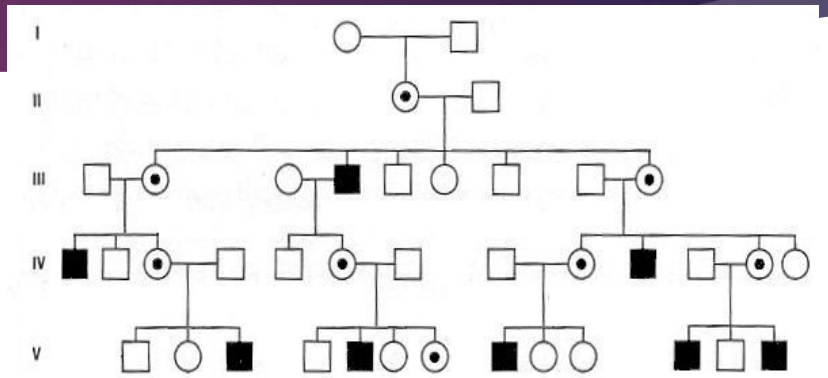
X linked recessive disorders



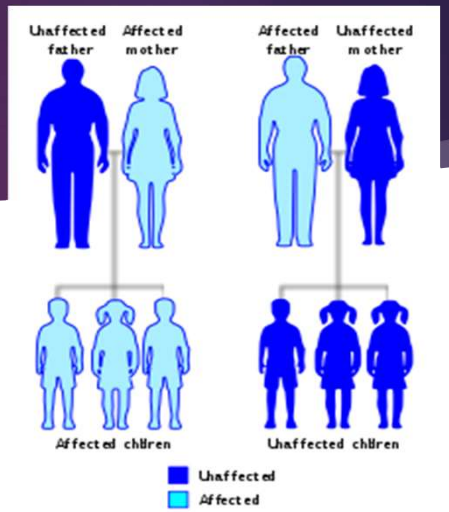
- Passed from carrier mother to her son
- Male more affected than female
- Never transmitted from father to son
- All daughters of a affected male are carrier
- Examples: Fragile X syndrome, Duchene muscular dystrophy, Hemophilia A, Color blindness, G۶PD deficiency, Adrenoleukodystrophy

Multifactorial or polygenic disorders

- Interplay between genes and environmental factors
- Cluster in a family

- Examples: Cleft lip and palate, Hypertrophic pyloric stenosis, Neural tube defects, Asthma, Cancers, Diabetes, Atherosclerosis, Height, Weight, Skin color, Eye color, Hair color

Mitochondrial inheritance

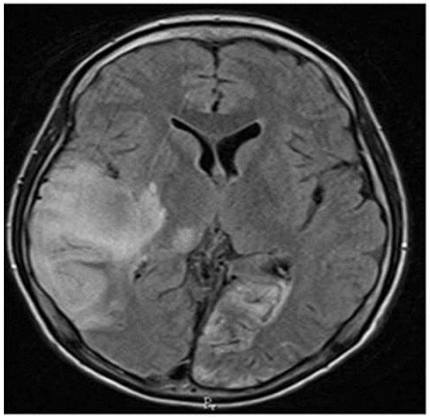


- Transmitted through mtDNA, from oocyte
- Heteroplasmy, range of clinical involvement
- Energy dependent organs like as brain, liver and muscle

- Examples: Leigh syndrome, Pearson syndrome, MELAS, Kearn Sayre syndrome

Mitochondrial Encephalomyopathy with Lactic Acidosis and Strokelike episodes (MELAS)

- Normal in early childhood
- Episodic vomiting and acidosis, seizure and recurrent stroke between ۵ to ۱۰ years old
- First degree relatives with external ophthalmoplegia, hearing loss, diabetes, cardiomyopathy

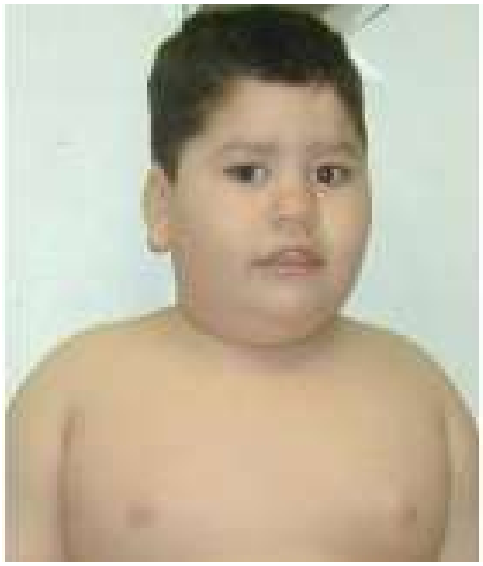


Uniparental disomy

- Tow copies of one parent chromosome and no copy from the other parent
- They have normal karyotype
- Maternal : Prader Willi syndrome
- Paternal : Beckwith Wiedemann syndrome, Angelman syndrome

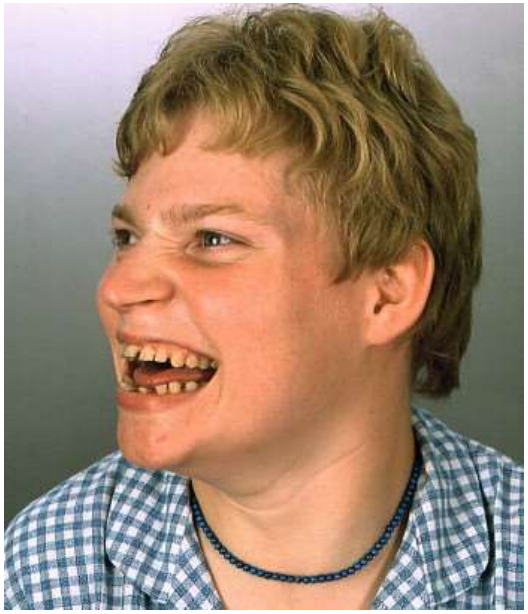
Prader Willi syndrome

- Neonatal hypotonia
- Postnatal growth delay
- Developmental delay
- Almond shape eyes, small hands and feet
- Hypogonadism
- Obesity after the first year of life
- Maternal UPD, ١٥



Angelman syndrome

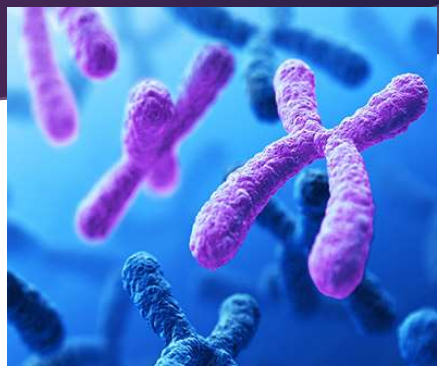
- Seizure disorders
- Ataxic arms and legs
- Low IQ
- Delayed speech
- Inappropriate laughter
- Paternal UPD, ١٥



Teratogens

- Maternal infections (toxoplasmosis, herpes, rubella, varicella, cytomegalovirus)
- Maternal diseases (diabetes, phenylketonuria)
- Medications and chemicals (alcohol, heavy metals, warfarin, retinoic acid, phenytoin)
- Smoking
- Radiation (٢٥ Rad)

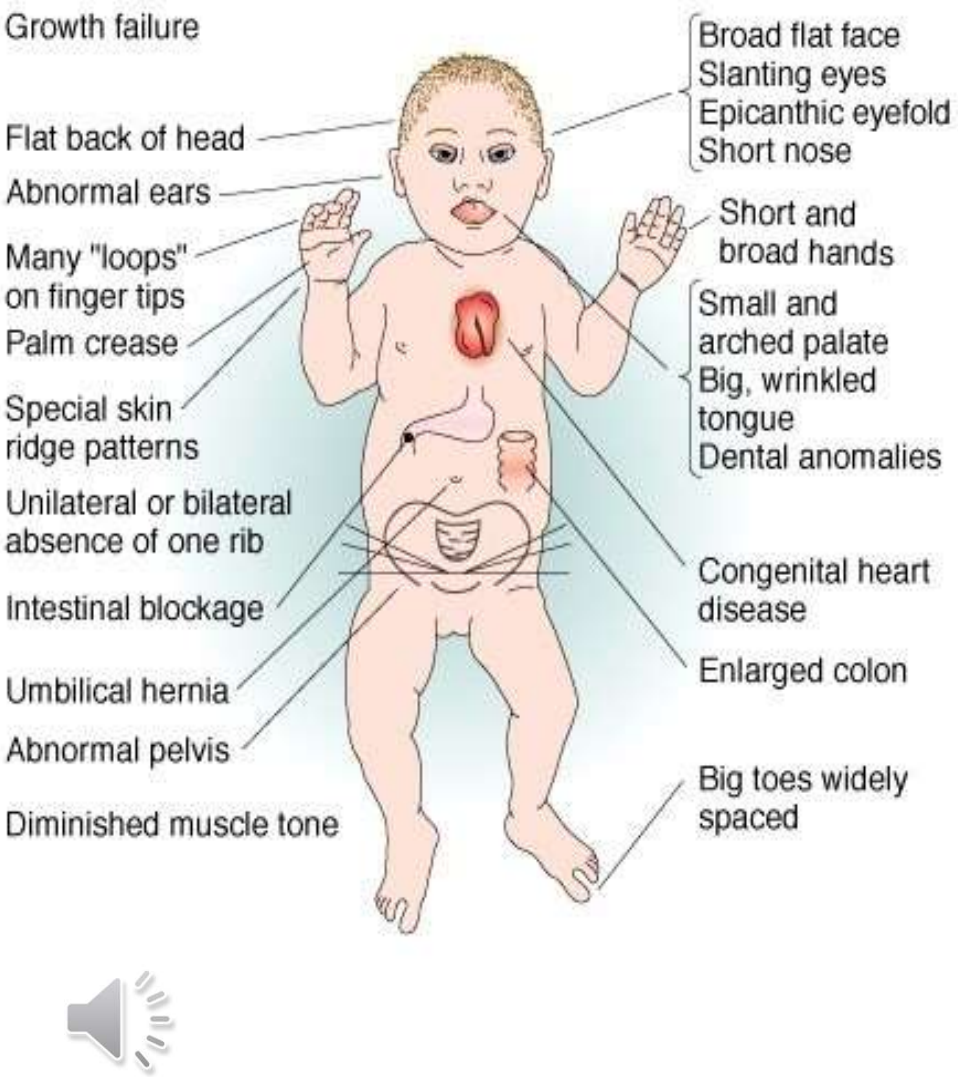
Chromosomal disorders



- ٥٠% of spontaneous abortuses have a chromosomal abnormality
- ٩٩% of Turner syndrome
- ٨٠% of Down syndrome
- Small for gestational age, failure to thrive, developmental delay, presence of three or more congenital malformation (suspect chromosomal disorders)
- Trisomy ٢١, ١٣, ١٨, Turner syndrome, Klinefelter syndrome

Trisomy ٢١ (Down syndrome)

- Normal birth weight and height, hypotonic
- Polycythemia at birth, leukemoid reaction
- ٥٠% have **congenital hearth disease** (atrioventricular canal, VSD, valvular disease, ASD)
- ٤ to ١٨% have **congenital hypothyroidism**, **acquired hypothyroidism** also is common
- ٥ to ١٠% have **gastrointestinal abnormalities** (duodenal atresia, annular pancreas, imperforated anus)


Growth failure
Flat back of head
Abnormal ears
Many "loops" on finger tips
Palm crease
Special skin ridge patterns
Unilateral or bilateral absence of one rib
Intestinal blockage
Umbilical hernia
Abnormal pelvis
Diminished muscle tone
Broad flat face
Slanting eyes
Epicanthic eyefold
Short nose
Short and broad hands
Small and arched palate
Big, wrinkled tongue
Dental anomalies
Congenital heart disease
Enlarged colon
Big toes widely spaced


Upslanted palpebral fissures
Flat nasal bridge
Nuchal folds
Single palmar flexion crease
Clinodactyly of the fifth finger
Hypotonia

Trisomy ٢١

- ١٠ to ٢٠ fold risk of **leukemia** (AML under ٢ years old, ALL after ٣ years old)
- Are more **susceptible to infections**
- **Cataract**
- **Hearing problem**
- **Adenoid hypertrophy**, sleep apnea
- Alzheimer at age of ٣٥
- ٥ to ١٠% have **atlantoaxial instability** (spinal cord injuries)