Paediatric Gastroenterology

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Paediatric Gastroenterology

- Deals with:
  - Gastrointestinal diseases
  - Liver disorders
  - Pancreas disorders
  - Nutritional problems

Chief Complaints in Paediatric Gastroenterology

- Abdominal pain
- Diarrhea and malabsorption
- Constipation and encopresis
- Vomiting
- Gastrointestinal hemorrhage
- Jaundice

Diagnostic Methods

- Careful history taking
- Detailed physical examination
- Blood, urine and stool tests
- Imaging techniques:
  - Abdominal ultrasound
  - Computed Tomography (CT)
  - Magnetic Resonance Imaging (MRI)
  - Endoscopies
- pH-metries and Multichannel Impedance with pH-metry (MII-pH)
- Liver biopsies

Abdominal Pain

- Abdominal pain can be divided into:
  - Acute
  - Chronic

Acute Abdominal Pain

- Can originate from:
  - Abdominal causes
  - Extra-abdominal causes

Abdominal Causes of Acute Abdominal Pain

Acute abdomen – surgical intervention is often required:

- Inflammatory:
  - Acute appendicitis
  - Peritonitis:
    - Diffuse
    - Localized
- Non-inflammatory:
  - Intussusception
  - Volvulus
  - Incarcerated hernia
  - (Sub)ileus
  - Trauma
  - Bleeding from the GIT

Abdominal Causes of Acute Abdominal Pain

Usually do not require surgical intervention

- Acute gastroenteritis
- Mesenteric adenitis
- Infantile colic
- Constipation
- Gastrointestinal ulcer disease
- Pancreatitis
- Cholecystits, cholangitis
- Urinary tract infections (UTI)
- Nephrotic syndrome
- Kidney stones
- Hepatitis
- Dysmenorrhoea
- Ectopic pregnancy
- Ovarial cysts
- Intoxication

Extra-abdominal Causes of Acute Abdominal Pain

- Febrile illness
- ENT diseases
- Upper respiratory tract infections
- Lower lobar pneumonia
- Abdominal migraine
- Diabetic ketoacidosis
- Sickle cell anemia
- Henoch-Schönlein purpura (HSP)

Chronic Abdominal Pain

- 3 or more episodes of recurrent abdominal pain that affect the child's life quality
- Affects 10 – 15% of children aged 5 – 15 years!
- Usually begins between 5 – 8 years
- A female predominance
- A large group without a proven organic cause = functional abdominal pain

Organic Causes of Chronic Abdominal Pain

- Lactose intolerance
- Gastroesophageal reflux disease (GERD)
- Oesophagitis
- Coeliac disease
- Ingestion of indigestible carbohydrates
- Malrotation
- Abdominal tumors
- Gastroduodenal ulcers
- Parasitic infections
- Sickle cell anemia
- Constipation
- Hereditary angioedema
- Systemic lupus erythematosus

Functional Abdominal Pain

- Functional dyspepsia
- Functional abdominal pain
- Irritable bowel disease (IBS)
- Abdominal migraine

Diarrhoea

- Diarrhoea can be divided into:
  - Acute
  - Chronic

Differential Diagnosis of Acute Diarrhoea in Infants

Common

- Gastroenteritis
- Systemic infections
- Antibiotic associated

Uncommon

- Primary disaccharidase deficiency
- Hirschsprung toxic colitis
- Adrenogenital syndrome

Differential Diagnosis of Acute Diarrhoea in Schoolchildren

Common

- Gastroenteritis
- Food poisoning
- Systemic infection
- Antibiotic associated

Uncommon

- Toxic ingestion

Differential Diagnosis of Acute Diarrhoea in Adolescents

Common

- Gastroenteritis
- Food poisoning
- Antibiotic associated

Uncommon

- Hyperthyroidism

Differential Diagnosis of Chronic Diarrhoea in Infants

Common

- Post-infectious secondary lactase deficiency
- Cow's milk/soy protein intolerance
- Chronic nonspecific diarrhea of infancy
- Coeliac disease
- Cystic fibrosis
- AIDS enteropathy

Uncommon

- Primary immune defects
- Familial villous atrophy
- Secretory tumors
- Congenital chloridorrhoea
- Acrodermatitis enteropathica
- Lymphangiectasia
- Abetalipoproteinemia
- Eosinophilic gastroenteritis
- Short bowel syndrome
- Intractable diarrhoea syndrome
- Autoimmune enteropathy
- Facticious

Differential Diagnosis of Chronic Diarrhoea in Schoolchildren

Common

- Post-infectious secondary lactase deficiency
- Irritable bowel syndrome
- Coeliac disease
- Lactose intolerance
- Giardiasis
- Inflammatory bowel disease (IBD)

Uncommon

- AIDS enteropathy
- Acquired immune defects
- Secretory tumors
- Pseudoobstruction
- Factitious

Differential Diagnosis of Chronic Diarrhoea in Adolescents

Common

- Irritable bowel syndrome
- Inflammatory bowel disease (IBD)
- Lactose intolerance
- Giardiasis
- Laxative abuse
- AIDS enteropathy

Uncommon

- Secretory tumors
- Primary bowel tumor
- Gay bowel disease

Malabsorption Syndromes

- Reduced digestion
- Reduced absorption
- Lymphatic obstruction
- Others
- Infestations

Malabsorption Syndromes Reduced Ingestion

- Pancreatic exocrine deficiency:
  - Cystic fibrosis, pancreatitis, Schwachman syndrome, Pearson syndrome
- Bile salt deficiency:
  - Cholestasis, biliary atresia, hepatitis, cirrhosis, bacterial deconjugation
- Enzyme defects:
  - Lactase, sucrase, enterokinase, lipase deficiencies

Malabsorption Syndromes Reduced Absorption

- Primary absorption defects:
  - Glucose-galactose malabsorption, abetalipoporteinemia, cystinuria, Hartnup disease
- Decreased mucosal surface area:
  - Crohn’s disease, malnutrition, short bowel syndrome, anti-metabolite chemotherapy, familial villous atrophy
- Small intestine disease:
  - Celiac disease, tropical sprue, giardiasis, immune-allergic enteritis, Crohn disease, lymphoma, AIDS

Malabsorption Syndromes
Lymphatic Obstruction

- Lymphangiectasia
- Whipple disease
- Lymphoma
- Chylous ascites

Malabsorption Syndromes Others

- Drugs:
  - Antibiotics, anti-metabolites, neomycin, laxatives
- Collagen vascular:
  - Scleroderma

Malabsorption Syndromes Infestations

- Hookworms
- Tapeworm
- Giardiasis
- Immune defects

Coeliac Disease

- Most common primary malabsorption cause in children
- Coeliac disease is an immune mediated systemic disorder elicited by gluten and related prolamines in genetically susceptible individuals
- Prevalence of 1 : 100 people

Coeliac Disease

- Gluten is contained in:
  - Wheat
  - Rye
  - Barley
  - Oats

Clinical Manifestations of Coeliac Disease

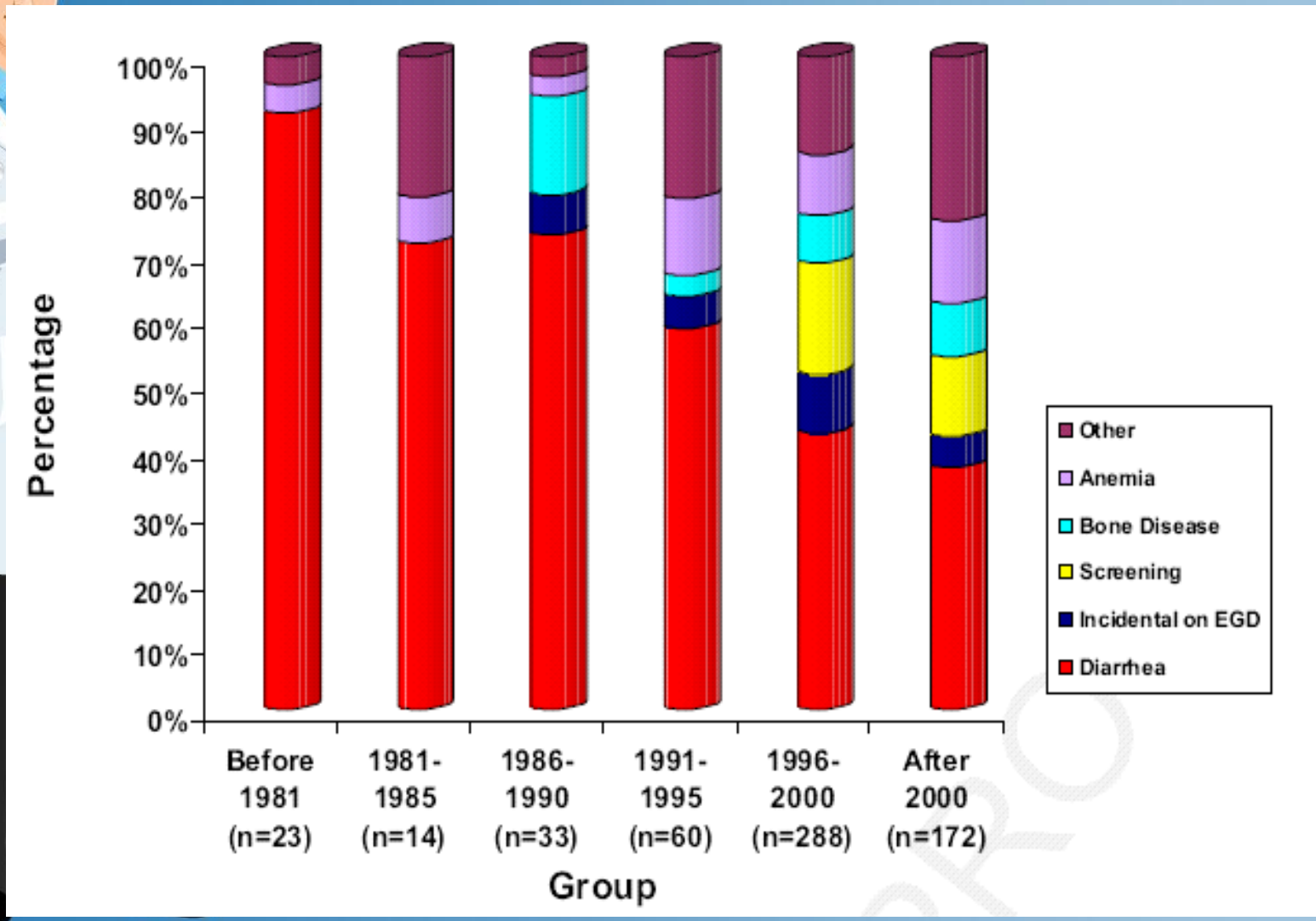
Classical	Non-Classical	Subclinical	Potencial
Patients have malabsorption symptoms	Patients don't have malabsorption symptoms	Patients have symptoms underneath the clinical detection limits	Patients have positive antibodies and HLA typing but no histological findings

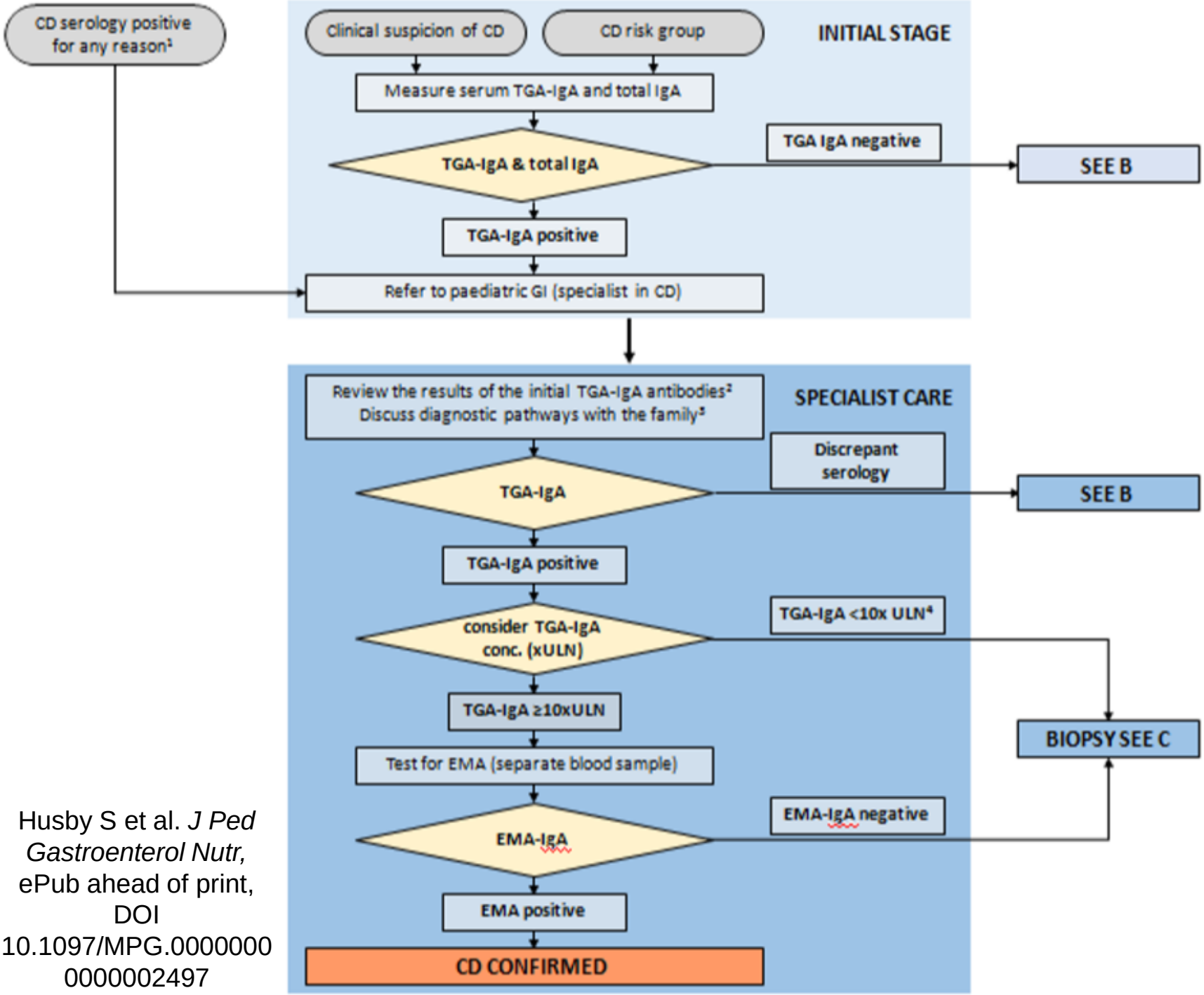
Classical Coeliac Disease

- Manifests between 7 and 24 months of age
- Abdominal pain
- Weight loss, failure to thrive
- Vomiting
- Diarrhoea
- Hypochromic anaemia
- Muscle wasting and hypotonia
- Low protein oedemas
- Sadness, mood alterations

Classical Coeliac Disease

Changes of Coeliac Disease Manifestations Over Time





Husby S et al. *J Ped Gastroenterol Nutr,* ePub ahead of print, DOI 10.1097/MPG.0000000000002497

Coeliac Disease Treatment

- The only treatment for coeliac disease is a strict, life-long, gluten free diet:
  - i.e. 0 gluten intake!!
  - Sometimes with a transient milk and dairy products free diet

Constipation

- Non-organic (functional)
- Organic:
  - Intestinal
  - Drugs
  - Metabolic
  - Neuromuscular

Intestinal Causes of Constipation

- Milk protein allergy
- Hirschsprung disease
- Neuronal dysgenesis
- Anal stenosis
- Anal stricture
- Anterior dislocation of the anus
- Pseudoobstruction
- Collagen-vascular disease
- Rectal abscess or fissures
- Stricture post-necrotizing enterocolitis

Drugs Leading to Constipation

- Narcotics
- Antidepressants
- Psychoactive drugs
- Chemotherapeutic agents
- Pancreatic enzymes

Metabolic Causes of Constipation

- Dehydration
- Cystic fibrosis
- Hypothyroidism
- Hypokalaemia
- Hypercalcaemia
- Hypermagnesaemia

Neuromuscular Causes of Constipation

- Infant botulism
- Absent abdominal muscles
- Myotonic dystrophy
- Spinal cord lesions
- Chagas disease

Vomiting

- Causes of vomiting:
  - Gastrointestinal
  - Non-gastrointestinal

Gastrointestinal Causes of Vomiting

- Gastrointestinal obstruction
- Gastroenteritis
- Acute appendicitis
- Overfeeding
- Gastroesophageal reflux
- Food allergy
- Cow’s milk protein intolerance
- Reye syndrome
- Hepatitis
- Helicobacter pylori
- Ulcers
- Pancreatitis
- Malrotation
- Inflammatory bowel disease
- Achalasia

Non-Gastrointestinal Causes of Vomiting

- Systemic infection
- Hyperammonaemia
- Adrenogenital syndrome
- Increased intracranial pressure
- Subdural hemorrhage
- Toxic ingestions
- Brain tumors
- Cyclic vomiting
- Abdominal migraine
- Middle ear infection
- Chemotherapy
- Whooping cough syndrome

Differential Diagnosis of Gastrointestinal Bleeding in Infants

Common

- Bacterial gastroenteritis
- Swallowed maternal blood
- Anal fissure
- Milk protein allergy
- Necrotizing enterocolitis
- Intussusception
- Lymphonodular hyperplasia

Uncommon

- Volvulus
- Hemorrhagic disease of newborn
- Meckel diverticulum
- Necrotizing enterocolitis
- Stress ulcer

Differential Diagnosis of Gastrointestinal Bleeding in Schoolchildren

Common

- Bacterial gastroenteritis
- Anal fissure
- Intussusception
- Ulcer/gastritis
- Swallowed epistaxis
- Juvenile polyp
- Mallory-Weiss syndrome

Uncommon

- Oesophageal varices
- Oesophagitis
- Coagulopathy
- Meckel diverticulum
- Lymphonodular hyperplasia
- Foreign body
- Hemangioma, AVM
- Sexual abuse
- Hemolytic-uremic syndrome
- Henoch-Schönlein purpura

Differential Diagnosis of Gastrointestinal Bleeding in Adolescents

Common

- Bacterial gastroenteritis
- Inflammatory bowel disease
- Ulcer/gastritis
- Polyps
- Anal fissure

Uncommon

- Hemorrhoids
- Oesophageal varices
- Oesophagitis
- Coagulopathy
- Mallory-Weiss syndrome
- Teleangiectasia
- Gay bowel disease

Jaundice

- Jaundice is the yellowish discoloration of skin and sclerae
- Jaundice becomes visible in the newborn when bilirubin level surpasses 85 ɥmol/l and 35 ɥmol/l in adults
- Conjugated bilirubin should not make more than 10 – 15% of total bilirubin levels

Differential Diagnosis of Jaundice

Unconjugated hyperbilirubinaemia

- Hemolysis and reticulocytosis
  - Positive Coombs test
  - Negative Coombs test
- No hemolysis

Conjugated hyperbilirubinaemia

- Obstructive
- Infectious
- Metabolic
- Toxic
- Idiopathic
- Autoimmune

Haemolysis and Reticulocytosis

Positive Coombs Test

- ABO and Rh incompatibility
- Autoimmune, systemic lupus erythematosus
- Drug induced and idiopathic acquired hemolytic anemia

Negative Coombs Test

- RBC enzyme defect (G6PD deficiency)
- Hemoglobinopathy (sickle cell anaemia)
- RBC membrane defects (hereditary spherocytosis)
- Hemolytic-uremic syndrome
- Wilson disease

No Haemolysis

- Gilbert syndrome
- Physiological jaundice of the newborn
- Breast milk jaundice
- Crigler-Najjar syndrome
- Hypothyroidism
- Pyloric stenosis
- Internal haemorrhage

Obstructive Causes of Conjugated Hyperbilirubinaemia

- Billiary atresia
- Choledochal cyst
- Cholelithiasis
- Tumor/neoplasia
- Bile duct stenosis
- Spontaneous bile duct perforation
- Bile-mucus plug

Infectious Causes of Conjugated Hyperbilirubinaemia

- Hepatitis A, B, C, D, E, G
- Cytomegalovirus
- Herpes Simplex 1, 2, 6
- Epstein-Barr virus
- Coxsackievirus
- ECHO virus
- Measles
- Varicella
- Syncitial giant cell
- Human parvovirus B19
- Toxoplasmosis
- Syphillis
- Leptospirosis
- Bacterial sepsis/UTI
- Cholecystitis

Metabolic Causes of Conjugated Hyperbilirubinaemia

- Wilson disease
- Alpha-1-antitrypsin deficiency
- Galactosemia
- Tyrosinemia
- Fructosemia
- Niemann-Pick disease
- Gaucher disease
- Zelleweger syndrome
- Wolman disease
- Cystic fibrosis
- Neonatal iron storage disease
- Indian childhood cirrhosis
- Defects in bile acid synthesis

Toxic Causes of Conjugated Hyperbilirubinaemia

- Total parenteral nutrition
- Acetaminophen
- Ethanol
- Salicylates
- Iron
- Halothane
- Isoniazid
- Valproic acid
- Venoocclusie disease (cyclophosphamide)
- Herbal teas
- Volatile hydrocarbons
- Bacillus cereus toxin
- Phenytoin
- Estradiol

Idiopathic Causes of Conjugated Hyperbilirubinaemia

- Idiopathic neonatal hepatitis
- Alagille syndrome
- Nonsyndromic paucity of intrahepatic bile ducts
- Progressive familial intrahepatic cholestasis
- Familial benign recurrent cholestasis
- Cholestasis with lymphoma
- Cholestasis with hypopituitarism
- Familial erythrophagocytic lymphohistiocytosis

Autoimmune Causes of Conjugated Hyperbilirubinaemia

- Autoimmune chronic hepatitis
- Sclerosing cholangitis
- Graft vs. host disease