



## ENCOURAGING CONSUMPTION OF WHOLE MULTIGRAIN

Vaishali Choudhari

Department of Home Economics,  
Shri Niketan Arts Commerce College, Reshimbag, Nagpur  
\*Corresponding Author: [abhiyanki216@gmail.com](mailto:abhiyanki216@gmail.com)

Communicated : 20.08.2025

Revision : 07.09.2025  
Accepted : 25.09.2025

Published: 15.10.2025

### ABSTRACT:

Whole multi grain—grains that retain the bran, germ, and endosperm either individually or in combination—are nutrient-dense foods linked to reduced risk of chronic diseases, improved metabolic health, and better micronutrient status. Despite robust evidence of benefit, global consumption of whole grains remains below dietary recommendations in many populations.

This paper investigates strategies to encourage the consumption of whole multigrain through an integrative approach that blends nutrition education, product innovation, policy incentives, supply-chain interventions, and behaviour-change techniques. Using a mixed-methods design (cross-sectional consumer survey, focus groups, and a pilot intervention), we assessed determinants of whole multigrain intake, evaluated acceptance of multigrain products, and tested a multi-component intervention combining school-based education, supermarket nudges, and product labelling in a small urban sample.

Key findings indicate that lack of awareness about definitions and benefits, sensory preferences (taste/texture), perceived cost, and limited availability are primary barriers to adoption. Facilitators include health motivations, family influence, product convenience, and appealing taste. The pilot intervention (8 weeks) resulted in a statistically significant increase in self-reported whole multigrain servings per week and improved knowledge scores. Practical recommendations include: (1) standardised front-of-package labelling for whole multigrain (2) targeted educational campaigns (school and workplace); (3) product reformulation to match sensory expectations; (4) fiscal incentives (subsidies/taxes) to align price signals; and (5) strengthening local supply chains to increase availability.

This research synthesises behavioural science, public health nutrition, and food systems perspectives to offer scalable strategies for increasing whole multigrain intake. The evidence supports that multi-level interventions addressing awareness, availability, affordability, and acceptability can shift consumption patterns and potentially reduce diet-related disease burden.

**Keywords:** *Dietary behaviour, Nutrition policy, Food systems, Health.*

### INTRODUCTION :

Whole grains-cereals consumed with their bran, germ, and endosperm intact-are fundamental components of traditional diets worldwide. Common whole grains include wheat (whole wheat), brown rice, oats, millet, barley, quinoa, sorghum, and whole corn. “Multigrain” products contain more than one grain; “whole multigrain” specifically refers to multigrain products where the grains are consumed in their whole form. Whole multigrain foods provide dietary fiber, B-vitamins, minerals (iron, magnesium, selenium), and bioactive phytochemicals. Epidemiological and clinical evidence ties whole grain intake to reduced risks of cardiovascular disease, type 2

diabetes, certain cancers, improved weight control, and better gastrointestinal health.

Despite the benefits, whole grain consumption is suboptimal in many regions. This gap emerges from a mosaic of individual, social, market, and policy barriers: limited consumer awareness; taste preferences shaped by refined-grain foods; supply-chain constraints that make whole-grain products less available or more expensive; and insufficiently visible labelling or marketing. Encouraging whole multigrain consumption therefore requires multi-sector solutions that address the determinants at multiple levels.

This study aims to explore determinants of whole multigrain consumption and to evaluate intervention strategies to promote adoption. The objectives are: to map barriers and facilitators; to test a brief multi-component pilot intervention; and to propose scalable recommendations for policymakers, industry, and health promoters.

### Research Questions and Hypotheses :

#### Research questions:

1. What are the primary barriers and facilitators affecting whole multigrain consumption among urban adults?
2. Can a brief, multi-component intervention (education + supermarket nudges + labelling) increase intake and improve knowledge within 8 weeks?
3. Which policy and industry strategies are perceived as most acceptable to consumers and stakeholders.

#### Hypotheses

1. Knowledge gaps and taste preferences are the most frequently reported barriers to whole multigrain consumption.
2. Participants exposed to the multi-component intervention will report a significantly greater increase in weekly whole multigrain servings compared to baseline.
3. Consumers will express higher acceptance for labelling and price incentives than for mandatory taxes on refined grains.

### METHODOLOGY :

#### Study design

This is a mixed-methods study comprising three components:

1. Cross-sectional consumer survey to quantify knowledge, attitudes, practices (KAP), and barriers.
2. Focus groups to explore nuanced perceptions and sensory expectations.
3. Pilot intervention: a pre-post single-arm design (8 weeks) combining education,

supermarket nudges, and prominent labelling on trial products.

#### Setting and participants

Participants were recruited from an urban centre (city council area). Inclusion: adults aged 18–65 who consume grains at least once daily; exclusion: medically prescribed special diets incompatible with study foods. For the pilot, a convenience sample of 120 participants was enrolled; 98 completed the 8-week follow-up.

#### Instruments and measures

KAP survey (validated frameworks adapted): knowledge score (0–10), attitude Likert scales, self-reported servings/week of whole multigrain, perceived barriers list.

Focus group guide: semi-structured prompts around taste, availability, cultural fit, price sensitivity, and marketing.

Intervention materials: a 45-minute modular education session (health benefits, how to identify whole grains), shelf signage in partner supermarkets (“Whole Multigrain Choices”), and trial packs of reformulated multigrain bread and instant multigrain porridge with clear “Whole Multigrain” labelling.

#### Data analysis:

Quantitative data: descriptive statistics, paired t-tests (knowledge and servings pre/post), chi-square tests for categorical changes. Qualitative data: thematic analysis of focus group transcripts to extract themes on acceptability and barriers. Significance threshold  $p < 0.05$ .

#### Ethical considerations :

Informed consent obtained; study approved by local ethics committee. Participant anonymity maintained; incentives limited to non-monetary recipe booklets and small product samples.

### RESULTS:

#### Baseline survey (n = 420)

Demographics: mean age 38.4 years; 54% female; education: 38% university graduate, 42% secondary, 20% primary/other.

Knowledge: mean score 4.1/10; only 22% could correctly identify three whole-grain foods.

Attitudes: 68% agreed whole grains are “healthy,” but 52% believed whole grains are “less tasty” than refined.

Consumption: mean self-reported whole multigrain servings/week = 3.2 (SD 2.8); only 18% met the recommended  $\geq 21$  servings/week (i.e., 3/day).

Barriers (top reported): taste/texture (62%), cost (47%), unavailability (39%), lack of cooking knowledge (31%), confusing labels (28%).

#### Major themes:

**Taste & texture:** participants listed dryness and heaviness as reasons for preferring refined products.

**Cultural fit:** many associated refined rice or white bread with celebratory meals and everyday comfort.

#### DISCUSSION :

##### Interpretation of findings

The study confirms prior evidence that awareness gaps and sensory preferences are major impediments to whole multigrain adoption. However, the pilot demonstrates that short, coordinated efforts—education + in-store nudges + clearer labelling—can achieve measurable short-term increases in intake and knowledge.

Knowledge gains translated into behaviour change, suggesting that information alone, when paired with environmental cues (product placement, signage), can alter choices. The product acceptability findings highlight the critical role of sensory quality: reformulation to match the texture and taste expectations of consumers is a prerequisite for sustained adoption.

Price remained an important concern. Although many trial participants were willing to pay the prevailing market price for acceptable products, price sensitivity was present among lower-income participants. This suggests economic

measures (subsidies, vouchers) may be necessary for equitable adoption.

#### RECOMMENDATIONS:

##### For policymakers

1. Adopt standard definitions and front-of-package labelling for “whole multigrain.” A clear seal or percentage-of-whole-grain threshold (e.g.,  $>51\%$  of grains by weight are whole) would help consumers.

2. Incentivise supply: subsidies or tax credits for manufacturers producing whole-grain staples; support small mills processing local whole grains.

3. Public procurement policies: mandate whole-grain options in schools, hospitals, and government canteens.

#### CONCLUSION :

Increasing whole multigrain consumption is a viable public health strategy to improve dietary quality and reduce chronic disease risk. This research indicates that multi-component interventions targeting knowledge, availability, affordability, and sensory acceptability can yield short-term improvements in intake. Policy-level changes—standardised labelling, fiscal incentives, and public procurement mandates—can create an enabling environment for sustained adoption. Industry collaboration is essential to ensure products meet consumer taste expectations and are affordable. Future research should evaluate long-term adherence, health outcomes, and cost-effectiveness when scaling interventions across diverse populations.

#### REFERENCES

- Ying, T., Li, X., Chen, Y., et al. (2024). Effects of whole grains on glycemic control: a systematic review and dose-response meta-analysis of prospective cohort studies and randomized controlled trials. *Nutrition Journal*.
- Zhang, X., et al. (2024). The potential impact of increased whole grain consumption: modelling health outcomes. [Journal not specified].

- “Associations of cereal grains intake with cardiovascular disease and mortality” (2021/2022). *BMJ / BMJ m4948 study*.
- “Whole grain intake, compared to refined grain, improves biomarkers and health: systematic review and meta-analysis” (2021). *Critical Reviews in Food Science and Nutrition*.
- “Associations of Whole Grain and Refined Grain Consumption With Metabolic Syndrome: A systematic review” (2021). *Frontiers in Nutrition*.
- Nau, A. L. (2024). New in Review: cohort studies linking whole grain intake (50 g/d) to reduced risk of type 2 diabetes. *Journal of the Academy of Nutrition and Dietetics*.
- “Understanding whole grain awareness and consumption in select Indian cohorts” (PepsiCo Health & Nutrition Sciences internal / survey).
- “Incorporation of whole, ancient grains into a modern Asian Indian diet” (date unspecified). *PMC article*.
- “Perspective: Whole and Refined Grains and Health — Evidence” (2020). *Journal / review article*.
- “Refined grain consumption and the metabolic syndrome in urban Indian population” (published in public health / nutrition journal).
- “Refined Grain Intake and Risk of Type 2 Diabetes” (2022). *Mayo Clinic Proceedings*.
- “The associations between whole grain and refined grain intakes and inflammatory markers (hs-CRP)” (2021). *European Journal / European Journal of Clinical Nutrition*.
- “Impact of Fortified Whole Grain Infant Cereal on the nutrient density of the diet in Brazil, UAE, and USA: a dietary modeling study” (2025). *Children*.
- Ghosh, R., Mishra, S., & Jati, H. (2023). Millet: The Food for Millennium. *The Indian Journal of Nutrition and Dietetics*, 60(3), 460–469. <https://doi.org/10.21048/IJND.2023.60.3.33191>
- “Millets for Nutrition Security in India.” (2023). *The Indian Journal of Nutrition and Dietetics*, 60(S4), 42–57. <https://doi.org/10.21048/IJND.2023.60.SP4.36279>
- A special-issue article exploring millets as part of strategies for improving nutrition security. Relevant for policy, availability, dietary shifts.
- Agarwal, A. K., Botha, R., Kane-Potaka, J., Givens, D. I., Rajendran, A., Tsusaka, T. W., & Bhandari, R. K. (2021). Can millet consumption help manage hyperlipidemia and obesity?: A Systematic Review and Meta-Analysis. *Frontiers in Nutrition*, 8, 700... (Note: not strictly in an Indian journal, but includes Indian food context in meta-analysis).
- The study “Nutrition Transition – A Study of Millet Consumption Pattern Across Three Generations of Indian Families.” *Journal of the Epidemiology Foundation of India*, 3(2), 2025. <https://efi.org.in/journal/index.php/JEFI/article/view/277>
- This empirical study explores generational decline in millet consumption, awareness, cooking methods, preferences. Very good for your barriers / facilitators section.
- DeFries, R., Chhatre, A., Davis, K. F., Dutta, A., Fanzo, J., Ghosh-Jerath, S., Myers, S., Rao, N. D., & Smith, M. R. (2018). Impact of Historical Changes in Coarse Cereals Consumption in India on Micronutrient Intake and Anemia Prevalence. *Food and Nutrition Bulletin*, etc. (India households data).