PHYSIOLOGY

OBESITY

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ENERGY BALANCE AND OBESITY

WHAT IS ENERGY BALANCE

Energy balance is achieved when the kilocalories consumed (Energy in) equal to the kilocalories expended (Energy out)

- Kilocalories comes from foods & beverages
- Bomb calorimeter used in laboratories to measure kilocalories
- Nutrition analysis software or food composition tables can estimate energy in

Carbohydrate & protein =4 kcal/g

Fat =9 kcal/g

Alcohol =7 kcal/g

- The bodies energy balance depends on :

  1. Energy intake

  2.Energy expenditure

- **Energy intake** - calculated energy value of actual food consumption
- **Energy expenditure** – Is the sum of internal heat produced and external work.
- Internal heat produced is the sum of Basal Metabolic Rate(BMR) & Thermic Effect of Food(TEF)
- External work may be estimated by measuring the Thermic Effect of Exercise(TEE) or physical activities

IMBALANCE

Positive energy balance

- Positive balance is a result of energy intake being higher than what is consumed in external work
- Overweight & obesity may develop

Causes

- Overeating
- Sedentary lifestyle

Negative energy balance

- Negative balance is the result of energy intake being less than what is consumed in external work
- Negative energy balance results in weight loss
- The main cause is undereating

OBESITY

DEFINITION: Deposition of excess fat in the body

Excessive weight that may impair health

-Body Mass Index(BMI) used for the measurement of obesity

BMI categories

Normal weight=18.5-24.9

Over weight=25-29.9

Obesity =BMI of 30 or greater

WHAT CAUSES OBESITY

Simply .....when you eat more than you use.....it is stored in your body as fat

- Genetics
- Overeating
- A diet high in simple carbohydrates
- Frequency of eating
- Slow metabolism
- Physical inactivity
- Medications
- Psychological factors
- Diseases

GENETICS

- A person is more likely to develop obesity if one or both parents are obese
- Genetics also affect hormones involved in fat regulation

OVEREATING

- Overeating leads to weight gain,especially if the diet is high in fat
- Foods high in fat or sugar(eg:fast food,fried food,sweets etc…)have high energy density

A DIET HIGH IN SIMPLE CARBOHYDRATES

- Carbohydrates increase blood glucose levels
- It stimulate insulin release by the pancreas
- Insulin promotes the growth of fat tissue and can cause weight gain
- Simple carbohydrates (sugars,wine,soft drinks,etc…)contribute to weight gain.
- They are more rapidly absorbed into the bloodstream than complex carbohydrates
- It stimulate higher insulin release and contributes to weight gain

FREQUENCY OF EATING

- The relationship between frequency of eating and weight is somewhat controversial
- Overweight people eating less often than people with normal weight
- Small frequent meals produce stable insulin levels,where as large meals cause large spikes of insulin after meals

SLOW METABOLISM

- Women have a slower metabolism than men
- They have a tendency to put on more weight than men,and weight loss is more difficult for women

MEDICATIONS

- Medications associated with weight gain includes-medications used in treating depression,diabetes,high blood pressure,etc….

DISEASES

- Diseases such as hypothyroidism,ovary syndrome,cushing's syndrome also contributors to obesity

PSYCHOLOGICAL FACTORS

- For some people,emotions influence eating habits
- Emotions such as boredom,sadness,stress,anger,etc…

PHYSICAL INACTIVITY

- Physical inactivity is strongly correlated with weight gain in both sexes
- Sedentary people burn fewer calories than people who are active

CONSEQUENSES OF OBESITY

- Shorter life expectancy
- Compared to people of normal weight,obese people have a 50% to 100% increased risk of dying prematurely
- Diabetes (type 2)
- Joint problems
- High blood pressure
- Heart disease
- Gallbladder problems

- Certain types of cancer
- Digestive disorders
- Breathing difficulties
- Psychological problems such as depression
- Problems with fertility and pregnancy
- Urinary incontinence

TREATMENT OPTIONS

NON-SURGICAL TREATMENT

- DIETING
- EXERCISE
- MEDICATION

DIETING

- Eating smaller meals
- Maintaining protein intake
- Cutting down certain types of food(containing fat & carbohydrate)

EXERCISE

- Muscles consume energy derived from both fat & glycogen
- Walking,running & cycling are the most effective means of exercise to reduce body fat
- During moderate exercise,fat changed as fuel

MEDICATIONS

Several anti-obesity medications are currently approved by the FDA

Orlistat(xenical)

Reduces intestinal fat absorbtion by inhibiting pancreatic lipase

Meridia

Which acts in the brain to inhibit deactivation of the neurotransmitters ,thereby decreasing appetite

SURGICAL TREATMENT

Bariatric surgery(weight loss surgery)

- **It is the use of surgical intervention in the treatment of obesity**
- **Surgery is only recommended for severely obese people(BMI>40)**
- **Weight loss surgery relies on various principles**

1) reducing the volume of the stomach-which produces an earlier sense of satiation

2) reducing the length of bowel that comes into contact with food -which directly reduces absorption

Ileojejunal bypass

- **The digestive tract is rerouted to bypass the small intestine**