MNT Of CKD &Gout

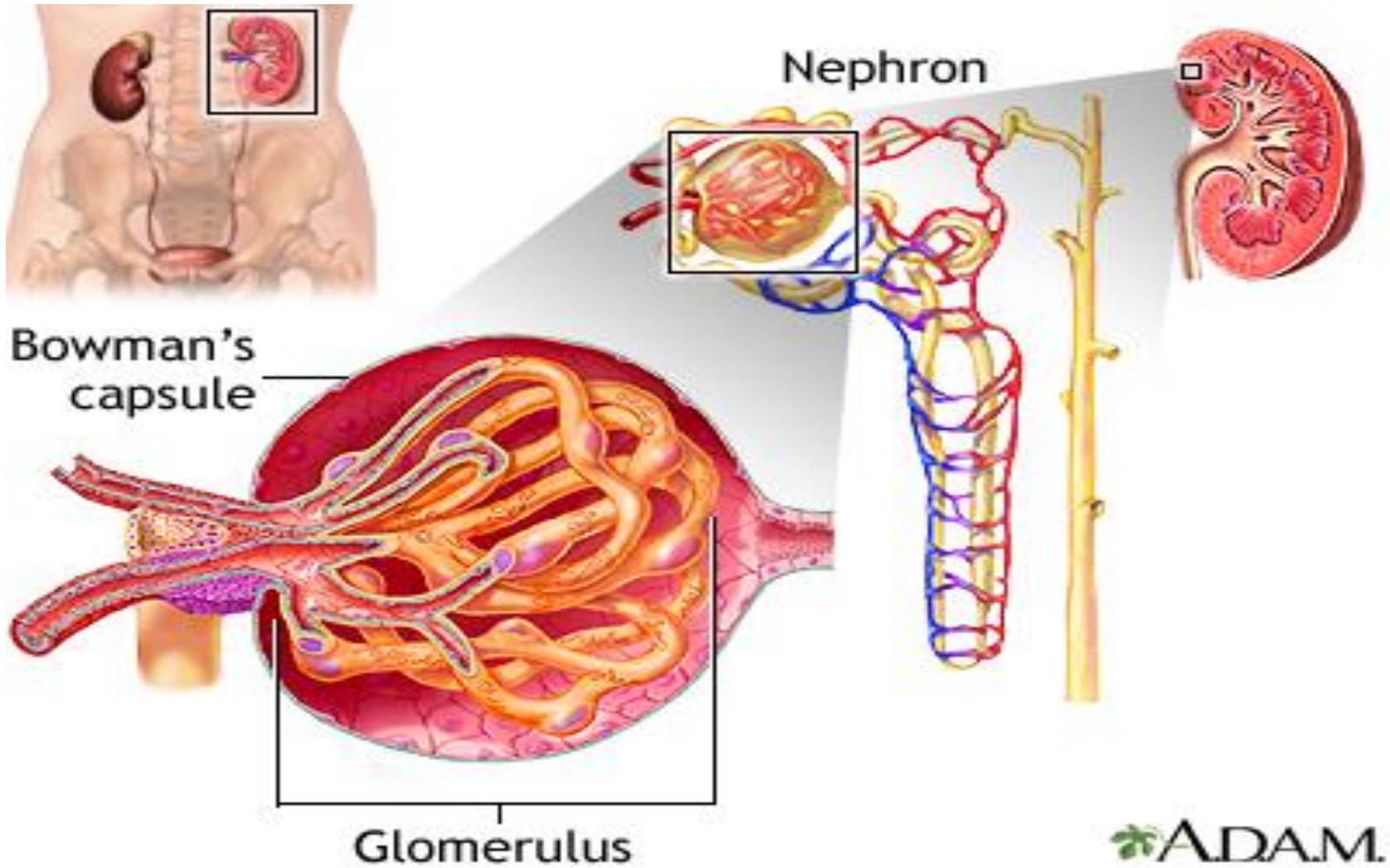
Assistant professor Mayasah A. Sadiq FIBMS-FM

Kidneys

- Excrete wastes
- Maintain volume and composition of body fluids
- Synthesize and secrete certain hormones as needed
- Filter blood and remove or recycle waste products

Kidneys

- Maintain fluid, acid-base, and electrolyte balance
- Nephrons
  - Working parts
- Glomerulus
  - Filtering unit


Nephron
Bowman's capsule
Glomerulus
A.D.A.M.

Kidneys

- Ureters transport liquid waste materials from kidneys to bladder
  - Waste materials:
    - End products of protein metabolism, excess water and nutrients, dead renal cells, and toxic substances

Kidneys

- Oliguria:
  - Urinary output less than 500 mL per day
  - Kidneys unable to adequately eliminate waste products
    - Can result in renal failure

Etiology of CKD

• Diabetes mellitus (DM)	40%
• Hypertension	30%
• Glomerulonephritis	15%
• Hereditary cystic renal disease	4%
• Interstitial nephritis/pyelonephritis	4%
• Tumours	2%
• Miscellaneous	5%

Box 21-1 Risk Factors and Common Causes of Kidney Disease

SOCIODEMOGRAPHIC FACTORS

- Older age
- Family history of chronic kidney disease
- Hereditary diseases affecting the kidneys (e.g., polycystic kidney disease)

CLINICAL FACTORS

- Poor glycemic control in diabetes
- Hypertension
- Obesity
- Autoimmune disease
- Glomerulonephritis
- Systemic infection
- Repetitive urinary tract infection or kidney stones
- Lower urinary tract obstruction
- History of acute kidney injury
- Reduction in kidney mass or congenital malformations
- Exposure to certain nephrotoxic drugs or environmental conditions

Renal Diseases

- Acute renal failure
  - Occurs suddenly
  - May last a few days to a few weeks
  - Can be caused by another medical problem
    - E.g., serious burn, crushing injury, cardiac arrest
- Chronic kidney disease
  - Develops slowly with number of functioning nephrons diminishing

- CKD (CRF) means : chronic progressive irreversible loss of renal function. It is defined as the presence of clinical and/or pathologic evidence of kidney disease for at least 3 months.

- ESRD: advanced CKD (Stage-5) requiring dialysis or kidney transplantation

Chronic Kidney Disease - Stages

Stage	Description	GFR (ml/min/1.73m²)
1	Kidney damage with normal or ↑ GFR	➢90
2	Mild ↓ GFR	60 – 89
3	Moderate ↓ GFR	30 - 59
4	Severe ↓ GFR	15 – 29
5	Kidney failure, ESRD	<15 or dialysis

GFR FORMULA

- GFR[mL/min] = (140 − Age [years]) × weight [kg]/(72 × serum creatinine [mg/dL]) × 0.85 if female

- **Chronic kidney failure, also known as chronic renal failure, chronic renal disease, or chronic kidney disease** , is a slow progressive loss of kidney function over a period of several years. Eventually the patient has permanent kidney failure.
- **Chronic kidney failure is much more common than people realize** , and often goes undetected and undiagnosed until the disease is well advanced and kidney failure is fairly imminent. It is not unusual for people to realize they have chronic kidney failure only when their kidney function is down to 25% of normal.

RENAL FAILURE

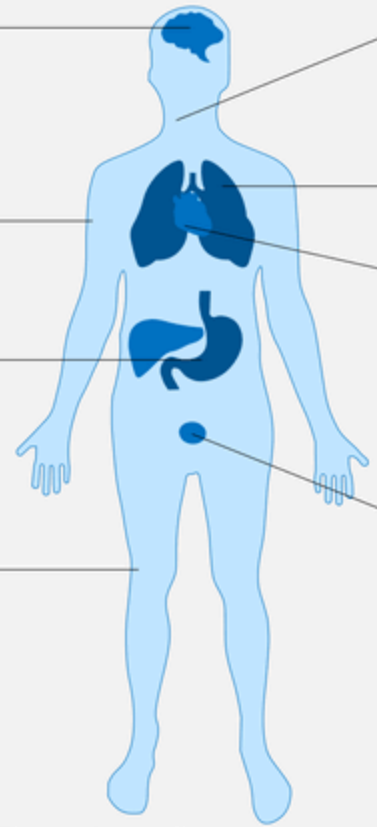
Multi-Systemic Effects of End-stage Renal Disease

Neurologic
- Coma
- Headache
- Inattentiveness
- Lethargy
- Seizures

Skeletal
- Hyperphosphatemia
- Hypocalcemia
- Weak, brittle bones

GI
- Anorexia
- Decreased appetite
- Gastric hypomotility
- Glucose intolerance
- Hyperphosphatemia

Dermatologic
- Dry skin
- Poor healing
- Pruritus



Hematologic
- Bleeding
- Immunosuppression
- Platelet dysfunction

Respiratory
- Pleural effusions

Cardiovascular
- Arrhythmias
- Edema
- Heart failure
- Hypertension
- Pericarditis
- Pericardial

Genitourinary
- Amenorrhea
- Hematuria
- Proteinuria

End-stage (ESRD) renal disease affects multiple organ systems, causing numerous health problems and frequent hospitalization

Renal Diseases

- Chronic kidney disease
  - Uremia
    - Condition in which protein wastes not excreted
      - Instead, circulated in blood
    - Symptoms:
      - Nausea, headache, coma, and convulsions
  - Severe renal failure can result in death unless dialysis used

Renal Diseases

- Nephrosclerosis
  - Hardening of renal arteries
  - Caused by arteriosclerosis and hypertension
  - Usually occurs in older clients
    - Sometimes develops in younger clients with diabetes

Renal Diseases

- Nephritis
  - Inflammatory disease of kidneys
  - Caused by infection, degenerative processes, or vascular disease
- Glomerulonephritis
  - Inflammation affecting capillaries in glomeruli

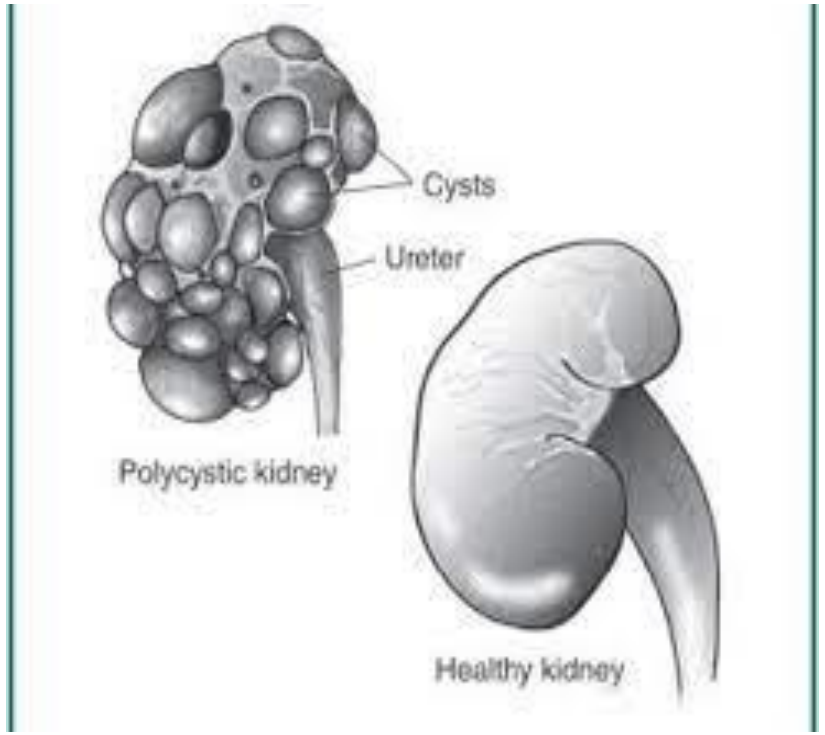
Renal Diseases

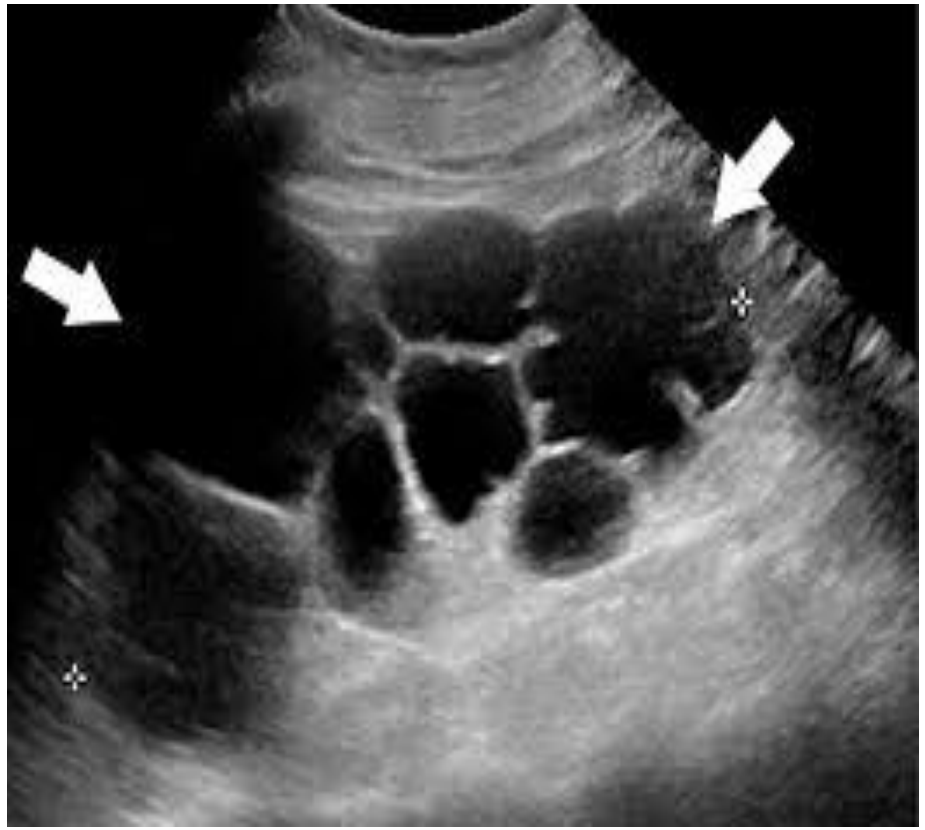
- Polycystic kidney disease
  - Relatively rare hereditary disease
  - Cysts form
    - Press on kidneys
  - Kidneys enlarge
    - Lose function
  - Renal failure may develop

Polycystic kidney

- Ninety percent of PKD cases are autosomal dominant.
- Approximately 85 percent of families with autosomal dominant polycystic kidney disease (ADPKD) have a mutation in the PKD1 gene, located on chromosome 16; these people have PKD1 disease. The remaining 15 percent have a mutation in the PKD2 gene on chromosome 4; this is called PKD2 disease.
- Patients with PKD1 mutations have bigger kidneys, more kidney related complications and require dialysis at an earlier age compared to those with PKD2 mutations (55 versus 75 years, respectively).
- ADPKD is a common disorder mainly affecting adult patients, ARPKD is the rare but often severe form of PKD usually presenting in early childhood.

POLYCYSTIC KIDNEYS





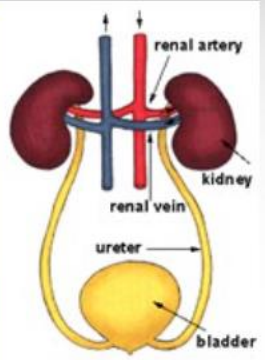
Renal Diseases

- Nephrolithiasis
  - Stones develop in kidneys
    - Classified according to composition
  - Associated with metabolic disturbances and immobilization of client

FAT<30 %

MNT goal :

- ✓Control hypertension
- ✓ Minimize edema
- ✓Decr. urinary alb. losses
- ✓Prevent protein malnutrition& muscle catabolism
- ✓Supply adequate energy
- ✓Slow the progress of renal disease.



MNT:

- Adequate **protein** *0.8-1gm/kg/d* to avoid catabolism.
- **Energy** *≥35Kcal/kg/d*, to avoid malnutrition.
- **CHO** *50-60%*of total caloric intake..

Nutrients to Monitor

Protein (80 grams is a common daily limit for people on hemodialysis.)

Phosphorus (Normal levels for serum phosphorus are (1.8-2.6 mEg/L)

Sodium (Normal levels for serum sodium are 135-145 mEg/L)

Potassium (Normal levels for serum potassium are 3.5-5 mEg/L)

Fluid

Dietary Treatment of Renal Disease

- Energy requirements should be fulfilled by carbohydrates and fat to spare protein
- Metabolized protein increases amount of nitrogen waste kidneys must handle
- Protein allowance based on glomerular filtration rate and weight

Vegetables, grains, meats, fish, poultry, and legumes (beans and peas) have protein. Most of the protein you eat should come from meats, fish, poultry (chicken) and legumes (beans and peas).

1 ounce cooked meat, fish, poultry	= 7 g
1 large egg	= 7 g
1/2 cup cooked dried beans, peas, lentils	= 8 g
1/2 cup tofu	= 7 g
2 tablespoons peanut butter	= 7 g
1 cup milk, soy milk, or yogurt	= 8 g
1/2 cup pudding or custard	= 4 g
1 slice or 1 inch cubed cheese	= 7 g
1/2 cup cottage cheese or ricotta cheese	= 7 g
2 tablespoons Parmesan cheese	= 7 g

Dietary Treatment of Renal Disease

- Sodium and fluids may be limited to prevent edema, hypertension, and CHF
- Calcium and vitamin D supplements may be prescribed
- Phosphorus may be limited if retained

Sodium

Sodium makes us thirsty and want to drink more. As we drink more fluids, we retain fluid and our blood pressure goes up which puts a strain on our kidneys and heart.

Avoiding foods high in salt and sodium helps control fluid. You may eat 2000 mg (2 grams) of sodium per day.

1 TEASPOON OF SALT EQUALS 2 G OF SODIUM WHICH IS EQUAL TO YOUR SODIUM ALLOWANCE FOR THE DAY.

High Sodium Foods

Limit sodium to 2000 mg each day

- Processed meats
- **Meat product** (ham, bacon, sausage)
- Salty snacks (chips, pretzels, nuts)
- Pickled foods
- Butter, garlic salt, seasoned salt
- Barbecue sauce , soy sauce, ketchup, mustard
- Processed cheeses

Dietary Treatment of Renal Disease

- Hyperkalemia may occur in end-stage renal disease (ESRD)
  - Potassium may be restricted
- Renal clients often have increased need for vitamin B, vitamin C, and vitamin D
  - Supplements often given

Potassium

Potassium helps muscles including the heart muscles to contract and relax. Too much potassium in your blood can cause hyperkalemia and emergency treatment should be started. Unless your doctor tells you otherwise, limit potassium to 2000 mg each day.

Apricots	Honeydew Melon	Yogurt	Tofu
Avocado	Milk	Prunes	Tomato Juice
Banana	Molasses	Pumpkins	Salmon
Bran Cereal	Potatoes /Sweet Potatoes	Raisins	Tomatoes
Buttermilk	Figs	Salt Substitutes	Vegetable Juice
Chard	Oranges	Spinach	Watermelon
Dried Beans/Peas	Papaya	Sunflower Seeds	Winter Squash

Phosphorus

Most foods have phosphorus in them. Too much phosphorus can cause calcium to come out of bones, making bones brittle and easier to fracture or break. Most people with kidney failure should limit phosphorus to 800-900 mg a day.

Baking powder	Cheese (except cottage cheese)	Dried peas	Organ meats (brain and liver)
Beer	Chocolate	Eggs	Nuts, peanuts, and peanut butter
Gran cereals	Dark cola beverages	Fish	Poultry
Dreads raised with baking powder Caramel	Dried beans	Milk and milk products	Whole grains, whole wheat bread

Dietary Treatment of Renal Disease

- Iron commonly prescribed to treat or prevent anemia

Dialysis

- Hemodialysis
  - Requires permanent access to bloodstream through fistula
  - Treat three times per week for three to five hours each time
- Peritoneal dialysis
  - Uses peritoneal cavity for access
  - Less efficient than hemodialysis
  - Usually treat three times per week for approximately 10 to 12 hours per day

Dialysis

- Continuous ambulatory peritoneal dialysis (CAPD):
  - Exchanges fluid four to five times daily
  - Complications:
    - Peritonitis, hypotension, and weight gain

Diet during Dialysis

- Must carefully control protein intake
  - 75 percent should be high biological value
- Potassium usually restricted
- Typical renal diet could be written as “80-3-3”
  - 80 g protein, 3 g sodium, and 3 g potassium daily

Diet after kidney transplant

- Most people with a kidney transplant don't have many limits on what they can eat or drink, but it's important for everyone to follow a healthy diet (low fat, low salt) and drink plenty of fluids.
- If the patient has diabetes or other health problems, he may still have some limits on what he can eat or drink

Kidney stones

- also called renal calculi, nephrolithiasis or urolithiasis).
- are hard deposits made of minerals and salts that form inside kidneys.
- Increased incidence of obesity, diabetes, hypertension, and metabolic syndrome have been linked to increasing rates of nephrolithiasis.

- About 1 in 11 people has a kidney stone in their lifetime.
- more than 50% of these will have a recurrence within 5 to 10 years.
- A positive family history influences the clinical course of idiopathic calcium stones.
- significant gender-related differences:
- • Earlier onset in females and higher rate of recurrence.
- • Men are 1½ times more likely than women to develop stones.

Risk factors

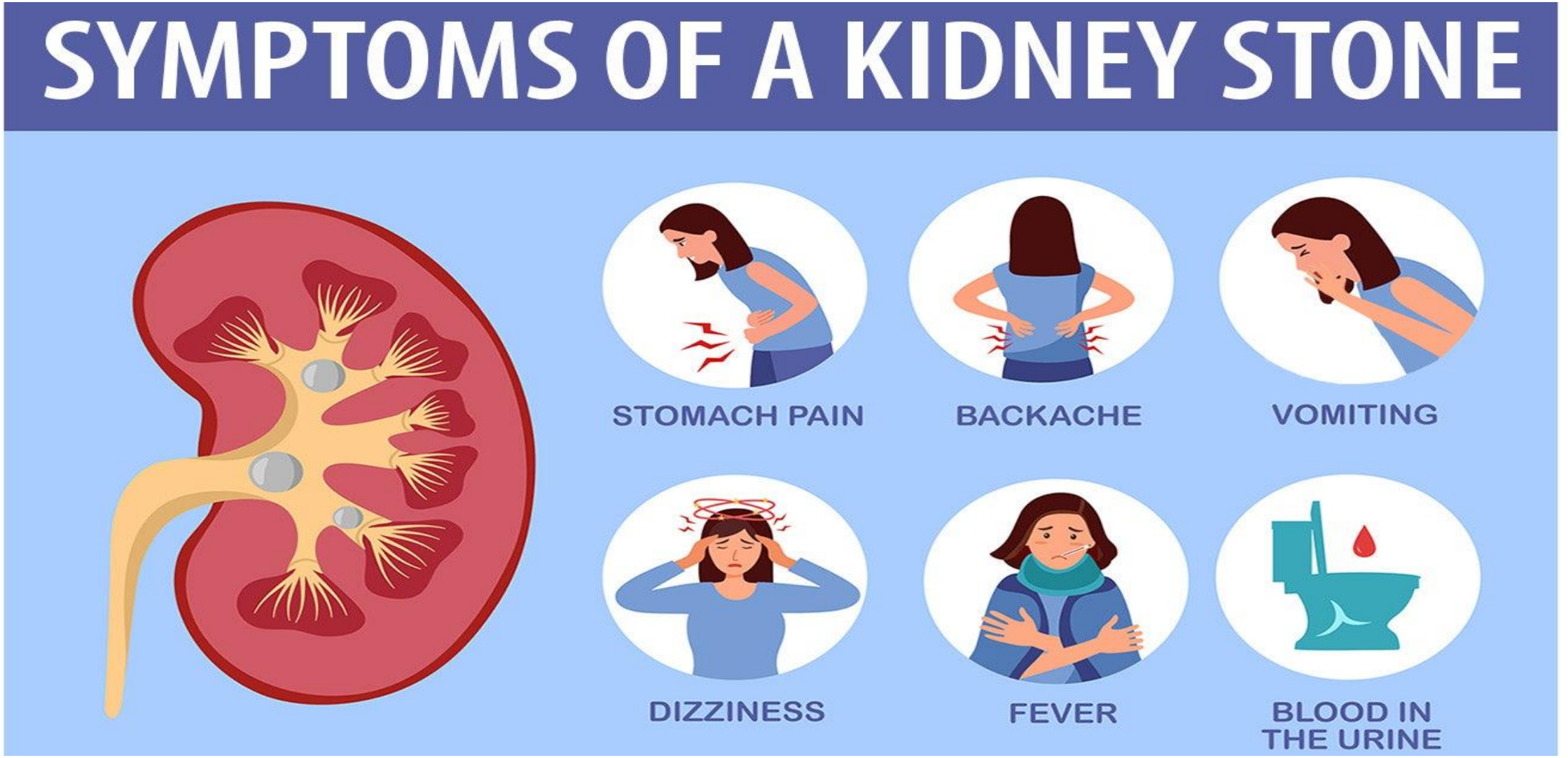
- A low urine volume is the single most important risk factor for all types of nephrolithiasis.
- The five modifiable risk factors that account for more than 50% of incident kidney stones are:
- Body mass index (BMI).
- Fluid intake.
- Dietary Approaches to Stop Hypertension (DASH)-style diet.
- Dietary calcium intake.
- Sugar sweetened beverage intake.

- Stone formers with obesity excrete increased amounts of sodium, calcium, uric acid, and citrate, and have lower urine pH.
- Obesity is the strongest predictor of stone recurrence in first-time stone formers.
- As body weight increases, the excretion of calcium, oxalate, and uric acid also increases.
- Patients with a higher BMI have a decrease in ammonia excretion and impaired hydrogen ion buffering.
- With increasing BMI,
- uric acid stones become more dominant than calcium-oxalate stones, especially in men.

- Uric acid stones are common in the presence of type 2 diabetes.
- Hyperinsulinemia also may contribute to the development of calcium stones by increasing urinary calcium excretion.
- Uric acid stones are also associated with higher prevalence of CKD.
- Weight control may be considered one of the preventive modalities, and in stone formers a BMI of 18 to 25 kg/m2 is recommended.

- Some oral antibiotics such as sulfa and broad-spectrum penicillins play a role in increasing stone risk in adults and children given the latter are prescribed antibiotics at a higher rate than adults.
- Antibiotics alter the composition of human microbiome, and disruptions in the intestinal and urinary microbiome have been linked to the occurrence of kidney stones.

RENAL STONES




Spleen
LT KID LONG


Abd Renal
C5-1
19Hz
RS
2D
62%
Dyn R 55
P Low
HPen
TIS0.3 MI 1.1
Dist 1.35 cm
RT KID UPJ
22cm

Dietary Treatment of Renal Stones

- Varies based on type of stone
- Drink large amount of fluid
- Eat well-balanced diet
- Once stones analyzed, specific diet modifications may be indicated

Calcium Oxalate Stones

- Risk factors:
  - Excessive animal protein intake
  - Oxalate
- Reduce level of oxalate
  - Found in beets, wheat bran, chocolate, tea, strawberries, and spinach

ACCOUNTS FOR 80%

Uric Acid Stones

- Restrict purine-rich foods
  - Found in meats, fish, poultry, organ meats, anchovies, sardines, meat extracts, and broths
- Usually associated with gout, gastrointestinal diseases that cause diarrhea, and malignant disease

ACCOUNT FOR 9%

Cystine Stones

- Caused by excessive cystine concentration in urine
  - Due to hereditary metabolic disorder
- Increased fluids and alkaline-ash diet recommended

ACCOUNT FOR 1%

Struvite Stones

- Composed of magnesium ammonium phosphate
- Develop following urinary tract infections caused by certain microorganisms
- Low-phosphorus diet often prescribed

Struvite stones(STAGHORN)

- REPEATED UTI of urease-producing bacteria including Proteus, Staphylococcus, Pseudomonas, Providencia, and Klebsiella.
- However, these stones only account for approximately 10% of all staghorn calculi

Medical Management

- Uric acid stones are the only type amenable to dissolution therapy or
- dissolving of the stone by alkalinization of the urine.
- This is done with consumption of a more vegetarian diet that is also lower in purines or by the use of medication.
- Shockwave lithotripsy and endourologic techniques almost have replaced the open surgical procedures of stone removal of 20 years ago.
- Struvite stones also are treated with adjunctive culture-specific antimicrobial therapy that uses urease inhibitors.
- Management strategies are now aimed at kidney stone prevention.

Gout

Hereditary abnormal metabolism of purines, cause a form of acute arthritis, with inflamed joints (usually knees& feet).

Hyperuricemia results with deposition of urate& s.t. sodium.

MNT goals:


Photo: U.S. Centers for Disease Control and Prevention

-Weight loss for obese patient.

-Increase urates excretion.

-Force fluid intake to prevent uric acid stones.

-Correct any existing hyperlipidemia.

High level of uric acid concentration in the blood------Hyperuricemia

Normal Uric acid levels are 2.4-6.0 mg/dL (female) and 3.4-7.0 mg/dL (male).

Blood uric acid level rises above 7 mg/dL.----Gout

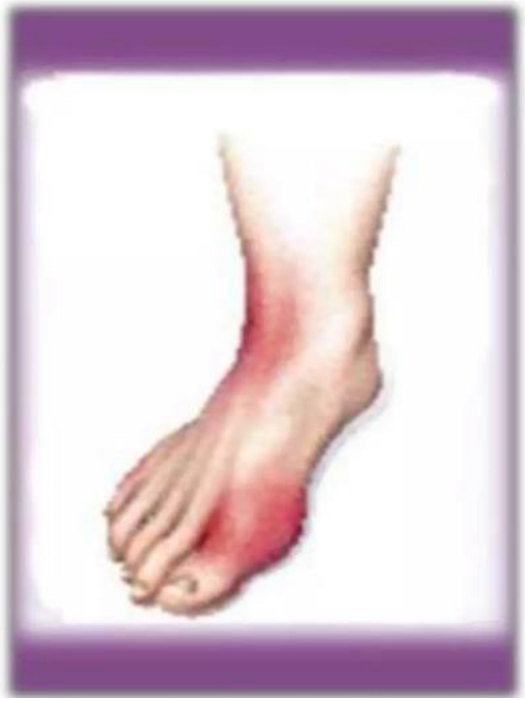
Uric acid deposition called tophi (Tophus)

Tophi

Predisposing Factors

- Gender- male > female
- Family History
- Previous attack
- Body size - large > small
- Alcohol
- Diet – purine rich
- Diuretics
- Causes of high cell turnover e.g. psoriasis, chemotherapy
- Renal insufficiency

The Four Stages of Gout



- Asymptomatic
- Acute
- Intercritical
- Chronic

Asymptomatic

- No symptoms
- Only by physical examination/ diagnostic studies
- **Uric acid Level: 7-8 mg/dl**

Acute stage

- Severe and sudden onset
- Only one or two joints will be involved
- Symptoms will appear usually at the night time
- Joints will be warm, red, oedematous, pain and tender
- **increase in uric acid level (8-12mg/dl)**

Intermediate stage

- Symptoms will worsen over an extended time
- Joints will be warm, red, oedematous, pain and tender
- Severe Pain
- Increased accumulation of uric acid crystals
- **Uric acid level : 12-15mg/dl**

Chronic stage

- Continuous and persistent pain
- Decrease in the mobility of joints
- Increase in redness and edema
- Difficulty to treat with medicine
- **Uric acid level: >15 mg/dl**

Dietary recommendations (MNT):

1-High CHO diet& low fat intake

increase excretion of urates.

2- In acute case; avoid excessive intake of purines(shellfish, smoked meat, sardines & meat extracts).

3-Exclude alcohol beverages.

4-Calorie controlled diet for obese.

5-Ensure high fluid intake.

Foods high in purines

- **High: content 150-825mg/100g**

*Shellfish, seafood, sardines.

*Meat, brain, kidney, liver.

- **Moderate: content 50-150mg/g**

*Vegetables; cauliflower, green peas, mushrooms, spinach

*Grains& legumes; peas, lentils, beans,

*Oatmeal, wheat bran, whole grain breads & cereals.

*Fish; all kind, lobsters, oysters.

*Meat; beef, lamb

*Poultry; chicken, duck, turkey.

- **Low: content 0-50mg/100g**

*Beverages; carbonated beverages, coffee, tea.

*Grains; bread& cereals (refined white flour)

*Dairy; cheese, milk (all fat levels)

*Miscellaneous; eggs, fat, fruits& juices, gelatin, nuts, sugars& sweets, vegetables.