

Community-based nutritional intervention for reducing malnutrition among children under 5 years of age in the Islamic Republic of Iran

H. Malekafzali,¹ Z. Abdollahi,² A. Mafi³ and M. Naghavi⁴

التدخلُ الغذائي المُركّز على المجتمع للتخفيف من سوء التغذية بين الأطفال دون سن الخامسة في جمهورية إيران الإسلامية
حسين ملك أفضل و زهرا عبد الله وعلي رضا مافي ومحسن نقوي

خلاصة: تم تنفيذ هذا المشروع في منطقة ريفية في أيلول/سبتمبر 1994 بهدف إنقاص معدل وقوع سوء التغذية بنقص الطاقة والبروتين بين الأطفال دون سن الخامسة، وذلك عن طريق التدخل الغذائي من خلال نظام الرعاية الصحية الأولية. وأجري تحليل ميداني للوضع أسفر عن معرفة موارد المنطقة وأسباب سوء التغذية. وقد اختير كل من التثقيف العملي حول طرائق التغذية، والتخلص من الديدان المعوية، والإصحاح البيئي، وتعزيز زراعة الخضراوات المنزلية، وتطبيق برنامج لرصد نمو الأطفال، باعتبارها سُبُلًا للتدخل. وبعد مضي سنة أعيد تقييم سائر المناسب في المنطقة. وأظهرت النتائج أن الوعي الغذائي قد ارتفع بين الأمهات، وأن معدل حدوث سوء التغذية قد انخفض من 6.5% إلى 1.8%، مقاسًا بمسبب الوزن مقابل الطول.

ABSTRACT A project was conducted in a rural area in September 1994 with the aim of decreasing the incidence of protein-energy malnutrition among children under 5 years, by nutritional intervention through the primary health care system. An initial situation analysis revealed the region's resources and causes of malnutrition. Practical instruction on feeding methods, deworming, environmental sanitation, the promotion of home-grown vegetables and reinforcement of the growth monitoring programme were chosen as the routes for intervention. All indices were reassessed in the region after 1 year. Results showed that nutritional awareness had grown among mothers, and that the incidence of malnutrition had dropped from 6.5% to 1.8%, as measured against the weight-for-height index.

Intervention nutritionnelle communautaire pour la réduction de la malnutrition chez les enfants de moins de 5 ans en République islamique d'Iran

RESUME Le projet a été réalisé dans une zone rurale en septembre 1994 dans le but de réduire l'incidence de la malnutrition protéino-énergétique chez les enfants de moins de cinq ans, grâce à une intervention nutritionnelle passant par le système de soins de santé primaires. Une analyse de la situation initiale a fait apparaître les ressources de la région et les causes de malnutrition. L'enseignement pratique des méthodes d'alimentation, du traitement vermifuge, de l'hygiène du milieu, la promotion des légumes cultivés à domicile et le renforcement du programme de suivi de la croissance ont été choisis comme modes d'intervention. Tous les indices ont été réévalués dans la région un an après. Les résultats ont montré que la sensibilisation nutritionnelle avait augmenté chez les mères et que l'incidence de la malnutrition était passée de 6,5% à 1,8%, mesurée à l'aide de l'indice poids/taille.

¹Faculty of Public Health, Teheran University of Medical Science, Teheran, Islamic Republic of Iran.

²Nutrition Office; ³Department of Family Health; ⁴PHC Expansion Centre, Ministry of Health and Medical Education, Teheran, Islamic Republic of Iran.

Received: 09/02/98; accepted: 20/05/98

Introduction

Protein-energy malnutrition is a common nutrition problem in the Islamic Republic of Iran among children under 5 years of age. According to the national child health survey of 1991, between 6.5% and 34.0% of all children fall below the third percentile based on the weight-for-age index of the US National Center for Health Statistics (NCHS) reference population [1]. The national survey in 1995 also showed 15.0% of boys and 16.3% of girls under 5 years to be moderately or severely malnourished, based on the weight-for-age index [2].

There is plenty of evidence to show that malnutrition in early childhood and the pre-natal period can cause retardation in mental and physical, especially linear, growth. Such children with fall short of achieving their full potential for physical and mental development [3]. Severe malnutrition during the growth period has proven detrimental effects on physical, cognitive and social development, resistance to infection, and on physical activity [4]. Increased expenditure on medical services and curative strategies, and a higher incidence of sick-leave are some of the undesirable side-effects of malnutrition which place a heavy burden on the economy in both the public and private sectors [3].

Community-based nutritional intervention has been a strategy of choice for eliminating malnutrition since its trial in Indonesia, Thailand and India's Tamil-Nadu province during the 1980s [5-7]. The nutrition project in Iringa, Tanzania also uses primary health care, growth-monitoring, household food security, education, and public motivation to combat malnutrition [8]. Such intervention strategies can also be economically sound.

The present project was conducted in the village of Sibak, in the Borujen district

of Chahar Mahall va Bakhtiari province, located in the centre of the country. The objective of the project was to decrease malnutrition in children under 5 years covered by health houses, and then to expand the results to other rural areas of the country. In the Islamic Republic of Iran, the most common causes of mortality in children under 5 years are accidents and trauma, followed by acute respiratory infections and diarrhoeal diseases [9]. Malnutrition increases the incidence, duration, severity, complications and mortality of other diseases [3]. The World Health Organization (WHO) estimates that malnutrition is a contributing factor in 54% of deaths. The incidence of respiratory and diarrhoeal diseases and their mortality rate can be limited by controlling malnutrition. The project was expected to produce an appropriate model for intervention to decrease nutritional deficits among children under 5 years covered by health houses.

The health house is the basic level of health service in rural areas, usually covering a population of 500 to 2000. This population is spread over the main village where the clinic is situated, as well as the satellite village(s) located within an hour's walk. The grass-roots community health workers called *behvarz* deliver active primary health care services at the health house. Each health house is usually staffed by one male and one female *behvarz*.

Behvarz are selected from young, motivated members of the local population of the main or satellite village. They receive 2 years training at the district centre's *behvarz* training facility. In accordance with the growth monitoring programme, all children covered by the health house are visited once a month in their first year of life, alternate months in their second year, every 3 months in their third year and every 6 months during their fourth, fifth and sixth years.

Sibak's population is over 1779, composed of 270 households, most of which are engaged in farming. Women also weave carpets. The principal crops are wheat, barley, beans, apples, grapes, walnuts and almonds. Running water is supplied from nearby fountains. Sibak has two guidance schools (junior high schools). Of the women involved in this study (those with children under 5 years), 44% were able to read and write. The health house has one male and one female indigenous *behvarz* providing primary health care services. Based on the health house's monthly reports to the district health centres, respiratory and diarrhoeal diseases are common in the region during the cold and warm seasons respectively. *Giardia* infestation is prevalent among all age groups, particularly those under 5 years.

Subjects and methods

The project was conducted in three stages: a situation analysis, intervention and evaluation.

Situation analysis

Data were collected on the eating habits of the people of Sibak, the local foodstuffs, the mothers' knowledge of, attitude towards and practice of child nutrition, and the anthropometric (height and weight) measurements of the children under 5 years of age.

Eating habits

Food frequency questionnaires were used to determine food habits. The forms were completed by specially instructed nutritionists employed within the region's health network.

Knowledge, attitude and practice (KAP) of mothers

All families with at least one child aged under 5 years were studied to determine the mothers' KAP. Data on knowledge were collected from each mother with a child under 5 years. Data on practices were gathered from mothers with a child under 2 years of age through questionnaires and interviews. Exclusive breastfeeding data on mothers with a child aged 4 months or less were sought (mothers were asked whether they had fed their child anything but breast milk over the past 24 hours). Data collection was undertaken by specially instructed family health workers; 205 questionnaires on knowledge were completed and 99 questionnaires were completed on mothers' practices regarding breastfeeding, supplementary foods, feeding during diarrhoea and other diseases, growth monitoring, and nutrition during pregnancy and nursing.

Anthropometry

While the KAP sheets were being filled in by the mother, the child's height and weight were measured and recorded on special forms at the health house by a trained health worker. The child's weight was measured using either a tray scale or a standing scale with measuring ruler for height. A box-type measuring instruments was used to determine the supine height of those under 2 years of age. Each mother was given containers to collect stool samples from every member of the household. Samples were collected during a second home visit at noon on the following day, and transported to the district central laboratory. Thus the age-specific prevalence of various infestations was determined.

Intervention

Food preparation training

A group of volunteer women of experience and influence (i.e. grandmothers) were recruited from within the community. Two local kitchens equipped with a minimum of essential utensils were erected at the health house and the girls' guidance school. *Behvarz* began training mothers on appropriate nutritional practices by way of a demonstration, after having received an instructional course themselves.

The training process called for mothers with children under 5 years to bring ingredients and watch the grandmother preparing their child's food at the health house kitchen, supervised by a *behvarz* and a nutritionist.

The nutritional value of locally available foodstuffs, how to incorporate them in a child's meal, proper cooking techniques, and the importance of growth monitoring were among the subjects discussed at these training sessions. Girls were trained at the school kitchen by their teacher and by a nutritionist.

Environmental sanitation and disinfection

Classes were held on personal hygiene and prevention of parasitic diseases for both students and their parents, with the aid of the health education unit. Environmental sanitation and the creation of safe latrines were undertaken by the environmental health unit. Infestations were detected and treated at the same time.

Home gardening

Promotion of home-grown vegetables was adopted as an important strategy. Local agricultural authorities determined the type of vegetables suitable for local cultivation. Mothers were encouraged to plant the vegetables at home, using seeds and fertilizer provided by the same source.

Home gardening can provide a household's daily supply of vegetables and can add to its income. Village women received regular training on cultivation, harvesting and storage of vegetables and foodstuffs by agricultural experts.

Expanding chances for work

Arrangements were made with the relevant authorities to increase the number of carpet-weaving working places, enhancing the opportunity for work and income generation. The joint survival project carried out by Imam Khomeini's aid agency, Jihad for Development, and by the environmental and occupational health unit aims to increase the income of rural households. This project was also supported within the present study, with particular attention given to its nutritional objectives.

Evaluation

All indices were re-evaluated 1 year after the intervention. The results are presented in the following section.

Results

Mothers' knowledge and practice

The evaluation showed that compared with before intervention, nutritional awareness about breastfeeding including exclusive breastfeeding, the value of colostrum and rooming-in, timely introduction of supplementary and regular foods, feeding during diarrhoea, and growth monitoring had increased among mothers in Sibak. Table 1 shows this significant improvement in knowledge in every aspect among mothers, as evidenced by the chi-squared test ($P = 0.02$ for timely initiation of supplementary foods and $P < 0.01$ for the other parameters).

Table 2 shows the practices of mothers relating to child nutrition. The percentage of mothers who followed sound nutritional practice had grown in Sibak following intervention. Because of the limited sample size, no significant change could be detected in a number of parameters, including exclusive breastfeeding, timely initiation of supplementary and regular foods and feeding during diarrhoea.

Malnutrition

Figure 1 shows the incidence of malnutrition, assessed by the weight-for-age and weight-for-height index and defined as two standard deviations below the NCHS mean. The value given is for Sibak before and after intervention. Based on the weight-for-height index, the incidence of malnutrition decreased by approximately 27% ($P = 0.05$).

Table 1 Mothers' knowledge about child nutrition before (1994) and after (1995) intervention, Sibak, Islamic Republic of Iran

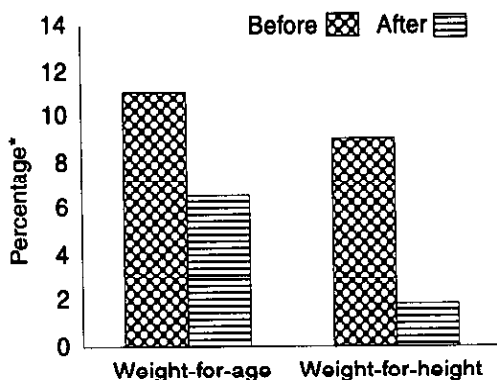
Practice	Knowledge of proper practice pre-intervention (%) (n = 205)	Knowledge of proper practice post-intervention (%) (n = 176)	P-value
Breastmilk: the child's first food	48.8	85.2	$P < 0.001$
Feeding colostrum	92.2	99.4	NS
Rooming-in (breastfeeding within 2 hours of delivery)	55.1	93.8	$P < 0.001$
Exclusive breastfeeding for the first 4 months	45.5	82.0	$P < 0.001$
Feeding during diarrhoea	15.6	53.4	$P < 0.001$
Significance of the growth chart	42.8	88.1	$P < 0.001$
Introduction of regular food at 1 year	43.4	75.0	$P = 0.001$

NS = not significant

Table 2 Mothers' practice of child nutrition before (1994) and after (1995) intervention, Sibak, Islamic Republic of Iran

Practice	Proper practice pre-intervention (%) (n = 99)	Proper practice post-intervention (%) (n = 79)	P-value
Breastmilk: the child's first food	45.0	88.6	$P < 0.005$
Feeding colostrum	49.5	87.0	NS
Rooming-in (breastfeeding within 2 hours of delivery)	21.8	38.9	NS
Exclusive breastfeeding for the first 4 months	57.0	76.0	NS
Feeding during diarrhoea	57.0	87.6	NS
Proper interpretation of the growth chart	36.0	81.0	$P < 0.006$
Introduction of regular food at 1 year	44.8	48.0	NS

NS = not significant



*More than 2 SDs below US National Center for Health Statistics indices

Figure 1 Comparison of anthropometric values in children under 5 years before (1994) and after (1995) intervention, Sibak, Islamic Republic of Iran

Routine anthropometric data for the period 1994–96 were obtained from the Sibak health house and compared with those of the village of Dehno, a village similar to Sibak in every respect except that no intervention had been carried out in Dehno. The Sibak data indicated that the percentage of children who fell below the third percentile of weight-for-age had decreased from 7.9% in 1994 to 3.1% in 1996. Values for the same index had increased from 5.4% to 7.8% in the control village of Dehno over the same period of time.

Discussion and conclusion

Results of the annual evaluation at Sibak showing a decrease in the percentage of children falling below the third percentile of weight-for-age confirm the efficacy of multisectoral nutritional interventions when administered through the primary health care system. During the past decade, it has been

recognized that primary health care represents the best strategy for improving the health status of a maximum number of people in the minimum length of time [10]. Projects conducted in other countries, including the Narangwal project in India [11], the Chilean project and the Iringa project in Tanzania provide considerable evidence on the benefit of such interventions. Integration of nutritional programmes into primary health care in the 1980s has represented a major advance in delivering comprehensive services to rural areas. Studies conducted over these years have shown that poverty exerts its detrimental effect on children's growth, primarily through the shortage of food and prevalence of diseases such as diarrhoea. Interventions have consequently come to include growth monitoring, oral rehydration therapy, disinfestation and supplementary feeding programmes [12]. Intestinal disinfestation was taken into account in the Sibak project as an important measure in controlling failure to thrive. Studies in Sri Lanka have also verified the positive influence of vaccination and disinfestation on child growth [12].

Encouraging multisectoral cooperation, particularly between the health, agricultural and education sectors, together with community involvement has been fundamental to the Sibak project's success. Reinforcement of the growth monitoring programme and the mothers' attentiveness to their child's growth chart are also important in any nutritional intervention. This has been demonstrated in the Indonesian programme of family nutrition, where growth monitoring was a major tool for timely detection and control of growth retardation [6]. Growth monitoring is the responsibility of a female *behvarz* and so it was in the Sibak project.

One of the project's characteristics was that commercial food supplements were ex-

cluded from the training. Child food distribution programmes have been demonstrated to be cost-effective in Senegal, Morocco, Sri Lanka, Tanzania (Iringa) and India (Tamil-Nadu) where they helped in limiting moderate to severe malnutrition [12]. Commercial supplements have an obvious impact upon the height and weight of neonates when given to pregnant women [14-16]. Yet proper nutrition education has been shown to be equally effective, as in the Dominican Republic, for example, where community-based intervention was conducted with the aim of increasing awareness, incentives and self-reliance through training. Within 3 years of the intervention, considerable changes were observed in the practice of child-feeding, management of diarrhoeal diseases and personal hygiene. The prevalence of moderate to severe malnutrition among 2- to 3-year-olds was reduced by a third [12]. The impact on the feeding practices of low-income pregnant women in Mexico after education on proper nutrition is further evidence of the effectiveness of appropriate intervention [13]. In the Sibak project, mothers received proper nutrition education by demonstration. Volunteer senior women (grandmothers) showed them how to prepare child food in practice (after receiving a short preparatory course from the female *behvarz*). This food was prepared at no additional cost, except for the cost of the ingredients voluntarily brought in by mothers. Community involvement in a self-supported nutritional training programme can be very effective and is less costly and more sustainable than programmes involving the distribution of food supplements. Past experience with the distribution of donated foods in the 1970s showed that such programmes promoted the dependence of communities and actually discouraged local food production [14].

Due to the relatively small size of this study, it was not possible to determine the magnitude of the decrease in malnutrition among different age groups, or between boys and girls. However, the evaluation did show that concerted efforts can bring about a decrease in the rate of malnutrition among a region's children, even within a short period of time. As evidenced by this project, the nutritional status of a community can be expected to improve once education on proper nutrition is combined with other health programmes and delivered through the primary care system.

The most fundamental factor determining the sustainability of an intervention is to use materials and capabilities which are locally available, and to gain political support for the programme. The primary health care system is a cost-effective mechanism for the prevention of diseases and enhancement of public awareness about health and nutrition. In the Islamic Republic of Iran's primary health care system, it is the *behvarz*, working at the grass-roots level in rural areas, who is in the best position to advise on the possible cause of malnutrition (e.g. problems with breastfeeding, weaning foods, vaccination and infectious diseases). Arriving at a suitable model for controlling the problem of malnutrition in rural areas in a country with such climatic, cultural, social and economic diversity as is found in the Islamic Republic of Iran will no doubt require larger community-based interventions at the district or provincial level.

Acknowledgements

We thank all staff members of the Ministry of Health and Medical Education, the Chahar Mahall va Bakhtiari provincial health centre and Borujen health centre.

References

1. Ghasemi H. *Review of the Iranian research on child and adolescent growth*. Teheran, National Institute for Research in Nutrition and Food Industry, 1992.
2. *Health indices of the Islamic Republic of Iran*. Teheran, Ministry of Health and Medical Education and United Nations Children's Fund, 1995.
3. McGuire JS, Austin JE. *Beyond survival: children's growth for national development*. New York, United Nations Children's Fund, 1987.
4. Grantham M, McGregor SM. The effect of malnutrition in mental development. In: Waterlow JC, ed. *Protein-energy malnutrition*. London, Edward Arnold, 1992:340-60.
5. Berg A. *Malnutrition: what can be done?* (A World Bank publication). Baltimore, Johns Hopkins University Press, 1987.
6. *An Indonesian integrated family planning, nutrition and health program. The evaluation of the first five years of program implementation in East Java and Bali*. Ann Arbor, Community Systems Foundation, 1986.
7. Chavalit C. *Family and community level action for better child growth: the experience of Thailand*. New York, United Nations Children's Fund, 1986.
8. *The Joint WHO/UNICEF Nutrition Support Programme in Iringa, Tanzania, 1983-1988*. Evaluation report. New York, New York Defense for Children International, 1989.
9. Malekafzali H. *Maternal and child health in the Islamic Republic of Iran*. Teheran, Ministry of Health and Medical Education, 1991.
10. Rossi-Espagnet A. Health services and environmental factors in urban slums and shanty towns of the developing world. *Food and nutrition bulletin*, 1987, 9(4):4-20.
11. Arnfried A, Kielmann Taylor CE, Parker RL. The Narangwal nutrition study. A summary review. *American journal of clinical nutrition*, 1978, 31:2040-52.
12. Ghassemi H. Supplementary feeding in programmes in developing countries: lesson of the eighties. *Asia Pacific journal of clinical nutrition*, 1992, 1:195-206.
13. Hunt IF et al. Effect of nutrition education on the nutritional status of low-income pregnant women of Mexican descent. *American journal of clinical nutrition*, 1976, 29:675-84.
14. Edozien JC, Switzer BA, Bryan RB. Effect of nutrition education of the special supplemental food programme for women, infants and children. *American journal of clinical nutrition*, 1979, 32:677-92.
15. Mora JO et al. Nutritional supplementation and the outcome of pregnancy. I. Birth weight. *American journal of clinical nutrition*, 1979, 32:455-62.
16. Tontisirin K et al. Formulation and evaluation of supplementary foods for Thai pregnant women. *American journal of clinical nutrition*, 1986, 43:931-9.