CHAPTER

8

Endocrinology

Competencies covered:

PY 8.1: Describe the physiology of bone and calcium metabolism

PY 8.2: Describe the synthesis, secretion, transport, physiological actions, regulation and effect of altered (hypo and hyper) secretion of pituitary gland, thyroid gland, parathyroid gland, adrenal gland, pancreas and hypothalamus

PY 8.3: Describe the physiology of thymus and pineal gland

PY 8.4: Describe function tests: Thyroid gland; Adrenal cortex; Adrenal medulla and pancreas

PY 8.5: Describe the metabolic and endocrine consequences of obesity and metabolic syndrome, stress response. Outline the psychiatry component pertaining to metabolic syndrome.

Case 1

21-year-old medical student complained of severe pain in right flank which was radiating to groin. It was unbearable. So he went to his professor immediately. He told him to get admitted, meanwhile he had hematuria. Professor suspected of renal/ureteric calculus. So he gave him painkiller and told him to drink lot of water.

On investigations, serum Ca^{++} levels were elevated while serum phosphate was low.

1. What could be the cause of this condition?
2. What are the different forms in which Ca^{++} is stored in body?
3. What is normal serum Ca^{++} level?

4. Describe the hormonal regulation of serum Ca^{++}.
5. Explain role of Ca^{++} in body.

Case 2

After thyroidectomy, young baby developed carpopedal spasm and twitching of facial muscles. Later on he developed laryngeal stridor.

1. What is the name of this condition?
2. What is the cause of this condition?
3. What is the physiological basis of signs and symptoms?
4. What is the line of treatment?

Case 3

A 24-year-old male visited to OPD with complaints of increasing in foot size as he changed his shoe size twice since past 6 months. He also noticed his hands and jaw growing out of proportion.

On investigations, his random blood glucose level was 160 mg/dl

1. What is his condition?
2. What must be the causative factor?
3. Why the blood glucose level was higher in this case?
4. Describe the pathophysiology of the same?

Case 4

In a school visit it was noted that a 13-year-old boy was having a height twice as compared to his batch mates. On further enquiring with the student, he said he is having diabetes mellitus as well. He said he is having some endocrine problem for which he is taking treatment.

1. What must be the endocrine problem?
2. Describe the physiological actions of growth hormone.

3. Explain regulation of growth hormone.
4. What is dwarfism?
5. What are the various causes of dwarfism?

Case 5

A 25-year-old boy visited OPD with complaints of lethargy and cold intolerance. He gave history of weight gain from 45 to 60 kg in 2 months. He lost his sexual functions. He also gave history of headache and visual disturbances.

On investigations, CT scan of brain showed an abnormal mass in sella turcica, certain hormone levels were also impaired.

1. What could be the condition?
2. What type of hormonal imbalance must have been noted from the reports?
3. What are the hormones secreted by anterior and posterior pituitary gland?

Case 6

50-year-old lady came to OPD with complaints of swelling in the neck and observed little protrusion of eyes. She also complained of tremors in the hand.

On examination, her pulse rate at rest was 100/minute. She was restless. Fine hand tremors in hands were present.

1. What is the probable diagnosis?
2. How to confirm it?
3. What is the physiological basis of her signs and symptoms?
4. Explain the physiological effects of hormone involved in above condition.

Case 7

18-month-old boy was brought to OPD by mother for delayed milestones, drooling of saliva from mouth and rounded appearance of face and abdomen.

On examination, child had pot belly, moon face and poor muscular strength and coordination.

1. What is the probable cause?
2. What is physiological basis of his symptoms?
3. What is the role of hormone deficiency in above condition?

Case 8

A 40-year-old lady brought by her husband with complaints of excessive weight gain and tiredness since 3 months. Lady complained of loss of appetite.

On examination, pulse rate was 52/minute, respiratory rate was 20/minute. Her weight was 90 kg. Generalised non-pitting, oedema was present.

1. What is the probable diagnosis?
2. What is oedema?
3. Why oedema was non-pitting?
4. What investigations will be advised to her?
5. What is physiological basis of the treatment?

Case 9

50-year-old male noticed tanning of skin and pigmentation over extremities. He also noticed hair loss from axillary and pubic areas. He lost 5 kg in 1 month.

On examination, his pulse was 92/minute and BP was 90/56 mm Hg.

Physician advised him a battery of a few laboratory tests.

On investigations, Blood glucose level was 60 mg/dl

Serum Na^+: 128 mEq/L

Serum K^+: 5.2 mEq/L

1. What is the probable diagnosis?
2. Explain the physiological mechanism of the condition.

3. Why blood glucose level was low?
4. Why there was hyperkalaemia and hyponatraemia?
5. Why there is pigmentation?

Case 10

A 5-year-old boy brought by mother to paediatrician with complaints of moon face, weight gain, irritability, insomnia and excessive hunger. She also gave history that boy is taking steroids for nephrotic syndrome since 2 years.

On examination, his BP was 130/86 mm Hg.

On investigations, his thyroid hormone levels were normal.

1. Diagnose the condition.
2. What is the cause behind it?
3. What are the other manifestations of the condition?
4. What are the physiological actions of steroids?

Case 11

A 42-year-old female referred to medicine department for persistent hypertension in spite of antihypertensive medications since 1 year. She is also complaining of weakness, muscle pain, paraesthesia.

On investigations, her serum sodium level was 160 mEq/L, serum potassium level was 2 mEq/L. Blood aldosterone/Renin ratio was high.

1. Diagnose the condition.
2. What is the mechanism of action of aldosterone?
3. Describe physiological actions of aldosterone.

Case 12

50-year-old male attended medicine OPD with non-healing ulcer on right foot. He gave history of excessive urge for urination especially at night. He had increased appetite and thirst.

On investigations, fasting plasma glucose was 240 mg/dl.

Urine glucose was positive.

1. What is normal fasting blood glucose level?
2. Why his ulcer was non-healing?
3. Why his urine was positive for glucose?
4. Why there was excessive frequency of urination at night?
5. Why there was increased appetite and thirst?
6. Describe the physiological actions of insulin?

Case 13

A 55-year-old Salma brought to casualty in an unconscious state by her son. Her breathing rate was high (26/minute) and her breath smelled sweet. Son gave history of increased appetite since many months.

On investigations, her random blood glucose level was 360 mg/dl

Blood pH was 7.3.

1. What are normal fasting and postprandial blood glucose levels?
2. What is probable diagnosis?
3. What is physiological basis of polyphagia and polyuria?
4. Why there was increase in respiratory rate?
5. How the blood glucose level is regulated after food and in between meals?

Case 14

50-year-old lady came to OPD with complaints of increased thirst and water intake. Urine output was also increased to a great extent. Physician advised renal function tests and serum electrolyte.

On investigations, serum Na^+ was 152 mEq/L

Urine osmolarity was 130 mOsm/kg

1. Which are the hormones involved in regulation of water loss from kidneys?
2. How these hormones are regulated?
3. What is free water clearance?
4. Why serum Na^+ was increased?
5. Why urine osmolarity was decreased?

Case 15

Daniel, a 44-year-old patient, was admitted in hospital for the treatment of severe pneumonia. On third day of admission he developed nausea, confusion along with fatigue and generalised weakness.

On investigations, his serum Na^+ level was 130 mmol/L.

Plasma osmolarity was 260 mOsm/kg.

Serum thyroid and cortisol levels were normal.

Urine osmolarity was raised with high Na^+ concentration.

1. What is the probable condition?
2. Which hormone is responsible for the same?
3. Explain the physiological basis of alteration in plasma and urine osmolarity?
4. Describe the normal physiological actions of the hormone responsible.

Case 16

Ritesh had flown from America to India, to meet his family members. Initial 2 days after travelling he was not able to sleep properly at night. But he felt drowsy during daytime. He attributed this to jet lag.

1. What is jet lag?
2. What do you understand by circadian rhythm?
3. What is the role of thymus in regulation of circadian rhythm?

Case 17

We sleep in the night and wake-up in the morning.

1. What is the mechanism behind this called?
2. What is the pathway for the same?
3. Which physiological functions are regulated by this phenomenon?
4. What are zeitgebers?

Case 18

10-year-old boy brought by his mother to medicine OPD for steadily gain in weight. And day by day he is becoming lazy. Mother was worried about his obesity.

1. What is obesity?
2. What are the types of obesity?
3. What are the causes of obesity?
4. What are the consequences of obesity?
5. What is hunger and appetite?
6. What is role of hypothalamus in regulation of food intake?
7. What are the other central and peripheral areas involved in regulation of food intake?
8. What is leptin and discuss its role in obesity?
9. Which are the other hormones involved in obesity?
10. What is the physiological basis for the management of obesity?

ENDOCRINOLOGY

Answer keys

1. **Hyperparathyroidism**
2. **Tetany**
3. **Acromegaly**

4. **Gigantism**
5. **Panhypopituitarism**
6. **Thyrotoxicosis**
7. **Cretinism**
8. **Hypothyroidism**
9. **Addison's disease**
10. **Cushing's syndrome**
11. **Conn's syndrome/hyperaldosteronism.**
12. **Diabetes mellitus**
13. **Diabetic coma**
14. **Diabetes Insipidus**
15. **Syndrome of inappropriate ADH secretion**
16. **Circadian rhythm: Jet lag**
17. **Circadian rhythm**
18. **Metabolic and endocrine consequences of obesity/ Regulation of food intake**