



Impact of Formula Feeding Verses Breast Feeding, On Prevalence of Gastroenteritis, Otitis Media and Lower Respiratory Tract Infections among Infants

¹*Saleha Sadeeqa; ²Rabia Ali & ³Anam Saleem

¹Institute of Pharmacy, Lahore College for Women University
Lahore Pakistan

*Email of corresponding author: salehasadeeqa@gmail.com
Phone: 0092-3054122345

²Institute of Pharmacy, Lahore College for Women University
Lahore Pakistan
Rabia.ali4@gmail.com

³Institute of Pharmacy, Lahore College for Women University
Lahore Pakistan
Anamsh450@gmail.com

ABSTRACT

Breast milk is considered the gold standard of infant nutrition while commercially available infant formulae are designed to mimic its unique combination of carbohydrates, fats, proteins, vitamins and minerals. Breast milk however contains numerous components that cannot be synthesized, including maternally-derived antibodies which protect against disease and infection. A questionnaire based study was conducted on 105 mother- infant pairs, and aimed to compare the prevalence of gastroenteritis, otitis media and lower respiratory tract infections in breast feeding and formula feeding children of age 6 to 24 months. Mothers were interviewed and data about child illnesses and feeding practices was collected. Results showed that the prevalence of gastroenteritis, otitis media and lower respiratory tract infections was less in exclusive breast fed infants as compared to exclusive formula fed infants and partial breast fed infants. Rate of hospitalization due to gastroenteritis and lower respiratory tract infections was higher in exclusive formula fed infants as compared to those who received exclusive breast milk for the first six months of their lives. It is concluded that exclusive breast feeding during first six months of life not only reduce morbidity due to gastroenteritis, otitis media and lower respiratory tract infections but it also helps to reduce the health care cost.

Key words: Breast milk, Formula milk, Gastroenteritis, Otitis media, Respiratory tract infections.

INTRODUCTION

FDA classifies children from age one month to two years as infants [1]. A major concern in the provision of health care today is the desire to improve the quality of life of infants by selecting the best mode of feeding, which provides maximum benefit and least risk of illness and mortality. Breastfeeding is widely

believed to be the most beneficial method of feeding for the health and well-being of most infants [2]. Early breast milk (Colostrum) is very rich in nutrients and antibodies to protect baby. Colostrum then changes into mature milk. By the third to fifth day after birth, this mature breast milk has just the right amount of fat, sugar, water, and protein which helps baby to continue grow and provides all of the nutrients and antibodies a baby needs. For most of the babies especially premature babies, breast milk is easier to digest than formula milk. Breast milk is the right temperature for babies and helps to prevent hypothermia when the body temperature drops too low. [3]. It is also an important source of energy and nutrients in children aged 6 to 23 months. It can provide half or more of a child's energy needs between the ages of 6 and 12 months, and one third of energy needs between 12 and 24 months. Breast milk is a critical source of energy and nutrients during illness, and reduces mortality among children who are malnourished [4].

Infant formula is made from cow's milk that has been treated to make it suitable for babies and it contains a mix of two types of proteins (whey and casein). Different types of infant formula are available both as ready-to-feed liquid infant formula, sold in cartons, which is sterile; and powdered infant formula, which is not sterile. As proteins in formula are made from cow's milk, it takes time for babies' stomach to adjust to digesting them. Breast milk fights disease, the cells, hormones, and antibodies in breast milk protect babies from illness. Formula milk cannot match the chemical makeup of human breast milk, in fact among formula-fed babies, ear infections and diarrhoea are more common [5].

There are a number of risks of formula feeding for infants that include an increased risk of asthma, allergy, acute respiratory disease, infection from contaminated formula, nutrient deficiencies, obesity, gastrointestinal infections, mortality, otitis media, ear infections, side effects of environmental contaminants and reduced cognitive development [6].

Human milk contains components which inhibit the attachment of *Streptococcus pneumoniae* and *Haemophilus influenzae* to host cell surface receptors. Immune complexes in breast milk help to initiate and stimulate the child immune system. Oligosaccharides, immunoglobulin A (IgA), lactoferrin and other immune cells provided from mother's milk have been shown to protect the child from infection [7].

Exclusive breastfeeding for 6 months has many benefits for the infant and mother. Chief among these is protection against gastrointestinal infections. Early initiation of breastfeeding, within one hour of birth, protects the newborn from acquiring infections and reduces newborn mortality. The risk of mortality due to diarrhoea and other infections can increase in infants who are either partially breastfed or not breastfed at all [4].

Otitis media is an infection of the middle ear space, behind the eardrum (tympanic membrane) and is characterized by pain, dizziness, and partial loss of hearing. The incidence of acute otitis media was sequentially lowest in exclusive breast fed, followed by partial breast fed and exclusive formula-fed infants. Breast-feeding has a protective effect against acute and prolonged infections, including otitis media. The protective effect of breast-feeding against respiratory diseases, including otitis media, has been ascribed to passively transfer maternal antibodies, mainly secretory IgA [8]. It is suggested that infants and young children who had never initiated breastfeeding, as well as those who received some supplementary or replacement feeding in the first 6 months, were at increased risk of otitis media [9]. The possible reasons by which breastfeeding reduces risk of otitis media may include that human milk is a biologically active substance containing antimicrobial, anti-inflammatory, and immunomodulatory agents that function to compensate for the physiologic immaturity of the infant immune system [9].

Respiratory illness and infection are grouped as upper respiratory tract infections (tonsillitis, otitis media) and lower respiratory tract illness (bronchiolitis, bronchospasm, or asthma, chest infection, pneumonia, whooping cough, chronic cough, or croup). A strong association is evident for the protection of predominant or partial breast feeding against respiratory morbidity. It is reasonable to speculate that human milk may confer several effects on the development of the respiratory tract and its subsequent ability to fight infection and illness [10]. Breast milk not only ensures optimal nutrition but also provides a number of elements such as immunoglobins and growth factors not present in formula milk that facilitate the development of immunologic response and growth of infant tissues such as the brain. Hence

breastfeeding is associated with low rates of infant illness [8]. There is strong evidence demonstrating the failure of manufactured products to provide infants with adequate protection from infections and allergies in the first year of life. Formula fed children are more likely to be exposed to pathogens, which may contaminate bottle, formula and the food given to the child [11].

The American Academy of Paediatrics (AAP) and the American Dietetic Association (ADA) endorsed breastfeeding as the most beneficial method to ensure the health and well-being of most infants. AAP recommends that infants during the first 6 months of life should be breastfed exclusively and that breastfeeding should continue for at least 1 year [12].

The incidence of diarrheal illness in the first year for exclusively breastfed infants is less as compared to formula-fed babies. Breastfeeding provides protection against diarrhoea in infants because formula feeding carries risk for unhygienic conditions of introducing pathogens to an infant's system while breast milk contains immune globulins that increase an infant's resistance to infection [13].

An increase in exclusive breastfeeding prevalence can substantially reduce mortality and morbidity among infants. Results of the breast feeding promotion programs show that breastfeeding promotion can be one of the most effective health interventions for preventing cases of diarrhoea and preventing deaths from diarrhoea [14]. Literature indicates that breastfeeding not only decreases child morbidity and mortality rates, but improves maternal health outcomes, provides economic benefits to the family, decreases national health care costs, increases mother-child attachment, and positively impacts society as a whole [15]. A multi-center study showed that infants who had not been breast fed, had a 10-fold higher risk of dying of any cause and a 3-fold higher risk of being hospitalized for any cause when compared with those who had been predominantly breast fed [16].

Further findings from studies showed that breastfeeding is protective under poor sanitary conditions, as revealed in studies from the developing nations, it also plays a major role in transitional countries, by preventing morbidity in young infants, decreasing hospitalization rates and the resulting health expenditure. Counselling and helping mothers to continue to breastfeed their infants during the early months of life enhances the health of children, and remains a crucial step in preventive paediatrics [17]. Meta-analysis of five cohort studies showed that breastfeeding was associated with a significant reduction in the risk of acute otitis media. Comparing ever breastfeeding with exclusive formula feeding, the risk reduction of acute otitis media was 23 percent [18]. When comparing exclusive breastfeeding with exclusive formula feeding, either for more than 3 or 6 months duration, the reduction was 50 percent. A recent case-control study from England reported that infants who were breastfeeding had a 64 percent reduction in the risk of non-specific gastroenteritis compared with infants who were not breastfeeding [19].

Breastfeeding creates a unique maternal-infant physiology, including important bacterial and hormonal interactions between the mother and child and pressure gradients of suck and swallow that are distinct from those of formula feeding. Thus, recent epidemiologic evidence suggests that introduction of infant formula in the first 6 months of life is associated with an increased risk of otitis media when compared with 6 months of exclusive breast feeding [20].

Exclusive breastfeeding until the age of 4 months and partially thereafter was associated with a significant reduction of respiratory and gastrointestinal morbidity in infants. These findings support health-policy strategies to promote exclusive breastfeeding for at least 4 months, but preferably 6 months, in industrialized countries [21].

The study aims to compare the prevalence of gastroenteritis, otitis media and upper respiratory tract infections in breast feeding and formula feeding children of age 6 to 24 months and to educate mothers about benefits of breast feeding and drawbacks of formula feeding.

MATERIALS AND METHODS

Study design:

An observational and questionnaire based study was conducted in private and public sector hospitals of Lahore during June 2015 to August 2015, using simple random sampling technique.

Inclusion and exclusion criteria:

Children of age from 6 to 24 months were included in study while neonates, children above 24 months and infants with congenital anomalies were excluded from study.

Data collection and data analysis

Children were seen at hospital based clinics for developmental check-up, routine immunizations or common childhood ailments and data about feeding practices, history of illnesses and hospital admissions was collected on a questionnaire. Questionnaire consisted of four parts. Part-A was about demographics of child, part-B consisted of questions about child's feeding pattern, part-C about evaluation of child's health and part-D about mother's evaluation.

Data was analysed in SPSS and results were presented in the form of graphs.

Ethical approval

The study was approved by Institute of Pharmacy, Lahore College for Women University Lahore and respective hospitals.

RESULTS

A total of 105 subjects were observed in different health care hospitals of Lahore. Results showed that 37.14% of the total infants were on exclusive formula feed, 34.28% on exclusive breast feed and 28.57% were given partial breast feed (Figure 1). 43.71% mothers opted formula feed because of their medical conditions, 35.89% due to their personal choice and 15.38% were directed by doctors (Figure 2). Moreover, 88.89% mothers chose breast feed because of their own choice and 11.11% were directed by physician (Figure 3). Among infants who were on exclusive formula feed, 65% had ideal weight, 20% were overweight and 15% were under weight, while among infants who were on exclusive breast feed, 85% had ideal weight and 15% were under weight. Among the partial breast fed infants 80% had ideal weight, 10% were overweight and 10% underweight (Figure 4).

Results further showed that 50.73% of the exclusive formula fed infants had frequent visits to hospital in last six months, while in case of partial breast fed infants 20.09% and only 18.86% of exclusive breast fed infants had frequent visits to hospital (Figure 5). 35.9% of exclusive formula fed infants were hospitalized during last six month as compared to exclusive breast fed infants where ratio was only 2.78% (Figure 6). 79.49% of exclusive formula fed infants, 16.67% of exclusive breast fed infants and 60% partial breast fed infants suffered from diarrhoea in last six months (Figure 7) while 25.65% of exclusive formula fed infants and 20% of partial breast fed infants were hospitalized due to diarrhoea (Figure 8).

A total of 71.80% of exclusive formula fed infants, 46.67% of partial breast fed infants and only 16.67% of exclusive breast fed infants suffered from lower respiratory tract infections (Figure 9). On the other hand, 10.25% of exclusive formula fed infants and 3.33% of partial breast fed infants were hospitalized due to lower respiratory tract infection in last six months (Figure 10). A total of 20.51% of exclusive formula fed infants, 33.33% of partial breast fed infants and only 2.78% of exclusive breast fed infants suffered from otitis media in last six months (Figure 11).

Results further showed that, 94.44% of exclusive breast fed infants, 93.33% of partial breast fed infants and 61.53% of exclusive formula fed infants had good sleep (Figure 12) while 100% of exclusive breast fed infants, 89.74% of exclusive formula fed infants and 86.33% of partial breast fed infants were physically active (Figure 13). All of the mothers think that breast feeding is better than formula feeding. Almost all (97.14%) mothers consulted doctor about the feeding practices (Figure 14).

DISCUSSION

The health effects of breastfeeding are well recognized and apply to mothers and infants. Breast milk is uniquely suited to the human infant's nutritional needs and is a live substance with unparalleled immunological and anti-inflammatory properties that protect against a host of illnesses and diseases for both mothers and children.

In the survey conducted in public hospitals of Lahore 105 mother infant pairs were interviewed. Majority of infants were on exclusive formula feed. Mothers opted formula feed because of their medical

conditions such as disease and pregnancy, due to their personal choice and to some of infants doctors prescribed formula milk. Significant number of infants who were on exclusive breast feed had ideal weight whereas exclusive formula fed infants tends to be overweight.

The frequency of hospital visits and hospital admissions was higher in exclusive formula fed infants as compared to exclusive breast fed infants. The prevalence of gastroenteritis was higher in exclusive formula fed infants as compared to exclusive breast fed infants, this is because formula milk do not contain natural antibodies that are present in breast milk furthermore formula feeding also carries the risk of contamination. Immunoglobulin A, oligosaccharides, lactoferrin and other immune cells are component of breast milk [7], that play a part in the immature immune system providing bactericidal, viricidal and fungicidal properties to protect the infants, preventing morbidity in young infants, decreasing hospitalization rates and the resulting health expenditure, as studied before [17,18]. Counseling and helping mothers to continue to breastfeed their infants during the early months of life enhances the health of children, and is a crucial step in preventive pediatrics.

The ratio of infants suffering from lower respiratory tract infection was higher in exclusive formula fed infants and partial breast fed infants as compared to exclusive breast fed infants, as previously studied [10,21]. Only exclusive formula fed infants and partial breast fed infants were hospitalized due to lower respiratory tract infections in last six months. Prevalence of otitis media is higher in partial breast infants as compared to exclusive formula fed infants, and least in exclusive breast fed infants, this is in line with previous studies [8,9,20]. The number of exclusive breast fed infants that are hospitalized due to gastroenteritis or lower respiratory tract infection was zero, this is in line with previous studies [19]. This shows that the severity of illness is less in exclusive breast fed infants. It has been observed during the study that exclusive breast feeding had positive effects on infant's physical health. Exclusive breast fed infants had good sleep and were physically active as compared to exclusive formula fed infants. Majority of the mothers think that breast feeding is better than formula feeding but the ratio of exclusive breast fed infants was less, this was due to the mother's medical condition in which mother is not able to breast feed the infant and in many cases either due to lack of knowledge and hesitation. Mothers do not consult doctor or pharmacist about the feeding practices.

CONCLUSION

It is concluded from the study that breast feeding has a protective effect on infant health. The prevalence of gastroenteritis, lower respiratory tract infection and otitis media is higher in exclusive formula fed infants with a higher ratio of hospital visits and hospitalization than in exclusive breast fed infants. Formula fed infants tend to be overweight and less active as compared to breast fed infants. Formula feeding adds not only a needless financial burden but also the rate of illnesses and hospitalization. Promoting exclusive breastfeeding can help to reduce the prevalence of various illnesses and health conditions, which in turn results in lower health care costs.

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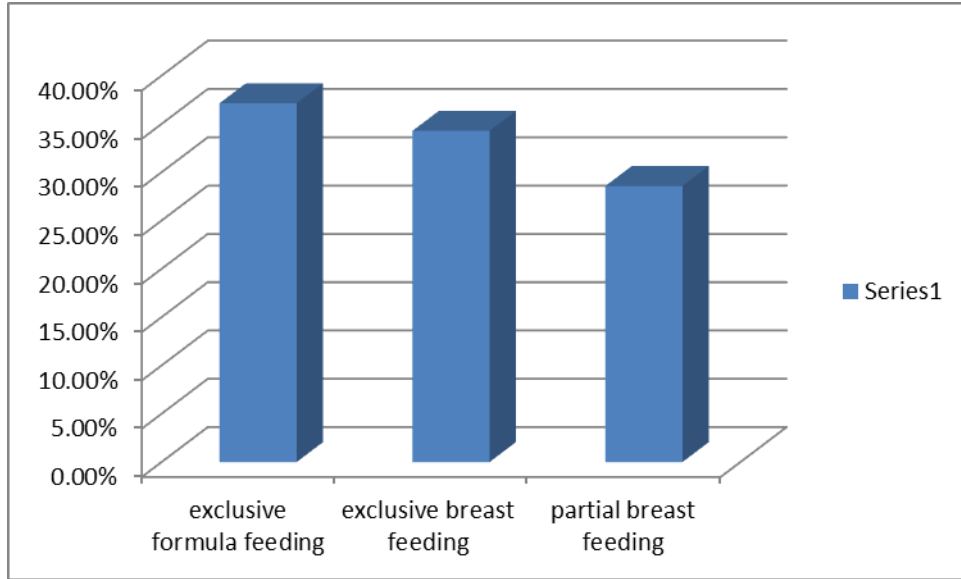


Figure 1: Mode of feeding

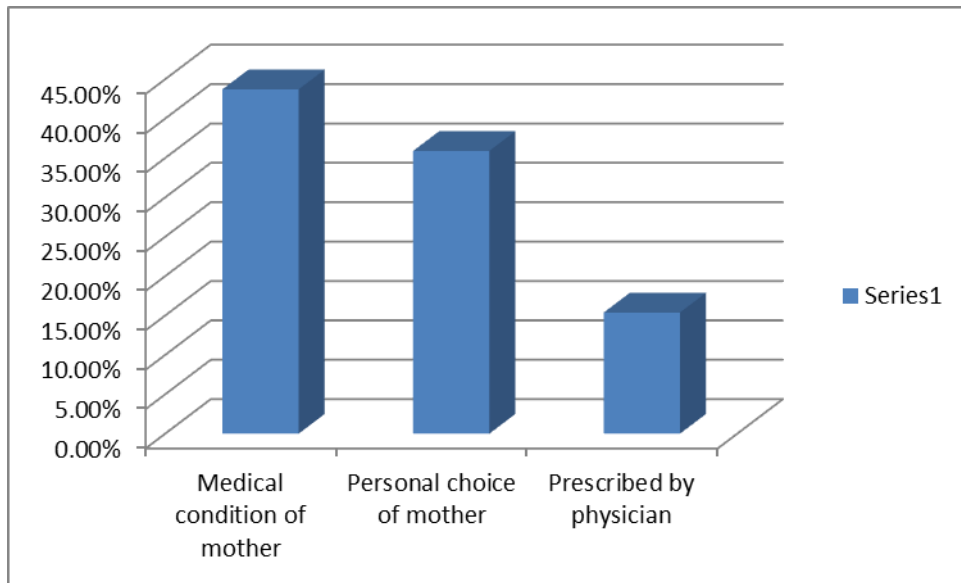


Figure 2: Reason of choosing formula feed

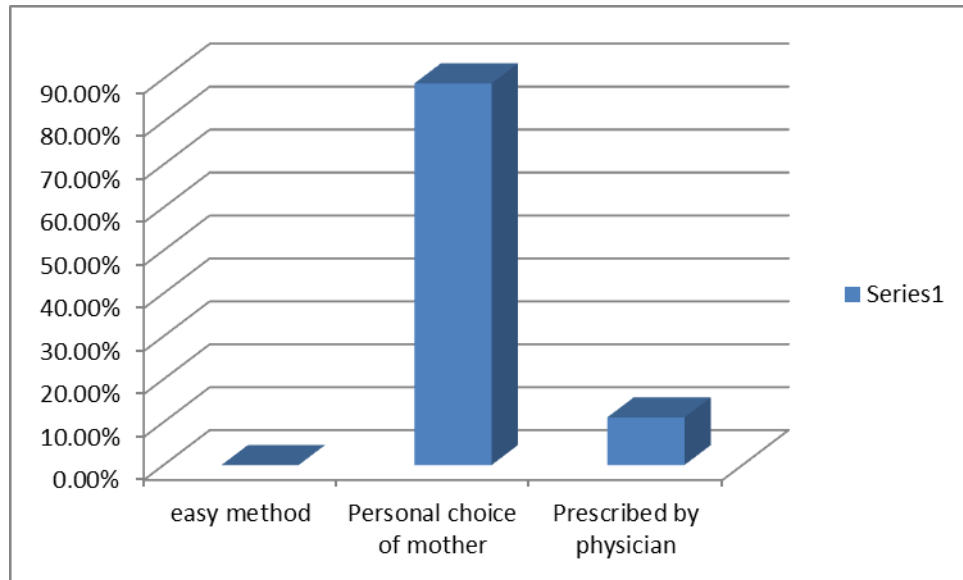


Figure 3: Reason of choosing breast feed

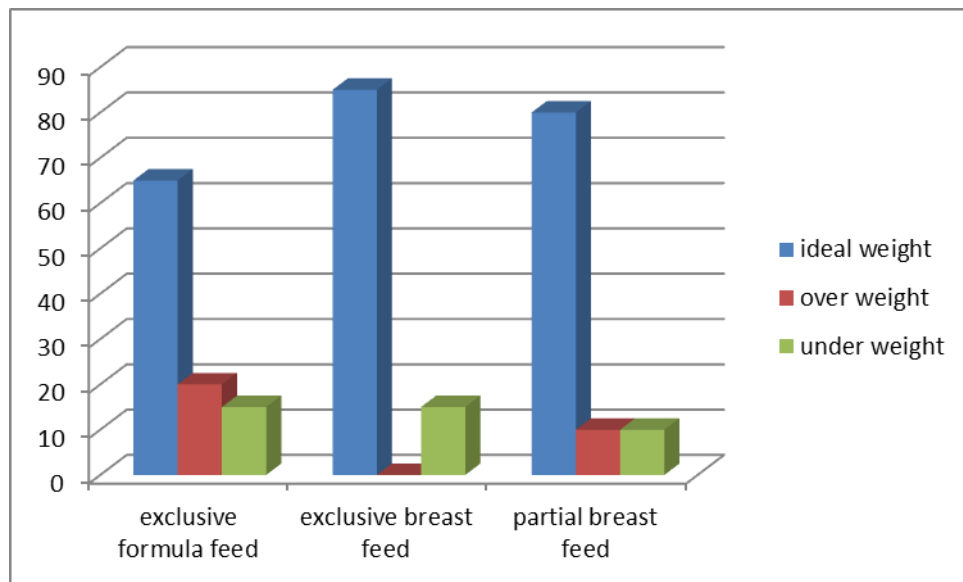


Figure 4: Weight of child

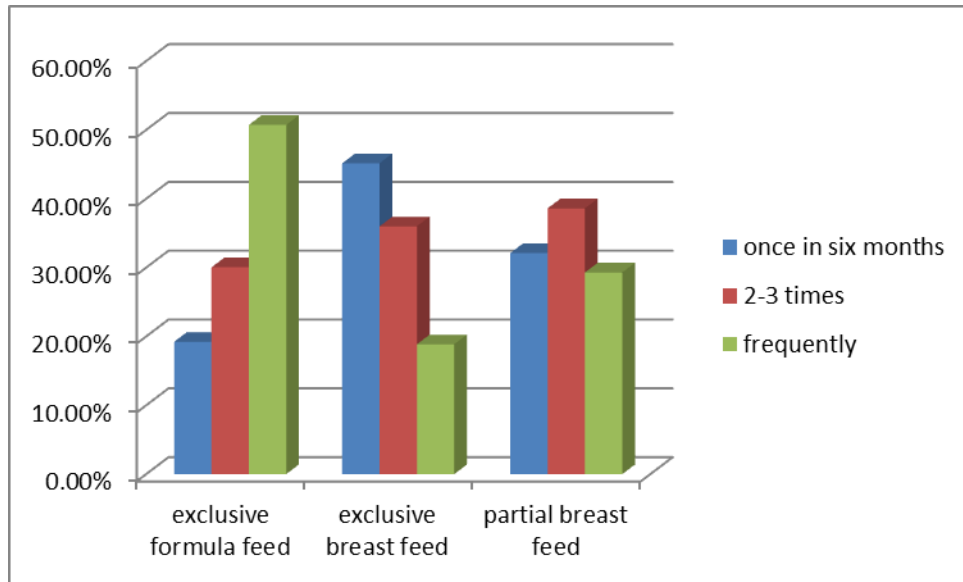


Figure 5: Visit to hospital due to illness in last six months

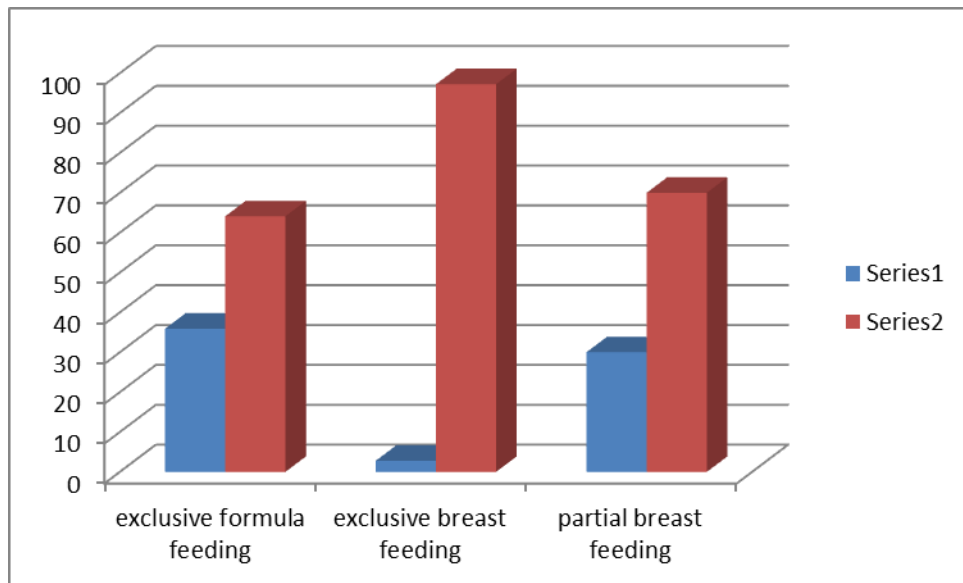


Figure 6: Hospitalized due to illness in last six months

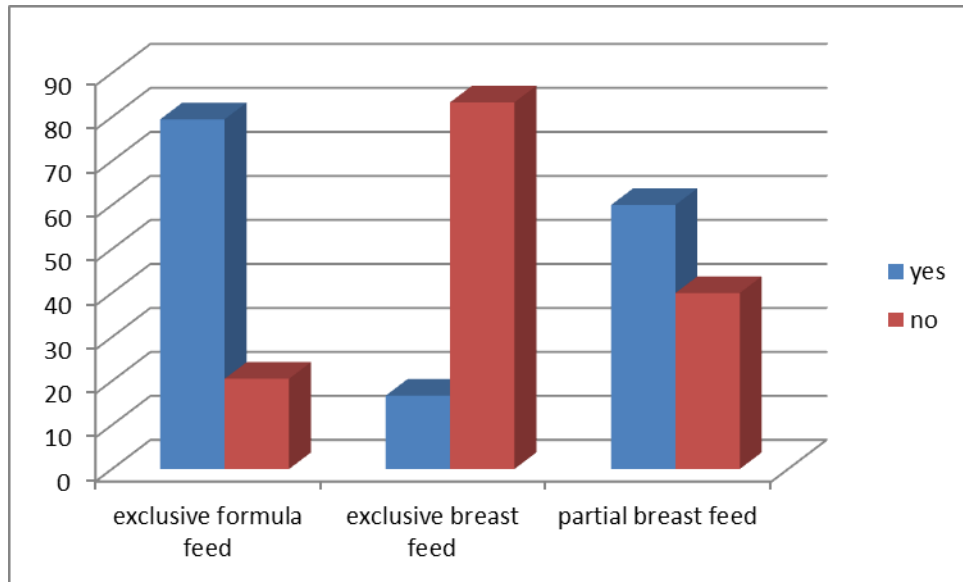


Figure 7: Prevalence of diarrhoea in last six months

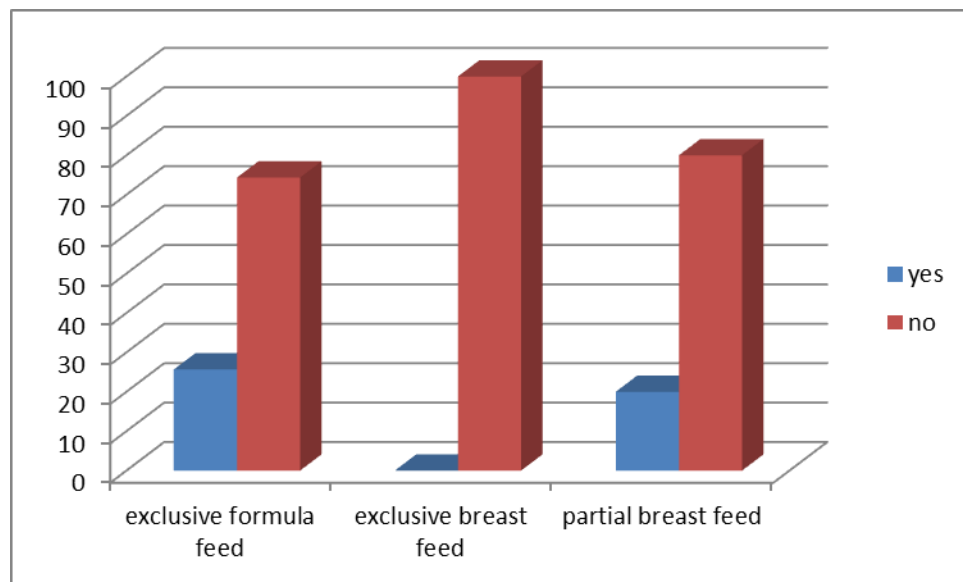


Figure 8: Hospitalized due to diarrhoea

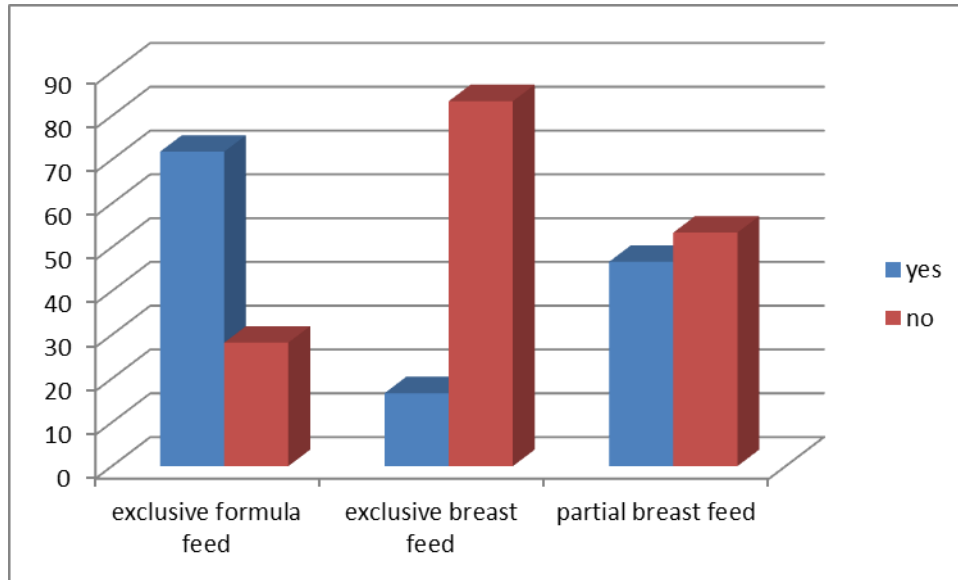


Figure 9: Prevalence of lower respiratory tract infection in last six months

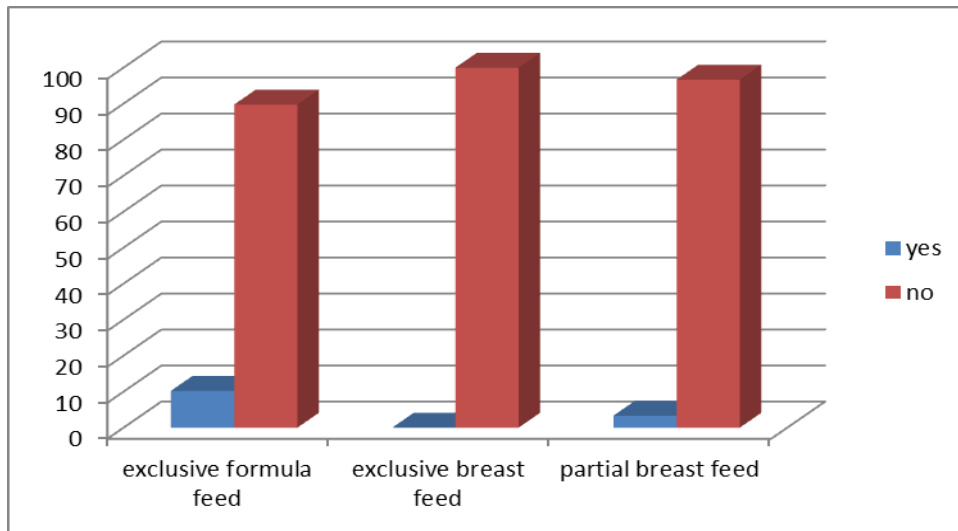


Figure 10: Hospitalized due to lower respiratory tract infection in last six months

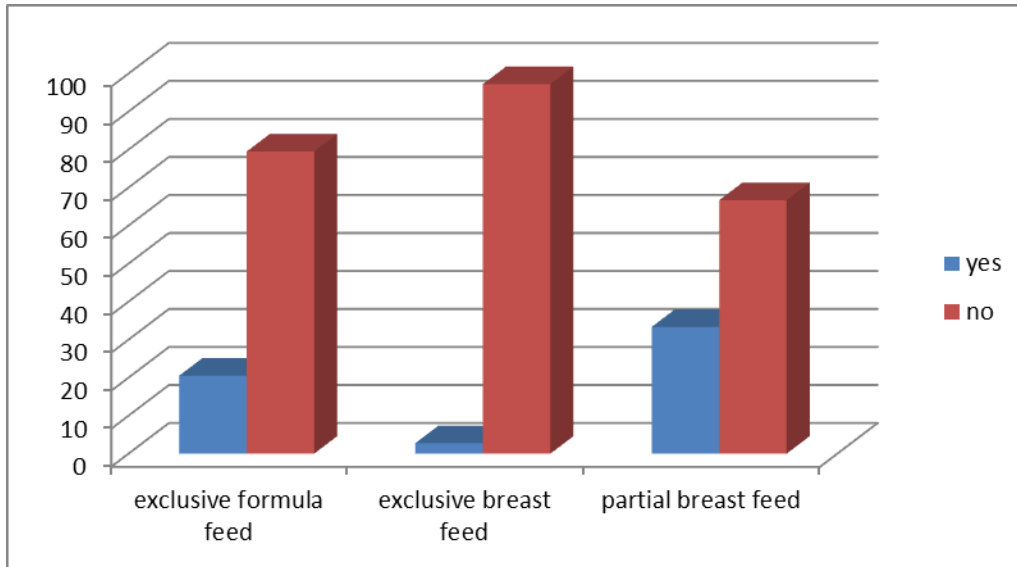


Figure 11: Prevalence of otitis media in last six months

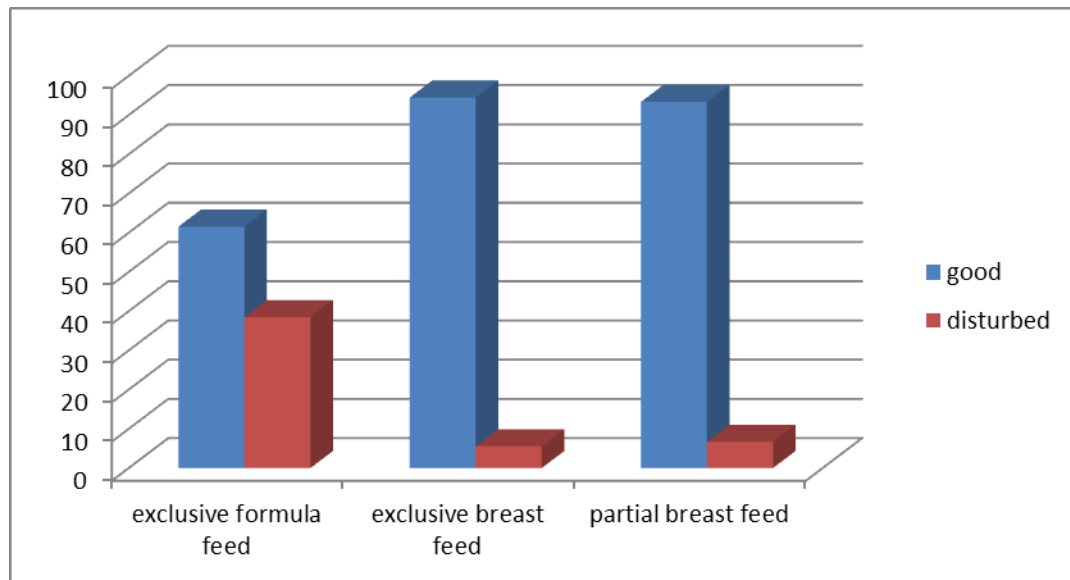


Figure 12: Sleep pattern of child

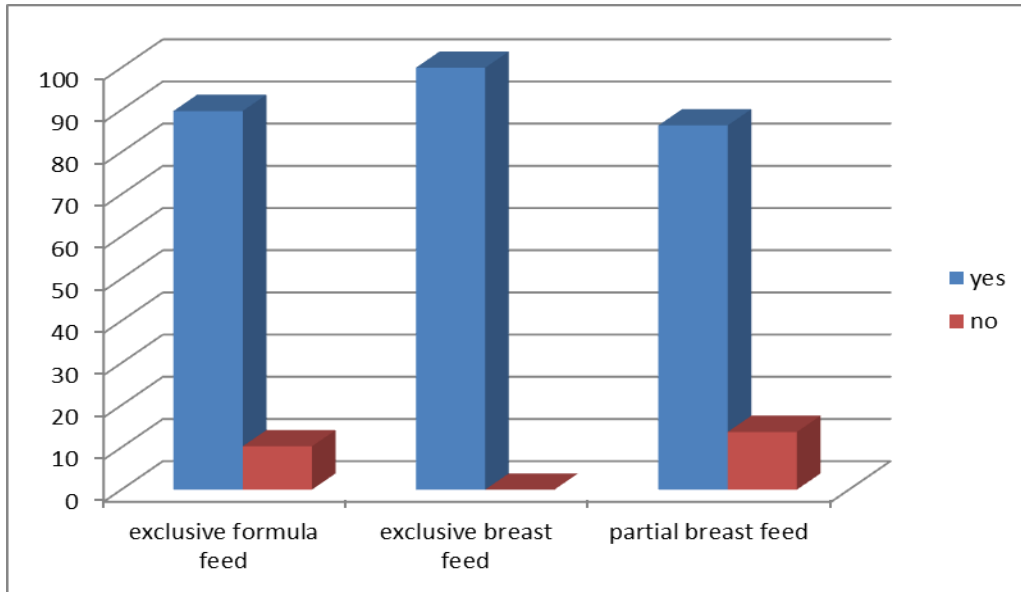


Figure 13: Child physically active

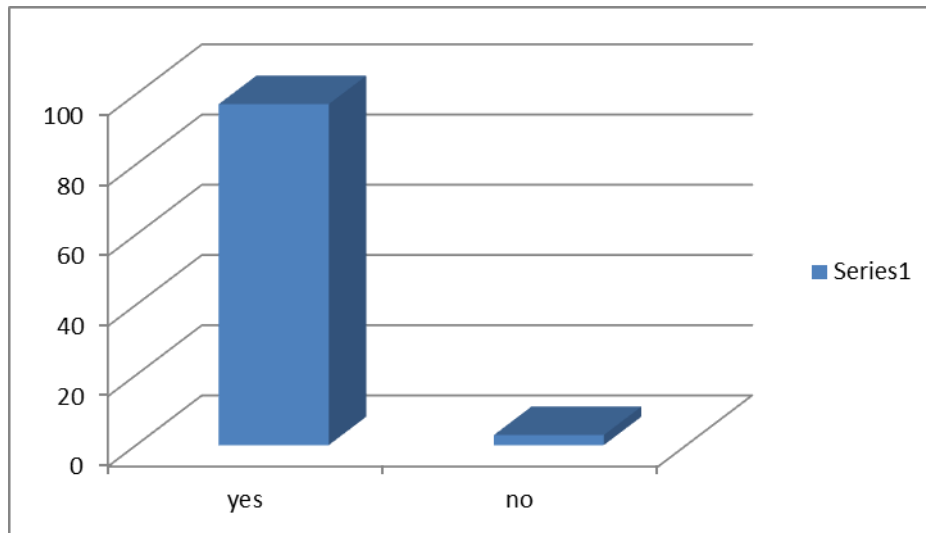


Figure 14: Consultation with doctor or pharmacist about child feeding method