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**COURSE CODE: PHS 303**

**COURSE TITLE: RENAL PHYSIOLOGY, BODY FLUID, AND TEMPERATURE REGULATION**

**QUESTION 1)** Discuss the pathophysiological process involved in renal failure

Renal failure refers to failure of excretory functions of kidney. It is usually, characterized by decrease in glomerular filtration rate (GFR). So GFR is considered as the best index of renal failure. However, decrease in GFR is not affected much during the initial stages of renal failure. If 50% of the nephrons are affected, GFR decreases only by 20% to 30%. It is because of the compensatory mechanism by the unaffected nephrons. The renal failure may be either acute or chronic. Renal failure is always accompanied by other complications such as:

1). Deficiency of calcitriol (activated vitamin D) resulting in reduction of calcium absorption from intestine and hypocalcemia. Deficiency of calcitriol and hypocalcemia may cause secondary hyperparathyroidism in some patients

2). Deficiency of erythropoietin resulting in anemia

3.) Disturbances in acid­base balance.

**ACUTE RENAL FAILURE:**

Acute renal failure is the abrupt or sudden stoppage of renal functions. It is often reversible within few days to few weeks. Acute renal failure may result in sudden life-threatening reactions in the body with the need for emergency treatment.

**CAUSES:**

1. Acute nephritis (inflammation of kidneys), which usually develops by immune reaction

2. Damage of renal tissues by poisons like lead, mercury and carbon tetrachloride

3. Renal ischemia, which develops during circulatory shock

4. Acute tubular necrosis (necrosis of tubular cells in kidney) caused by burns, hemorrhage, snake bite, toxins (like insecticides, heavy metals and carbon tetrachloride) and drugs (like diuretics, aminoglycosides and platinum derivatives)

5. Severe transfusion reactions

6. Sudden fall in blood pressure during hemorrhage, diarrhea, severe burns and cholera

7. Blockage of ureter due to the formation of calculi (renal stone) or tumor.

**FEATURES:**

1. Oliguria (decreased urinary output)

2. Anuria (cessation of urine formation) in severe cases

3. Proteinuria (appearance of proteins in urine) including albuminuria (excretion of albumin in urine)

4. Hematuria (presence of blood in urine)

5. Edema due to increased volume of extracellular fluid (ECF) caused by retention of sodium and water

6. Hypertension within few days because of increased ECF volume

7. Acidosis due to the retention of metabolic end products

8. Coma due to severe acidosis (if the patient is not treated in time) resulting in death within 10 to 14 days.

**CHRONIC RENAL FAILURE**

Chronic renal failure is the progressive, long standing and irreversible impairment of renal functions. When some of the nephrons loose the function, the unaffected nephrons can compensate it. However, when more and more nephrons start losing the function over the months or years, the compensatory mechanism fails and chronic renal failure develops.

**CAUSES:**

1. Chronic nephritis

2. Polycystic kidney disease

3. Renal calculi (kidney stones)

4. Urethral constriction

5. Hypertension

6. Atherosclerosis

7. Tuberculosis

8. Slow poisoning by drugs or metals.

**FEATURES:**

1. Uremia Uremia is the condition characterized by excess accumulation of end products of protein metabolism such as urea, nitrogen and creatinine in blood. There is also accumulation of some toxic substances like organic acids and phenols. Uremia occurs because of the failureof kidney to excrete the metabolic end products and toxic substances. Common features of uremia i. Anorexia (loss of appetite) ii. Lethargy iii. Drowsiness iv. Nausea and vomiting v. Pigmentation of skin vi. Muscular twitching, tetany and convulsion vii. Confusion and mental deterioration viii. Coma.
2. Acidosis Uremia results in acidosis, which leads to coma and death.
3. Edema Failure of kidney to excrete sodium and electrolytes causes increase in extracellular fluid volume resulting in development of edema.
4. 4. Blood Loss Gastrointestinal bleeding accompanied by platelet dysfunction leads to heavy loss of blood.
5. 5. Anemia Since, erythropoietin is not secreted in the kidney during renal failure, the production of RBC decreases resulting in normocytic normochromic anemia.
6. 6. Hyperparathyroidism Secondary hyperparathyroidism is developed due to the deficiency of calcitriol (1,25­dihydroxycholecalciferol). It increases the removal of calcium from bones resulting in osteomalacia

**QUESTION 2)** With the aid of suitable diagrams discuss the types of dialysis

There are three different types of dialysis.

1. **Hemodialysis**: Hemodialysis is the most common type of dialysis. This process uses an artificial kidney (hemodialyzer) to remove waste and extra fluid from the blood. The blood is removed from the body and filtered through the artificial kidney. The filtered blood is then returned to the body with the help of a dialysis machine.

To get the blood to flow to the artificial kidney, your doctor will perform surgery to create an entrance point (vascular access) into your blood vessels. The three types of entrance points are:

* **Arteriovenous (AV) fistula**. This type connects an artery and a vein. It’s the preferred option.
* **AV graft.** This type is a looped tube.
* **Vascular access catheter.** This may be inserted into the large vein in your [neck](https://www.healthline.com/human-body-maps/internal-jugular-vein).

Both the AV fistula and AV graft are designed for long-term dialysis treatments. People who receive AV fistulas are healed and ready to begin hemodialysis two to three months after their surgery. People who receive AV grafts are ready in two to three weeks. Catheters are designed for short-term or temporary use.

Hemodialysis treatments usually last three to five hours and are performed three times per week. However, hemodialysis treatment can also be completed in shorter, more frequent sessions.

Most hemodialysis treatments are performed at a hospital, doctor’s office, or dialysis center. The length of treatment depends on your body size, the amount of waste in your body, and the current state of your health.

After you’ve been on hemodialysis for an extended period of time, your doctor may feel that you’re ready to give yourself dialysis treatments at home. This option is more common for people who need long-term treatment.

1. **Peritoneal dialysis**

Peritoneal dialysis involves surgery to implant a peritoneal dialysis (PD) catheter into your [abdomen](https://www.healthline.com/human-body-maps/abdomen). The catheter helps filter your blood through the peritoneum, a membrane in your abdomen. During treatment, a special fluid called dialysate flows into the peritoneum. The dialysate absorbs waste. Once the dialysate draws waste out of the bloodstream, it’s drained from your abdomen.

This process takes a few hours and needs to be repeated four to six times per day. However, the exchange of fluids can be performed while you’re sleeping or awake.

There are numerous different types of peritoneal dialysis. The main ones are:

* **Continuous ambulatory peritoneal dialysis (CAPD).** In CAPD, your abdomen is filled and drained multiple times each day. This method doesn’t require a machine and must be performed while awake.
* **Continuous cycling peritoneal dialysis (CCPD).**CCPD uses a machine to cycle the fluid in and out of your abdomen. It’s usually done at night while you sleep.
* **Intermittent peritoneal dialysis (IPD).** This treatment is usually performed in the hospital, though it may be performed at home. It uses the same machine as CCPD, but the process takes longer.

1. **Continuous renal replacement therapy (CRRT)**

This therapy is used primarily in the intensive care unit for people with [acute kidney failure](https://www.healthline.com/health/acute-kidney-failure). It’s also known as hemofiltration. A machine passes the blood through tubing. A filter then removes waste products and water. The blood is returned to the body, along with replacement fluid. This procedure is performed 12 to 24 hours a day, generally every day

