

International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2026): 5.29
IJABR 2026; SP-10(4): 957-960
www.biochemjournal.com
Received: 12-01-2026
Accepted: 16-02-2026

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Understanding phytate in urban diets: A study on knowledge, attitudes, and practices affecting mineral bioavailability in Ahmedabad

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DOI: <https://www.doi.org/10.33545/26174693.2026.v10.i4SI.8246>

Abstract

Phytate, often found in grains, beans, and millets, can make key minerals like iron, zinc, and calcium harder for your body to absorb. The study looked at what people in Ahmedabad know, think, and do about foods high in phytate, and how those foods affect mineral absorption. Researchers surveyed 200 adults using a set questionnaire. People ate a lot of foods high in phytate, but most didn't know how phytate can reduce mineral absorption. People often soaked, fermented, and sprouted foods out of routine, not because they understood the science behind it. People with different education levels showed a clear link to phytate awareness ($p < 0.05$). The study finds that people's eating habits don't match what they know about nutrition, so it calls for focused education to help minerals be absorbed better.

Keywords: Phytate, mineral absorption, anti-nutritional factors, dietary practices, nutrition awareness

Introduction

In recent years, more attention has been given to plant-based diets because they can help the planet, cost less, and lower the risk of long-term diseases. In cities across India, like Ahmedabad, people mostly eat cereals and pulses, and traditional grains such as millets are making a comeback. These foods pack a lot of nutrition and make up many everyday meals, but they also contain phytate, a naturally occurring substance that affects human nutrition in more than one way. Phytate, also called myo-inositol hexakisphosphate (IP6), is the main way plants store phosphorus in their seeds, making up a large share of the seed's total phosphorus (Kumar *et al.*, 2010) [5]. Because of its strongly negative structure, it grabs onto positively charged minerals, especially iron, zinc, and calcium, forming hard-to-digest compounds that the body can't easily absorb in the stomach and intestines (Hurrell, 2004) [3]. This property makes phytate an important dietary factor because it affects mineral absorption, especially in people who eat mostly plant-based foods. Phytate's nutritional effects matter a lot in India. Even with more food, many people still lack key vitamins and minerals. Iron-deficiency anemia still affects many women and young people, even in cities where food is easier to get. The Indian Council of Medical Research says this paradox isn't caused only by people not getting enough nutrients. It's also strongly shaped by how well the body absorbs them, including the effect of anti-nutritional substances like phytate (ICMR, 2020; Gibson, 2007) [4, 1]. At the same time, it's important to remember that phytate isn't only harmful. New studies suggest it may protect the body in several ways: acting as an antioxidant, helping control blood sugar, and possibly reducing cancer risk. Because it has both helpful and blocking effects, judging its nutrition is tricky, so you need a fair, balanced view that weighs both sides (Gupta *et al.*, 2015) [2]. For centuries, traditional Indian diets used different processing methods that, without meaning to, help reduce the harmful effects of phytate. Soaking, fermenting, sprouting, and roasting can switch on the body's own phytase enzymes, which break phytate down into smaller inositol phosphate forms and make minerals easier for the body to use (Sandberg, 2002) [6]. For instance, fermented foods and sprouted legumes have much less phytate than their raw versions. But as cities grow fast and daily habits change, these practices are being reshaped, and science is learning more about them. In today's busy city homes, people cook in ways shaped by limited time, convenience,

and the foods they're into now. Some old traditions still carry on, but people keep doing them without realizing how they affect nutrition. At the same time, millets are being pushed as "superfoods" or "nutri-cereals" because they're rich in fiber and key micronutrients. Still, millets contain a fair amount of phytate, which may affect how well your body absorbs minerals, so it's important to weigh their health benefits against that drawback. Even though this issue matters more than ever, we still don't have enough consumer-level data on how city people view phytate and what it does. Most studies have looked at chemicals and food processing, but they haven't paid much attention to behavior or people's awareness. To close this gap, you need to understand what people know, how they think, and what they actually do about food, because results depend not just on what's in meals, but also on personal choices, culture, and how aware people are. So, this study looks at what people in Ahmedabad know about phytate-rich foods, what they think about them, and how they deal with them day to day. By looking at phytate in the wider picture of what people eat and how aware they are about nutrition, this study hopes to guide specific nutrition education and help minerals from plant-based diets be absorbed better.

2. Materials and Methods

2.1 Study Area and Design

This study used a descriptive cross-sectional design to look at people's knowledge, attitudes, and practices about phytate-rich foods and how they think these foods affect mineral absorption. This study plan made sense because it lets you gather information from a specific group at one time, giving a clear snapshot of what people know, how they feel, and what they eat, without changing anything. The study took place in Ahmedabad's city areas, a fast-growing metropolis in western India. The city is home to people from many educational backgrounds, occupations, and income levels, so it's a good place to study everyday food

knowledge and eating habits. The study focused on adult people living in Ahmedabad, students, homemakers, and working professionals. Participants with diverse dietary patterns were included, with particular emphasis on individuals consuming predominantly plant-based diets, as these are most relevant for assessing phytate intake. The study involved 200 respondents, chosen using the sampling method described in this section. The sample size was large enough to run both descriptive and inferential statistics for the KAP-based survey.

2.2 Study Population and Sampling:

The study population consisted of adult individuals residing in the urban areas of Ahmedabad. A total of 200 respondents were selected using a convenience sampling technique, ensuring representation from different age groups, educational backgrounds, and occupations.

Inclusion Criteria

- Individuals aged 18-60 years
- Residents of Ahmedabad for at least one year
- Willing to participate voluntarily

Exclusion Criteria

- Incomplete responses
- Individuals unwilling to provide consent

2.3 Development of Data Collection Tool

Data were collected using a structured questionnaire developed specifically for this study based on the Knowledge-Attitude-Practice (KAP) framework. The questionnaire was designed to capture comprehensive information related to dietary patterns, awareness of phytate, and food preparation behaviors.

2.4 Structure of Questionnaire

Table 1: Domains and Key Areas Covered in the Questionnaire

Domain	Focus Area	Example Question	Response Options
Consumption Pattern	Frequency of intake	How often do you consume cereals?	Daily/Weekly/Occasionally
	Preferred food choices	Which meal do you prefer most?	Breakfast/Lunch/Dinner/Snacks
Types of Foods	Variety of phytate-rich foods	Which of the following do you consume regularly?	Cereals/Pulses/Millet/Nuts
Knowledge	Awareness of phytate	Have you heard about phytate?	Yes/No
	Nutritional understanding	Does phytate affect mineral absorption?	Yes/No
Attitude	Perception towards diet	Plant-based diets are healthy	Strongly Agree → Strongly Disagree
Practices	Cooking methods	Do you soak pulses before cooking?	Always/Sometimes/Never
	Food combinations	Do you include vitamin C-rich foods?	Yes/No/Sometimes
Health Awareness	Nutrition-related knowledge	Are you aware of anemia?	Yes/No

The questionnaire was pre-tested on 15 individuals to evaluate clarity, relevance, and comprehension. Based on the feedback, necessary modifications were made to improve the wording and sequencing of questions.

2.5 Data Analysis:

The collected data were coded and analyzed using descriptive and inferential statistical techniques:

- **Descriptive statistics:** Frequency and percentage
- **Inferential statistics:** Chi-square test to assess the association between variables

A significance level of $p < 0.05$ was considered statistically significant.

3. Results and Discussion

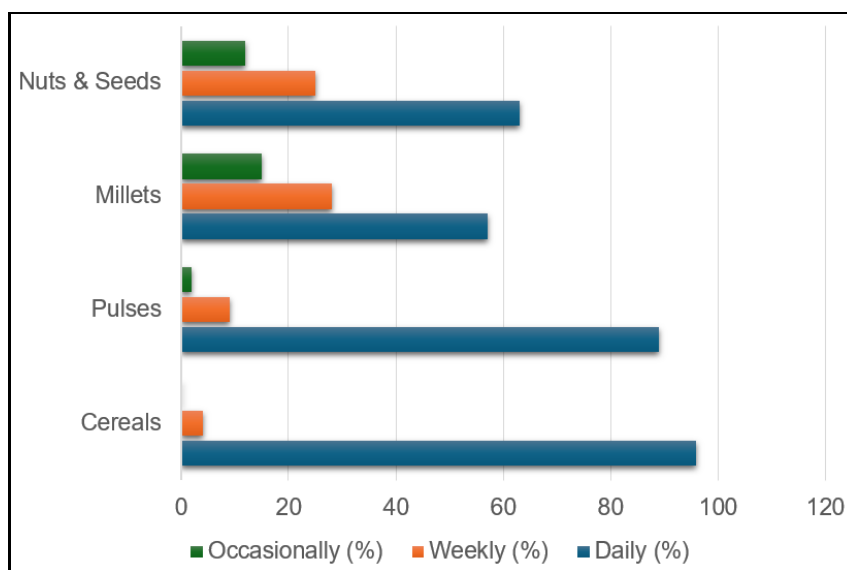
3.1 Socio-Demographic Profile of Respondents

The study surveyed 200 people in Ahmedabad, with a mix of different social and demographic backgrounds. The group had 60% women and 40% men, so women were a bit more represented. That's typical in nutrition surveys, since women often play a big role in what families eat at home. Nearly half the participants were aged 18-30 (46%). The next group was 31-45 years (34%), and the remaining 20% were 46-60 years old. About 72% of the people surveyed had graduated or more, showing that the city residents were fairly well educated. Even though most participants had a lot of formal education, the results showed they didn't really understand phytate or what it means for nutrition. This

means that schooling by itself may not be enough to build practical nutrition knowledge, especially about things like anti-nutritional factors.

Table 2: Demographic Distribution of Respondents

Variable	Category	Frequency (n = 200)	Percentage (%)
Gender	Female	120	60
	Male	80	40
Age	18-30	92	46
	31-45	68	34
	46-60	40	20
Education	Up to 12th	56	28
	Graduate & Above	144	72



Graph 1: Food Consumption Pattern

3.3 Knowledge Regarding Phytate and Mineral Bioavailability

Only 23% of people said they had heard of phytate, and just 18% knew it can lower how well minerals are absorbed. About 21% knew ways to lower phytate, including soaking and fermenting. These results show that many city consumers don't know much about phytate. Even in a mostly educated group, most people barely knew the concept or why it's nutrition matters.

3.4 Attitudes towards Phytate-Rich Foods and Nutrition

The survey found that 78% thought plant-based diets are healthy, and 69% preferred whole grains over refined ones, showing their choices fit today's diet advice. Only 14% of respondents said diet planning should account for anti-nutritional factors; most stayed unsure or disagreed. The findings show that respondents feel good about healthy eating, but their knowledge is still broad and doesn't really cover the more detailed issues, like anti-nutritional components. It suggests people may choose healthy foods, but they don't fully understand what affects how their bodies absorb and use nutrients.

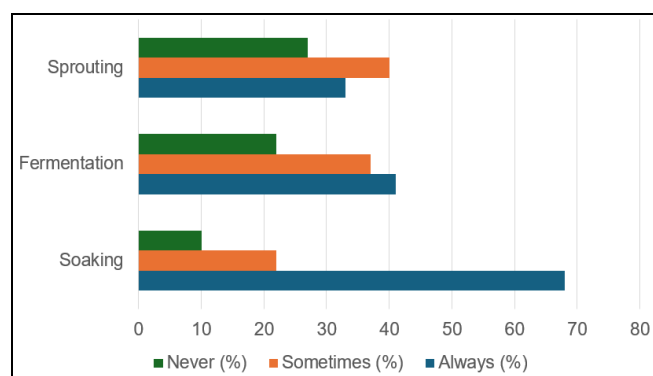
3.5 Food Preparation Practices Influencing Phytate Content

The study reported that 68% always soak, 41% regularly ferment, and 33% eat sprouted foods as part of their routine. These results show that many city families still rely on

3.2 Dietary Consumption Patterns of Phytate-Rich Foods

The food survey showed that everyone often ate foods high in phytates. Almost all participants ate cereal every day, 96% ate wheat or rice, while 89% said they also had pulses and legumes daily. About 57% ate millets regularly, showing they're gaining popularity in city meals, while 63% said they eat nuts and oilseeds often. Since daily meals are mostly cereals and pulses, the diet is naturally high in phytates. Even though these foods are nutritious, eating them often without proper preparation can reduce how well your body absorbs minerals. Including more millets is good for sustainability and nutrients, but it also makes it even more important to understand how phytates affect what we eat.

traditional methods to process their food. But the answers we got showed people followed these habits mainly because of routine, personal taste, or cultural norms, not because they knew the nutritional benefits. This means people's current eating habits can be the starting point for nutrition lessons, using clear science to build on what they already do.



Graph 2: Preparation Practices

3.6 Health Awareness and Perceived Dietary Influence

Most respondents, 72%, said they knew about anemia, and 81% agreed that diet affects how well minerals are absorbed. Still, only 38% said they or their family had anemia. Even though many people seem aware of nutrition

and related health issues, they don't really know specifics like phytate. So their understanding is more on the surface than something they can put into practice. If people don't connect diet and micronutrient needs, food changes may not work as well.

Table 3: Health Awareness

Parameter	Yes (%)	No (%)
Aware of anemia	72	28
Diet affects absorption	81	19
History of anemia	38	62

3.7 Association between Education and Phytate Awareness

Using a chi-square test, the numbers showed a clear link ($p < 0.05$) between education level and knowledge of phytate. Even though people with higher education seemed more aware, everyone still lacked enough knowledge, no matter which group they were in. This shows why nutrition education must fit the real situation, teaching people what to eat in everyday life, not just academic facts.

3.8 Discussion

This study sheds light on how people's eating habits connect with what they know about good nutrition. People eat plenty of phytate-rich foods, but most still don't realize how these foods can limit mineral absorption. This finding matters a lot because phytate is well known to block the absorption of both iron and zinc. Research shows that phytate can latch onto minerals with two positive charges, making them harder to dissolve and less likely to be absorbed in the gut (Hurrell, 2004) [3]. When people rely heavily on plant-based foods, these interactions can still lead to low vitamin and mineral levels, even if their diet seems enough. This study found low awareness, matching earlier work that shows most people don't really understand anti-nutritional factors (Gibson, 2007) [1]. Nutrition programs may push certain food groups, but they don't always explain the factors that affect how well your body uses nutrients. So, people might eat better, but they still may not get the best possible nutrition. The study found something encouraging: many people still use old methods like soaking, fermenting, and sprouting to prepare food. These approaches lower phytate levels a lot by turning on the body's own phytase enzymes, which helps minerals absorb better (Sandberg, 2002) [6]. Because many people don't understand what these practices actually do, they're kept more like traditions than like thoughtful, informed decisions. People are eating more millets now, which shows the country's push for sustainable, healthy diets. Millets offer fiber and key micronutrients, but they also contain a lot of phytates. So, if they aren't processed the right way, you might not get all the nutrition they could provide (Gupta *et al.*, 2015) [2]. A clear link between education and awareness suggests that what people know helps shape how they understand their diet. Even among well-educated people, low awareness about nutrition still shows up, which suggests that typical school programs may not teach the practical parts, like how well the body can absorb nutrients. Overall, the results show we need more connected nutrition education, teaching people to pick healthy foods and helping them understand how those foods work in the body. By combining old food traditions with modern science, we can raise the quality of what people eat and better prevent micronutrient shortages.

4. Conclusion

This study sheds light on what people in Ahmedabad know, believe, and do about phytate-rich foods, and how those foods affect mineral absorption. The results show that many people eat plant-based foods, but few know phytates are there or what that means nutritionally. Cereals, pulses, and millets make up much of what people eat each day, but only a few respondents knew about phytate and how it can lower mineral absorption. This suggests that even if diets look like they match general health advice, we don't always have a full understanding of what affects how well nutrients are used. Encouragingly, many respondents said they regularly soak, ferment, and sprout traditional foods as part of their usual routine. Still, people mostly did these things out of tradition, not because they knew the nutrition facts. This points to a real chance to make current habits work better by mixing science with traditional ways, improving how well minerals are absorbed. The research also shows that education helps people understand nutrition, because higher education levels were strongly linked to better knowledge of phytate. Even well-educated people seem to have little awareness, which suggests today's nutrition education doesn't really help them with the practical, everyday side of eating. As people push plant-based diets and millets for sustainable nutrition, we need a wider view, enjoying their health benefits while also being aware of any downsides. By using simple home habits to handle phytate, people can learn to improve how well minerals are absorbed, without having to overhaul their diets. To get the most health benefits from plant-based eating, we need to close the gap between what people eat and what they understand about nutrition. Carefully designed nutrition lessons, using both age-old knowledge and solid science, can greatly improve what city people eat and help prevent vitamin and mineral shortages.

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