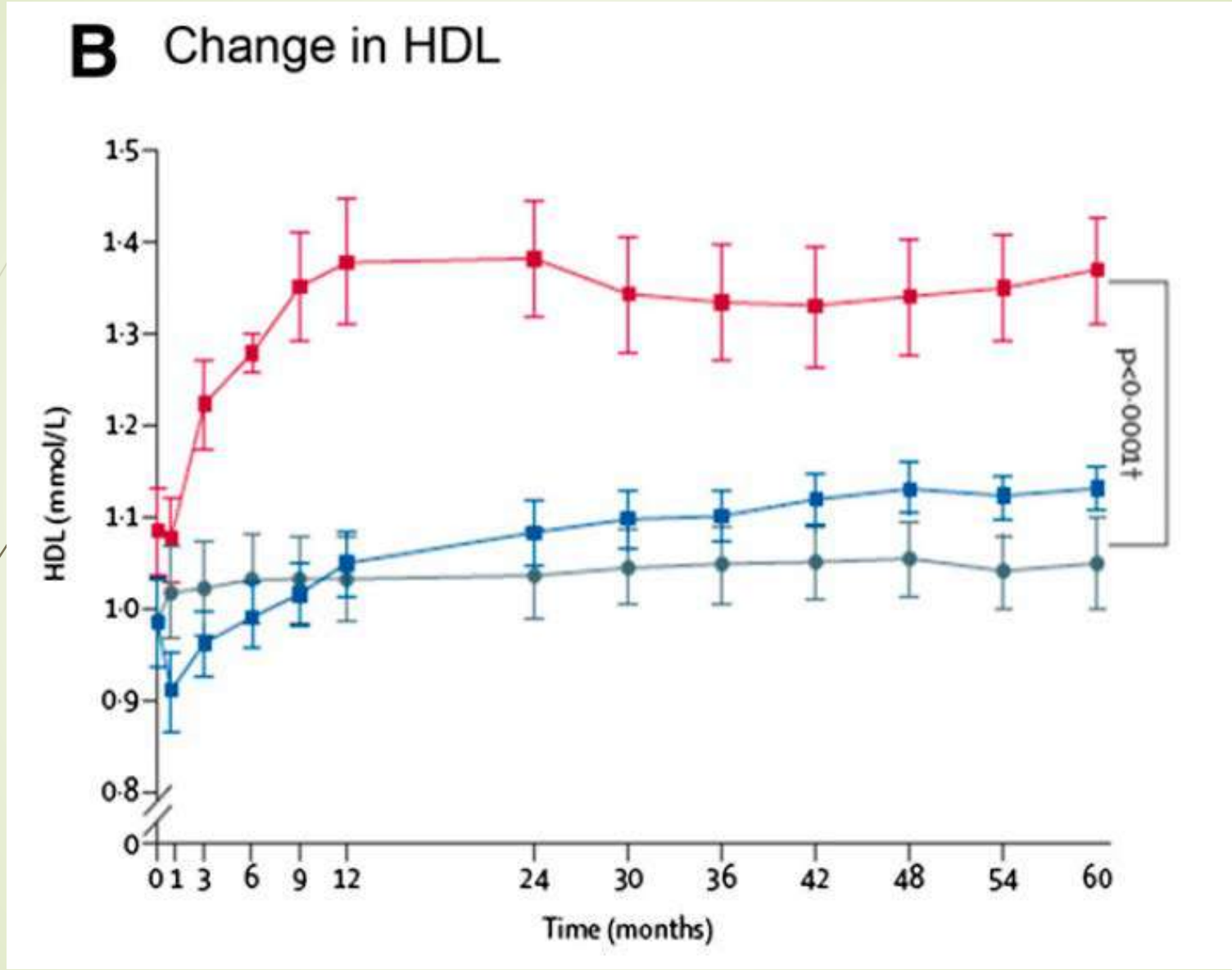


Fig (5): Other secondary end points favoring surgery over medical treatment.



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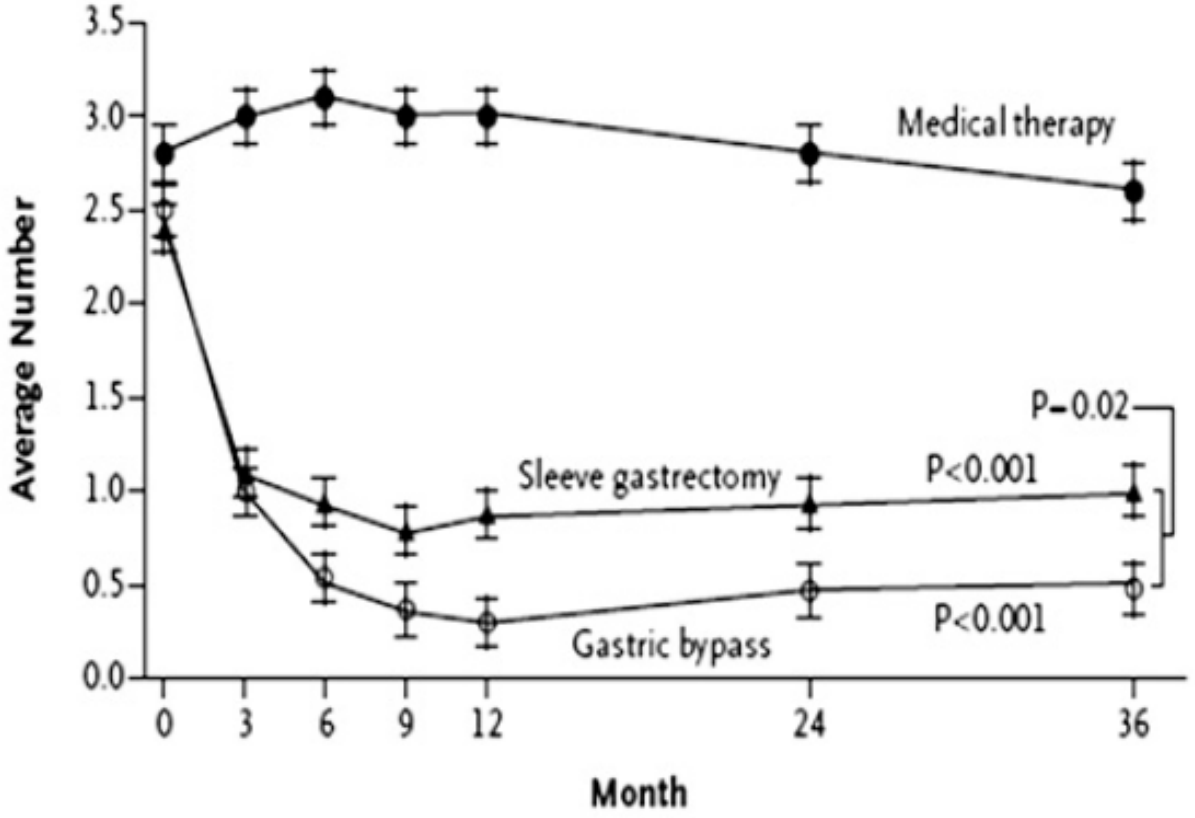
C Change in Medications



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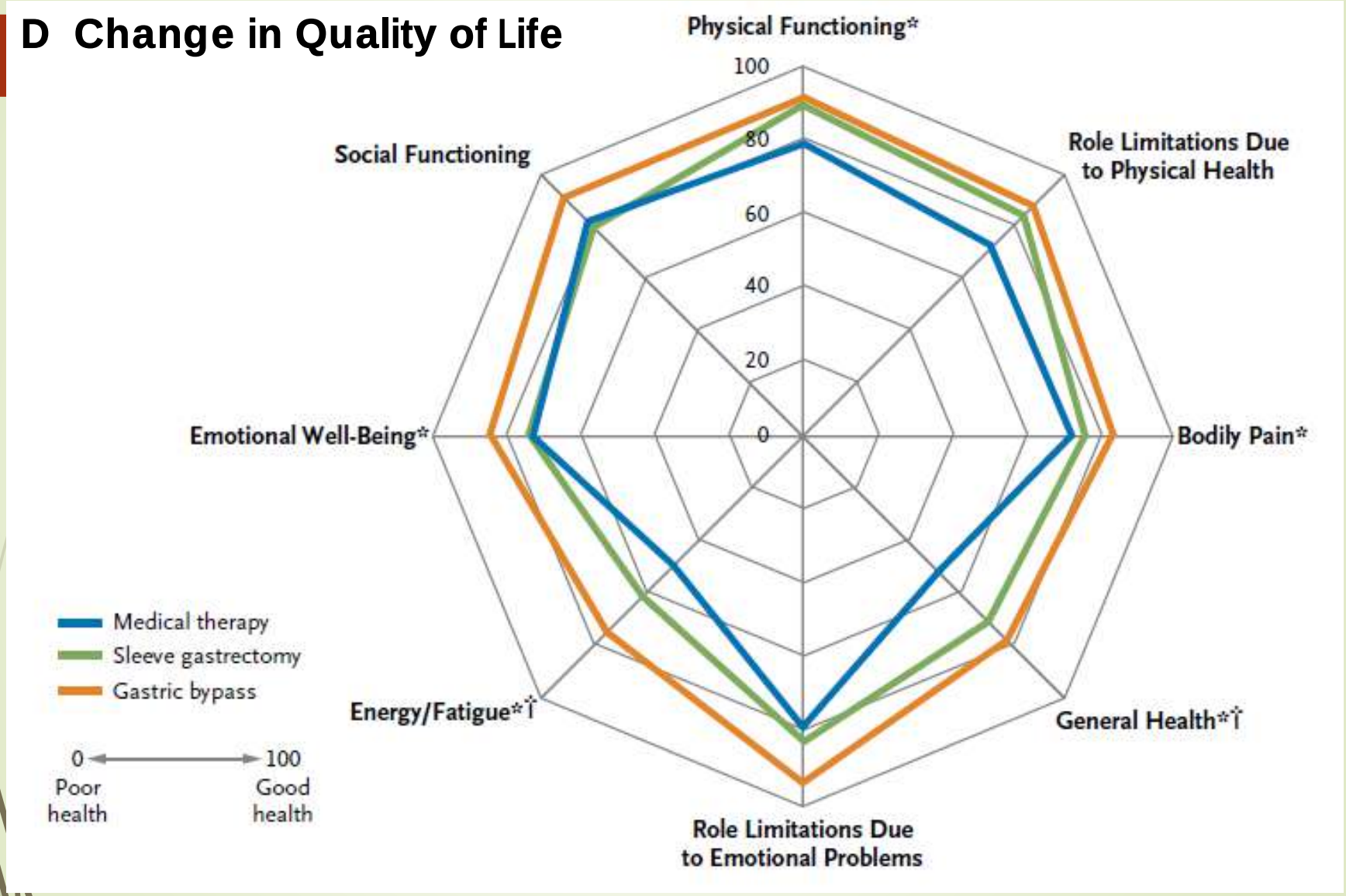

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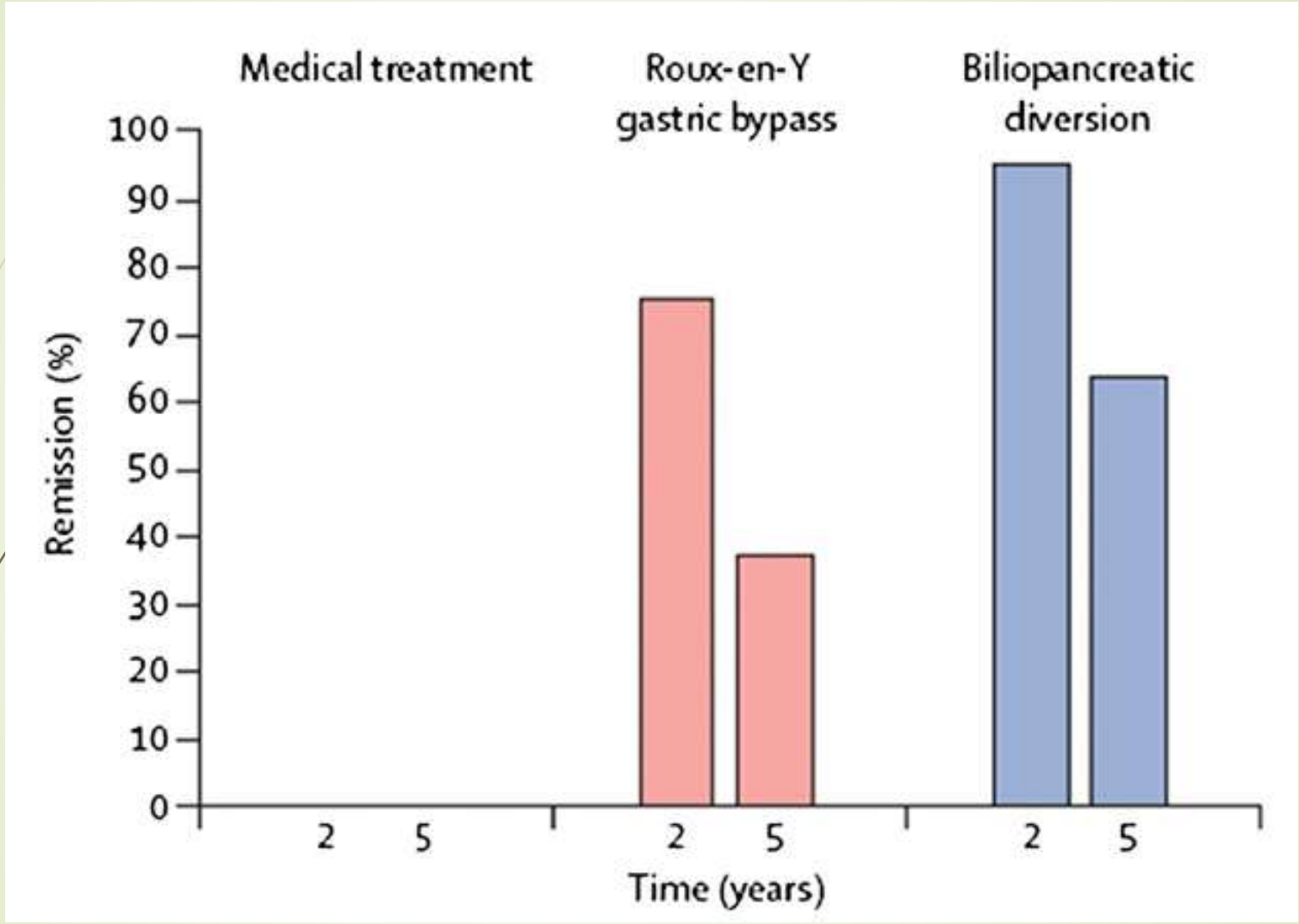

Fig (6): Remission at 5 years in the study

Complications of Metabolic Surgery

Complications	Frequency (%)
Sepsis from anastomotic leak	0.1–5.6
Hemorrhage	1–4
Cardiopulmonary events	<1
Thromboembolic disease	0.34
Death	0.1–0.3
Late complications for LAGB	
Band slippage	15
Leakage	2–5
Erosion	1–2
Late complications of bypass procedures	
Anastomotic strictures	1–5
Marginal ulcers	1–5
Bowel obstructions	0.5–2
Kidney stones	NK
Metabolic bone disease	NK
Alcohol use disorder	NK
Micronutrient and macronutrient deficiencies from RYGB 2–3 years postoperative	
Iron deficiency	45–52
Vitamin B_{12} deficiency	8–37
Calcium deficiency	10
Vitamin D deficiency	51
Fat-soluble vitamin deficiencies (A, D, E, and K) and protein calorie malnutrition from BPD+DS procedures	1–5

NK, not known.

Early Action Type 2 Diabetes

The Four Pillars of Early Action are firmly rooted in the evidence base on what is most valuable in reducing the economic, societal and personal burden of type 2 diabetes:

Prevention

Taking steps to prevent people from developing type 2 diabetes from the outset

Early detection

Identifying those at high risk of developing type 2 diabetes and diagnosing them as early as possible

Early control

Ensuring that people with diabetes are given the treatment and support they need to achieve good control of their blood glucose levels as early as possible, to reduce the risk of complications

Early access to the right interventions

Ensuring that health systems are addressing the need for equitable, early access to the personalised education, lifestyle change programmes and treatments that people with type 2 diabetes need

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MMDA®
Myanmar Diabetes Association

OUR VISION IS……..

A Nation with minimal burden of health due to Diabetes

MMDA®
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OUR MISSION IS……

Prevention of Diabetes and its complications in the country through the delivery of comprehensive diabetes care

MMDA®

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