

Medical Advantages of Breast Feeding

D Kumar, MD

MetroHealth Medical Center

Division of Neonatology



Figure 1.1. Five-month-old twins from Islamabad, Pakistan. The bottlefed twin, a girl, was malnourished and suffered from frequent bouts of diarrhea. (Courtesy of Dr. Mushtaq A. Khan, Pakistan Institute of Medical Sciences, Islamabad.)

Protective effects of human milk

- Provides essential protection (delayed development of the immune system)
- Protection is provided by two main mechanisms:
 - Immuno-protective effect.
 - Immuno-modulating effect.

Immune Protection

1. Proteins
2. Lysozyme
3. Casein
4. Glycoconjugates and Oligosaccharides
5. Lipids

Immuno-modulating agents

1. Anti-inflammatory component.
2. Cells
3. Nucleotides
4. Enzymes
5. Hormones and growth factors
6. Prolactin
7. Erythropoietin, melatonin, and leptin



Immunoglobulins

- Secretory IgA
 - Plasma cells produce IgA
 - Lymphoid tissues in the intestine and bronchial tree.
 - Provides protection against immediate environment.
- IgG, IgM, IgD, IgE

Lactoferrin

- Anti-infective function
- High affinity to iron
- Bacteriostatic effect
- Bactericidal effect
- Antiviral (HIV, CMV, HSV)
- Anti-inflammatory
- Modulates cytokines (↔ IL1, IL2, IL6, TNF α)

Lysozyme

- Lyses G +ve and few G –ve bacteria

Casein

- Inhibits adherence of H. Pylori to human gastric mucosa.
- Inhibits adherence of S. Pneumonia, and H. Influenza to respiratory tract epithelial cells
- Bifidobacterium bifidum growth factor.
(acid producing)

Glycoconjugates and Oligosaccharides

- Act as a ligand for microorganisms and viruses and toxins.
- Inhibits binding of
 - E. coli
 - Rota virus
 - HIV
 - Vibrio choerae
 - H. Influenzae
 - S. Pneumonia

Lipids

- Membrane glycoconjugates act as specific bacterial and viral ligand.
- Detergent lytic action of products of TG and FA against enveloped viruses (HIV, HSV), G+ve, G-ve , fungi and protozoa.



Immuno-modulating agents

- Affects the development of the newborn's immune system
- Cytokines that enhance or suppress inflammation
- Soluble receptors of cytokines.

Anti-inflammatory component

- Anti-oxidants (vitamins A, C, E) acts as radicals scavengers.
- Prostaglandin E
- Enzyme inhibitors (PAF)
- Protease Inhibitors (trypsin and chymotrypsin)
- Growth factors

Cells

- Human milk leukocytes
 - Might adhere to the epithelium
 - Might cross into the circulation.

Nucleotides

- Enhance intestinal repair after injury
- Potentiate immune response
- Promote growth of lactobacillus

Other Immuno-modulating agents

- Enzymes
- Hormones and growth factors
- Prolactin



Defense benefits of BF

- BF limits infant exposure to environmental pathogens, and function to enhance infants immune system.
- It offers immunity against
 - Gastrointestinal disease
 - Respiratory illness
 - Otitis media
 - UTI

Gastrointestinal disease

- Protective effect against diarrheal illness in developing countries
- In developed countries it has been proven that breast feeding had a significant effect against GI infections, with a protective effect up to one year in those who were breast fed.
- BF is better tolerated after a GI illness as compared to formula.

Respiratory illness

- Several studies which were done in the US and around the world have shown the protective effect of BF against respiratory illness.
- Other studies have shown protective effect reaching later in childhood.

Otitis Media

- Protective effect.
- BF for at least 4 month.
- Effect up to one year.
- In a study, Nasopharyngeal cultures had lower rate of colonization.

Urinary tract infections

- UTI greater in formula fed infants as compared to BF (5x)
- Reduced adhesion to uroepithelial cells.

H. Influenzae

- Causes sepsis and meningitis in infants
- Reduced risk among BF compared to formula
- Effect on epithelial adhesion.



Defense against chronic diseases

- Chronic diseases in childhood and adolescence.
- IDDM
- Celiac disease
- Childhood cancer
- IBD

Type 1 DM (IDDM)

- An association between formula feeding and later development of IDDM.
- Exclusive or partial non-breast milk may increase the risk among genetically susceptible children.
 - Early exposure to foreign proteins.
 - Depriving of complex immune activity of BM.

IDDM (cont'd)

- Increase in IDDM was associated with with low prevalence of BF.
- Case control studies have found association between artificial feeding and IDDM
- Cross reactivity with receptors on pancreatic β cell surface.

Celiac Disease

- Decreased incidence of CD among those who were BF
- Longer BF duration among those without CD.
- Delayed onset of CD among those BF for a longer duration.
- Some studies have shown 4x increase in the disease in those who are formula fed.

Childhood Cancer

- Studies have found association between artificial feeding and increased risk of childhood cancer.
- Leukemia and lymphoma.
- Duration of exposure to BM was an important factor.
- Hypothesis (infectious agents)

Inflammatory Bowel Disease

- IBD (Ulcerative colitis and Crohn's Disease)
- No consensus in the literature.
- Hypotheses:
 - BF protects infants from GI infections.
 - BF stimulates development and maturation of GI mucosa.



BF effect on brain development and visual acuity.

- Role of Poly-unsaturated fatty acids (LCPUFA)
 - Docosahexaenoic acid (DHA)
 - Arachidonic acid
- These are not present in human formula, but can be synthesized from precursors (α -Linolenic acid, and linoleic acid)
- Brains of infants who were breast fed were found to be more abundant in these LCPUFA, as compared to Formula.

Effect on visual acuity

- Studies have shown that BF infants had a better visual acuity (preferential looking) at 2-4 month of age.
- Same at 6mo, 9 mo and 12 mo.
- Effect is more prominent in preterm infants (enhanced maturation of the visual system)

Effect on cognitive outcome

- Effect is controversial because of so many unforeseen biases, and so many confounding variables.
- Meta-analysis (1999), (11 studies)
 - BF infants had higher “cognitive development score” as compared to formula.
 - Advantage seen at 6-23 month
 - Continued till 10-15 years

Cognitive outcome (cont'd)

- Duration of breast feeding correlated with developmental and cognitive outcome.
- No difference when duration of BF was 4-7 weeks.

Cognitive outcome in premies

- Low birth weight infants had 5.18 point advantage (cognitive development score), as compared with 2.6 advantage in term BF infants.
- Association between BF and higher IQ
 - 10.9 advantage in IQ at 7.5-8 years.



Effect of BF on mother

- BF is beneficial to woman's health.
 - Direct health benefits
 - Sense of bonding
 - Sense of well being.
- Health benefits
 - Breast cancer
 - Ovarian cancer
 - Osteoporosis
 - fertility

Breast cancer

- Significant protective effect of BF against premenopausal breast CA.
- The protective effect is directly related to the duration of breast feeding.

Relative risk of breast CA

<u>Duration of BF</u>	<u>RR</u>
3-6 mo	0.54-.85
Up to 12 mo	0.39-0.71
>2 years	0.4-0.72
>6 years	0.35

Ovarian Cancer

- Protective effect.
- RR 0.6
- BF even for 2 month showed a ↵ by 20-25% of risk of ovarian ca.
- No dose response phenomena.

Osteoporosis.

- Women who breast fed earlier in life had a better bone status at menopause
- BF
 - Negative short term effect on bone.
 - Long term positive effect.



- **Questions for Self learning**

- 1. Name 5 immunoprotective components present in Human Breast Milk
- 2. What is the role of oligosaccharides in breast milk
- 3. What is the role of nucleotides in Breast milk
- 4. Role of breast milk in preventing respiratory diseases in childhood
- 5. Role of breast milk in preventing childhood diarrhoea
- 6. Name 3 chronic childhood diseases that breast milk use may prevent
- 7. What is the role of breast milk in visual acuity and cognitive development of preterm infants?
- 8. What are the benefits of breast feeding to the mother?