URINE

General information	Normal urine excretion	Normal Composition Of Urine	
		Major inorganic constituents	Major organic constituents
✓ Urine is a fluid excreted by most animals including humans ✓ It is formed in the kidneys (renal glomeruli). ✓ The fluid undergoes chemical changes before it is excreted as urine	Healthy person excretes about 1.5 L per day	➢ Sodium ➢ Potassium ➢ Chloride ➢ Small amounts of Ca, Mg, sulfur and phosphates ➢ Traces of Fe, Cu, Zn, I	➢ Non-protein nitrogen (NPN) compounds ➢ Organic acids ➢ Sugars ➢ Traces of proteins, vitamins, hormones, pigments

Abnormal Composition Of Urine

	Proteinuria	Glycosuria	Ketonuria	Choluria	Nitrite	Blood	
						Hematuria	Hemoglobinuria
Definition	Excretion of abnormal amounts of protein in urine	Presence of sugar in urine	Presence of ketones, acetone, acetoacetic acid and beta-hydroxybutyric acid in urine	Presence of bile, bilirubin and bile salts in urine		Presence of detectable amount of blood in urine	Presence of hemolysed blood in urine
Normal amount of excretion	< 200 mg/day Excretion of more than this level causes proteinuria						
Types	1-Pre-renal 2-Renal 3-Post-renal	1-Glucosuria 2-Fructosuria 3-Galactosuria		1-Bilirubin 2-Urobilinogen			
Causes			○ Diabetic ketoacidosis ○ Starvation ○ Dietary imbalance - high fat and low CHO diet ○ Phenylketonuria (PKU)		Positive nitrite test is significant of bacteria in urine	• Acute and chronic glomerulonephritis • Local disorders of kidney & genito-urinary tract (Trauma , cystitis , renal calculi and tumors) • Bleeding disorders (Hemophilia)	• Hemoglobinopathies 1- Sickle cell anemia 2- Thalassemia • Malaria (P. falciparum) • Transfusion reaction (Blood group Incompatibility)

Proteinuria

Pre-renal proteinuria

1-Some abnormal conditions increase plasma protein levels before reaching the kidneys
2-Causes increased filtration of these proteins in the kidneys
3- This exceeds the normal reabsorptive capacity of renal tubules
4- Results in overflow of proteins in the urine

Multiple myeloma

1. A proliferative disorder of the immunoglobulin-producing plasma cells
2. The serum contains elevated levels of monoclonal light chains antibodies (Bence-Jones protein)
3. Bence-Jones protein is filtered in kidneys in high amounts
4. Exceeding the tubular reabsorption capacity
5. Hence excreted in the urine
6. The Bence-Jones protein coagulate at 40–60 oC
7. Dissolves at 100 oC
8. Multiple myeloma cases are diagnosed by using:
   - Serum electrophoresis
   - Immunoelectrophoresis

Renal Proteinuria

Associated with renal disease

Glomerular proteinuria	**Tubular** proteinuria
High glomerular permeability	Normal glomerular permeability with Low tubular reabsorption
Causes filtration of high molecular weight proteins	Causes excretion of low molecular weight proteins
e.g. glomerulonephritis	e.g. chronic nephritis

Physiological

Orthostatic (Postural) Proteinuria

- Persistent benign proteinuria
- Occurs frequently in young adults due to periods spent in a vertical posture
- Increased pressure on the renal vein in the vertical position causes orthostatic proteinuria
- Disappears in horizontal posture

In General

Microalbuminuria

- Presence of small amounts of albumin in the urine (20– 200 mg/day)
- Cannot be detected by ordinary urine testing
- Needs special tests for detection
- Early indicator of glomerular dysfunction due to uncontrolled diabetes mellitus or hypertension

Post renal proteinuria

- Proteins added to the urine as it passes through the structures of the lower urinary tract (ureters, bladder , urethra, prostate and vagina)
- Due to Lower urinary tract infection, trauma, tumors and stones

Glycosuria					
Glucosuria		**Fructosuria**		**Galactosuria**	
Presence of detectable amount of glucose in urine		Presence of fructose in urine		Presence of galactose in urine	
Uncontrolled Diabetes mellitus	**Renal glucosuria**	**Alimentary**	**Metabolic (congenital)**	**Alimentary**	**Metabolic**
The conc. of glucose in the plasma exceeds the renal threshold	Normal plasma glucose conc. with a malfunction in proximal tubule leads to decrease in renal threshold e.g. gestational diabetes Fanconi's syndrome.	High fructose intake	Low fructokinase or aldolase B in the liver	High galactose intake	Low galactokinase or galactose -1-phosphate uridyl transferase in the liver

Choluria	
Bilirubin / Bile salts	**Urobilinogen**
Presence of bilirubin in the urine, which normally not detectable in the urine.	Presence of High amounts of urobilinogen, which is normally present in trace amounts in urine.
Hepatocellular damage Obstruction of bile duct: 1-Extrahepatic (Stone) 2-Intrahepatic (hepatic tumors).	Hemolytic anemia Hepatocellular damage

Important