

LECTURE 1 Infant feeding:

Learning objectives: By the end of this lecture the students should know:

- Significant of breast milk.?
- How to achieve successful breastfeeding?
- common Problems may associated with breastfeeding?
- What are the Contraindication of breastfeeding.?
- Why some mothers used formula feeding?
- The Differences between breast and formula milk.?
- Common Problems associated with feeding in infancy?
- Complementary feeding: Weaning, Why?!, Timing, Type of food.

Breastfeeding : here are some terms you need to know

Rooting :-Is natural reflex., Baby widely open his mouth, The head move from side to side searching for the nipple. To start rooting the must lightly touch her nipple to the baby lower lip.

- **Latching on**: The baby grasping the mother nipples with his mouth.
 - A skill that the baby must learn with little help from the mother.
- **Colostrum**: Colostrum, rather than milk, is produced for the first few days. Colostrum differs from mature milk in that the content of protein and immunoglobulin is much higher, low volumes, yellowish, that is:
 - Rich in antibodies and growth factors.
 - Laxatives.
 - Prepare the baby's gut for digestion and absorption.
- **Exclusive breast feeding**: the infant receiving breast milk only, no additional food, water, or other fluid, with the exception of medicine and vitamin drops. .
- **Bottled feeding**: the infant feeds from the bottle, regardless its contents, even expressed breast milk while **Artificial feeding**: the infant receiving breast milk substitutes, and not breast milk.
- **Formula feeding**: the infant receiving cow's milk based formula.
- **Mixed feeding**: breast feeding + formula feeding.
- **Complementary feeding**: the infant is given food in addition to breast milk or infant formula.

Breast feeding:

Human milk and breastfeeding are the ideal and normative standards for infant feeding and nutrition. The WHO recommend that infants should be exclusively breastfed or given breast milk for 6 months. Feedings should be initiated soon after birth unless it is contraindicated. The first 2 days of breastfeeding, and perhaps the first hour of life, may determine the success of breastfeeding. Mothers should be encouraged to nurse from both breast at each feeding starting with the breast offered second at the last feeding. It is preferable to empty the first breast before offering the second in order to allow complete emptying of both breasts and therefore better milk production.

Proper technique and position of breast feeding

- The baby should be held in a semi-setting position to prevent vomiting.
- Support the breast to prevent nasal obstruction by one hand of the mother and support the baby with the other hand.
- Skin to skin, eye to eye contact, Infant's back is covered with blankets.
- Infant's nose and mouth are not covered.
- Infant's head is turned to one side, Infant's head is in "sniffing" position.
- Infant's shoulders and chest face mother while infant's legs are flexed.
- The infant's lip should engage considerable areola as well as nipple.
- Complete one breast then shift to other one.

Recommendations for maintain breast feeding and adequate milk supply

- Initiation of breastfeeding within the first hour of life.
 - The infant should only receive breast milk without any additional food or drink.
 - Breastfeeding on demand – that is as often as the child wants
 - Feeding at night. and ensure 8-12 feedings per day.
 - No use of bottles or pacifiers.
 - Give no supplements (water, glucose water, commercial infant formula,..etc.)
 - Mother and infant should sleep in proximity to each other to facilitate breastfeeding.
- Different position of mother can achieve the previous goals; cradle position , football position, and slide lying position .

Benefits of breast feeding: Breast feeding decreases the incidence and severity of diarrhea, respiratory illnesses, otitis media, bacteremia, bacterial meningitis, and necrotizing enterocolitis

Selected Beneficial Properties of Human Milk Compared With Infant Formula

FACTOR	ACTION
ANTIBACTERIAL FACTORS	
Secretory IgA	Specific antigen-targeted antiinfective action
Lactoferrin	Immunomodulation, iron chelation, antimicrobial action, antiadhesive, trophic for intestinal growth
κ -Casein	Antiadhesive, bacterial flora
Oligosaccharides	Prevention of bacterial attachment
Cytokines	Antiinflammatory, epithelial barrier function
GROWTH FACTORS	
Epidermal growth factor	Luminal surveillance, repair of intestine
Transforming growth factor (TGF)	Promotes epithelial cell growth (TGF- β) Suppresses lymphocyte function (TGF- β)
Nerve growth factor	Promotes neural growth
ENZYMES	
Platelet-activating factor (PAF)-acetylhydrolase	Blocks action of PAF
Glutathione peroxidase	Prevents lipid oxidation
Nucleotides	Enhance antibody responses, bacterial flora

Adapted from Hamosh M: Bioactive factors in human milk, *Pediatr Clin North Am* 48:69–86, 2001.

Table 56.2

Absolute and Relative Contraindications to Breastfeeding Because of Maternal Health Conditions

MATERNAL HEALTH CONDITION	DEGREE OF RISK
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- There are beneficial effects of feeding preterm infants with human milk on long-term neuro-development (IQ) in preterm infants and have a lower readmission rate in the first year of life.
- Mothers who breastfeed experience both short- and long-term health benefits. Decreased risk of postpartum hemorrhages, more rapid uterine involution, longer period of amenorrhea, and decreased postpartum depression have been observed. Similarly, there is an association between a long lactation and a significant reduction of hypertension, hyperlipidemia, cardiovascular disease, and diabetes in the mother. **Cumulative lactation of more than 12 months also correlates with reduced risk of ovarian and breast cancer**

Problem associated with breast feeding:

***Nipple Pain:** is one of the most common complaints of breastfeeding mothers . Poor infant positioning and improper latch are the most common reasons , If the problem persists and the infant refuses to feed, evaluation for nipple candidiasis is indicated. If candidiasis is present, the mother should be treated with an antifungal cream that is wiped off of the breast before feeding, and the infant treated with an oral antifungal medication.

***Engorgement:** Breasts may become engorged ,firm, overfilled, and painful as a result of incomplete removal of milk due poor breastfeeding technique or infant illness , To reduce engorgement, breasts should be softened prior to infant feeding with a combination of hot compresses and expression of milk. Breastfeeding immediately at signs of infant hunger will eventually prevent engorgement.

***Cracked nipple:** Severe nipple pain and cracking usually indicate improper latch-on, try to

improve the baby's latch, temporary pumping may be all that is needed.

***Plugged ducts** :A plugged milk duct can cause a tender or painful lump to form on the breast. If the nipple itself is plugged, a white dot or bleb can form at the end of the nipple, **causes include:** poor feeding technique, wearing tight clothing or an abrupt decrease in feeding, and infections.

Improve the position the baby so that the baby can latch on properly, Make sure to vary the position during feedings so every part of the breast gets emptied, pumping or manually expressing after feedings to improve drainage. **Never stop breastfeeding**, as this could lead to engorgement and worsen the problem. Try using warm compresses or taking a warm shower and then manually massaging the breast.

***Mastitis**: Mastitis occurs in 2-3% of lactating women and is usually unilateral, manifesting with localized warmth, tenderness, edema, and erythema after the second post-delivery week. Sudden onset of breast pain, myalgia, and fever with fatigue, nausea, vomiting, and headache can also occur. Diagnosis is confirmed by physical examination. Oral antibiotics and analgesics, while promoting breastfeeding or emptying of the affected breast, usually resolve the infection.

***A breast abscess** is a less common complication of mastitis, but it is a more serious infection that requires intravenous antibiotics, incision, and drainage, along with temporary cessation of feeding from that breast.

Breast pumps: Different types of pumps are available, ranging from inexpensive hand pumps to electric pumps. If the baby is not nursing well or if the breasts remain uncomfortably full after breastfeeding, pump after feedings to express any remaining milk and reduce breast firmness. Ten to fifteen minutes of pumping with an electric pump is usually sufficient at one session. Removing milk is essential to reduce the pressure in the breasts and the backup of milk to be used on need however breast milk should never be microwaved.

***Inadequate Milk Intake**: Insufficient milk intake and dehydration in the infant can become evident within the first week of life. Signs of insufficient milk intake include: lethargy, delayed stooling, decreased urine output, weight loss >7% of birth weight, hypernatremic dehydration, inconsolable crying and increased hunger. Insufficient milk intake may be caused by insufficient milk production, failure of established breast-feeding, and health conditions in the infant that prevent proper breast stimulation. Parents should be counseled that breastfed neonates feed 8-12 times a day with a minimum of 8 times per day. Direct observation of breastfeeding can help identify the cause.

Contraindications of breast feeding:

1. **HIV and HTLV** infection In the United States breastfeeding is Contraindicated. In other settings, health risks of not breastfeeding must be weighed against the risk of transmitting virus to the infant.
2. **Tuberculosis** infection Breastfeeding is contraindicated until completion of approximately 2 wk of appropriate maternal therapy
3. **Varicella-zoster infection**: Infant should not have direct contact to active lesions. Infant should receive immune globulin
4. **Herpes simplex infection** : active herpetic lesions of the breast.
5. **CMV infection** May be found in milk of mothers who are CMV seropositive, Transmission through human milk causing symptomatic illness in term infants is uncommon.
6. Chemotherapy, radiopharmaceuticals
 - **Hepatitis B and C** infection Breastfeeding is not contraindicated.

Ten Hospital Practices to Encourage and Support Breastfeeding :

1. Have a written breastfeeding policy that is routinely communicated to all health care staff.
2. Train all health care staff in skills necessary to implement this policy.
3. Inform all pregnant women about the benefits and management of breastfeeding.

4. Help mothers initiate breastfeeding within half an hour of birth.
5. Show mothers how to breastfeed, and how to maintain lactation even if they should be separated from their infants.
6. Give newborn infants no food or drink other than breast milk, unless medically indicated.
7. Practice rooming-in-that is, allow mothers and infants to remain together - 24 hrs a day.
8. Encourage breastfeeding on demand.
9. Give no artificial teats or pacifiers to breastfeeding infants.
10. Foster the establishment of breastfeeding support groups and refer mothers to them on discharge from the hospital or clinic.

• **Formula Feeding**

Despite efforts to promote exclusive breastfeeding through 6 months, less than 50% of women continue to breastfeed at 6 months. The causes include: -

- Parental preference.
 - Medical problems of the infant (e.g. Inborn errors of metabolism).
 - Maternal factors: Medical, social or psychological reasons or other health reasons may prevent a mother from breastfeeding
 - As a supplement to support inadequate weight gain in breast fed infant.
- **Comparison of breast milk, cow's milk and infant formula:-**

	Mature Breast Milk	Cow's Milk	Infant Formula (Modified cow's milk)
Energy (kcal)	62	67	60-65
Protein (g)	1.3	3.5	1.5-1.9
Carbohydrate (g)	6.7	4.9	7.0-8.6
Casein:whey	40:60	63:37	40:60 to 63:37
Fat (g)	3.0	3.6	2.6-3.8
Sodium (mmol)	0.65	2.3	0.65-1.1
Calcium (mmol)	0.88	3.0	0.88-2.1
Phosphorus (mmol)	0.46	3.2	0.9-1.8
Iron (µmol)	1.36	0.9	8-12.5

- Infant formulas are available in
 - Ready-to-feed,
 - Concentrated liquid
 - Powder forms.

* The caloric density of formulas is 19- 20 kcal/30 ml (oz) , similar to that of human milk. Care must be taken in following the mixing instructions to avoid over- or under dilution, to use boiled or sterilized water, and to use the specific scoops provided by the manufacturer as scoop sizes vary. Water that has been boiled should be allowed to cool fully to prevent degradation of heat labile nutrients, specifically vitamin C. Parents should be instructed to use proper hand washing techniques when preparing formula and feedings for the infant.

* Once prepared, all bottles, regardless of type of formula, should be used within 24 hr. Formula should be used within 2 hr of removal from the refrigerator, milk should never be microwaved, and once a feeding has started, that formula should be used within 1 hour or be discarded.

Types of formula:-

- ✓ Cow's-milk-based formula: commonest formula available.
- ✓ Soy-based formula: Indications for soy formula include galactosemia , cow's milk allergy, hereditary lactase deficiency; and situations in which a vegetarian diet is preferred.
- ✓ Hydrolyzed formula: Protein hydrolysate formulas may be partially hydrolyzed, containing

oligopeptides or extensively hydrolyzed.

- ✓ Specialized infant formula Formulas for (premature and low-birth-weight babies)
- ✓ Lactose free formula and Others.

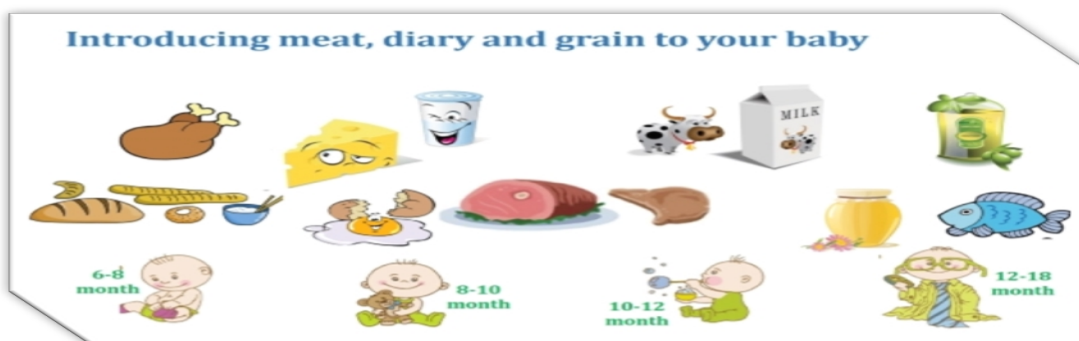
- **Problems associated with formula feeding**

- Risk of cow's milk protein intolerance: Gastrointestinal bleeding, anemia, wheezing, eczema
- Infections risk of contamination.
- Obesity due to over feeding.

- **Complementary feeding:**

After 6 months of age, breast milk becomes increasingly nutritionally inadequate as a sole feed, as it does not provide sufficient energy, vitamins or iron. Solid foods are recommended to be introduced from around 6 months of age, not before 17 weeks and no later than 26 weeks. This is done gradually, initially with small quantities of pureed fruit, root vegetables or rice. Foods high in salt and sugar should be avoided. The timely introduction of complementary foods (solid and liquid foods other than breast milk or formula, also called weaning foods during infancy is necessary to enable transition from milk feedings to other table foods and is important for nutritional and developmental reasons . The most commonly fed complementary foods between 4 and 11 months of age are infant cereals. The complementary foods should be varied to ensure adequate macro- and micronutrient intake. In addition to complementary foods introduced at 6 months of age, continued breastfeeding or the use of infant formula for the entire 1st year of life should be encouraged.

- Begin at 6 mo of age Breast milk should continue to 12 month and Introduce 1 food at a time.
- Whole cow milk should not be introduced until 12 mo of age.
- Iron-containing foods (meat, iron-supplemented cereals) are required
- Zinc intake should be encouraged with foods such as meat, dairy products, wheat, and rice
- Phytate intake should be avoided to enhance mineral absorption
- Give no more than 24 oz/day of cow milk.
- Fluids other than breast milk, formula, and water should be discouraged
- Give no more than 4-6 oz/day of fruit juices; no sugar sweetened beverages.



Feeding problems during the 1st year of life

- Underfeeding and Overfeeding
- Regurgitation and vomiting
- Constipation and Diarrhea stool
- Colic
- Underfeeding and Overfeeding It is difficult to know if a baby is getting enough breast milk except by demonstrating normal weight gain through regular weight checks. Insufficient milk intake and dehydration in the infant can become evident within the first week of life. Inadequate milk intake may be caused by insufficient milk production, failure of established breastfeeding, and health conditions in the infant that prevent proper breast stimulation. Parents should be

counseled that breastfed neonates feed 8-12 times a day with a minimum of 8 times per day. Direct observation of breastfeeding can help identify the cause.

- In formula fed infant the usual intake of formula feed baby is to allow a weight gain of 25-30 g/day will be 140-200 mL/kg/ day in the first 3 months of life. The rate of weight gain declines from 3-12 months of age.
- Adequacy of milk intake can be assessed by voiding and stooling patterns of the infant. A well-hydrated infant voids 6-8 times a day. Each voiding should soak, not merely moisten, a diaper, and urine should be colorless. By 5 to 7 days, loose yellow stools should be passed at least four times a day. Rate of weight gain provides the most objective indicator of adequate milk intake(25-30 g/day).
- **Possetting and regurgitation** are terms used to describe the non-forceful return of milk, but differ in degree. **Possetting** describes the small amounts of milk that often accompany the return of swallowed air (wind) whereas **Regurgitation** describes larger, more frequent losses. Possetting occurs in nearly all babies from time to time, while regurgitation may indicate the presence of more significant gastroesophageal reflux.
- **Vomiting** is the forceful ejection of gastric contents. Common chronic cause is gastro esophageal reflux. Feed volumes should be calculated as overfeeding is common in bottle-fed infants. If vomiting is transient and occurs with other symptoms, e.g. fever, diarrhea or runny nose and cough, most likely to be gastroenteritis or respiratory tract infection, but consider urine infection, sepsis or meningitis. If projectile at 2–8 weeks of age, exclude pyloric stenosis.
- If bile stained, potential emergency – exclude intestinal obstruction, especially intussusception, malrotation and a strangulated inguinal hernia.
- **Infant ‘colic’** The term ‘colic’ is used to describe a common symptom complex that occurs during the first few months of life. Paroxysmal, inconsolable crying or screaming often accompanied by drawing up of the knees and passage of excessive flatus takes place several times a day, Often crying occurs in the evening.
- Definition: the episodes of crying for more than 3 hours a day, for more than 3 days a week for a 3week duration in an otherwise healthy child between the ages of two weeks and four months. The condition occurs in up to 40% of infants typically in the first few weeks of life and resolves gradually from 3–12 months of age. it is a benign condition but it is very frustrating and worrying for parents.

The Diagnosis: exclude any organic cause: cow’s milk protein allergy, gastro-esophageal reflex, obstructed inguinal hernia, etc. Fewer than 5% of infants evaluated for excessive crying have an organic etiology.

Treatments: Techniques for calming infants include soothing vocalizations or singing, swaddling, slow rhythmic rocking, walking, white noise, and gentle vibration (e.g a ride in a car).

- Medications: including phenobarbital, diphenhydramine, simethicone, dicyclomine, and lactase, are of no benefit in reducing colic and should be avoided.
- In most circumstances dietary changes are not effective in reducing colic but should be considered in certain specific circumstances. There is rationale for change to a non-cow’s milk formula if the infant has signs of cow’s milk protein colitis
- Infants who have been tightly swaddled for sleep and rest during the first weeks of life often calm to swaddling during a crying episode; this is not true for infants who have not experienced swaddling before a crying episode.
- **References:**
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- Nelson essentials Textbook of Pediatrics , 7th edition.

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- Protecting, Promoting and Supporting Breastfeeding: The Special Role of Maternity Services, a joint WHO/UNICEF statement published by the World Health Organization