BOTTLE-FEED VERSUS MOTHER FEED CHILDREN – LONG TERM EFFECTS OF INFANT FEEDING ON COGNITIVE DEVELOPMENT AND SCHOOL PERFORMANCE

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ABSTRACT

Mother feed (i.e. Breast feeding) provides essential nutrients, antibodies and immune cells to allow infant growth and protect them from infections. Mother feed not only have short term effects but it influences brain development as well as life time effects in many organ systems. This study was conducted to compare mother feed and bottle feed children at school going age. The self-administrated questionnaire survey was conducted including parents of children between 5 to 10 years of age (n=300). There was no significant difference found in the median age of children reported for, neither there was any significant difference in the weight of the two groups. However, bottle feed children significantly showed better performance in mathematics while mother feed children were significantly better in general science and physical activities at school. The study concluded that bottle feed or breast feed both provides nutrition and overall children were doing good.

Key Words: bottle feed, mother feed, school performance

INTRODUCTION

Breastfeeding is widely considered to be the optimal method of infant feeding due to its numerous benefits for both the mother and the child. Breast milk contains a range of nutrients, hormones, immune cells and antibodies that support the infant's growth and development, as well as protecting them from infections and diseases. However, not all mothers are able to or choose to breastfeed. As a result, infant formula has been developed as an alternative method of infant feeding(1). While formula can provide adequate nutrition for infants, there is evidence to suggest that breastfed babies may have some advantages over those who are bottle-fed. This may include differences in immune function, gut microbiota, and long-term health outcomes(2,3). There have been numerous studies on the relationship between infant feeding and school performance, but the results are often conflicting or inconclusive. Some studies have suggested that breastfeeding may be associated with higher academic achievements, while others have found no significant difference between breast-fed and formula-fed children. Though there is strong evidence suggesting lower number of infectious diseases and number of hospitalizations in breast feed infants as compared to bottle feed(4,5).

Overall, there are contradicting literature regarding the impact of bottle feeding versus mother feeding on school performance, as the relationship may be complex and multifaceted. Previously published studies have found that children who were breastfed for at least 6 months had significantly higher scores on standardized tests of verbal and nonverbal intelligence at the school going age as compared to those who were never breastfed (6,7). A meta-analysis of 18 studies concluded that breastfeeding was associated with higher cognitive performance in children, particularly in language and reading skills. The effect was stronger in children who were breastfed for longer durations and received more exclusive breast milk(8).

Another study found that children who were exclusively breastfed for the first 6 months of life had lower odds of being diagnosed with attention-deficit/hyperactivity disorder (ADHD) at age 3 as compared to those

who were never breastfed or received formula feed straight away(9). In another study investigators followed a group of children from birth to age 7 and found that those who were breastfed for at least 6 months had higher scores on tests of math, reading, and writing than those who were never breastfed or received formula(10). However, the effect was modest and disappeared after adjusting for other factors such as maternal education and socio-economic status. The study found that children who were breastfed for at least 6 months had higher scores on a standardized test of school readiness at age 4 than those who were never breastfed or received formula(11). The effect was partially mediated by language skills and behavior problems. While these studies provide some evidence for the benefits of breastfeeding on school performance, it's important to note that the findings are not always consistent. There was limited literature available from Pakistan. Therefore, this study was conducted to evaluate impact of the mode of infant feeding on their performance in school, in children between 5 to 10 years of age.

METHODOLOGY

The study was a population based survey from two large cities of Sindh including Hyderabad and Karachi, Pakistan. The parents of the school going children between 5 to 10 years of age were selected. The children whose parents were available to respond and those who were on mother feed or on bottle feed after three months of their life and exclusively continued the feeding for at least one year of their life regardless of weaning after six months. Their parents were requested to fill a self-administrated questionnaire. The sampling was done by using non probability snowball technique, where four children were recruited through a non-probability purposive sampling initially, then their friends were traced and request sent to their parents. Finally, the sample size of 300 parents was achieved. Figure 1 presents the method of sampling technique adopted in this study. The questionnaire in the first part confirmed that eligibility criteria that the child has mother or bottle feed after three months (regardless of the feeding pattern during initial three months) and continued feeding for at least one year. The information of the age, weight, performance in mathematics, Sciences and physical activities was asked. The information was gathered in categorical manner where average, below average and above average was considered.

Statistical methods

Data was entered in Statistical package for social sciences (SPSS version 23.0). Categorical variables were analyzed initially for frequency distribution then comparison was made between the groups by using cross-tabs and application of Chi-squared test. A p-value of <0.05 was considered significant. Bar charts were used for presentation of data.

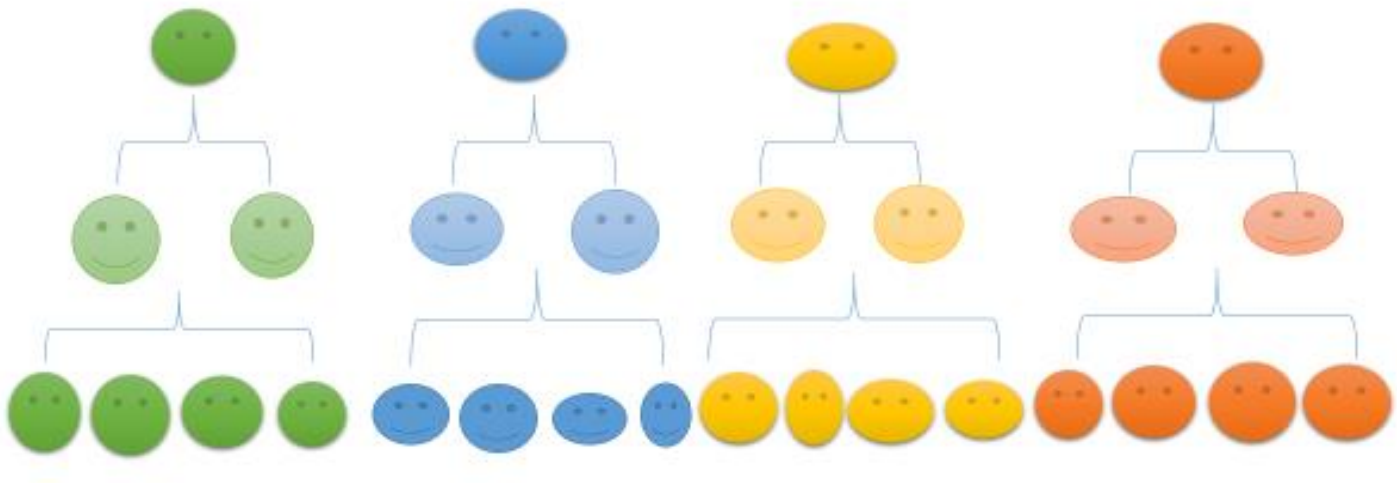

Figure 1. A summary of Snowball sampling method for the study

RESULTS

A total of 251 parents responded to the questionnaires regarding 300 children. Median age of the children was 7 (±SD 1.625) years. Age distribution of participants is given in Figure 2. A summary of the children characteristics is given in Table 1.

Comparison of Bottle feed and mother feed children

Both groups were comparable in age (Figure 3) and there was no significant difference in the weight of the children in both groups (Figure 4). The bottle feed children showed significantly high performance in mathematics (Figure 5), while mother feed children were ahead in their performance in general science subject (Figure 6). The children who were on mother feed were also significantly more physically active as compared to bottle feed children (Figure 7).

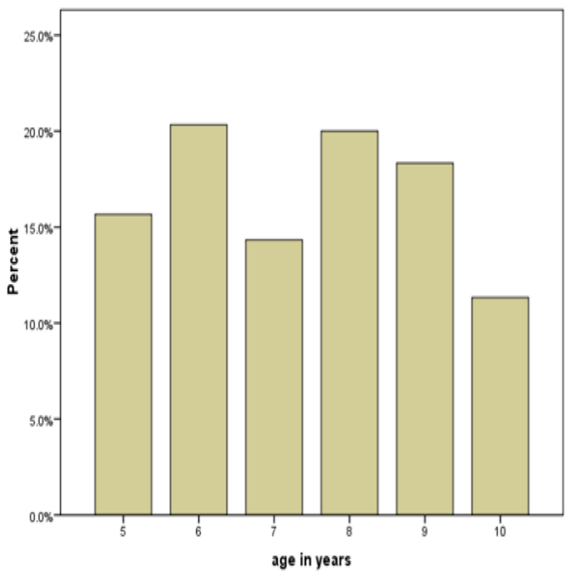

Figure 2. Age distribution of the children included in this study

Table 1. Sumary of weight and school performance in school going children

Parameter	Average N(%)	Below average N(%)	Above average N(%)
Weight	174 (58)	54(18)	72(24)
Performance in Maths	199(66.3)	53(17.7)	48(16.0)
Performance in Sciences	190(63.3)	77(25.7)	33(11.0)
Physical activity	185(61.7)	100(33.3)	15(5.0)

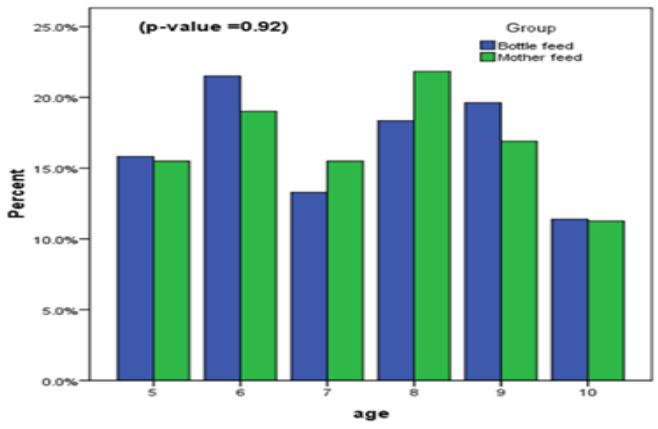

Figure 3. Age distribution of the groups- Mother feed versus Bottle Feed

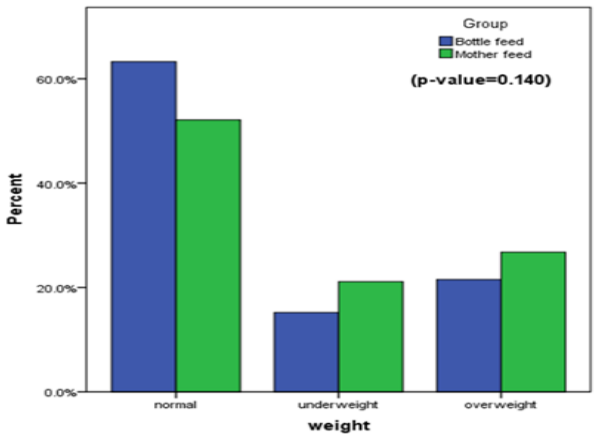

Figure 4. Comparison of weight of the groups- Mother feed versus Bottle Feed

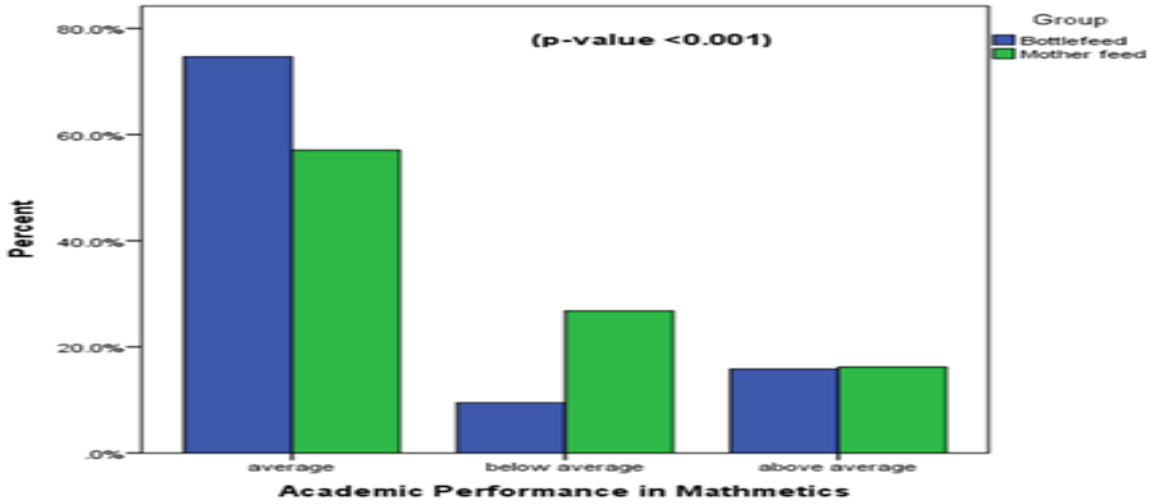

Figure 5. Comparison of Academic performance in Mathmetics- Mother feed versus Bottle feed

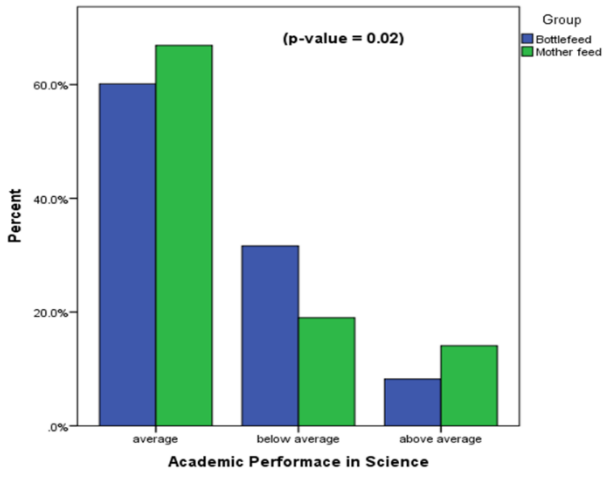

Figure 6. Comparison of Academic performance in Science- Mother feed versus Bottle feed

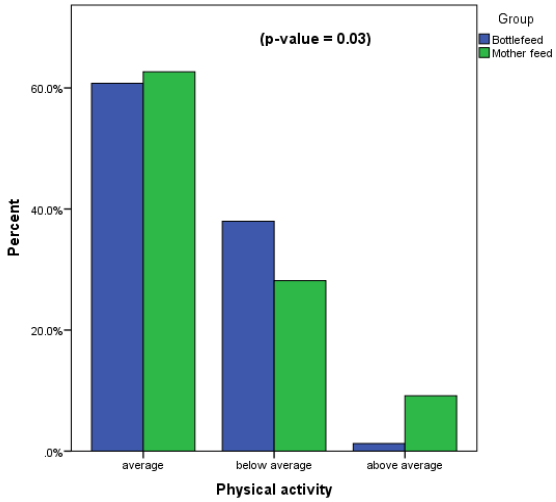

Figure 7. Comparison of physical activity- Mother feed versus Bottle feed

DISCUSSION

The study raises interesting points about the potential impact of feeding methods on academic performance and physical activity in children. Infant feeding is a crucial factor in the child's development, especially in terms of cognitive development and school performance. The nutritional content and the feeding method play a significant role in the cognitive development of the child. The two primary modes of infant feeding are bottle feeding and mother feeding. The debate over which method is better for cognitive development and school performance has been ongoing for many years.

Overall, this study provides important insights into the potential long term impact of feeding methods on child development. It is important to note, however, that every child is unique and may respond differently to different feeding methods. There have been several studies conducted in recent years that have examined the potential relationship between infant feeding and child development. One such study published in the Journal of Pediatrics in 2016 found that breastfed infants showed better cognitive development at 12 months of age, as measured by the Bayley Scales of Infant and Toddler Development(12). The study also found that longer duration of breastfeeding was associated with better scores on cognitive and language development tests. In terms of physical activity, a study published in the Journal Pediatrics in 2019 found that breastfed infants were more physically active at 3 months of age compared to formula-fed infants. The study also found that the duration of breastfeeding was positively associated with physical activity levels(13). It is important to note that while these studies provide important insights into the potential impact of infant feeding on child

development, more research is needed to fully understand the complex relationship between these factors. Additionally, every child is unique and may respond differently to different feeding methods.

Additional studies have explored the potential relationship between infant feeding and child development. Another study found that breastfed infants had better mental and psychomotor development scores at 6- and 12-months of age, as measured by the Griffiths Mental Development Scales(14). The study also found that longer duration of breastfeeding was associated with better developmental outcomes.

Another study published in the European Journal of Pediatrics in 2018 found that breastfed infants had better visual and auditory attention compared to formula-fed infants at 6 and 12 months of age(15). The study also found that the duration of breastfeeding was positively associated with attention scores.

Our study is also consistent with existing literature, it is important to note that while the groups were comparable in age and weight, there may have been other factors that influenced the results. For example, socioeconomic status, parental education, and other environmental factors may have played a role in the children's academic performance and physical activity.

That being said, the study found that children who were bottle-fed showed significantly higher performance in mathematics, while those who were breastfed had an advantage in general science subjects. This may be due to the differences in the nutritional composition of breast milk and formula, as breast milk contains important nutrients and antibodies that are not found in formula.

Additionally, the study found that children who were breastfed were significantly more physically active than bottle-fed children. This may be because breastfed infants experience more skin-to-skin contact with their mothers and are more likely to be held and carried, which can promote physical activity and motor development.

It is known that breast milk contains essential nutrients and vitamins that help develop a strong immune system and cognitive abilities in infants(16). Breast milk also helps in the overall development of the child's cognitive, emotional, and social skills(17). Breastfeeding has also been linked to improved cognitive development in areas such as memory, language, and problem-solving.

The study has small sample size and parents were questioned about the past, therefore, there is a little risk of recall bias. The parents were not asked about the type of the formula they gave to their infant this might also influence the results and considered as a limitation of the study. However, this study provides an important insight about long term impact of formula milk.

CONCLUSION

The results of the study suggest that there is long term impact of the type of milk an infant is receiving. The children fed on formula milk showed significantly higher performance in mathmetics while breast fed children are more physically active and showing significantly higher performance in science subjects. Further studies to explore the type of thr formula milk used and its composition and correlation with long term outcome of the children is required.

Ethical Consideration: The study was approved by the local Research Ethics Committee

Conflict of Interest: There is no conflict of interest.

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