Correlation Between Infant and Young Child Feeding Practices and Anthropometric Measurements in Children Less Than 2 Years in A Tertiary Care Centre In Kolar – an Observational Study.

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ABSTRACT

Introduction: Under-nutrition is estimated to be associated with 2.7 million child deaths annually or 45% of all child deaths. Infant and young child feeding is a key area to improve child survival and promote healthy growth and development. **Methodology:** This study was conducted in RLJH hospital, Pediatric OPD. The study was started after obtaining ethical clearance from the institutional ethical committee as well as consents from the parents. All children satisfying inclusion and exclusion criteria were included for the study. IYCF Questionnaire was used to elicit the infant feeding practices and was correlated with the Anthropometric measurements.

Results: The study shows that there are numerous feeding practices practiced in rural India which has impact on anthropometry. The practice which has a positive impact needs to be encouraged. In the study practice of Exclusive breast feeding for 6 months, initiating complementary feeding with locally available foods, no pre-lacteal feeds, introduction of fruits, vegetables, not introducing sugars and sweeteners till two years are good practices and need to be encouraged. The practices that need to discouraged are usage of feeding bottles, usage of formula feeds and not introducing eggs and meat till one year of age. Although cultural practices have an influence on feeding practices only positive ones need to be followed.

In the study it was seen that only weight for age was majorly affected compared to other anthropometric measurements. This shows acute nutritional deficiency is more common rather than chronicity. The inter-current illnesses might also be a cause for this rather than feeding practice alone.

Conclusion: The various feeding practices that are followed across India varies from Place to Place and Home to Home. Education alone can bring about changes in feeding practices

Keywords: *Feeding, Infant, Practices*

1. INTRODUCTION

Under-nutrition is estimated to be associated with 2.7 million child deaths annually or 45% of all child deaths. Infant and young child feeding is a key area to improve child survival and promote healthy growth and development. The first 2 years of a child's life are particularly important, as optimal nutrition during this period lowers morbidity and mortality, reduces the risk of chronic diseases, and fosters better development overall. WHO and UNICEF recommend: Early initiation of breastfeeding within 1 hour of birth; Exclusive breastfeeding for the first 6 months of life; and introduction of nutritionally adequate and safe complementary (solid) foods at 6 months together with continued breastfeeding up to 2 years of age or beyond.[1] Exclusive breastfeeding for 6 months has many benefits for the infant and mother. Chief among these is protection

against gastrointestinal infections which is observed not only in developing but also industrialized countries. Early initiation of breastfeeding, within 1 hour of birth, protects the newborn from acquiring infections and reduces newborn mortality. The risk of mortality due to diarrhea and other infections can increase in infants who are either partially breastfed or not breastfed at all. Breast-milk is also an important source of energy and nutrients in children aged 6–23 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 also a critical source of energy and nutrients during illness, and reduces mortality among children who are malnourished. Children and adolescents who were breastfed as babies are less likely to be overweight or obese. Additionally, they perform better on intelligence tests and have higher school attendance. Breastfeeding is associated with higher income in adult life. Improving child development and reducing health costs results in economic gains for individual families as well as at the national level.[1]

Complementary feeding: Around the age of 6 months, an infant's need for energy and nutrients starts to exceed what is provided by breast milk, and complementary foods are necessary to meet those needs. An infant of this age is also developmentally ready for other foods. If complementary foods are not introduced around the age of 6 months, or if they are given inappropriately, an infant's growth may falter. The health outcomes of a child are directly proportional to their feeding practices, which are, in turn, dependent on the knowledge and practices of the mother. The first two years of a child's life are crucial to ensure appropriate growth and development. Malnutrition during this period results in a series of problems, beginning with reduced weight for age and stunting, progressing to the inability to achieve potential height in adulthood, and reduced capacity for physical work[2] Improper feeding practices have also been linked to reduced reproductive capacity, complicated deliveries, and increased incidence of low birth weight infants in women who were malnourished as children.[3]

2. METHODOLOGY

The study was conducted at RL Jalappa Hospital, Pediatric Department. The ethical clearance from the institutional ethical committee was obtained prior to the start of study. All the children satisfying inclusion and exclusion criteria were enrolled for the study after obtaining written informed consent from the parents. The inclusion criteria were children aged less than 2 years. The exclusion criteria were children born preterm i.e., before completion of 37 weeks of gestation., Children admitted to NICU, Children with major congenital malformations of Cardiovascular, Gastrointestinal, Respiratory and Central Nervous System and Children who are diagnosed with chronic systemic illness and skeletal deformities. The sample size was 98. The validated Infant and Young Child Feeding Questionnaire was given to the parents. It was in both English and Kannada language for better understanding. Before answering, each of the questions were discussed with the parents and all their doubts were clarified. The anthropometric measurements of the children were recorded.

The collected data were entered in the Microsoft Excel 2016 and analysed with IBM SPSS Statistics for Windows, Version 29.0.(Armonk, NY: IBM Corp). To describe about the data, descriptive statistics frequency analysis, percentage analysis were used for categorical variables and the mean & S.D were used for continuous variables. To find the significant difference in the multivariate analysis the one way ANOVA with Tukey's Post-Hoc test was used. To find the significance in qualitative categorical data Chi-Square test was used. In all the above statistical tools the probability value 0.05 was considered as significant level. [4,5,6,7]

3. RESULTS

The age distribution of Infants, included in the study. There were 19 (19.4%) infants aged between 0 to 6 months, 35 (35.7%) aged between 6 – 12 months, 21 (21.4%) aged between 12 – 18 months and 23 (23.5%) aged between 18 – 24 months. In the study there were a total of 31 (31.6%) female and 67 (68.4%) males. In all the age groups males were more than females. On analyzing the questionnaire:

Table 1: Analysis of the question "Was the child breastfed immediately after birth?"

Was the child breastfed immediately after birth?			Yes	No	Total
Age	Upto 6 months	Count	17	2	19
		%	89.5%	10.5%	100.0%
	6 - 12 months	Count	24	11	35
		%	68.6%	31.4%	100.0%
	12 - 18 months	Count	15	6	21
		%	71.4%	28.6%	100.0%
	18 - 24 months	Count	17	6	23

		%	73.9%	26.1%	100.0%
Total		Count	73	25	98
		%	74.5%	25.5%	100.0%
Pearson Chi-Square		**Value:2.998ᵃ**	**df 3**	**p-value 0.392**	

Table 1 shows the analysis of the question "Was the child breastfed immediately after birth?". In the study it was found that only 73(74.5%) of infants were breastfed immediately after birth and the rest did not. On analysis of the question, "Why was there a delay in breastfeeding?". In the study it was found that 25 (25.5%) of infants could not be breast fed immediately and there was a delay. Among the 25, 23(92%) was due to LSCS which caused delay in initiation due to procedure and shifting of mother from Operation theatre to ward and 2 (8%) were due to NICU admission of neonate. On the analysis of the question "Was child fed anything other than breast milk in 1st 2 days?". In the study it was found that 15 (15.5%) of infants were fed pre-lacteal feeds apart from breast milk in first 2 days of life.

Table 2: Analysis of the question "Was the child exclusively breastfed up to 6 months of age?"

Was the child exclusively breastfed up to 6 months of age?			No	Yes	Total
Age	Upto 6 months	Count	1	2	3
		%	33.3%	66.7%	100.0%
	6 - 12 months	Count	13	22	35
		%	37.1%	62.9%	100.0%
	12 - 18 months	Count	8	13	21
		%	38.1%	61.9%	100.0%
	18 - 24 months	Count	4	19	23
		%	17.4%	82.6%	100.0%
Total		Count	26	56	82
		%	31.7%	68.3%	100.0%
Pearson Chi-Square		**Value: 3.054ᵃ**	**df 3**	**p-value 0.383**	

Table 2 shows the analysis of the question "Was the child exclusively breastfed up to 6 months of age?". In the study it was found that 56 (68.3%) were exclusively breastfed till 6 months. In age group < 6months, 2 (66.7%) babies had already started weaning. Hence in the questions related to weaning in infants <6months only these 2 cases were included for analysis. On analysis of the question "Was the child breastfed yesterday during the day or at night?". In the study it was found that 64 (65.3%) were breastfed both during day and night. It was statistically significant with p-value 0.004.

On analysis of the question "Did the child drink from a bottle with a nipple during the day or at night?". In the study it was found that 43 (43.9%) were breastfed both during day and night. It was statistically significant with p-value 0.005. On analysis of the question "Had the child been fed with plain water?". It was found that 81(98.8%) were fed with plain water and only one child was not fed as it was less than 6 months. It was statistically significant with p-value 0.001. On analysis of the question "Had the child been given formula feeds?". In the study it was found that 63(76.8%) were not given formula feeds and 19(23.2%) were given formula feeds. It was statistically significant with a p-value 0.0001. For a rural place this was a high number for usage of formula feeds. The most common age group was between 6 to 12 months, the reason is working mothers had started weaning but couldn't continue breastfeeding, Hence formula feed was introduced. On analysis of the question "Did the child have animal milk?". In the study it was found that 41(50%) had been given animal milk. It was statistically significant with p-value 0.0001. The introduction was only after 6 months of age and majority was only after one year which was a good practice. On analysis of the question "Was the animal milk sweet flavored?". In the study it was found that 33(80.5%) had been sweet flavored. Since there were no cases below 6 months, it has been excluded for analysis. On analysis of the question "Did the child have yogurt?". In the study it was found that 77(93.95%) did not have yogurt. It was found that only after 18 months Yogurt was introduced. It was statistically significant with a p-value 0.003. On analysis

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of the question "Was the yoghurt sweet or flavoured type of yoghurt?". In the study it was found that 3(33.3%) were sweet flavoured.

On analysis of the question "Did the child have chocolate flavoured drink including those made from syrups or powders?". In the study it was found that only 2(2.4%) had chocolate flavoured drink including those made from syrups or powders after 18 months of age which is a good practice. On analysis of the question "Did the child have fruit juice?". In the study it was found that 11(13.6%) had fruit juice. On analysis of the question "Did the child drink sodas, sports drinks or energy drinks?". In the study it was found none of the children had sodas, sports drinks or energy drinks which is a good practice. On analysis of the question "Did the child drink tea, coffee or herbal drinks?". In the study it was found none of the children had tea, coffee or herbal drinks which was a good practice. On analysis of the question "Did the child drink clear broth or clear soup?". In the study it was found that 4(84.9%) had clear broth or clear soup in the age group of 18 to 24 months. On analysis of the question, "Did the child drink any other liquids?". In the study it was found that none of the children had any other liquids. On analysis of the question "Did the child have curds?". In the study it was found that 13(16%) had curds. Curds was introduced only after one year of age. It was statistically significant with a p-value 0.003. On analysis of the question "How many times did the child have curds?". In the study it was found that curds was given only once per day irrespective of age. On analysis of the question "Did the child have any porridge?". In the study it was found that 46(56.8%) had porridge which was statistically significant and was the common weaning food. On analysis of the question "**Did the child have rice, ragi ball or chapathi?".** In the study it was found that 67(82.7%) had rice, ragi or chapathi. As ragi and rice are staple food, they are most commonly used for weaning. On analysis of the question **"Did the child have carrot, sweet potatoes or pumpkin?".** In the study it was found that 27(33.3%) had carrot, sweet potato or pumpkins. Since it was introduced after 6 months it is a good practice. It was statistically significant with a p-value 0.0001. On analysis of the question "**Did the child have dark green leafy vegetables such as spinach?**". In the study it was found that only 18(22.2%) had been fed on **dark green leafy vegetables such as spinach. This practice needs to be modified as spinach is good for health and needs to be a complementary food.** On analysis of the question "Had brinjal/potato/ other vegetables?"?". In the study it was found that 37(45.7%) had brinjal/potato. On analysis of the question, "**Did the child have ripe mangoes or ripe papayas**?". In the study it was found that 74(91.4%) did not have mango/papaya. This practice needs modification. On analysis of the question "**Did the child have any other fruits such as banana, apple, watermelon, muskmelon or grapes**?". In the study it was found that 69(85.2%) had other fruits which is a good practice. The reason for this could be due to local availability of these fruits. On analysis of the question "**Did the child have dry fruits such as raisins, almonds or cashew?".** In the study it was found that 16(19.8%) had **dry fruits such as raisins, almonds or cashew.** On analysis of the question "**Did the child have egg?".** In the study it was found only 19(23.5%) had **egg and was statistically significant and was introduced after 6 months of age as a weaning food.**

On analysis of the question "**Did the child have meat?".** In the study it was found that none of the children had meat. On analysis of the question "**Did the child have sea food?".** In the study it was found that none of the children had sea food. On analysis of the question "**Did the child have any sweet foods such as chocolates, candies, pastries, cakes, biscuits or ice cream?"** In the study it was found that 24(29.6%) had **sweet foods such as chocolates, candies, pastries, cakes, biscuits or ice cream. It was statistically significant with a p-value of 0.001. This practice should be discouraged.** On analysis of the question **"Did the child have chips, puffs, French fries, pizza, burger, frozen food or instant noodles?".** In the study it was found that 17(21%) had **chips, puffs, French fries, pizza, burger, frozen food or instant noodles. It was statistically significant with a p-value of 0.001. This practice should be discouraged.** On analysis of the question **"Did the child have any other solid, semi-solid or soft food?".** In the study it was found that 78(96.3%) did not have any other **solid, semi-solid or soft food which is a good practice.**

Table 3: Analysis of the Weight for Age

Weight for Age			Normal	Underweight	Total
Age	Upto 6 months	Count	13	6	19
		%	68.4%	31.6%	100.0%
	6 - 12 months	Count	34	1	35
		%	97.1%	2.9%	100.0%
	12 - 18 months	Count	17	4	21
		%	81.0%	19.0%	100.0%
	18 - 24 months	Count	22	1	23
		%	95.7%	4.3%	100.0%

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Total	Count	86	12	98
	%	87.8%	12.2%	100.0%
Pearson Chi-Square	**Value: 11.719ª**	**df 3**	**p-value 0.008**	

The table 3 shows the analysis of weight for age. 86(87.8%) are normal for age and 12(12.2%) are underweight. It was statistically significant.

Table 4: Analysis of Length for Age

Length for Age			Normal	Stunting	Total
Age	Upto 6 months	Count	16	3	19
		%	84.2%	15.8%	100.0%
	6 - 12 months	Count	33	2	35
		%	94.3%	5.7%	100.0%
	12 - 18 months	Count	19	2	21
		%	90.5%	9.5%	100.0%
	18 - 24 months	Count	22	1	23
		%	95.7%	4.3%	100.0%
Total		Count	90	8	98
		%	91.8%	8.2%	100.0%
Pearson Chi-Square		**Value: 2.252ª**	**df 3**	**p-value 0.522**	

The table 4 shows the analysis of length for age. 90(91.8%) are normal for age and 8(8.2%) had stunting.

Table 5: Analysis of Weight for Length

Weight for Length			Normal	Wasting	Total
Age	Upto 6 months	Count	19	0	19
		%	100.0%	0.0%	100.0%
	6 - 12 months	Count	35	0	35
		%	100.0%	0.0%	100.0%
	12 - 18 months	Count	21	0	21
		%	100.0%	0.0%	100.0%
	18 - 24 months	Count	20	3	23
		%	87.0%	13.0%	100.0%
Total		Count	95	3	98
		%	96.9%	3.1%	100.0%
Pearson Chi-Square		**Value: 10.092ª**	**df 3**	**p-value 0.018**	

The table 5 shows the analysis of Weight for Length. 95(96.9%) are normal and 3(3.1%) had wasting. It was statistically significant.

Table 6: Analysis of Mid upper arm circumference for Age

Mid upper arm circumference for Age			Normal	Total
Age	Upto 6 months	Count	2	2
		%	100.0%	100.0%
	6 - 12 months	Count	35	35
		%	100.0%	100.0%
	12 - 18 months	Count	21	21
		%	100.0%	100.0%
	18 - 24 months	Count	23	23
		%	100.0%	100.0%
Total		Count	81	81
		%	100.0%	100.0%

The table 6 shows the analysis of **Mid upper arm circumference for Age**. All children were within normal range.

Table 7: Analysis of the question Head circumference for age

Head circumference for age			Normal	Total
Age	Upto 6 months	Count	19	19
		%	100.0%	100.0%
	6 - 12 months	Count	35	35
		%	100.0%	100.0%
	12 - 18 months	Count	21	21
		%	100.0%	100.0%
	18 - 24 months	Count	23	23
		%	100.0%	100.0%
Total		Count	98	98
		%	100.0%	100.0%

The table 7 shows the analysis of **Head circumference for Age**. All children were within normal range.

4. DISCUSSION

The present study was done with a primary objective to study Infant and young child feeding (IYCF) practices such as early initiation of breast-feeding, exclusive breast-feeding for first 6 months, continuation of breast-feeding for 1 year and beyond and introduction of complimentary feeds in children aged less than 2 years. The feeding practices vary from region to region, place to place and home to home. Various traditional beliefs can interfere in feeding practices. These beliefs sometimes can be useful or harmful or have no effect. Practices that help in better growth of child should be encouraged, harmful practices need to be discouraged. Educating mothers and family plays a pivotal role in this aspect. For analysis the children were divided into four groups aged 0 to 6 months, 6 to 12 months, 12 to 18 months and 18 to 24 months. Majority of our subjects were parents of children aged between 6 to 12 months. Similar results was seen in study done by Naik et al.[8], Garti et al.[9] and Ma JQ et al.[10] In the present study most of the parents had male child which was similar to study done by Naik et al.[8]

In the present study breastfeeding was started immediately after birth by majority of the mothers. It was similar to the study done by Deshmukh et al.[11] Bhagwat et al.[12] and Prasad et al.[13]. It is a good practice that requires encouragement. In the cases

where delay in initiation of breast feeding was noted, LSCS and NICU admissions were most common causes in the present study. Similar cause of delay due to LSCS was found in study done by Bhagwat et al.[12] On analyzing if pre-lacteal feeds were given to neonates after birth, in our study majority did not give any pre-lacteal feeds. In contrast to present study majority of the neonates received pre-lacteal feeds in study done by Mukhopadhyay, et al.[14] This is a practice which should be discouraged. Educating family and health care workers about it can bring a change in such practices. On analyzing if the children were breast fed exclusively for 1st 6 months, majority of the subjects in the present study were exclusively breast fed. It was similar to the study done by Deshmukh et al.[11] and Prasad et al.[13], but Mukhopadhyay et al.[14]study showed lower rates of exclusive breastfeeding till 6 months of age. Insisting mothers on exclusive breastfeeding can lower down the infant mortality.

On analyzing if the children were fed with feeding bottles, it was found that after 6 months of age, a significant number of babies were bottle fed. Similar observations were found in the study done by Deshmukh et al.[11], Prasad et al.[13] and Garti et al.[9] Bottle feeding increases the risk of respiratory tract infections if proper hygiene is not maintained. Hence is a practice which needs to be discouraged. Creating awareness among parents can bring about a change in this practice. On analyzing usage of formula feeds in children, the present study found that 23.2% used formula feed which was statistically significant especially between 6 to 12 months. This could be due to improper initiation of complementary feeding, rejoining of mothers to work after completing maternity leave and lack of proper knowledge. Similar observations were found in study done by Deshmukh et al.[14], Prasad et al.[13] and Garti et al.[9] On analyzing usage of animal milk in children, the majority usage was after one year of age, which is a good practice. Similar results were found in the study done by Deshmukh et al.[11] On analyzing the introduction of curds in most cases, the introduction was after one year of age. There were no similar studies to this observation in the literature. On analyzing introduction of Porridge to children, in the present study it was the first complementary food initiated after 6 months of age. Similar observations were found in the study done by Deshmukh et al.[11], Prasad et al.[13] and Garti et al.[9] These studies had similar results with respect to introduction of Chapathi, ragi and vegetables. On analyzing introduction of meat and eggs in the present study it was found only after one year of age it was introduced. This could be due to various differences in cultural practices in the locality and traditional beliefs. Proper education about this can bring a change in the practices. Similar observation was noted in study done by Bhagwat et al.[12]

On analyzing introduction of sweetened foods, present study did not find it a significant practice. Only after one year of age sweetening of foods was seen. Similar observation was noted in study done by Bhagwat et al.[12] On analyzing introduction of chocolate, candies, cakes, biscuits and ice creams in majority of cases they were not introduced till one year of age and minimally used till 2 years. This is surprising but a good feeding practice followed and needs to be continued. Although there were multiple practices which had good and harmful impacts, the ultimate effect falls on the growth of the child. The physical growth indicators are the anthropometric measurements, the study had a secondary objective to study the anthropometric measurements among children aged less than 2 years in relation to feeding practices. On analyzing the weight for age, majority of the children were in normal range, 12.2% were under weight. Although the percentage looks less, but it's a significant number for the current sample size. Similar observations was seen in study done by Bhagwat et al.[12], Naik et al.[8], Mukhopadhyay et al.[14] and Ma et al.[15] The main reason for this could be due to improper complementary feeding practices. Educating mothers and family can bring about a change in these practices.

On analyzing the length for age, majority of the children were in normal range, 8.2% were having stunting. Similar observations was seen in study done by Bhagwat et al.[12], Naik et al.[8], Mukhopadhyay et al.[14] and Ma et al.[15] This shows that the under-nutrition is most often acute rather than chronic as weight for age is lower than the length. The reason could be due to minor illness that the child gets recurrently halting the weight gain. Proper vaccinations can decrease illness episodes and improve the weight of children. On analysing the weight for length, majority of the children were in normal range, 3.1% were having wasting. Similar observations was seen in study done by Bhagwat et al.[12], Naik et al.[8], Mukhopadhyay et al.[14] and Ma et al.[15] This denotes the majority of feeding practices are good and only some require modifications. On analyzing the mid arm circumference, all of the children were in normal range in contrast to studies done by Bhagwat et al.[12], Naik et al.[8], Mukhopadhyay et al.[14] and Ma et al.[15] Mid arm circumference is an age independent criterion between 6 months to 5 years and is a key indicator of Severe Acute Malnutrition. Since all the children had normal circumference, it indicates the feeding practices were good and only some require modifications.

On analyzing the Head circumference, all the children were in normal range in contrast to studies done by Bhagwat et al.[12], Naik et al.[8], Mukhopadhyay et al.[14] and Ma et al.[15] Head circumference is not an indicator of Malnutrition. Although in the present study only few feeding practices were analyzed through questionnaire, it is only the tip of iceberg. There are various hidden practices which need to be addressed. Proper education of Mothers and Family can bring about a change in these practices. The aim should be to make sure not a single child is affected by malnutrition due to a wrong feeding practice and no child should be undernourished due to improper calories and proteins in diet. Although in rural India under nutrition is still a major problem, in urban places Obesity and Overweight is becoming a cause of concern. Probably the study did not address this issue as it targeted only rural population. Education alone can bring changes in feeding practices.

5. CONCLUSION

The study concludes that there are numerous feeding practices practiced in rural India which has impact on anthropometry. The practices which have a positive impact need to be encouraged. In the study practice of Exclusive breast feeding for 6 months, initiating complementary feeding with locally available foods, no pre-lacteal feeds, introduction of fruits, vegetables, not introducing sugars and sweeteners till two years are all good practices and need to be encouraged. The practices which need to be discouraged are usage of feeding bottles, usage of formula feeds and not introducing egg and meat till one year of age. Although cultural practices influence the feeding practices only the positive ones need to be followed.

In the study it was seen that only weight for age was majorly affected compared to other anthropometric measurements. This shows acute nutritional deficiency is more common rather than chronicity. The inter current illnesses might also be a cause for this rather than feeding practices alone. To bring about a change in the community, educating and creating awareness is the key.

6. LIMITATIONS

The limitations of the present study are, sample size is small, all the questions are not applicable for the different age groups, hence age specific questions need to be formed for better analysis. Single institute is involved, and a multi-centric study would give better results.

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