

Can frontline workers be change agents for infant feeding and growth? - A community Trial

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Abstract: *Background:* Role of optimum infant feeding practices on growth and survival of children is well established. Promoting it through routine public health care system is the challenge. *Objectives:* To assess the change in knowledge and practices of caregivers about infant feeding and physical growth of infants through training of frontline health workers. *Methods:* A cluster-randomized controlled trial was conducted among 130 infant mother pairs (65 in each group), recruited at birth, in a rural community in Bankura, West Bengal. Frontline health workers of the intervention area received modular training on infant feeding and supported the caregivers in adopting optimum feeding practices. Change in knowledge and practice of caregivers on infant feeding and physical growth of infants were assessed at monthly interval. *Results:* Knowledge regarding early initiation, duration of exclusive breastfeeding, and timely introduction of semi-solid food was increased significantly at 6th month in intervention area with almost no improvement in control area. At 6th month, exclusive breastfeeding was practiced by 76.9% infants in intervention area and 63.1% in control area, although in both cases, it was reduced from the proportion at birth. Proportion of infants having bottle feeding and intake of other liquid food also increased with time and more so in control area. In 6 months, infants of intervention area gained on average 600 gms more weight than those of control area, but gain in length was almost similar in both the groups. *Conclusion:* Promotion of infant feeding through frontline workers is a feasible intervention in the present context.

Keywords: Infant Feeding, Knowledge, Practice, Change, Frontline Workers, Training

Introduction

The period from birth to the first two years of age is the “critical window” for the promotion of optimal health, growth and development [1]. Appropriate feeding practices are essential for attainment and maintenance of proper nutrition, health and development of infants and young children [2]. Studies have demonstrated the adverse consequences of inappropriate feeding practices on the growth, development and survival of infants and children [3-4].

World Health Organization (WHO) has articulated the guideline for optimum infant and young child feeding (IYCF) practices [5]. It was endorsed by other international agencies. WHO in collaboration with other international agencies spelt out the global strategy for promotion of IYCF [5]. Childhood under-nutrition is a huge

public health problem in India and child feeding is considered as a proximate variable for under-nutrition [6-7]. Government of India adopted national policy to promote IYCF as a strategy to protect child health and envisaged to promote IYCF through routine health services [8].

Available evidences support that training to health workers can improve child feeding practices and thereby make nutritional status of children better [9]. Community-based intervention with trained health workers had some successes in even resource-constrained areas [10]. In countries where government health services have wide coverage and easy accessibility, it would be more effective and sustainable channel for educational intervention [11]. Community Health Workers

(CHWs) play a pivotal role in the health status of rural people due to their close and continuous contact with the community [12]. Moreover, due to lack of accessibility to appropriate health institutions in rural India, CHWs act as key contacts in identifying and meeting the health needs of the community [12]. National Rural Health Mission created a great opportunity by creating a new dedicated health workforce at village level - Accredited Social Health Activists (ASHA) [13].

They are supposed to visit each and every household of their village regularly to popularize preventive health care activities and also to promote utilization of health care services. Female health workers are the pivot of health care system in implementing national health programmes in rural India [14]. However, proper training is required to accomplish the goal of introducing change in health behavior of the people [12]. In this background the present study was undertaken to measure the change in infant feeding practices and to assess the effect of this change on physical growth of infants through the training of ASHAs and female health workers.

Material and Methods

Study design, Setting and duration: A community-based, cluster randomized, controlled trial was conducted during January 2013 to February 2014 in Gangajal Ghati Community Development Block in Bankura district of West Bengal, India having 1.86 lakhs population.

Sample size and sampling technique: Sample size for each group was calculated using the formula $n = (Z_{\alpha} + Z_{\beta})^2 * 2 * \sigma^2 [1 + (m-1)\rho] / \delta^2$; where Z_{α} for 95% confidence level was 1.96 and Z_{β} for 80% power was 0.84. σ was the standard deviation, δ was the assumed difference of between average gain in weight of two groups, m was number of children per cluster and ρ was intra-cluster correlation coefficient. Considering average weight gain among control group as 3000 (\pm 700) gms, expected higher gain among intervention group by 500 gms, $m=22$ and $\rho = 0.05$, the sample size was estimated to be 64 per group [15]. Considering the birth rate of 16 per 1000 population and recruitment period of 3½ months, population around 15000 for each group i.e. what is usually catered by three sub-centers were considered adequate.

In Gangajal Ghati Block, out of 30 sub-centers, six sub-centers were randomized in two groups. All the babies born in the intervention and control areas from fourth week of May to first week of September 2013 were included in the study after taking written informed consent of the mothers. Infants with obvious neurological disorder, physical disability and chronic illnesses which might affect feeding and/ or growth were excluded.

Intervention: ASHAs and Health Workers-(Female) [HWs (F)] of the intervention area were given modular training on IYCF practices in local vernacular. ASHAs were asked to visit the households of study infants fortnightly to counsel the mothers/ caregivers about IYCF practices, to help them in solving problems regarding feeding and to give necessary health advices. HWs (F) counseled the mothers/ caregivers at sub-center and outreach clinics and supported ASHAs during their field visit in promoting optimum infant feeding practices. They were supervised on the job by a group of public health experts. ASHAs and HWs (F) of the control area did not receive any such training or sensitization. ASHAs and HWs (F) of both the areas were continuing their routine activities.

Initiation of breastfeeding within one hour of birth; only breastfeeding for at least 8 times in last 24 hours of survey without any other food or bottle feeding among infants below six month of age and initiation of semi-solid food at 6 months were considered optimum infant feeding practices. [6-7, 11].

Methods of data collection: List of women with expected date of delivery within the reference time period was prepared through house-to-house survey. Written informed consents were obtained from the women. During base-line survey, socio-demographic and economic information were collected. Knowledge and practice of caretakers on IYCF were collected at baseline within one week of birth, at 3rd and 6th month of age of the infants. Weight in grams to the nearest of 100 gm and length in cm to the nearest of 0.1 cm of the infants were measured at monthly interval using digital child weighing machine and infantometer respectively.

Data management & analysis: The knowledge and practices regarding IYCF and physical growth of the study children were compared between study and control groups. Changes in knowledge, practice and growth on visit in 6th month were compared in both intervention and control group and examined for significant differences with McNemar's chi-square or binomial test with Brier's adjustment and independent sample adjusted 't' test based on type of data and its distribution [16-17].

Ethics: The study obtained clearance from the Institutional Ethics Committee (IEC), B.S. Medical College, Bankura (vide memo no. PR-HC/06EC/4116/6 dated 20th November 2012).

Results

Characteristics of mothers of study infants: In the intervention area, 71 children were born in the reference period from last week of May to first week of September 2013. In the same period, 73 children took birth in the control area. Five mothers and children each in intervention and control area who were absent in the study area for consecutive one month or more were excluded. Similarly, 1 mother of intervention area and 3 of control area shifted to other place (majority to their paternal houses) and could not be registered within the reference period. The final analysis was done with 65 infants in each group.

Mean (\pm SD) age of mothers of children was similar in case of both intervention (22.3 ± 2.6 years) and control (22.8 ± 3.1 years) areas ($p=0.285$). Similarly, average per-capita monthly income of the family of children of intervention area ($\text{INR } 564.5 \pm 662.5$) was slightly higher than that of control area (473.8 ± 381.0), but the difference was not significant ($p=0.340$). All the participating infants of two areas were Hindu. Proportions of study children belonging to general caste were 55.4% and 53.8% in intervention and control areas respectively and rest were of scheduled caste. Around one-fourth mothers (24.6%) in intervention area and one-third (35.4%) in control area were illiterate. Only 18.5% of both the areas had formal schooling. Proportions of mothers who worked outside home for earning wages were 27.7% and 29.2% in intervention and control areas respectively. Below Poverty Line (BPL) cards were possessed by 52.3% and 50.8% families in intervention and

control areas whereas 80.0% and 81.5% families respectively had per capita monthly income less than $\text{INR } 643/-$, the cut-off for poverty as determined by Tendulkar Committee for rural West Bengal [18]. In intervention area, 47.7%, 33.8% and 18.5% families respectively had kutchcha, pucca and mixed houses. The corresponding figures for control area were 52.3%, 26.2% and 21.5% respectively. Tube-well was the source of water to 80.0% and 86.2% families in intervention and control areas while access to sanitary latrine was limited to 29.2% and 24.6% families respectively.

Knowledge of mothers of study infants regarding IYCF (Table-1): Proportion of mothers who were aware about initiation of breastfeeding within one hour of birth increased from less than half to 70.8% in intervention group at 6th month while the proportion decreased slightly in control group. Similarly knowledge regarding optimum duration of exclusive breastfeeding (EBF) was acquired by the three-fourth women in the intervention area which was a significant increase at 6th month from base-line ($p=0.016$) whereas it remained below 50% in control area. Proportion of women aware of timely introduction of semi-solid food increased at 6th month in intervention area, but remained static at nearly 50% in control area.

Infant feeding practices (Table-2): Exclusive breastfeeding (EBF) in optimum frequency was more than 90% at the beginning in both the areas and declined in six months time. However, still more than three-fourth infants had EBF at 6th month in intervention area which higher than that of control area. Proportion of bottle feeding was almost negligible in both the areas at the beginning but at 6th month it had increased significantly in control area. Proportion of infants having liquid feed other than breast milk increased significantly in both the areas but more so in control area.

Gain in length and weight (Table-3): Average gains in length in both the areas were comparable but on an average, there was approximately 600 gms more weight gain in intervention area than the control area.

Table-1: Distribution of mothers of study children according to knowledge on infant feeding					
Group	Correct knowledge on early initiation of breastfeeding				McNemar's χ_b^2 (p value)
	At First Visit	At 6 th Month		Total	
		Correct	Incorrect		
Intervention	Correct	23 (74.2)	8 (25.8)	31 (47.7)	3.084 (0.0791)
	Incorrect	23 (67.6)	11 (32.4)	34 (52.3)	
Total		46 (70.8)	19 (29.2)	65 (100.0)	
Control	Correct	22 (61.1)	14 (38.9)	36 (55.4)	1.643 (0.199)
	Incorrect	5 (17.2)	24 (82.4)	29 (44.6)	
Total		27 (41.5)	38 (58.5)	65 (100.0)	
Correct knowledge on duration of exclusive breastfeeding					
Intervention	Correct	26 (86.7)	4 (13.3)	30 (46.2)	5.854 (0.016)
	Incorrect	23 (65.7)	12 (34.3)	35 (53.8)	
Total		49 (75.4)	16 (24.6)	65 (100.0)	
Control	Correct	18 (62.1)	11 (37.9)	29 (44.6)	0.0203 (0.887)
	Incorrect	13 (36.1)	23 (63.9)	36 (55.4)	
Total		31 (47.7)	34 (52.3)	65 (100.0)	
Correct knowledge on timely introduction of semi-solid food					
Intervention	Correct	26 (72.2)	10 (27.8)	36 (55.4)	2.108 (0.147)
	Incorrect	20 (69.0)	9 (31.0)	29 (44.6)	
Total		46 (70.8)	19 (29.2)	65 (100.0)	
Control	Correct	14 (43.8)	18 (56.2)	32 (49.2)	0.0136 (0.907)
	Incorrect	18 (54.5)	15 (45.5)	33 (50.8)	
Total		32 (49.2)	33 (50.8)	65 (100.0)	
χ_b^2 (Brier's adjusted χ^2) = χ^2 / C ; where C = 1 + (m-1)p;					

Table-2: Distribution of infants according to infant feeding practices					
Group	Exclusive breastfeeding in optimum frequency				McNemar's χ_b^2 p value
	At First Visit	At 6 th Month		Total	
		Yes	No		
Intervention	Yes	49 (79.0)	13 (21.0)	62 (95.4)	4.216 (0.040)
	No	1 (33.3)	2 (66.7)	3 (4.6)	
Total		50 (76.9)	15 (23.1)	65 (100.0)	
Control	Yes	39 (63.9)	22 (36.1)	61 (93.8)	7.338 (0.007)
	No	2 (50.0)	2 (50.0)	4 (6.2)	
Total		41 (63.1)	24 (36.9)	65 (100.0)	
Bottle feeding#					
Intervention	Yes	1 (100.0)	0 (0.0)	1 (1.5)	2.033 (0.154)
	No	6 (9.4)	58 (90.6)	64 (98.5)	
Total		7 (10.8)	58 (89.2)	65 (100.0)	
Control	Yes	1 (100.0)	0 (0.0)	1 (1.5)	5.888 (0.0152)
	No	14 (21.9)	50 (78.1)	64 (98.5)	
Total		15 (23.1)	50 (76.9)	65 (100.0)	
Intake of other liquid food#					
Intervention	Yes	1 (100.0)	0 (0.0)	1 (1.5)	4.435 (0.035)
	No	11 (17.2)	53 (82.8)	64 (98.5)	
Total		12 (18.5)	53 (81.5)	65 (100.0)	
Control	Yes	1 (100.0)	0 (0.0)	1 (1.5)	8.319 (0.004)
	No	19 (29.7)	45 (70.3)	64 (98.5)	
Total		20 (30.1)	45 (69.2)	65 (100.0)	
* χ_b^2 (Brier's adjusted χ^2) = χ^2 / C ; where C = 1 + (m-1)p; # Binomial test is done					

Table-3: Average gain in length and weight of infants at completion of 6 months

Group	Average gain in length (cms)			Adjusted 't' test p value
	N	Mean	SD	
Intervention	65	15.22	3.7	0.409 (0.342)
Control	65	14.64	3.0	
	Average gain in weight (gms)			't' test p value
	N	Mean	SD	
Intervention	65	3682.9	727.7	3.387 (0.0005)
Control	65	3067.8	719.5	

Discussion

Role of child feeding practices in survival and growth of young children is well established [1-2]. Ill-effects of inappropriate feeding on health and nutritional status of children area was also reported in several scientific publications [3-4]. International and national agencies and governments identified the key child feeding practices and devised strategic framework for its promotion worldwide [5, 8]. Now, the challenge is to implement these guidelines through routine public health system using front-line workers [19]. It was observed that in the health system, health care providers influence and support feeding decision at key moments before and after birth and later when challenges occur to sustain optimum feeding [9, 20]. Britton et al concluded in a review that all forms of extra-support increase the duration of 'any breastfeeding' significantly and the changes were more pronounced in 'exclusive breastfeeding' [20]. Similar finding was also reported by Sunguya et al in case of children aged 6-23 months [9]. However, it was noted, even in developed country, that substantial gaps in knowledge and skill existed among all levels of health care providers [21].

The present study, in a small scale, examined the feasibility of involving front-line health workers in adoption of infant feeding practices as per national guideline in India by the mothers/ caregivers of infants and measured its effect. It was evident from this study that front-line health workers if trained with knowledge and skill of infant feeding practices and its promotion and supervised on the job, they could act as 'change agents' regarding infant feeding in the community. Although the extent of 'change' may

vary depending on the particular socio-cultural construct. Two earlier controlled trials showed that culturally acceptable, community-based nutrition education could improve infant feeding practices, dietary intake and growth [22-23]. Similar finding was also reported by Sethi et al. from India [24]. It was noted that knowledge regarding key infant feeding among the mothers of intervention area increased considerably with time as well as in comparison to control area. Transfer of knowledge to mothers of infants on infant feeding was achieved through their interaction with trained and skilled front-line workers at their household and at sub-center clinic. This model of knowledge transfer and the result thereto were supported by earlier researchers [9-11, 22-23].

Inadequate breastfeeding skills and lack of support to mothers were reported to be the common reasons for abandoning breastfeeding in early months [25]. Advices and practices that undermine the mother's confidence also affect breastfeeding [26]. Here lies the role of appropriate information. However, transformation of knowledge into practices does depend on several other socio-cultural factors including enabling environment as the experiences and role of female relatives affect the initiation and duration of breastfeeding [27-28]. It may also take some time. In the present study, increased knowledge might not be fully translated into feeding practices. Nearly universal exclusive breastfeeding practices at birth could not be sustained up to 6 months of age even in intervention area. Reduction in proportion of exclusively breastfed infants in both groups

was also noted by Penny et al and Haider et al. [11, 29]. Intake of other liquid and bottle feeding were also increased in intervention area. This might happen due to intricate complexities of socio-cultural construct in the process of adopting new behavior side by side with the transfer of knowledge.

Optimum breastfeeding was reported to have stronger effect on linear growth than on weight gain during infancy and later [30]. However, significantly higher weight gain was noted in this study alike another Indian study [24]. While similar physical growth at 6 months among exclusively and non-exclusively breastfed children was reported in Brazil [31]. Even, in an earlier study, Victora et al showed higher weight gain among infants who stopped breastfeeding at 3-6 months than those who continued [32]. Use of liquid food of lower nutrient value, particularly diluted animal milk, might be the reason for lower weight gain among infants in control group.

Limitation: This small-scale study covering a limited geographical area may not have considered many factors which might have influences on developing optimum infant feeding

practices. Follow-up for a longer period is necessary to comment on sustainability of the intervention.

Conclusion

The study emphasizes the feasibility of involving frontline health workers including ASHAs in promoting optimum infant feeding practices. It is also noted that educational intervention to frontline workers and on-the-job supervision could improve the awareness of caregivers on infant feeding substantially. Adoption and sustenance of optimum infant feeding practices in intervention area, although better than control area, the change was not as conspicuous as knowledge. Early trend showed higher weight gain in intervention area but the gain in length was similar in both areas.

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References

1. Pan American Health Organization. World Health Organization. Guiding principles for complementary feeding of breastfed child. Division of Health promotion and protection. *Food and Nutrition Program*. 2001.
2. Bhutta ZA, Ahmed T, Black RE, Cousens S, Dewey K, Giugliani E et al. What works? Interventions for maternal and child undernutrition and survival. *Lancet* 2008; 371:417- 440.
3. Kumar D, Goel NK, Mittal PC, Misra P. Influence of infant feeding practices on nutritional status of under-five children. *Indian J Pediatr* 2006; 73(5): 417-421.
4. Saha KK, Frongillo EA, Alam DS, Ariffen SE, Persson LA, Rasmussen KM. Appropriate infant feeding practices result in better growth of infants and young children in rural Bangladesh. *Am J Clin Nutr* 2008; 87:1852-1859.
5. World Health Organization. Global Strategy on Infant and young Child Feeding. *World Health Organization, Geneva, Switzerland*. 2003.
6. Ray SK. Actions for tackling malnutrition: growth monitoring or surveillance. *Indian J Public Health* 2005; 49(4):214-17.
7. Black RE, Allen LH, Bhutta ZA, Caulfield LE, de Onis M, Ezzati M et al. Maternal and child undernutrition: Global and regional exposure and health consequences. *Lancet* 2008; 371:243-60.
8. Food and Nutrition Board, Department of women and child development, Ministry of human resource development. National guidelines on infant and young child feeding. *Government of India, New Delhi, India*, 2004; 1-26.
9. Sunguya BF, Poudel KC, Mlunde LB, Shakya P, Urassa DP, Jimba M et al. Effectiveness of nutrition training of health workers toward improving caregivers' feeding practices for children aged six months to two years: a systematic review. *Nutr J* 2013; 12:66.
10. Zaman S, Ashraf RN, Martines J. Training in complementary feeding counseling of health care workers and its influence on maternal behaviours and child growth: A cluster-randomized controlled trial in Lahore, Pakistan. *J Health Popul Nutr* 2008; 26(2):210-22.
11. Penny ME, Creed-Kanashiro HM, Robert RC, Narro MR, Caulfield LE, Black RE. Effectiveness of an educational intervention delivered through the health services to improve nutrition in young children: a cluster-randomized trial. *Lancet* 2005; 365:1863-72.

12. World Health Organization. World Health Report-2000: Health systems- improving performance. Geneva, Switzerland, WHO. 2000.
13. National Rural Health Mission. Guidelines for community process. *Government of India, New Delhi, India*, 2013; 3-11.
14. Ministry of Health and Family Planning. Health Services and Medical Education: a programme for immediate action - Report of the group on Medical Education and Support Manpower. *Government of India, New Delhi, India*, 1975; 1-63.
15. Mathai M, Jacob S, Karthikeyan NG. Birth weight standards of south Indian children. *Indian Pediatr* 1996; 33(3):203-09.
16. Reed JF III. Adjusted chi-square statistics: application to clustered binary data in primary care. *Ann Fam Med* 2004; 2(3):201-203.
17. Campbell MK, Mollison J, Steen N, Grimshaw JM, Eccles M. Analysis of cluster randomized trails in primary care: a practical approach. *Fam Pract* 2000; 17(2):192-196.
18. Planning Commission of India. Press note on poverty estimates, 2009-10. *Government of India, New Delhi, India*. 2012.
19. National Rural Health Mission. Guidelines for enhancing optimal infant and young child feeding practices through the health system. *Ministry of Health and Family Welfare, Government of India*. 2012.
20. Britton C, McCormick FM, Renfrew MJ, Wade A, King SE. Support for Breastfeeding mothers. *Cochrane Database Syst Rev* 2007; 1:CD001141.
21. McAllister H, Bradshaw S, Ross-Adjie G. A study of in-hospital midwifery practices that affect breastfeeding outcomes. *Breastfeed Rev* 2009; 17:11-15.
22. Bhandari N, Bahl R, Mazumdar S, Martines J, Black RE, Bhan MK et al. Effect of community-based promotion of exclusive breastfeeding on diarrheal illness and growth: a cluster randomized controlled trail. *Lancet* 2003; 361:1418-23.
23. Guldán GS, Fan HC, Ma X, Ni ZZ, Xiang X, Tang MZ. Culturally appropriate nutrition education improves infant feeding and growth in rural Sichuan, China. *J Nutr* 2000; 130:1204-11.
24. Sethi V, Kashyap S, Seth V. Effect of nutrition education of mothers on infant feeding practices. *Indian J Pediatr* 2003; 70(6):463-66.
25. Odom EC, Li R, Scanlon KS, Perrine CG, Grummer-Strawn L. Reasons for earlier than desired cessation of breastfeeding. *Pediatrics* 2013; 131:e726-32.
26. Brown CRL, Dodds L, Legge A, Bryanton J, Semenic S. Factors influencing the reasons why mothers stop breastfeeding. *Can J Public Health* 2014; 105:e179-85.
27. Dobe M. Optimal infant feeding in rural areas - the missing agenda of communication needs. *Indian J Public Health* 2002; 46:145-50.
28. Fuller JJ, White AA. The effect of support networks on the choice of infant feeding method. *J Am Diet Assoc* 1998; 98(Suppl):A61.
29. Haider R, Ashworth A, Kabir I, Huttly SRA. Effect of community based peer counselors on exclusive breastfeeding practices in Dhaka, Bangladesh: a randomized controlled trial. *Lancet* 2000; 356:1643-47.
30. Santos I, Victora CG, Martines J, Goncalves H, Gigante DP, Valle NJ et al. Nutritional counseling increases weight gain among Brazillian children. *J Nutr* 2001; 131:2866-73.
31. Giugliani EJ, Horta BL, de Mola CL, Lisboa BO, Victora CG. Effect of breastfeeding promotion intervention on child growth: a systematic review and meta-analysis. *Acta Pediatr Suppl* 2015; 104:20-29.
32. Victora CG, Morris SS, Barros FC, Horta BL, Weiderpass E, Tamasi E. Breastfeeding and growth in Brazillian infants. *Am J Clin Nutr* 1998; 67:452-58.

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