Original Research Article

Effect of nutrition education intervention on undernutrition among under five children in urban and rural areas of Bhopal district, Madhya Pradesh

Shailendra Meena¹, Pratibha Meena²*

¹Department of Community Medicine, ²Department of Pathology, L N Medical College and Research centre, Bhopal, Madhya Pradesh, India

Received: 06 August 2018
Revised: 13 September 2018
Accepted: 14 September 2018

*Correspondence:
Dr. Pratibha Meena,
E-mail: pratibhameena1@gmail.com

ABSTRACT

Background: Nutrition education is defined as instruction or training intended to lead to acquired nutrition-related knowledge and/or nutrition-related skills and be provided in individual. It is also demonstrably capable of improving dietary behaviour and nutrition status on its own.

Methods: A prospective observational study was conducted in the urban and rural ICDS projects of Bhopal district, Madhya Pradesh from July 2014 to June 2015. Three types of instruments were used: NIPCCD Suposhan Guide, a structured questionnaire and anthropometric measurements including weight, height and MUAC. Data was entered into Microsoft Excel and was analyzed by using EPI Info version 7.

Results: As per Z score 7.9% children had normal weight (Z score above -1SD), 31.7% had mild underweight (Z score between -1SD to -2SD), 40.7% had moderate underweight (Z score between -2SD to -3SD) and 19.6% had severe underweight (Z score below -3SD). Reduction in moderate underweight was from 39.2% to 33.9% and in severe underweight it was from 19.3% to 15.2% in urban area. In the rural area reduction in moderate underweight was from 44.1% to 36.6% and in the severe underweight group it was from 20.4% to 9.7%.

Conclusions: In our nutrition education intervention we found that a well planned, short, simple, focused and based on locally available food items delivered with little empathy can do a lot even in weaker sections of the society.

Keywords: Nutrition education, Breast-feeding, Dietary intake, Undernutrition, Children under 5 year

INTRODUCTION

Nutrition education is defined as instruction or training intended to lead to acquired nutrition-related knowledge and/or nutrition-related skills and be provided in individual.¹ In order to be well-nourished, individuals need access to sufficient, safe and good quality food. But focussing solely on food security is unlikely to solve global malnutrition: improvements in food production alone do not necessarily translate to improvements in nutritional status. People need to know what constitutes a healthy diet and how to make good food choices.

Nutrition education is also coming into the limelight. It is now acknowledged as an essential catalyst for nutrition impact in food security, community nutrition and health interventions. It is also demonstrably capable of improving dietary behaviour and nutrition status on its own. Moreover it has long-term effects on the independent actions of parents and through them on the health of their children. At the same time it is low-cost, practicable and sustainable.²

Scarcity of suitable foods, lack of purchasing power of the family as well as traditional beliefs and taboos about
what the baby should eat, often lead to an insufficient balanced diet, resulting in malnutrition. Undernutrition is a global public health problem considered to be a principal cause of ill-health and premature morbidities. Undernutrition continues to be a global burden as reflected in World health Statistics 2016 which revealed that wasting affected 50 million children under 5 years of age (around 7%) globally in 2015 and the highest prevalence of wasting was observed in the WHO South-East Asia Region (13.5%, or 24 million children). Major portion of this burden belongs to India as reflected in National Family health survey-IV (2015-16) report which shows that 38.4% children under 5 years of age are stunted, 21% are wasted, 7.5% are severely wasted and 35.7% are under weight. Within India Madhya Pradesh has the worst case scenario as 42% children under 5 years of age are stunted, 25.8% are wasted, 9.2% are severely wasted and 42.8% are under weight as shown in the NFHS-4 report for Madhya Pradesh.

Prolonged early childhood nutritional deficiencies lead to inadequate growth, which in turn impairs brain development, creates academic difficulties and can lead to a lifetime of diminished earning capacity and an elevated risk of non-communicable diseases. Longitudinal studies indicate that if nutritional deficiencies are not treated by 2 years of age, the intellectual, health and human capital consequences are likely to be irreversible.

A lack of food is not the sole cause of malnutrition. Lack of awareness and knowledge about feeding amount, frequency, type of food, etc., contributes significantly to poor nutritional status among children even in families where adults meet their daily requirements. Interventions have shown that it is possible to improve infant growth and feeding practices through action-oriented messages.

Nutrition education is such an intervention that provides people with the knowledge, skills and motivation to make wise dietary and lifestyle choices, building thus a strong basis for a healthy and active life. Whether food supplies are scarce or abundant, it is essential that people know how best to use their resources to access a variety of safe and good quality foods; to ensure nutritional wellbeing. To be food secure and adequately nourished, households need sufficient resources to produce and/or purchase adequate food. In addition, they need the understanding of what constitutes an appropriate diet for health, as well as the skills and motivation to make sound choices on family care and feeding practices.

Food and nutrition education thus play a vital role in promoting food security, as it is especially important for poor households to make optimal use of local foods and practice healthy eating patterns.

Probably the most comprehensive Indian studies of infant-focused nutrition education interventions have been conducted by Bhandari and colleagues. The findings from these studies suggest that nutrition education messages can result in a longer duration of exclusive breastfeeding, decreased diarrheal morbidity, and increased energy intake.

Limited evidence exist that nutrition education and counselling delivered by trained community-based volunteers or health workers can significantly improve CF practices adopted by the mothers and growth of their infants in different settings.

In India, very few studies demonstrate the effectiveness of educational interventions delivered either through trained community health workers or through health workers from the existing government system on improved CF practices and growth of infant. Present Study was conducted to find out the effectiveness of a properly planned and executed nutrition education intervention on under nutrition among under five children in urban and rural areas of Bhopal district, Madhya Pradesh.

**METHODS**

A prospective observational study was conducted in the urban and rural ICDS projects of Bhopal district, Madhya Pradesh. The duration of the study was twelve months from July 2014 to June 2015. The target population in the urban setting was the under-five children population attending anganwadi centres while in the rural setting it was the under-five children population attending anganwadi centres of rural ICDS block of Bhopal district.

Sampling frame consisted of all under-five children attending anganwadis in the above mentioned areas. Sampling unit was an under-five child.

**Sampling method and sample size**

The minimum estimated sample size was calculated as 296, using the standard formula\( (n = \frac{Z^2pq}{d^2}) \) where \( P \) is the prevalence of undernutrition and \( q \) is the complement of \( p \). Considering the prevalence of stunting among under-five children as 26% as per NIN study (2010) and assuming an alpha error of 0.05 and relative precision of 5% (d=relative precision). To obtain the desired sample size, two ICDS project were selected from 10 functional ICDS projects of Bhopal district. From the above selected urban and rural ICDS project, 5 Anganwadi centres from each project were selected. Purposively all under-five children who were suffering from undernutrition and children got malnutrition during study period were taken as study subjects to get the desired sample size of 296. At the end we got 265 such under-five children whose mothers were given consent and participated in the study.

**Inclusion criteria**

All under five children, who were undernourished and all those children who developed malnutrition during the study period were included as study subjects. These...
children were enrolled from the selected anganwadi centres and included only when mothers were willing to participate in the study.

**Exclusion criteria**

Children whose mothers are not willing to participate and healthy children attending anganwadi centre.

**Study tools**

Three types of instruments were used: NIPCCD Suposhan Guide for anganwadi workers, a structured questionnaire and anthropometric measurements including weight, height and MUAC.

**Data source and method of data collection**

Data collection was started after obtaining clearance from ethical committee and respective authorities of ICDS scheme in Bhopal district. Primary information regarding undernourished children was obtained by reviewing the growth monitoring record, available at anganwadi centres. Weight was recorded while the subjects were minimally clothed using a digital weighing scale for children less than two years of age and by Salter’s weighing scale for 2 to 5 year old children nearest to 100 gram. Height and length were measured with bare foot using measuring board for babies and toddlers with 0.10 cm accuracy and by using stadiometer nearest to 1 cm and MUAC was taken by Shakir’s tape available at AWCs.

**Nutrition education intervention**

It was implemented by using audio-visual aids like short films on Laptop, flipchart and special guide called “Suposhan Kunji” developed by NIPCCD through group meetings and one to one in-depth interviews organized either at AWCs or at child residence.

The whole study was implemented in two phases first in the urban area then in the rural area. In each phase three visits were made. During the first visit growth monitoring records of last one year was assessed to find out undernourished children. Second visit was a pre-planned visit to implement nutritional education intervention through group meetings with the mothers of children identified during the previous visit. In the third and final visit that was made after the 3 months of second visit, weight for age was recollected to find out the effect of nutrition education intervention. Anthropometric indices including stunting, underweight, and wasting were respectively defined as height for age, weight for age, and weight for height at least 2 standard deviations below the mean for children aged 0-5 according to reference growth charts based on WHO child growth standards. 13

**Data analysis**

Data was managed by entering it into MS office and analysed by using Epi-Info software for windows, Version 7. Centre for Disease Control, Atlanta, USA. Chi-Square, Unpaired & Paired t test and McNemar Bowker test was used to see significance and association. A p value <0.05 is considered as statistically significant.

**RESULTS**

There were total 10 AWC visited, five each from one urban and one rural ICDS block of Bhopal district. There were total 1230 children enrolled in anganwadi centres under study. Urban anganwadis had more no. of children as compare to rural anganwadis. The ratio of boys and girls was found to be equal among enrolled children and same trend was observed in rural and urban area (Table 1). As per WHO child growth standards 2009 for weight for age, the prevalence of undernutrition was obtained in terms of Z scores. As per Z score 7.9% children had normal weight (Z score above -1SD), 31.7% had mild undernutrition (Z score between -1SD to -2SD), 40.7% had moderate undernutrition (Z score between -2SD to -3SD) and 19.6% had severe undernutrition (Z score below -3SD) (Table 2).

Table 1: Residence and gender wise distribution of children enrolled among AWCs under study.

| Gender | Urban area (n=659) | Rural area (n=571) | Total children (n=1230) |
|--------|--------------------|--------------------|-------------------------|
|        | n | %    | n | %    | n | %    |
| Male   | 335 | 50.83 | 281 | 49.21 | 616 | 50.08 |
| Female | 324 | 49.17 | 290 | 50.79 | 614 | 49.92 |

Table 2: Magnitude of undernutrition as per WHO child growth standards (weight for age) among study subjects.

| Undernutrition grade | Urban% (n=172) | Rural% (n=93) | Total% (n=265) | Chi-Square | P value |
|----------------------|----------------|--------------|----------------|------------|---------|
| Above -1 SD          | 10.4           | 3.2          | 7.9            |            |         |
| Between -1 SD to -2 SD | 31.3           | 32.2         | 31.7           | 4.44       | 0.217   |
| Between -2 SD to -3 SD | 38.9           | 44           | 40.7           |            |         |
| Below -3SD           | 19.2           | 20.4         | 19.6           |            |         |
Table 3: Socio-demographic characteristics of study population.

| Family and SES | Urban (%) (n=172) | Rural (%) (n=93) | Total (%) (n=265) | Chi-Square | P value |
|----------------|-------------------|------------------|-------------------|------------|--------|
| Family type    |                   |                  |                   |            |        |
| Nuclear        | 79.6              | 50.5             | 69.4              | 24.1       | <0.001 |
| Joint          | 20.4              | 49.5             | 30.6              |            |        |
| SES of family  |                   |                  |                   |            |        |
| Class I        | 0.5               | 2.1              | 1.1               |            |        |
| Class II       | 8.7               | 10.7             | 9.5               |            |        |
| Class III      | 29.6              | 28               | 29                |            |        |
| Class IV       | 51.1              | 51.7             | 51.4              |            |        |
| Class V        | 9.9               | 7.5              | 9                 |            |        |
| Child characteristics |          |                  |                   |            |        |
| Age in years (Mean: SD) | 3.65 (1.022) | 3.74 (1.132) | 3.69 (1.063) | t=0.732 | 0.465 |
| Gender         |                   |                  |                   |            |        |
| Male           | 48.2              | 45.1             | 47.2              | 0.232      | 0.630  |
| Female         | 51.8              | 54.9             | 52.8              |            |        |
| No. of living children |          |                  |                   |            |        |
| 1              | 20.9              | 10.7             | 17.4              |            |        |
| 2              | 47                | 35.5             | 43                |            |        |
| 3              | 19.9              | 30.1             | 23.4              |            |        |
| 4              | 7.6               | 16.2             | 10.5              |            |        |
| 5              | 1.7               | 3.2              | 2.3               |            |        |
| 6              | 2.9               | 4.3              | 3.4               |            |        |
| Birth order    |                   |                  |                   |            |        |
| 1              | 38.9              | 36.5             | 38.1              |            |        |
| 2              | 35.5              | 35.4             | 35.5              |            |        |
| 3              | 17.5              | 20.5             | 18.5              |            |        |
| 4              | 5.2               | 6.4              | 5.6               |            |        |
| 5              | 2.9               | 1.2              | 2.3               |            |        |
| Place of delivery |               |                  |                   |            |        |
| Home           | 27.9              | 23.66            | 26.41             |            |        |
| Institutional delivery | 72.1    | 76.34            | 73.59             |            |        |
| Time of commencing breast feeding |          |                  |                   |            |        |
| 1. < 1 hr      | 48.84             | 26.88            | 41.13             |            |        |
| 2. 1-4 hr      | 30.23             | 56.99            | 39.62             |            |        |
| 3. 4-24 hrs    | 11.63             | 8.60             | 10.57             |            |        |
| 4. > 24 hrs    | 9.30              | 7.53             | 8.68              |            |        |
| Duration of EBF |                   |                  |                   |            |        |
| 1. < 6 month   | 11.63             | 13.98            | 12.08             |            |        |
| 2. 6 month     | 54.07             | 55.91            | 54.72             |            |        |
| 3. 1 year      | 25.58             | 11.83            | 21.13             |            |        |
| 4. > 1 year    | 5.81              | 8.60             | 6.79              |            |        |
| 5. Never       | 2.91              | 9.68             | 5.28              |            |        |
| Complementary feeding Start at age of |          |                  |                   |            |        |
| 1. Since birth | 5.81              | 5.38             | 5.66              |            |        |
| 2. Before 6 month | 2.91     | 17.20            | 7.92              |            |        |
| 3. At 6 month  | 50.00             | 51.61            | 50.57             |            |        |
| 4. At 1 year   | 20.93             | 11.83            | 17.74             |            |        |
| 5. After 1 year | 20.35             | 13.98            | 18.11             |            |        |
| Mother's characteristics |          |                  |                   |            |        |
| Education status |                   |                  |                   |            |        |
| 1. Primary     | 35.47             | 21.51            | 30.57             |            |        |
| 2. Middle      | 24.42             | 18.28            | 22.26             |            |        |
| 3. High school | 6.98              | 8.60             | 7.55              |            |        |
| 4. 12th        | 5.81              | 5.38             | 5.66              |            |        |
| 5. Graduate    | 1.16              | 1.08             | 1.13              |            |        |
| 6. illiterate  | 26.16             | 45.16            | 32.83             |            |        |
| Occupation status |                 |                  |                   |            |        |
| 1. Unemployed  | 65.70             | 74.19            | 68.68             |            |        |
| 2. labourer    | 30.81             | 20.43            | 27.17             |            |        |
| 3. Clerical/shopkeeper | 2.33 | 3.23            | 2.64              |            |        |
| 4. Semiskilled work | 1.16     | 2.15             | 1.51              |            |        |
| Antenatal care; No. of ANC visits |          |                  |                   |            |        |
| 1. 1           | 6.40              | 4.30             | 5.66              |            |        |
| 2. 2           | 36.63             | 54.84            | 43.02             |            |        |
| 3. 3           | 43.60             | 9.68             | 31.70             |            |        |
| 4. 4           | 4.07              | 2.15             | 3.40              |            |        |
| 5. >4          | 4.65              | 2.15             | 3.77              |            |        |
| 6. No ANC visits | 4.65               | 26.88            | 12.53             |            |        |
Maximum numbers of study subjects were belong to nuclear family (69.4%) and upper lower SES (51.4%). Mean age of study subjects was 3.69 year (SD 1.063). 73.59% were delivered in health institutions & 41.13% received breast feed within 1hr of birth. EBF was practiced in 54.72% study subjects. 50.57% received complementary feeding from the age of 6 months. 32.83% mothers were illiterate and 68.68 were unemployed. 80.38% mothers did not receive 4 ANC visits during antenatal period of study subjects.

We found significant change in weight of children post Nutrition education intervention (Table 4). Reduction in moderate underweight was from 39.2% to 33.9% and in severe underweight it was from 19.3% to 15.2% in urban area (Table 5). In the rural area reduction in moderate underweight was from 44.1% to 36.6% and in the severe underweight group it was from 20.4% to 9.7% (Table 6). Overall reduction was from 40.9% to 34.8% and from 19.7% to 13.3% in moderate & severe group respectively (Table 7).

**DISCUSSION**

Our nutrition education intervention was successful in reducing undernutrition in both urban and rural areas. As mentioned in the Table 5, 6 and 7, reductions in moderate underweight was from 39.2% to 33.9% and in severe underweight it was from 19.3% to 15.2% in urban area. In the rural area reduction in moderate underweight was from 44.1% to 36.6% and in the severe underweight group it was from 20.4% to 9.7%. Overall reduction was from 40.9% to 34.8% and from 19.7% to 13.3% respectively. Results suggest that poor households within their given resources without food provision can improve

### Table 4: Pre and Post intervention change in weight for age of study participants.

| Factor                      | Pre intervention status Mean (SD) | Post intervention status Mean (SD) | P value |
|-----------------------------|----------------------------------|-----------------------------------|---------|
| Weight for age (rural area) | 10.99 (2.11)                     | 11.69 (2.10)                      | <0.001  |
| Weight for age (urban area) | 11.00 (2.11)                     | 11.47 (2.08)                      | <0.001  |
| Weight for age (overall)    | 10.99 (2.10)                     | 11.58 (2.09)                      | <0.001  |

Paired samples ‘t’ test applied

### Table 5: Effect of nutrition education intervention on the magnitude of malnutrition among study subjects in urban area.

| Nutritional status         | Z score | Before intervention status Frequency (%) | After intervention status Frequency (%) |
|----------------------------|---------|------------------------------------------|----------------------------------------|
| Normal                     | > -1 SD | 18 (10.5)                                | 31 (18.1)                              |
| Mild underweight           | -1 SD to -2 SD | 54 (31)                              | 56 (32.7)                              |
| Moderately underweight     | >-2 SD to -3 SD | 67 (39.2)                            | 58 (33.9)                              |
| Severely underweight       | < -3 SD | 33 (19.3)                                | 26 (15.2)                              |

McNemar Bowker test applied. No. of valid cases=172, p=0.001

### Table 6: Effect of nutrition education intervention on the magnitude of malnutrition among study subjects in rural area.

| Nutritional status         | Z score | Before intervention status Frequency (%) | After intervention status Frequency (%) |
|----------------------------|---------|------------------------------------------|----------------------------------------|
| Normal                     | > -1 SD | 3 (3.2)                                  | 14 (15.1)                              |
| Mild underweight           | -1 SD to -2 SD | 30 (32.3)                             | 36 (38.7)                              |
| Moderately underweight     | >-2 SD to -3 SD | 41 (44.1)                            | 34 (36.6)                              |
| Severely underweight       | < -3 SD | 19 (20.4)                                | 9 (9.7)                                 |

McNemar Bowker test applied. No. of valid cases=93, p<0.0001

### Table 7: Overall effect of nutrition education intervention on the magnitude of malnutrition among study subjects.

| Nutritional status         | Z score | Before intervention status Frequency (%) | After intervention status Frequency (%) |
|----------------------------|---------|------------------------------------------|----------------------------------------|
| Normal                     | > -1 SD | 21 (8)                                   | 45 (17)                                |
| Mild underweight           | -1 SD to -2 SD | 84 (31.4)                             | 93 (34.8)                              |
| Moderately underweight     | >-2 SD to -3 SD | 108 (40.9)                            | 92 (34.8)                              |
| Severely underweight       | < -3 SD | 52 (19.7)                                | 35 (13.3)                              |

McNemar Bowker test applied. No. of valid cases=265, p<0.0001
growth if specific nutrition education based on personal dietary assessment is provided to them. The increase in weight may be attributed to the advice given leading to change in the feeding habits and better hygienic practices followed. Change in weight for age is found highly statistically significant in urban, rural area and among overall study subjects (p<0.001). Similar findings were reported by Brown et al in their study in rural Bangladesh, Guldan et al in Rural Sichuan, China, Walsh et al in Bloemfontein, South Africa, Salehi et al in Iran and by Kilaru et al in rural Karnataka, Bankwar et al in Bhopal, Madhya Pradesh.7,9,14-18

CONCLUSION
As far as our nutrition education intervention we found that a well planned, short, simple, focused and based on locally available food items delivered with little empathy can do a lot even in weaker sections of the society. We found a significant improvement in the nutritional status of “at risk” children with in three month after intervention.

Recommendations
If appropriate messages are marketed through appropriate channels, changes in infant-feeding practices resulting in improved infant growth are possible, despite impoverished conditions and are also cost-effective. Despite their poverty, families should be encouraged to feed hygienic and cheap energy and protein enriched foods with one fruit daily as expensive practices are not likely to achieve sustained compliance. Teaching families to increase feeding frequency, increase dietary diversity, modify household food as well as raising awareness on existing food taboos for young children (e.g., bananas and eggs), could reduce the incidence of growth faltering and subsequent malnutrition.

ACKNOWLEDGEMENTS
We are thankful to all the under five children registered at AWCs under study and their parents who form the backbone of this study and without their support and co-operation this study could not be completed. We are also thankful to DPM and CDPOs of ICDS scheme of Bhopal district for their constant support. Our thanks and regards are extended to the supervisors, anganwadi workers and anganwadi helpers of ICDS scheme of Bhopal district who graciously extend their full cooperation during this study.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES
1. McNulty J. Challenges and issues in nutrition education. Rome: Nutrition Education and Consumer Awareness Group, Food and Agriculture Organization of the United Nations. Available at: www.fao.org/ag/humannutrition/nutritioneducation/en. Accessed 5 July 2017.
2. Nutrition Education FAO concept note 2011. Why Nutrition Education Matters: Nutrition Education and Consumer Awareness Group, Food and Agriculture Organization of the United Nations. Available at http://www.fao.org/fileadmin/user_upload/red-icean/docs/Nutrition%20Education_FAO_Concept%20Note.pdf. Accessed 5 July 2017.
3. Park K. In Park’s Textbook of preventive and social medicine. 23rd edition 2015. M/s Banarasidas Bhanot Publishers, Jabalpur (MP) India: 2015: 640-653.
4. Tigga P, Sen J, Mondal N. Association of some socio-economic and socio- Demographic variables with wasting among pre- school children of North Bengal, India. Ethiop J Health Sci. 2015;25(1):63-72.
5. World health statistics 2014. WHO Press, World Health Organization, 20 Avenue Appia, 1211 Geneva 27, Switzerland. Available at apps.who.int/iris/bitstream/10665/112738/1/9789240692671_eng.pdf. Accessed 5 July 2016.
6. International Institute for Population Sciences (IIPS) and ICF. 2017. National Family Health Survey (NFHS-4), 2015-16: India. Mumbai: IIPS. Available at: http://rchiips.org/NFHS/NFHS-4Reports/India.pdf. Accessed on 5 July 2017.
7. International Institute for Population Sciences (IIPS) and ICF. 2017. National Family Health Survey (NFHS-4), 2015-16: India. Mumbai: IIPS. Available at http://rchiips.org/NFHS/pdf/NFHS4/MP_FactSheet.pdf. Accessed on 5 July 2017.
8. Fabrizio Cecilia S, Marti van L, Gretel P. Identifying determinants of effective complementary feeding behaviour change interventions in developing countries. Maternal Child Nutr. 2014;10:575–92.
9. Kilaru A, Griffiths PL, Ganapathy S, Ghosh S. Community-based Nutrition Education for Improving Infant Growth in Rural Karnataka. Indian Pediatr. 2005;42:425–32.
10. Nutrition Education in Primary Schools. Vol. 1: The Reader. Nutrition Division. 2006. Food and Agriculture Organization of United Nations. Rome. Itly. Available at http://www.fao.org/publications/card/en/c/9f41f45e-9c03-5d77-8945-a9e9894840ab. Accessed on 5 July 2017.
11. 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;131:1879-80.
12. Garg A, Chadha R Community-Based Nutrition Counseling Improves Complementary Feeding Practices and Growth of Infants (6-12 Months) in Rural Uttar Pradesh, India. J Hum Nutr Food Sci. 2016;4(5):1099.
13. WHO child growth standards and the identification of severe acute malnutrition in infants and children. A Joint Statement by the World Health Organization and the United Nations Children’s Fund. World Health Organization and UNICEF 2009. WHO Press, World Health Organization, 20 Avenue Appia, 1211 Geneva 27, Switzerland. Available at http://www.who.int/childgrowth/standards. Accessed 5 July 2015.

14. Brown LV, Zeitlin MF, Peterson KE, Chowdhuri AMR, Rogers BR, Weld LH, et al. Evaluation of the impact of weaning food messages on infant feeding practices and child growth in rural Bangladesh. Am J Nutr. 1992;56:994-1003.

15. Guldan GS, Heng-Chun F, Xiao M, Zong-Zan N, Xia X, Ming-Zhen T. Culturally Appropriate Nutrition Education Improves Infant Feeding and Growth in Rural Sichuan, China. J Nutr. 2000;130:1204–11.

16. Walsh CM, Dannhauser A, Joubert G. The impact of a nutrition education programme on the anthropometric nutritional status of low-income children in South Africa. Pub Health Nutr. 2002;5(1):3-9.

17. Mousa S, Kimiagar SM, Shahbazi M, Mehrabi Y and Kolahi A. A. 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 J Nutr. 2004;91:779–87.

18. Jamra V, Bankwar V. Effect of Short Term Community Based Intervention to Reduce the Prevalence of Under Nutrition in Under-five Children. Natl J Community Med. 2013;4(3):413-7.

Cite this article as: Meena S, Meena P. Effect of nutrition education intervention on undernutrition among under five children in urban and rural areas of Bhopal district, Madhya Pradesh. Int J Community Med Public Health 2018;5:4536-42.