2 CHRONIC KIDNEY DISEASE

أسئلة نظام جديد

1. **Indications of renal replacement therapy in end-stage renal failure**

All must be persistent not responding to medical therapy

فاينال 57

① **Persistent signs of uremia**
- **Serositis Pericarditis (uremic pericarditis)**
- **Acid-base disturbances Metabolic acidosis (refractory to medical management)**
- **HYPERKALEMIA (severe or refractory)**
- **Pruritus**
- **Anorexia**
- **Uremic encephalopathy, asterixis, or seizures**

② **Persistent Inability to control volume status (fluid overload → pulmonary edema)**

③ **Persistent Inability to control blood pressure**

④ **Persistent Malnutrition not responsive to dietary interventions**

⑤ **Persistent Cognitive impairment**

2. **CKD CASE**

فاينال 58

- **What is the diagnosis?**
  - CKD
- **Why?:**
  - **Bilateral small kidney indicate chronic kidney disease**
  - **↑ S. creatinine - ↓ Hb - ↓ Ca - ↓ GFR**
- **Acid base status:**
  - Metabolic acidosis
- **MENTION Other causes of this acid base status.**

			A. HIGH Anion Gap Metabolic Acidosis	B. NORMAL Anion Gap Metabolic Acidosis
↑↑ Acids	↑↑ Production	Exogenous acids	1. Methanol, Ethylene glycol 2. Paraldehyde 3. NH_4Cl 4. Salicylates	---
		Endogenous acids	1. Lactic acidosis 2. Ketoacidosis (DKA & Starvation)	---

	⇊ Renal acid excretion	- Uremia (CKD)	1. Type 1 (Distal or Classic) RTA "Renal Tubular Acidosis" 2. Type 4 RTA
⇊ HCO_3^-	**Loss of bicarbonate**	---	1. **From kidney** ▪ Type 2 (Proximal) RTA 2. **From GIT:** ▪ Diarrhea ▪ Tube drainage ▪ Ureteral diversion (e.g, ileal loop)

◈ MENTION 4 lines of treatment of the case.

① Treatment of the cause e.g. DM

② **Supportive:**

- **Stop nephrotoxic medications and adjust dose**
- **For volume overload** Salt restriction & use diuretics
- **For hypernatremia:** NA restriction
- **For hyperkalemia:** k restriction & use kaliuretic diuretic
- **For metabolic acidosis:** NA bicarbonate
- **For bone Dx :**
  - Correction of hyperphosphatemia
  - Vit D & Ca supplementations
- **For hypertension:** ACEI & ARBs
- **TREAT Anemia**
- **For skin:** gabapentin
- **For blood sugar:** control it not to exceed 7 for HBA1C
- **Healthy diet – stop smoking – weight reduction**

③ **Renal replacement therapy**

④ **Kidney transplant (best & definitive)**

3. **Mr. M.R.T. is a 66-year-old male, who has had long-standing diabetes mellitus and hypertension. He presented with a several-week history of itching, persistent vomiting, anorexia, and dyspnea. His BP was 170/100 mmHg, respiratory rate 26 breaths/min, and temperature 36.8°C. Laboratory investigations showed proteinuria 2+, hematuria 1+, serum creatinine 12 mg/dl, serum bicarbonate 10 mmol/l, and serum potassium 6.9 mmol/L. Abdominal ultrasound revealed bilaterally small echogenic kidneys**

فاينال 59

- **What is the diagnosis of this patient?**
  - Chronic kidney disease due to DM & HTN
- **What is the most appropriate step for definitive treatment of the overall condition?**
  - Renal replacement therapy (dialysis)
- **Mention 2 other urgent lines for management of his serum potassium.**
  1. Ca gluconate (FIRST: you protect the HEART !!!!!)
  2. Correction of acidosis: IV NAHCO3
  3. K binders
  4. Glucose + insulin
  5. B2 agonist (salbutamol)

4. **A 58-year-old male presents to the nephrology clinic with complaints of fatigue, loss of appetite, and swelling in his legs for the past three months. He has a history of poorly controlled hypertension for 15 years and type 2 diabetes for 10 years. His blood pressure is 160/90 mmHg, body mass index is 32 kg/m2, and there is bilateral pitting edema. Serum creatinine is 4.2 mg/dL, eGFR is 20 mL/min/1.73 m2, serum sodium is 128 mEq/L, serum chloride is 100 mEq/L, and serum potassium is 6.5 mEq/L. Urine dipstick shows +3 proteinuria and no hematuria. His arterial blood gases: pH 7.28, bicarbonate 16 mEq/L, pCO2 32 mmHg.**

فاينال 60

- **What is his acid base disturbance?** See later
- **Calculate anion gap?** See later
- **What factors predict faster progression of chronic kidney disease in this patient**
  - Age → old
  - Gender → male
  - Hypertension
  - Diabetes
  - Obesity
  - Proteinuria
  - Hyperkalemia
  - ↑↑ed s. Creatinine
- **Management of hyperkalemia ?** See later

أسئلة نظام قديم

a) Mention 4 respiratory manifestations of chronic renal failure

Pulmonary Edema	From Fluid overload.
Pleurisy	
Pleural Effusion	From Fluid overload and inflammation.
Kussmaul Breathing (HYPERVENTILATION)	Respiratory compensation for metabolic acidosis.
Pneumonia/TB	

b) When dialysis is indicated for chronic renal failure, mention 3

All must be persistent not responding to medical therapy

① **Persistent signs of uremia**
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- Acid-base disturbances Metabolic acidosis (refractory to medical management)
- HYPERKALEMIA (severe or refractory)
- Pruritus
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② **Persistent Inability to control volume status (fluid overload → pulmonary edema)**

③ **Persistent Inability to control blood pressure**

④ **Persistent Malnutrition not responsive to dietary interventions**

⑤ **Persistent Cognitive impairment**

c) Mention 4 urgent indications for renal replacement therapy in patients with chronic kidney disease

◈ look before

d) Mention complications of chronic renal failure

① **Hypervolemia → Pulmonary Edema & Persistent Hypertension**

② **Bone Dx:**
- **Metabolism** (↑↑ P - ↓↓ Ca – Secondary & Tertiary Hyperparathyroidism)
- **Renal Osteodystrophy**
  - Osteofibrosis Cystica
  - Adynamic Bone Disease
  - Osteomalacia
  - Mixed

③ **Calcification Of Coronary Artery → ↑↑ Risk Of CVD**

④ **Heart:** (HTN – Left Ventricular Hypertrophy And Heart Failure – Arrythmia – Ischemic Heat Disease {Leading Cause Of Death} – Uremic Pericarditis)

⑤ **Anemia**

⑥ **Functional Thrombocytopenia → Bleeding**

⑦ **Skin:** (Pigmentation – Pallor – Pruritis)

⑧ **Respiratory:** (Pleurisy – Pulmonary Edema – Pneumonia)

⑨ **CNS:** (Uremic Encephalopathy – Asterixis – Neuropathy – Myopathy)

⑩ **Infection:** { 2nd Leading Cause Of Death}

⑪ **GIT:** (Uremic Odor – Glossitis – Gerd – Gastritis – Constipation)

⑫ **Malnutrition - Hyper Or Hypoglycemia**

⑬ **Acute On Top Of CKD (Look AKI)**

e) Mention two acute emergency of this patient (CKD due to hypertension) that need urgent interference?

① **Acute on top of chronic** → ↑↑ serum creatinine, urea, K
② **Pericarditis**
③ **Uremic encephalopathy** → Coma & convulsions
④ **Acute pulmonary edema**

f) What is the expected change in the following laboratory data in case of CKD?

a) Serum phosphorus
- ↑↑ed

b) Serum potassium
- Initially maintained then →
- ↑↑ed

c) Serum bicarbonate
- ↓↓ed

d) Serum calcium
- ↓↓ed

g) What is the cause of decreased level of s. calcium and Hb in CKD?

◈ **s. Calcium:**

① Phosphate retention
② ⇊ Active vit D → ⇊ intestinal Ca^{2+} absorption

◈ **Hb:**

① EPO deficiency Mainly
② Uremic toxins → BM suppression & ⇊ RBCs life span
③ Bleeding tendency → ⇊ iron stores
④ Folate or Vit B12 Deficiency.

h) Enumerate 4 skin manifestations of chronic kidney diseases

① **Pigmentations**
② **Pallor**
③ Uremic **pruritus**
④ **Bullous dermatoses**
⑤ **Calcific uremic arteriolopathy** (calciphylaxis)
⑥ **Nephrogenic systemic fibrosis** (formerly known as nephrogenic fibrosing dermopathy)

i) Mention 4 points in management of chronic kidney disease

① **Treatment of the cause e.g. DM**

② **Supportive:**

- **Stop nephrotoxic medications and adjust dose**
- **For volume overload** Salt restriction & use diuretics
- **For hypernatremia:** NA restriction
- **For hyperkalemia:** k restriction & use kaliuretic diuretic
- **For metabolic acidosis:** NA bicarbonate
- **For bone Dx :**
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- **For hypertension:** ACEI & ARBs
- **TREAT Anemia**

- For skin: gabapentin
- For blood sugar: control it not to exceed 7 for HBA1C
- Healthy diet – stop smoking – weight reduction

③ **Renal replacement therapy**

④ **Kidney transplant (best & definitive)**

j) How can you differentiate between acute and chronic kidney disease? Discuss 3 points

	AKI	CKD
History	**Short** (Hours - Days)	**Long** (Months years)
Renal size	◈ Prerenal → Normal. ◈ Intrinsic → May enlarges. ◈ Postrenal → Hydronephrosis.	Reduced
HB	**Usually, normal**	**Usually, Low**
Renal osteodystrophy	May be present	Present
Neuropathy	Absent	present
Serum creatinine	Acute reversible increase	Chronic irreversible

k) Mention 4 of the most important causes of end-stage renal disease

- ◈ Diabetes Mellitus (Diabetic Nephropathy)
- ◈ Hypertension (Hypertensive Nephrosclerosis)
- ◈ Glomerulonephritis
- ◈ Nephrotoxic drugs
- ◈ Autoimmune disease

◈ **Any AKI can progress to CKD**

All subjected to SCREENING

l) Define: CKD

◈ **Irreversible kidney dysfunction with…**

- eGFR < 15 mL/min/1.73 m²
- Manifestations of uremia requiring chronic renal replacement therapy

CRITERIA FOR CKD (one or more of the following present for ≥ 3 months)	
MARKERS OF KIDNEY DAMAGE	① **Lab abnormalities:** ▪ Albuminuria: AER ≥ 30 mg/24 h – ACR ≥ 30 mg/g ▪ Urinary sediment abnormalities. ▪ Electrolyte & other abnormalities due to tubular disorders. ② **Pathologic abnormalities.** ③ **Structural abnormalities detected by imaging.** ④ **History of kidney transplantation.**
MARKERS OF ⇊ FUNCTION	◈ ⇊ **GFR:** < 60 mL/min per 1.73 m² (i.e., GFR categories G3a–G5)

M) A 54-year-old male patient presents to emergency hospital with acute shortness of breath and orthopnea. He has a past medical history of hypertension 20 years ago. On examination, pulse is 100 b/m, blood pressure is 170/95 mmHg, RR is 20/min. His lab shows Hb of 6.5 gm%, MCV is 88, serum Na 143 mmol/L, serum K of 7.1 mmol/L, serum creatinine of 10.7 mg/dl, serum Ca of 7.7 mg/dl and serum phosphorus of 6.5 mg/dl. His renal ultrasound shows bilateral small echogenic kidneys.

A- What is the diagnosis of the case:

- Chronic kidney disease due to hypertension
- complicated by non cardiogenic pulmonary edema

B- Mention two acute emergency of this patient that need urgent interference:

1- High serum creatinine, urea & K
2- Pericarditis
3- Uremic encephalopathy
4- Acute pulmonary edema

C- Mention 4 differences between patients with acute and chronic renal failure

	AKI	CKD
History	**Short** (Hours - Days)	**Long** (Months years)
Renal size	◈ Prerenal → Normal. ◈ Intrinsic → May enlarges. ◈ Postrenal → Hydronephrosis	Reduced
HB	**Usually, normal**	**Usually, Low**
Renal osteodystrophy	May be present	Present
Serum creatinine	Acute reversible increase	Chronic irreversible

D- Mention 4 points in management of this patient

1- Correction of serum K → refer to k Dx
2- Correction of anemia
3- Correction of hypertension → ACEIs
4- Management of pulmonary edema → by dialysis or Lasix

N) A 52-year-old farmer has a long history of urinary troubles. He was told to have prostatic problem. He presents with fatigue, anorexia, nausea and dyspnea. Investigations reveal chronic renal failure and he is advised to start on regular hemodialysis.

1- Mention 4 clinical signs that could suggest renal disease during clinical examination:

- Ammonia smell – hiccough – nausea & vomiting
- Pitting edema - Pallor – pigmentation
- Purpura – pruritus – urea frost - ↑↑ Blood pressure

2- Name 4 investigations that should be ordered in this patient to evaluate his condition

- Serum K and other electrolytes
- Serum creatinine & BUN
- eGFR
- ABG
- Urine analysis
  - Albumin
  - Urine dipstick
- Renal US

3- Evaluate the role of renal ultrasound in diagnosis of kidney disease

FINDING SUGGESTING CHRONIC KIDNEY DAMAGE	① ⇊ Kidney length (< 9 cm) ② ⇊ Parenchymal thickness (< 1 cm) and/or cortical thickness ③ ⇈ Cortical echogenicity ④ Multiple cysts ⑤ Calcifications ⑥ Renal scaring
FINDING SUGGESTING SPECIFIC ETIOLOGIES	① Ureteral or renal pelvic dilation suggests **obstructive nephropathy.** ② Bilaterally enlarged kidneys with multiple cysts suggest **polycystic kidney disease.**

O) A 62-year-old man presents to the ER with myoclonic convulsions. The attending doctor notices increasing breath odor. His skin is pale and earthy looking and blood pressure is 180/110 mmHg. Investigations revealed serum creatinine of 9.7 mg/dl and hemoglobin of 6.0 gm/dl. Abdominal US shows both kidneys measuring 7 cm × 3 cm in longitudinal and transverse axis respectively.

1- What is the most likely renal diagnosis?

- Chronic renal failure

2- From the above scenario, how can you differentiate between acute and chronic renal failure?

- By size of kidney on US: Small size → CKD
- Pale skin and earthy look indicate chronic

3- Mention 4 important complications of this condition:

- look before

4- What is the expected change in the following laboratory data?

a) Serum phosphorus
- ↑↑ed

b) Serum potassium
- Initially maintained then →
- ↑↑ed

c) Serum bicarbonate
- ↓↓ed

d) Serum calcium
- ↓↓ed

أسئلة اخرى

P) Albuminuria categories in CKD

Category	AER (mg/24 hours)	ACR (mg/mmol)	ACR (mg/g)	Terms
A1	30	3	30	- Normal to mildly increased
A2	30-300	3-30	30-300	- Moderately increased
A3	300	30	300	- Severely increased

C- Mention 4 important complications of this condition:

◈ look before

D- What is the expected change in the following laboratory data?

1. **Serum phosphorus**
   ↳ ↑↑ed
2. **Serum potassium**
   ↳ Initially maintained then →
   ↳ ↑↑ed
3. **Serum bicarbonate**
   ↳ ↓↓ed
4. **Serum calcium**
   ↳ ↓↓ed

أسئلة اخرى

1. Discuss Albuminuria categories in CKD

Category	AER	ACR		Terms
	(mg/24 hours)	*(mg/mmol)*	*(mg/g)*	
A1	30	3	30	- Normal to mildly increased
A2	30-300	3-30	30-300	- Moderately increased
A3	300	30	300	- Severely increased

2. List the markers of kidney damage used to define CKD?

1. **Albuminuria** (AER ≥ 30 mg/24 h; ACR ≥ 30 mg/g [≥ 3 mg/mmol]).
2. **Urine sediment** abnormalities.
3. **Electrolyte** and other abnormalities caused by **tubular disorders.**
4. Abnormalities detected through **histology.**
5. **Structural abnormalities** detected through **imaging** (e.g., shape, size, symmetry, or evidence of obstruction).
6. History of **kidney transplantation.**

3. Identify the high-risk groups that should be screened for CKD?

1. **Elderly** individuals.
2. Patients with **hypertension** or **diabetes mellitus.**
3. Individuals with **atherosclerotic cardiovascular disease** or heart failure.
4. Those with **urologic disease,** stone disease, or recurrent urinary infections.
5. Patients with **systemic autoimmune conditions.**
6. Individuals exposed to **nephrotoxic drugs.**
7. People with a **family history of CKD.**
8. **Obese** individuals, **smokers,** and patients with a history of **Acute Kidney Injury (AKI).**

4. Classify Chronic Kidney Disease (CKD) based on GFR categories?

GFR Category	GFR Range (mL/min/1.73 m^2)	GFR Description
G1	≥ 90	Normal or high
G2	60-89	Mildly decreased
G3a	45-59	Mildly to moderately decreased
G3b	30-44	Moderately to severely decreased
G4	15-29	Severely decreased
G5	< 15	Kidney failure

5. List the most common causes of Chronic Kidney Disease (CKD)?

1. **Diabetes mellitus** (the most common cause worldwide).
2. **Hypertension** (the second most common cause).
3. Primary and secondary **glomerular diseases.**
4. **Polycystic kidney disease** and other hereditary nephropathies.
5. **Obstructive uropathy.**
6. **Chronic interstitial nephritis.**
7. **Chronic infections** such as HIV, Hepatitis B, or Hepatitis C.
8. **Renovascular disease.**

6. List the general and skin manifestations of advanced Chronic Kidney Disease (CKD)?

- **General symptoms:**
  1. **Salt and water retention** (edema, pulmonary edema).
  2. **Lethargy and tiredness** related to renal anemia.
  3. **Generalized aches and pains** due to mineral bone disease.
- **Skin manifestations:**
  1. **Pruritus** (itching).
  2. **Skin pigmentation** (melanin and urochrome deposition).
  3. **Easy bruising** due to platelet dysfunction.
  4. **Uremic "frost"** (urea and urate deposits on the skin).

7. Describe the pattern of dyslipidemia found in Chronic Kidney Disease (CKD)?

1. **Triglycerides:** Increased levels due to impaired clearance of VLDL and chylomicrons.
2. **High-density lipoprotein (HDL):** Decreased concentrations and loss of anti-atherogenic properties.
3. **Low-density lipoprotein (LDL):** Levels may be normal or mildly increased, but particles are typically **small and dense** (more atherogenic).

8. List the strategies for delaying or halting the progression of CKD?

- **Aggressive blood pressure control** (Target <140/90 mmHg for non-proteinuric; <130/80 mmHg for proteinuric).
- **Aggressive glycemic control** (Target HbA1C < 7%).
- Treatment of **hyperlipidemia**.
- Use of **ACE inhibitors (ACEIs) or ARBs** in patients with proteinuria.
- Avoidance of **nephrotoxins** (NSAIDs, radiocontrast media, aminoglycosides).
- **Smoking cessation**.

9. Identify the absolute and relative contraindications for dialysis?

- **Absolute contraindications:**
  1) Patient's refusal of dialysis.
  2) No possible vascular access.
- **Relative contraindications:**
  1) Difficult vascular access.
  2) Needle phobia.
  3) Advanced cardiac failure.
  4) Coagulopathy.