International Journal of Community Medicine and Public Health
Rastogi P et al. Int J Community Med Public Health. 2023 Oct;10(10):3721-3727
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: https://dx.doi.org/10.18203/2394-6040.ijcmph20233105

Original Research Article

Improving dietary diversity among women of reproductive age group (15-49 years) through community-based activities across four districts of India

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Received: 13 July 2023
Revised: 07 September 2023
Accepted: 08 September 2023

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ABSTRACT

Background: Globally, more than two billion people have micronutrient deficiencies (MiNDs), with approximately half of them residing in India. Nutri-gardens offer the opportunity to diversify a family's diet. The objective of the present study is to assess the effectiveness of growing nutri-gardens in improving the dietary diversity of women and girls compared to no nutri-gardens.
Methods: It was a post-test-only comparison with a control group. The intervention and control groups were similar in all aspects except that the intervention group received seeds for growing a nutri-garden. A random sample of 100 adolescent girls (15-19 years) and women per district in the intervention and control groups was drawn from four districts. A campaign was launched to spread awareness of nutri-gardens, a balanced diet, and food groups. The data were collected using a pre-designed semi-structured questionnaire that included a standardized diet quality questionnaire.
Results: In total, there were 804 women and adolescent girls. Out of 804, 457 grew (the intervention group) and 347 did not grow nutri-garden (the control group). Women and girls who grew nutri-gardens had 0.38 times higher odds of having higher dietary diversity (≥5) than women and girls who did not. Similarly, women and girls who are educated have higher odds of having a higher dietary diversity compared to illiterates.
Conclusions: The study concludes that establishing nutri-garden along with nutrition education improved dietary diversity among girls and women in the intervention areas. Nutri-garden is a low-cost sustainable approach to providing fruits and vegetables daily and meeting their daily requirements.

Keywords: Diet, Dietary diversity, Food, Fruit, Nutritional status, Vegetables

INTRODUCTION

India faces a triple burden of malnutrition, defined as the coexistence of undernutrition, overnutrition, and micronutrient deficiencies, which is a significant threat to health in developing countries, particularly India.[1] India remains the single most significant contributor to the global prevalence of undernutrition.[2] Globally, more than two billion people have micronutrient deficiencies (MiNDs), with approximately half of them residing in India.[3] Due to serious deficiencies in a variety of vital micronutrients, India is currently in high danger of "hidden hunger".[3] Evidence suggests that maternal malnutrition is significantly associated with maternal morbidity, preterm deliveries (babies born before 37 weeks), and small-for-gestational-age babies, and intra-uterine growth restriction.[4,5] According to the National Family Health Survey-5 (NFHS-5) data, 18.7% of women

in the reproductive age group are underweight (BMI<18.5 kg/m^2), and 57.2% are anemic (<12.0 g/dl).[6] In low and middle-income countries, the diet of women suffers from macro and micronutrient imbalance and is plant-based; therefore, they are deficient in essential micronutrients such as iron, zinc, vitamin B_{12}, D, and iodine throughout their reproductive period.[4]

In India, women's diets are often poor to meet nutritional needs. Essential nutrition interventions are required to meet the essential nutrition needs of women to prevent micronutrient deficiencies.[7] The government of India launched *Poshan Abhiyan 2.0 (nutritional campaign)* to address the challenges of malnutrition in children, adolescent girls, pregnant women, and lactating mothers and to promote nutrition awareness and good eating habits for sustainable health and wellbeing.[8,9] *Poshan Abhiyan* 2.0 aims to convert the agenda on improving nutrition into a *Jan Andolan* (mass campaign) with the involvement of stakeholders, community-based events, community mobilization, behaviour change, and Information and Education and Communication (IEC) approach.[9] Moreover, it emphasizes the establishment of nutri-gardens to meet the nutritional needs of women and children. Nutri-gardens are basically the advanced form of kitchen gardens in which fruits and vegetables are grown as a source of food and income. Nutri-gardens offer the opportunity to diversify family's diet and provide several other benefits, particularly for women.[10]

Research indicates that rural Indian households often have inadequate diets lacking in nutrient-dense foods. This may be due to the limited availability of high-quality and diverse food options, which could be unaffordable or culturally and religiously unacceptable.[11] Additionally, it is worth noting that the average consumption of fruits and vegetables in rural areas falls below the recommended daily intake of 100g and 400g, respectively.[12] Furthermore, the study revealed that Indian households consumed approximately 145g of fruits and 15g of vegetables per capita per day.[13] Women's consumption of micronutrient-rich foods, such as green leafy vegetables and vitamin A-rich fruits and vegetables, in the Empowered Action Group states in India, like Bihar and Uttar Pradesh, is low. Only one-third of women reported consuming these food groups.[14]

The intake of micronutrient-rich foods was found to be below 20% of the Recommended Daily Intake, and the average consumption of green leafy vegetables and fruits in Wardha and Koraput was significantly below the suggested level of 100g.[11,15] Findings revealed personal preference, preferences of family members, distribution of food as part of the household, societal and cultural norms, seasonality, unavailability, poor accessibility, and cost were all the barriers to fruits and vegetable intakes cited by the rural women.[11]

Nutri-garden is one of the effective, affordable, accessible, and sustainable strategies for combating malnutrition and micronutrient deficiencies and achieving food and nutrition security.[16,17] Along with healthy eating habits**,** nutri-garden helps in bridging the gap between the use of long-term resources.[18] A study from Bihar found the establishment of the nutri-garden improved overall vegetable production, consumption, and calorie intake by 100% and 53%, respectively, and around 40% of them earned good annual incomes through nutri-gardens.[19] Likewise, another study from Bihar revealed that the establishment of nutri-gardens, along with nutrition awareness rallies, had improved the consumption of food groups from 3-4 to 7-8 food groups among households.[20] However, the studies on nutri-gardens and improved dietary diversity among women are limited in the context of the state of Uttar Pradesh and Bihar. In another study, the consumption of different food groups increased from 4% to 34%, and the percentage of the average consumption of nutrients increased from 1% to 5% after the implementation of nutri-gardens in Karnataka.[17]

The use of community videos in a social and behaviour change communication (SBCC) strategy is engaging, beneficial, and powerful in social norms and behaviour.[21] Findings show that community videos can influence behaviours related to nutrition and hygiene-related behaviour, without follow-up visits.[21]

Another finding revealed the average household consumption of fruits and vegetables has increased by 10% in the intervention group in Ethiopian households after viewing the videos on recommended consumption behaviour messages and methods on how fruits and vegetables can promote an individual's health and nutrition outcome.[22] There is limited evidence on the effectiveness of nutri-garden along with nutrition education or *Jan Andolan* (mass campaign) in enhancing dietary diversity among women.

Considering the need for improving dietary diversity among women of reproductive group (15-49 years), we developed a comprehensive package of interventions, including establishing nutri-gardens, along with generating awareness through educational role plays and videos. The objective of the present study is to assess the effectiveness of growing nutri-gardens in improving the dietary diversity of women and girls compared to no nutri-gardens.

METHODS

Study design

The study design was a post-test-only comparison with a control group. Adolescent girls and women who were distributed seeds for nutri-gardens and attended educational role plays and video shows formed the intervention group. However, the adolescent girls and women who were not given seeds but attended role plays and video shows formed the control group.

Study population and study areas

The study was conducted with adolescent girls (15-19 years) and women in one block in each of the two districts of *Uttar Pradesh* (*Kaushambi and Varanasi*) and *Bihar (Jamui and Khagaria)*. The study sites were included as they were a part of the ongoing intervention by MAMTA. The beneficiaries living in the area for the past 6 months were included; however, those who did not provide consent or migrated from the area were excluded from the study.

Sample size

A random sample of 100 girls and women per district in the intervention and control groups was drawn. Simple random sampling was done to select 100 women and girls from the list of beneficiaries who were distributed seeds for nutri-gardens. The control population was selected from the same villages where nutritional education was given, but seeds were not distributed to the families.

Intervention details

A campaign was launched between June, 2022 and September, 2022 to spread awareness for establishing nutri-gardens in the wasteland areas near/in the households of the beneficiaries. In addition, the campaign aimed to improve the knowledge of dietary diversification and consumption of 10 food groups and to improve their dietary practices by increasing the intake of fruits and vegetables. The campaign encompassed four different and major approaches, primarily training beneficiaries on nutri-gardens, distributing seasonal seeds to the beneficiaries, and conducting educational *role plays* and video shows.

Primarily, the marginalized families were line-listed at the village level in each district for distributing seeds. A one-day training cum orientation of the beneficiaries was conducted on the balanced diet, importance of diet, diversity, technical knowledge on the process of seeds growing and cultivation, use of organic fertilizers and pests, layout preparation training, etc. The beneficiaries were guided to plan the nutri-garden scientifically and organically so that all seasonal fruits and vegetables could be grown fresh and available for consumption. A packet of twelve types of seasonal seeds containing bitter gourd, bottle gourd, ridge gourd, beans, cowpeas, *poi saag*, spinach, lady finger, tomato, green chilies, moringa, and papaya was provided. The follow-up with the beneficiaries was conducted fortnightly on the yield.

To make the campaign more interactive and interesting, educational role plays and video shows were conducted to encourage women and families to establish nutri-gardens. This was done to enhance their nutritional intake and support their livelihood. The educational videos on the importance of maternal dietary diversity and consumption of 10 food groups, followed by the importance of establishing nutri-gardens in the household, were shown to reinforce the messages. At the end of each activity, questions based on the content covered were asked, and the correctly answered participants were rewarded with a prize which acted as a motivation to listen to the play carefully.

Study tools

The study used a quantitative approach to collect data from the beneficiaries. The yield of the fruits and vegetables grown in the nutri-gardens was obtained and recorded in a monitoring format post 3 months after sowing them. Moreover, a post-test was conducted using a pre-designed semi-structured questionnaire that included a standardized diet quality questionnaire [23] to collect information on dietary diversity based on a memory recall. The questionnaire also comprised of basic socio-demographic information, household-related information, and the questions related to seeds obtained, sown, grown, and consumed.

Statistical analysis

The data obtained was analyzed in STATA version 14.0 (StataCorp. 2015. Stata Statistical Software: Release 14. College Station, TX: StataCorp LP). Numerical data were presented as mean (standard deviation) and median (interquartile range), and categorical data as percentages and frequencies. The dependent variable includes the minimum dietary diversity of <5 or ≥5. Independent variables included the presence of a nutri-garden, education status, age, caste, and type of ration cards. Unadjusted and adjusted binary logistic regression analysis was done to assess associations between dependent and independent variables. The results were expressed as odds ratio (OR) and 95% Confidence Interval (CI). P-value <0.05 was considered statistically significant.

RESULTS

In total, there were 804 women and adolescent girls. Out of 804, 457 grew (the intervention group) and 347 did not grow nutri-garden (the control group). In almost all the nutri-gardens, fruits and vegetables grew. Out of 457 nutri-gardens, bitter gourd grew in 408 (89%), bottle gourd grew in 375 (82%), sem (beans) in 351 (77%), cow pea in 324 (71%), pow greens in 348 (76%), spinach in 319 (70%), ladyfingers in 380 (82%), tomato in 247 (54%), green chilies in 240 (52%), ridge gourd in 363 (79.4%), papaya in 236 (51.6%), and moringa in 180 (40%) gardens. Approximately 97% of women and girls ate green vegetables and fruits that grew in their nutri-gardens. The average yield of the fruits and vegetables in the nutri-garden is shown in Table 1.

Table 2 shows the distribution of socio-demographic characteristics of the women and girls who grew and did not grow nutri-gardens. Around one-third of the study

participants in both the groups belonged to scheduled castes/tribes. Nearly half of the participants in both the groups were housewives. Unadjusted and adjusted binary logistic regression analysis is shown in Table 3.

Table 1: Average yield and nutrients in the 12 different types of seeds distributed for nutri-gardens.

Type of seeds/plants	Nutrients	Average yield per family (kgs)
Bitter gourd	Phosphorus, potassium, magnesium, vitamin A, C and B-7, and folic acid	5.7
Bottle gourd	Folic acid, potassium, magnesium, calcium, and vitamin B-9	13.6
Beans	Proteins, fibre, vitamin B-complex, vitamin A and K and minerals	4.9
Cow pea	Proteins, folic acid, magnesium, phosphorus, potassium, iron, vitamin B-1, 3, 5, and 9	5.7
Poi greens	Proteins, folic acid, vitamin A and C, and minerals	5.4
Spinach	Vitamin A, C. K, and E, folic acid, vitamin B1, B2 and B6, magnesium, manganese, iron, calcium, potassium, phosphorus and fibre	5.4
Lady finger	Folic acid, potassium, magnesium, vitamin C and K and fibre	8.4
Tomato	Vitamin C, A, fibre, potassium, calcium and vitamin K	4.3
Green chillies	Vitamin A, C, B-complex, vitamin K, fibre, minerals	3.9
Papaya	Vitamin A, C, E, K, B2, folic acid, magnesium, potassium, and fibre	1.3
Moringa	Vitamin A, calcium, iron, vitamin B1, B2, B3, B6, C, E, potassium, phosphorus, fibre	2.6
Ridge gourd	Potassium, fibre, vitamin C, B2, B3, calcium, phosphorus	8.4

Table 2: Socio-demographic characteristics of the women and girls who grew or did not grow nutri-gardens.

Variables	Women and girls who grew a nutri-garden (n=457) N (%)	Women and girls who did not grow a nutri-garden (n=347) N (%)
Age (years)	20 (15-26)	21 (15-26)
Education status		
Illiterate	74 (16.2)	79 (22.7)
Primary level (1^{st}-5^{th})	73 (16.0)	58 (16.7)
Middle level (6^{th}-8^{th})	112 (24.5)	78 (22.5)
Secondary level (9^{th} -10^{th})	105 (23.0)	72 (20.7)
High school (11^{th}-12^{th})	69 (15.0)	53 (15.3)
Graduation and above	24 (5.3)	7 (2.0)
Occupation status		
Student	201 (44.0)	133 (38.3)
Housewife	221 (48.3)	187 (54.0)
Others	35 (7.7)	35 (7.7)
Caste		
Scheduled caste/tribe	151 (33.0)	127 (36.6)
Other backward classes	276 (60.4)	191 (55.0)
Non-marginalized	30 (6.6)	29 (8.4)
Monthly family income from all sources	6800 (4500-10000 INR)	6500 (3800-9000 INR)
Type of ration cards		
Above the poverty line	46 (10.0)	22 (6.3)
Below the poverty line	381 (83.4)	297 (85.6)
Extremely below the poverty line	21 (4.6)	19 (5.5)
None of the above	9 (2.0)	9 (2.6)
Dietary diversity		
<5	117 (25.6)	94 (27.1)
≥5	340 (74.4)	253 (72.9)

Women and girls who grew nutri-gardens had 0.38 times higher odds of having higher dietary diversity (≥5) than women and girls who did not. Similarly, women and girls who are educated have higher odds of having a higher dietary diversity compared to illiterates. On the contrary, women and girls who belonged to other backward classes had lower odds of having a high dietary diversity than

non-marginalized women and girls (OR (95%CI); p-value: -1.85 (-2.83, -0.88); <0.001).

Table 3: Unadjusted and adjusted binary logistic regression of assessing associations between minimum dietary diversity and independent variables.

Variable	Unadjusted model minimum dietary diversity (≥5)* OR (95%CI); p-value	Adjusted model minimum dietary diversity (≥5)*OR (95%CI); p-value
Nutri-garden		
Yes	0.07(-0.23,0.39); 0.63	0.38 (0.02,0.74); 0.03
No	Reference	Reference
Age (years)	-	0.03 (0.01,0.05); 0.006
Education status		
Primary	-	0.96 (0.38, 1.54); 0.001
Middle		1.35 (0.78, 1.93); <0.001
Secondary		1.55 (0.95, 2.14); <0.001
Senior secondary		1.47 (0.83, 2.10); <0.001
Graduation		1.30 (0.21, 2.40); 0.02
Illiterate		Reference
Caste		
SC/ST	-	-0.14 (-1.14,0.86); 0.78
OBC		-1.85 (-2.83,-0.88); <0.001
Non-marginalized		Reference
Type of cards		
BPL	-	-0.36 (-0.96,0.24); 0.24
None		0.95 (-1.18,3.09); 0.38
APL		Reference

*Comparison group is minimum dietary diversity <5
Abbreviations: APL: Above the Poverty Line; BPL: Below the Poverty Line; OBC: Other Backward Classes; OR: Odds Ratio; SC/ST: Scheduled Caste/Scheduled Tribe
p-value <0.05 is considered statistically significant

DISCUSSION

Nutri-garden is a low-cost sustainable approach to providing fruits and vegetables daily. In the present study, the seeds were distributed alongside nutrition education to enhance the dietary diversity scores of adolescent girls and women. The findings of this study indicate that women and girls who grew nutri-gardens had a higher dietary diversity score compared to those who did not after adjusting for the covariates and confounders. Furthermore, our research reveals that education and caste play a crucial role in improving the dietary diversity scores among adolescent girls and women, particularly when compared to their illiterate and non-marginalized counterparts, respectively. Likewise, literate women exhibited notably higher scores in dietary diversity, leading to increased consumption of diverse diets by their family members as well. Research indicates that nutrition knowledge has a particularly influential effect on enhancing dietary diversity at both the individual and household levels.[24]

The fruits and vegetables distributed in our study were rich in various nutrients like folic acid, potassium, magnesium, calcium, and vitamins A, C, E, K, and B-complex, etc., which helps in combating malnutrition and other micronutrient deficiencies. Our study demonstrated a sequential process starting with the training of the beneficiaries to cultivate a nutri-garden. This led to an increase in the knowledge about a balanced diet and the availability of fruits and vegetables, to adolescent girls and women. Evidence suggests that training on nutri-garden has increased awareness and improved knowledge among rural women in Bihar. The average per capita of vegetables has increased along with the consumption of vegetables, especially green leafy.[16]

A study from Karnataka demonstrated findings congruent to our study, indicating that the establishment of a nutri-garden led to an improvement in average nutrient consumption ranging from 1% to 5%.[17] Similar studies were conducted in other countries on establishing nutri-garden and its connection with women's nutrition knowledge, empowerment, and dietary patterns.[25] Research conducted in Ethiopia indicated that higher nutritional knowledge was associated with higher dietary diversity.[26] However, in the present study, we did not collect data on nutritional knowledge or women's empowerment and therefore did not assess these factors as covariates.

Combining a nutri-garden with nutrition education in a community-based setting has the potential to serve as a potent tool for enhancing both vegetable production and consumption, particularly among households that are highly susceptible to micronutrient malnutrition.[25,26] Therefore, information campaigns aimed at raising

awareness of the importance of nutrition can be a cost-effective approach to improve dietary outcomes [24] of the women and community at-large.

The plausible reason for the statistically insignificant association between nutri-garden and dietary diversity in the unadjusted model was that the control group also received nutrition education. Nutrition education alone is a strong predictor of improving dietary diversity, as evidenced in other studies.[27–29]

The current study is subjected to various limitations. Firstly, we relied on a semi-structured quantitative tool and a food frequency questionnaire for data collection, which may not have provided a comprehensive understanding due to their inherent limitations. A 24-hour dietary recall method should be conducted for a more detailed capture of food items and beverages consumed within the last 24 hours to record the quantity. Additionally, the study was conducted in only two states, which restricts the generalizability of the findings. Conducting the study with a larger sample size across multiple states would have yielded more robust results. Another notable weakness of our study is that data on vegetable and fruit consumption, as well as dietary diversity, were collected only once. The estimated impact could have been different, potentially higher, during another period of the year. While collecting data in multiple seasons poses challenges, it should be considered in future impact studies involving nutri-gardens. Lastly, the study was a post-test-only comparison with a control group, which does not establish causation between the exposure and outcomes compared to randomized trials or pre-post study designs.

Notwithstanding these limitations, the study offers compelling evidence that implementing a nutri-garden accompanied by nutrition education can effectively enhance dietary diversity, compared to nutrition education alone.

CONCLUSION

The study concludes that establishing nutri-garden along with nutrition education improved dietary diversity among adolescent girls and women in the intervention areas. As a result, it is crucial to generate more awareness of the consumption of fruits and vegetables, particularly among the community, with a specific focus on adolescent girls and women. Utilizing interactive and innovative approaches will be particularly valuable in engaging and educating the community effectively.

ACKNOWLEDGEMENTS

We would like to thank the team members who have been a part of the campaign.

Funding: CSR
Conflict of interest: None declared
Ethical approval: The study was approved by the MAMTA Internal Ethical Review Board

REFERENCES

1. Kumar P, Chauhan S, Patel R, Srivastava S, Bansod DW. Prevalence and factors associated with triple burden of malnutrition among mother-child pairs in India: a study based on National Family Health Survey 2015–16. BMC Publ Heal. 2021;21(1):391.
2. Meenakshi JV. Trends and patterns in the triple burden of malnutrition in India. Agricul Econom. 2016;47(S1):115-34.
3. Bangale N, Mahesh M, Sudagani J, Mylapore SS, Bharti BB, Kumar Dhandhania V, et al. Demystifying the micronutrient deficiency burden in India. IJNMHS. 2022;5(3):91-9.
4. Nguyen PH, Kachwaha S, Tran LM, Sanghvi T, Ghosh S, Kulkarni B, et al. Maternal Diets in India: Gaps, Barriers, and Opportunities. Nutrients. 2021;13(10):3534.
5. Jose S, Navaneetham K. A Factsheet on Women's Malnutrition in India. Econ Polit Week. 2008;43:61-7.
6. International Institute for Population Sciences (IIPS) and ICF. 2020. National Family Health Survey (NFHS)-5, India and State Factsheet Compendium. Mumbai: IIPS. Available at: http://rchiips.org/nfhs/NFHS-5_FCTS/India.pdf. Accessed 17 April 202.
7. UNICEF India. Women's nutrition. Available at: https://www.unicef.org/india/what-we-do/womens-nutrition. Accessed 20 June 2023.
8. Ministry of Women and Child Development. Poshan Vatikas or Nutri- gardens being set up across the country to provide easy and affordable access to fruits, vegetables, medicinal plants and herbs Available at: https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1861686. Accessed 17 April 2023.
9. Ministry of Women and Child Development. Guidelines of 'Saksham Anganwadi and Poshan 2.0' - an Integrated Nutrition Support Programme. Available at: https://pib.gov.in/pib.gov.in/Pressreleaseshare.aspx?PRID=1847548. Accessed 17 April 2023.
10. Mamgai P, Nautiyal P, Jethi R. Nutri–gardens: A rich source of nutrition for farm women. LEISA INDIA. 2021.
11. Kehoe SH, Dhurde V, Bhaise S, Kale R, Kumaran K, Gelli A, et al. Barriers and Facilitators to Fruit and Vegetable Consumption Among Rural Indian Women of Reproductive Age. Food Nutr Bull. 2019;40(1):87-98.
12. My plate for the day. Available at: https://www.nin.res.in/downloads/My%20plate%20for%20the%20day-20-12-2022.pdf.
13. Minocha S, Thomas T, Kurpad AV. Are 'fruits and vegetables' intake really what they seem in India? Eur J Clin Nutr. 2018;72(4):603-8.

14. Gupta S, Sunder N, Pingali PL. Are women in rural India really consuming a less diverse diet? Food Nutr Bull. 2020;41(3):318-31.
15. Vijaya Bhaskar AV, Nithya DJ, Raju S, Bhavani RV. Establishing integrated agriculture-nutrition programmes to diversify household food and diets in rural India. Food Sec. 2017;9(5):981-99.
16. Shahi V, Singh P, Kumar V, Maurya R. Role of kitchen gardening in diet diversification and nutritional security. AJHS. 2019;14(2):288-92.
17. Patil PB, Biradar SA, Jadhav S, Kohlar BC. Nutri garden: A Low Cost Sustainable Approach to Improve Nutritional Security of Farm Families. Int J Curr Microbiol App Sci. 2020;9(11):3662-6.
18. Londhe. Poshan Vatika (Nutri-Gardens) at Anganwadi centers-Holistic approach by Government of India towards nutritional security. Available at: https://www.jdrasccras.com/article.asp?issn=2279-0357;year=2023;volume=8;issue=1;spage=81;epage=85;aulast=Londhe. Accessed 18 April 2023.
19. Sinha N. Nutrition Gardens for Improved Food Security and Enhanced Livelihoods in Gaya District of Bihar. Int J Curr Microbiol App Sci. 2018;(7):3456–62.
20. The Coalition for Food and Nutrition Security. Compendium of nutri-garden interventions in India. Available at: https://dietdiversity.communitygis.net/media/document_nutri/2021/04/24/Nutri_Garden_Compandium_for_web_25032021.pdf. Accessed 22 June 2023.
21. SPRING. The Value-Add of Community Video in Changing Nutrition and Hygiene Behaviors: Evidence from a Comparative Study in Senegal, 2018. Available at: https://www.spring-nutrition.org/publications/reports/value-add-community-video-changing-nutrition-and-hygiene-behaviors-evidence. Accessed 21 April 2023.
22. Abate GT, Baye K, De Brauw A, Hirvonen K, Wolle A. Video-based behavioral change communication to change consumption patterns: Experimental evidence from urban Ethiopia. 0 ed. Washington, DC: International Food Policy Research Institute; 2021.
23. Dietquality.com. Global Diet Quality Project. Available from: https://www.dietquality.org/countries/ind. Accessed 21 April 2023.
24. Gupta S, Sunder N, Pingali PL. Market access, production diversity, and diet diversity: evidence from India. Food Nutr Bull. 2020;41(2):167-85.
25. Depenbusch L, Schreinemachers P, Brown S, Roothaert R. Impact and distributional effects of a home garden and nutrition intervention in Cambodia. Food Sec. 2022;14(4):865-81.
26. Agize A, Jara D, Dejenu G. Level of knowledge and practice of mothers on minimum dietary diversity practices and associated factors for 6-23-month-old children in Adea Woreda, Oromia, Ethiopia. Biomed Res Int. 2017;2017:7204562.
27. Kuchenbecker J, Reinbott A, Mtimuni B, Krawinkel MB, Jordan I. Nutrition education improves dietary diversity of children 6-23 months at community-level: Results from a cluster randomized controlled trial in Malawi. PLoS One. 2017;12(4):e0175216.
28. Tamiru D, Argaw A, Gerbaba M, Nigussie A, Ayana G, Belachew T. Improving dietary diversity of school adolescents through school based nutrition education and home gardening in Jimma Zone: Quasi-experimental design. Eating Behaviors. 2016;23:180-6.
29. Makate M, Nyamuranga C. The long-term impact of education on dietary diversity among women in Zimbabwe. Revi Develo Econ. 2023;27(2):897-923.

Cite this article as: Rastogi P, Choudhary S, Mehra S, Sharma S. Improving dietary diversity among women of reproductive age group (15-49 years) through community-based activities across four districts of India. Int J Community Med Public Health 2023;10:3721-7.