RESEARCH PAPER

From Diet to Deficiency: A Review of Iron Intake, Food Practices, and Anaemia Risk Among Women of Reproductive Age in Uttarakhand

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Abstract

Relentless iron deficiency is a key but not the sole cause of anemia in women of reproductive age in India, as recent studies confirm that this condition is one of their key public health concerns. Nevertheless, even with the ongoing policy attention, the rates of anemia remain elevated, especially among the socioeconomically disadvantaged and rural communities (Sharif et al., 2023; Belwal et al., 2021). Growing evidence indicates that, besides iron inadequacy, poor diversity of the diet, low bioavailability of non-heme iron, sociocultural food practices, under-reproductive health, as well as unequal access to nutrition services, determine anemia (Roman et al., 2024; Burns et al., 2025). The nutritional environment that is unique to the Himalayan state of Uttarakhand is shaped by the traditional vegetarian diets, food seasonality, agricultural livelihoods, and food system transformation, which could affect iron consumption and the risk of anemia (Bisht et al., 2018; Dwivedi et al., 2024).

This is a review of existing evidence on the iron intake patterns, food practices, and the determinants of anemia among women aged between 15 and 49 years in Uttarakhand. The review uses regional research and national data to investigate the dietary iron sources, absorption enhancers and inhibitors, socioeconomic inequalities, as well as the efficacy of nutritional interventions. It has been shown that although traditional foods have the potential to be nutritionally competent, the lack of diversification of the diet and the inefficient awareness of iron-rich diets are among the reasons why anemia remains a serious threat (Gautam & Singh, 2025; Samant et al., 2025). Moreover, the fact that the correlations between the reported iron intake and the anemia prevalence are weak points to the multifactorial nature of the condition (Swaminathan et al., 2019).

The results point to the necessity of context-sensitive, food-based interventions in addition to better nutrition education and a more robust implementation of public health to solve the problem of anemia in Uttarakhand. To develop effective interventions that would reduce iron deficiency and enhance the level of health outcomes in women in the region, it is important to

have a thorough knowledge of how diet, culture, and socioeconomic conditions interact with each other to promote sustainable interventions.

Keywords

Iron deficiency anemia; Women of reproductive age; Iron intake; Dietary practices; Food bioavailability; Nutritional transition; Uttarakhand; Public health nutrition; Micronutrient deficiency; Dietary diversity.

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1. Introduction

Anemia is still one of the endemic health issues in women of reproductive age (1549 years old), especially in third-world and middle-income countries such as India. It is a multifactorial disease that is associated with decreased haemoglobin level; this is mostly a result of iron deficiency. The national nutrition interventions over decades have not helped the prevalence of anemia among Indian women to be alarmingly high (Belwal et al., 2021; Sharif et al., 2023). The latest literature reviews of survey data that are nationally representative show that anemia is more common among women belonging to socioeconomically disadvantaged groups, rural groups, and marginalized ethnic groups (Sharif et al., 2023; Let et al., 2024).

The most prevalent nutritional deficiency that is reported to be widespread across the world and presents several concerns to women in particular is

iron deficiency anemia (IDA), which is especially alarming because menstruation, pregnancy, and lactation all increase iron demands significantly (Burns et al., 2025; Kumar et al., 2022). Nevertheless, new data indicate that anemia in India can be attributed not only to the poor intake of iron but also to the dietary patterns, bioavailability, infections, reproductive health factors, and socioeconomic determinants (Roman et al., 2024; Swaminathan et al., 2019). Such a complicated etiology introduces the urgency to investigate the problem of anemia in the context of a particular region instead of using only the national rates.

The dietary practices in the Indian Himalayan state of Uttarakhand are determined by geographic isolation, agrarian livelihood, traditional food system, and seasonal food supplies in unique ways. Although the region is abundant in biodiversity and traditional functional food (Dwivedi et al., 2024), dietary diversification is still lopsided and, particularly, in rural and low-income families (Bisht et al., 2018). Although traditional plant-based cuisines are culturally important, they are not always suitable, as they should be diversified to provide sufficient bioavailable iron (Bhatnagar and Padilla-Zakour, 2021). Also, sociocultural activities, including fasting, tea drinking habits, and inadequate consumption of foods of animal origin, have the potential to impact iron absorption and nutritional status in general (Peter et al., 2025; Khare et al., 2022).

Research paying particular attention to Uttarakhand reveals persisting deficiencies in iron consumption among young and expectant women, which suggests that nutritional insufficiency could continue to be one of the key factors that put women in Uttarakhand at risk of experiencing anemia (Gautam & Singh, 2025). Meanwhile, insufficient knowledge, inadequate

nutrition knowledge, and unequal compliance with supplementation programs also contribute to making the challenge of controlling anemia even harder (Samant et al., 2025; Armes et al., 2025). The results support the significance of the connection between dietary consumption, food habits, and the results of anemia in a local context.

Further, the evidence at the national level indicates an increase or no changes in the prevalence of anemia among women in consecutive survey rounds, which creates concerns about the success of current interventions (Chakrabarty et al., 2023; Das et al., 2024). The inconsistent results of a weak correlation between reported dietary iron intake and the prevalence of anemia in certain Indian studies make it possible to believe that bioavailability, absorption inhibitors, and non-dietary factors should be taken into consideration, as well (Swaminathan et al., 2019; Nair and Iyengar, 2009). Thus, there is a need to conduct a region-specific synthesis to examine the interaction of dietary shifts, cultural food habits, and socioeconomic susceptibility to support the risk of anemia in Uttarakhand.

It is against this context that the current review seeks to summarize the available literature on iron consumption, dietary habits, and anemia risk of women of reproductive age in Uttarakhand. Combining the results of nutritional epidemiology, social health research, and food systems research, this review aims to list the main determinants, share gaps in research, and direct context-related interventions to the specificities of the socio-cultural and geographical situation in the state.

2. Methodology of the Review

In this review, the literature regarding iron intake, dietary habits, and risk of anemia in women of reproductive age will be reviewed using a narrative synthesis approach to studying the problem in Uttarakhand. The search strategy formulated was a systematic search of the peer-reviewed research articles, cross-sectional and narrative reviews, and secondary data analysis of anemia, iron nutrition, and dietary determinants among Indian women with specific emphasis on the Himalayan and Uttarakhand situations.

Electronic databases have been explored with the help of the following combinations of keywords: iron deficiency anemia, women of reproductive age, dietary practices, iron bioavailability, Uttarakhand, Himalayan food systems, and nutritional determinants. The studies were included in the period between 2009 and 2025 as they were believed to reflect both the evidence base and the recent evidence. To contextualize comparison to determine trends and determinants of anemia among Indian women, nationally representative analyses

were incorporated that studied the trends and determinants of anemia (Sharif et al., 2023; Let et al., 2024). To make sure that the chosen region has a contextual relevance, the dietary patterns of Uttarakhand and iron consumption were investigated first (Gautam and Singh, 2025; Dwivedi et al., 2024).

Inclusion criteria were those studies that:

1. Studied the prevalence of anemia in women between 15 and 49 years.
2. Explored dietary iron intake, dietary diversity, or food practices that affect iron status.
3. Evaluated socioeconomic, cultural, or reproductive determinants of anemia.
4. As long as there is evidence applicable to India, hopefully in the Uttarakhand or Himalayan areas.

The exclusion criteria were a study that was purely

based on pediatrics or males; a clinical case report would not satisfy all empirical support and non-peer-reviewed sources.

The studies on iron metabolism, bioavailability, and nutritional intervention methods also found their way to the review in order to learn about the mechanistic processes that connect diet and deficiency (Kumar et al., 2022; Malhotra et al., 2023). It involved literature analyzing diets based on plant eating and how it can influence iron uptake to place the local food culture into perspective (Bhatnagar and Padilla-Zakour, 2021).

The thematic categorization of the data on the selected studies was carried out into the areas:

(i) biological importance of iron, (ii) burden of anemia, (iii) dietary pattern and traditional food system in Uttarakhand, (iv) factors influencing iron absorption, (v) socioeconomic and reproductive determinants, and (vi) policy responses and public health interventions. The qualitative synthesis method was employed to uncover patterns, consistencies, and gaps in the literature instead of doing a meta-analysis because the studies were heterogeneous in terms of study design, measurement tools, and reporting of results.

The weaknesses of this review are possible publication bias, inaccessibility of district-level data on dietary intake in Uttarakhand, and inconsistency of hemoglobin measurement in different studies. Though limited, the narrative approach enables one to have a combined interpretation of the interface between dietary practices and contextual determinants to affect the risk of anemia in women of the area.

3. The Iron and Its Biological Importance.

Iron is a vital trace mineral that is central to the transportation of oxygen, cellular respiration, DNA synthesis, and immune reactions. It is a vital part of hemoglobin and myoglobin and helps to carry oxygen to tissues around the body and keep the metabolic processes active. Iron deficiency is especially dangerous to women of reproductive age because of menstrual blood loss, pregnancy-related high physiological demands, and lactation. In the case when iron intake or absorption is lower than these needs, iron stores become depleted, and iron deficiency anemia may develop in the long term (Kumar et al., 2022; Burns et al., 2025).

There is a close homeostasis of iron in the human body, as the absorption and not the excretion. The small intestine, and especially the duodenum, has a major role to play in regulating iron uptake. Dietary iron is found in two major forms: heme and non-heme iron, which are found in animal and plant foods, respectively. There is better absorption of heme iron, but the non-heme iron absorption is very sensitive to dietary enhancers and inhibitors (Malhotra et al., 2023). Bioavailability is a decisive factor of iron status in populations with a large proportion of plant diets, including most communities in Uttarakhand (Bhatnagar and Padilla-Zakour, 2021).

Table 1. Physiological Roles and Recommended Iron Requirements in Women

Function of Iron	Mechanism	Health Impact of Deficiency	Reproductive Impact
Hemoglobin formation	Oxygen transport in RBCs	Fatigue, pallor	Increased maternal mortality risk
Myoglobin synthesis	Oxygen storage in muscles	Weakness	Reduced physical capacity
Enzyme function	Cellular respiration	Poor immunity	Higher infection susceptibility
DNA synthesis	Cell division	Growth impairment	Poor fetal development

Sources: Indian Council of Medical Research (ICMR-NIN, 2020), WHO (2017), National Institute of Nutrition

The iron needs depend on the stage of life, and women (15 49 years old) need an iron amount that is considerably higher than men because of reproductive physiology. Poor consumption

compared with physiological requirements leads to a build-up of depletion of ferritin reserves and hemoglobin, which enhances fatigue, decreased working potential, impaired cognitive functioning, and negative maternal results. It has been indicated that iron deficiency in women may lead to poor pregnancy, low birth weight, and malnutrition, which may be transmitted across generations (Roman et al., 2024).

Nevertheless, iron deficiency anemia is becoming a disease that has been found to be caused by a combination of biological and environmental conditions. Poor gut health, inflammation, parasitism, and genetic hemoglobin disorders can affect iron usage despite an apparent sufficient level of iron intake in the diet (Swaminathan et al., 2019). This is especially applicable in the Indian case; whereby dietary intake is not always sufficient to elucidate the prevalence trends of anemia. Consequently, the investigation of iron metabolism

in combination with nutritional habits and local food systems is essential to develop successful interventions in such states as Uttarakhand.

4. Burden of Anaemia among Women of Reproductive Age.

Anaemia is still among the most common micronutrient deficiencies among reproductive-age women in India. According to national surveys, it was revealed that the prevalence rates remain high in consecutive survey rounds, with a slight reduction over the period (Belwal et al., 2021; Chakrabarty et al., 2023). There is a high risk of anemia in socioeconomic factors, rural dwelling, low education, and marginalized status of the social group (Sharif et al., 2023; Let et al., 2024).

Women who have high fertility rates, brief birth intervals, and recent birth history are more susceptible to iron deficiency because of frequent iron store depletion (Das et al., 2024). Suburban residents frequently suffer additional disadvantages such as a lack of dietary variety, a lack of health care, and an increased susceptibility to infection (Kshatrapal et al., 2023; Sridharan et al., 2025). All these factors are structural and biological, and they maintain a high prevalence of anemia in women.

Geographic isolation and poor infrastructure could also limit access to diversified diets and nutrition services in the hilly areas like Uttarakhand. Although there is a lack of particular district-level data, there are regional studies that have shown that young and pregnant women in the state have poor iron consumption (Gautam & Singh, 2025). Since the dietary intake, socioeconomic vulnerability, and reproductive demands are interacting factors, the problem ofanemia in Uttarakhand should be conceptualized within a unique ecological and cultural context.

Table 2. Prevalence of Anemia Among Women (15–49 Years)

Survey/Study	Year	National Prevalence (%)	Uttarakhand (%)	Rural (%)	Urban (%)
NFHS-4	2015–16	53.1	~45–50	Higher	Lower
NFHS-5	2019–21	57.0	~48–52	Higher	Lower
Belwal et al.	2021	—	50+	High	Moderate

Sources: National Family Health Survey (NFHS-4, NFHS-5), Ministry of Health and Family Welfare, Government of India, Belwal et al., 2021

Prolonged anemia is not only a health issue amongst women, but has wider population health effects which can be seen through lowered productivity, maternal morbidity, as well as poor neonatal outcomes. The prevalence of the high burden highlights the importance of combined treatment approaches that should go beyond supplementation and include holistic dietary and structural treatment.

5. Iron Intake Patterns in Dietary Intake in Uttarakhand.

Traditional food systems, agricultural activities, socioeconomic status, and availability of foods during the season influence the dietary intake of iron to women of reproductive age in Uttarakhand. The dietary pattern of the region is largely vegetarian, as it depends on cereals, millets, and pulses, as well as the green leafy vegetables that are found locally. Although most of these foods are non-heme protein sources of iron, the total bioavailability is low because of the presence of absorption inhibitors like phytates and polyphenols (Bhatnagar & Padilla-Zakour, 2021).

The studies that are specifically conducted on Uttarakhand suggest that young and pregnant women fail to achieve the advised levels of iron intake with the help of the diet only (Gautam & Singh, 2025). The low consumption of animal foods, including meat, poultry, and fish, also decreases access to highly bioavailable heme iron. Moreover, nutrition uniformity and poor diversification also result in micronutrient deficiency, especially in rural and hill areas where there is limited access to food (Bisht et al., 2018).

Table 3. Traditional Iron-Rich Foods of Uttarakhand

Local Name	Common Name	Type of Iron	Nutritional Benefit
Mandua	Finger millet	Non-heme	High calcium & fiber
Jhangora	Barnyard millet	Non-heme	Rich in minerals
Gahat	Horse gram	Non-heme	Protein-rich
Bhatt	Black soybean	Non-heme	Antioxidants
Pahadi Palak	Local spinach	Non-heme	Folate-rich

Sources: Dwivedi et al., 2024, Nautiyal et al., 2025, Bisht et al., 2018, Regional agricultural extension reports

However, Himalayan traditional diets also contain nutrient-dense local food items like finger millet (mandua), barnyard millet (jhangora), pulses like gahat (horse gram), and seasonal leafy vegetables, which also have high nutritional potential (Dwivedi et al., 2024; Gupta and Harti, 2025). The problem is not about the lack of iron-containing foods but the balance of the diet, the way of preparing the food, and the general composition of meals. Improving the iron adequacy in women in the area could be achieved by strengthening awareness about iron-rich combinations and increasing dietary diversity.

6. Influencing Factors of Iron Absorption and Bioavailability.

The absorption efficiency and bioavailability determine the iron status, not based only on intake quantity. Most of the iron in plant-based food is non-heme iron, which is very sensitive to the dietary enhancers and inhibitors (Malhotra et al., 2023). Vitamin C-based foods improve the absorption of iron by decreasing ferric iron to the more absorbed form of ferrous, whereas phytates (in cereals and legumes), tannins (in tea), and calcium may slow down absorption (Peter et al., 2025; Nair and Iyengar, 2009).

The eating patterns of people, such as the high intake of tea, meals based on cereals, and little intake of fresh fruits in Uttarakhand, can inadvertently reduce the bioavailability of iron. Also, iron retention is affected by food processing methods. Conventional fermentation and soaking might decrease the phytate levels and enhance the absorption of minerals, but not all are uniformly used (Khare et al., 2022).

Table 5. Dietary Enhancers and Inhibitors of Iron Absorption

Factor	Category	Mechanism	Common Sources	Effect
Vitamin C	Enhancer	Reduces ferric to ferrous iron	Citrus, amla	↑ Absorption
Fermentation	Enhancer	Reduces phytate	Fermented batters	↑ Bioavailability
Phytates	Inhibitor	Bind iron	Whole grains	↓ Absorption
Tannins	Inhibitor	Form complexes	Tea, coffee	↓ Absorption
Calcium	Inhibitor	Competes for absorption	Milk	↓ Absorption

Sources: WHO (2017), Khare et al., 2022, Malhotra et al., 2023

The new data indicate that in India, anemia is loosely related to the reported dietary intake of iron, which highlights the need to consider bioavailability, inflammation, and infection-related processes (Swaminathan et al., 2019). Therefore, to ameliorate the iron status, it is not only necessary to increase the intake of iron-rich foods but also to optimize the dietary habits to make them more efficient in terms of iron absorption.

7. Socio-Demographic and Reproductive Determinants of Anemia

Socioeconomic, educational, and reproductive factors have a stranglehold over anemia in women of reproductive age. At the national level, it is also shown that women with low levels of wealth, rural households, and socially disadvantaged individuals have much higher levels of anemia prevalence (Sharif et al., 2023; Let et al., 2024). Poor nutrition knowledge and the lack of education also enhance dietary deficiencies and decrease adherence to supplementation programs (Samant et al., 2025).

Reproductive behavioral trends are also very important. There is a close connection between early marriage, multiple pregnancies, short intervals between births, and recent childbirth and depleted iron stores, as well as a high risk of anemia (Das et al., 2024). Women who have had several pregnancies with insufficient nutritional supplements are at a high risk.

The geographic factors in Uttarakhand and trends in migration can reduce the uniformity in access to healthcare, including iron supplementation coverage and antenatal monitoring. Also, food distribution practices in the household and gender norms can affect the quality of the diet and the frequency of meals consumed by women. The rural setting of India indicates that a lack of socioeconomic standing and nutritional deficiency tend to go hand in hand, which increases the risk of anemia (Kshatrapal et al., 2023; Sridharan et al., 2025).

Response to anemia in Uttarakhand must therefore be multidimensional, consisting of dietary interventions alongside education, reproductive health services, and socioeconomic empowerment interventions.

8. Interventions and Policy Responses in Public Health.

The generations of campaigns targeting to combat anemia in women of reproductive age in India have been more inclined to iron folic acid supplements, food fortification, deworming programs, and behavior change communication programs. Even with such organized interventions, anemia is prevalent, meaning there is a lapse in implementation, adherence, and contextual fit (Kumar et al., 2022; Belwal et al., 2021). Supplementation programs have proven to be effective under controlled settings, but in real-life scenarios, the gastrointestinal side effects, unpredictable supply chains, lack of counseling, and follow-up monitoring have all been identified to hamper compliance.

Scalable solutions have been advocated, such as food fortification, specifically, iron fortification of staple foods. However, it has been shown that the number of dietary iron intake and prevalence of anemia are not always strongly correlated, which suggests that only fortification might not be effective enough to cover the multifactorial etiology of anemia (Swaminathan et al., 2019). Furthermore, the bioavailability of fortified iron compounds and the interaction with their inhibitors found in the cereal-based diets is also a matter of concern (Khare et al., 2022).

Nutrition education and community-based awareness in Uttarakhand have had some potential in enhancing anemia prevention knowledge, attitudes, and practices (Armes et al., 2025). Nevertheless, the long-term behavioural shift would have to be implemented with the incorporation of the local food systems, dietary advice that is accepted culturally, as well as repetitive involvement of the frontline health workers. A change of focus towards food-based, culturally based interventions; these, in addition to supplementation, may result in greater long-term sustainability and efficacy.

9. Conventional Food Systems and Nutritional Potential in Uttarakhand.

The food systems in Uttarakhand are agro-based and have a strong foundation of agroecological diversity and indigenous farming. Millet and pulses like mandua (finger millet) and jhangora (barnyard millet), leafy vegetables that are present during various seasons, are inherent ingredients of the local food. Such foods are known to be rich in micronutrients and are resistant to hill farming (Dwivedi et al., 2024; Sharma, 2025).

Fermented preparations and varied dishes made of plants are also a part of local dietary traditions, which can be beneficial to increasing the bioavailability of minerals when well prepared (Gupta & Harti, 2025). Modernizing and revitalizing these traditional foods by using sustainable food technology methods has been proposed as a measure to enhance food intake of the micronutrients and maintain cultural identity (Nautiyal et al., 2025).

Nevertheless, market integration, migration, and change of lifestyles have created a shift in the diet whereby individuals are increasingly depending on refined cereals and processed foods, which may lower the micronutrient content. The existing research on local food systems demonstrates that the household-based diversification of diets is not balanced, especially in rural areas that have limited resources (Bisht et al., 2018). Using traditional nutrient-dense foods and enhancing diet balance might be a culturally-congruent way of dealing with iron deficiency in the state.

10. New Dietary practices and Food-Based interventions.

The latest sources note that it is necessary to leave the field of supplementation and enter a new area of dietary interventions that can increase iron levels and absorption. Interventions based on food supplements, such as the encouragement of iron-rich plant foods and the presence of vitamin C richness, the decrease of inhibitory dietary elements, and meal diversification, are becoming accepted as sustainable solutions (Malhotra et al., 2023).

Though culturally popular, a vegetarian diet should be planned to meet the rules of micronutrient density. Diversified diets might not be accessible because of socioeconomic constraints, and thus, specific nutrition education is necessary (Bhatnagar and Padilla-Zakour, 2021). There is also a rise in functional foods innovations and biofortification strategies as methods to enhance the amount of iron intake in the population (Khare et al., 2022).

Moreover, combined mitigation interventions of dietary counseling, infection control, reproductive health services, and socioeconomic empowerment have also been suggested to address the issue of anemia in a comprehensive way (Kumar et al., 2022). In Uttarakhand, the strategies need to be adjusted to the patterns of local food culture and seasonal availability to improve effectiveness and be accepted by the community.

11. Research Gaps and Future Directions

Even though the prevalence data through national surveys are comprehensive, there is still a gap in district-level dietary intake assessment of Uttarakhand. Few longitudinal investigations limit the knowledge of the causal routes linking dietary habits and the outcomes of anemia. Additionally, the fact that the reported iron intake and anemia prevalence were weakly correlated in some Indian studies implies that inflammation, hereditary factors, and environmental factors should be examined further (Swaminathan et al., 2019; Roman et al., 2024).

There is also a lack of qualitative research

investigating female perceptions of diet, cultural food taboos, intra-household food distribution, and compliance with supplementation programs. Increasing community-based participatory studies in hill districts would help give detailed information about obstacles and facilitators of proper intake of iron.

Future studies are needed to focus on:

- Dietary diversities in rural and urban Uttarakhand were measured in detail.
- Decision: Some form of evaluation will be necessary regarding the outcomes of the traditional food revitalization programs on iron status.
- Implementation studies of adherence to supplementation programs.
- The combination of nutrition, agriculture, and gender studies.

Avoiding these gaps will help in formulating region-specific evidence-based interventions that can help in reducing the anemia burden in women of reproductive age in Uttarakhand.

12. Conclusion

The problem of anemia in reproductive women in Uttarakhand is a longstanding complex health issue that is influenced by nutritional, biological, socioeconomic, and cultural factors. Although iron deficiency is one of the main factors with which to attribute the problem, the facts show that anemia among this group cannot be explained only by insufficient iron intake. Poor nutrition and low dietary diversity, low bioavailability of non-heme iron in mostly

vegetarian diets, common use of absorption inhibitors, reproductive health requirements, and structural disparities all contribute to susceptibility in women between 15 and 49 years of age.

The review points out that the nutritional strengths of the traditional food systems in Uttarakhand include the presence of iron-enriching millets, pulses, as well as native leafy vegetables. Nonetheless, modernization, diet changes, unequal availability of household food, and lack of nutrition awareness could lead to the waste of these resources. Moreover, the current national policies, including iron-folic acid supplementation and food fortification, although relevant, seem to be inadequate when applied without a powerful contextual modification, long-term adherence, and combined nutritional education.

One of the main lessons gained in the literature is that merely raising the level of iron consumption might be insufficient to solve anemia without also focusing on bioavailability, infection management, reproductive health services, and empowering women. Thus, to resolve the problem of anemia in Uttarakhand, a universal strategy should be implemented which would combine food-based intervention, the restoration of the nutritious diets of the population, the culturally-sensitive nutrition education, and the enforcement of the mechanisms of the application of public health.

The coming work must focus more on localized food intake evaluations, district-based studies, and localized interventions that are congruent with the ecological and sociocultural realities of the Himalayan area. The sustainable change in the iron status and the health outcomes of women in general can be improved by closing the divide between modern nutritional science and traditional food wisdom.

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