

**An assessment of the importance of breast-feeding and its impact on
Infants**

Dissertation Submitted to



The IIHMR University, Jaipur

for the partial fulfilment for the award of the degree of Master of Business

Administration (MBA)

in

Pharmaceutical Management

by

Dhruv Dharoch

Under the Supervision and Guidance of

Mr. Rahul Sharma

2021

**An assessment of the importance of breast-feeding and its impact on
Infants**

Dissertation Submitted to



The IIHMR University, Jaipur

for the partial fulfilment for the award of the degree of Master of Business

Administration (MBA)

in

Pharmaceutical Management

by

Dhruv Dharoch

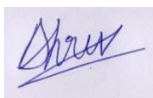
Under the Supervision and Guidance of

Mr. Rahul Sharma

2021

DECLARATION BY STUDENT

I hereby declare that this dissertation titled “An assessment of the importance of breast-feeding and its impact on Infants” is the bonafide record of my original research work. I declare that it has not been submitted to any other university or institution for the award of any degree or diploma. Information derived from the published or unpublished work of others has been duly acknowledged in the text.



(Signature)

Name of Student – Dhruv Dharoch

Date- 30-06-2021

CERTIFICATE

This is to certify that Dhruv Dharoch in partial fulfillment of the requirements for the award of the degree of MBA Pharmaceutical Management from the IIHMR University, Jaipur has successfully completed her/his internship at Nestle India during March 22, 2021 to June 19, 2021.

Place- Jhansi

Date- 30-June-2021

Manish Mishra

Senior Nutrition Executive

Nestle India

CERTIFICATE

This is to certify that dissertation titled “An assessment of the importance of breast-feeding and its impact on Infants” is a record of the research work undertaken by Dhruv Dharoch in partial fulfillment of the requirements for the award of the degree of /MBA (Pharmaceutical Management) from the IIHMR University, Jaipur under my guidance and supervision and his/her approach to the research study has been sincere, scientific, and analytical.

Faculty Guide
IIHMR University, Jaipur

Date

School Dean
IIHMR University, Jaipur

Date

ABSTRACT

Breast milk is said to be the most important feed for babies, specially up to 6 months of age yet in India less than half of the mothers are able to breastfeed their babies exclusively during the first 6 months of age. Also, orphans do not get breast milk and they form a large part of the population. Therefore, it is important to understand what is the composition of breast milk and what makes it so important that it is claimed that it cannot be and should not be replaced until and unless necessary. In this paper, composition of milk is given along with its importance and impacts on mothers, babies and on larger population as well. Secondary research is done and data is collected from existing studies for the same. Some diseases and conditions that are directly linked to non-consumption of breast milk are also discussed in this paper. A brief comparison between breast milk and infant formula is also done and the impact of both on infants is also discussed.

There are many components in the breast milk and their individual role is also mentioned so that we can get an idea of how important each component is. Breast milk is dynamic in nature which means its composition changes with time. These changes must be taken into account when designing an infant formula and this is again, an important part of this paper. Finally, we can conclude that breast milk is in fact the best feed that is irreplaceable with the current available alternatives. There are negative effects according to many studies mentioned in this paper in cases where infants do not consume breast milk, these effects are even seen in the later life of the infants. In India many parents and caretakers are voluntarily choosing infant formulas without understanding the role of breast milk. Many health institutes are unnecessarily feeding new-borns with formulas as it is becoming a trend. So, it is important to understand and people must be made aware that breast milk should be given to infants and other alternatives should be only considered when it is impossible to obtain breast milk.

ACKNOWLEDGEMENTS

I take this opportunity to express my profound gratitude and deep regards to Manish Mishra (Senior Nutrition Officer Nestle) for providing me this wonderful opportunity. I want to extend my sincere regards to my team for sharing his feedback and views on the project.

I would like to sincerely thanks my college mentor Mr. Rahul Sharma for his cordial support and feedback. With his continuous help and effective guidance, I was able to complete my thesis.

I express my deep sense of gratitude to my dear friends and family for their moral support through the process of researching and writing the thesis. The accomplishment wouldn't have been possible without them.

TABLE OF CONTENTS

CHAPTER 1. Introduction.....	1
CHAPTER 2. Review of Literature.....	9
CHAPTER 3. Methodology.....	12
CHAPTER 4. Research Question.....	12
CHAPTER 5. Objective.....	12
CHAPTER 6. Case definitions.....	13
CHAPTER 7. Results.....	14
CHAPTER 7.1. Screening Methods for Oral Cancer.....	14
CHAPTER 7.1.1. Opportunities.....	20
CHAPTER 7.1.2. Challenges.....	22
CHAPTER 7.2. Policies and Facilities for screening of Oral Cancer.....	25
CHAPTER 7.2.1. Central and State Government initiatives.....	25
CHAPTER 7.2.2. Non-Governmental initiatives.....	30
CHAPTER 7.2.3. Challenges.....	33
CHAPTER 8. Discussion.....	36
CHAPTER 9. Recommendations.....	38
CHAPTER 10. References.....	39

LIST OF FIGURES

Fig 1.1: Important potentially malignant disorders (PMDs)

Fig 1.2: Estimated no. of incident cases of lip and oral cavity for all age groups and sexes:

Fig 1.3: Age standardised incidence and mortality rates (World) in 2020 for lip and oral cavity cancer

Fig 1.4: Number and proportion of new cancer cases in India in 2020 for both sexes and ages

Fig 1.5: Estimated number of incident cases and deaths from 2020 to 2025

Fig 1.6: Number of lip, tongue and mouth cancer related with the use of tobacco by region

Fig 1.7: Proportion of total cancer DALYs by several cancer types in India, 2016 (top 10 only)

Fig 1.8: Estimated no of cases in 2020 – according to Income levels

Fig 6.11: Methods for oral cancer detection

Fig 6.12: Description of techniques for oral cancer detection

Fig 6.13: Adults aged 30–69 years who had ever undergone oral cancer screening (%)

Fig 6.21: Screening and follow up processes for Oral cancer screening

Fig 6.22: Relative position of people who attended the NCD Clinics or attended Outreach Activities (including population-based screening) for the last 5 years

Fig 6.23: a) Total registrations for screening services under ACTREC; b) Total persons screened for common cancer under ACTREC

LIST OF TABLES

Table 1.1: Number and relative proportion as per Stage of disease for both tongue and mouth cancer

Table 6.21: Relative position of infrastructure from 2014-2020

Table 6.22: Impact of the cancer screening initiatives by ICS

ABBREVIATIONS

AB - Ayushman Bharat
ANM- Auxiliary Nursing Midwifery
ASHA- Accredited Social Health Activist
BPL - Below Poverty Line
CCI - Commission on Chronic Illness
CHC - Community Health Centre
CPHC - Comprehensive Primary Health Care
CSR – Corporate Social Responsibility
DALY - Disability-adjusted life year
DH - District Hospital
GBD - Global Burden of Disease
GDP - Gross domestic product
GLOBOCAN – Global Cancer Incidence, Mortality and Prevalence
GoI – Government of India
HBCRs - Hospital Based Cancer Registries
HMC PF - Health Minister’s Cancer Patient Fund
HMDG - Health Minister’s Discretionary Grant
HWC - Health and Wellness Centers
IACR - International Agency for Research on Cancer
ICD - International Classification of Diseases
ICMR - Indian Council of Medical Research
LMICs - Low- And Middle-Income Countries
MeSH - Medical Subject Headings
MoHFW - Ministry of Health and Family Welfare
NCCP - National Cancer Control Programme
NCD - Noncommunicable Disease
NCDIR - National Centre for Disease Informatics and Research
NCRP - National Cancer Registry Program
NFHS - National Family Health Survey
NGO – Non-Governmental Organisation
NNMS - National Noncommunicable Disease Monitoring Survey

NPCDCS - National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke

OC – Oral Cancer

OEC - Oral Exfoliative Cytology

OOPE- Out-of-pocket expenditure

OPMDs - Oral Potentially Malignant Disorders

OSCC – Oral Squamous Cell Carcinoma

OVE - Oral Visual Examination

PBCRs - Population Based Cancer Registries

PMJAY - Pradhan Mantri Jan Arogya Yojana

RAN - Rashtriya Arogya Nidhi

RCC – Regional Cancer Centres

RSBY - Rashtriya Swasthya Bima Yojana

SCHIS - Senior Citizens Health Insurance Scheme

SCI – State Cancer Institutes

TCCC - Tertiary Care Cancer Centres

UHC - Universal Health Care

WHO - World Health Organization

INTRODUCTION

Why is it so important to know how many mothers breastfeed their babies? What happens in all of those cases where it becomes impossible for the mother to breastfeed her baby? What makes breastmilk so important and are there really any replacements or alternatives to breastmilk? What is it in breastmilk that makes it so crucial for the infants? And finally, what are the impacts on babies that are not fortunate enough to consume breast milk with respect to their brief term and prolong-term health.

These are the questions that we are going to find the answers to in this research paper and that is the aim of this research paper.

The objective of this paper is to understand what proportion of mothers, breastfeed their infants exclusively and what proportions of them rely on infant formulas for their needed nutritional requirements and what are the short term and long-term difference between breastfed and infant formula fed infants.

On December 13, Dr Hash Vardhan, Union Minister for Health and Family Welfare released some information of the fifth round of the NFHS-5 conducted in 2019-20 for 21 states and Union Territories (UTs) included in the first phase of this survey. NFHS-5 findings show a worrying trend in child feeding practices. A significant decline has been reported in children under three years of age who are breastfed during the first hour of birth.

In India, only 44% of the babies breastfeed during the first hour of their birth according to Rapid Survey on Children report (2013-2014), “Ministry of Women and Child Development” Government of India. So, the main question is what happens to those babies that do not get mother’s milk? This is important to understand as the future generation’s health rely on the current breastfeeding practices.

In this paper, along with the composition of breastmilk, the conditions due to which breastfeeding becomes impossible are also discussed.

REVIEW OF LITERATURE

Author	Objective	Study location	Methodology	Salient features
“Olivia Ballard, JD, PhD (candidate) and Ardythe L. Morrow, PhD, MSc” (2013)	“Human Milk Composition: Nutrients and Bioactive Factors”	NA	Secondary Research through research articles.	“Human milk is a dynamic. Standardized, multi-population studies of human milk composition are sorely needed to create a rigorous, comprehensive reference inclusive of nutrients and bioactive factors.”
“Felix Akpojene Ogbo, Mansi Vijaybhai Dhami, Akorede O. Awosemo, Bolajoko O. Olusanya, Jacob Olusanya, Uchechukwu L.” (2019)	Regional prevalence and determinants of exclusive breastfeeding.	NA	“This study used a total weighted sample of 21,352 from the 2015–2016 India National Family Health Survey.”	“This study indicated that wide differences in the prevalence of EBF and other childhood feeding practices exist across regions of India, where Southern India had the highest EBF prevalence (79.2%) and the North-East reported the lowest (68.0%)”. “Improving only breastfed participation in India would need multifaceted attempts that comprise dedicated funds and the establishment of appropriate policy and interventions that are consistently monitored and evaluated.”

“Elana Pearl Ben-Joseph, MD” (2017)	Breastfeeding vs. Formula Feeding	NA	To guarantee our babies’ health depends on having clean air, clean water, safe food and safe environment. Breast-milk as a product has been endorsed to be the safest, uncontaminated and environmental friendly, with the product consumed without waste that could contribute to environmental disaster.	To guarantee our babies’ health depends on having clean air, clean water, safe food and safe environment. Breast-milk as a product has been endorsed to be the safest, uncontaminated and environmental friendly, with the product consumed without waste that could contribute to environmental disaster. Breast-milk as a product has been endorsed to be the safest, uncontaminated and environmental friendly, with the product consumed without waste that could contribute to environmental disaster. To guarantee our babies’ health depends on having clean air, clean water, safe food and safe environment. Breast-milk as a product has been endorsed to be the safest, uncontaminated and environmental friendly, with the product consumed without waste that could contribute to environmental disaster. To guarantee our babies’ health depends on having clean air, clean water, safe food and safe environment. Breast-
-------------------------------------	-----------------------------------	----	--	--

				milk as a product has been endorsed to be the safest, uncontaminated and environmental friendly, with the product consumed without waste that could contribute to environmental disaster. To guarantee our babies' health depends on having clean air, clean water, safe food and safe environment. Breast- milk as a product has been endorsed to be the safest, uncontaminated and environmental friendly, with the product consumed without waste that could contribute to environmental disaster. To guarantee our babies' health depends on having clean air, clean water, safe food and safe environment. Breastfeeding is a skill that must be learnt by mother and child for good breastfeeding outcome.
“Xin-Nan Zong,Hui Li ,Ya-Qin Zhang,Hua-Hong Wu” (2020)	“Growth performance comparison of exclusively breastfed infants with partially	NA	“Data was collected from more than 100000 infants from China National Surveys in 2006 and 2015 which is in	To guarantee our babies' health depends on having clean air, clean water, safe food and safe environment. Breast- milk as a product has been endorsed to be the safest, uncontaminated and environmental friendly, with the product consumed without waste that could contribute to environmental disaster.

	breastfed and formula fed infants”		fourth and fifth phase.”	“Exclusively breastfed infants were generally a little heavier than partially breastfed and formula fed infants aged 1-<6 months; however, there was not a significant statistical difference between continued breastfeeding and formula feeding infants aged 6-<12 months. However, infants who were continued to be breastfed were a little shorter compared to those who were formula fed (ages 6-<12 months)”
“Sears, Allan B Becker, Piushkumar J Mandhane 1, Stuart E Turvey, Theo J Moraes, Padmaja Subbarao, James A Scott 4, Anita L Kozyrskyj,” (2018)	“Associati on of Exposure to Formula in the Hospital and Subsequen t Infant Feeding Practices With Gut Microbiot a and Risk of Overweig ht in the 1 st year”	Canada	“In this study of a subset of 1087 infants from the prospective CHILD pregnancy cohort, mothers were recruited between January 1, 2009, and December 31, 2012. Statistical analysis was performed from February 1 to December 20, 2017.”	To guarantee our babies’ health depends on having clean air, clean water, safe food and safe environment. Breast-milk as a product has been endorsed to be the safest, uncontaminated and environmental friendly, with the product consumed without waste that could contribute to environmental disaster. To guarantee our babies’ health depends on having clean air, clean water, safe food and safe environment. Breast-milk as a product has been endorsed to be the safest, uncontaminated and environmentally friendly, with the product consumed without waste that could contribute to environmental disaster.

				“Breastfeeding may be protective against overweight, and gut microbiota may contribute to this effect. Formula feeding appears to stimulate changes in microbiota that are associated with overweight, whereas other complementary foods do not. Microbiota profiles at 3 months were more strongly associated with risk of overweight than were microbiota profiles at 12 months.”
--	--	--	--	---

METHODOLOGY

This study is a descriptive study, which utilizes a structured search of articles based on keywords, wherein relevant studies were retrieved from well recognized databases presented on the Google Scholar, PubMed, Cochrane Library, ScienceDirect & GOI websites. The following keywords were used to gather the sources required, which was accomplished through a secondary desk research:

1. “Breastfeeding vs Infant formula fed babies” OR “Composition of human milk” OR “how many mothers breastfeed their babies in India”. Then the resultant papers were studied and evaluated.
2. “Diseases due to lack of breastfeeding” OR “reasons for not breastfeeding” OR “infant formula” OR “NCDs due to lack of breastfeeding” OR “after effects of not breastfeeding” OR “rise of use of infant formula” OR “early detection”
3. Indian states or nearby countries to India

Then a targeted research was done based on the above mentioned terms.

Inclusion criteria:

1. Relevant articles published after 2000 which were available for public use
2. Studies conducted in the English language.

RESEARCH QUESTION

How many mothers breastfeed their babies in India, and what are the impacts of breast milk and infant formula on baby's health.

OBJECTIVES

- To find out what proportion of mothers in India breastfeed their babies and why is it so important?
- What is the composition of breastmilk? And what are the conditions where breastfeeding is not possible?
- What impact does it have on babies that do not consume breast milk and those who consume infant formula?

RESULTS

CHAPTER 6: IMPORTANCE OF BREAST FEEDING

Composition Of Breastmilk or Human Milk

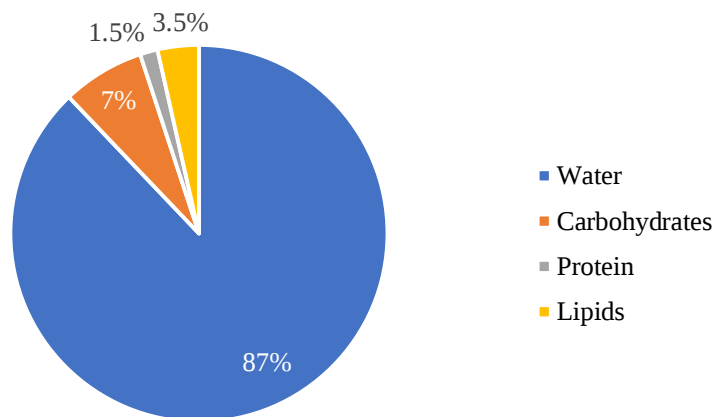
Human milk is indeed an extremely complex solution that adapts itself according to the need of the baby. So, the composition of breast milk actually changes with time. In fact, breast milk is so dynamic that it differs with respect to the sex of the baby and with respect to preterm and term babies.

According to some studies breast milk can vary based on the environment too. For example, in dry regions, the water content is more in breastmilk as compared to tropical regions. Therefore, breast milk is said to be the gold mark of food source for infants and WHO recommends absolute breastfeeding for six months which should be continued to 2 years of age and even beyond. This means that even after six months of age, when the infant is introduced to solid food, breast milk should be fed to two years of age and even beyond as there is no alternative to it that can replace it.

This is how the composition of breast milk is-

There is 87% water, protein is 1.5%, 3.5% lipids and 7% carbohydrates in human milk.

Basic Composition of Breast Milk

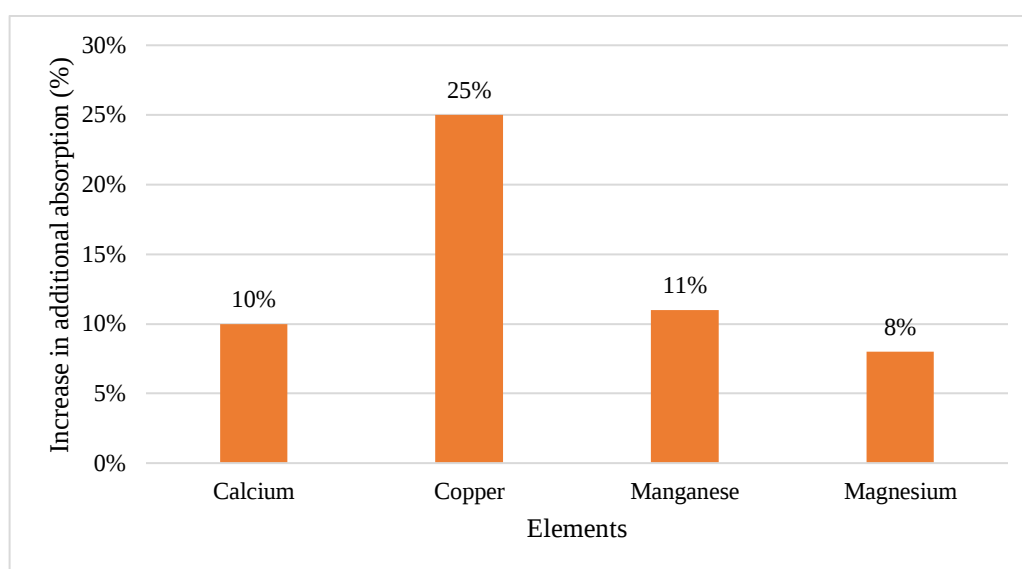


Macronutrient Content of the milk- The overall carbohydrate, fat and protein content in human milk is robust even in different population despite differences in nutritional intake by

mothers. On average, the macronutrient composition of breast milk is 1.3g/dL for Protein, 3.5g/dL for Fat, 7.4g/dL for Lactose (which is also the predominant form of sugar present in breast milk), the energy content is about 70 kcal/dL. Lactose is a prebiotic for probiotics, it acts as a metabolite substrate for gut microbiota and increases saccharolytic functions leading to growth of bifidobacterial and lactobacilli. This function can result in having with lowered pH and reduced ammonia concentration, decreased aerobic flora.

Lactose enhances nutrient absorption as well. It has been observed that lactose increases the additional absorption in the following percentages-

Calcium by 10%, copper by 25%, manganese by 11% and magnesium by 8%.



Additional amounts of elements absorbed due to Lactose

The most commonly found protein in breast milk are whey and casein in ratio of 72:28 respectively in early lactation which decreases to about 50:50 in late lactation as per the requirement of infant. This happens because, in the early days, the digestive system of the infant is quite immature and whey protein is easy to digest and absorb as compared to casein but with time the digestive system of the baby matures and becomes more effective. Whey protein has a good level of branched chain amino acids (BCAAs) that are crucial for tissue repair and growth.

L. reuteri is a probiotic which is found in the breast milk. It has antimicrobial action as it produces antimicrobial substances like reuterin and reutericyclin that inhibits the growth of unhealthy bacteria in the gut microbiota and promotes growth of healthy bacteria. *L. reuteri*

has antioxidant effect as it prevents oxidative damage caused by free radical. Immunoregulatory and anti-inflammatory effects in the human gut through controlling LPS induced TNF alpha and intestinal damage which means it also has anti-inflammatory effects. Oligosaccharides are present in about 1g/DL.

Micronutrient Content of the milk- There are few vitamins and minerals found in breastmilk. Vitamins like “Vitamin B12, Vitamin D, Vitamin C and Vitamin A are present in good quantities. Vitamin E, Vitamin K, Folate, Thiamin (B1), Riboflavin (B2), Niacin (B3), and Pantothenic Acid (B5) are all present in breast milk.” The Calcium to Phosphorus ratio of breast milk is appropriate which is about 1.9:1 which helps in softer stool formation and supports bone health and development.

Breastmilk contains various bioactive factors (living cells, antibodies, cytokines, growth factors, oligosaccharides, hormones).

Fig: Guatemalan mothers' breast milk mineral and trace element concentrations at 3 stages of lactation.

	Stage of lactation			
	Transitional, 5–17 d	Early, 18–46 d	Established, 4–6 mo	P
Minerals, ² mmol/L				
Calcium	6.56 ± 1.22	6.64 ± 0.90	6.37 ± 0.84	0.15
Magnesium	0.93 ± 0.18 ^b	0.93 ± 0.16 ^b	1.45 ± 0.22 ^a	<0.00
Potassium	15.1 ± 2.1 ^a	13.4 ± 1.8 ^b	11.0 ± 1.4 ^c	<0.00
Sodium	6.35 ± 1.44 ^a	5.41 ± 1.17 ^b	4.17 ± 0.96 ^c	<0.00
Trace elements, ² µmol/L				
Copper	9.24 ± 1.81 ^a	7.24 ± 1.51 ^b	4.13 ± 1.25 ^c	<0.00
Iron	10.0 ± 7.9 ^a	10.4 ± 8.0 ^a	5.73 ± 4.48 ^b	<0.00
Manganese	0.21 ± 0.15 ^a	0.20 ± 0.17 ^{a,b}	0.14 ± 0.13 ^b	0.002
Rubidium	13.1 ± 2.9 ^a	12.3 ± 2.7 ^a	9.48 ± 2.22 ^b	<0.00
Selenium	0.21 ± 0.06 ^a	0.21 ± 0.08 ^a	0.17 ± 0.07 ^b	<0.00
Strontium	0.50 ± 0.16	0.53 ± 0.18	0.52 ± 0.16	0.59
Zinc	66.7 ± 14.4 ^a	53.0 ± 17.7 ^b	20.0 ± 11.9 ^c	<0.00

Guatemalan mothers' breast milk mineral and trace element concentrations at 3 stages of lactation.

There are HMOs, growth hormones, DHA and ARA and *L. reuteri* in human milk. *L. reuteri* is a probiotic which is naturally found in breast milk, and it helps infants to fight infantile colic and it promotes the growth of healthy bacteria in gut microbiota as well as inhibits the growth of unhealthy gram-negative bacteria in gut microbiota of infants.

Bifidus factors are also present in breast milk, t

his aspect is a selected aspect that promotes the boom of *Lactobacillus Bifidus*. The Bifidus aspect is found in human milk however now no longer cow's milk. The *L. Bifidus* produces acetic acid and lactic acid, which bring about reduced stool pH, which, in turn, inhibits the boom, of ability pathogens together with *E. Coli*. There are approximately 800 lines of micro organism observed in breastmilk. As the breast milk continues to adapt itself as per the need of the infants, it is classified as per stages namely colostrum, transitional milk, and mature milk.

Colostrum- Colostrum is the yellowish milk which is produced for the initial 3-5 days of breastfeeding. It contains big number of antibodies and WBCs, therefore it is also referred to as natural vaccination. Colostrum's protecting traits also are crucial to your baby's digestive system. Its Vitamin A, Vitamin C, Vitamin K and Vitamin E quantities are higher than the mature milk. Compared to mature milk, colostrum contains more protein, less carbohydrates and much less fat. A higher percentage of fat-soluble vitamins and minerals is there in colostrum and increased concentrations of secretory immunoglobulin A, oligosaccharides and lactoferrin which contribute too its infection protection properties.

- Vitamin A is a fat-soluble vitamin that has many functions including roles in growth, immune function and maintaining cellular differentiation throughout life, it is also responsible in maintaining healthy vision.
- Vitamin C also functions as a cofactor for enzymes. It is involved in biosynthesis of collagen, fatty acid metabolism, iron absorption, transport and storage. It is also a highly effective antioxidant.
- Vitamin D is a fat-soluble vitamin that plays important role in bone growth by maintaining concentrations of calcium and Ph in the blood. It is necessary for bone mineralization and growth.

- Choline is an essential nutrient that is important for brain development related to memory, it is also necessary for synthesis of phosphatidylcholine, which is an important component of cell membranes.
- Carotenoids are natural antioxidants found in breastmilk that have possible immune enhancing effects. Breastmilk contains a variety of carotenoids such as provitamin A carotenoids and lutein which is also found in human retina.
- Vitamin E is a fat soluble vitamin that functions within an antioxidant network to help protect cells from adverse effects of free radicals. It appears to stabilize the cell membranes in the lenses of the eyes.

Transitional Milk- From day 5 to 14, breast milk is known as transitional milk and this is because the milk is changing from colostrum milk to mature milk during this phase. Transitional milk has higher fat content, lactose and calories that supports rapid growth of babies. In the transitional milk, concentration of immunoglobulins and total protein are decreasing, levels of fat- soluble vitamins are decreasing, lactose, fat and total protein are increasing and levels of water-soluble vitamins are increasing.

Mature Milk- By the time the infant is 4 weeks old, the milk becomes mature milk, it is rich in sugars, proteins, vitamins and minerals.

Importance Of Breast Feeding

There are many reasons why breastfeeding is so important. Many infants die due to suboptimal breastfeeding, and according to WHO, suboptimal breastfeeding causes more than 800,000 infant deaths.

There are many diseases that studies have found to be more prevalent in babies that did not breastfeed. This is because natural antibiotics present in breast milk provides protection to baby from Diabetes, Cardiovascular diseases, hypertension, mental retardation, obesity and obesity linked diseases, gastritis, pneumonia, diarrhoea etc according to WHO.

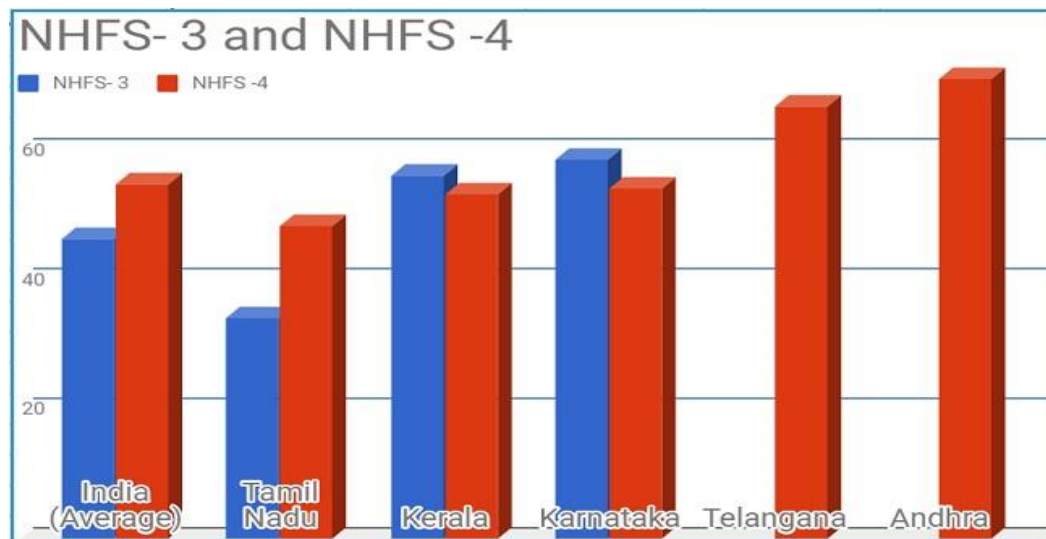
Breast milk contains components that cannot be mimicked artificially. So, it does not matter how close an infant formula comes to breast milk, breast milk will remain to be the gold standard for infant food source. ~~The composition is given later in this paper.~~ For mothers, breastfeeding protects them from breast cancer, diabetes, uterine cancer and postpartum depression according to WHO.

Breastfeeding is also important for India as low investment in breastfeeding results in economic loss of 14 billion US\$ due to child death and cognitive loss caused from poor breastfeeding practices. It also forms an emotional bond between mother and her baby which can never be measured and hence is biggest loss caused by lack of breastfeeding. For poor households, affordability of alternatives to breastmilk is a task in India. Infant formulas are expensive, and many families struggle to afford them.

Hence, breast milk becomes the most economical option. Also, in developing Nations, due to unhygienic conditions, infant formulas can cause more infections even when they are sterile.

Proportion Of Mothers Breastfeeding In India

In India, only 44% of the babies breastfeed during the first hour of their birth according to RSC Report (2013-2014), “Ministry of Women and Child Development Government of India”. According to a report by UNICEF, only 41.6% babies in India are breastfed. As per WHO tracking tool, currently only 55% of babies are exclusively breastfed in India.



Reference- NFHS-3 and NFHS-4 data available on The News Minute.

Now the question that comes in our mind is why so many mothers do not breastfeed their babies?

There are many conditions and situations in which it becomes extremely difficult for the mothers to breastfeed their babies like- Nipple soreness, swelling of breast after delivery, maternal psychological and physiological factors, maternal stress, caesarean delivery, severe illness such as postpartum haemorrhage, breast infection, inadequate glandular tissue and so on.

CHAPTER 2: IMPACT OF BREASTFEEDING v.s. INFANT FORMULA ON INFANTS

Impact On Babies That Do Not Consume Breast Milk But Consume Infant Formula

A range of fitness organizations — which include the American AAP, the AMA, and WHO — advocate breastfeeding because the exceptional preference for toddlers. Breastfeeding enables shield in opposition to infections, save you allergies, and defend in opposition to some of continual conditions.

The AAP say that babies should be breastfed solely for the primary six months. Beyond that, breastfeeding is endorsed till as a minimum one year, and after one year in case each the mom and infant are willing. WHO recommends that little one need to be completely breastfed for 6 months after which persevered breastfeeding need to be accomplished for 2 years and beyond.

In a take a look at accomplished through Xin-Nan Zong, Hui Li, Ya-Qin Zhang, Hua-Hong Wu (2020), boom overall performance of completely breastfed, partly breastfed and little one components fed toddlers in China changed into accomplished.

Information from a more than 100000 babies elderly One to less than twelve months have been gathered from the 4th and fifth China National Surveys in 2005 and 2015. Feeding styles have been labeled into 3 kinds for babies beneath Neath 6 months of age: unique breastfeeding, partial breastfeeding and components feeding. Exclusive breastfeeding refers to feeding completely from the mother's personal milk (bottle-feeding included).

This changed into a study of China National Surveys carried out in 2005 and 2015. 34.0% and 43.9% of babies have been completely breastfed and 41.5% and 36.3% have been partly breastfed at 4-<6 months in 2005 and 2015 respectively. Exclusively breastfed babies have been typically a touch heavier than partly breastfed and components fed babies elderly 1-<6 months; however, there has been now no longer a sizeable statistical distinction among persevered breastfeeding and components feeding babies elderly six to 12 months. No sizeable statistical distinction for period changed into determined a few of the 3 companies for a long time one to six months; however, babies who have been persevered to be breastfed have been a touch shorter in comparison to individuals who have been components fed (a long time 6-<twelve months). For babies one to two months there has been now no longer a

widespread distinction from the 2006 WHO boom standards; however, for babies elderly two months to 1 year the common weight and period of various feeding babies in China have been a touch heavier and longer than the 2006 WHO boom standards.

Obesity- This is one of the most interrelated condition with breastfeeding and infant formula feeding. According to a research done by Jessica D. Forbes, Meghan B. Azad and Lorena Vehling, in 2018 beginning from 2009, “it was observed that infants who were exclusively formula fed at 3 months had an increased risk of overweight in covariate-adjusted models. Formula feeding appears to stimulate changes in microbiota that are associated with overweight, whereas other complementary foods do not.”

It is evident from many research on breastfeeding and obesity that breastfeeding does reduce the chances of obesity, not only during infancy but in later life as well. This also has to do with the amount of insulinogenic amino acids present in breast milk. In majority of the infant formulas across a wide range of brands, insulinogenic amino acids were found to be in higher quantities than breast milk. IAA or insulinogenic amino acids are directly linked with obesity as their exposure leads to adipogenesis. Adipogenesis is the process in which stem cells are transformed into adipocytes which are the cells that store fat molecules.

Breastfeeding also supports growth of healthy bacteria in gut thus improving baby’s digestive system which further improves immunity and metabolism, ultimately leading to reduced risk of obesity. Also, infants that breastfeed control the intake of milk that they need to consume as per their requirement.

Cardiovascular Disease- It has been observed in a number of studies that non-breastfed people have higher risk of developing cardiovascular diseases in their later life.

According to a paper- “Association Between Breastfeeding and Childhood Cardiovascular Disease Risk Factors” it was found that those babies that were not breastfed showed greater prevalence of CVDs than the breastfed group. Therefore it is true that breastfeeding reduces the cardiovascular disease risk factor in the later stages of life. Breastfeeding is also associated with BMI, HDL and LDL levels.

People that were breastfed have more appropriate BMI and HDL levels in adulthood as well which means their chances of developing cardiovascular diseases reduces significantly.

Gastrointestinal Infections- There are many studies that have found that formula fed infants are more likely to develop diarrhoea and gastroenteritis. In a study done by Howie and Chien it was observed that those infants that consumed infant formula had about three times more chances of developing gastrointestinal infection than breast milk fed infants.

FGIDs are one of the greatest problems that infants suffer from during first six months of their lives. FGIDs are mind intestine interplay issues that have an effect on approximately 1 out of each four adults and feature a enormous terrible effect on best of life, paintings productiveness and fitness care costs. Functional Gastro Intestinal Disorders include Infant regurgitation which can occur till 12 months of age. IRS is another symptom that can be seen under FDIDs. One of the biggest FGIDs is Infantile Colic. It has been proven by a number of research that *L. reuteri*, which is a probiotic naturally present in the breast milk can treat infantile colic with great efficacy. Nestle uses *L. reuteri* in its infant formulas for the same purpose as this probiotic is patented by them.

Infant dyschezia can occur up to 8months of age and functional constipation can occur to babies of even 2years plus of age. Lactose, which is the predominant form of sugar present in breast milk helps in smoother stool formation by its laxative effects, hence helping with the problems of constipation as well. Other than that lactose has some other important role as well. But in all those cases where breast milk is not consumed by the baby then all these problems can occur. Likewise, if the infant is taking some term formula which does not contain lactose and *L. reuteri* then it may lead to the above mentioned FGIDs.

Diabetes – There have been many studies that indicate that non-breastfed infants are 3 times more likely to develop Type 2 Diabetes mellitus (T2DM). According to a paper “Breastfeeding and Type 2 Diabetes: Systematic Review and Meta-Analysis” by Bernardo Lessa Horta & Natalia Peixoto de Lima, the majority of the included studies reported that breastfeeding decreased the odds of type 2 diabetes. Researchers have proposed several mechanisms to explain these associations, including differences in composition of human milk versus formula, feeding practices, associated lifestyle factors, and self-regulation of intake by the infant. Moreover, human milk contains adipokines, which may play a role in regulating energy intake and long-term obesity risk.

Neurodevelopment- For brain development there are many components that play their important role, for example phospholipids, choline, DHA, ARA, and iodine are naturally

present in milk which if not given up to certain amounts will lead to underdeveloped neurodevelopment.

Impact Of Infant Formula On Infant's Health

To understand the role and effect of infant formula on the health of infants it is first important to understand the composition of infant formulas. The first infant formula was developed in 1865 by chemist Justus von Liebig. Liebig's formula— which include cow's milk, wheat and malt flour, and potassium bicarbonate. This formula was considered to be the best alternative of breast milk in that time. But, today, we cannot allow someone to even feed such formula to an infant. This is because, infant formulas have developed and evolved so much with time. There are many big infant food companies that invest billions of dollars in their research and development just like any other pharmaceutical company do. This is also because now, many stringent guidelines by many important organizations regarding infant formula have taken account for the very same purpose.

The AAP recommends fortified breast milk for premature infants. IYCF, AAP are some of the many such organizations that sets recommendations and guidelines on such matters related to breastfeeding. Infact, any organization that is manufacturing, selling, or promoting infant formula have to mandatorily promote the importance of breastmilk in order to conduct its own business.

With time, many brands have developed infant formulas that comes so close to the breast milk but still no infant formula is better than or equal to the natural breast milk. Extensive reverse engineering is done to come up with these formulas. Milk is studied with super advanced technologies and newer technologies are implemented to mimic breastmilk.

This makes it very confusing to decide the exact impact of infant formula on infant's health. But, for a long period infant formulas were disregarded by a big majority of healthcare professionals. This is definitely changing with time as more and more doctors are recommending infant formulas. This has both, positive and negative effects on population and specially the future generations.

This is to be noted that WHO, although recommends only breastfeeding for half year of age and continued breastfeeding for two years and beyond, but it still says that in those cases where breastmilk is not available, infant formula is the solution. And this is the positive side of infant formulas. There are many conditions where breastfeeding is not an option, example-

nipple soreness, breast cancer, breast infection, inappropriate milk production etc, and specially in case of orphans. We must find a solution for the survival of the babies. And with advancements in biochemistry and other fields of science it only makes sense to save infants rather than criticising the use of infant formulas.

ESPHGAN recommends preterm infants who are formula fed need to obtain unique post-discharge formulation with excessive contents of minerals, proteins, lipids and strength as properly as lengthy chain polyunsaturated fatty acid deliver as a minimum till a postconceptional age of forty weeks. On the other hand, it is very important that this business of infant formula should be done in extremely controlled manner, otherwise unethical promotion and misconduct will become normal and breastfeeding rates will decline further. This is the negative side as it will only benefit these companies and the rest of the population can suffer.

DISCUSSION

It is a very crucial to understand the importance of breastfeeding. And in order to understand the importance of breastfeeding, we must understand the composition of breast milk and understand the role of all the components present in it. Breastmilk is almost impossible to mimic due to its dynamic nature, as it changes its composition as per the requirement of the baby. The breast milk composition can even vary from left to right breast. This makes it extremely complex and dynamic in nature. The breast milk contains all biomolecules like fats, carbohydrates, proteins, water etc and there are bioactive factors in it as well along with antibodies that provide passive immunity to the infants. There are hormones that promote growth of the babies as well in breast milk. Breast milk also contains components like DHA, ARA, cholic, folate etc that helps in neurodevelopment. There is zinc, vitamin A, vitamin C like components in breast milk that boosts immunity of the infants. There are peptides present in the breast milk that partially digests long chain amino acids in advance so that it becomes easy for the babies to digest the milk. There is whey protein predominance as well in breast milk which also makes it easy to digest as it enables smooth curdling. Lactose predominance in the breast milk helps in smoother stool formation and even good absorption of a number of nutrients like calcium, copper, manganese and magnesium.

The digestive system of the infants in the initial months is very immature therefore they rely completely on breast milk for their energy. In fact, all health organizations recommend exclusive breastfeeding for 6 months and continued breastfeeding for 2 years and beyond. We have discussed the importance of breastfeeding in this paper. Specially talking about India, which is a developing country, it has to be accepted that breast milk is the best feed and no other alternatives should be used until and unless there is literally no other option.

Unfortunately, breastfeeding rate is declining in India and many parents or caretakers are opting for infant formula. This has negative impacts on the health of the infants and poses health risk in the future as well. Diseases like diabetes, cardiovascular diseases, pneumonia, neurodevelopment disorders, functional gastro-intestinal disorders etc are directly linked to breastfeeding.

Breastfeeding also has impact on the economies of the nation. As non-breastfeeding can lead to increased disease burden on the healthcare system of India thus leading to more expenditure on the healthcare system. Breastfeeding is also important for India as low

investment in breastfeeding results in economic loss of 14 billion US dollars due to child death and cognitive loss caused from poor breastfeeding practices.

Therefore, it should be made extremely clear that breastfeeding is the best for babies and nothing can truly replace it. And infant formulas should only be introduced where they become necessary but not by choice. This has apparently become a trend in India as many healthcare setups are involved in this malpractice of introducing infant formula to the babies without the consent or approval of the parents. This kind of promotion of infant formulas should be prohibited and infant formulas should be only consumed like any other medicine, not to replace the natural available sources but to treat the condition as per the need.

CONCLUSION

Its evident from many studies as discussed in this paper that breastfeeding rate is declining in India. Many mothers are switching to infant formula nowadays which can also be deduced from NFHS data. This is probably happening as mothers are working now and environmental factors are leading to lesser lactation as many environmental factors are responsible in creating conditions like breast cancer that forbids the production of breast milk. Caesarean deliveries are also increasing in India that also affects breast milk production and hence reduces breastfeeding rate. There are many factors and conditions that does not allow breastfeeding to take place properly. Therefore, it is very important for the survival of the babies that we find some suitable alternative to breastfeeding. Currently, the best available method is infant formula. Although, American Association of Paediatrics (AAP) does not recommend the consumption of cow's milk or bovine milk as it delivers inappropriate quantities of nutrients due the different composition than human milk. Cow's milk contain 3 times more protein than human milk which can lead to obesity. It also has 8.3 times less iron than human milk which can lead to anaemia. The Vitamin A and Vitamin C content is 77 times and 6.2 times less than human milk respectively which can reduce immunity of infant significantly. Even the PRSL value is more than the range provided by ESPHGAN (European Society for Paediatric Gastroenterology Hepatology and Nutrition). This puts unnecessary burden on immature kidneys of infants.

REFERENCES

Ogbo FA, Dhami MV, Awosemo AO, Olusanya BO, Olusanya J, Osuagwu UL, Ghimire PR, Page A, Agho KE. Regional prevalence and determinants of exclusive breastfeeding in India. *International breastfeeding journal*. 2019 Dec;14(1):1-2.

Nguyen B, Gale J, Nassar N, Bauman A, Joshy G, Ding D. Breastfeeding and cardiovascular disease hospitalization and mortality in parous women: evidence from a large Australian cohort study. *Journal of the American Heart Association*. 2019 Mar 19;8(6):e011056.

Wang L, Collins C, Ratliff M, Xie B, Wang Y. Breastfeeding reduces childhood obesity risks. *Childhood Obesity*. 2017 Jun 1;13(3):197-204.

Forbes JD, Azad MB, Vehling L, Tun HM, Konya TB, Guttman DS, Field CJ, Lefebvre D, Sears MR, Becker AB, Mandhane PJ. Association of exposure to formula in the hospital and subsequent infant feeding practices with gut microbiota and risk of overweight in the first year of life. *JAMA pediatrics*. 2018 Jul 1;172(7):e181161-.

Agostoni C, Grandi F, Gianni ML, Silano M, Torcoletti M, Giovannini M, Riva E. Growth patterns of breast fed and formula fed infants in the first 12 months of life: an Italian study. *Archives of disease in childhood*. 1999 Nov 1;81(5):395-9.

Wang L, Collins C, Ratliff M, Xie B, Wang Y. Breastfeeding reduces childhood obesity risks. *Childhood Obesity*. 2017 Jun 1;13(3):197-204.