RESEARCH

Comparison of Growth Pattern in Neonates on Breast Feed Versus Formula Feed

Singh Arun Kumar[*1], Singh Raj Kumar[2], Shah Rajesh Prasad[1], Ahmad Equbal[3], Ansari Akhtar Alam[4], Mansuri Mohammed Islam[5]

[1] Department of Paediatrics, BPKIHS, Dharan, Nepal
[2] Department of Paediatrics, Kanti Bal Hospital, Kathmandu
[3] Department of Paediatrics, Novel Medical College, Biratnagar, Nepal
[4] Department of Pharmacology, National Medical College, Birgunj, Nepal
[5] Department of Emergency, National Medical College, Birgunj, Nepal

ABSTRACT

Background: Breast milk and colostrums are the first feeding sources for infant, providing nutrients, growth factors and immunological components. So we conducted this study to compare the growth pattern of neonates on breast feed versus formula feed.

Methods: This study was done in the Department of Pediatrics, King Edward Medical University, Mayo Hospital, Lahore from 2015 July to 2016 July as cross sectional study. The Non Probability purposive sampling technique was used. Information on type of feeding was obtained from mothers. Subsequently neonates were divided in two groups on the basis of type of feeding (i.e. breast feeding or formula feeding).

Results: In this study the mean age of the patients was 16.56±6.26 days and the mean gestational age of the patients was 8.52±0.97 months. The male to female ratio of the patients was 1.3:1. Statistically there was significant difference found between the weight gain in study groups at 10^{th}, 14^{th} week and 4^{th} month follow up i.e. p-value<0.05.

Conclusion: The prevalence of breastfeeding in infants in our study was 52.3%. Our results showed that the breast fed infants had better weight gain compared to formula fed infants; however there was no statistically significant difference in gain in length between breast fed and formula fed infants.

Keywords: Exclusive Breast feeding, Formula feeding, Length, Infants, Weight

***Corresponding Author:** Dr. Arun Kumar Singh, BPKIHS, Dharan, Nepal, Email: arunsinghnepal@gmail.com

INTRODUCTION

Breast milk and colostrums are the first feeding sources of infant, providing nutrients, growth factors and immunological components, which are crucial for the newborn's optimum development and health. Duration of exclusive breast feeding & time of introduction of solid foods is a key factor that may influence allergy development.[1]

Breast feeding is one of most effective ways to ensure child health & survival. Failure to breast feed during the 1st 6-months of life contributes to

over a million preventable child death each year. There are well established benefits to the mother and to the child's growth, mental development and immunological system.[2]

The WHO recommends that an infant should be exclusively breast fed for the six months and then continued breast feeding for two years with supplemental foods. Globally less than 40% of infants less than six months of age are exclusively breast fed. Increasing this rate can be achieved by improving breast feeding support for mothers and families.[2]

The incidence of breast feeding has recently been found to be 81% in the London UK (an increase from 76% in 2005). The incidence of breast feeding was only 62% in 1990.[3] The incidence of Exclusive breast feeding in Pakistan was reported by about 54% of the mothers.[4]

Breastfeeding, also known as nursing, is the feeding of babies or young children with milk from the female breast.[7] Breastfeeding should be started during the hour after birth and allowed as the baby wishes.[8] During the first few weeks of life babies may nurse eight to twelve times a day. The duration of a feeding is usually ten to fifteen minutes on each breast. The frequency of feeding decreases as the child gets older.[9] Some mothers pump milk so that it can be used later when their child is being cared for by others. Breastfeeding benefits both mother and baby. Infant formula does not have many of the benefits.[10]

It is estimated that greater than a million babies could be saved globally per year through greater breastfeeding. Breastfeeding decreases the risk of respiratory tract infections and diarrhea. This is true both in developing and developed countries. Other benefits include a lower risk of asthma, food allergies, celiac disease, type-1 diabetes and leukemia. Breastfeeding may also decrease the risk of obesity in adulthood and improved cognitive development.[7]

Benefits of breastfeeding for the mother include less blood loss following delivery, better uterus shrinkage, weight loss and less postpartum depression. It also increases the time before menstruation and fertility returns, known as lactational amenorrhea. Long term benefits may include a decreased risk of breast cancer, cardiovascular disease and rheumatoid arthritis. Breastfeeding is less expensive for the family than infant formula.[11]

Health groups, such as World Health Organization (WHO), support six months of exclusive breastfeeding.[12] This means that no other foods (other than vitamin) D are typically given. Continued partial breastfeeding until at least a year of age is recommended. Globally about 38% of infants are just breastfed during their first six months of life In the United States about 75% of women begin breastfeeding and about 43% breastfed until six months. Medical conditions that do not allow breastfeeding are uncommon. During breastfeeding drugs and certain medications are not recommended.[12]

But a study found that there is no significant difference ($p>0.05$) between infants either on breast feed or formula feed in their length and weight (breast feed: Weight = 6835.5±782grams and Length = 63.85±2.35cms vs. formula feed: Weight = 6922±703grams and Length = 63.9±1.6cms). The growth was slightly better in formula feeding during first 6 months of life.[5]
But another study also found that there are infants on breast feed have better weight gain (6712±626.5grams) as compared to infants on formula feeding (6356±667grams), moreover, the length was also greater with breast feeding (i.e. 63.15±2.14 cms of breast feed infants vs. 62.45±2.33 cms of formula feed infants, $p<0.05$).[6]

The rationale of my study is to determine the frequency of exclusive breast feeding and growth pattern of neonates presenting in Department of Pediatrics, King Edward Medical University, Mayo Hospital, Lahore of a tertiary care hospital. Infant formula is the only alternative to breast milk. It is available in cartons or as powder to be made up as directed. But mother feed is better in all means. So we conducted this study to assess the growth pattern of infants in local population who are on either formula feed or breast feed.

MATERIAL AND METHODS

Operational Definition

Breast Fed: It was defined as neonate on exclusively mother feed / breast feeding.

Formula Fed: It was defined as neonate on bottle feed or formula feed.

Measurement of Weight: It was measured as increase in weight of baby from baseline till 4 months of age in terms of grams measured by digital weighing scale.

Measurement of Length: It was measured as increase in length of baby from baseline till 4 months of age in terms of centimeters (cms) measured by infantometer.

Study Design

Cross sectional study, Department of Pediatrics, King Edward Medical University, Mayo Hospital, Lahore. Sample size of 382 neonates was calculated with 95% confidence level, 5% margin of error and taking expected percentage of exclusive breast feeding i.e. 54% in neonates presenting in Department of Pediatrics, King Edward Medical University, Mayo Hospital, Lahore. However 400 cases were enrolled. Non Probability, Purposive sampling technique.

Inclusion Criteria

Neonates with <28 days of age, Both genders and Neonates delivered at term (gestational age >36weeks from maternal history)

Exclusion Criteria

Children having congenital heart diseases, tracheoesophageal fistula, cleft lip, cleft palate or with visible congenital deformity assessed through general physical examination, twin birth (on history),LBW (birth weight<2500grams) on birth card, Sick babies (on clinical examination), Infants on exclusive breast feeding at start of study converted on bottle/formula feeding due to environmental circumstances like mother's health is not fit or she has conceived again and change in breast feeding practice (exclusive breast feeding/ formula feeding) during the follow-up period.

DATA COLLECTION PROCEDURE

400 neonates fulfilling inclusion criteria were enrolled from Department of Pediatrics, King Edward Medical University, Mayo Hospital, Lahore. A verbal consent was obtained from their parents & ensuring confidentiality. Demographic variables (name, age, gestational age at birth, contact number) were also obtained. Feeding information was obtained from mothers. Then neonates were divided in two groups on the basis of type of feeding (i.e. breast feeding or formula feeding). Weight of neonate was measured by digital weighing scale. Neonate's length was measured (cms) using an infantometer. The mothers were advised to visit Department of Pediatrics, King Edward Medical University, Mayo Hospital, Lahore, regularly till 4 months. Then again Weight and Length of infant was measured.

DATA ANALYSIS PROCEDURE

The data collected was analyzed by statistical program SPSS Version 18. Quantitative variables like age, gestational age, weight and length at time of first presentation and after 4 months was presented as mean and standard deviation. Qualitative variables like gender were presented as frequency and percentage. Both groups were compared by using t-test. $p \leq 0.05$ was taken as significant. Chi-square test was applied. P-value ≤ 0.05 was considered as significant.

RESULTS

In present study, total 400 cases were enrolled. The mean age of the cases was 16.56±6.26 days with age range 7 to 27 days.

Table1 : Age Distribution of Study cases (days)

Age (days)	n	400
	Mean	16.56
	SD	6.26
	Minimum	7
	Maximum	27

57% patients were males and 43% patients were females (M:F ratio 1.3:1).

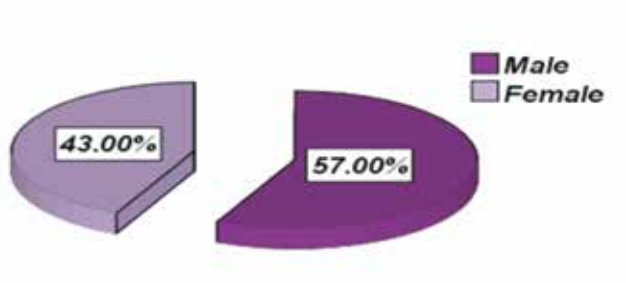

Figure 1 : Sex distribution of Study cases

The results showed that the mean weight of the study cases at 28th day was 3244.75±445.75 grams; at 6th week the mean weight was 4745.00±853.99 grams and at 10th week the mean weight was 6428.75±1329.93 grams, the mean weight at 14th week was 6428.75±1329.93 grams and at 4th month the mean weight was 7372.50±1274.38 grams.

Table 2 : Comparison of weight at different follow ups in both study groups

Mean		Group A		Group B		p-value
		SD	Mean	SD	Mean	
Weight (gms)	28th day	3225.36	448.07	3265.97	442.41	0.363
	6th week	4729.67	840.604	4761.78	870.302	0.708
	10th week	6830.14	1290.163	5989.53	1233.265	0.000
	14th week	6830.14	1290.163	5989.53	1233.265	0.000
	4th month	7825.36	1251.683	6876.96	1105.866	0.000

Group A= Breast feed
Group B= Formula feed

In group A, the mean length at 28th day was 51.57±0.86 cm compared to group B (51.55±0.86 cm). The mean length of study cases on 6th week in group A was 55.88±1.73 cm and in group B 56.02±1.69 cm. The mean length of study cases on 10th week in group A was 59.88±1.73 cm and in group B 60.02±1.69 cm. The mean length of study cases on 14th week in group A was 62.46±0.85 cms and in group B 62.59±0.89 cm. Similarly at 4th month in group A the mean length was 64.46±0.86 cm and in group B 64.59±0.88 cm. Statistically there was no significant difference between the mean lengths of study groups at follow up at 28th day, 6th, 10th, 14th week and 4th months (p-value=0.81, 0.41, 0.41, 0.12, 0.12 respectively).

Table 3 : Comparison of length at different follow ups in both study groups

Mean		Group A		Group B		p-value
		SD	Mean	SD	Mean	
Weight (gms)	28th day	51.57	0.86	51.55	0.86	0.81
	6th week	55.88	1.73	56.02	1.69	0.41
	10th week	59.88	1.73	60.02	1.69	0.41
	14th week	62.46	0.85	62.59	0.89	0.12
	4th month	64.46	0.86	64.59	0.88	0.12

Group A= Breast feed
Group B= Formula feed

DISCUSSION

This cross sectional survey was done determine the frequency of neonates on exclusively breast feeding and compare the growth in terms of length gain and weight gain between breast fed and formula fed infants.

According to our study results in their growth of weight at 10th, 14th week & 4th month there is significant difference was found between the breast fed and formula fed baby. The greater weight was observed in breast fed infants than in formula fed infants. The mean weight in breast fed patients at 4th month was 7825.36±1251.68gms and in formula fed infants it was 6876.96±1105.86 gms i.e. p-value=0.000.

Our study results showed no difference among length of babies between the breast fed and formula fed infants. On 4th month in breast fed infants the mean baby length of the patients was 64.46±0.86cms and in formula fed it was 64.59±0.88cms i.e. p-value=0.12.

Agostoni, et al. concluded in their study that the growth pattern of breast fed and formula fed Italian infants differs in the first 12 months of life. Growth indices in breast fed groups was high at birth and closer than expected to the reference at 12 months, may reflect differences in genetic factors, intrauterine conditions, or both.[6]

On contrary a study by Ahmed, et al. showed that no statistical significant differences between the weight, length, head, and chest circumference to breast-fed and artificially fed infants during the second visit as regards to all anthropometric measurements.[14]

A study found that there is no significant difference ($p>0.05$) between infants either on breast feed or formula feed in their length and weight (breast feed: Weight = 6835.5±782 grams and Length = 63.85±2.35 cms vs. formula feed: Weight = 6922±703 grams and Length = 63.9±1.6 cms). The growth was slightly better in formula feeding during first 6 months of life.[5]

But another study also found that there is infants on breast feed have better weight gain (6712±626.5 grams) as compared to infants on formula feeding (6356±667 grams), moreover, the length was also greater with breast feeding (i.e. 63.15±2.14 cms of breast feed infants vs. 62.45±2.33 cms of formula feed infants, $p<0.05$).[6] One study in Menoufia, Egypt reported that the infants who were exclusively breast-fed lost 14 percentiles of weight for age from birth to 6 months while those who were exclusively formula fed lost 18 percentiles.[15]

Dewey showed in their study that there is no significant difference in linear growth between feeding groups. Growth in head circumference does not differ by feeding mode. Because of the difference in weight gain, breast-fed infants are generally leaner than formula-fed infants by 12 months of age. Evidence to date suggests that there are no apparent adverse consequences associated with the lower intake and slower weight gain of breast-fed infants: compared to formula-fed infants.[16]

Ziegler, et al. demonstrated in their study that during the first 6–8 weeks of life there was little difference in growth (gain in weight and length) between breast- and formula-fed infants. However, from about 2 months of age to the end of the first year of life formula-fed infants gain weight and length more rapidly than breast-fed infants. There are no consistent differences in adiposity during the first 4–5 months of life, but during the later part of the first year of life the preponderance of the evidence suggests that breast-fed infants are leaner than formula-fed infants.[17]

In our study breast fed infants were 52.25% while the formula fed infants were 47.75%. Some of the studies discussed here showing the incidence of breast fed infants. In 2010, HHS released Healthy People 2020, which provides updated national breastfeeding objectives for 2020, The exclusively Breastfed infants at 3 months were 46.2%, and who are exclusively breastfed at 6 months to 25.5% ever breastfed to 81.9%, who are breastfed at 6 months to 60.6%, who are breastfed at 12 months to 34.1%.[18]

Cai, et al. showed in their study that trend data suggest the prevalence of exclusive breastfeeding among infants younger than six months in developing countries increased from 33% in 1995 to 39% in 2010. The prevalence increased in almost all regions in the developing world, with the biggest improvement seen in West and Central Africa.[19]

CONCLUSION

The prevalence of exclusively breast fed infants in our study was 52.3%. Our study results showed that the breast fed infants had better weight gain than formula fed infants; however no statistically significant difference was observed in the average length on breast fed and formula fed infants.

REFERENCES

1. Minniti F, Comberiati P, Munblit D, et al. Breast-milk characteristics protecting against allergy. Endocr Metab Immune Disord Drug Targets. 2014;14(1):9-15.
2. WHO 10 on breastfeeding. facts. 2014; Available from:http://www.who.int/features/factfiles/breastfeeding/en/.
3. McAndrew F, Thompson J, Fellows L, Large A, Speed M, Renfrew MJ. Infant feeding survey 2010. Health and Social Care Information Centre. 2012.

4. Ali S, Ali SF, Imam AM, Ayub S, Billoo AG. Perception and practices of breastfeeding of infants 0-6 months in an urban and a semi-urban community in Pakistan: a cross-sectional study. J Pak Med Assoc. 2011;61(1):99.
5. Dewey KG, Heinig MJ, Nommsen LA, Peerson JM, Lönnerdal B. Growth of Breast-Fed and Formula-Fed Infants From 0 to 18 Months: The DARLING Study. Pediatrics. 1992;89(6):1035-41.
6. Agostoni C, Grandi F, Gianni M, et al. Growth patterns of breast fed and formula fed infants in the first 12 months of life: an Italian study. Arch Dis Child. 1999;81(5):395-9.
7. Breastfeeding and Breast Milk: Condition Information. Available from. www.nichd.nih.gov/health/topics/breastfeeding/conditioninfo/Pages/default.aspx
8. Wagner C, Greer F. American Academy of Pediatrics Section on Breastfeeding; American Academy of Pediatrics Committee on Nutrition; American Academy of Pediatrics Section on Breastfeeding; American Academy of Pediatrics Committee on Nutrition. Prevention of rickets and vitamin D deficiency in infants, children, and adolescents. Prevention of rickets and vitamin D deficiency in in fants, children, and adolescents. Pediat rics. 2008;122:1142-52.
9. What is weaning and how do I do it?2015,Available from: https://www.nichd.nih.gov/health/topics/breastfeeding/conditioninfo/Pages/weaning.aspx.
10. Ip S, Chung M, Raman G, Trikalinos TA, Lau J. A summary of the Agency for Healthcare Research and Quality's evidence report on breastfeeding in developed countries. Breastfeeding med. 2009;4(S1):S-17-S-30.
11. Garner L, Black L. Breastfeeding and the use of human milk. American Academy of Pediatrics Working Group on Breastfeeding. Pediatrics. 1997;100(6):1035-9.
12. Kramer M, Kakuma R. Optimal duration of exclusive breastfeeding Cochrane Database. Syst Rev. 2009;2012(8):CD003517.
13. Agostoni C, Grandi F, Gianni M, Silano M, Torcoletti M, Giovannini M, et al. Growth patterns of breast fed and formula fed infants in the first 12 months of life: an Italian study. Arch Dis Child. 1999;81(5):395-9.
14. Ahmed EM, Ibrahim IA, Hussein AAE-AM, Ahmed FA. Impact of Breast Feeding Versus Formula Feeding On Surgical Wound Healing In Infants During The First Three Months Of Age. IJSBAR. 2013;10(1):25-37.
15. Eissa A, El-Sherbini A, Khashaba A, El-Bakry M, ER AA. Breast feeding and infant growth a follow-up study in Menoufia Egypt. Population Sciences. 1990;9:69-75.
16. Dewey KG. Growth characteristics of breast-fed compared to formula-fed infants. Neonatology. 1998;74(2):94-105.
17. Ziegler EE. Growth of breast-fed and formula-fed infants. Nestle Nutr Workshop Serpediatr program 2006;58:51-9.
18. Healthypeople.gov. U.S. Department of Health and Human Services. Healthy People 2020 Objectives. 2011 [cited 2015]; Available from: http:// healthypeople.gov/2020/topicsobjectives2020/pdfs/HP2020objectives.
19. Cai X, Wardlaw T, Brown DW. Global trends in exclusive breastfeeding. Int Breastfeed J. 2012;7(1):12.