



**INTERNATIONAL JOURNAL OF  
PHARMACEUTICAL SCIENCES**  
[ISSN: 0975-4725; CODEN(USA): IJPS00]  
Journal Homepage: <https://www.ijpsjournal.com>



## Research Article

# Awareness Regarding the Role of Diet in the Prevention of Iron and Vitamin D Deficiency Disorders Among Married Women: A Community-Based Educational Intervention Study

Piyush Ranjan<sup>1</sup>, Manish Kumar<sup>2</sup>, Md Musab Sufiyan<sup>3</sup>, Sushil Raj<sup>4</sup>, Himanshu Roy<sup>5</sup>,  
Supriya Mehta<sup>6</sup>, Khushi Gupta<sup>7</sup>, Asad Raza<sup>8</sup>, Abel B.<sup>9</sup>, Md Sayeed Anwar\*<sup>10</sup>

<sup>1,10</sup> PharmD Post Baccalaureate Intern, Department of Pharmacy Practice, NIMS Institute of Pharmacy, Jaipur, Rajasthan

<sup>2</sup> PharmD, Department of Pharmacy Practice, Ambedkar Group of Institutions, Bihar University of Health Science, Bihar

<sup>3,5</sup> M. Pharma, Department of Pharmacology, NIMS Institute of Pharmacy, Jaipur, Rajasthan

<sup>4,6</sup> M. Pharma, Department of Pharmaceutics, NIMS Institute of Pharmacy, Jaipur, Rajasthan

<sup>7</sup> PharmD Intern, Department of Pharmacy Practice, NIMS Institute of Pharmacy, Jaipur, Rajasthan

<sup>8,9</sup> B. Pharma, Department of Pharmacy, NIMS Institute of Pharmacy, Jaipur, Rajasthan

## ARTICLE INFO

Published: 15 Jun. 2026

### Keywords:

Iron Deficiency Anemia,  
Vitamin D Deficiency,  
Rickets, Nutrition  
Education, Dietary  
Awareness, Nutritional  
Deficiency Disorders,  
Women's Health.

### DOI:

10.5281/zenodo.20703012

## ABSTRACT

Anemia due to iron and deficiency in vitamin D are considered to be the commonest nutritional health problems in the world especially in developing countries like India, which affects a majority of women, with various health consequences like anemia, compromised immunity, poor growth, rickets, osteomalacia and lower quality of life. Adequate knowledge of food rich in nutrients, food habits, and preventive practices is extremely important for prevention of these deficiency disorders but inadequate awareness about these disorders is still a public health problem. This study was a community based pre-post interventional study, in which 30 randomly selected married women (18 to 35 years) from Jaipur, Rajasthan were selected to assess their level of awareness about iron and vitamin D deficiency disorders and to find out the effectiveness of the nutrition education intervention provided. The knowledge regarding causes, symptoms, food sources, prevention, and management of these deficiency disorders was assessed by using a structured questionnaire as the pre-test. After that, nutrition education was provided to the participants by using posters and group discussion.

\*Corresponding Author: Md Sayeed Anwar

Address: PharmD Post Baccalaureate Intern, Department of Pharmacy Practice, NIMS Institute of Pharmacy, Jaipur, Rajasthan

Email ✉: [ajmalsayeed2468@gmail.com](mailto:ajmalsayeed2468@gmail.com)

Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.



Again, after that, knowledge was reassessed after intervention using the same questionnaire (as the post test). Data was analyzed statistically using frequencies and percentages and by calculating mean scores, standard deviations, and confidence limits. It was revealed from the study that there were different levels of awareness in the selected participants. But on the post-test it was found that there was an improvement in the knowledge about causes, symptoms, food sources, prevention, and treatment of these deficiency disorders. Thus, nutrition education intervention using poster was found effective in enhancing awareness about various deficiency disorders related to nutrients. Hence, it is suggested that nutrition education should be provided to the community members as this can enhance awareness regarding nutritional deficiency disorders and may eventually improve food habits and practices, detection of these disorders and health of the communities.

## **INTRODUCTION**

Malnutrition can have long-term impacts on a person's health, growth, cognition, immunity, productivity, and wellbeing, particularly in the context of the developing world where knowledge about diet is low, poverty levels are high, there is a lack of adequate food supplies, and health care facilities are limited [1,2].

Iron deficiency is one of the most common micronutrient deficiencies around the world and one of the most common and serious nutritional deficiency disorders in women and children. Iron deficiency is also one of the most common micronutrient deficiencies in the world and a contributor to anemia [3]. Women of reproductive age suffer from the most common form of iron deficiency, due to menstrual iron losses and iron requirements during pregnancy and lactation, and iron is essential for the synthesis of hemoglobin, and plays critical role in the body for transport of oxygen, cellular energy production, immune function and cognitive function[4]. This is responsible for weakness, fatigue, lowered work capacity, lowered immunity and bad pregnancy outcomes[5].

Vitamin D deficiency also has been identified as a major nutritional issue in various ages of the population. Vitamin D is a fat-soluble vitamin that has a vital role in calcium and phosphorus metabolism, bone mineralization, immune regulation and muscle function. Deficiency causes rickets in children, osteomalacia in adults, muscle weakness, a higher incidence of fractures, and impaired skeletal development[6]. Many parts of India get lots of sunshine, and vitamin D deficiency is highly prevalent despite these conditions due to lack of awareness about vitamin D preventive measures, poor dietary intake, lifestyle factors and lack of sunlight exposure.[7]

Prevalence of nutritional deficiencies is still on the higher end, especially in women and children in India. The National survey has also reported a high prevalence of anemia in women of reproductive age group, and a high rate of Vitamin D deficiency has also been found.[8] These deficiencies contribute to increased medical costs, diminished productivity, stunted child growth, and negative socioeconomic impacts. Hence, there is a need for effective preventive measures to reduce the prevalence and burden of these disorders.[9]

An important determinant for the prevention and control of nutritional deficiency is diet. Iron deficiency can be prevented by eating foods that are rich in iron such as, green leafy vegetables, pulses, beans, dry fruits, seeds, cereals fortified with iron and meat, and fish. [10] Vitamin D deficiency can be prevented through sunlight exposure and consumption of vitamin-D-rich food sources such as fatty fish, eggs, fortified milk, and vitamin-D supplements. [11] The effectiveness of such prevention measures is limited by people's lack of awareness of these methods.

Programs on health and nutrition education are effective methods for increasing people's knowledge of nutrition needs and behavior.



Posters, group talks and counseling, and demonstrations and workshops improve people's awareness, encourage healthy behaviors and preventive habits. Women, especially mothers are the decision makers regarding nutrition for their family and child [12,13]. Therefore, educating women about the consequences of nutrition deficiency disorders would encourage positive nutrition practice among the mother and the child [14], and would lead to better nutritional status of the community. These education programs will only be effective if these strategies work in conjunction with other sustainable programs such as food diversification, promotion of diverse diet practices, etc. [15,16]. Food fortification and biofortification are also programs that need to be implemented to increase micronutrients consumption in a community and would complement other interventions that target specific groups or households in a population [17]. Besides programs that impact the individual household and community, for example health, nutrition education programs, fortification and bio-fortification programs, strategies that address the underlying causes of micronutrient malnutrition should be implemented and scale up. Specific poverty-reduction initiatives will help the poorest groups, including women and children, have access to a varied and balanced diet [18,19]. The government should also establish strong public-private partnerships to make fortified foods available to the people who are at risk of having malnutrition [20]. All these interventions will be effective only if they are well monitored and evaluated to see whether they have achieved their goal of providing adequate nutritional intake in the population, for example, food bio-fortification or food enrichment programs should ensure that the nutrient content of the fortified or enriched foods meet the daily nutrient requirements of the people [21,22]. Furthermore, mandatory, coordinated, equitable, and sustainable fortification and bio-

fortification policies should be strengthened and incorporated within broader public social welfare programs [23]. To make these policies effective, technical limitations of these programs need to be addressed and there needs to be standardized guidelines to monitor fortification programs in developing countries [24]. In addition to policy frameworks and guidelines that strengthen food fortification and bio-fortification programs, a multi-sectorial approach that integrates agriculture with nutritional objectives needs to be developed such as promoting diversified agricultural practices that include different food crops and livestock to improve micronutrient content in the diets [25].

This study was conducted to determine the knowledge level on iron deficiency anemia and vitamin D deficiency diseases among the married women (18-35 yrs) of Jaipur district of Rajasthan. It was also attempted to evaluate the role of poster based presentation & interactive discussion method of Nutrition Education in increasing the awareness on importance of dietary modification to prevent these diseases. With these efforts in mind the study was designed to increase the knowledge & awareness for the prevention & control of the deficiency diseases in the society.

### **Aim of the Study**

The study aims to evaluate the knowledge regarding the role of diet in preventing iron deficiency anaemia (IDA) and Vitamin D deficiency disorders and to sensitise married women by implementing nutrition education intervention programme.

### **Objectives of the Study**

1. To measure how aware married women currently are about iron and vitamin D deficiency conditions.



2. To screen out women and children likely to be at risk for iron and vitamin D deficiency disorders.
3. To test participant awareness about the etiology, manifestations, preventive strategies and therapy of iron deficiency anemia and vitamin D deficiency disorders.
4. To provide participants with information on cost-effective dietary sources for iron and vitamin D.
5. To create awareness on health outcome of malnutrition related disorders.
6. To assess the effectiveness of nutrition education through pre-test and post-test evaluation.
7. To promote healthy nutritional behaviour towards prevention of iron and vitamin D deficiency disorder.

## **MATERIALS AND METHODS**

### **Study Design**

This pre-post intervention study was conducted in community environment to know the knowledge about the role of food in the prevention of iron and vitamin D deficiency disorder among married women and the effectivity of nutrition educational intervention.

### **Study Area**

The study area chosen for the research is a specific community area located within Jaipur district, Rajasthan. The participants selected were married women residing in this community area.

### **Study Population**

Participants of this research were married women aged 18 to 35 years. Women who agreed to take part and were present during the period of the research were included in the study.

### **Sample Size and Sampling Technique**

30 married women were randomly selected and informed about the aim of the study before obtaining informed consent for enrolment.

### **Inclusion Criteria**

- Married between the ages of 18 and 35 years.
- Agreeable to participate in the study.
- Present during the data collection.

### **Exclusion Criteria**

- Women younger than 18 years of age and older than 35 years of age.
- Women who did not consent to participate in the study.
- who were not present during data collection.

### **Study Tool**

In order to evaluate awareness on iron deficiency anemia and vitamin D deficiency disorder, data was collected with a pretested structured questionnaire consisting of three parts:

#### **Section I: Demographic Information**

The present section presented information on age, education, employment, family type, and socioeconomic status of the participants.

#### **Section II: Assessment Questionnaire**

A structured questionnaire assessed participants awareness of:

- iron deficiency anaemia;
- vitamin D deficiency disorders;
- cause and risk factors;
- signs and symptoms;
- sources of dietary iron and vitamin D;
- prevention; and



- treatment and management

### Section III: Educational Assessment

Pre- and post-test questionnaires were used to measure shifts in awareness before and after the intervention.

#### Educational Intervention

After the baseline data collection was over, nutrition education was provided via posters and group discussions. The participants were educated on:

#### Iron Deficiency Anemia

- Definition and Causes
- Risk Factors
- Signs and Symptoms
- Complications
- Iron Rich Foods
- Prevention and Treatment

#### Vitamin D Deficiency Disorders

- Definition and causes
- Risk factors
- Signs and symptoms
- Rickets and osteomalacia
- Sources of vitamin D
- Importance of sunlight exposure
- Prevention and treatment

Participants were encouraged to ask questions and contribute to the conversation to facilitate a better understanding of nutritional deficiency disorders.

#### Data Collection Procedure

The study was conducted in four phases:

##### Phase I: Baseline Survey

We asked all the study participants a series of questions about their demographic characteristics and awareness levels.

##### Phase II: Pre-Test Assessment

A structured questionnaire was used to evaluate the pre-intervention knowledge about iron deficiency anemia and vitamin D deficiency disorders.

##### Phase III: Nutrition Education Intervention

To address nutrition education needs, poster presentations were displayed and group discussions were held on the dietary approaches to the prevention of iron and vitamin D deficiency disorders.

##### Phase IV: Post-Test Assessment

A follow-up survey was also conducted after the intervention to evaluate any changes in the awareness and knowledge of the participants.

#### Statistical Analysis

Data were collected and organized in Microsoft Excel. Descriptive statistics were employed to summarize data, and measures of central tendency (mean) and dispersion (standard deviation, standard error, 95% confidence intervals), as well as frequencies and percentages were calculated to describe the study results. Changes in the mean pre-test awareness scores were compared to those for the post-test scores to evaluate the impact of the education intervention.

#### Research Hypothesis

**Null Hypothesis (H<sub>0</sub>):** A nutrition education intervention did not significantly increase awareness of the role of diet in preventing iron and vitamin D deficiency disorders in married women.



**Alternative Hypothesis (H<sub>1</sub>):** Intervention on nutrition education improved awareness on the role of diet in prevention of iron and vitamin D deficient disorders among married women.

## RESULTS

This study was conducted to assess the awareness among the married women about the role of diet in the prevention of iron and vitamin D deficiency disorders. A total of 30 married women in the age range of 18 to 35 years participated in the study. A pre-test was conducted using a structured questionnaire to evaluate the level of awareness

about diet and iron and vitamin D deficiency disorders at the beginning of the study. After that, a post-test was conducted to evaluate the effectiveness of intervention (post-test knowledge score) through presentation and discussion on nutrition posters.

### Demographic Characteristics of Participants

The study sample comprised 30 women from the 18 to 35 age group randomly selected from the community in Jaipur, Rajasthan, India who were married.

**Table 1. Demographic Characteristics of Participants (n = 30)**

Parameter	Value
Total Participants	30
Gender	Female
Marital Status	Married
Age Group	18–35 Years
Study Area	Jaipur, Rajasthan

### Assessment of Women and Children at Risk of Iron and Vitamin D Deficiency Disorders

We gave out a questionnaire to the women and children who were likely at risk of nutritional deficiency disorders. The questionnaire asked about anaemia, underweight, childhood nutritional disorders, feeding practices, episodes of recurrent illness and nutritional morbidity. We observed that several people had some risk factors for nutritional

disorders and there was a need for sensitisation on preventive nutritional practices and prompt handling of deficiency disorders.

Furthermore, a hypothesis test indicated that the mean age of those considered to be at risk for developing anemia is  $26.18 \pm 5.96$  years old, and the 95% CI for that age is between 24.69 years and 27.67 years.

**Table 2. Statistical Analysis of Women at Risk of Anemia**

Parameter	Value
Sample Size	16
Mean Age (Years)	26.18
Standard Deviation	5.96
Standard Error	1.49
95% Confidence Interval	24.69–27.67



### Pre-Test Awareness Assessment

Prior to the educational intervention, a pre-test questionnaire was conducted to ascertain the awareness of the subjects about iron deficiency anemia and vitamin D deficiency disorders including their aetiology, signs, sources, prevention and cure.

The pre-test mean awareness score was recorded at  $11.06 \pm 5.45$  out of 20. The 95% confidence interval for the mean score ranged from 9.11 to 13.01. The study revealed that some women were ignorant on the dietary intake of Iron and Vitamin D, and on the preventive and management strategies of deficiency diseases.

**Table 3. Pre-Test Awareness Scores**

Parameter	Value
Sample Size	30
Mean Score	11.06
Standard Deviation	5.45
Standard Error	0.995
95% Confidence Interval	9.11–13.01
Maximum Score	20
Minimum Score	0

The pre-test scores were also tested for hypothesis testing and resulted in the t statistic of 1.0650 and the p value of 0.29566. Because the p value was greater than the significance level 0.05, the null hypothesis for the pre-test scores was not rejected.

### Nutrition Education Intervention

After the pre-test, participants took part in a nutrition education session through posters and discussion regarding the etiology, signs and symptoms, adverse effects, prevention and dietary management of iron deficiency anemia and vitamin D deficiency disorders and were informed about economic sources of iron and vitamin D as

well as importance of a balanced diet and preventive measures.

### Post-Test Awareness Assessment

The knowledge gained from the educational intervention was evaluated via the use of post-test which was administered using the same tool.

The average post-test level of awareness rose to  $16.46 \pm 3.74$  on a maximum score of 20, with a 95% CI from 15.12 to 17.80 (indicating a significant increase). Participants had improved knowledge on the symptoms, food sources, prevention and treatment for iron deficiency anemia and vitamin D-deficiency disorders.

**Table 4. Post-Test Awareness Scores**

Parameter	Value
Sample Size	30
Mean Score	16.46



Standard Deviation	3.74
Standard Error	0.68
95% Confidence Interval	15.12–17.80

Post-test scores also had their means tested by hypothesis testing and showed that the mean was within the targeted mean of 15 to 17. Results of confidence interval analysis showed an increase in

the level of participants' knowledge after the educational intervention.

### Comparison of Pre-Test and Post-Test Scores

**Table 5. Comparison of Awareness Scores Before and After Educational Intervention**

Parameter	Pre-Test	Post-Test
Mean Score	11.06	16.46
Standard Deviation	5.45	3.74
Mean Improvement	0	5.40
95% Confidence Interval	9.11–13.01	15.12–17.80

The scores before the intervention were compared with the scores after the intervention, and an improvement of the average scores after the intervention was revealed. There was a difference of 5.40 points (the average score before the intervention was 11.06 and after the intervention was 16.46). These results suggest that the poster nutrition education program had a positive effect on increasing the knowledge of the participants on iron deficiency anemia, vitamin D deficiency disorders and how to prevent through diet.

### Overall Findings

The study and the educational program were carried out as planned. The participants gained a greater understanding of malnutrition disorders after the poster displays and discussions. It appears that educational programs on nutrition at the community level can be successfully employed to improve knowledge of iron-deficiency anemia and

vitamin D-deficiency disorders and to encourage better dietary habits among women.

### DISCUSSION

Objective: To assess awareness on the role of diet in prevention of iron and vitamin D deficiency disorders among married women of 18 to 35 years of age in Jaipur, Rajasthan, and to evaluate the impact of nutrition education. Nutritional deficiency disorders have been a major public health problem in developing countries especially among women of reproductive age group and children. Iron deficiency anemia and vitamin D deficiency are the major public health concern as micronutrient deficiency which results in adverse effects to health, productivity, immunity and quality of life.

Pre-test mean level of knowledge was moderate about iron deficiency anemia and vitamin D deficiency. The 95% Confidence Interval (CI) of



pre-test knowledge was 9.11 to 13.01. The score was  $11.06 \pm 5.45$ . This result revealed that many subjects were not fully aware about the etiology, symptoms, food sources, prevention, and treatment related to both of deficiency diseases, which implied that most women were less aware about nutritional deficiency problems.

Also, the assessment questionnaire identified women and children who may be at risk of nutritional deficiency diseases. The data indicated the mean age of females at risk of anemia was  $26.18 \pm 5.96$  years with a confidence interval of 24.69 and 27.67 years. Thus, women who were in their reproductive years might be at higher risk of developing iron deficiency anemia because of menstrual blood loss, pregnancy, lactation, poor eating patterns and increased metabolic needs.

After the nutrition education intervention, a significant increase in the level of awareness was found among the participants with a mean score of  $16.46 \pm 3.74$  (CI 15.12 to 17.80). The score difference between pre and post test was 5.40 which is the difference seen in the level of awareness of the participant regarding IDA, Vitamin D deficiency, food sources, prevention and treatment of disease. This could be because poster presentation and interactive discussion is an effective teaching technique and also as visual information as a teaching tool to facilitate understanding and to explain health problems that sometimes are difficult to understand and explain by the participants within the community especially in a complex manner. This is also made possible by the interactive discussion as it helps clarify issues for them to be explained by the facilitator, thereby enhancing the practical knowledge and understanding of the community about healthy eating patterns. The findings are consistent with other research that community nutrition education interventions can increase

awareness and promote positive health-related behaviors.

Women are still significantly affected by iron deficiency anemia, a widespread condition in India despite the availability of treatments to prevent and address it. Lack of knowledge about iron-rich foods, poor dietary intake, inadequate absorption, and late detection are some of the factors contributing to this disease. A similar scenario exists for vitamin D. Despite abundant sunlight availability, this population has a huge population affected by vitamin D deficiency. Lack of sun exposure, limited outdoor activity, and low dietary intake of foods high in vitamin D are some of the major factors that lead to this disease. Thus, interventions that improve awareness of nutrient-dense foods, and lifestyle are necessary to control the prevalence of these conditions.

This result revealed that women play a vital role in promoting nutrition and health status of the household. Increased understanding of women can affect food consumption, nutrition, and health status of women and children. Understanding about iron rich food, vitamin D rich food, adequate food, supplementation and sunbathing could prevent the nutritional deficiency and increase nutrition and health status.

Community-oriented programs using relatively easy-to-use means such as posters and group discussions were found to be effective. These can be embedded within public health and maternal-child health and community nutrition promotion programmes, to raise awareness on the issue of nutritional deficiency disorders.

However, there are not many limitations to the research. The findings are limited by the small number of subjects and the fact that the subjects were collected from a particular locality, so these findings might not be generalisable. It was also



unable to assess long term knowledge and behaviour change, and only assessed short term knowledge improvement. More studies with large population and longer duration of follow up need to be conducted to determine whether the knowledge on nutrition obtained from nutrition education translates into nutritional practices and health benefits. Finally, the results of this study showed that nutrition education interventions have a positive impact on the improvement of awareness of iron and vitamin D deficiency disorders. This increased awareness can enable women and children to make better informed and healthy dietary decisions, encourage early identification and management of these deficiency diseases, and prevent nutrition problems.

## CONCLUSION

A study was planned to assess the awareness on the role of diet in preventing the iron and vitamin D deficiency disorders among the married women of 18 to 35 years of age in the city of Jaipur, Rajasthan of India. The data obtained in the present study revealed that the women have some knowledge on the various nutritional deficiency disorders but the awareness was less about their causes, signs and symptoms, food sources, prevention and treatment of iron deficiency anemia and vitamin D deficiency disorders.

Our pre-assessment showed a mean score of  $11.06 \pm 5.45$  (95%CI=9.11-13.01). Post intervention with a poster presentation and a discussion group, the post score improved to  $16.46 \pm 3.74$  (95%CI=15.12-17.80). Therefore, the intervention showed improvement in the awareness score by 5.40 which is effective in enhancing the knowledge of nutritional deficiency disorders and diet functions in these disorders. Nutrition education was recommended as simple and inexpensive intervention in the present study, because the awareness of iron rich food, Vitamin

D rich food, balanced nutrition, nutritional supplement and lifestyle modification can contribute in improving the nutritional deficiency disorders in a timely manner. To further improve the nutrition literacy of women, health education and nutrition counseling can be promoted and integrated into the public health programmes and the women can be reached through community-based campaigns of awareness. Such intervention will be likely to reduce the prevalence of iron deficiency anaemia and vitamin D deficiency disorders in the community, as well as improve the nutritional status of mothers and children and consequently that of the community in general. This study, therefore, recommends a nutrition education approach as a successful intervention strategy that has the potential to create awareness and understanding of iron and vitamin D deficiency disorders among women and encourage initiation of lifestyle changes to prevent these conditions.

## ACKNOWLEDGEMENT

The authors are highly thankful to the women who gave their consent to participate in the study by sharing the necessary information with us. We would like to express our heartfelt appreciation to the local society for providing assistance for this survey and nutrition education programme. Furthermore, our profound thanks are to all who were involved in designing poster presentation and awareness session. We could not have completed the study without their support and contribution.

## CONFLICT OF INTEREST

The authors report no conflicts of interest in connection with this paper's publication.

## FUNDING STATEMENT



The authors confirm that the study did not receive any funds from outside sources.

### **ETHICAL APPROVAL**

The study was conducted in accordance with ethical principles for community based educational research. Participants were included in the study after obtaining their oral informed consent. Participation in the study was voluntary and the identity of the study subjects was kept confidential during the conduct of the study. Permission was obtained from the concerned authorities prior to commencement of the survey and educational interventions.

### **INFORMED CONSENT**

Oral informed consent was obtained from all participants before participation in the study. Participants were informed regarding the objectives and procedures of the study, and participation was entirely voluntary.

### **REFERENCES**

1. Muonde M, Olorunsogo TO, Ogugua JO, Maduka CP, Omotayo O. Global nutrition challenges: A public health review of dietary risks and interventions. *World Journal of Advanced Research and Reviews* 2024;21:1467–78. <https://doi.org/10.30574/wjarr.2024.21.1.0177>
2. Kiani AK, Dhuli K, Donato K, Aquilanti B, Velluti V, Matera G, et al. Main nutritional deficiencies. *PubMed* 2022;63. <https://doi.org/10.15167/2421-4248/jpmh2022.63.2s3.2752>.
3. Peroni D, Hufnagl K, Comberiat P, Roth - Walter F. Lack of iron, zinc, and vitamins as a contributor to the etiology of atopic diseases. *Frontiers in Nutrition* 2023;9. <https://doi.org/10.3389/fnut.2022.1032481>.

### **AUTHOR CONTRIBUTIONS**

All authors: read and approved the final manuscript.

### **DATA AVAILABILITY STATEMENT**

The data used and analyzed during the current study are available from the corresponding author upon reasonable request.

### **DECLARATION OF GENERATIVE AI USE**

We used generative artificial intelligence technology to assist only in language editing, grammar checking and manuscript formatting. All AI-generated text and figures have been meticulously checked and edited by the authors and are fully accountable and responsible for the accuracy and integrity of the work.

4. Kolarš B, Mijatović V, Živanović N, Minaković I, Gvozdrenović N, Kokeza ID, et al. Iron Deficiency and Iron Deficiency Anemia: A Comprehensive Overview of Established and Emerging Concepts. *Pharmaceuticals* 2025;18:1104–1104. <https://doi.org/10.3390/ph18081104>.
5. Benson CS, Shah A, Stanworth S, Frise C, Spiby H, Lax S, et al. The effect of iron deficiency and anaemia on women's health. *Anaesthesia* 2021;76:84–95. <https://doi.org/10.1111/anae.15405>.
6. Singh P, Saraswat S. Understanding Vitamin D Deficiency: Insights into Epidemiology, Health Impacts, and Supplementation Options. *JOURNAL OF CLINICAL AND DIAGNOSTIC RESEARCH* 2026. <https://doi.org/10.7860/jcdr/2026/88273.23025>.



7. Abhiti A, Saiyed M. Vitamin-D Deficiency: Health Implications and Therapeutic Approaches. *Asian Journal of Pharmacy and Technology* 2024;363–72. <https://doi.org/10.52711/2231-5713.2024.00058>.
8. Kumar A, Ahluwalia K, Edathil AP, Sankar R, Arlappa N, Nair S, et al. Cost-effectiveness of oil and milk fortification by scale for reducing Vitamin A and Vitamin D deficiency in India. *PLoS ONE* 2025;20. <https://doi.org/10.1371/journal.pone.0331790>.
9. Jiang W, Li X, Wang R, Du Y, Zhou W. Cross-country health inequalities of four common nutritional deficiencies among children, 1990 to 2019: data from the Global Burden of Disease Study 2019. *BMC Public Health* 2024;24. <https://doi.org/10.1186/s12889-024-17942-y>.
10. Bailey RL, West KP, Black RE. The Epidemiology of Global Micronutrient Deficiencies. *Annals of Nutrition and Metabolism* 2015;66:22–33. <https://doi.org/10.1159/000371618>.
11. Rajwar E, Parsekar SS, Venkatesh BT, Sharma Z. Effect of vitamin A, calcium and vitamin D fortification and supplementation on nutritional status of women: an overview of systematic reviews. *Systematic Reviews* 2020;9. <https://doi.org/10.1186/s13643-020-01501-8>.
12. Tamilarasi B, Kanchana S, Raghul A, Martin A, J BP, Fathima N, et al. A study to assess the effectiveness of educational intervention regarding the rainbow nutrition chart on knowledge and attitude among mothers of school children in selected UPHC at Chennai. *International Journal of Research in Paediatric Nursing* 2025;7:135–40. <https://doi.org/10.33545/26641291.2025.v7.i2.b.248>.
13. Göbel P, Ercan A, Bayram S. The Impact of Nutrition Education of Parents on Food Choices of Their Children. *Acta Scientifci Nutritional Health* 2020;4:89–98. <https://doi.org/10.31080/asnh.2020.04.0755>.
14. Subramanian G. A Study to Evaluate the Knowledge among Mothers of Children Under-Five Regarding the Prevalence of Nutritional Deficiencies at a Selected Balwadi Centre. *International Journal of Neonatal Care and Pediatric Nursing* 2026;7:16–24. <https://doi.org/10.46610/ijnpcn.2026.v07i01.003>.
15. Chaudhary V, Saraswathy KN, Sarwal R. Dietary diversity as a sustainable approach towards micronutrient deficiencies in India. *International Journal of Microbiology Research* 2022;156:31–45. [https://doi.org/10.4103/ijmr.ijmr\\_3314\\_21](https://doi.org/10.4103/ijmr.ijmr_3314_21).
16. Haridas S, Ramaswamy J, Natarajan T, Nedungadi P. Micronutrient interventions among vulnerable population over a decade: A systematic review on Indian perspective. *Health Promotion Perspectives* 2022;12:151–62. <https://doi.org/10.34172/hpp.2022.19>.
17. Shehzad A, Suleria HAR, Akram S. Editorial: Nutritional interventions for tackling micronutrient deficiencies. *Frontiers in Nutrition* 2024;11:1451493–1451493. <https://doi.org/10.3389/fnut.2024.1451493>.
18. Kapoor A, Baig F, Channa NA, Othman SS, Abualhamael SA, Baig M. Estimation of calories intake, iron, zinc, and selenium among children of the underprivileged area in Sindh, Pakistan. *PLoS ONE* 2024;19. <https://doi.org/10.1371/journal.pone.0304277>.
19. Elegbeleye JA, Fayemi OE, Agbemavor WSK, Krishnamoorthy S, Adebawale OJ, Adeyanju AA, et al. Beyond Calories: Addressing Micronutrient Deficiencies in the World's Most Vulnerable Communities—A Review.



- Nutrients 2025; 17:3960–3960.  
<https://doi.org/10.3390/nu17243960>.
20. Owino V, Kumwenda C, Ekesa B, Parker M, Ewoldt L, Roos N, et al. The impact of climate change on food systems, diet quality, nutrition, and health outcomes: A narrative review. *Frontiers in Climate* 2022;4. <https://doi.org/10.3389/fclim.2022.941842>.
21. Safiri S, Kolahi A, Noori M, Nejadghaderi SA, Karamzad N, Bragazzi NL, et al. Burden of anemia and its underlying causes in 204 countries and territories, 1990–2019: results from the Global Burden of Disease Study 2019. *Journal of Hematology & Oncology* 2021;14. <https://doi.org/10.1186/s13045-021-01202-2>.
22. Ofori KF, Antonietto S, English M, Aryee ANA. Improving nutrition through biofortification—A systematic review. *Frontiers in Nutrition* 2022;9. <https://doi.org/10.3389/fnut.2022.1043655>.
23. Gallina AL, Otay S, Frutos-Lucas J de, Buso M, Martinez PM, Cashman KD, et al. Hidden hunger in Europe: a review on determinants, fragmented policy responses, and implementation barriers. *Frontiers in Nutrition* 2025;12. <https://doi.org/10.3389/fnut.2025.1669008>.
24. Shah N, Zaheer S, Safdar NF, Turk T, Hashmi S. Women’s awareness, knowledge, attitudes, and behaviours towards nutrition and health in Pakistan: Evaluation of kitchen gardens nutrition program. *PLoS ONE* 2023;18. <https://doi.org/10.1371/journal.pone.0291245>.
25. Ajayi OO, Oparah SK, Ezech FE, Olatunji GI. Policy and systems framework linking agricultural practices with improved nutrition outcomes at population level. *International Journal of Applied Research in Social Sciences* 2025;7:783–804. <https://doi.org/10.51594/ijarss.v7i10.2083>.

**HOW TO CITE:** Piyush Ranjan, Manish Kumar, Md Musab Sufiyan, Sushil Raj, Himanshu Roy, Supriya Mehta, Khushi Gupta, Asad Raza, Abel B., Md Sayeed Anwar Awareness Regarding the Role of Diet in the Prevention of Iron and Vitamin D Deficiency Disorders Among Married Women: A Community-Based Educational Intervention Study, *Int. J. of Pharm. Sci.*, 2026, Vol 4, Issue 6, 3660-3672. <https://doi.org/10.5281/zenodo.20703012>

