ENDOCRINE DISORDERS

Objectives

- To know the ENDOCRINE DISORDERS
- To know the ACTIONS OF HORMONES

ENDOCRINE SYSTEM

1- Hypothalamus .
2- Pituitary gland .
3- Thyroid gland .
4- Parathyroid glands .
5- Adrenal (supra-renal) glands .
6- The pancreas .
7- The gonads :-
   - male gonads _ testes .
   - female gonads _ ovaries .

FUNCTIONS OF ENDOCRINE SYSTEM

A- hypothalamus

1. secrete of releasing hormones for the anterior lobe of pituitary gland hormones .
2. synthesis of the hormones that are secreted by the posterior lobe of pituitary gland .

B- pituitary gland

1. anterior lobe hormones
   - growth hormone _ GH
   - prolactin _ PRL
   - thyroid-stimulating hormone _ TSH
   - adreno-corticotrophic hormone _ ACTH
   - luteinizing hormone _ LH
   - follicle-stimulating hormone _ FSH

2. posterior lobe hormones
- anti-diuretic hormone _ ADH
- oxytocin

C- thyroid gland
1. thyroxine _ T4
2. triiodothyronine _ T3

D- parathyroid glands
- parathyroid hormones _ PTH

E- adrenal glands
1. adrenal cortex hormones
- cortisol
- aldosterone
- testosterone
- estradiol

2. adrenal medulla hormones

- dopamine
- norepinephrine
- epinephrine

F- the pancreas

1. Alfa cells _ glucagon
2. Beta cells _ insulin

G- the gonads

1. testes _ testosterone
2. ovaries _ estrogen

ACTIONS OF HORMONES

*Pituitary hormones

1- anterior lobe

- GH _ growth of body tissues
- PRL _ formation of milk in breast glands
- TSH _ production of thyroid hormones
- ACTH _ production of adrenal cortex hormones
- LH and FSH _ affect on gonads

A- on testes _ 1. sperm formation

2. production of testosterone

B- on ovaries _ 1. follicular stimulation

2. production of estrogen

2- posterior lobe

- ADH _ reduce renal tubular loss of water
- Oxytocin _ expulsion of milk from the breast

*Thyroid hormones

- increase oxygen consumption .
- stimulate protein synthesis .
- affect the growth in general .
- affect carbohydrates , lipid and vitamin metabolism

*Parathyroid hormones

- PTH _ regulate the serum level of calcium and phosphorous by acting on gut , renal tubules and bone .

*Adrenal hormones

1. adrenal cortex hormones

- cortisol _ metabolic , immunologic , renal effects and affect on growth .
- aldosterone _ affects on the collecting tubules of kidney and regulate water and electrolytes excretion .
- androgens _ sex characters .

2. adrenal medulla hormones actions

a. Increase the blood pressure .

b. Increase the cardiac output .

c. hyperglycemia .

*The pancreatic hormones

- insulin _ anabolic hormone
- glucagon _ catabolic hormone

*The gonadal hormones

- secondary sexual characters

CLINICAL FEATURES

1- short stature or tall stature .

2- precocious puberty .

3- delayed sexual maturation .

4- sleep disturbance .

5- obesity .

6- polyuria and polydepsia .

7- seizures and behavioral changes .

8- metabolic disorders _ hypoglycemia .

9- electrolytes disorders _ hyperkalemia .

1o- change of vital signs _ hypertension .

HYPOTHYROIDISM

A- Congenital hypothyroidism

*Causes

1. defect in thyroid hormone synthesis .
2. iodine deficiency (endemic) .
3. maternal causes :
   - maternal antibodies .
   - maternal medications _ iodides .
4. congenital defect of fetal thyroid development .

*Clinical features

1- it is twice common in girls than boys .

2- prolonged physiological jaundice .

3- feeding difficulties .

4- slow action and prolonged sleeping .

5- frequent choking .

6- constipation .

7- large head and anterior fontanels .

8- slow pulse ,low temperature and dry skin .

9- anemia .

*Diagnosis

1. clinical features .
2. low T4 .
3. high TSH .
4. X-ray of limb .

*Treatment

Thyroxine given orally is the treatment of choice .

a- neonate _ 10-15 Mg/kg/day .

b- child _ 4 Mg/kg/day .

c- adult _ 2 Mg/kg/day .

B- Acquired hypothyroidism

*Causes

1. autoimmune .
2. surgical removal of thyroid .
3. radiation of neck .
4. drugs _ iodide .
5. systemic diseases .

*Clinical features

a- decreasing growth .

b- dry skin and prolonged sleeping .

c- cold intolerance and constipation .

d- no change in school works .

PRECOCIOUS PUBERTY

* Facts of puberty

1- puberty in girls usually occur earlier than boys .

2- puberty begins with breast development in girls and testicular enlargement in boys .

3- in girls puberty usually starts at 10 – 11yr. while in boys it delayed slightly .

4- in girls the sequences of puberty start from breast changes _ increase linear height then menarche .

5- in boys start by testicular and scrotal changes then growth acceleration .

6- growth in girls stopped at 14 yr.,in boys at 18 yr.

* Definition

precocious puberty(early puberty) defined as occurrence of secondary sexual characters before 8 yrs. In girls and 9 yrs. In boys .

- it is common in girls than in boys .
- when occurs in boys it usually pathological .

* Causes

1. CNS . tumors .
2. hydrocephalus .
3. post - CNS . infections .
4. hypothyroidism .
5. adrenal gland tumors .

* Diagnosis

a- assess growth measurements .

b- assess pubertal staging .

c- examine the thyroid or adrenal glands .

d- careful examination of CNS .

DIABETES MELLITUS

- Diabetes mellitus(DM) is the commonest endocrine disorder in children ,it is chronic metabolic disease characterized by hyperglycemia .
- Divided into :-

1. type 1 DM , it is most common endocrine - metabolic syndrome of childhood and adolescence due to insulin deficiency caused by pancreatic B- cell damage .
2. type 2 DM , it is a consequence of insulin resist . at the level of skeletal muscle, liver and fatty tissues with some degrees of B-cell defects .

Causes of DM

A- genetic susceptibility .

B- environmental factors :-

1. viral infections _ rubella , mumps .
2. seasonal factors _ autumn and winter .
3. dietary factors _ cow's milk .
4. chemicals _ pentamidine .
5. associated autoimmune disease _ celiac disease , thyroiditis , Addison disease

Factors that can reduce the incidence of DM . ;-

1. vitamin D .
2. breast feeding .

Clinical features

1- polyuria .
2- nocturia or nocturnal enuresis .
3- polydipsia .
4- hyperphagia .
5- weight loss .
6- in female child develops monilial vaginitis .
7- features of diabetic ketoacidosis (DKA) :-
   - abdominal pain . - vomiting .
   - rapid breathing . - acetone smell .
   - signs of dehydration .
   - impaired level of consciousness .

Diagnosis

1- clinical features .

2- fasting bl. sugar > 7 mmol/L (> 126 mg%) .

3- postprandial bl. sugar > 11.1 mmol/L (> 200mg%)

4- other investigations :-

- urine for sugar and ketones .
- blood for ketone bodies .
- serum electrolytes .
- PH and blood gas analysis .

* DKA occurs in 20-40% of new onset DM .

* 85% of children with new onset DM have no family history of disease .

Treatment

A. New onset DM without DKA

1. insulin therapy
   - prepuberty _ 0.5 IU/kg/day .
   - midpuberty _ 0.7 IU/kg/day .
   - late of puberty _ 1 IU/kg/day .
2. diet of the child with DM .
3. exercise .

Principles of insulin therapy

1- insulin usually given premeal .

2- given in 2 – 3 doses not one dose .

3- using the short-acting and long-acting insulin .

4- should be stored in cold area ,but not freezed .

5- routs of given insulin :-

- subcutaneous (multiple injections)
- insulin pump therapy .
- inhaled and oral insulin (in adults) .

B. Child with DKA

1- treated as emergency case in ED or ICU .

2- correction of dehydration by IV. Fluid

- start by normal saline or ringer lactate .
- if the patient passed urine add potassium .
- the fluid should be given slowly .
- put mannitol at bed side for treating brain edema

3- given insulin IV.

0.1 IU/kg/hr . as insulin drip .

4- when bl. sugar becomes < 250 mg%

fluid change to glucose saline .

5- if the condition stabled start oral intake + insulin subcutaneously .

* General principles in treating diabetic child

A- nutritional management :-

- carbohydrates 50_55% usually complex(starch) .
- fat about 30% .
- protein about 15% .
- increase fibers intake .
- decrease the intake of refined sugars like sucrose and carbonated (soda) liquids .
- the amount and type of diet depends on : age , sex , activity and body weight .
- diabetic child need frequent snacks in between the meals .

B- monitoring bl. sugar

- self monitoring by glucometer .
- continuous glucose monitoring by subcutaneous sensor every 5 minutes .
- from glycosylated hemoglobin .
- glucowatch .

C- exercise of diabetic child

- regular exercise is needed .
- exercise can improve glucose regulation .
- exercise increase insulin receptors in tissues .
- also enhanced the insulin absorption from inject. site so can induced hypoglycemia .

D- education

1- how to give the insulin .
2- monitoring bl. sugar at home .
3- not forget any meal or snack .
4- complications of DM as hypoglycemia .
5- educate the family to encourage the child not fear from injection or stop treatment .
6- the child needs food for growth ,so there's no any type of diet never been given to diabetic child except ,the refined sugars .
7- encourage the child to do regular exercise .

*Complications of DM

A- acute complications

1. DKA
2. hypoglycemia .

B- long term complications

1. diabetic retinopathy .
2. diabetic nephropathy .
3. diabetic neuropathy .
4. coronary heart diseases .
5. cerebrovascular diseases .

Hypoglycemia

- Infants and toddlers are more susceptible .
- The most common causes :
  1- heavy exercise .
  2- given large dose of insulin .
  3- delayed meals or snacks .

- Clinical features of hypoglycemia

a. pallor ,sweating and tachycardia .
b. irritability and drowsiness .
c. seizures and coma .

- Treatment of hypoglycemia

1. Should be in the emergency room .
2. Given glucose water 5% or 10% .
3. Can use hypertonic 4 – 8 mg/kg/hr with gradual increasing the dose .
4. Can use glucagon 0.5 mg IM .
5. In simple cases of hypoglycemia can give the child glucose as juice or candy .

- Complications

a. Permanent brain damage .
b. Seizures . c. death .

Questions

- What are the functions of Endocrine system?
- What are the actions of pituitary hormones?
- What are the actions of thyroid hormones?
- What are the actions of parathyroid hormones?
- What are the actions of adrenal hormones?
- What are the actions of pancreatic hormones?
- What are the Gondola hormone?
- What are the causes of congenital hypothyroidism? And what are the treatment of it?

- What are the causes of Acquired hypothyroidism?
- And what are the clinical features of it?
- Definition of precocious puberty?
- What are the causes of precocious puberty?
- What are the causes of Diabetic mellitus?
- What are the clinical features of D.M?
- What are the treatment of D.M?
- What are the principles of insulin therapy?
- What are the general principles in treating diabetic child?

- What are the complication of D.M?
- What are the causes and clinical features of hypoglycemia?
- What are the treatment of hypoglycemia”?
- What are the complication of hypoglycemia?