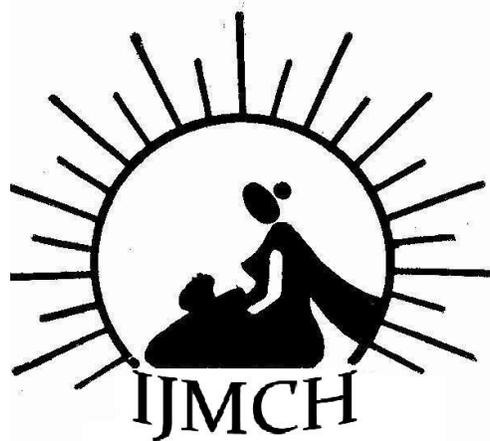


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Vijayashree S
Vijaya Naik
NS Mahantshetti
Shivprasad S

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Web of morbidity, growth and development during infancy: A systematic review

Vijayashree S¹, Vijaya Naik², NS Mahantshetti³, Shivprasad S⁴

¹Research Scholar, ²Professor and Head Dept of Public Health, ³Dean JN
Medical College and Professor Pediatrics, KLE University, Belgaum

Correspondence: Dr Vijayashree Mathad

Abstract: Infants growth and development is very crucial component among infants as it depicts the physical and mental development of the child. Infections and impairment in growth during infancy adversely effects the achievement of developmental milestones. The burden of morbidity and malnutrition is highest in developing countries hence a systematic study pertaining to morbidity, growth and development among infants were carried out. Results of the literature and the study revealed that morbidity plays and vital role in the growth of the child as well as timely achievement of developmental milestones. Various factors responsible for this web of morbidities during infancy were categorized under physiological factors, environmental conditions and psychological conditions.

Background

About 2.92% of Indian population is constituted by infants.¹ Infants form a vulnerable group. In India, fifty percent of them are underweight and 1/3rd are premature². Hence they are susceptible to infections. Growth indicates the increase in size and development depicts increase in skills, intellect, and emotional aspect.³ Growth is at its peak during fetal life, first year of life and at puberty. Twenty percent of the body growth, eighty percent of the brain growth and myelination is completed by second year of life. Growth and development during infancy is multifactorial. Many factors influence it directly or indirectly.³

Faulty feeding practices like: Prelacteal feeds, discarding of colostrum, improper weaning and poor hygiene practices will influence growth and development of the infant. According to NFHS(National Family Health Survey) 3 data, acute respiratory infections, diarrhea and fever are the three major morbidities, prevalence being 8.1%, 18.1% and 21.1% respectively among infants.⁴

During infancy morbidities adversely affect the growth and development and vice versa. It indicates poor health status of the community as a whole.¹ According to NFHS 3 the prevalence of stunting, wasting and underweight during infancy is 44.8%, 39.8% and 50.8% respectively.⁴ Assessment of growth and development during infancy becomes crucial for planning, implementation and evaluation of health programme especially for under five children. Assessment of morbidity, growth and development at regular interval during infancy gives a valuable data since it measures the progress of the same child.

Literature on morbidity

The incidence of morbidities like Acute Respiratory infections (ARI), Diarrhea and fever among infants of India according to NFHS 3 data is 6.2, 10.6 and 11.6 respectively.⁴

Various longitudinal studies at Bangladesh, Delhi and South India carried out to assess the morbidities among infants revealed the morbidity rate was low during first 6 months as compared to next 6 months. Common morbidities seen were fever 26 %, cough 24% & diarrhea 20%. There was positive correlation between socioeconomic status, literacy rate and sex.^{5, 6, 7}

Whereas in a longitudinal studies conducted in semi urban areas and safdurjung hospital of New Delhi and Hadassah Hospital Jerusalem, the results revealed the morbidity more during the first half on infancy than in the second half on infancy. Majority of illness were due to RTI and diarrhea. The incidence was found to decrease with rise in family income and proper feeding practices.^{8, 9, 10}

In a follow up study conducted in Aligarh among infants to study the morbidity pattern and feeding practices, the results showed that top fed infants had more incidence of RTI, diarrhea, severe malnutrition, anemia and vitamin A deficiency. The incidence of RTI in artificial fed infants showed the abrupt increase after six months of age.¹¹

In a case control study done among infant of Dhaka, to study association between Vitamin A deficiencies and feeding practices, the results showed that breast feeding was associated with 74% reduced risk of Vitamin A deficiency.¹²

In a prospective studies carried out at Philipinese, Dundee and Pantnagar, the results showed the prevalence of diarrhea high among non breastfed infants. Multiple episodes of otitis media was significantly associated with bottle feeding.^{13,14,15,16}

In a prospective study conducted in vajjra hospital in Thailand, the results revealed that the incidence of iron deficiency anemia was significantly higher among formula fed infants.¹⁷

In a one year longitudinal study conducted among Malawian infants in march 2006, monthly visits was done to assess morbidity and growth parameters. The results revealed that the infants with early complementary feeding had lower weight for age at 3 months and 6 months and early complementary feeding was significantly associated with increased risk of RTI.¹⁸

In a longitudinal study done for 1 year in New York to know the effect of exclusive Breast feeding on morbidities among infants revealed increase in incidence of morbidities among infants with limited breast feeds (<4 ½ months) and given bottle feeds which was statistically significant.¹⁹

A cross sectional study was conducted to study infant feeding and rearing practices among rural and urban infants of Jammu. Various faulty feeding practices included: Delayed initiation of breast feeding, administration of prelacteal feeds and early weaning practices. All these factors contribute to increased incidence of diarrhoea and vomiting.²⁰

In a longitudinal study conducted in april 1973 among 500 infants attending wellbaby clinic in Bhopal, the results revealed an increase in average weight of the baby of six months

among exclusively breastfed and positive association between artificially fed infants with diarrhoea and severe malnutrition.²¹

In longitudinal studies carried out in New York and Bassett done for a period of one year revealed the incidence of morbidity in infants increased with bottle feeding and limited breast feeds.^{22,23} In a study carried out in rural areas of Pondicherry and Jammu regarding infant feeding and rearing practices, faulty feeding practices seen like delayed initiation of breast feed, faulty rearing practices like instillation of oil into eyes, nose, ears and mouth which led to morbidity among infants. Diarrhoea and vomiting occurred with greater frequency among top fed infants.^{24,25}

In a longitudinal study done in urban pediatric center, Pondicherry to study the feeding pattern and growth parameters the results proper gain in weight for infants up to 7 months of age who were exclusively breast fed.²⁶

Various studies conducted to assess the effect of feeding practices on morbidity and mortality among infants revealed higher incidence of morbidity among partially breastfed and totally bottle fed infants and also high risk of death was attributed to ARI and diarrhea.^{27, 28,29,30,31,32,33,34}

In a prospective cohort study done in southern Brazil between 2006 to 2008 found a positive association between postnatal abuse against women with the risk of infant diarrhoea and respiratory infections.³⁵

Literature on Growth

In longitudinal studies done among infants of Indonesia, Kenya and Mexican village to study the morbidity and growth among infants showed high incidence of morbidities like ARI, Diarrhea and skin infections and also shown to have an adverse effect on nutritional status of infants. The incidence of these diseases were highest during first 6 months of infancy.^{36,37,38}

In a study conducted for 1 year in March 2006 among infants of Malawi to assess the morbidity and growth parameters, significant association was found between early complementary feeding and increased risk of RTI and eye infections during 3rd, 6th and 9th month.³⁹

A prospective study carried out in Alexandria among newborn during first year of life to find an association between morbidity pattern and nutritional status, the results showed a significant association between morbidity risk exposure and nutritional status. It also showed that children with the highest morbidities were also suffering from severe malnutrition.⁴⁰

In various studies conducted to assess the effect of morbidity from infectious diseases and physical growth of the infants the results revealed a positive association between morbidities and decreased average weight for age and length for age during infancy. The prevalence of malnutrition were found to be considerable higher among bottle fed children than breast fed children.^{41,42,43,44,45,46,47}

Literature on Development

In a prospective follow up study, carried out in hospital and community in Thiruvananthapuram, children were subjected to stimulation package and nutritional management. The results revealed stimulation package to be more effective than nutritional management in influencing the positive effect on growth and development. There was also a positive correlation between environmental parameters, anthropometric scores and IQ level.⁴⁸

In a study conducted among 12520 under five children in Thiruvananthapuram to assess the prevalence of developmental delay, deformity and disability, the results revealed that there were total of 2.48% children with developmental delay, deformity and disability and up to 2 years the developmental delay was found to be 2.31%.⁴⁹

In a longitudinal follow up studies done in Poland and Pune, India to estimate the time elapsed for catch up growth among LBW (Low Birth Infants) in the first 12 months of life, the results revealed rapid Growth during first 6 months of life and growth in terms of weight during 9th month of life.^{50,51}

In a follow up community based study done among LBW babies of Kolkata to study morbidity pattern the results revealed increase in episodes of morbidities and hospitalization rate among LBW.⁵²

In a study conducted at Varanasi, 1.19% of rural children were delayed of breast feeding by one day and the colostrums was discarded in 90% children. These faulty feeding practices had a statistical significance with the nutritional status of children.⁵³

The prevalence of developmental delay among infants of deprived urban settlements was found to be 2.5% and the attributed risk factors for the developmental delay like low birth weight, birth asphyxia, poor environment and child care practices.⁵⁴

Randomized control trial to study the effectiveness of early stimulation therapy among infants in improving the developmental outcome of at risk neonates revealed a statistically significant higher score for mental developmental index and psychomotor developmental index at infancy.^{55,56}

Morbidity during infancy has adverse effect on growth and development of infants. Majority of studies are cross sectional and have focused on either growth or morbidity. There are very few studies showing morbidity and its relationship with growth and development during first year of life.

Table 1: Factors contributing to Morbidity, Growth and Development during Infancy

Morbidity	Growth	Development
<ul style="list-style-type: none"> • Faulty feeding practices • Non immunization • Morbidities among household contacts • Malnutrition • Household sanitation • Non availability of latrines • Cooking over wood 	<ul style="list-style-type: none"> • Morbidities more than 2 episodes • Gender • Socio Economic status • Literacy status • Anthropometry of parents 	<ul style="list-style-type: none"> • More than 4 episodes of morbidity during a month. • Severe malnutrition • Birth order • Hospitalisation • Birth weight

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