

Infant Rearing Practices in South India: A Longitudinal Study

Nitin Joseph, B. Unnikrishnan, Vijaya A. Naik¹, N.S. Mahantshetti²,
M.D. Mallapur¹, Shashidhar M. Kotian, Maria Nelliyanil³

Department of Community Medicine, Kasturba Medical College, Manipal University, Mangalore,

¹Departments of Community Medicine, JNMC, and ²Pediatrics, J.N. Medical College, Belgaum,

³Department of Community Medicine, A.J Institute of Medical Sciences, Mangalore, India

ABSTRACT

Background: Rearing practices are a major determinant of nutritional and health status of infants. Therefore these practices need to be better understood. **Objectives:** To find out infant rearing practices in the study area. **Materials and Methods:** A longitudinal study was conducted on a birth cohort of 194 infants. Information on rearing practices and anthropometric measurements were recorded every month for a period of 1 year. **Results:** Only 67 (34.5%) newborns were breast fed within half an hour of delivery. Prolactal feeds was given to 65 (33.5%) newborns and this was seen more among home deliveries ($P=0.018$). Demand feeding was practiced by 169 (87.1%) mothers. Exclusive breast feeding (EBF) for 6 months was practiced by 81 (41.7%) mothers. Bottle feeding was seen in 7 (3.6%) cases. Weight gain during infancy was found to be maximum when infants were EBF for 6 months ($P<0.001$) and weaned with semi-solid and solid diet alone in the following 6 months ($P=0.002$). Gain in all anthropometric measurements was more in the initial 6 months of infancy compared to latter. Four (2.1%) infants were malnourished. Oil massage before bath was practiced by 189 (97.4%) mothers. Over 50% mothers practiced oil application to eyes or ears of infants. Delayed initiation of bath (beyond 1week) was seen in 15 (7.7%) cases. **Conclusion:** Faulty rearing practices need to be corrected in order to improve the health status of infants.

Keywords: Anthropometry, breast feeding, infants, longitudinal study, rearing practices

Introduction

Rearing practices are a major determinant of morbidity status of infants. Most important of these are the feeding practices. Breastfeeding during infancy is of particular importance because it is fundamental for survival, growth and development and health and nutrition of infants. Breast feed is the first fundamental right of the child. WHO recommends exclusive breastfeeding of all infants until 6 months of age. In spite of all the efforts deployed as information, education or training campaigns to promote mother's milk as the best food for the infant, the prevalence of exclusive breastfeeding remains low.^[1] This is because psychosocial and cultural barriers still exists to early breastfeeding.^[2]

Non-exclusive breastfeeding which includes prelactal feeding is an important cause of infant morbidities. The other contributory factors for infection are improper and inadequate weaning foods

and unhygienic feeding practices like bottle feeding as reported by International Code of Breast Milk Substitute.^[3]

According to an analysis, breastfeeding was identified as the single most effective preventive intervention, which could prevent 13-16% of all childhood deaths in India. Adequate complementary feeding between the age of 6 and 24 months could prevent an additional 6% of all such deaths.^[4]

Inadequate and faulty practices of feeding newborns and children also results in under nutrition as reflected by their anthropometric measurements. Undernutrition leads to poorly functioning body immunity and hence infections. This in our country is also coupled with exposure to contaminated environment.

Therefore poor complimentary feeding practices mean that many children continue to be vulnerable to irreversible outcomes of stunting, poor cognitive development and significantly increased risk of infectious diseases such as diarrhea and acute respiratory infection.^[5-7]

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Address for correspondence:

Dr. Nitin Joseph,
Associate Professor, Department of Community Medicine,
Kasturba Medical College, Manipal University, Mangalore, India.
E-mail: drnitinjoseph@gmail.com

Apart from the feeding practices, there are certain other rearing practices which also influence the health of infants and are widely prevalent among families or communities.

These are oil massaging the baby before giving a bath, application of oil into eyes and ears of infants, burping the baby, application of black carbon into the eye, trimming of nails, etc. Familiarity with these rearing practices is of considerable significance to a health worker serving the community. For promotion of infant health, the health care provider must identify the beneficial, innocuous and harmful rearing practices. He/she has to be tactful in persuading the people to abandon the harmful ones such as oil application into the eyes or ears of the baby.

Overall, a good number of infant morbidity and mortality is attributed to improper new born care practices which depend on the knowledge, attitude and practice of the community in addition to other factors like availability and accessibility of medical services.^[8] Hence the social pattern and customs influencing the feeding pattern and rearing practices in a community needs to be understood in order to improve the nutritional and health status of infants at the primary care level. Many other studies already done in this field has not covered infant rearing practices comprehensively. With this background, this longitudinal study was conducted to find out the rearing practices among infants in a rural area of south India.

Materials and Methods

Study settings

This longitudinal study was done in Kinaye Primary Health Centre (PHC) area, the field practice area of Jawaharlal Nehru Medical College situated in Belgaum District of Karnataka state. Ethical clearance for conducting this study was obtained from the institutional ethical clearance committee.

Sample size

PHC Kinaye comprises of five subcenters of which three subcenters namely Santibastwad, Machhe and Peeranwadi were randomly selected for the study. The total population of these subcenters is approximately 20,000. Based on the birth rate of 21 per 1000 population, 420 births were expected over a period of 1 year or 210 over 6 months period. Over the enrollment period, i.e. first 6 months of study period (between November 2004 to April 2005), 215 births took place in these three subcenters. Of these, 4 infants died and 17 were lost to follow up during the one year follow up period between May 2005 and April 2006 resulting in the final sample of 194 infants.

Study period

All new born during the first 6 months of study period, i.e. from November 2004 to April 2005 formed the birth cohort who were followed up for 1 year. Therefore, the study period was of one and half years from November 2004 to April 2006.

Inclusion criteria

All newborns of mothers who were permanent residents of the study area and who were available for follow-up for 1 year and singleton pregnancies were included in this study.

Exclusion criteria

Babies born to mothers who had come to parental house for delivery were excluded. It is a common cultural practice in India for pregnant women to come to their parental house few months before delivery and stay there till few months after. This is to obtain better care and support during these vital periods. When the baby is a few months old they go back to their place of residence. That would make them unavailable for a full-year of follow up.

Data collection

During the initial phase, the investigator visited houses of mothers within 10 days of childbirth and collected baseline data on a pretested proforma after obtaining their informed consent. Thereafter, monthly follow-up visits were done for 1 year to enquire about their feeding and rearing practices during the period of infancy. Anthropometric measurements like weight, height, head circumference, chest circumference and mid-arm circumference were also recorded during each of these visits.

The mid-arm circumference was measured at the midpoint between the tip of the acromion and the olecranon process in the left upper arm with a flexible fiberglass tape to the nearest 0.1 cm. The chest circumference was obtained at the level of the nipples during quiet respiration. The head circumference was measured by passing the tape between the supraorbital ridges and the maximum occipital prominence. The length was recorded on an aluminum infantometer to the nearest 0.1 cm. Weight was measured on a beam balance to the nearest 20 g using standard techniques.

Data analysis

All the data collected were entered and analyzed using version 17.0 of the Statistical Package for Social Sciences software package (SPSS Inc., Chicago, IL) into categories and percentages. The chi-square test was used for testing association and Analysis of Variance (ANOVA) was done for comparison of means. Multivariate analysis was done to adjust the effect of confounders. A *P* value less than 0.05 was considered as statistically significant. Socio-economic status was calculated using Modified B G Prasad's classification of 2004.^[9]

Results

Out of 194 newborns, 65 (33.5%) received prelacteal feeds (PLF). Most common PLF given to newborns was sugar water 41 (63.1%) as shown in Table 1. PLF were given by greater proportion of mothers without any formal education, 23 (40.4%) in comparison to literate mothers 42 (30.7%). PLF were given in 23 (46.9%) of 49 home deliveries as compared to 42 (29.0%) of 145 hospital deliveries ($\chi^2=5.3$, $P=0.018$).

67 (34.5%) mothers breastfed within ½ an hour of delivery, 42 (21.7%) between ½ to 2 h, 29 (14.9%) between 2 to 24 h of delivery and 56 (28.9%) after 24 h of delivery. Proportion of illiterate mothers who initiated breast feeding within half an hour and after 24 h were 20 (35.1%) as compared to 47 (34.3%) and 36 (26.3%) respectively among literate mothers ($\chi^2=3.16$, $P=0.367$). Demand feeding was practiced by 169 (87.1%) mothers. Among the rest who fed their infants at fixed timings, the proportion of illiterate mothers were 12 (21.1%) in comparison to 13 (9.4%) among literate mothers ($\chi^2=4.795$, $P=0.03$). The proper method of burping the baby was practiced only by 14 (7.2%) mothers.

Eighty-one (41.7%) mothers exclusively breastfed (EBF) their infants for 6 months, 77 (39.7%) mothers for less than 6 months and 36 (18.6%) mothers for more than 6 months. 20 (10.3%) mothers discontinued breastfeeding before the end of 1 year.

Type of weaning foods given to infants were semi-solid and solid diet in 112 (57.7%) cases; animal milk, semi-solids, and solids in 57 (29.4%) cases; formula powder milk, semi-solids and solids in 10 (5.1%) cases and a combination of all the above in 15 (7.7%) cases. Bottle feeding was seen in 7 (3.6%) cases.

There was a marginal difference in the mean weight gain from birth to 6 months between the infants who were EBF for less than 6 months and those who were EBF for 6 or more months. This observation was not significant using the ANOVA test ($F=1.086$, $P=0.278$). However mean weight gain between 7 to 12 months was significantly better in babies EBF for 6 months compared with babies who were EBF for less or more than 6 months ($F=8.89$, $P<0.001$). Similarly, mean weight gain over the entire period of infancy (0 to 12 months) was significantly better among babies EBF for 6 months than those with EBF for less or more than 6 months ($F=9.12$, $P<0.001$) [Table 2]. Mean weight gain in infants was found to be significantly more when the infants were fed on breast milk along with semi-solids and solids followed by when they were fed with animal and formula powder milk along with semi-solids and solids ($F=3.458$, $P=0.002$) [Table 3].

The gain in weight, length/height, head circumference, chest circumference and mid-arm circumference was seen more during the first 6 months compared to second 6 months of infancy. Chest circumference which was on an average 2 cm less than head circumference at birth became 0.3 cm more than head circumference after the completion of 1 year as shown in Table 4.

In this study, the total number of infants with malnutrition was 4 (2.1%). Three fourth of them were females and all of them were of Grade I malnutrition as per Indian Academy of Pediatrics Classification.

Oil massage was done using coconut oil and it was given before bathing the infant. This was seen in 189 (97.4%) cases. Oil application into the eyes and ears of infants was practiced by

Table 1: Distribution of newborns according to types of (PLF) (n=65)

Type of PLF	No. of new borns	%
Plain water	1	1.5
Sugar water	41	63.1
Glucose powder water	2	3.1
Gripe water	4	6.2
Ghutti water	9	13.8
Honey (diluted)	5	7.7
Cow's milk (diluted)	7	10.8
Formulated milk powder	5	7.7
Rice water	1	1.5

PLF: Pre lacteal feeds

Table 2: Distribution of weight gain in infants according to period of exclusive breast feeding (n=194)

Period of EBF	Wt. gain between 0 and 6 months (kg)	Wt. gain between 7 and 12 months (kg)	Wt. gain during the entire period of infancy (kg)
Less than 6 months (n=77)	3.59±0.74	1.99±0.48	5.58±0.76
For 6 months (n=81)	3.67±0.71	2.41±0.45	5.81±0.84
More than 6 months (n=36)	3.69±0.66	2.1±0.62	5.79±0.86

F=1.086; P=0.278 ns; F=8.89; P<0.001 vhs F=9.12; P<0.001 vhs; EBF: Exclusively breastfed

Table 3: Distribution of weight gain in infants according to type of weaning foods (n=194)

Type of weaning foods	Wt. gain in infants between 0 and 12 months (kg)
Semi solids and solids (n=112)	5.79±0.81
Animal milk and Semi solids and Solids (n=57)	5.62±0.81
Formula powder milk and Semi solids and Solids (n=10)	5.52±0.73
Formula powder milk, Animal milk and Semi solids and Solids (n=15)	5.67±0.89

F=3.458 P=0.002 hs

Table 4: Periodic anthropometric measurements of the study group (n=194)

Measurements	At 0 month	At 6 th month	At 12 th month
Weight (kg)	2.64±0.47	6.29±2.83	8.68±4.3
Length/height (cm)	47.89±2.98	62.48±3.38	71.37±3.24
Head circumference (cm)	33.96±1.47	40.67±1.54	44.24±1.44
Chest circumference (cm)	31.95±1.52	39.05±1.91	44.52±1.99
Mid arm circumference (cm)	9.56±1.04	13.03±1.23	14.29±1.41

100 (51.5%) and 109 (56.2%) mothers respectively. This was seen significantly more among infants of illiterate mothers 37 (64.9%) compared to literate mothers 63 (45.9%) ($\chi^2=5.773$, $P=0.016$).

A majority of the mothers 105 (54.1%) gave bath to their newborns on the day of delivery, 36 (18.6%) on the following day

of delivery, 38 (19.6%) after 2 days but within 7 days of delivery and 15 (7.7%) after 7 days of delivery. Among the mothers who delayed bath for more than a week, proportion of mothers of Class V socio-economic status was significantly more 10 (12.2%) compared to other socio-economic groups 5 (4.5%) ($\chi^2=3.966$, $P=0.046$). It was also observed that 58 (29.9%) mothers in this study did not bathe their infants every day. Out of these 58 infants, 28 (48.3%) belonged to Class V socio-economic status.

Multivariate analysis showed that oil application into the eyes was significantly practiced more by illiterate mothers ($P=0.026$), but when this was adjusted for the confounding effect of socioeconomic status the association was not statistically significant ($P=0.128$). Timely bath to new born was practiced significantly more by literate mothers ($P=0.003$) and this was statistically significant even after adjusting for confounding effect of socioeconomic status ($P=0.033$) [Table 5].

In the present study, 47 (24.2%) mothers were applying black carbon into the eyes of the infants. Most of the mothers 137 (70.6%) used to trim the nails of infants regularly. Among those who did not, the proportion of illiterate mothers were significantly more 25 (43.9%) in comparison to literate mothers 32 (23.44%) ($\chi^2=8.154$, $P=0.004$).

Discussion

Rearing practices form an important aspect of community medicine. Healthy rearing practices not only ensure health safety of infants but are also a reflector of the positive cultural practices in the community. One third of the newborns in our study were given PLF and it was significantly more in home deliveries. This is similar to the findings in a study done in Mumbai where PLF was given to 31.6% newborns and significantly more in home deliveries.^[10] However, other studies have shown pre-lacteal feeding rate of 60% and above.^[11-15] Another study done in Gujarat found that home delivered infants received PLF significantly more than institutional deliveries.^[12] This may be because home deliveries are usually conducted by traditional dais who invariably have no knowledge

of hazards associated with PLF. Therefore unquestioningly they continue with the common cultural practice of pre-lacteal feeding the baby.

Most common substance used for PLF in the present study was sugar water which was similar to the findings of Patna-based^[15] and Gujarat-based^[16] studies. However, in a Jhansi-based study^[17] it was diluted milk, Agra-based study^[11] it was Ghutti and in studies done in West Bengal^[14] and Nagpur^[18] it was honey.

Breast feeding within half an hour of delivery was initiated by 34.5% of mothers. This was lower than the observations of the study done in West Bengal where it was 42.4%.^[14] Even though 75% of the deliveries in the present study took place in hospitals, 65.5% of mothers' breastfed their newborns after half an hour of birth. This meant that hospitals were not always ensuring that mothers' breast feed their newborns in time. This is a cause of concern and has to be addressed by the hospital authorities. On the contrary, the hospital staff should play an active role in improving the attitude of parents toward breast feeding.

According to Infant and Young Child Feeding Practices 2006 guidelines, Government of India recommends that initiation of breastfeeding should begin immediately after birth. In the present study no association of early initiation of breast feeding was seen with educational status of mothers. However, the study done in Gujarat found significant association in early initiation of breastfeeding with educational status of mothers.^[12]

The present study found that 87.1% of mothers were feeding on demand. This was similar to the observations made in the West Bengal based study where demand feeding was practiced by 84.1% of mothers.^[19] Other studies have shown a demand feeding rate from 70.5% to 98%.^[18,20] In the present study, only 7.2% mothers practiced the right method of burping their babies which was similar to the observations made in the West Bengal based study where it was practiced correctly by 6.1% mothers.^[19] This means that the right burping method is minimally practiced and hence needs to be widely popularized. The percentage of mothers who EBF their infants up to 6 months in this study was similar to the observations of National Family Health Survey-3 data in Karnataka state where it was 58%.^[13]

The World Health Organization recommends exclusive breastfeeding for the first 6 months of life with early initiation and continuation of breastfeeding for 2 years or more together with nutritionally-adequate, safe, age-appropriate complementary feeding starting at 6 months.^[21]

The continuation rate of breastfeeding of 89.7% after completion of 1 year found in the present study was similar to observations made in several other studies^[18,19,22] which is indicative of the continuation of traditional practice of breast feeding. Another study done in West Bengal reported a breastfeeding continuation rate of 97.9% at the end of 1 year which was higher than the observations made in this study.^[16]

Table 5: Multivariate analysis of rearing practices with respect to literacy and socioeconomic status of mothers

Source	Dependent variable	F	P value
Literacy	Oil into eyes	5.065	0.026
	Oil into ears	1.582	0.210
	Oil massage	0.540	0.463
	Day of giving bath	9.377	0.003
SES status	Oil into eyes	0.373	0.828
	Oil into ears	0.466	0.761
	Oil massage	1.099	0.358
	Day of giving bath	2.100	0.083
Interaction	Oil into eyes	2.078	0.128
	Oil into ears	2.674	0.072
	Oil massage	1.365	0.258
	Day of giving bath	3.469	0.033

Early initiation of breastfeeding, exclusive breastfeeding for 6 months and timely introduction of age-appropriate complementary feeding are the key interventions to achieve the Millennium Development Goal 1 and 4, which address child malnutrition component of the targets and mortality respectively.

Most infants in this study were weaned with semi-solid and solid diet. The proportion of infants fed with formula milk, semi-solid and solid diet in a study done in Peru was 10% which was similar to the observations made in the present study. However, the proportion of infants fed with given animal milk, semi-solid and solid diet in the former study was 58% which was higher than the observations made in this study.^[23] Proportion of infants who were bottle fed was much lower in this study compared to other studies.^[19,20,24] This is a positive observation in the present study area as bottle feeding is known to cause infections and hence needs to be discouraged.

The mean weight gain of the cohort in first 6 months was found to be 3.64 kg and in the second 6 months 2.2 kgs. In a study done in Delhi, the mean weight gain of infants between 0 and 6 months was 4.2 kg and between 7 and 12 months was 1.8 kg.^[25]

In this study, feeding practices was found to influence the weight gain of infants. Those who were EBF for 6 months gained significantly more weight than others who were not, between 7 and 12 months and throughout the period of infancy. In a study done in Haryana, it was found that infants breastfed till the end of 6 months were 0.3 kg heavier than those breastfed for less than 6 months at 6 months of age.^[26] Another study in rural Malawi found that the weight of infants weaned early was less by the end of 12 months.^[27] These findings were in accordance to this study and reaffirm the fact that the practice of exclusive breastfeeding till 6 months is the best in terms of child growth.

Weight gain in this study was found to be significantly less among infants weaned with artificial foods compared to those weaned with semi-solids and solids. This was similar to the observations made in a study done in Bhopal.^[20]

The gain in various anthropometric measurements was more in the first 6 months which is in accordance to the expected normal process and also supported by a study done in Surat.^[28,29] In a study done in Chandigarh, mid-arm circumference showed a rapid increase between 1 and 6 months compared to 6 and 12 months which is also similar to observations made in this study.^[30] Thus, good quality rearing needs to be more emphasized during initial 6 months of infancy compared to latter half in order to cater for rapid growth and physiological requirements of the body during the initial periods.

The possible practice of gender bias may be present in this study as 3 out of 4 malnourished infants were females. Female children in certain communities in India are not well fed compared to their male counterparts as parents believe that they do not contribute

toward family earnings during adulthood like males. However, the overall proportion of malnourished cases in this study was lower than 6% proportion reported in a study done in Bhopal.^[20]

Almost all the infants in this study received oil massage before bath which was similar to findings reported by other studies with only differences in the type of oil being used.^[31-33] Oil massage is a beneficial practice as it tones up the muscles of infant and is a good exercise for the infant. More than half of the mothers were instilling oil into eyes and ears of the infant which are harmful practices and have to be stopped. In a study done in Pondicherry, oil was instilled into eyes, nose and ears in all the cases.^[31]

If culturally acceptable, the first bathing is delayed for 24 hours after birth to avoid cooling the body temperature.^[34] Only 18.6% infants were bathed on the second day of delivery and in 30% cases infants were not bathed daily. A majority of mothers (54.1%) gave bath to their infants on the same day of delivery. This was higher than the findings of a study done in West Bengal where 17.6% of newborns were given bath on the day of delivery.^[14] Among those mothers who delayed the first bath to newborn by more than a week and who did not put the baby to bath daily, majority were from low socioeconomic families or were illiterate. These findings reflect the fact that poverty and illiteracy influence the hygienic practice of mothers. The harmful practice of applying black carbon to the eyes of infants was seen in about one fourth of children which is much lower than 91.8% found in a study done in Gwalior.^[32] Although this proportion is lower, there is a further need to discourage this practice as it can lead to eye infections. About 30% of mothers did not trim the nails of their infants regularly. This again reflects mothers' negligence toward hygienic rearing practices.

Conclusion

Faulty rearing practices such as pre-lacteal feeding, not practicing exclusive breast feeding and on demand, early discontinuation of breast feeding, application of oil into the eyes and ears of infant, delay in giving bath to infant, application of black carbon into the eyes of infants, ignorance of correct burping method and not trimming the nails of infant were very much prevalent in this study area. Illiteracy and low socioeconomic status were found to be the influencing factors behind these faulty practices. This magnifies the importance of health education which is the best cost-effective intervention in a rural set up. Gain in all anthropometric measurements was more in the initial 6 months of infancy compared to latter. Weight gain was found to be maximum among infants EBF for 6 months and weaned with semi-solid and solid diet. Overall, the present study identified several deficiencies in new born and infant care practices in the study area. From these observations it appears that traditional and customary child rearing practices are still prevalent in rural areas and certainly not to the advantage of the growth and development of children. Only education on infant health and nutrition imparted to young mothers would correct such age-old infant feeding and rearing practices. The present scenario

can be improved through enhancing information education communication (IEC) activities, distribution and display of locally developed IEC material and training of health staff with emphasis on preventive and promotive health-care practices. By these means we can ensure a healthy childhood and stronger India.

Limitation

This being a prospective study is influenced by loss due to follow up. If the mother and child were not available during the monthly follow up visit, data pertaining to the present month was obtained during the next visit. Therefore accuracy of data obtained could have been influenced by recall bias. Moreover this information cannot be generalized to the entire country due to the influence of local cultural practices on infant rearing practices.

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