

## **A Comprehensive Review on the Health Status of Exclusively Breastfed and Early Weaned Infants.**

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## ABSTRACT:

**Background:** Exclusive breastfeeding (EBF) till six months is a key determinant for the optimum growth and prevention of common childhood diseases. WHO recommends EBF for the primary six months with the introduction of appropriate complementary foods and continued breastfeeding thereafter. Weaning describes the method where an infant's diet pattern is gradually modified from breast milk or formula milk to cooked foods. **Objective:** The study aims to review the consequences of short and long-term exclusive breastfeeding, and the problems and the reasons of early weaning of infants. **Methods:** Google scholar and PubMed databases were used for the searching process of the published papers. **Results and conclusions:** According to most of the researchers, breastfeeding has several beneficial roles for both mother and baby. For children, these benefits are immunological benefits, gastroenteritis, respiratory tract infection, neurological benefits, etc. For mother these benefits are reduced risk of ovarian cancer, breast cancer, obesity etc. Early weaning with various types of processed and formula foods before the age of six months has several harmful consequences on infant's health, like, obesity, diarrhea, respiratory diseases, poor brain development, infections, etc. Global breastfeeding scorecard of WHO (2018) reveals that 41% of infants less than 6 months of age are exclusively breastfed, far short for the 2030 global target of 70%.

**Keywords:** Complementary food, early weaning, exclusive breastfeeding, global breastfeeding scorecard, WHO recommendations.

## INTRODUCTION:

'Breast milk is the best milk or nature's gifts for an infant', as, breast milk is complete nourishment for babies. <sup>[1]</sup> Breast milk is a biological fluid which aids the physiological growth, accelerates postnatal intestinal function, immune ontogeny, and brain development. <sup>[2]</sup> It is a great concern for weaning, that the young infant's digestive tract may not permit large foreign proteins to penetrate and provoke immune sensitization; and secondly, foods with a high solute load may concentrate urine to a degree that exceeds the young infant's kidney's filtering capability. The initiation of solid/semi-solid or liquid food and the gradual replacement of breast-milk by these foods as the main source of nutrition is the process known as weaning. An important determinant of the appropriate age for weaning is the physiological maturity of gastrointestinal and renal function. <sup>[3]</sup> National family health survey of Indian children in 2019-20 (NFHS-5) indicated that — 53.3% of children under the age of 6 months had exclusively breastfed, 24% children age under 6-23 months had received an adequate diet with breastfeeding, and 17% children received adequate diet without breastfeeding. (NFHS-5) <sup>[4]</sup> The 2017 data of UNICEF shows global rates of continued breastfeeding drop from 74.0% at 1 year of age to 46.3% at 2 years of age, also Global breastfeeding scorecard of WHO (2018) reveals that 41% of infants less than 6 months of age are exclusively breastfed, far short for the 2030 global target of 70%. <sup>[5]</sup>

**AIMS & OBJECTIVES:**

The objective of this review study is-

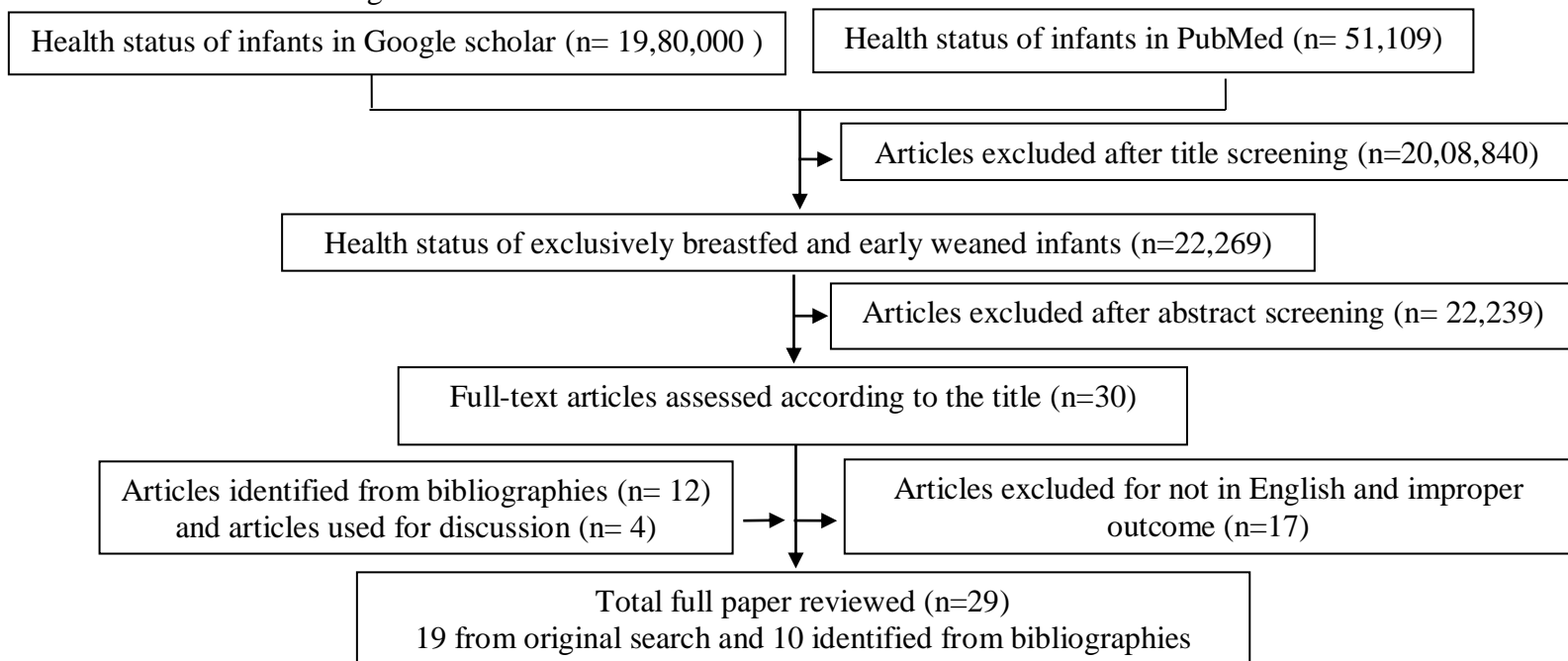
- To know the importance of exclusive breastfeeding for the child.
- To gather information about the factors contributing to non-exclusive breastfeeding.
- To get the knowledge regarding problems associated with the early introduction of formula milk or complementary feeding in infants.

**METHODOLOGY:****Search Method:**

The literature review was searched for:

- Recent systematic reviews and meta-analyses that applied the selective criteria for inclusion of studies.
- Critical reviews (non-systematic) that had been published in the past decade
- Original papers in India and other countries, on the health advantages of breastfeeding, effects of early initiation of complementary feeding.

Google scholar and PubMed databases were used for the searching process of the published papers. The keywords used for the search were: Health status of infants, Health status of exclusively breastfed and early weaned infants, Benefits of exclusive breastfeeding, Effects of early introduction of complementary feeding, Factors responsible for non-exclusive breastfeeding. There was no time and area limitation for search method.



**Figure: 1** Flow diagram for the database search and selection process for literature review.

## REVIEW OF LITERATURE:

- **WHO RECOMMENDATIONS FOR POSTNATAL CARE:**

Both mothers and newborns ought to receive postnatal care for at least 24 hours after birth. Minimum three further postnatal contacts should be taken. Clinical signs like, stopped feeding well, history of convulsions, quick respiration of the newborn (breathing rate > 60 per minute), severe chest in-drawing no spontaneous movement, fever (temperature > 37.5 °C), low body temperature (temperature < 35.5 °C), any jaundice within the initial twenty four hours after birth, or yellow palms and soles should be assessed. [6]

WHO recommendations for mother and child should be followed by health workers and mothers properly, so that the percentage of exclusive breastfeeding infants can be increased much more.

- **BENEFITS OF EXCLUSIVE BREASTFEEDING IN INFANTS:**

The composition of breast milk is best suited to provide nutrients in easy bio-available and digested form and has other enormous benefits, like defensive, reduced mortality risk, hormonal factor, intellectual and motor development and also economic benefits for the household, health system, workers and society. [7]

**Allen J. and Hector D. in the year of 2005**, gave an overview of the evidence about the health benefits of breastfeeding in developed countries. They have observed that breastfeeding is protective against major infectious diseases such as upper and lower respiratory tract infections, gastrointestinal illnesses, and otitis media, during the infancy and later-age. [8]

All the information were well justified and we cannot find any limitations in the study.

- **Immunological benefits:**

**Kasla, R. R et al. in the year 2005**, conducted a longitudinal study of feeding practices of and morbidity in 537 infants and assessed the feeding practices at monthly follow-up visits. They found that all infants were initially exclusively breastfed but their percentage dropped to 59.8% and 35.3% at the end of 3 months and 6 months respectively. Exclusively breastfed babies were three-times less likely to fall sick than artificially fed babies. They considered breastfeeding to be the strongest for providing physical and biochemical barriers against infectious agents and has anti-infective properties providing cellular components like leukocytes, lactoferrin, and antibodies predominantly in the IgA fraction of milk protein and humoral factors, that does not require activation of infants own immunity. [9]

The study was conducted on 537 infants but the gender was not mentioned. The breastfeeding practices were assessed at monthly follow-up visits, so there can be a mismatch of data between the months as there was a long day's gap.

➤ **Gastroenteritis:**

**Dieterich C.M. et al. in the year 2013**, observed the latest evidence of relationships between breastfeeding behaviors and health outcomes for infants and mothers both. They observed gastroenteritis is an intestinal infection in infants characterized mainly by diarrhea. Breast milk contains secretory IgA, having an immunoprotective effect that inhibits the penetration of pathogen in gastrointestinal tract by phagocytosis or cytotoxicity. Acquired secretory antibodies, such as Ig-G and IgM protect from maternal exposure to pathogens and provide specific immunity. <sup>[10]</sup>

The socio demographic characteristics like personal hygiene, economical condition and living area of the family have not been reported properly and these data may influence the outcome of the infectious diseases.

➤ **Respiratory tract infection:**

**Heinig, M. J. in the year 2001**, reviewed on host defense properties on human milk, he showed that breastfed infants from two to five months and first two years of life generate acquire immunity against *Haemophilus influenzae* type-b disease and *Streptococcus pneumoniae* respectively with some controlled factors. Another infection like Otitis media is also inversely related to exclusive breastfeeding practice. <sup>[11]</sup>

**In 1995**, a retrospective study was done between breastfed and bottle-fed in Manitoba Indian communities by which **Kasla, R. R et al** showed respiratory infections in bottle-fed is 3.6 times higher than breastfed, indicating greater immunity power of breast-milk against respiratory illness. <sup>[9]</sup>

In this study researchers were unable to describe the mechanisms of building up the immunity against bacteria. There is no significant relationship with exclusive breastfeeding and otitis media.

➤ **Neurological benefits:**

**Robinson S and Fall C. in the year 2012**, reviewed on infant nutrition and later health. They found that breastfeeding has beneficial role in intellectual and neurological development. Breast milk providing long-chain polyunsaturated fatty acids, present in high concentrations in brain and accumulate during the period of rapid growth, has a beneficial effect on motor development. Nucleotides, other bioactive constituents, may have also important roles. <sup>[12]</sup>

In this review the beneficial effects of breastfeeding on blood pressure, BMI, and risk of diabetes have not been confirmed so, further information is needed.

➤ **Intellectual and Motor Development:**

**León-Cava N in the year 2002**, confirmed that breastfed infants are better on tests of intellectual and motor development than children who are not breastfed. <sup>[7]</sup>

Here the mechanisms for motor development are not well understood by researcher. It was a review based study and any age group is not mentioned here so, it may be a limitation of the study.

• **OTHER BENEFITS DURING CHILDHOOD AND LATER AGE IN LIFE**

➤ **Body Composition and Obesity:**

**Robinson S and Fall C. in the year 2012**, had identified that, breastfed babies learn effective self-regulation of energy intake by controlling the quantity of milk when they consumed, which remains in later life and have slow weight gain in early infancy than formula-fed infants, may be associated with a lower risk of obesity in later life. The bioactive component leptin and adiponectin in breast milk have long-term effects in setting endocrine responses to feeding and appetite regulation. <sup>[12]</sup>

**Turck, D. in the year 2005**, found that the effects of components in breast milk and microbiome together with lower protein concentration may help to protect infants against later adiposity. <sup>[13]</sup>

The title of the study is not justified as there is less information regarding aspects of infant feeding in relation to later obesity. It also may be a limitation of research as differences in adiposity in children have been found in relation to duration of breastfeeding.

➤ **Asthma:**

**Allen J. and Hector D. in the year 2005**, found breastfeeding to be protective against asthma and allergy but some other studies show no relation to breastfeeding and increased risk of asthma and atopic disease in children possible due to family history of allergy and asthma. <sup>[8]</sup>

The study contradicted other studies as other factors also influence the occurrence of asthma. On correspondence, breastfeeding is still recommended to prevent asthma and atopic outcome.

➤ **Risk of Chronic diseases:**

**Allen J. and Hector D. in the year 2005**, showed breastfeeding may protect against chronic diseases in infancy or beyond such as risk markers for diabetes and heart disease, reduced insulin response, lipoprotein profile, and diastolic blood pressure. A recent meta-analysis demonstrated that six-months exclusive breastfeeding and long-term breastfeeding reduces systolic blood pressure in older children. <sup>[8]</sup>

This is a review study, so evidence from original research requires for justification.

**Robinson S and Fall C. in the year 2012**, observed the association of metabolic disorders and non communicable diseases like cardiovascular disease, allergies, obesity, type-1, and type-2 diabetes, hypertension, cancer, and Crohn's disease to infant feeding. <sup>[12]</sup>

In this review study there is very few data regarding the aspects of infant feeding in relation to cardiovascular disease in later life. As the study mainly conducted in high-income countries, further data from contemporary populations in low and middle-income countries are surely needed.

**Foote, K. D and Marriott L. D. in the year 2003**, reviewed the weaning practices and UK recommendations for weaning in infants. They found that children from Western Australia showed a significant reduction in the risk of childhood wheezing associated with exclusive breastfeeding for at least four months. <sup>[3]</sup>

- **REASONS BEHIND EARLY COMPLEMENTARY FEEDING:**

Several reasons for which infants may not be exclusively breastfed. Here, Initiation of early complementary feeding can be categorized based on the Mother's willingness.

- **Mother not intending to breastfeed:**

(i) **Fear of insufficient milk:** When mothers are concerned over low milk supply.

(ii) **Intention of working:** This problem is highly seen in urban countries, rather than rural, working women may not be continued to feed.

(iii) **Embarrassed by breastfeeding:** This can be due to culture or society or feeling of embarrassment to which the mother does not find comfortable to feed publicly.

- **Mother cannot breastfeed due to involuntary reasons:**

(i) **Lack of Knowledge:** many studies of breastfeeding practices, found that the illiteracy status of mothers influenced duration of breastfeeding.

(ii) **Mother's illness-** breastfeeding problem arises in mother due to fever or infection, sore nipples, breast engorgement, plugged milk ducts, mastitis etc. They cannot feed for the longer period and lead to early complementary feeding or formula feeding.

(iii) **Mother's medication:** Certain medications, like chemotherapy drugs for cancer, radioactive iodine for an overactive thyroid, or some anticoagulants, steroids drugs are not compatible with breastfeeding, so mothers are unable to feed the infant.

(iv) **Infant's illness:** Few infants are ill or not willing to suck properly due to harelip or cleft palate.

(v) **Pregnancy:** Multiple pregnancies between short-time intervals may lead to insufficient supply of breast milk. <sup>[14, 15, 16]</sup>

Other factors like distraction during breastfeeding, death of mother can be a reason for early complementary feeding.

**Suresh S et. al. in the year 2014**, conducted a prospective cohort study with 400 mother-newborn dyads to determine the breastfeeding problems in the 1st postnatal week, their predictors and impact on EBF rate at 6 months. They found few major reasons given by mothers for discontinuation of breastfeeding. Those are only breastfeeding leads to poor weight gain in a baby (28.6%), advice from elders at home (27.7%), and perception of breast milk insufficiency (25%). Additionally several breastfeeding problems (8%), baby reused to suck or had sucking difficulty (7.1%) and the baby remains hungry after feeding (3.6%) are also a strong reason for non-exclusive breastfeeding. <sup>[17]</sup>

Researchers are unable to differentiate these problems for urban and rural areas. This data may vary by the area of study.

#### • **PROBLEM FACED BY INFANTS DUE TO EARLY COMPLEMENTARY FEEDING**

The early introduction of complementary feeding with various types of processed and formula food before the age of six months has many harmful consequences for the infant's health and later phase in life. <sup>[18]</sup>

Some of them are:

##### ➤ **Diarrhea:**

Yasmin H. in the year 2008, had studied in six different villages of Chandaulia district, Uttar Pradesh on 120 mothers 18 to 30 years of age. She noticed that the main common cause of diarrhea in infants, which is viral infection. Rotavirus can infect the intestine, particularly during complementary feeding because the diet changes from anti-infective factors present in clean breast milk to foods that may often be contaminated during preparation or storage. Moreover the formula-food or milk protein may cause an allergic reaction and may cause diarrhea or vomiting. <sup>[18]</sup> An immune reaction to eating gluten in wheat, barley, and rye may even cause chronic diarrhea. <sup>[23]</sup>

In this review 43 primary studies on maternal health outcomes, and 29 systematic reviews or meta-analyses were included. The study subject selection criteria are not clear. Reliable collection of data for feeding practices is absent.



RG. Feachem reviewed 35 studies on diarrheal incidence from 14 countries. He found a clear protection associated with breastfeeding, but this varied according to the age of the child. The relative risks for non-breastfed infants compared with all those who were breastfed, either exclusively or partially, were 3.0 up to two months of age, 2.4 at three to five months, and about 1.4 thereafter. But there was no significant evidence for protection after infancy. [24]

This article not showed any area specific research. So, problem specific new intervention research for control of diarrhea is required, to address questions which will assist in the design or implementation of specific interventions.

➤ **Respiratory Illness:**

**Robinson S and Fall C. in the year 2012**, found that the early introduction of solid foods had been linked to a higher risk of respiratory infection in infants. [12]

**Rosa, E. in the year 2017**, conducted a study in Indonesia and reported that the incidence of death from respiratory diseases was 3.27 times greater and Acute Respiratory Infections are 2.23 times higher in non-exclusive breastfed children than exclusive breastfed children. [19]

The agent which is actually responsible for prevention of respiratory illness is unclear as well as mechanism of action of respiratory illness is also absent in this study.

➤ **Obesity:**

**Pearce J. et al. in the year 2013**, from the University of Nottingham conducted a systematic review on the timing of the introduction of complementary feeding and the risk of childhood obesity and found that introducing complementary foods at < three months, four months, or 20 weeks was associated with higher BMI in childhood. [20]

Some evidence suggested that very early introduction of complementary food (at or before four months), rather than at four to six months or > six months, may increase the risk of childhood obesity. [21]

**Burdette HL. et al. in the year 2006** used absorptiometry (DXA) for body fat measurement and found neither breastfeeding nor the timing of the introduction of complementary foods was associated with adiposity at age 5 years. [22]

The reason of high BMI among infants only for complementary feeding is not cleared. Weight for height is a useful method of measuring overweight and obesity but it does not measure body fat and does not determine fat mass or distribution.

➤ **Poor brain development:**

**Turck, D. in the year 2005**, found that children whose weaning diet includes higher intake of fruit, vegetables, and home-prepared foods had higher scores on tests of full-scale and verbal intelligence at age 4 years. <sup>[13]</sup>

**Stuebe A. in the year 2009**, reported that there was a lower IQ score in formula-fed children compared to breastfed children. However, few meta-analysis carried by adding a long chain of PUFA (present in breast milk) to the complementary fed, outcome result show not many significant differences. <sup>[23]</sup>

Here the review study was done in UK, so the data may alter for cultural and social differences.

#### ➤ **Other Infection:**

**Victora CG. in the year 1996**, reviewed on the impact of infection and disease on early weaning. He found that breastfeeding is also potential to prevent other infections like neonatal sepsis, meningitis, and bacteremia. Also, the study revealed that the chance of common infection like septicemia, conjunctivitis, diarrhea, and umbilical sepsis are more when bottle-fed rather than breastfed infants. <sup>[25]</sup>

The study was conducted in Fortaleza, the capital of Ceara' State in Brazil with 650 cases and 650 matched controls. At present PCV vaccine is included in India's immunization schedule so these study findings may not be a threat for Indian citizens at all.

#### **DISCUSSION:**

Breast milk is a complex secretion that is the only ideal food for babies for a minimum of the primary six months of life. The review study occupies an overall concept about the problems associated with early weaning. Acceptance of weaned food is poor among children who were exclusively breastfed [26, 27]. Some evidence shows that, greater exposure to breast milk has been linked to healthier dietary habits in adult life [28, 29]. Some studies did not measure body fat percentage for the assessment of obesity. Still weight for height is an accepted technique for measuring overweight and obesity but it does not measure body fat and does not determine fat mass or distribution. Few studies used DXA for measuring body fat percentage whereas measurement errors were associated with using skin-fold thickness [22]. The majority of the studies failed to provide sufficient information to detect a meaningful association between the consequences of the timing of introduction of complementary food and BMI/body composition in childhood. Also there is limited data to justify the mechanism of action against infections and neurological problems. Some major limitations of this study are- the effects are relied only on weaning and breastfeeding practices, socio-demographic parameters like income level, literature level of the parents, age of mothers during pregnancy, environmental conditions of the household could also affect the health status of infants which were not included in our study. Most of the studies could not found any meaningful association between the effects of infant feeding

practices and obesity in later childhood. This kind of results may vary with the sample size as; the majority of the sample size is relatively small and could therefore lack sufficient information. [22] Unpublished papers are not included in this review. Another possible limitation of this study is, it did not cover studies from all the developing countries. Further research in developing countries should be included in future reviews of infant feeding.

## CONCLUSION:

Exclusive breastfeeding is associated with a reduced risk of many diseases, as well as morbidity and mortality in infants and provides stronger immunity. Several studies have shown that the early complementary feeding problem is much highlighted in urban areas while in rural areas there is a lack of proper knowledge regarding exclusive breastfeeding. Home-brewed complementary foods are superior to artificial complementary foods, as it reduces the possibilities of infection. Training programs regarding breastfeeding should be developed for implementation in obstetric and pediatric residents and additionally the nursing workers. Nutrition education of antenatal women with the active involvement of Accredited Social Health activist (ASHA)/ Anganwadi Workers (AWW)/ Auxiliary Nurse Midwives (ANM) regarding timely initiation of breastfeeding after delivery, feeding period and importance of feeding colostrums is needed. Government or non-government organizations should try to disseminate the education of exclusive breastfeeding practices in rural and urban areas, furthermore encourage them to strive for every possible way to feed the baby only breast milk exclusively. Clear differentiation of health status between exclusively and non- exclusively breastfed children should be studied in future.

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