Cauvery College for Women (Autonomous)

Nationally Accredited (III Cycle) with 'A' Grade by NAAC

Annamalai Nagar, Tiruchirappalli-18.

Name of the Faculty : **T.R. REVATHI**

Mobile Number : 9500603972

Designation : Assistant Professor

Department : Food Service Management and Dietetics.

Programme : B.Sc Nutrition and Dietetics.

Batch : 2016-2017 Onwards

Semester : IV

Course Title : **Nutrition Through Life Cycle**

Course code : **16SCCND4**

Unit : II a

Topic covered : Nutrition during Lactating Women.

LACTATION

Lactation

- For the first two days following delivery, no further anatomic changes in the breasts occur.

- The secretion from the breast called colostrum which starts during pregnancy becomes more abundant during the period.

Components of the colostrum

- It is deep yellow serous fluid, alkaline in reaction.
- It has got a higher specific gravity; high protein, vitamin A, sodium and chloride content but has got lower carbohydrate, fat and potassium than the breast milk.
- It contains antibody (IgA) produced locally.

Components of the colostrum contd…

- *Microscopically*: fat globules, colostrum corpuscles and acinar epithelial cells.

- The colostrum corpuscles are larger polynuclear leucocytes, oval or round in shape containing numerous fat globules.

Advantages of colostrum

- The antibodies (IgA, IgG, IgM) and humoral factors (lactoferrin) provides immunological defence to the new born.

- It has laxative action on the baby because of large fat globules.

PHYSIOLOGY OF LACTATION

Physiology of Lactation.

Lactation can be divided into 5 stages:

1. **Mammogenesis**-Development of breasts to a functional state
2. **Lactogenesis**-Synthesis and secretion of milk from the breast alveoli
3. **Galactokinesis**-Ejection of milk outside the breast
4. **Galactopoiesis**-Maintenance of lactation
5. **Involution**-regression and atrophy post lactation

1.Mammogenesis

- Growth of ducts and lobuloalveolar systems
- This starts from birth to puberty and continues in pregnancy
- Ductal sprouting predominates in 1st trimester and lobular sprouting occurs more in 2nd trimester hence the breast will contain more glandular epithelial cells than stroma
- Just before and during parturition there is a new wave of mitotic activity causing growth growth and maturation

Hormonal influence during mammogenesis

Prepubertal growth-

- depends on estrogen and progesterone.
- Secretion of prolactin and somatotropin by the pituatory gland results in mammary growth.
- Adrenocorticotrophic hormone(ACTH) and thyroid stimulating hormone(TSH) acting on the adrenal gland and thyroid gland also play a minor role in growth of the mammary gland

Hormonal influence during mammogenesis...

Pubertal growth-

- When the hypophyseal-ovarian –uterine cycle is established, there is extensive branching of the duct system and parenchymal proliferation and canalization of the lobuloalveolar units controlled by estrogen and progesterone

2. LACTOGENESIS(stage 1)

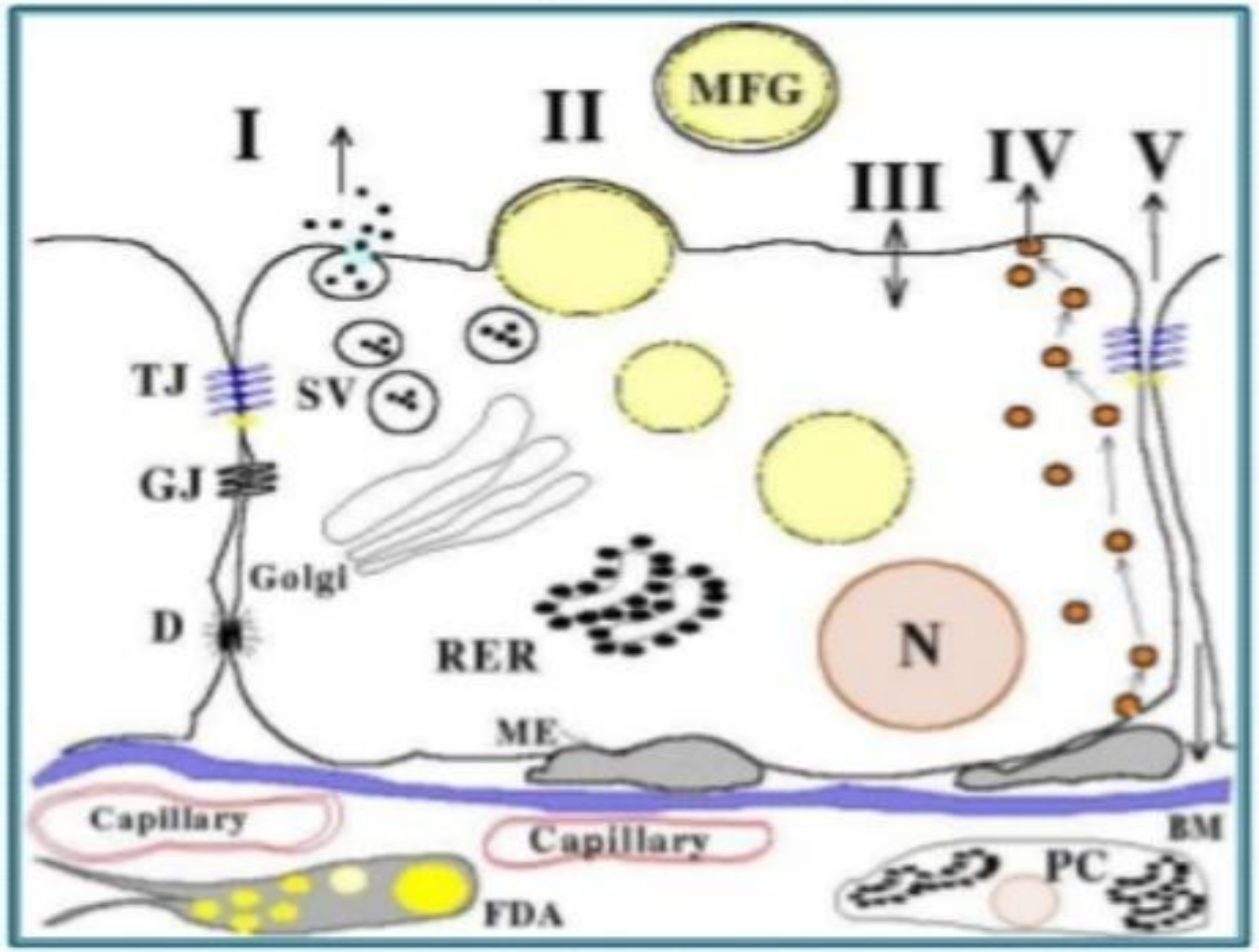
Stage 1: occurs in mid pregnancy

- There is initiation of milk synthesis,
- alveoli differentiates into secretory cells and prolactin stimulates mammary secretory cells to produce milk.
- **insulin** and **serum growth factor** induced cell division of stem cells of the gland and presence of cortisol for formation of alveoli is required for induction of milk synthesis .
- Further differentiation is inhibited by high levels of progesterone from the placenta and loss of progesterone receptors in the lactating breast

LACTOGENESIS-stage 2

- **Stage 2:** from late pregnancy to day 8.
- This is triggered by rapid drop in progesterone levels after placental delivery
- requires the presence of elevated levels of prolactin and cortisol , insulin, growth hormone and parathyroid hormone to facilitate mobilization of nutrients and minerals
- there is a switch from endocrine to autocrine control

Pathways for milk secretion by the mammary epithelial cell



I. Exocytosis
II. Reverse pinocytosis
III. Apical transport
IV. Transcytosis
V. Paracellular pathways

2. Lactogenesis. Pathways for milk secretion by the mammary epithelial cell

I - **Exocytosis** : milk protein and lactose are transported in Golgi-derived secretory vesicles, with water and electrolytes in to the alveolar lumen

II – **Reverse Pinocytosis**: lipid formed in smooth ER forms droplets and covered by phospholipid membrane transported as milk-fat globule

III – **Apical transport**: Direct movement of monovalent ions, water, and glucose across the apical membrane of the cell.

Lactogenesis……

IV – **Transcytosis**. sodium, potassium, chlorides, some monosaccharides, and water

V - The **paracellular** pathway for some interstitial fluid components and leukocytes to pass by diapedesis through the tight junctions.

galactokinesis

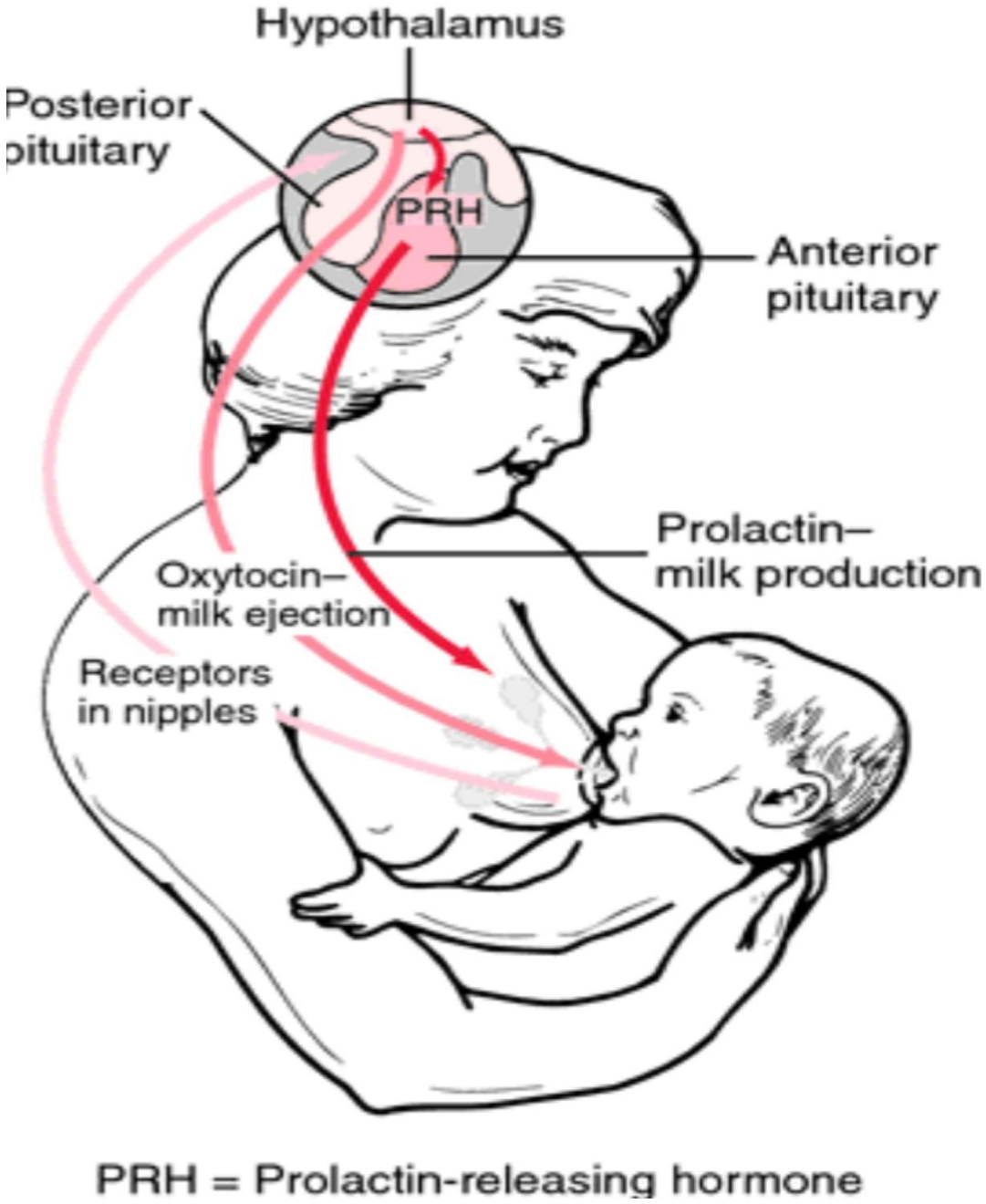
- Depends on the suckling mechanism of the baby and the contractile action which will express milk from the alveoli into the ducts.
- This contraction is brought about by the action of **Oxytocin**
- Milk let down reflex/milk ejection reflex
- Inhibited by psychic condition /pain /breast engorgement

Galactopoiesis.

- Prolactin is the hormone for maintenance of lactation
- And suckling is essential for maintenance of milk secretion
- Periodic breast feeding relieves pressure in the ducts and promotes more secretion
- Controlled by autocrine system(supply-demand)

5. Involution

- Apoptotic cell death and tissue remodelling post lactation
  - Requires a combination of lactogenic hormone deprivation and local signals to undergo regression and atrophy



PRH = Prolactin-releasing hormone

Hormones. A **hormone** called Prolactin secreted by the pituitary gland in the brain is **responsible** for the alveoli making milk. Prolactin rises when the baby suckles. There is another **hormone** called Oxytocin that causes tiny muscles around the alveoli to squeeze the milk via small tubes called milk ducts.

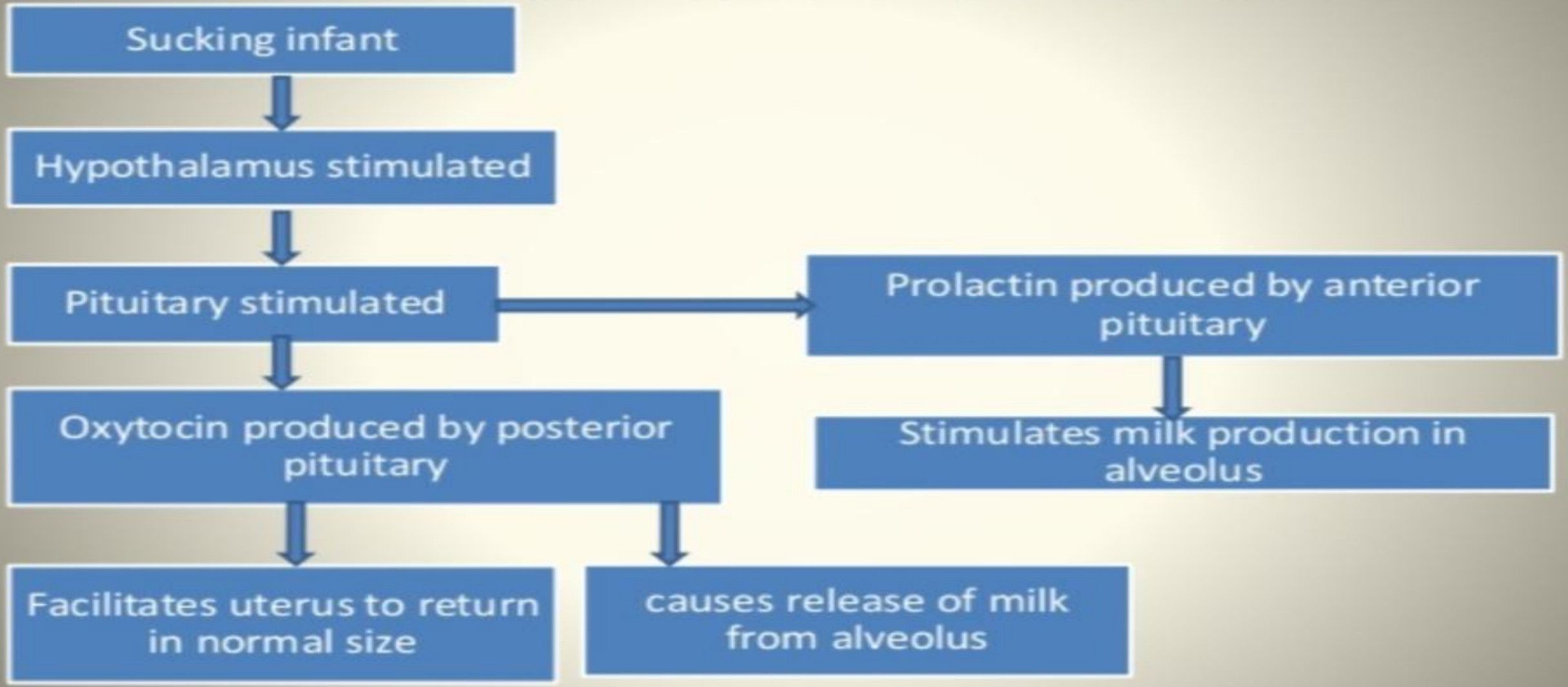
Prolactin:

- exerts its effects through receptors for initiation of milk secretion located on the alveolar surfaces.
- stabilizes and promotes transcription of mRNA and stimulates synthesis of **lactoalbumin,** which is a regulatory protein of the lactose synthetase enzyme system
- Increases lipoprotein activity in the mammary gland
- In conjunction with estrogen and progetserone it attracts and retain Ig-A immunoblasts
- estrogen enhances prolactin production by 10-20 fold. This is regulated by **human placental lactogen** which has an inhibitory effect
- Its inhibited by **prolactin inhibiting factor** under control of catecholamines in the hypothalamus.

oxytocin:

- Released from posterior lobe of the pituatory gland during nipple stimulation or sensory stimulation(visual, tactile , olfactory or auditary)
- Causes ejection of milk from the alveoli gland by contraction of the myoepithelial cells into ductules and ducts

Hormonal control of lactation



Mammogenic, lactogenic and galactopoietic (lactopoietic) hormones

Mammogenic	Lactogenic	Lactopoietic
Estrogens Progesterone Prolactin Growth hormone	Prolactin Insulin Glucocorticoids	Growth hormone Glucocorticoids Thyroid hormones Insulin Parathyroid hormone Prolactin (in goat and ewe)

Mammogenesis = mammary development
Lactogenesis = initiation (onset) of lactation
Lactopoesis = milk secretion (maintenance of lactation)

Breast Milk Composition

Breast milk changes to meet your growing baby's needs!

- Water
- Protien
- Carbohydrates/ Lactos
- Various fats
- Antibodies
- Vitamines/ Minerals
- Human milk oligosaccharides
- ~800 Stains of bacteria
- Other immue cells
- Hormones

Benefits of breast feeding

➢ Benefits to infant

- Protects from infections & illness including diarrhea, pneumonia, asthma.
- Decreases risk of obesity.
- Reduced risk of diabetes & cardiovascular diseases.
- Decreases health care costs.

Benefits to the Mother

Reduces post delivery bleeding and anemia
Helps delay next pregnancy
Protective effect against breast and ovarian cancer
Helps to loose weight
Emotional bonding
Needs no preparation

Benefits to the Baby

Perfect nutrition
Higher IQ
Complete food for the first six months
Emotional bonding
Prevents infections
Prevents chronic diseases
Easily digested

Nutrition during Lactation

- Breastfeeding offers many **health benefits** to both mother and infant.
- Nutrient and energy needs are higher.
- Fluid needs are higher.
- Drugs, smoking and contaminants may reduce milk production as well as enter breast milk and impair infant growth and development.

Nutritional requirement during lactation

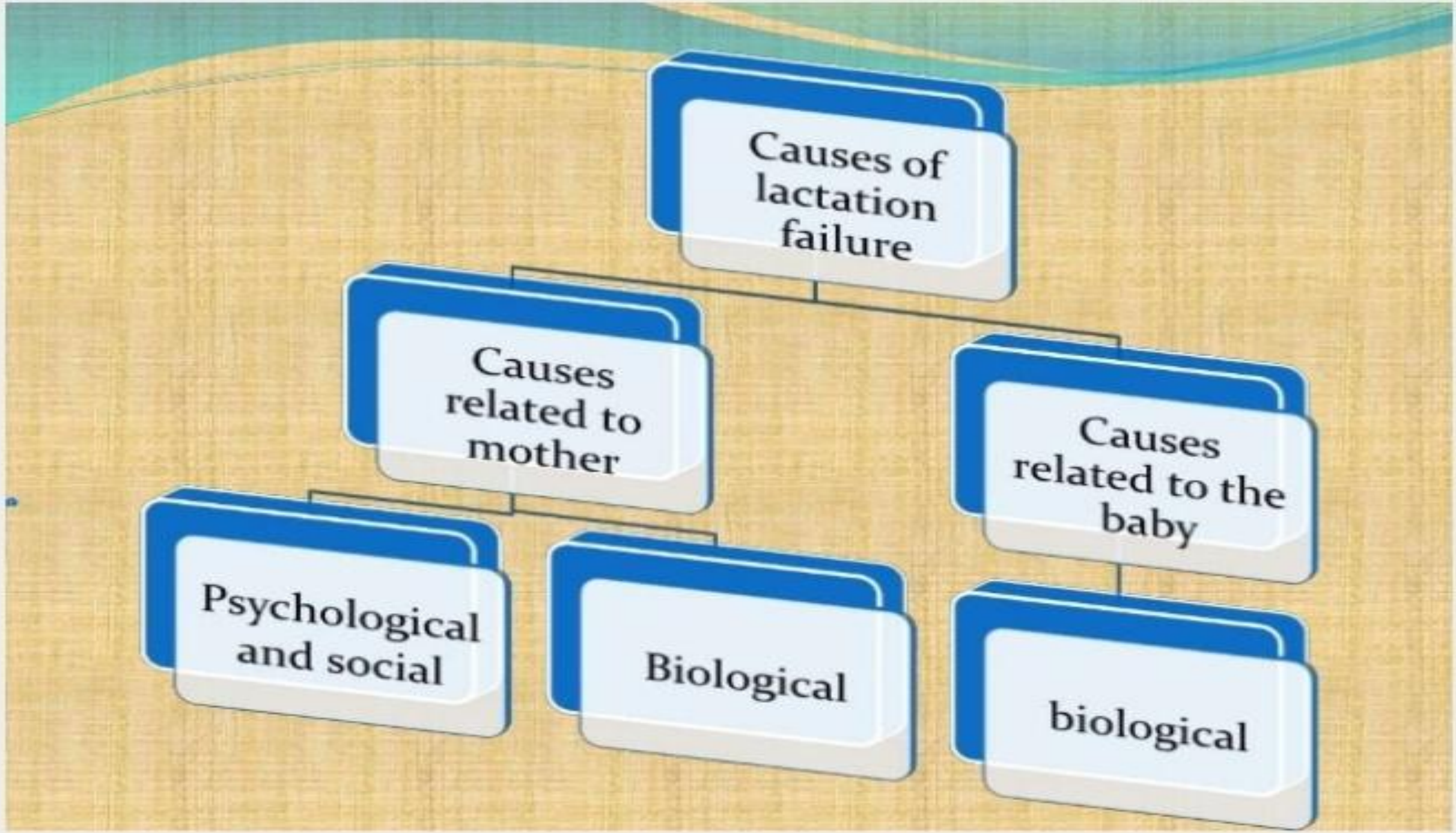
- Vitamin A (950µg/d): Breast milk is rich in vit. A so lactating mother needs adequate amount of vitamin A in their diet.
- Vitamin B6 (2.5mg/d): It's requirement increases during lactation.
- Vitamin B12 (1.5mg/d): Additional Vitamin B12 is required to meet the needs of the lactation.
- Folic acid (150µg/d): Additional folic acid intake will meet the needs of the lactation
- Vitamin C (25mg/d): Appreciable amount of vitamin C is secreted in breast milk. Additional intake will meet the need of the lactation.

LACTATION

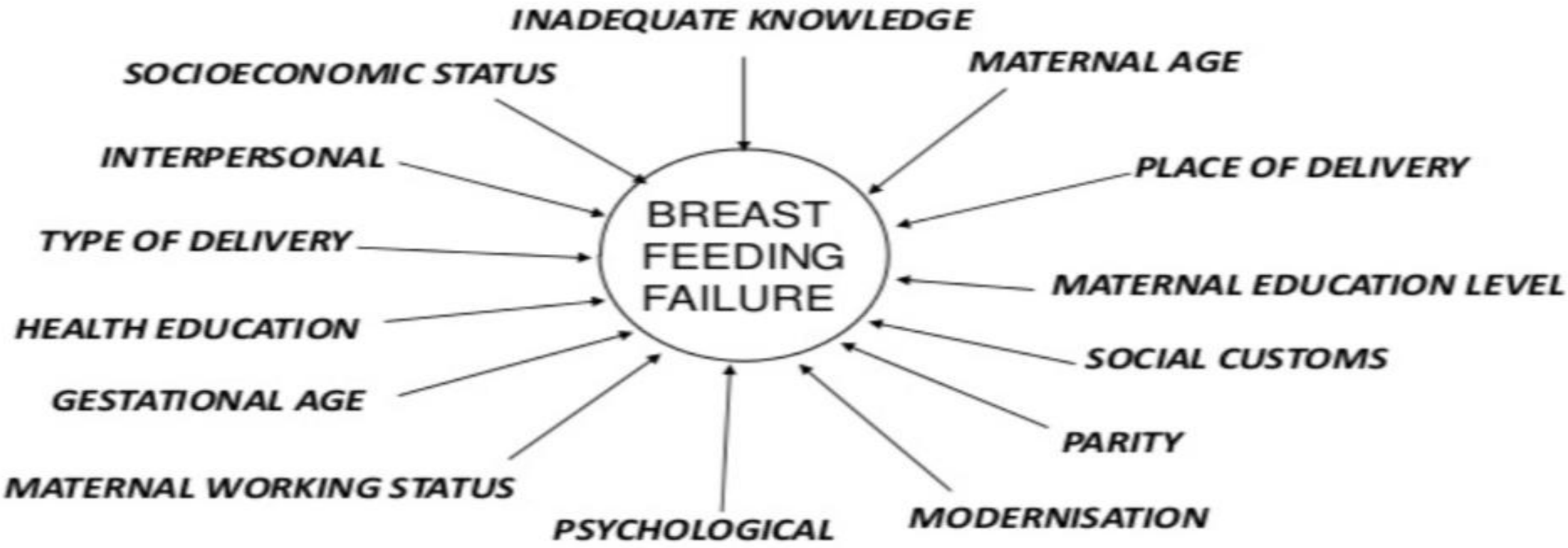
- It is the process of secreting milk from breast. It is a physiological process under neuroendocrine control.

LACTATION FAILURE

- Condition where mother is not able to produce milk.


Causes of lactation failure
Causes related to mother
Causes related to the baby
Psychological and social
Biological
biological

COMMON BARRIERS



When to suspect lactation failure?

- SYMPTOMS
- Infant is not satisfied after feeds, cries a lot.
- Wants to nurse frequently.
- Takes very long feeds.
- Improper weight gain
- Infrequent bowel movement- small in amount, dry and hard.
- Less need to change diaper(6-8)

- SIGNS INDICATING LACTATION FAILURE IN 1ST WEEK

- Weight loss greater than 10% of the birthweight,
- not regaining birth weight up to two weeks of life,
- no urinary output for 24 hours.
- absence of yellow stools in the first week
- Clinical signs of dehydration.

FACTORS AFFECTING LACTATION

Maternal problems:

- stress(post c/s,stressful vaginal delivery or other psychosocial stresses) opiates and beta-endorphins are released that block the stimulus-secretion coupling thus reducing oxytocin release
- polycystic ovarian syndrome,
- theca lutein cysts,
- obesity,
- labour analgesia,
- dm type 1,
- placental retention-increased circulating progesterone
- Alcohol dependence

FACTORS AFFECTING LACTATION..

- **Infrequent suckling/failure to empty breast** causes Elevated intrammary pressure also disrupts connections between cells and their attachment to the basement membrane disrupting synthesis and secretion of milk components.
- **Premature infants**-prolactin may not be sufficient

- Variations in composition :

- ✓ **Colostrum(1-5 days)** – is reacher in proteins ,minerals, immunoglobulins , anti inflammatory factors(PGE1 and PGE2, cytokines), phagocytes and lymphocytes.
- ✓ **Mature milk(>30 days)**-larger quantity than colostrum
- ✓ **Foremilk** –thin, proteins, lactose, water and other nutrients.
- ✓ **Hindmilk** –more fat therefore whiter, provides much of the energy of a feed.

- Other components include human growth factors, cortisol, insulin, thyroxine and prolactin

Thank you!