دانشگاه علوم پزشکی اصفهان

مرکز تحقیقات غدد و متابولیسم

Standards of Care in Diabetes-2026

Medical Nutrition Therapy

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American Diabetes Association

Benefits of Healthy Eating for Adults

May help you **live longer**

Keeps **skin, teeth,** and **eyes** healthy

Supports **muscles**

Boosts **immunity**

Strengthens **bones**

Lowers risk of heart disease, type 2 diabetes, and some cancers

Supports **healthy pregnancies** and **breastfeeding**

Helps the **digestive system** function

Helps achieve and maintain a **healthy weight**

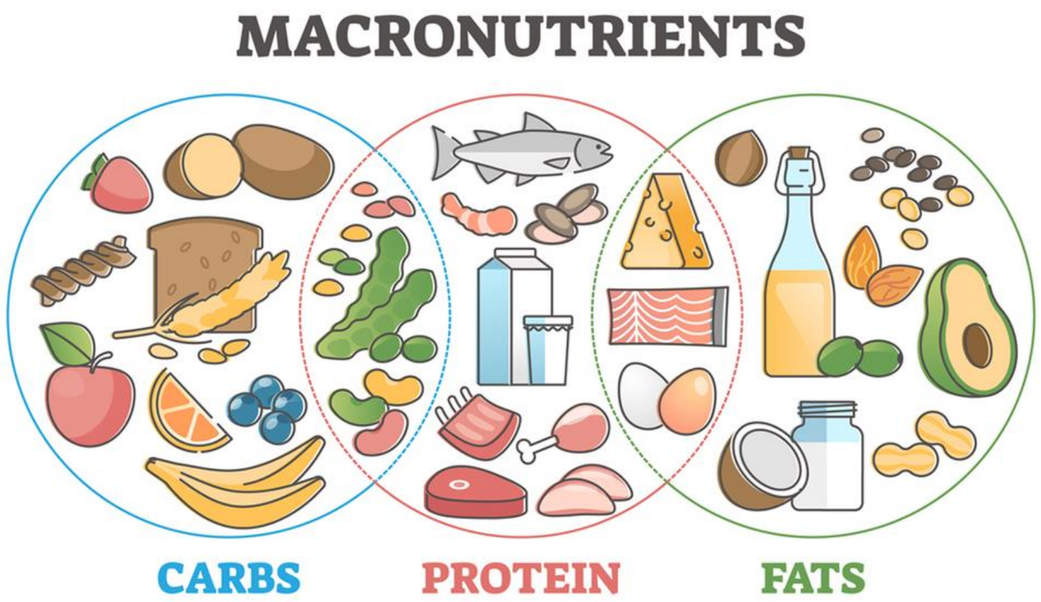
Bridging the Gap
What we know vs. what we do

Top 3 Behaviors Attributable to Chronic Disease:

1. **Dietary pattern**
2. **Physical activity level**
3. **Tobacco use**

Therapeutic Lifestyle Change

Macronutrients



Carbohydrate, **fat** and **protein** in foods provide energy for body functions and physical activities.

Protein

Recommended amount:

0.8-1.5 gr/Kg of body weight per day

- During pregnancy, breastfeeding, and in children and the elderly, the **need for protein increases.**
- **Animal:** red meat, poultry, dairy products, and eggs
- **Plant:** grains, legumes, soy, and nuts

The nutritional value of animal protein is greater than that of plant protein, and it is better to consume protein sources in a mixed form

Protein Complementing

A diet consisting solely of a plant-based diet will not be able to produce enough protein for growth due to the limiting amino acid.

Cereals and legumes
Cereals and dairy
Pulses and seeds

Fat

Providing energy

Providing essential fatty acids

Providing fat-soluble vitamins

30-35% of energy intake in the diet should come from fats.

Saturated fatty acids should be less than %10 of total calorie intake.

Trans fatty acids

High intake of trans fatty acids is linked to coronary heart disease, type 2 diabetes, various cancers, and allergies.

The main source of trans fatty acids is hydrogenated oils.

Fat

Emphasize healthy fats

Canola oil, olive oil, avocado, nuts, seeds, fatty fish

Reduce saturated and trans fats

Solid shortening, lard, fast food, processed foods

Carbohydrate

- Emphasis on **complex** and **fibrous** carbohydrates

Whole grains, legumes, vegetables, fruits with skin

- Reduce consumption of **simple and refined** carbohydrates

Sugar, all kinds of soft drinks and sweet drinks, white bread, white rice

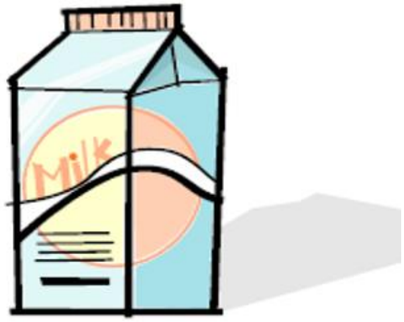
Carbohydrate

- The importance of controlling the **size of meals** containing carbohydrates.

- **Distribution** of carbohydrates in main meals and snacks

Carbohydrate

Food	Grams of Carbs/Serving
Starch/Bread	**15 grams**
Fruit	**15 grams**
Milk	**12 grams**
Vegetables	**5 grams**
Meat	**0 grams**
Fat	**0 grams**



General recommendation
for macronutrient distribution

Fats:
20 to 35%

Proteins:
10 to 25%

At least 130 gr/day of carbohydrates is recommended for adults to meet the brain's glucose needs.

Fiber

- **Insoluble fiber**, such as cellulose found in plants, increases the frequency of bowel movements and increases stool volume, leading to a decrease in the time it takes for waste to pass through the digestive tract.

- **Soluble fiber** is able to form a gel, and leads to a slowdown and increase in the time it takes for micronutrients to pass through and be absorbed.

Fiber

Foods with **at least 3 g of fiber per serving** are generally considered higher fiber choices.

Adequate total fiber intake

38 gr/day for men

25 gr/day for women

14gr/1000Kcal

Glycemic Index vs. Glycemic Load

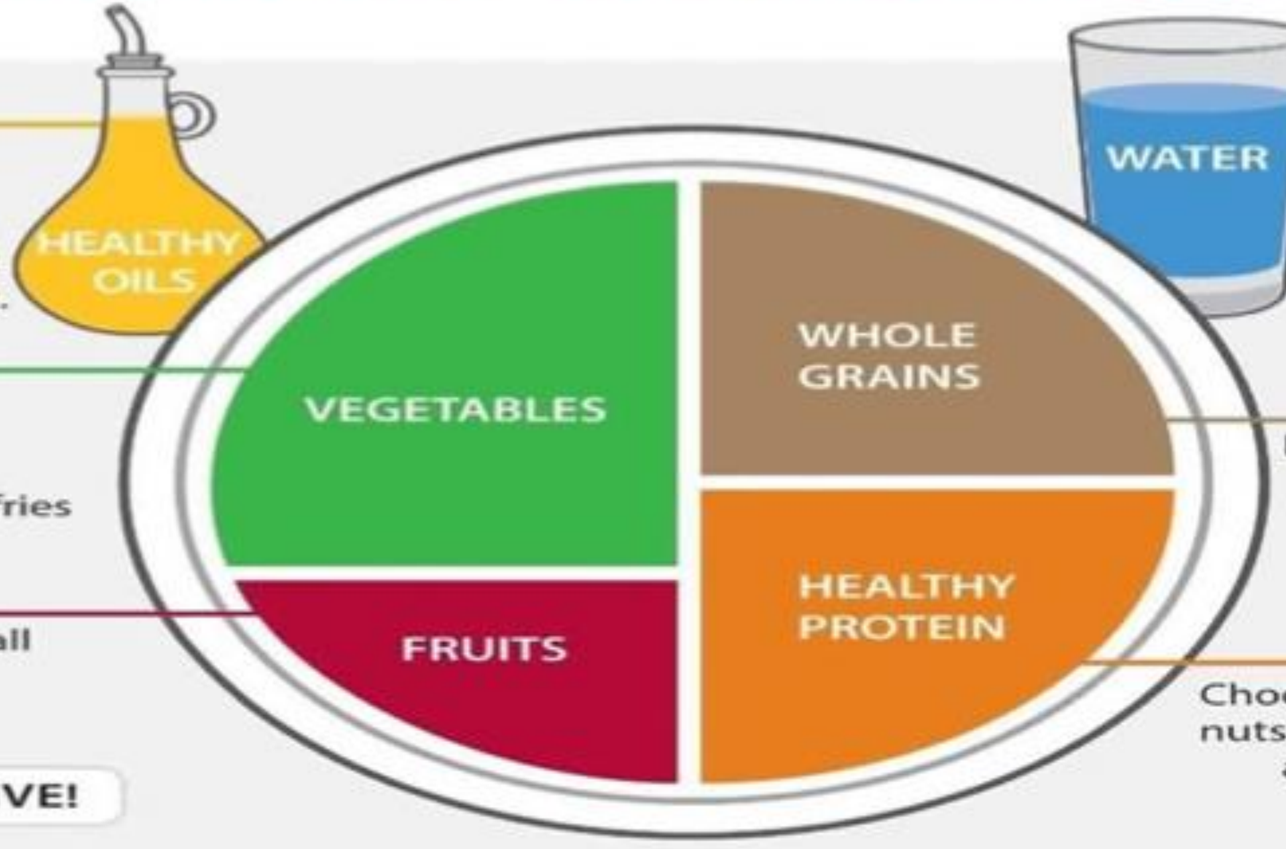
Glycemic index:
Numerical way of showing how carbohydrates affect blood sugar levels

Glycemic load:
Uses GI and the amount of total carbs per serving of a specific food to estimate how quickly a food causes blood sugar to rise and how much blood sugar levels will rise in total after eating

Main Food groups

Food List	Carbohydrate (g)	Protein (g)	Fat (g)	Calories
Carbohydrates				
Carbohydrates: breads, cereals and grains, starchy vegetables, crackers and snacks, and beans, peas, and lentils	15	0–3	0–1	80
Fruits	15	—	—	60
Milk				
Fat-free, low-fat, 1%	12	8	0–3	100
Reduced fat, 2%	12	8	5	120
Whole	12	8	8	160
Sweets, desserts, and other carbohydrates	15	Varies	Varies	Varies
Nonstarchy vegetables	5	2	—	25
Meat and Meat Substitutes				
Lean	—	7	0–3	45
Medium-fat	—	7	4–7	75
High-fat	—	7	8+	100
Plant-based proteins	Varies	7	Varies	Varies
Fats	—	—	5	45
Alcohol	Varies	—	—	100

HEALTHY EATING PLATE



Use healthy oils (like olive and canola oil) for cooking, on salad, and at the table. Limit butter. Avoid trans fat.

The more veggies – and the greater the variety – the better. Potatoes and French fries don't count.

Eat plenty of fruits of all colors.

STAY ACTIVE!

Drink water, tea, or coffee (with little or no sugar). Limit milk/dairy (1-2 servings/day) and juice (1 small glass/day). Avoid sugary drinks.

Eat a variety of whole grains (like whole-wheat bread, whole-grain pasta, and brown rice). Limit refined grains (like white rice and white bread).

Choose fish, poultry, beans, and nuts; limit red meat and cheese; avoid bacon, cold cuts, and other processed meats.

Harvard T.H. Chan School of Public Health
The Nutrition Source
www.hsph.harvard.edu/nutritionsource

Harvard Medical School
Harvard Health Publications
www.health.harvard.edu

Nutrition Behaviors to Encourage

Water should be the primary beverage of choice.

For individuals who do not prefer plain water, no-calorie alternatives are the next best choice.

Options include adding lemon, lime, berries, or cucumber slices to water; sparkling no-calorie water or flavored no-calorie waters; no-calorie carbonated beverages.

Nutrition Recommendations

1. Provide individualized MNT
2. MNT should be cost-saving; improve cardiometabolic outcomes and reimbursed by insurance
3. Consider weight management
4. Emphasis on key nutrition principles

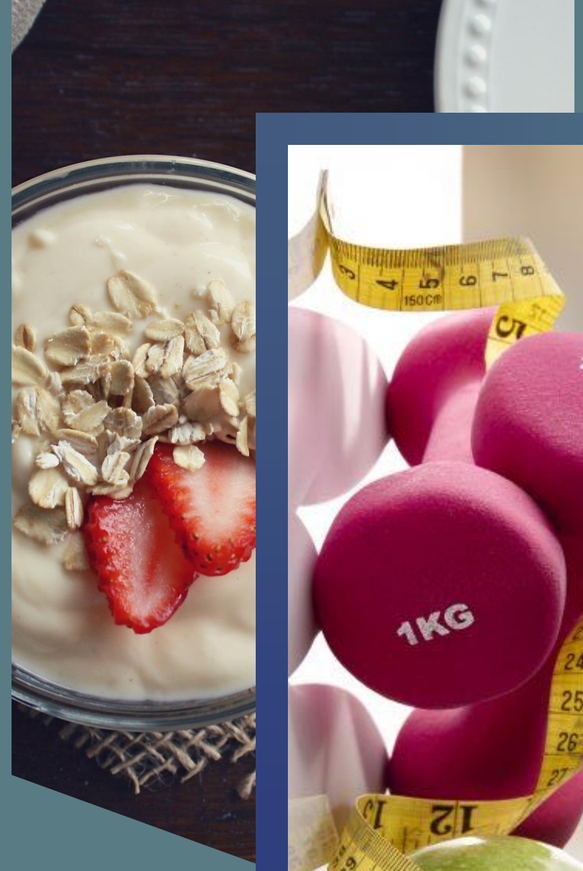
Nutrition Recommendations

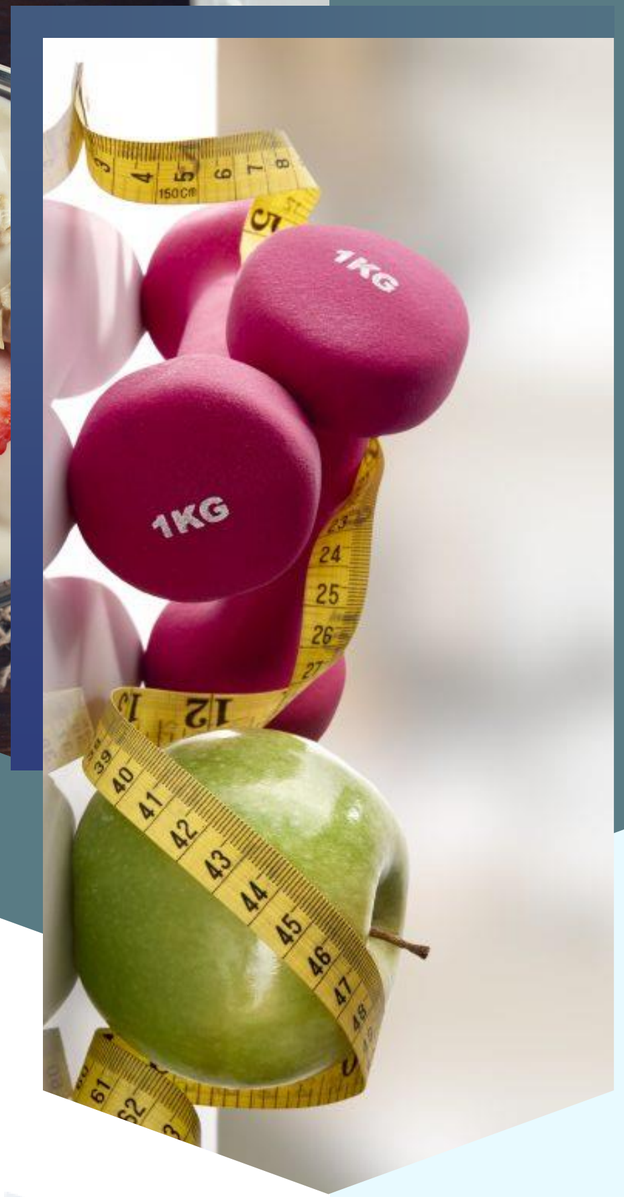
5. Reducing carbohydrate intake: an effective way is limiting processed foods.

6. Assess intake of supplements and herbs

7. Limit sodium intake <2300 mg/day

8. Consider dietary patterns such as Mediterranean diet

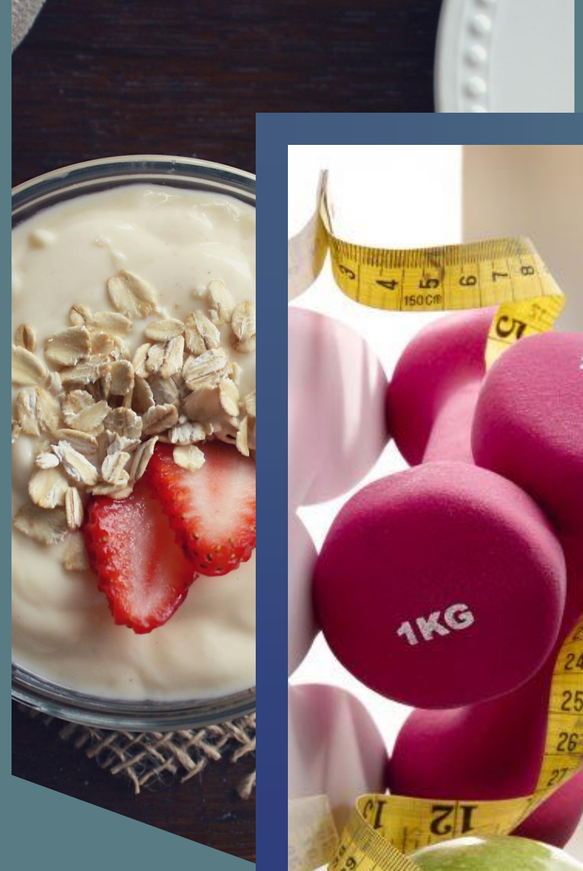


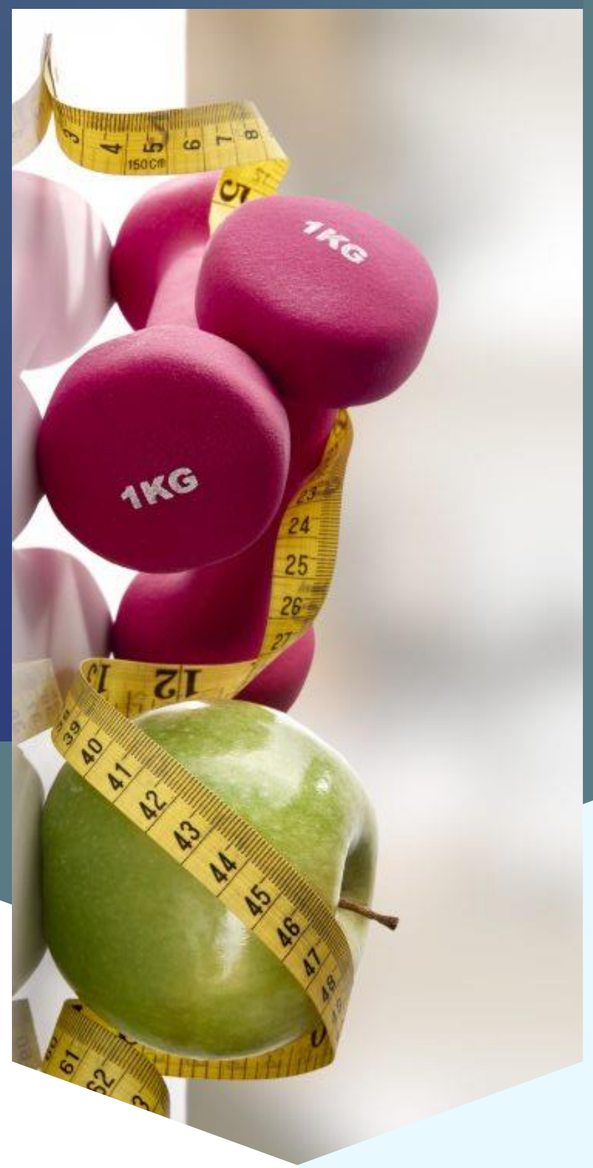


Weight Management

Diabetes prevention program

- More focus in weight loss = reduction in total fat and calorie intake
- There is no ideal percentage of calorie from macronutrients= macros distribution should be individualized based on current eating patterns, preferences, and metabolic goals





Weight Management

Diabetes prevention program

- At least 7% of weight, more feasible to achieve
- 7-10 % weight reduction= greater benefits
- The recommended pace of weight loss: 1-2 lb/week

Weight Management

Patient with diabetes and prediabetes

- Primary goal along with glycemic management
- At least 5%
- 7-10 % is recommended
- Benefits of weight loss are progressive and more intensive goals (15%) may be appropriate

Weight Management

Patient with diabetes and prediabetes

- Traditional interventions may not be effective in some Asian populations; should be tailored to their culture
- GLP1 RA, helps to loose more weight (10-15%), with higher risk of nausea and ketosis in T1DM
- Metabolic surgery > 20% weight loss

Weight Management

Metabolic dysfunction-associated steatotic liver disease (MASLD)

- Minimum weight loss goal: 5%
- Preferably ≧ 10% weight loss is needed to improve liver histology

More individualized = greater benefit

Weight Management

Metabolic dysfunction-associated steatosis liver disease (MASLD)

- No difference in energy deficit between individuals with diabetes with obesity with or without MASLD

- Limit saturated fat, refined carbohydrates, and added sugar

Med-diet

Best evidence for improvement of MASLD

Assessment and monitoring persons with obesity

- Screen for overweight or obesity using BMI annually
- Additional assessment for adiposity
- During active management increase monitoring to at least every 3 months.

Assessment and monitoring persons with obesity

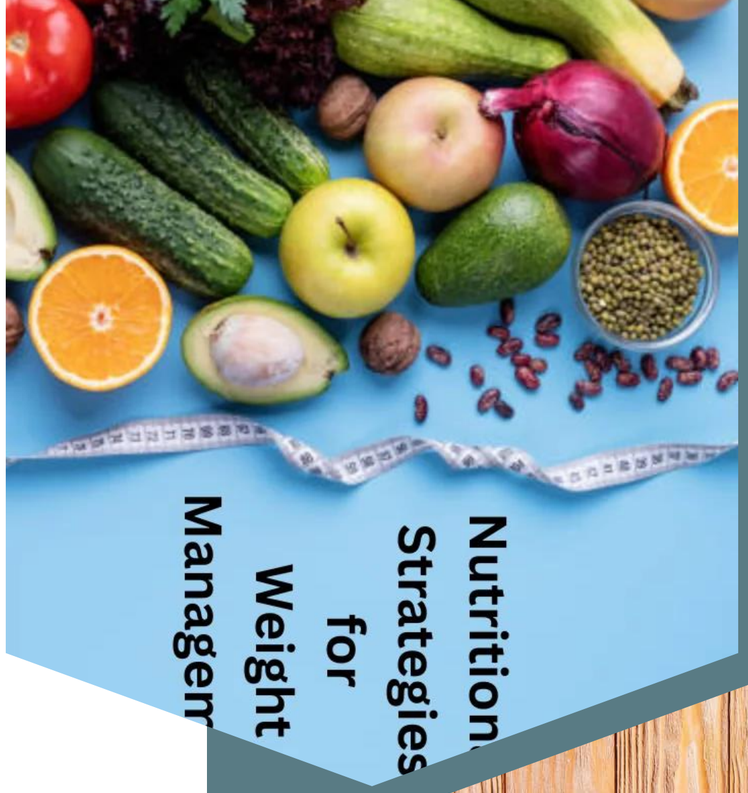
- BMI is not a prefect measure of adipose tissue mass and distribution; However, it remains an acceptable measure
- Do not forget about privacy
- Anthropometric measurement should be performed and reported nonjudgmentally

Assessment and monitoring persons with obesity

- Screening for history of dieting, past and current disordered eating pattern
- Past effort in weight loss and body weight history can be useful

Motivational interviewing technique

- First asking the individual if they want to discuss their weight
- Health care professionals should never assume a person with overweight or obesity wants to discuss weight at a medical appointment; especially when appointment is seemingly for an unrelated issue (i.e. back pain)



Strategies for weight management

Nutrition and eating pattern

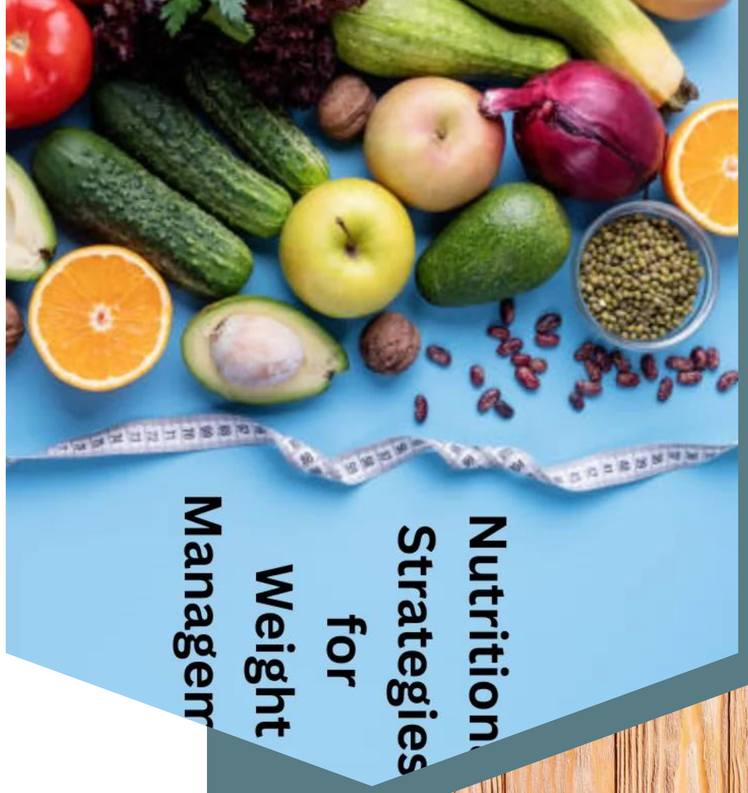
Physical activity and exercise

Behavioral counseling

Pharmacotherapy

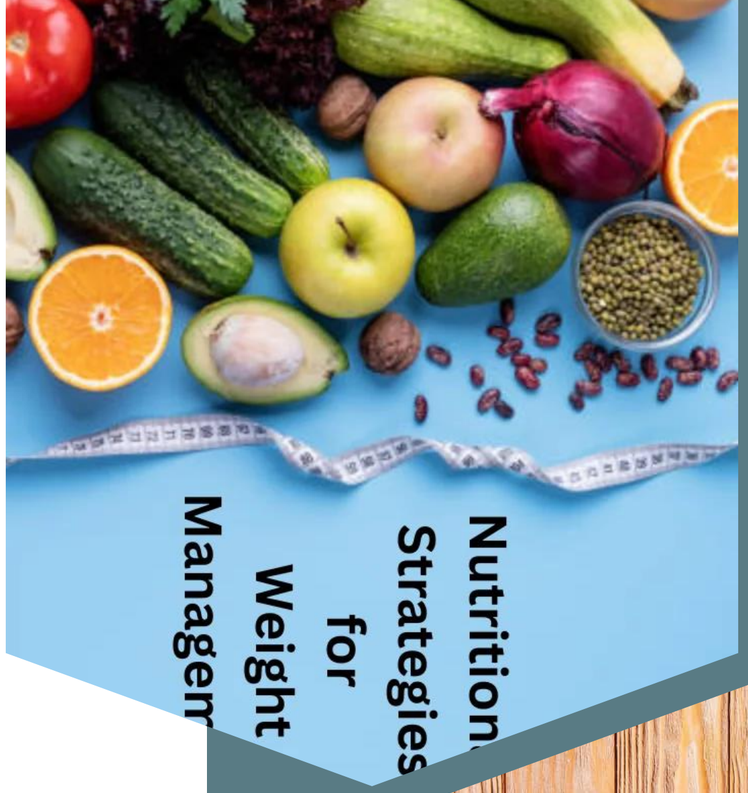
Medical devices

Metabolic surgery



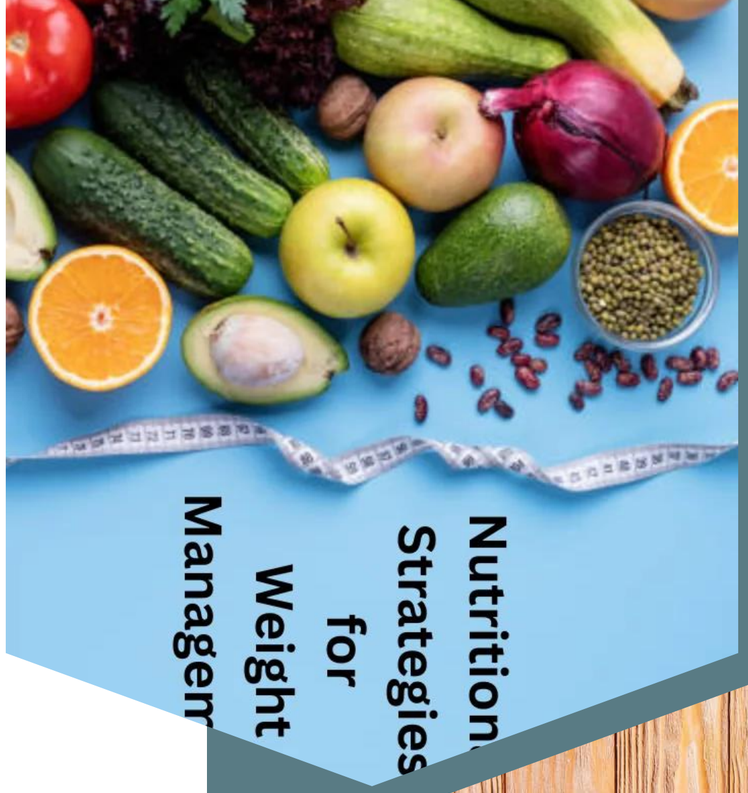
Strategies for weight management

Therapeutic choices should be individualized based on person's medical history, life circumstance, and preferences.



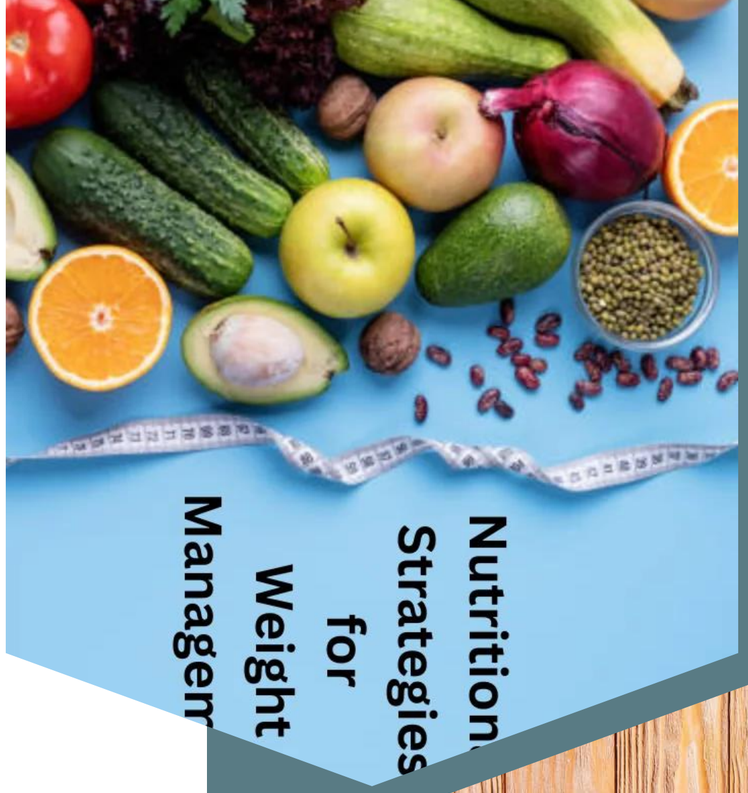
Individualized Approach

There is no one-size fits all eating pattern



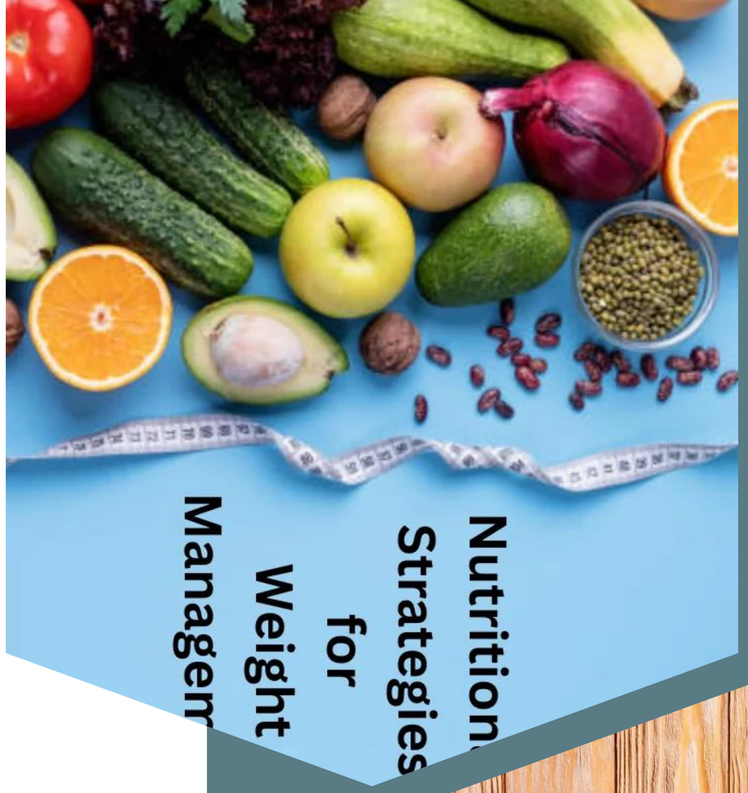
Individualized Approach

- Usual eating style
- Cultural background
- Food preferences
- Social Determinant of Health
- Behavioral health status
- Physical activity
- Try maintain the pleasure of eating: reducing or limiting foods only when indicated by scientific evidence



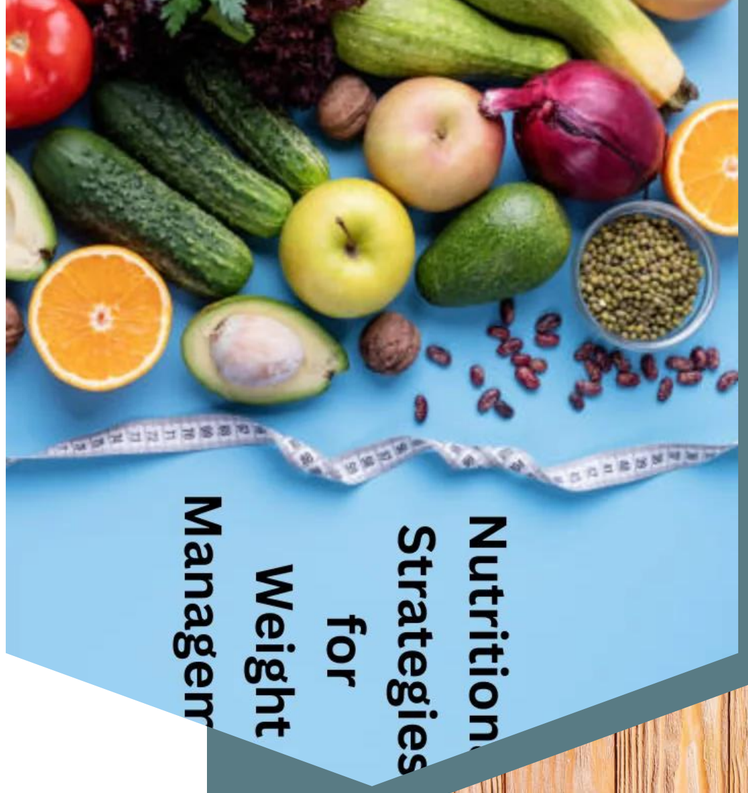
Strategies for weight management

- High frequency of counseling ≧ 16 sessions in 6 month
- Effective long-term (more than 1 years) weight maintenance provides monthly contact and support + weekly self-monitoring of body weight



Strategies for weight management

Achieve 500-750 kcal/day energy deficit

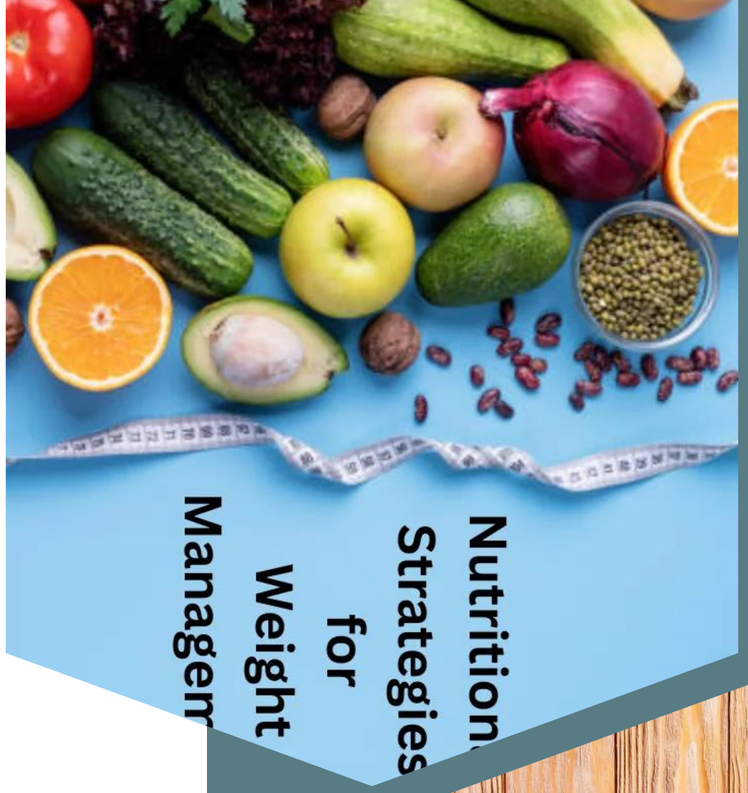


Strategies for weight management

- Very low calorie meals (800-1000 kcal/day) should only prescribed short-term (up to 3 months) and carefully with close monitoring

Complications:
electrolyte abnormalities, severe fatigue, cardiac arrythmias

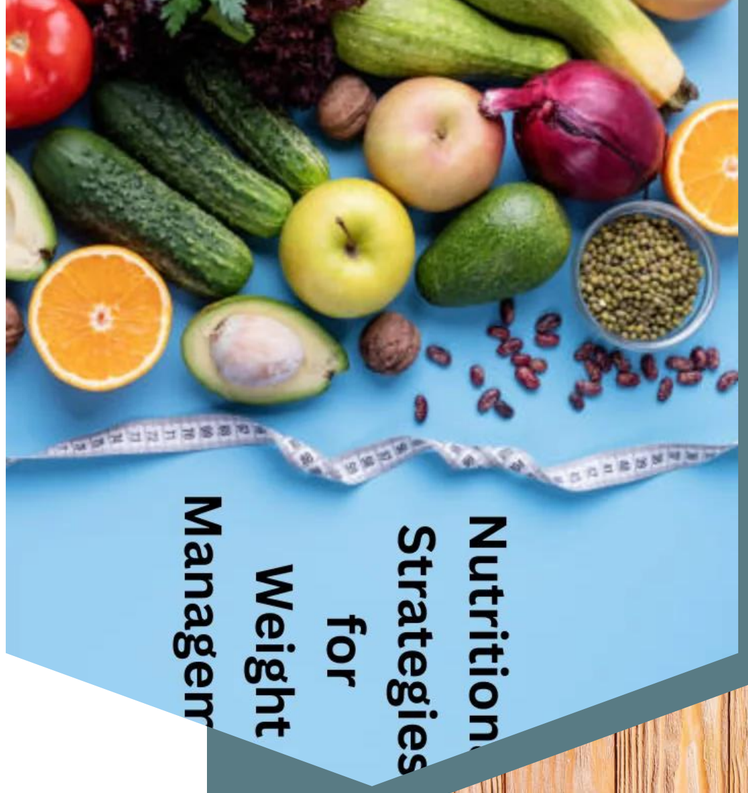
Selected individuals,
such as those requiring weight loss or glycemic management before surgery



Strategies for weight management

Nutritional supplements not recommended

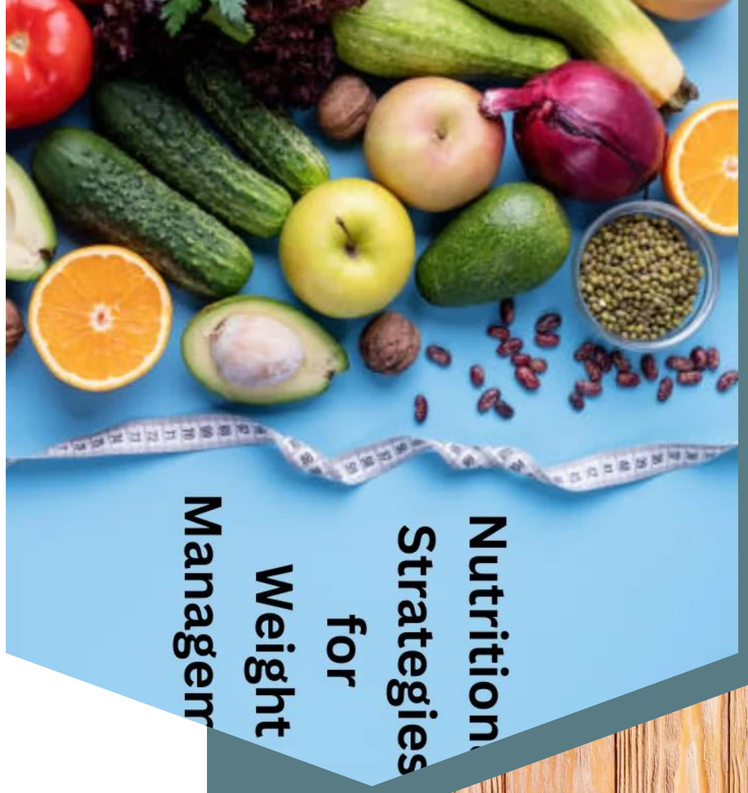
they are not effective



Strategies for weight management

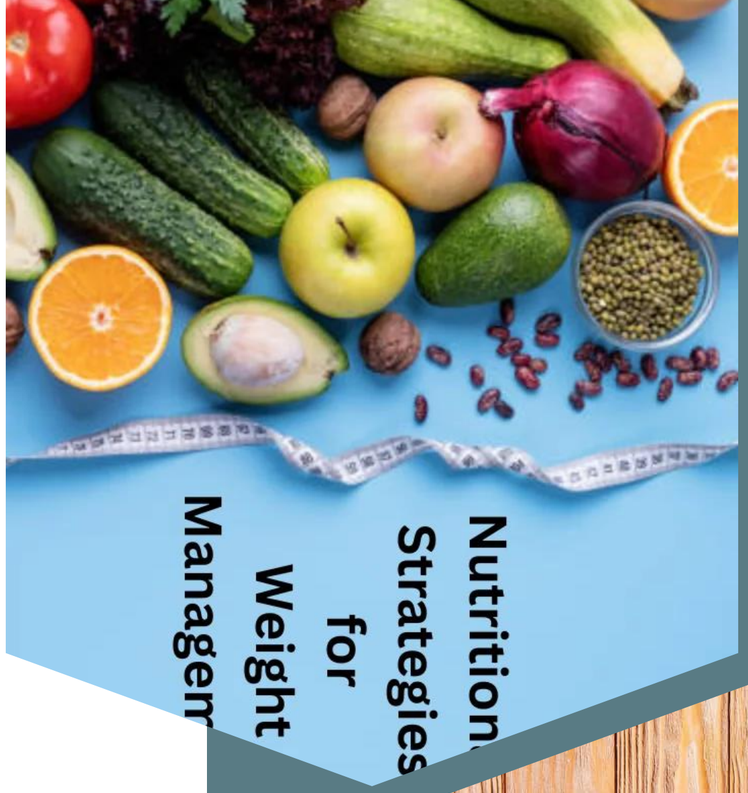
Different nutrition interventions can be applied, with energy deficit; No single way is best

Calorie restriction is necessary for glycemic and weight management, but rigid meal plans and strict tracking can be contraindicated



Strategies for weight management

Emphasis on food patterns instead of macro- and micronutrients;
totality of the foods and beverage a person consume



Strategies for weight management

Appropriate dietary patterns for individuals with prediabetes or diabetes:

Mediterranean style

Plant-based diet (vegetarian, vegan)

DASH diet

Low carbohydrate diet

Diabetes plate

Mediterranean Diet

Key Benefits

- Heart Health
- Weight Management
- Improved Blood Sugar Control
- Reduced Inflammation
- Longevity

Source: W. GBD 2023

Mediterranean diet

- Strong evidence for improved glycemic control and cardiovascular outcomes
- Associated with reduced HbA1c and improved lipid profile
- Benefits observed even without weight loss
- Recommended especially for patients with high cardiovascular risk

Mediterranean diet

- Characterized by high consumption of fruits, vegetables, whole grains, and healthy fats, has been linked to numerous health benefit.
- The Mediterranean diet is associated with a **reduced risk** of developing type 2 diabetes, promoting beneficial effects on glycemic control and cardiovascular health.

Mediterranean diet

- The Mediterranean diet is linked to improvements in various cardiometabolic risk factors including blood glucose levels and HbA1c reductions.

Mediterranean Diet Pyramid

A contemporary approach to delicious, healthy eating

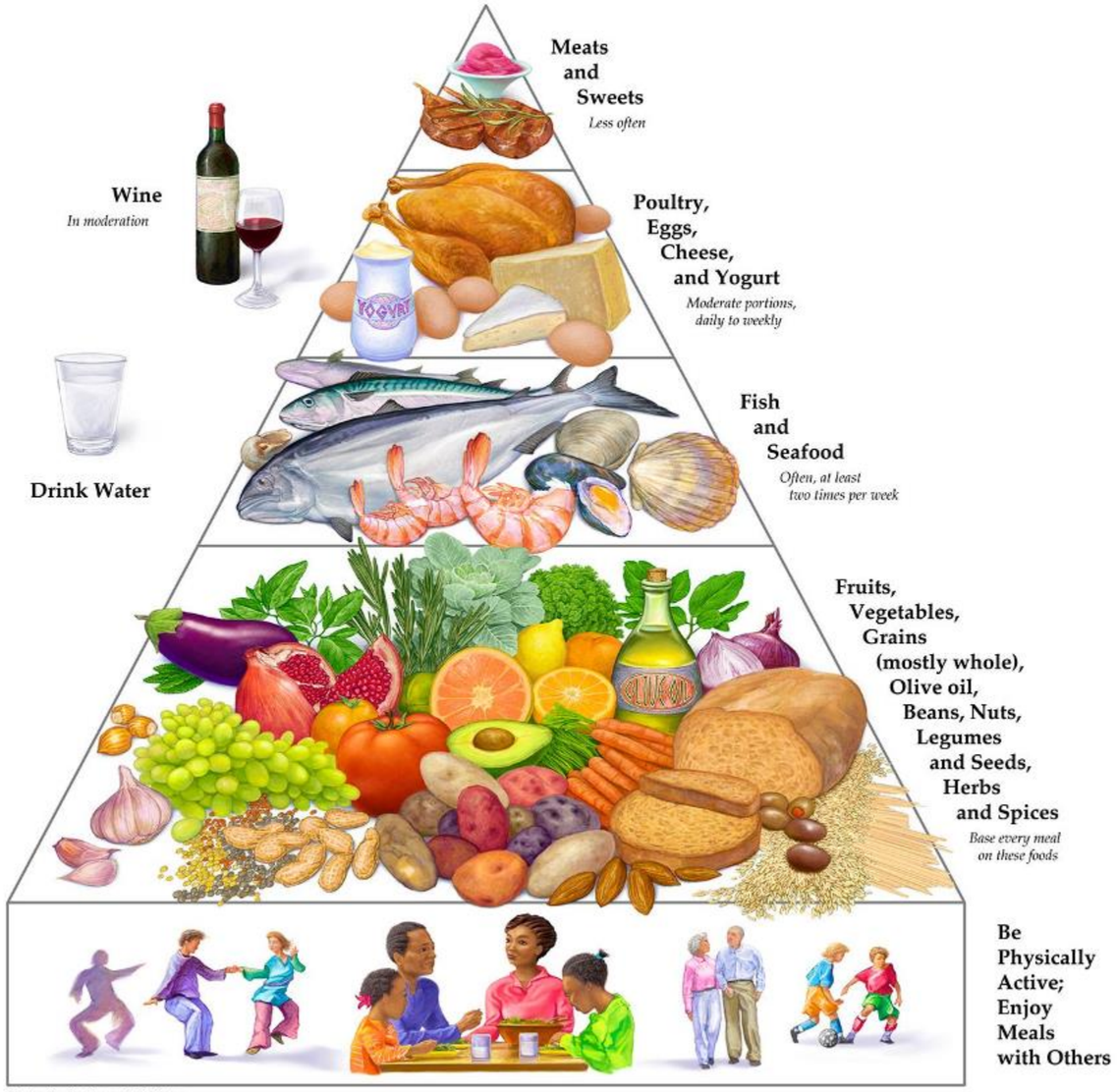


Illustration by George Middleton

Dietary Approaches to Stop Hypertension

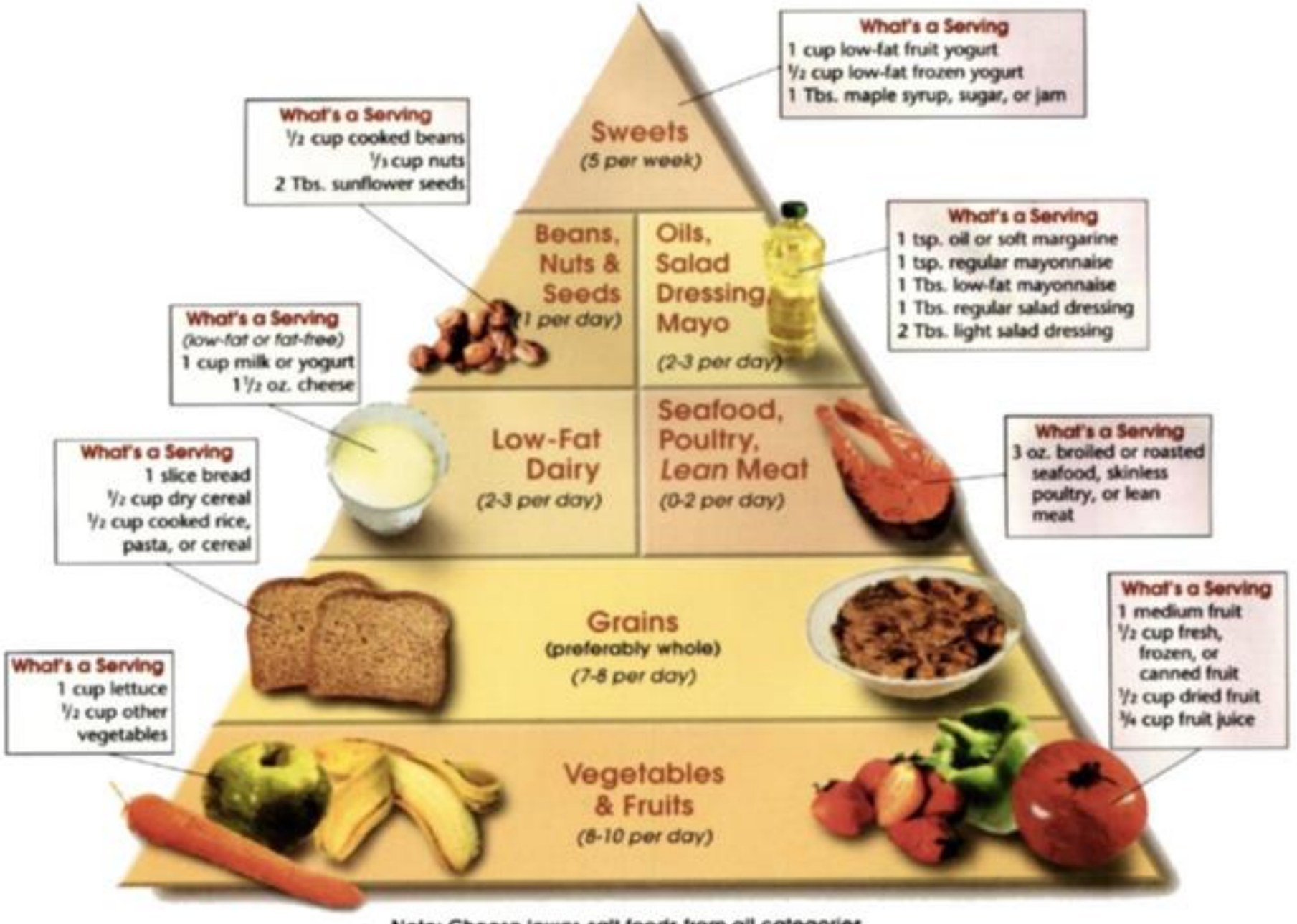
- The DASH diet, emphasizes high consumption of fruits, vegetables, and low-fat dairy while reducing saturated fats and sugars.
- It notably lowers blood pressure, enhances insulin sensitivity, and may reduce the risk of conditions like preeclampsia.

Dietary Approaches to Stop Hypertension

- Numerous studies have established that adherence to the DASH diet can improve glycemic control in individuals with type 2 diabetes .
- This dietary approach significantly reduces HbA1c levels and enhances insulin sensitivity, thus optimizing blood glucose homeostasis

Dietary Approaches to Stop Hypertension

- Particularly beneficial for diabetes with hypertension
- Improves blood pressure and cardiometabolic risk factors
- Emphasizes fruits, vegetables, whole grains, and low-fat dairy
- Not inherently low-carbohydrate but high in carbohydrate quality



Note: Choose lower-salt foods from all categories.

Comparing Med-diet and DASH

Main Differences

Aspect	Mediterranean Diet	DASH Diet
Primary Focus	Overall longevity, enjoyment, and lifestyle (includes social eating, exercise, moderate wine).	Specifically designed to lower blood pressure (high sodium restriction).
Fat Emphasis	High in healthy fats (extra-virgin olive oil, avocados, nuts); ~35-40% calories from fat.	Low-fat (focus on low-fat dairy); ~27% calories from fat.
Protein Sources	Fish/seafood prominent; moderate poultry, eggs, dairy; limited red meat.	More emphasis on low-fat dairy; lean meats, poultry, fish.
Structure	Flexible, no strict portions; pyramid-based with cultural foods.	Structured with daily/weekly servings (e.g., 4-5 fruits, limited sodium <2,300mg/day).

What is a Low Carb Diet?

Low carb means "low carbo" or lower intake of carbohydrates, where the focus is to cut out carbohydrates from your daily diet and meal consumption.

Will a Low Carb Diet Help You Lose Weight?

Cutting out carbohydrates will help you lose weight, especially when it comes to changing our bad habits of consuming ultra-processed carbohydrates such as bread, cakes, and pasta.

When you cut out these harmful foods, your body begins to deflate and help you with your weight goals with time.

Foods You Should Eat in a Low Carb Diet

The Low Carb Diet is to reduce and even cut into definitive carbohydrates from your diet.
The low-carbohydrate main purpose is the loss of weight in a natural way, providing the detoxification of the body. Often this diet includes healthier foods on their menu, such as dairy, fruits, vegetables, and lean meats.

Foods You Should Avoid in a Low Carb Diet

Sugar: It is forbidden within the low-carb context. So, honey, coconut sugar, and processed should not be consumed.

Wheat Flour: No products using wheat flour should be consumed even if it is full.

The low-carbohydrate diet (LCD)

- May improve HbA1c and reduce medication needs in selected patients
- Short-term benefits more consistent than long-term outcomes
- Requires careful monitoring for hypoglycemia
- Not recommended for pregnancy, eating disorders, or advanced kidney disease

Low-Fat, High-Quality Eating Patterns

- Effectiveness depends on food quality rather than fat reduction alone
- Should emphasize whole grains, fiber, and minimally processed foods
- Low-fat diets high in refined carbohydrates are not recommended

Fasting

- Effectiveness depends on food quality rather than fat reduction alone
- Should emphasize whole grains, fiber, and minimally processed foods
- Low-fat diets high in refined carbohydrates are not recommended

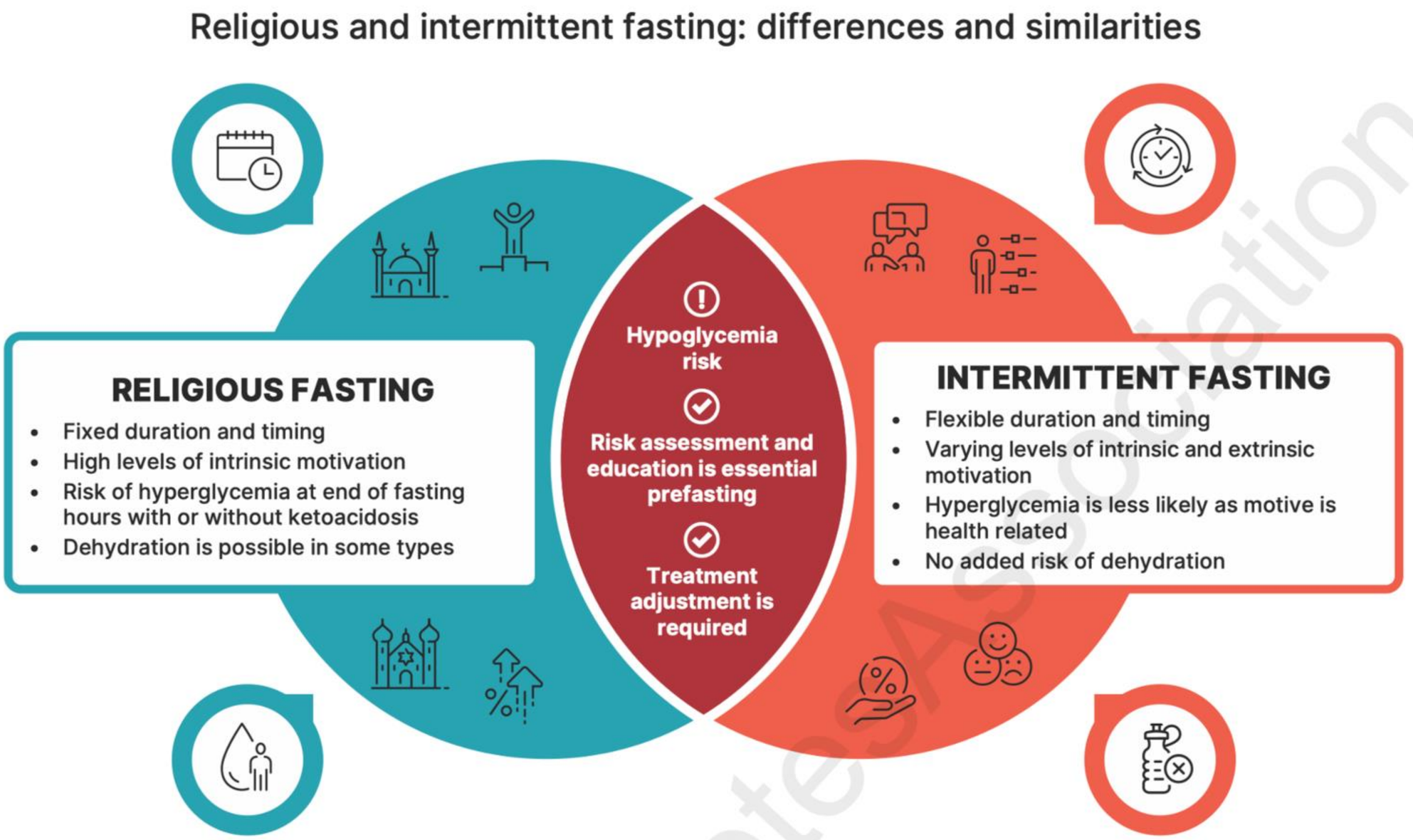
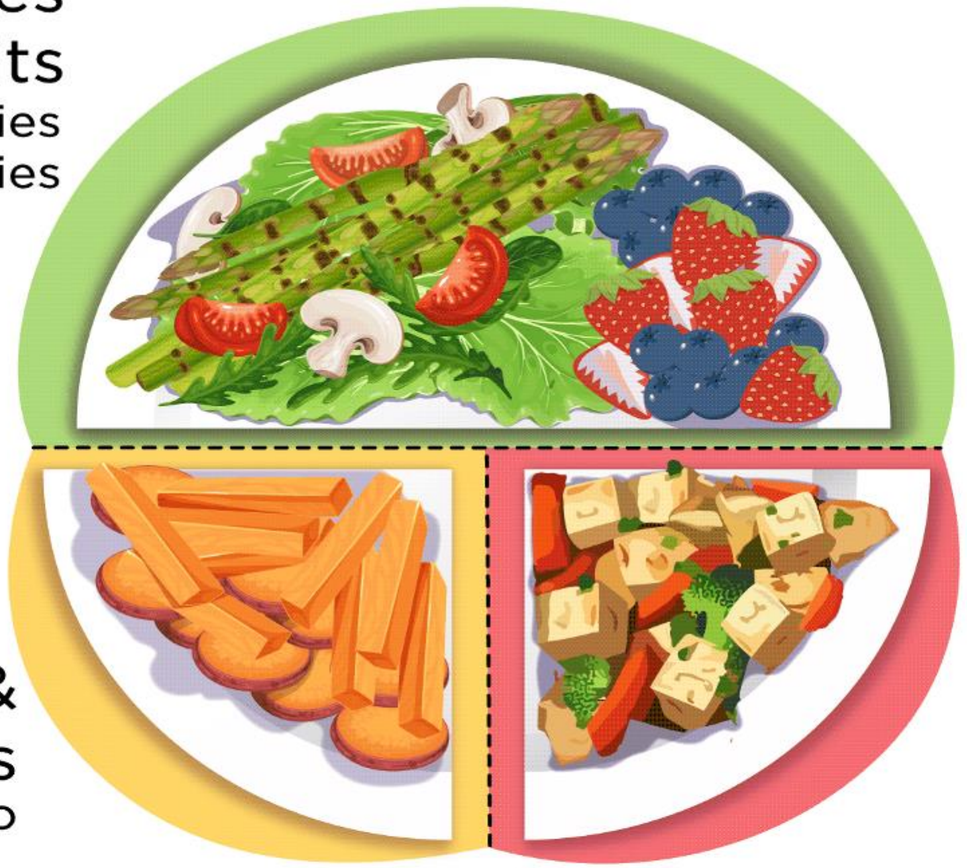


Figure 5.1—Differences and similarities between religious and intermittent fasting for people with diabetes.

A Healthy Plate

½ Vegetables & fruits
Asparagus, strawberries and blueberries



¼ Grains & starches
Sweet potato

¼ Protein
Tofu

9 Inches

Use of Supplements

- Despite lack of evidence of benefit, consumers continue to take supplements.
- One general rule:

Whiteout underlying deficiencies, there is no benefit from herbal or other (i.e., vitamins and mineral) supplementation for people with diabetes.

Use of Supplements: Vitamin D

- Supplementation to prevent diabetes (10-15% reduction in risk in specific populations such as older adults and lower baseline vitamin D)
- Risks: Hypercalcemia, Hypercalciuria, nephrolithiasis, kidney failure

Use of Supplements: Vitamin D

- Just ensure it meets the recommended daily allowance
- Optimal vitamin D level: 20-30 ng/mL generally thought to be sufficient,
- Those receiving antiresorptive therapy (including bisphosphonate) > 30 ng/mL is recommended

Use of Supplements: Calcium

- 1000-1200 mg/day through diet or supplement

Use of Supplements: Omega-3

- Supplementation is not recommended for prevention or treatment of cardiovascular event in people with diabetes; no evidence of benefit for glycemic control or cardiovascular events

Use of Supplements

- Routine supplementation with antioxidants (such as vitamin E and C) is not recommended: no evidence of efficacy, concern for long-term safety
- Harms of Beta-carotene supplementation outweigh the benefits for prevention of CVD and cancer

Use of Supplements

- Routine use of herbal supplements and micronutrients has no adequate evidence to improve glycemic control in people with T1&2D:

Cinnamon

Curcumin (turmeric)

Aloe vera

Chromium

Use of Supplements

Vitamin B12 levels should be monitored in those taking metformin, particularly in those with anemia and peripheral neuropathy

Use of Supplements

Multivitamin-mineral supplementation may be necessary in special populations:

Pregnancy or lactating,
older adults,
vegetarians or vegans,
following very low-calorie diets or low-carb diets
Individual who consume <1200 kcal/day

Nutrition deficiencies due to obesity pharmacotherapy

GLP-1 RA

13% after 6 months

22% after 12 months

Most frequent: vitamin D deficiency

Nutrition deficiencies due to obesity pharmacotherapy

- Semaglutide:

Sever constipation, GI side effects (reduce meal size, mindful eating, stop eating once full, decrease high fat or spicy foods

Nutrition deficiencies due to obesity pharmacotherapy

- Dual GIP and GLP-1 RA : same as GLP-1 RA
- Orlistat:

Fat soluble vitamins

Nutrition deficiencies due to obesity pharmacotherapy

- SGLT2 inhibitors:

- Very low carbohydrate diet or ketogenic diet should be avoided (potential risk of ketoacidosis)

- Alcohol intake should be avoided

- Adequate hydration is very important

Diabetes Related CKD

- Low protein Diet (in those with albuminuria or reduced eGFR)
- Below RDA (0.8 gr/kg) is not recommended due to alter glycemic measure, CVD risk, increase risk of malnutrition
- People with diabetes with or without CKD are advised to limit sodium to <2300 mg/day, processed foods are major contributors of sodium intake

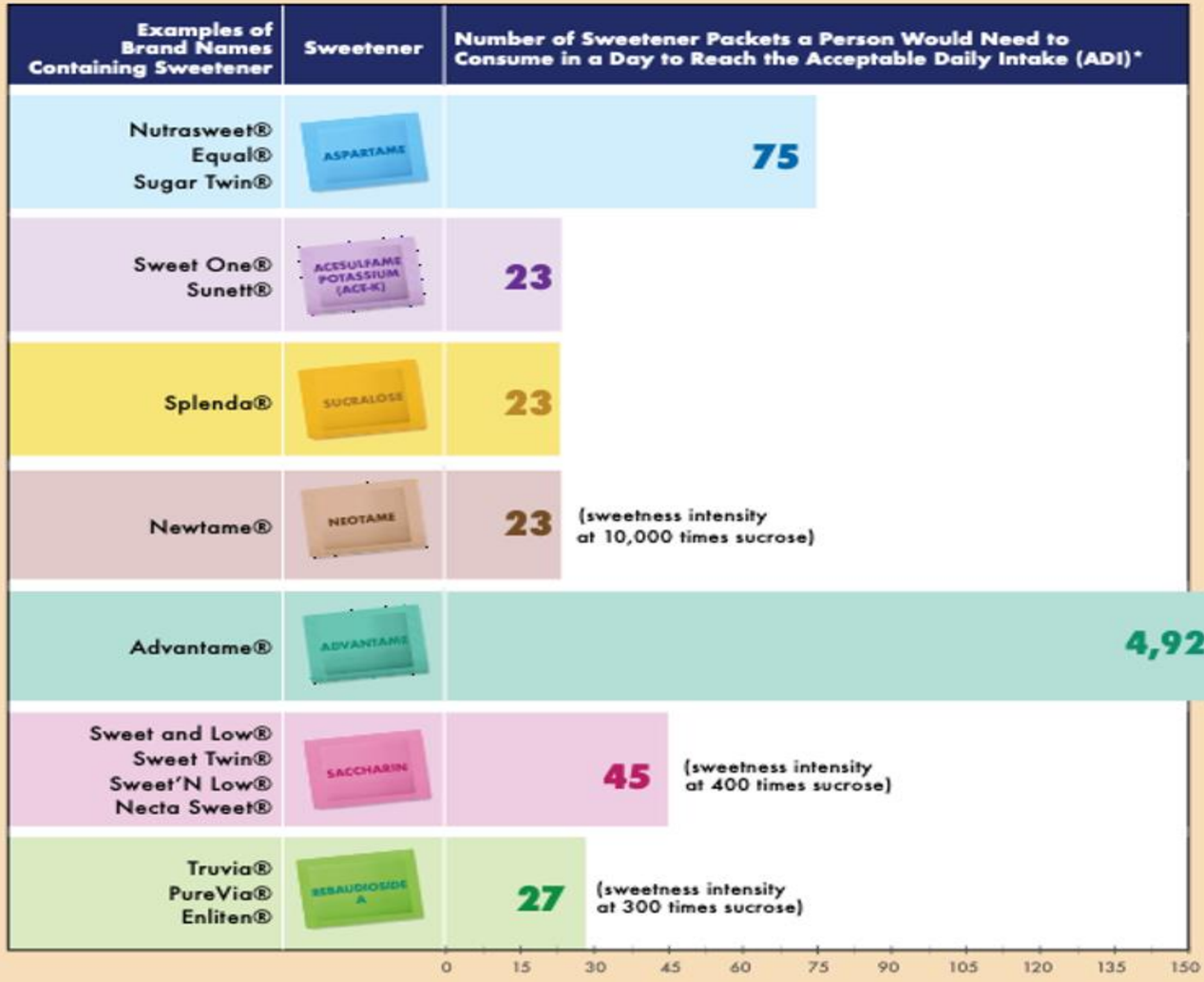
Nonnutritive sweeteners (NNS)

- Approved by FDA for all populations, including people with diabetes
- May be an acceptable substitute for nutritive sweeteners when consumed in moderation
- Do not appear to have significant effect on glycemic management

Safe Levels of Sweeteners

FDA

How many packets can a person consume and still be at the safe level for each sweetener based on its sweetness intensity?



Notes About the Chart:

The ADI in milligrams per kilogram body weight per day (mg/kg bw/d) for the sweeteners in the chart:

- Aspartame is 50 mg/kg bw/d
- Acesulfame potassium (Ace-K) is 15 mg/kg bw/d
- Sucralose is 5 mg/kg bw/d
- Neotame is 0.3 mg/kg bw/d
- Advantame is 32.8 mg/kg bw/d
- Saccharin is 15 mg/kg bw/d
- Rebaudioside A, a type of steviol glycoside, is 12 mg/kg bw/d

  This is based on the ADI for steviol glycosides: 4 mg/kg bw/d, expressed as steviol equivalents, set by the Joint FAO/WHO Expert Committee on Food Additives, on which the FDA participates.

* Number of sweetener packets a 60 kg (132 pound) person would need to consume to reach the ADI. The FDA assumed a sweetener packet is as sweet as two teaspoons (approximately 8 grams) of sugar for these comparisons.

Thank for Your Attention!

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