

The Effectiveness of Community-Based Nutrition Education on the Nutrition Status of Under-five Children in Developing Countries. A Systematic Review

J Majamanda^{1*}, D Maureen¹,
T M Munkhondia² and J Carrier³

1. Kamuzu College of Nursing, University of Malawi, Blantyre Campus, P.O Box 415, Blantyre

2. Kamuzu College of Nursing, University of Malawi, Lilongwe Campus, P/Bag 1, Lilongwe

3. Cardiff University, School of Nursing and Midwifery Studies, MSc RGN PGCE Dip

*Corresponding author, email: mdmajamanda@gmail.com

Abstract

Aim

This systematic review aimed at examining the best available evidence on the effectiveness of community-based nutrition education in improving the nutrition status of under five children in developing countries.

Methods

A systematic search of the literature was conducted utilising the following data bases: Cumulative Index to Nursing and Allied Health Literature (CINAHL), EMBASE, Medline, and Web of Knowledge. 9 studies were identified for the critical appraisal process. The Joanna Briggs Institute (JBI) critical appraisal check-list for experimental studies was utilised and two reviewers conducted the appraisal process independently. 7 studies were included for this review and data was extracted using the JBI data extraction form for experimental studies. The extracted data was heterogeneous as such narrative synthesis was conducted.

Results

The nutritional status of children in all studies improved and this was evidenced by increases in weight, height, mid upper arm circumference and reduced morbidity. Key messages about education were age at introduction of complementary foods, nutrition value on different types of feeds found locally and frequency of feeding the children. However, there were varied results regarding the effects of the intervention on the nutrition status of children. This was attributed by differences in implementers' characteristics, different intervention strategy and intensity, difference in age of the children at enrolment, pre-existing children's growth and nutritional status and follow-up periods. In addition to home visiting, conducting group meetings of care givers and community leaders, providing education twice a week and use of cooking demonstrations have shown that they produce highly significant findings.

Conclusion

The evidence from the identified studies suggests that community-based nutrition education improves the nutrition status of under-five children in developing countries.

Background

The prevalence of childhood malnutrition remains high in the developing world¹. Malnutrition rate is high between the ages of 6 to 24 months because breast milk alone is not enough to meet the nutritional needs of the child and other foods are introduced². World Health Organisation (WHO)³ defines complementary feeding as the introduction of other foods and/ or energy containing liquids to young children in addition to breast milk. While some studies indicate that complementary feeding can be introduced at 4 months^{4,5} WHO⁶, recommends that children should be introduced to complementary foods at 6 months. The food that is given should be safe, adequate and appropriate to prevent growth faltering in under-five children thereby reducing childhood deaths.⁴One of the major causes of malnutrition in young

children in developing countries is poor feeding practices such as: introducing complimentary foods at an early or late stage, restriction in food selection and giving children poor quality and insufficient amounts of complimentary foods.^{6,7,8,9} It is argued that poor feeding practices are associated with care-givers poor knowledge, lack of information and their being restricted by traditional beliefs¹⁰. Poverty is another major cause and affects food choices¹ With poverty, caregivers tend to give children the food that is available regardless of its nutrition value¹¹ Shortage of health-care providers, HIV and AIDS and few health care facilities are some of the contributing factors to malnutrition. In developing countries there is critical shortage of health-care providers¹². This has been made worse by the accelerating labour migration which is causing loss of nurses and doctors from countries that can least afford the brain drain¹³. There is also an increase in disease burden due to HIV and AIDS and as a result more of these health-care workers are based in the health care facility with few in the community. Consequently, primary care activities are not given a priority. There are a few health care facilities which are located very far from people and as such most people go to the hospital when they perceive an illness to be serious. As a result, health workers are mostly busy attending to serious cases and do not give much attention to preventive services such as health education. These factors provide a threat to the attainment of health-related millennium development goals number 4 and 6, which aim to reduce child mortality and combat HIV/ AIDS, malaria and other communicable diseases respectively³. It is against this background that numerous strategies have been put in place to reduce the prevalence rate of malnutrition in children. These strategies are: provision of supplementary feeding, fortified foods, immunisations and nutrition education^{1,14}. To combat malnutrition it has been recommended by many researchers that nutrition intervention should be accessible, sustainable, culturally sensitive and integrated with local resources^{7,15,16}. One such intervention is the training of some community members to provide nutrition education to care-givers in their villages to prevent and improve childhood under-nutrition. This systematic review will therefore evaluate the best available evidence on the effectiveness of community-based nutrition education in improving the nutrition status of under-five children in developing countries.

Methods

A comprehensive and systematic search of CINAHL, EMBASE, MEDLINE, PubMed and Web of Knowledge was undertaken utilising synonyms of the following key terms: Children, Community-based nutrition education and Nutrition Status. Search strings were created by combining the Boolean operators OR and AND. The search included studies with the following qualities: randomised controlled trials, quasi experimental studies, primary research from peer-reviewed journals, studies that used nutrition education or counselling as interventions. The interventions were delivered within the community or at home to groups or individual care takers by health-care providers and trained community members and/ or peer counsellors. Before

the implementation of the intervention, the implementers should have received training on nutrition content. The studies should have been written in the English language, conducted in developing countries and whose outcomes were increase in weight and height. The review excluded studies that evaluated the effectiveness of provision of supplementary or complementary feeding; those that combined the interventions of education and provision of supplementary feeding, systematic reviews, studies that looked at education provided at a health facility and those that looked at education provided to children at school. The search identified 5,074 articles for review. After reading the topic and abstract, 38 articles were identified. Full text articles assessed for eligibility were 25. After removing duplicates and systematic reviews, 9 studies were identified and appraised by two reviewers for methodological quality using the standardised critical appraisal instrument for Experimental Studies from the Joanna Briggs Institute. This process resulted in 7 studies for inclusion in this review (figure 1).

Fig 1: Literature search and study identification

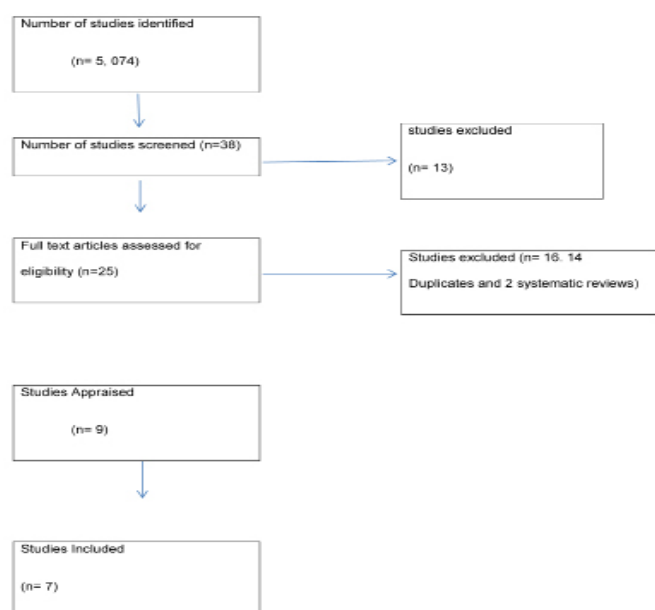


Table 1: Characteristics of included studies

Author, year and country	Subjects	Intervention strategies	Outcome	Results
Bhandari et al. (2004) Rural Haryana, India	• Children less than 2 years old • 502 in intervention, 475 in the control group • Followed from birth to 18 months of age	• Nutrition counselling (monthly home visits, group meetings, feeding demonstrations) • Training of health and nutrition workers • Community activity (kitchen rallies, school debates, nutrition fair)	• Weight • Length • Complementary feeding practices	• No difference in weight between comparison groups • Children in intervention group had a higher increment in length (0.33cm; 95% CI 0.03, 0.61) • Intervention group had higher energy intake (kcal) 9 months (mean ± SD: 1056 ± 109 vs. 1025 ± 88; P < 0.001) and 18 months (1087 ± 102 vs. 1057 ± 108; P < 0.001)
Roy et al. (2005) Bangladesh	• 382 Moderately malnourished children • Aged 5-6 months • Two intervention groups • One control group • 194 in each group • Followed for a further 6 months	• Intensive Nutrition Education (INE) group • Received nutrition education twice a week for 3 months (included food group discussions of new foods, cooking demonstrations) • RE-NEF group received nutrition education twice a week and their children received additional supplementary feeding • Comparison group and the two intervention groups received the standard routine IMR service	• Morbidity • Weight	• Intensive Nutrition Education (INE) group: 37% and 38% • Intensive Nutrition Education Supplementary Feeding (INE-SF): 47% and 48% • Comparison group: 18% vs. 18% and 32% vs. 32% of children reported from moderate to mild or normal nutritional status after 3 and 6 months of observation respectively • No significant difference in nutritional status between the INE and RE-NEF groups • The mean weight-for-age z-score significantly improved in the intervention group (z = 0.21 vs. -0.36 vs. -0.41) and in comparison groups (z = 0.76 vs. 0.50; comparison vs. RE-NEF, comparison vs. RE-NEF) compared to baseline
Le Roux et al. (2010) South Africa	• Malnourished children (Under five years) • 535 intervention • 532 control Follow up for one year	• Training of mentor mothers • Nutritional counselling (home visit) • Growth monitoring • Monitoring of mentor mothers by supervisors once a month	• Weight	• 42% (n=233) of 535 intervention children were rehabilitated • 31% (n=178) of 532 control were rehabilitated • P < 0.001
Shi et al. (2009) Rural China	• Children aged 2-4 months • 284 intervention group • 284 control group • Followed up until one year	• Training of health care providers • Group training with village committee leaders • Nutritional education messages • Group training (food selection, preparation, hygiene) • Demonstration of preparing enhanced home-prepared meals • Home visits every 3 months	• Behavior change of care givers • Weight • Length	• Food diversity, meal frequency and hygiene practices improved in the intervention group • Intervention group gained 0.23kg more weight (95% CI 0.003, 0.45kg; p=0.047) and gained 0.86mm more length (95% CI 0.05, 1.26mm; p=0.04) than did the controls over study period
Roy et al. (2007) Rural Bangladesh	• Normal and mildly malnourished children • 385 intervention • 385 control • Aged 6-18 months • Intervention done for 6 months • Both groups observed a further 6 months	• Weekly nutrition education for the first 3 months • Nutrition education once every 2 weeks for the remaining 3 months • Training of staff	• Complementary feeding practices • Weight	• Increased frequency of complementary feeding observed in the intervention group • Higher weight in intervention than control at end of observation (0.80 vs. 0.74kg; p=0.002) and after the end of observation period (1.81 vs. 1.78 kg; p=0.01)
Gulden et al. (2011) Rural Sichuan, China	• 250 infants education group • 245 infants in control groups • Followed for one year	• Recruiting, training and mobilizing local village committee leaders • Training of mothers • Nutrition education messages • Weekly growth monitoring and complementary feeding counselling to empower mothers and reduce malnutrition • Home visits every 3 months	• Nutrition knowledge (infant feeding practices) • Weight • Length	• Education group mothers showed higher nutrition knowledge and reported better infant feeding practices than the control group • Education group infants were heavier and longer than controls (weight for age: 1.17 vs. 1.02; p=0.004; height for age: 1.32 vs. 1.16; p=0.002)
Salehi et al. (2004) Iran	• Children aged 0-60 months • 485 intervention • 485 control • Study period: 12 months • Final data collected 3 months after the end of intervention	• Making sessions with influential members of the family and community • Recruitment and training of volunteer staff girls • Nutrition education • Demonstration of food preparation (methods of food preparation and cooking practices)	• Mothers Knowledge and attitudes on complementary feeding • Weight • Height • Mid Upper Arm Circumference (MUAC)	• An improvement in knowledge and attitudes in intervention mothers (p=0.05) compared to controls • Children in the intervention group gained 1.16 (SD 1.2) kg body weight, 0.002 (SD 1.8) m in height, 0.007 (SD 0.15) m in MUAC, 0.042 (SD 0.14) cm in waist circumference by the end of the study compared to the control group whose values were 0.42, 0.0167, 0.0017, 0.35, 0.30 and 0.014 respectively.

Table 2: Results

Characteristics of implementers	<ul style="list-style-type: none"> In all the seven studies, implementers were trained before commencing intervention. In [8], health-care providers and nutrition workers implemented the intervention, in [17] the implementers were graduate-level health assistants and [18] used community health workers. Four studies [10, 19, 20, 21] used community volunteers. Results ranged from highly significant [8, 17, 18] (P<0.001) to just significant [19] (p<0.05).
Training	<ul style="list-style-type: none"> In 4 studies [17, 18, 19, 20] researchers designed a training tool. The results ranged from highly significant [17] p<0.001 to just significant [19] p<0.05., 2 studies [8, 10] used an already existing training tool. Results from [8] were highly significant (95% CI, 0.03, 0.61 and P<0.001) compared to [11] (P= .004, P= 0.022 weight and height respectively) while 1 study [21] did not specify tool used. Training period ranged from half a day to two weeks.
Nutrition education	<ul style="list-style-type: none"> Education content included introduction of complementary foods at 6 months in [8, 17, 18, 19, 20] and 4 months in [10], giving children energy and protein-rich foods that were locally available. [17, 18, 19] encouraged use of separate cooking pot. All studies included personal hygiene and [19] added environmental hygiene. [8, 17, 18, 19] used cooking demonstrations. The results from [8, 17, 18] were highly significant compared to [19] P< 0.05.
Mode of intervention delivery	<ul style="list-style-type: none"> 5 studies [8, 10, 19, 20, 21] used home visiting, 1 study [8] added group meetings of care givers and community representatives once a month. 2 studies [17, 18] counselled mothers in groups twice a week for three months and weekly for 6 months respectively. Findings from [17, 18] were highly significant (P<0.001).
Study period	<ul style="list-style-type: none"> Ranged from 3 months [21] to one year [8, 10, 19, 20, 21], [18] was for six months. The results in [17] were highly significant (P<0.001).
Setting	<ul style="list-style-type: none"> All studies were conducted in developing countries and at community level. 6 studies were from Asia and one was from urban Africa
Outcome description	<ul style="list-style-type: none"> Increase in weight [18, 21], length [8], weight and height [10,20], weight, height and Mid Upper Arm Circumference [19] weight and reduced morbidity [17]

These findings show that community-based nutrition education is effective in improving the nutrition status of under-five children in developing countries. This is evidenced by the increase in weight^{18,21}, length,⁸ weight and height,^{10,20} weight, height and Mid Upper Arm Circumference¹⁹ weight and reduced morbidity.¹⁷

Discussion

Results from this review suggest that nutrition education provided to care-givers in their homes or community improves the nutrition status of under-five children in developing countries. To produce highly significant results, findings from this review suggest conducting group meetings of care givers and community leaders, providing education at frequent intervals for example twice a week and use of cooking demonstrations in addition to home visiting. Providing nutrition training to implementers prior to implementation of the study helped them to demonstrate higher levels of nutrition knowledge and counselling skills which they previously lacked²². This helped them to provide relevant nutritional education to care givers hence significant results were produced. However, this review has found varied results regarding the effects of the intervention on the nutrition status of children. The possible reasons for the difference are: different intervention strategy and intensity, difference in age of the children at enrolment, pre-existing children's growth and nutritional status. This was also previously reported in⁷ where they looked at effectiveness of educational interventions for improving complementary feeding practices. The difference with this review is the setting in which the implementation was conducted. In⁷ the interventions were delivered in various settings including the hospital while this review concentrated on educational interventions delivered in the community or home. In addition, implementers for studies in this systematic review had different characteristics. In 8 studies health-care providers and nutrition workers implemented the intervention. In 17 studies the implementers were graduate-level health assistants,¹⁸ used community health workers 21 used mentor mothers and 10,^{19,20} had trained community members and/ or peer counsellors. Health care providers, nutrition workers, graduate-level health assistants and community health workers may have had good understanding of nutrition as a subject and experience in community teaching

compared to community members and peer counsellors. These implementers were able to disseminate information to the intervention group in a simple way hence results of their studies were highly significant. Comparing children of different nutritional status would not bring the same effect of the intervention because malnourished children usually present with other medical conditions due to reduced immunity and as such, their appetite is reduced and they would not eat well compared to normal children. Even when the malnourished child eats well, the nutrients will be used to treat or rehabilitate the condition first and then later for catch up growth²³. Having children of different nutritional status in the same study meant that the nutrition education was the same yet they had different nutritional needs. This might mean that the care-givers followed the advice that they were given, only that it did not suit their children's needs. In this case the nutrition status of malnourished children would not improve at the same rate as that of normal children.

Implication for clinical practice

Children of different nutritional status should not be given the same nutrition information because they have different nutritional needs. Therefore, the education content should aim to target the audience. The education can also be more or less effective depending on the circumstance. With shortage of health care workers, utilising trained local people to provide nutrition counselling has shown to be effective. Instead of just asking any volunteer to provide nutrition education, it is necessary to consider care givers whose children are well nourished but living under the same conditions to act as mentors to other community members. By doing this it will be easy for the care-givers to change their behaviour since they will be encouraged by people whom they know and they will be able to understand that it is possible to have well-nourished children even in poor conditions.

Limitations

This review included studies published in peer-reviewed journals only. Studies published in non-English language were not included and as such only seven articles were included, of which six are from Asia and one from Africa. This has brought bias as the small number of studies and countries does not provide a good representation of all developing countries. There may be a lot of unpublished work which has not been included in this review and this has contributed to publication bias.

Further Research

Further research conducted in other developing countries would be of great help in concluding that community-based nutrition education is effective in improving the nutrition status of under-five children. The research should consider all the three nutritional indices which are: weight- for- age, weight- for-height and height- for- age. It should also be conducted on a large scale to allow in-depth analysis of the findings. Data of malnourished children should be analysed differently so as to understand the effects of the intervention on malnourished children²².

Conclusion

Evidence from the identified studies in this review suggests that community-based nutrition education improves the nutrition status of under-five children in developing countries.

Conflicts of interest

There are no financial and non-financial conflicts of interest in this review

Authors' Contributions

Maureen D. Juma Majamanda developed a protocol for this review, conducted the search strategy, appraisal of studies, data extraction and data synthesis under the supervision of Judith Carrier. Tiwonge Mbeya Munkhondia conducted the appraisal of studies. All contributed to the editing of this manuscript.

Acknowledgements

I would like to thank Judith Carrier for her guidance and support. This work was supported by funding from the Government of Malawi through University of Malawi. The funding was granted to the first author as part of Masters studies.

References

1. Imdad A, Yakoob MY and Bhutta ZA. Impact of maternal education about complementary feeding and provision of complementary foods on child growth in developing countries. BMC Public Health. 2011;11 (Suppl 3): S25 <http://dx.doi.org/10.1186/1471-2458-11-S3-S25>
2. Shrimpton R, Victoria CG, de Onis M, Lima RC, Blossner M, Clugston G. Worldwide timing of growth faltering: Implications for nutritional interventions. Journal of the American Academy of Paediatrics. 2001; 107 (5) e75.
3. World Health Organisation. Complementary Feeding. 2011; http://www.who.int/nutrition/topics/complementary_feeding/en/index.html Accessed 5/06/2011
4. Brown KH; Duggan C; Watkins J; Walker WA. Chapter 36. Complementary feeding. In: Nutrition in Pediatrics: Basic Science & Clinical Applications (4th edn.) 2008; BC Decker Inc. 411-6.
5. Duijts L, Jaddoe V.W.V, Hofman A, Moll HA. Prolonged and exclusive breastfeeding reduces the risk of infectious diseases in infancy. Paediatrics. 2010; 126(1) e18-25.
6. World Health Organisation. Report of Informal Meeting to Review and Develop Indicators for Complementary Feeding. 2002; Washington D.C
7. Shi L and Zhang J. Recent evidence of the effectiveness of educational interventions for improving complementary feeding practices in developing countries. Journal of Tropical Paediatrics. 2010; 57(2) 91-98.
8. Bhandari N, Mazumder S, Bahl R, Martinez J, Black RE and Bhan MK. An educational intervention to promote appropriate complementary feeding practices and physical growth in infants and young children in rural Haryana, India. The Journal of Nutrition. 2004; 134: 2342-8.
9. Dewey KG and Brown KH. Update on technical issues concerning complementary feeding of young children in developing countries and implications for intervention programs. Food and Nutrition Bulletin. 2003; 24 (1) 5-28.
10. Guldan GS, Fan HC, Ma X, Ni ZZ, Xiang X and Tang MZ. Culturally Appropriate Nutrition Education Improves Infant Feeding and Growth in Rural Sichuan, China. Journal of Nutrition. 2000; 130: 1204-1211.
11. Vorster HH and Kruger A (2007) Poverty, malnutrition, under-development and cardiovascular disease: A South African perspective. Cardiovascular Journal of Africa. 18(5) 321-324.
12. Task Force on Health Systems Research. Informed choices for attaining the millenium development goals: Towards an international cooperative agenda for health systems research. Lancet. 2004; 364: 997-1003 [http://dx.doi.org/10.1016/S0140-6736\(04\) 17026-8](http://dx.doi.org/10.1016/S0140-6736(04) 17026-8)
13. Chen L, Evans T, Anand S, Boufford JI, Brown H, Chowdhury

- M, Cueto M, Dare L, Dussault G, Elzing G, Fee E, Habte D, Hanvoravongchai P, Jacobs M, Kurowski C, Michael S, Pablos-Mendez A, Sewankambo N, Solimano G, Stiwell B, Waal A, Wibulpolprasert S. Human Resources for Health: Overcoming the Crisis. *The Lancet*. 2004; 364 (9449) 1984-1990.
14. Pelletier DL and Frongillo EA. Changes in child survival are strongly associated with changes in malnutrition in developing countries. *Journal of Nutrition*. 2003; 133: 107-119.
15. Penny ME, Creed-Kanashiro HM, Roberts RC, Narro MR, Caulifield LE and Black RE. Effectiveness of an educational intervention delivered through the health services to improve nutrition in young children: A cluster randomised controlled trial. *Lancet*. 2005; 365: 1863-1872.
16. Kilaru A, Griffiths PL, Ganapathy S and Ghosh S. Community-based nutrition education for improving infant growth in rural Karnataka. *Indian Paediatrics*. 2005; 42: 425-32.
17. Roy SK, Jolly SP, Fuchs GJ, Mahmud Z, Gulshan A, Islam S, Shafique S, Akter SS and Chakraborty B. Intensive nutrition education with or without supplementary feeding improves the nutritional status of moderately- malnourished children in Bangladesh. *Journal for Health Population and Nutrition*. 2005; 23(4) 320-330.
18. Roy SK, Jolly SP, Shafique S, Fuchs GJ, Mahmud Z, Chakraborty B and Roy S. Prevention of malnutrition among young children in rural Bangladesh by a food-health-care educational intervention: A randomised, Controlled Trial. *Food and Nutrition Bulletin*. 2007; 28(4) 375-383.
19. Salehi M, Kimiagar SM, Shahbazi M, Mehrabi Y and Kolahi AA. Assessing the impact of nutrition education on growth indices of Iranian nomadic children: an application of a modified beliefs, attitudes, subjective- norms and enabling-factors model. *British Journal of Nutrition*. 2004; 91: 779-787. <http://dx.doi.org/10.1079/BJN20041099>
20. Shi L and Zhang J, Wang Y, Caulifield LE and Guyer B. Effectiveness of an educational intervention on complementary feeding practices and growth in rural china: A cluster randomised controlled trial. *Public Health Nutrition*. 2009; 13 (4) 556-565.
21. Le Roux IM, Le Roux K, Comulada WS, Greco EM, Desmond KA, Mbewu N and Rotheram-Borus MJ. Home visits by neighbourhood mentor mothers provide timely recovery from childhood malnutrition in South Africa: Results from a Randomised Controlled Trial. *Nutrition Journal*. 2010; 9:56 <http://dx.doi.org/10.1186/1475-2891-9-56>.
22. Pelto G.H., Santos I, Goncalves H, Victoria C, Martines J, Habicht J.P. Nutrition Counselling training changes Physician behaviour and improves care giver knowledge acquisition. *Journal of Nutrition*. 2004; 134 (2): 357-362.
23. Ashworth A and Ferguson E. Dietary Counselling in the Management of Moderately Malnourished Children: WHO Technical Background Paper. 2008; http://www.who.int/nutrition/publications/moderate_malnutrition/MM_Background_paper3.pdf Accessed 28/08/2011.