Lesson 20.1

Diabetes mellitus is a metabolic disorder of glucose metabolism with many causes and forms.

About Diabetes

20.8 million Americans have diabetes (7% of the population).
54 million Americans have prediabetes.
Diabetes is the seventh leading cause of death from disease in the United States.

About Diabetes, cont’d

People with diabetes either do not produce insulin or cannot effectively use it.
Diabetes is characterized by hyperglycemia.

Incidence of Diabetes

Word Origins

Diabetes from Greek “to pass through”
Mellitus from Latin for “honey”
Insulin from Latin for “island”
Islets of Langerhans: clusters of pancreatic cells named for discoverer
- **Type 1 Diabetes Mellitus**
  - Accounts for 5% to 10% of cases
  - Previously called insulin-dependent or juvenile-onset diabetes
  - Severe, unstable form

- **Type 1 Diabetes Mellitus, cont’d**
  - Caused by autoimmune destruction of pancreatic cells
  - Can occur at any age
  - Requires exogenous insulin

- **Type 2 Diabetes Mellitus**
  - Accounts for 90% to 95% of cases
  - Previously called adult-onset or non-insulin-dependent diabetes
  - Initial onset usually after age 40 years
  - Now being diagnosed in children

- **Type 2 Diabetes Mellitus, cont’d**
  - Strong genetic link
  - Prevalent in older, obese people
  - Caused by insulin resistance or defect
  - Usually treated with diet, exercise
• Risk Factors for Type 2 Diabetes Mellitus
  • Family history of diabetes
  • Age 45 years or older
  • Overweight
  • Not physically active
  • Race/ethnicity (African American, Hispanic American, Native American, Asian American, Pacific Islander)

• Risk Factors for Type 2 Diabetes Mellitus, cont’d
  • History of gestational diabetes
  • Woman who has delivered infant weighing more than 9 pounds
  • Identified impaired glucose tolerance

• Gestational Diabetes
  • Temporary form of disease occurring in pregnancy
  • Presents complications for mother and fetus/infant
  • Must be carefully monitored and controlled

• Other Types of Diabetes (Secondary)
  • Causes
    — Genetic defect
    — Pancreatic conditions or disease
Endocrinopathies: imbalance with other hormones in the body

Drug/toxin induced or chemical induced

• Impaired Glucose Tolerance
• Above normal fasting blood glucose but not high enough to be diabetes
• A risk factor for type 2 diabetes
• Underlying conditions often present

Symptoms of Diabetes

• Initial signs
  — Increased thirst
  — Increased urination
  — Increased hunger
  — Unusual weight loss (type 1)
  — Unusual weight gain (type 2)

Symptoms of Diabetes, cont’d

• Laboratory test results
  — Glycosuria (sugar in urine)
  — Hyperglycemia (elevated blood sugar)
  — Abnormal glucose tolerance tests

• Progressive results
  — Water, electrolyte imbalance
  — Ketoacidosis
Diabetes mellitus is a metabolic disorder of glucose metabolism with many causes and forms.

Metabolic Patterns of Diabetes

Diabetes is especially related to metabolism of carbohydrate and fat.

It is important to control blood glucose within normal levels of 70 to 110 mg/dl.

If diabetes is uncontrolled and insulin is lacking:
- Glucose cannot enter the cells and builds up in the blood.
- Fat tissue breaks down.
- Protein breaks down, causing weight loss and nitrogen loss.

Three basic stages of normal glucose metabolism:
- Initial interchange with glycogen and reduction to smaller central compound
- Joining with fat and protein
- Common energy production
• Normal blood glucose balance
  — Sources of glucose include glycogen, carbohydrate, fat, and protein
  — Uses:
    • Burned for energy needs
    • Changed to glycogen
    • Stimulate lipogenesis
    • Inhibit tissue fat breakdown
    • Promote amino acid uptake
    • Influence burning of glucose

• Metabolic Pattern of Diabetes, cont’d

• Pancreatic Hormonal Control: Three Key Hormones
  — Islets of Langerhans produce:
    — Insulin
    — Glucagon
    — Somatostatin

• Pancreatic Hormonal Control
  — Insulin
    • Controls blood sugar
      — Helps transport glucose into cells
      — Helps change glucose to glycogen and store it in liver, muscles
      — Stimulates changes of glucose to fat for storage as body fat
      — Inhibits breakdown of tissue fat and protein
      — Promotes uptake of amino acids
Influences burning of glucose for energy

- Glucagon
- Acts in a manner opposite to insulin
- Breaks down stored glycogen and fat
- Raises blood glucose as needed to protect brain during sleep or fasting

- Somatostatin
- A “referee” for several other hormones
- Inhibits secretion of insulin, glucagon, and other hormones
- Also produced in other parts of the body (e.g., hypothalamus)

Abnormal Metabolism

- Glucose
- Fat
- Protein

Abnormal Metabolism, cont’d

- Long-Term Complications of Diabetes
- Retinopathy
- Nephropathy
- Neuropathy
- Heart disease

Dyslipidemia: Elevated triglyceride, decreased high-density lipoprotein cholesterol
Hypertension: A major comorbid condition

- Criteria for Diagnosis of Diabetes Mellitus
  - Symptoms of diabetes plus casual (any time) plasma glucose concentration \( \geq 200 \) mg/dl
  - Fasting plasma glucose \( \geq 126 \) mg/dl
  - Two-hour plasma glucose \( \geq 200 \) mg/dl during an oral glucose tolerance test

Chapter 20
Lesson 20.3

Key Concepts
- A consistent, sound diet is the keystone of diabetes care and control.
- Daily self-care skills enable a person with diabetes to remain healthy and reduce risks for complications.

Key Concepts, cont’d
- Blood glucose monitoring is a critical practice for blood glucose control.
- A personalized care plan balancing food intake, exercise, and insulin regulation is essential to successful diabetes management.

Management of Diabetes
- Early detection
- Glycemic control
- Prevention of complications
- Glucose tolerance test
• **Goals of care**
  
  — Maintaining optimal nutrition
  
  — Avoiding symptoms
  
  — Preventing complications

• **General Management**

• **Medical Nutrition Therapy**

• **The Diabetes Control and Complications Trial**
  
  — Compared the effects of intensive insulin therapy aimed at achieving blood glucose levels as close as possible to the normal nondiabetic range with the effects of conventional therapy on early microvascular complications of type 1 diabetes mellitus.

• **Applications in Clinical Practice: Recommendations**

• **For individuals at risk for type 2 diabetes or with prediabetes:**
  
  — Decrease risk of diabetes and cardiovascular disease
    
    • Promote healthy food choices and physical activity
    
    • Maintain moderate weight loss

• **Applications in Clinical Practice: Recommendations, cont’d**

• **Individuals with diabetes**
  
  — Achieve and maintain:
    
    • Blood glucose levels as safely as possible
    
    • Lipid and lipoprotein profile
    
    • Blood pressure levels
  
  — Prevent, or at least slow, the rate of chronic complications
— Address individual nutrition needs
— Maintain the pleasure of eating

• Applications in Clinical Practice: Recommendations, cont’d

• Goals of MNT that apply to specific situations
  — For youth with type 1 diabetes, youth with type 2 diabetes, pregnant and lactating women, and older adults with diabetes, to meet the nutrition needs of these unique times in the life cycle
  — For individuals treated with insulin or insulin secretagogues, to provide self-management training for safe conduct of exercise, including the prevention and treatment of hypoglycemia and diabetes treatment during acute illness

• Exercise

• Core Focus: Glycemic Control

• Nutrition therapy
  — Total energy balance
  — Nutrient balance
  — Food distribution balance

• Personal diet
  — Total kilocalories of energy balance
  — Ratio of carbohydrate, fat, protein
  — Daily food distribution pattern

• Total Energy Balance

• Normal growth and weight maintenance

• Energy intake
Nutrient Balance

Carbohydrate
- Starch and sugar: Complex and simple carbohydrates
- Glycemic index
- Fiber
- Sugar substitutes: Nutritive and nonnutritive

Protein
- About 15% to 35% of total energy

Fat
- No more than 25% to 30% of kilocalories

Food Distribution Balance
- Eat even amounts of food at regular intervals.
- Maintain even blood glucose supply.
- Snacks may be needed.
- Adjust eating according to activity level and stress.
- Regulate glycemic response according to physical activity and exercise.

Drug therapy.

Diet Management
- General planning according to type of diabetes
- Develop plan to meet individual needs

Diet Management, cont’d
• Food exchange system
• Carbohydrate counting
• Diet Management, cont’d
• Special concerns
  — Special diet food items
  — Alcohol
  — Hypoglycemia
  — Illness
  — Eating out
  — Stress
• Special Concerns
• Person-Centered Self-Care
• Persons with diabetes need essential skills and knowledge.
  — Understand nature of diabetes
  — Nutrition: Develop sound food plan
  — Insulin: Know type, duration of action, combinations
  — Monitor glucose levels
  — Control emergencies, illness
  — Identification bracelet
• Insulin
Diabetes mellitus is a syndrome of varying forms and degrees that have the common characteristic of hyperglycemia. Underlying metabolic disorder involves all three of the energy nutrients (carbohydrate, fat, and protein) and influences energy balance. The major controlling hormone involved is insulin from the pancreas; persons with diabetes have either a lack of insulin or a resistance to its action.

Type 1 diabetes affects approximately 5% to 10% of all persons with diabetes; it usually presents itself first during childhood and is more severe and unstable. Treatment of type 1 diabetes involves regular meals and snacks balanced with insulin and exercise. Self-monitoring of blood glucose levels is an important part of disease management.

Type 2 diabetes occurs mostly in adults, especially those who are overweight. Acidosis is rare. Treatment of type 2 diabetes involves weight reduction and maintenance along with regular exercise. Medications may or may not be needed.
Summary, cont’d

A significant keystone of care for all forms of diabetes is sound diet therapy.

The basic food plan should be rich in complex carbohydrates and dietary fiber; low in simple sugars, fats (especially saturated fats), and cholesterol; and moderate in protein.

Food should be distributed throughout the day in fairly regular amounts and at regular times and tailored to meet individual needs.