Paediatrica Indonesiana

VOLUME 46 March - April • 2006 NUMBER 3-4

Original Article

The influence of intensive nutritional counseling in *Posyandu* towards the growth 4-18 month old children

Noviati, JC Susanto, H Selina, M Mexitalia

ABSTRACT

Introduction Under 5 years is a critical period for child growth, when growth faltering often occurs. Periodical growth monitoring and nutritional counseling can detect growth faltering earlier, determine the cause, and find alternatives to solve such problems.

Objective To determine the benefit of nutritional counseling on knowledge, attitude, practice of mothers, and child growth.

Methods A randomized controlled trial was conducted in Sendangguwo, Semarang on 143 children of the treatment group and 135 children of the control group. Nutritional counseling was given to mothers in the treatment group by trained health volunteers. Changes of weight for age Z-score (WAZ), height for age Z-score (HAZ), and weight for height Z-score (WHZ) were analyzed repeatedly by using ANOVA. The differences of ΔWAZ, ΔHAZ, and ΔWHZ between groups were compared by student t-test. GEE (generalized estimating equation) analysis was used to analyze the effect of confounding variables on the changes of WAZ.

Results After 6 months of counseling, knowledge, attitude, and practice of nutrition in the treatment group significantly increased compared to that of the control group (P<0.001). The WAZ, HAZ, and WHZ curves in the control group decreased. However, in the treatment group, WHZ increased and there was stabilization of WAZ. At the end of the study, treatment group had significantly improved their WAZ (P<0.001), HAZ (P=0.004), and WHZ (P<0.001) compared to that of the control group.

Conclusion Nutritional counseling can improve knowledge, attitude, and practice of mothers, and has beneficial effects on child growth by WAZ, HAZ, and WHZ **[Pediatr Indones 2006;46:57-63].**

Keywords: *Nutritional counseling, growth direction, growth monitoring, health volunteers*

Under 5 years is a period of critical child growth. During this period, especially in the first two years, children grow quickly, including physical and brain growth.[1] Unfortunately, growth faltering often occurs in this period. Data from *Susenas* (National Health Survey) 1997 shows that the body weight of Indonesian children from birth to 4 months remains at the 50th percentile of WHO-NCHS curve, but afterwards it slowly decreases until it reaches the 3rd percentile at the age of 18 months.[2]

The government recommends monthly child growth monitoring in the Integrated Services Post (*Pos Pelayanan Terpadu/Posyandu*) or other health facilities. In *Posyandu*, regular growth monitoring is done, and growth faltering is able to be recognized and managed, therefore children can grow optimally.[3] Since the attendance in *Posyandu* is low, growth faltering can not be detected earlier. There is also no nutritional counseling in *Posyandu*. In addition, there is a preference in the community to visit *Posyandu* or other

Presented at 13th National Child Health Congress, Bandung, Indonesia, July 4-7, 2005.

From the Department of Child Health, Medical School, Diponegoro University, Kariadi Hospital, Semarang, Indonesia.

Reprint requests to: Noviati, MD, Department of Child Health, Diponegoro University, Kariadi Hospital, Jl. Dr. Sutomo 18, Semarang, Indonesia. Tel/Fax. 62-24-8414296.

health facilities only to receive immunizations for their children, thus the function of *Posyandu* to monitor child growth is not optimal.

There are several causes of growth faltering, generally, poor feeding and/or frequent infections. Both are synergistic in causing growth faltering.[4,5] Many studies have been done on the role of *Posyandu* on growth and development of children.[6-9] This study aimed to investigate the influence of intensive nutritional counseling in *Posyandu* towards knowledge, attitude, and practice of mother/caregiver about nutrition and growth of children 4-18 months old.

Methods

A randomized controlled trial was conducted in 14 *Posyandu* of Sendangguwo Village, Tembalang Sub-District, Semarang from January to July 2004. Samples were determined by stratified random sampling based on the number of *Posyandu* visitors during the period of November 2003. The study units were children <2 years old. Sample calculation for hypothesis testing for two population mean was used in the study with the power of 80% and α=0.05. The minimal sample size was 256 children.

The inclusion criteria were birth at term (>37 weeks gestation), birth weight 2500-4000 grams, 4-18 months old, visited *Posyandu* at a minimal 3 times during the study period, and resided in Sendangguwo. Exclusion criteria were congenital disorders (Down's syndrome, mental retardation), chronic illness (tuberculosis, chronic diarrhea), severe malnutrition, obese (weight for height >120% based on WHO-NCHS chart), short stature (height for age z-score/HAZ <2 SD), and parents/caregivers refused to participate in the study.

Health volunteers were trained prior to the study. Thirty-seven volunteers were trained by pediatricians, nutritionists, and psychologists every 2 months for 6 months (January-July 2004). Training materials were anthropometric measurements, growth chart interpretation, growth monitoring, growth faltering (causes and problem solution), feeding practice for infants and children, and nutritional counseling methods. After training, the nutrition knowledge of health volunteers significantly increased (knowledge score increased 22.1 points compared to that before training). In the control group, no training for health volunteers was performed.

Trained health volunteers worked in 8 study *Posyandus,* which covered 143 children aged 4-18 months, monitored growth using anthropometrics (weight and length) measurement every month for 6 months and provided nutritional counseling for those who did not grow optimally. Nutritional counseling was defined as individual counseling or demonstration on child growth by trained health volunteers to mothers, looked for the possible causes of problems, and solved them. We also distributed leaflets concerning child growth, feeding children according to age, immunization, and prevention of infections. During nutritional counseling, health volunteers were supervised by the author, yet the skill of nutritional counseling was not reviewed with a specific checklist. In 6 control *Posyandus*, no specific counseling was performed by health volunteers and only anthropometric measurements were carried out.

Body weight was measured by Tanita baby weighing scale and length was measured in supine position. Anthropometric measurements on both groups were performed 3 times, i.e: at the beginning of the study, during the 3rd month and 6th month. Knowledge, attitude, and practice of mothers were measured using specific questionnaires done simultaneously with anthropometrics measurement.

DZ-score was defined as the 6th month Z-score minus the 1st month Z-score. Knowledge was defined as the mother's knowledge of nutrition measured by a questionnaire which consisted of 15 questions concerning feeding and child-care (score range: 0-15). Attitude was defined as the mother's attitude on feeding and child-care measured by a questionnaire consisting of 15 questions (score range: 0-15). Practice was defined as the mother's practice of feeding and child-care measured by a questionnaire which consisted of 15 questions (score range: 0-45).

Subjects' health status was defined as the number of days of illness (fever, diarrhea, cough/influenza) in the previous month. Social economic status was determined by the Bistok Saing criteria and categorized into low (total score: 8-12), middle (13-17), and high (18-24). Mother's education was defined as the number of years of the mother's completed education.

In this study, we developed a questionnaire and validated the content and construction through consultation with experts (pediatrician, nutritionist, and

public health expert), pre-tested, and improved. The reliability test was not performed.

The independent variable was nutritional counseling by trained health volunteers in *Posyandu*. Dependent variables were DWAZ (D weight for age Z-sore), DHAZ (D height for age Z-score), DWHZ (D weight for height Z-score). Confounding variables were subjects' health status, social economic status, and mothers' knowledge on nutrition, and mothers' education.

Changes of WAZ, HAZ, and WHZ were analyzed using ANOVA. The differences of DWAZ, DHAZ, and DWHZ between the two groups were compared by the student t-test. Equal non-parametric analysis was performed when the assumption of the test was fulfilled. GEE (generalized estimating equation) analysis was used to analyze the effects of confounding variables on the changes of WAZ. P value of 0.05 was considered significant.

This study was approved by the Committee of Research Ethics, Medical School, Diponegoro University, Kariadi Hospital and also by *Badan Kesatuan Bangsa dan Perlindungan Masyarakat Pemerintah Kota Semarang*.

Results

Two-hundred and ninety-one subjects aged 4-18 months were enrolled in this study. During the study period, 13 subjects (4.5%) dropped out; 1 due to death caused by illness, and 12 moved out. There were 278 subjects who completed the study (143 of the treatment group and 135 of the control group). There were no significant differences in age, sex, body weight, length, immunization status, number of siblings, mothers' education, and social economic status between treatment group and control group. The baseline characteristics of the subjects are shown in **Table 1**.

After 6 months of counseling, mothers' knowledge, attitude, and practice of nutrition in the treatment group had significantly increased compared to that of the control group (**Figures 1, 2, 3**).

WAZ of the control group consistently slowed down, yet WAZ in the treatment group showed stabilization after 3 months of nutritional education. There was a significant difference in WAZ changes between the treatment group and the control group during 6 months of nutritional education (P=0.001).

The deceleration of HAZ in the control group was greater than that in the treatment group. There was a significant difference of HAZ changes between the treatment group compared to the control group during 6 months of nutritional education (P=0.004).

WHZ in the control group consistently slowed down, yet WHZ in the treatment group showed stabilization after 3 months of intervention. There was a significant difference of WHZ changes between the treatment group and the control group during 6 months of nutritional education (P<0.001).

DWAZ, DHAZ, and DWAZ of the treatment group were significantly smaller than that of the control group (P<0.001). At the 3rd month of nutritional counseling, DWAZ score was -0.2, DHAZ score -0.2, and DWHZ score -0.1 in the treatment group, while in the control group -0.4, -0.3, and -0.3, respectively. At the 6th month of nutritional counseling, DWAZ score was 0, DHAZ score -0.1, and DWHZ score 0 in the treatment group, while in the control group -0.2, -0.2, and -0.1, respectively (**Table 2**).

The median duration of illness in the treatment group was 3 days (0-21 days) and of the control group was 4 days (0-21 days). Number of duration of illness in the control group increased significantly after 6 months of follow-up (P<0.001) (**Figure 4**).

Multivariate analysis on the changes of WAZ showed that it was influenced by age, social economic status, knowledge score, and time of intervention (**Table 3**).

Discussion

Nutritional counseling in *Posyandu* can improve knowledge, attitude, feeding practice, DWAZ, DHAZ, and DWHZ of 4-18 month-old children. Knowledge, attitude, and practice of child-care and feeding improved significantly in the treatment group. This is similar to the result of a study in rural Vietnam.[10] A study in China shows that mothers who received appropriate nutritional educational intervention for one year had better knowledge and feeding practice with significantly better body weight as well as body height of the infants than those of the control group.[11]

TABLE 1. BASELINE CHARACTERISTICS OF SUBJECTS

Variables	Treatment group (n=143)	Control group (n=135)
Age (months)	11.0 (SD 4.36)	10.6 (SD 4.09)
Sex		
Boys	68 (24.4%)	75 (27.0%)
Girls	75 (27.0%)	60 (21.6%)
Body weight (kg)	8.2 (SD 1.33)	8.2 (SD 1.28)
Length (cm)	72.2 (SD 5.72)	71.4 (SD 5.09)
Immunization status		
Complete	138 (49.6%)	132 (47.5%)
Not complete	5 (1.8%)	3 (1.1%)
Number of sibling	0-8 (median=1)	0-8 (median=1)
Mother education (year)	8.9 (SD 3.44)	9.4 (SD 3.74)
Social economic status		
Low	2 (0.7%)	2 (0.7%)
Middle	89 (32.0%)	79 (28.4%)
High	52 (18.7%)	54 (19.5%)

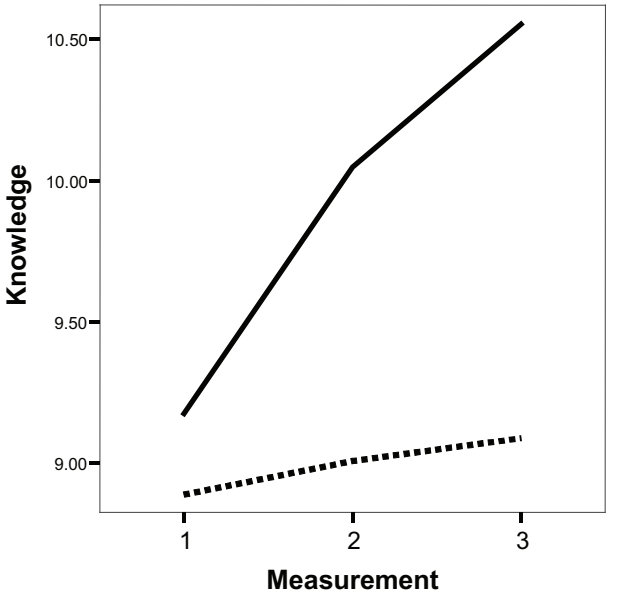

FIGURE 1. CHANGES OF MOTHERS' KNOWLEDGE IN THE TREATMENT GROUP (INTACT LINE) AND THE CONTROL GROUP (DASHED LINE) DURING 6 MONTHS OF NUTRITIONAL EDUCATION.

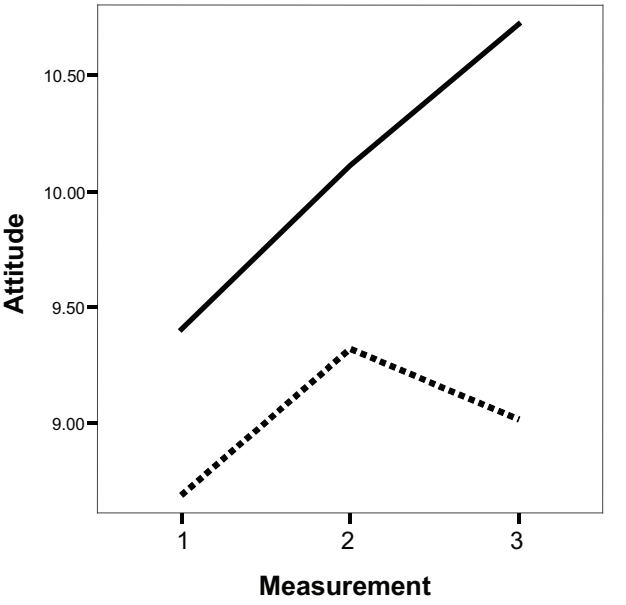

FIGURE 2. CHANGES OF MOTHERS' ATTITUDE IN THE TREATMENT GROUP (INTACT LINE) AND THE CONTROL GROUP (DASHED LINE) DURING 6 MONTHS OF NUTRITIONAL EDUCATION.

In this study, the improvement of Z-score in the last 3 months was better than that of the first 3 months since behavior changes may take time.[12] Although growth deceleration remained in the treatment group, it was slower than that in the control group. This could be due to several factors which influence growth.

A randomized controlled trial of home intervention of nutritional education delivered by community health nurses as part of clinical nutrition for children with failure to thrive shows significant improvement of growth and development compared to that of the control group.[13] A study in Bangladesh shows that nutritional education through demonstration by village workers increased energy intake in children of the treatment group after 5 months intervention, and deceleration of

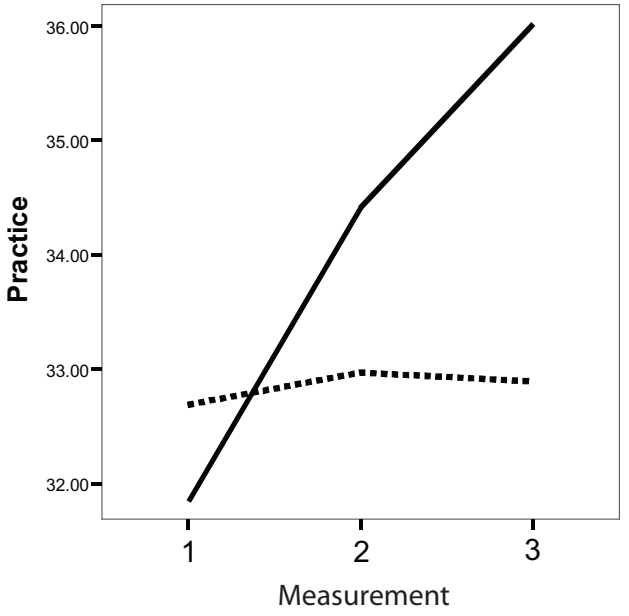

FIGURE 3. CHANGES OF MOTHERS' PRACTICE IN THE TREATMENT GROUP (INTACT LINE) AND THE CONTROL GROUP (DASHED LINE) DURING 6 MONTHS OF NUTRITIONAL EDUCATION.

WAZ in the treatment group was smaller than that in the control group (-0.19 versus -0.65).[14] Meanwhile in South Delhi, nutritional counseling increased energy intake, yet there was no significant benefit in improving weight and height.[15] A study in Rural Haryana, India, shows that nutritional educational intervention yielded a small but significant effect on length gain in the intervention group (difference in means 0.32 cm), while weight gain was not affected.[16]

The number of duration of illness in the treatment group decreased after 6 months of follow-up. This is similar to the result of a study in Vietnam.[17] A study by Sripaipan *et al*[18] in Vietnam showed that after intervention, children had less respiratory illness than those in the control group. Diarrhea was also lower in the intervention group, although differences were not statistically significant. These results may be due to the improvement of hygiene, such as frequent hand washing, and/or improved diet, including breastfeeding and micronutrient intake.[18]

TABLE 2. CHANGES OF WAZ, HAZ, AND WHZ IN THE TREATMENT AND THE CONTROL GROUP DURING 6 MONTHS OF NUTRITIONAL EDUCATION

Variables	Month	Group			
		Treatment group (n=143)		Control group (n=135)	
		Mean	(SD)	Mean	(SD)
WAZ	0	-1.0	(0.95)	-0.9	(0.85)
	3	-1.2	(0.91)	-1.3	(0.81)
	6	-1.2	(0.96)	-1.5	(0.81)
HAZ	0	-0.4	(0.85)	-0.5	(0.81)
	3	-0.6	(1.18)	-0.8	(0.80)
	6	-0.7	(0.77)	-1.0	(0.79)
WHZ	0	-0.9	(0.98)	-0.7	(0.88)
	3	-1.0	(0.96)	-1.0	(0.94)
	6	-1.0	(1.02)	-1.1	(0.89)

TABLE 3. EFFECTS OF CONFOUNDING FACTORS ON WAZ CHANGES DURING 6 MONTHS OF NUTRITIONAL EDUCATION

Variables	β	95% CI of β			SE	z	P
Group	0.13	-0.06	to	0.32	0.098	1.30	0.2
Sex	-0.15	-0.33	to	0.04	0.096	-1.50	0.1
Age	-0.05	-0.07	to	-0.03	0.011	-4.25	<0.001*
Mother education	-0.01	-0.04	to	0.02	0.015	-0.39	0.7
Economic status	0.06	0.02	to	0.10	0.021	2.78	0.005*
Knowledge score	0.03	0.00	to	0.06	0.014	2.25	0.02*
Attitude score	0.00	-0.02	to	0.03	0.014	0.29	0.8
Practice score	0.01	-0.01	to	0.02	0.006	1.05	0.3
Duration of sickness	0.00	-0.01	to	0.01	0.005	-0.06	1.0
Time	-0.21	-0.25	to	-0.18	0.019	-11.47	<0.001*
Constant	-1.69	-2.51	to	-0.87	0.420	-4.03	<0.001*

* significant

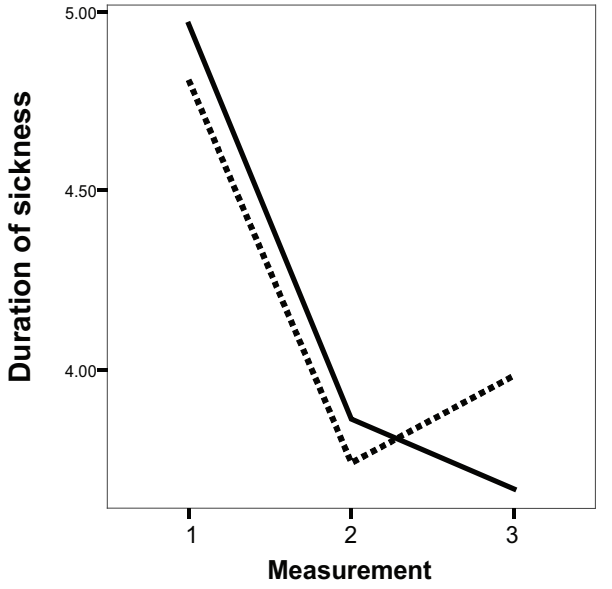

FIGURE 4. NUMBER OF DURATION OF ILLNESS IN THE TREATMENT GROUP (INTACT LINE) AND THE CONTROL GROUP (DASHED LINE) DURING 6 MONTHS OF NUTRITIONAL EDUCATION.

A study by Wright[19] on persistent failure to thrive without organic abnormality showed that repeated home visits gave immediate improvement in child growth patterns after dietary advice. This study also emphasizes the importance of early detection of growth deceleration and dietary advice on prevention and treatment of failure to thrive.[19] Our study also shows similar benefits of nutritional counseling on child growth; however, in this study, counseling was conducted by health volunteers instead of pediatric dieticians and mothers visited *Posyandu* instead of receiving home visits. The important role of health volunteers as trained lay workers was also mentioned in a systematic review that involved 34 studies on home visiting. These studies mention the capacity of lay workers, where their performance in counseling as good as professional counselors.[20] However, a study by Wright[19] also emphasizes the important role of pediatric dieticians and pediatricians in taking over patient management in cases of persistent growth failure which may be caused by organic abnormality. Based on these findings, it can be concluded that growth monitoring and nutritional counseling by health volunteers have important roles in preventing growth faltering.

In conclusion, nutritional counseling can improve knowledge, attitude, and practice of mothers or caregivers and has beneficial effects on child growth by WAZ, HAZ, and WHZ. Therefore, it is important to conduct nutritional counseling in *Posyandu* by health volunteers to all *Posyandu* visitors and to train health volunteers regularly to improve their nutritional knowledge.

Acknowledgments

The authors are grateful to *Kesejahteraan Keluarga Soegijopranoto* (KKS) organization Semarang for their support. The authors are also grateful to all *Posyandu* health volunteers (and those involved) for their invaluable help and cooperation.

References

1. Widodo DP. Pertumbuhan dan perkembangan susunan saraf pusat pada janin dan bayi. In: Tarjoto BH, Kosim MS, Deliana E, Muarif YS, editors. Naskah lengkap KONAS VII Perinasia dan Symposium on International Adolescent Reproductive and Perinatal Health Toward 3rd Milenium. Semarang: Perinasia Jawa Tengah; 2001. p. 154-62.
2. Susanto JC. KMS sebagai alat deteksi dini hambatan pertumbuhan pengalaman dari Semarang. In: Kumpulan makalah diskusi pakar bidang gizi tentang ASI-MP ASI antropometri dan BBLR. Cipanas: Persatuan Ahli Gizi Indonesia. LIPI, UNICEF, 2000.
3. Departemen Kesehatan RI Direktorat Jenderal Bina Kesehatan Masyarakat-Direktorat Gizi Masyarakat. Pemantauan pertumbuhan balita. Jakarta: Departemen Kesehatan; 2002.
4. Corrales KM, Utter SL. Failure to thrive. In: Samour PQ, Helm KK, Lang CE, editors. Handbook of pediatric nutrition. 2nd ed. Maryland: Aspen Publishers; 1999. p. 395-412.
5. King FS, Burgess A. Nutrition for developing countries. Oxford: Oxford University Press; 1996. p. 209-21.
6. Akademi Gizi Surabaya. Growth monitoring field experience in Mojokerto district East Java province 2002.
7. Satoto, Djahari AB. Growth data from Posyandu in Indonesia: Precision, accuracy, reliability, and utilization. Presented at International experts' seminar on child growth and poverty, Jakarta; 2002 November.
8. Sub Bagian Gizi Ilmu Kesehatan Anak RSUP Dr. Kariadi Semarang. Laporan pengamatan pertumbuhan anak di 6 Posyandu sekitar RSUP Dr. Kariadi Semarang (Januari-Juni 2002). Unpublished data.

9. Sub Bagian Gizi Ilmu Kesehatan Anak RSUP Dr. Kariadi Semarang. Laporan bulanan BKIA RSUP Dr. Kariadi Semarang tahun 2002. Unpublished data.
10. Hendrickson JL, Dearden K, Pachon H, An NH, Schroeder DG, Marsh DR. Empowerment in rural Vietnam: Exploring changes in mothers and health volunteers in the context of an integrated nutrition project. Food and Nutrition Bulletin 2002;23:83-91.
11. Guldan 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.
12. Notoatmojo S. Ilmu kesehatan masyarakat. Jakarta: Rineka Cipta, 1997.
13. Black MM, Krishnakumar A. Predicting longitudinal growth curves of height and weight using ecological factors for children with and without early growth deficiency. J Nutr 1999;129:539-43.
14. Brown LV. Evaluation of the impact of weaning food messages on infant feeding practices and child growth in rural Bangladesh. Am J Clin Nutr 1992;56:994-1003.
15. Bhandari N, Bahl R, Nayyar B, Khokhar P, Rohde JE, Bhan MK. Food supplementation with encouragement to feed it to infants from 4 to 12 months of age has a small impact on weight gain. J Nutr 2001;131:1946-51.
16. Bhandari N, Mazumder S, Bahl R, Martines J, Black RE, Bhan MK, *et al*. An educational intervention to promote complementary feeding practices and physical growth in infants and young children in rural Haryana, India. J Nutr 2004;134:2342-8.
17. English RM, Badcock JC, Giay T, Ngu T, Waters AM, Bennett SA. Effect of nutrition improvement project on morbidity from infectious diseases in preschool children in Vietnam: Comparison with control commune. BMJ 1997;315:1122-5.
18. Sripaipan T, Schroeder DG, Marsh DR, Pachon H, Dearden KA, Ha TT, *et al*. Effect of an integrated nutrition program on child morbidity due to respiratory infection and diarrhea in northern Vietnam. Food and Nutrition Bulletin 2002;23:67-75.
19. Wright CM. Identification and management of failure to thrive: A community perspective. Arch Dis Child 2000;82:5-9.
20. Kendrick D, Elkan R, Hewitt M, Dewey M, Blair M, Robinson J, *et al*. Does home visiting improve parenting and the quality of the home environment? A systematic review and meta-analysis. Arch Dis Child 2000;82:443-51.