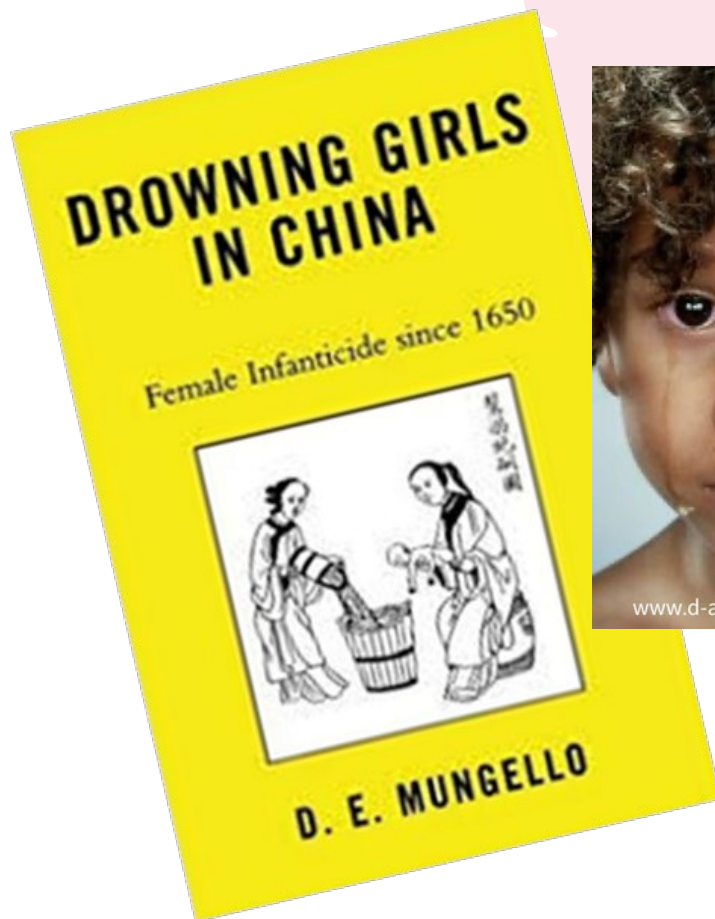


# Infant Deaths



A systematic review and survey of statistical offices across 44 nations, found that contrary to media portrayal and therefore public perception, children face the highest risk of homicide by parents. The majority of perpetrators in all categories were women and in some categories, women made up 100% of perpetrators.

Source: Know Violence in Childhood - Global Learning Initiative



**Dr. Asela Mendis**

# Causes of Infant Deaths

## Natural causes

- **Preterm Birth and Low Birth Weight.**
- **Congenital Defects.**
- **Pregnancy Complications.**
- **Placenta and Umbilical Cord Complications.**
- **Sudden Infant Death Syndrome (SIDS).**
- **Bacterial sepsis**
- **Respiratory distress**
- **Diseases of the circulatory system**
- **Neonatal hemorrhage**

## Unnatural causes

- **Infant Accidents.**
- **Infanticide**
- **Infant murder**

# INFANTICIDE



- Killing of an infant (age,1yr) by its biological mother when balance of the mind of the mother is disturbed due to the effects of pregnancy, childbirth or lactation

# Risk Factors:

- **Second or subsequent child**
- **Maternal age < 15 years**
- **Maternal education at the time of birth**



**“Hence ,it is obvious that in a case of infanticide the matters to be proved are”**

- Whether it was viable when born**
- Whether the foetus was born alive.**

**Whether it had separated existence for sometimes???**

**In Sri Lanka proof of separate existence is not required**



- That the cause of death was neither natural nor accidental but was due to some deliberate act of commission or omission.

- That the dead infant examined belonged to the woman charged for commission of the offence of infanticide



# Investigation of Infanticide

- **Examine the case by detail autopsy:**
- **Determine whether the child is viable or not**
- **Determine whether it is live born or still born or dead born**
- **Time of survival if born alive**
- **Cause of death**
- **Circumstance of death**

# Medico legal aspects of infanticide

- Viability of the baby.
- It is important to establish the viability which determines whether it is capable of separate existence.
- If found not viable it excludes infanticide.





# WEEK TWENTY-FOUR

- In countries outside the United States, especially in less industrialized countries, the baby's chance of survival (when it becomes viable) is often as high as 28-30 weeks. This is usually the case when countries have fewer resources to support very premature babies.

Weight gain close to 6  
Increase in muscle,  
and internal organs.

At 24 weeks the fetus is  
considered to be viable.

The fetus is about 12 inches in  
length and close to 1 ½ lbs.

Footprints start to develop, as  
do the alveoli (air sacs) in the  
lungs.

The brain is beginning to go  
through rapid brain  
growth at this time.



## **Legal aspect in Sri Lanka**

- **Culpable homicide not amounting to murder.**
- **Exception 5 of section 294**

**England and Wales-special infanticide act enacted in 1938. Charge- manslaughter**

# Exclusion of infanticide

- Maceration of foetus-IUD
- Congenital malformations, incompatible with life.
  - Anencephaly,
  - Oesophageal atresia
  - Cardiac causes
- Extreme immaturity
- Intrapartum (During labour) deaths
  - Aspiration
  - Cord round the neck
  - Footling
  - Delayed labour-asphyxia

• Maceration



## **Whether it was viable when born**

**Two other condition of newly born foetuses are recognised, when they are not born alive.**

**These are:**

- 1. Still born foetus**
- 2. Dead born foetus**

## Still born foetus

- According to WHO- “a still born child as one, which has issued forth from the mother , after 28 wks of pregnancy and didn't at any time after being completely expelled, breathe or show any sign of life”
- In contrast to general conception, some still born foetuses may show signs of respiration, when they are still in the vagina or uterus.

( Vagitus vaginalis or Vagitus uterinus)

# Medico legal aspects of still birth

- **Charge of infanticide will not stand in still birth cases.**

# Dead born

Death of a foetus inside the uterus.

Sign Of Dead Born Foetus

1.Rigor mortis

2.Intrauterine maceration (Autolytic decomposition)

Overlapping of skull bones (Spalding sign)

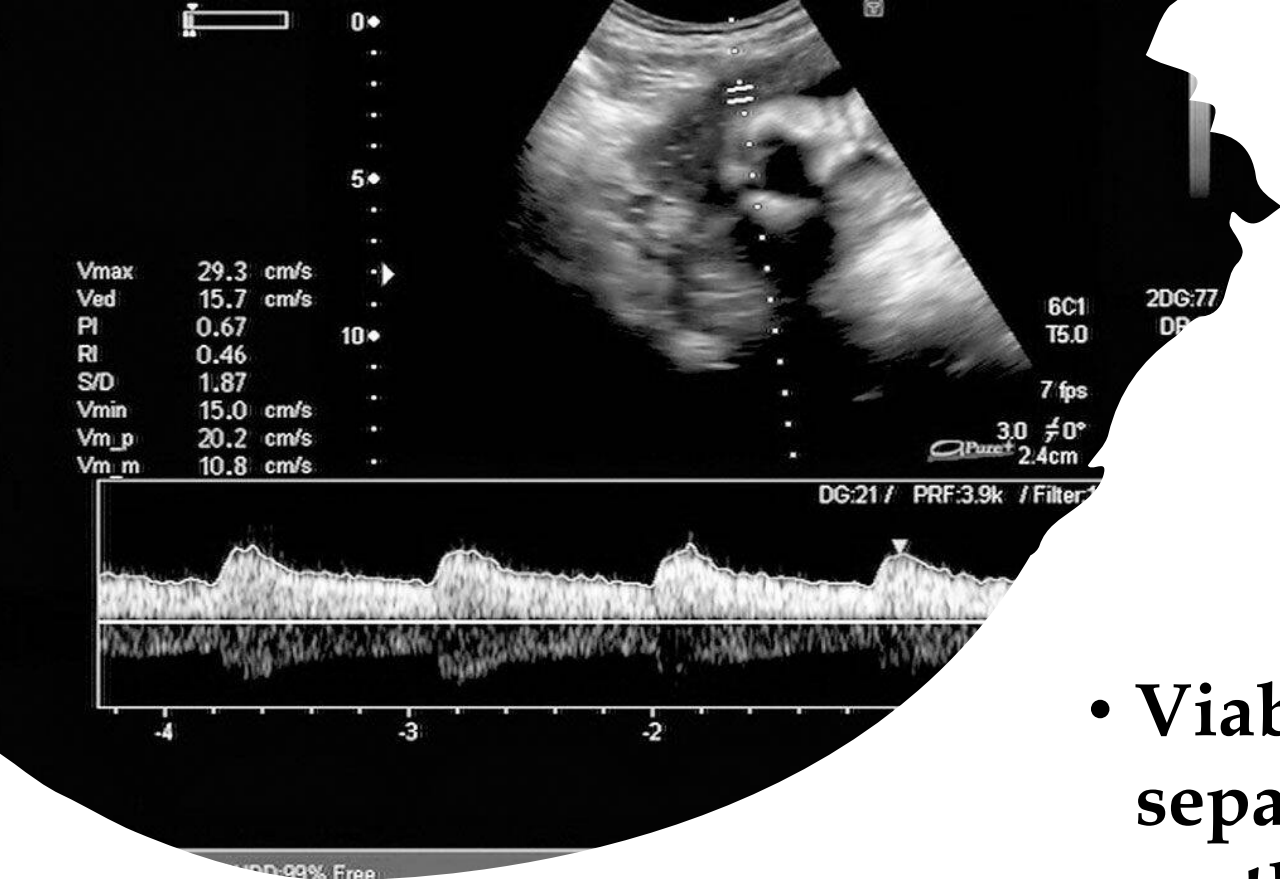
Soft tissue oedema: skin >5 mm

3. Intrauterine mummification

4.Putrification

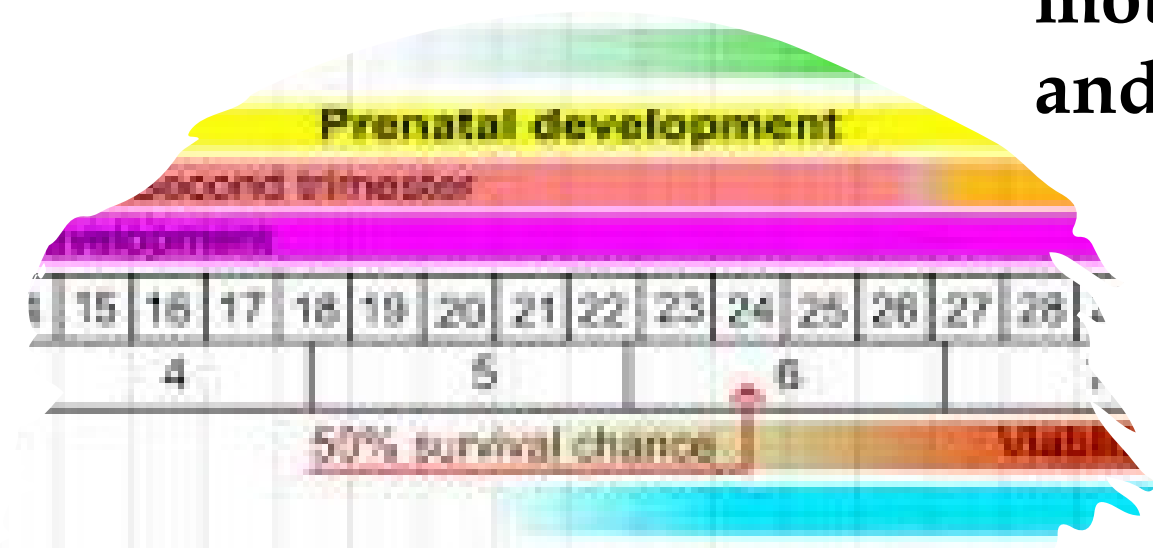
Gas shadow in foetal heart& vassels(Robert's sign)





# Whether the foetus was born alive

- Viability or capacity to lead a separate life outside the body of mother, depends on many biological and physiological factors.





**Doing a proper autopsy is the accurate way to determine this;**

**Establishing viability:**

- **By considering the foetal development**
- **By Hasse's formula.**

# Foetal development

- Length - 50-53 means term (crown heel)
- BPD, crown rump length..
- Weight - 2.5 or above = term
- Eyes: - eye brows/lashes, eye lids pupillary membrane
- Hands and feet skin creases, growth of fingernails, presence or absence of fingernails etc.

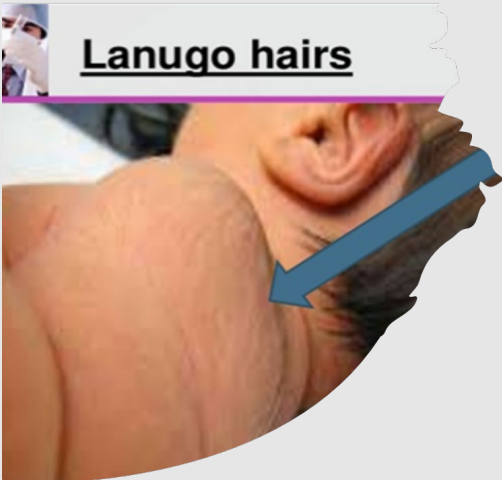
- Umbilical cord
- Placental weight,
- External genitalia - testes in scrotum (9/12)
- Vernix caseosa
- Presence of meconium
- Absence of lanugo hair



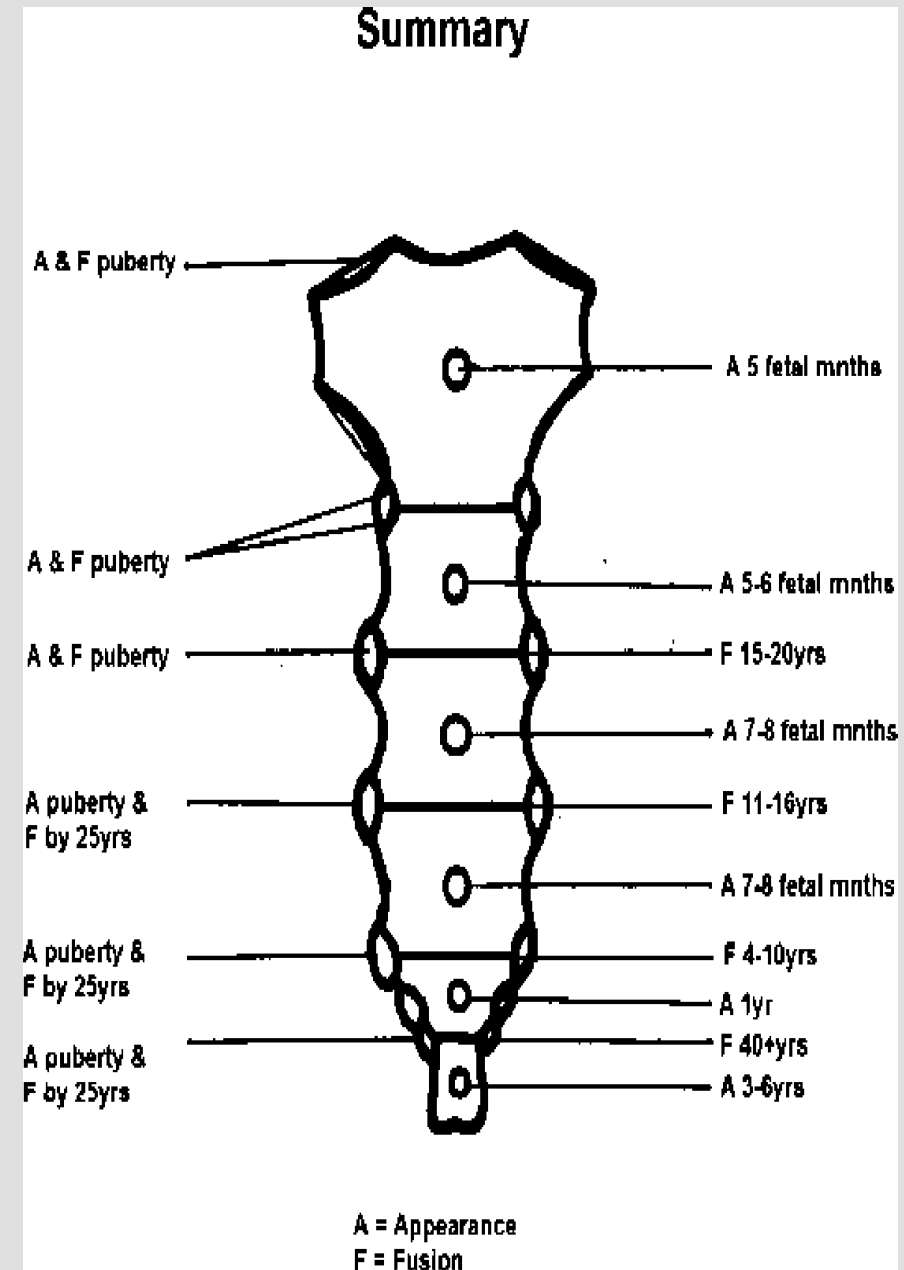
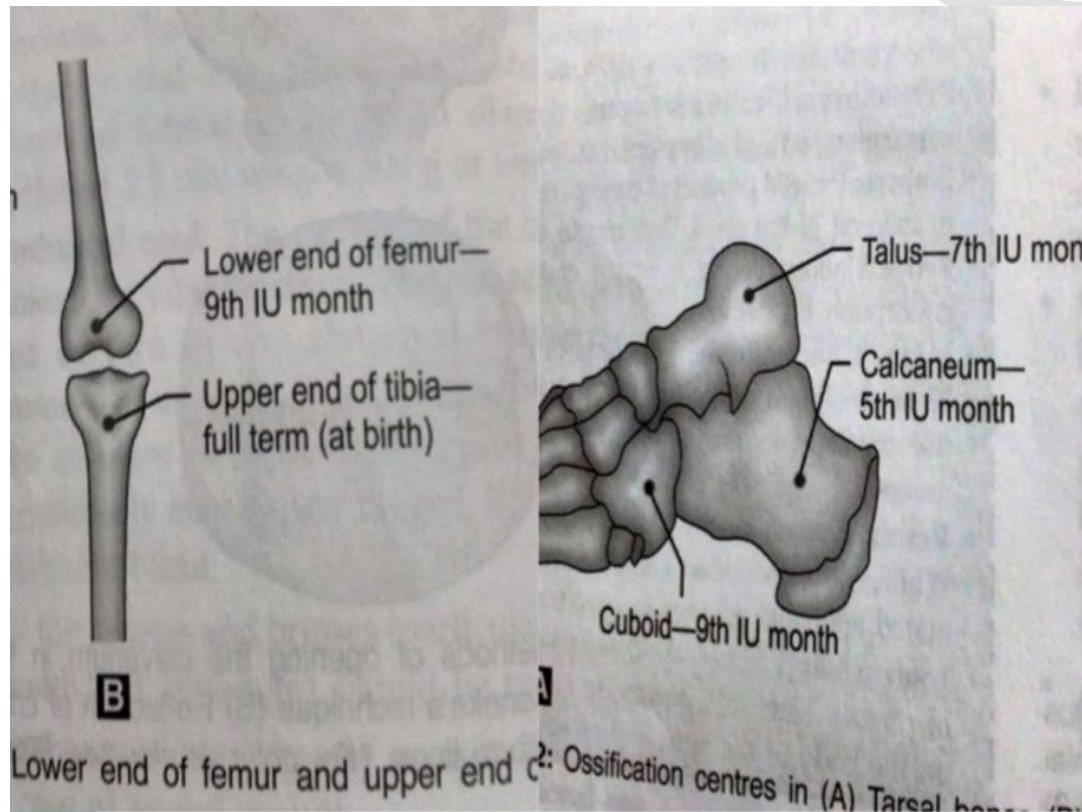
Meconium



Lanugo hairs



# Ossification centres



# **Live birth**

- **Circumstantial evidence**
- **Medical evidence**
- **Proof of respiration- expanded lungs**
- **Food in the alimentary canal**
- **Changes in the umbilical cord.**

# Sign Of Live Birth

## External Signs :

### 1. Shape of chest and its measurements:

increase AP diameter and circumference

### 2. Changes in skin

- **Colour** -bright red at birth

Brick red- 2<sup>nd</sup> to 3<sup>rd</sup> day

Yellowish -3<sup>rd</sup> to 6<sup>th</sup> day

Normal-7<sup>th</sup> to 10<sup>th</sup> day

- **Desquamation of skin** -begins over abdomen by 2<sup>nd</sup> day and is completed by 3<sup>rd</sup> to 4<sup>th</sup> day

### 3. Caput succedaneum

### 4. Cephalhaematoma

### 5. Change in the Umbilical cord

- **Cut margin dries up by about 2 hrs.**
- **The cord dries up about 24 hrs.**
- **Red ring appears around umbilicus on the 2nd day.**
- **Cord falls off by 4<sup>th</sup> -5<sup>th</sup> day and complete healing of the surface occurs.**

# Sign of live birth and separate existence in dead infants

## Internal Examination

1. Position of highest point of diaphragm goes down from 3<sup>rd</sup>- 4<sup>th</sup> ribs to 6<sup>th</sup> / 7<sup>th</sup> ribs.
2. Examination of lungs
  - Ploucquet's test.
  - Hydrostatic test.
  - Histological examination of the lungs.



### 3. Findings in the **stomach and intestine-**

- **Breaslau's second life test.**
- **Demonstration of air in x ray.**
- **Presence of milk / honey in stomach.**

4. **Meconium** - large intestine is completely free of meconium within **24 hrs** after birth.

### 5. Change in the **heart-**

**closure of foramen ovale** occurs within **3 months** after birth.

## 6. Change in **blood vessels-**

- **Umbilical arteries** – start contracting within **10 hrs** after birth and obliteration completed by **3<sup>rd</sup> day**.
- **Umbilical vein** -start contracting by **2<sup>nd</sup> to 3<sup>rd</sup> day** after birth and completely obliterate by **4<sup>th</sup> to 6<sup>th</sup> day**.
- **Ductus arteriosus** starts to obliterate by **2<sup>nd</sup> to 3<sup>rd</sup> day** after birth and completed by **7 to 10 days**.
- **Ductus venosus-** starts to obliterate by **3<sup>rd</sup> to 4<sup>th</sup> day** after birth and completed by **10 days**.

7. **Incremental line in the enamel** of the teeth-one of the **surest sign** of live birth.

8. Air in the **middle ear**.

9. Presence of some **ossification centres** e.g. at the lower end of radius, heads of humerus and femur and capitulum of humerus.

10. Changes in the **blood**-

- **Nucleated RBC** is absent in peripheral circulation within **24 hrs**.
- **Foetal haemoglobin** 55 % to 60 % at birth.

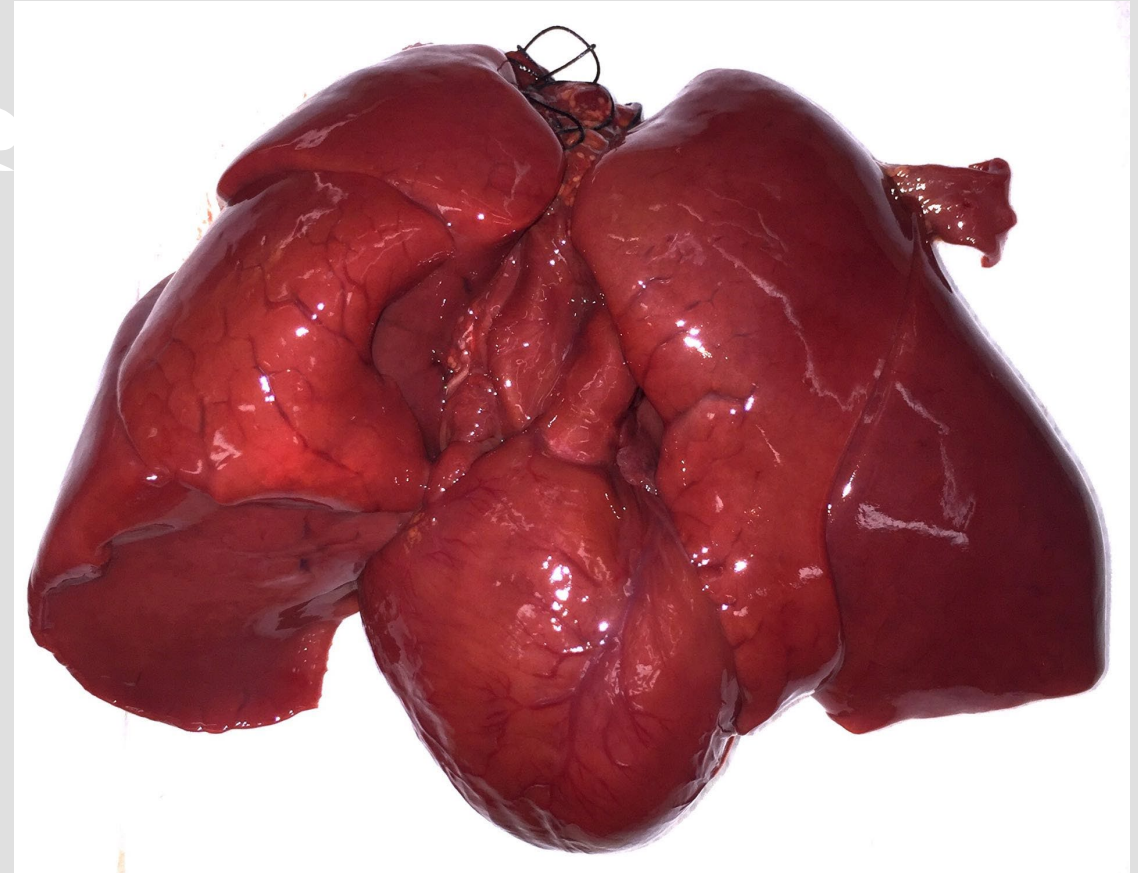
11. Closure of fontanelle.

<b>Character</b>	<b>Unrespired Lungs</b>	<b>Respired Lungs</b>
<b>Weight in relation to body weight</b>	1/70	1/35
<b>Volume</b>	Small	Large and covers the heart
<b>Consistency</b>	Liver Like: Dense firm non crepitant	Soft, spongy, elastic, Crepitant
<b>Extension</b>	Up to the level of 4 <sup>th</sup> and 5 <sup>th</sup> rib	Up to the level of 6 <sup>th</sup> and 7 <sup>th</sup> rib
<b>Specific gravity</b>	1.04	0.94

<b>Margin</b>	Sharp	Rounded
<b>Color</b>	Uniform reddish	Mottled/ marbled appearance
<b>Air vesicles</b>	Not inflated	Inflated
<b>Section</b>	Little froth less blood exudates on pressure	Abundant frothy blood exudates
<b>Breslau's second life test</b>	Whole or part sinks in water	Expanded parts or whole floats
<b>Microscopy</b>	Cuboidal lining	Squamous Epithelium
<b>Blood vessel</b>	Less patent	More Patent

# Proof of Respiration

- **Pink expanded lungs**
- **Floatation test.**
- **Histology**
- **Crepitation**
- **Rib markings present**
- **Weight approx: 1/35 of the body**
- **Stomach bowel test**

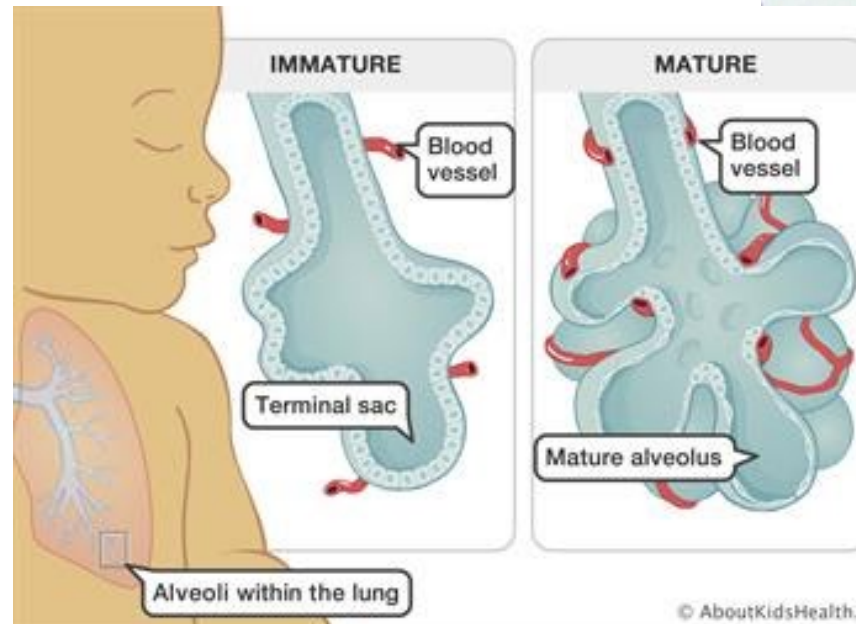
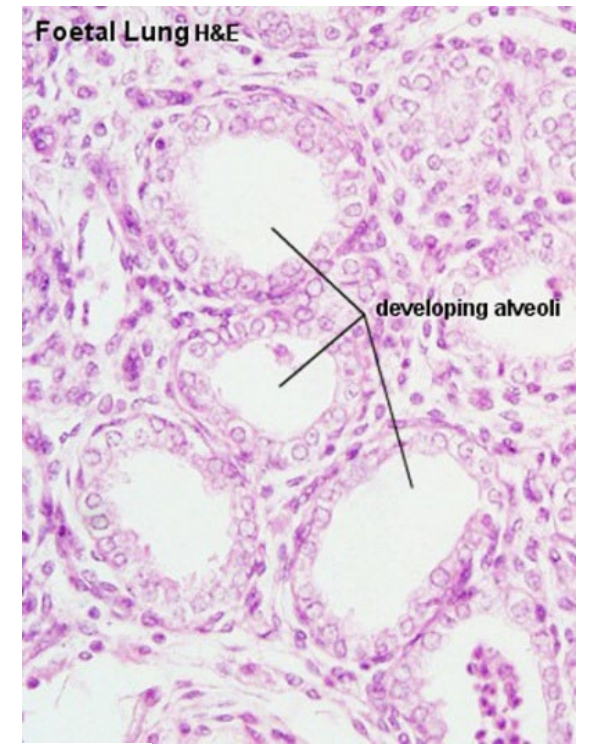
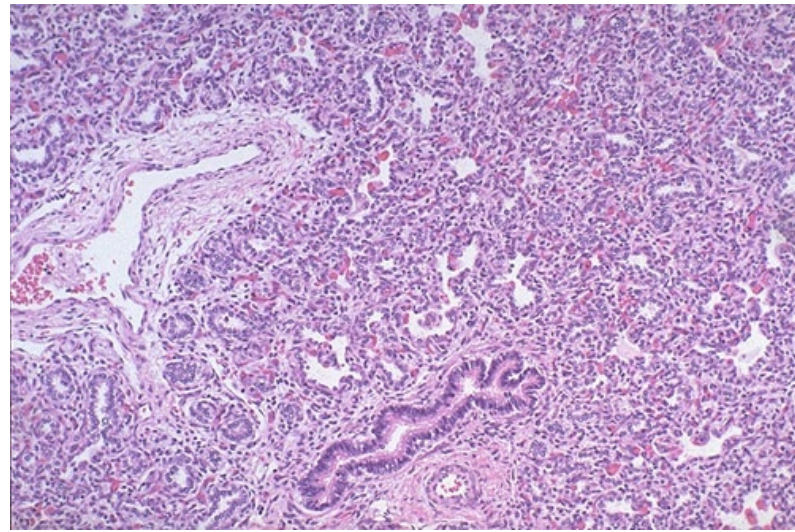


- **Changes in the chest**

- **Lung changes**

- **Floatation test**

- **Histology**





**Refer the mother for psychiatric assessment**



# Methods -Acts of commission

- **Manual strangulation**
- **Smothering**
- **Ligature strangulation- even by the umbilical cord**
- **Blunt weapon trauma**
- **Sharp weapon- cuts, stabs**
- **Drowning**
- **poisoning**

# **Methods -Acts of omission**

- **Unattended labour**
- **Failure to tie the cord**
- **Non-feeding**
- **Exposure to cold/heat without proper clothing**

# **Medico legal aspects-question to be answered by the JMO**

- Was the child still born?**
- Was the child born live?**
- If born alive how long did it survive?**
- What is the cause of death?**



# **SUDDEN INFANT DEATH SYNDROME**

# INTRODUCTION

- **Sudden Infant Death Syndrome (SIDS) continues to be the most common cause of postneonatal infant death**
  - **25% of all deaths between 1 month and 1 year of age**
- **SIDS is a complex, multifactorial disorder of which the cause is not fully understood**
- **Some environmental risk factors are modifiable**
  - **Reducing exposure to modifiable risk factors has lowered the incidence of SIDS**
- **New research indicates genetic risk factors**
  - **Actual risk of SIDS may depend on interaction of environmental and genetic risk factors**

## Definition - SIDS

- **Sudden Infant Death Syndrome (crib death) - the sudden death of an infant, usually under 1 year of age, which remains unexplained after a complete postmortem investigation, including an autopsy, examination of the death scene and review of the case history**

# **SIDS - What It Is**

- **Major cause of death in infants after 1st month of life**
- **Sudden & silent in an apparently healthy infant**
- **Unpredictable & unpreventable**
- **Quick death with no signs of suffering - usually during sleep**



# **SIDS - What It Is Not**

- **Caused by vomiting or choking**
- **Caused by external suffocation or overlaying**
- **Contagious or Hereditary**
- **Child abuse**
- **Caused by lack of love**
- **Caused by immunizations**
- **Caused by allergy to cows milk**

# General Characteristics of SIDS

- Usually occurs in colder months
- Mothers younger than 20 years old
- Babies of mothers who smoke during pregnancy or are exposed to secondhand smoke
- 60% male Vs 40% female
- Premature or low birth weight
- Upper respiratory infections, 60% in prior weeks
- Occurs quickly and quietly during a period of presumed sleep

# Risk Factors for SIDS

- **Parental**
  - **Young maternal age (age <20 years)**
  - **Maternal smoking during pregnancy**
  - **Drug abuse in either parent, specifically paternal marijuana and maternal opiate, cocaine use**

**Short intergestational intervals**

**Late or no prenatal care**

**Low socioeconomic group**

**African American and American Indian  
ethnicity (? socioeconomic factors)**

# **Infant**

**Brain stem abnormalities, associated defective arousal,  
and cardiorespiratory control**

**Prematurity and/or low birth weight**

**Male sex**

**Product of a multiple birth**

**SIDS in a prior sibling**

**Antecedent respiratory infections**

# **Environment**

**Prone sleep position**

**Sleeping on a soft surface**

**Hyperthermia**

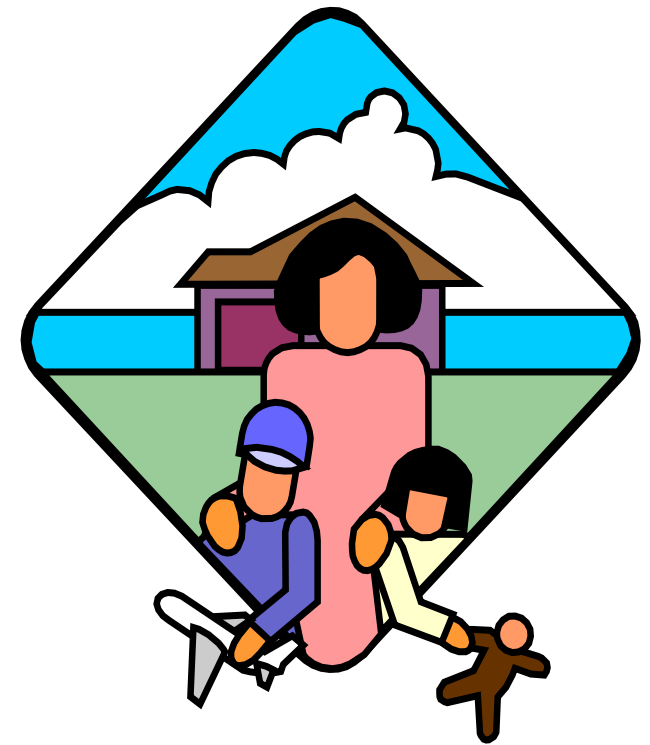
**Postnatal passive smoking**

# Pathogenesis of SIDS

- **Generally accepted to be multifactorial**
- **Triple risk model**
  - **Vulnerable infant**
  - **Critical development period in homeostatic control**
  - **Exogenous stressors**
- **Brain stem abnormalities, associated defective arousal, and cardio-respiratory control**

# External Appearance

- Normal state of hydration & nutrition
- Small amount of frothy fluid in or about mouth & nose
- Vomitus present
- Postmortem lividity &/or rigors





# Internal Appearances On Autopsy



- **Pulmonary congestion & edema**
- **Intrathoracic petechiae 90% of time**
- **Stomach contents in trachea**
- **Microscopic inflammation in trachea**

# Autopsy findings

- **No pathognomonic findings**
- **Common findings:**
  - **Petaechial haemorrhages of thymus gland, visceral pleura in 68-95%**
  - **Pulmonary congestion (89%) and oedema (63%) indicative of terminal left ventricular failure**
  - **Oronasal secretions that are typically frothy, mucous and pink or bloody**

- **2/3 structural evidence of pre-existing, chronic low-grade asphyxia**
- **Study identified CSF abnormalities.**
- **Hypoxia frequently precedes death in SIDS**

- **One study of 20 SIDS infants found 50% had levels of IL-6 in CSF equivalent to those found in infants who died of infectious diseases**
- **Staphylococcus aureus may have role in infection as 56% of healthy infants and 86% of SIDS infants had these bacteria in the respiratory tract**

# Typical SIDS Infant Scenario

- **Almost always occurs during sleep or appearance of sleep**
- **Usually healthy prior to death**
- **May have had a cold or recent physical stress**
- **May have been place down for nap, found not breathing or appearing dead**
- **Parents not hearing signs of struggle**

# Diagnosis of SIDS

- SIDS is a diagnosis of **exclusion**
- Complete autopsy
- Examination of the death scene
- Review of the clinical history
- Differential diagnosis
  - child abuse
  - intentional suffocation

**Thank you**