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Article

Understanding the Role of Millet-Based Foods in Adolescent Nutrition: Assessment of Awareness, Perceptions, and Health Implications

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Abstract

Purpose
The purpose of this study is to assess the awareness level, perceptions, and consumption patterns associated with millet-based foods among adolescents. The study aims to examine whether awareness regarding the nutritional and health benefits of millets influences their acceptance and inclusion in daily dietary practices. Additionally, the study explores the factors affecting millet consumption behaviour among adolescents.
Design/methodology/approach
A quantitative cross-sectional research design was adopted. Data were collected from 250 adolescents aged 13–19 years using a structured questionnaire developed based on previous literature related to nutritional awareness, food choice behaviour, and millet consumption. The research instrument included demographic characteristics, awareness statements, perception-based measures, and consumption behaviour indicators. Reliability of the questionnaire was assessed using Cronbach's alpha. Data analysis was conducted using descriptive statistics, chi-square test, correlation analysis, ANOVA, and multiple regression analysis to examine relationships among study variables.
Findings
The findings reveal that adolescents possess a moderate level of awareness regarding the nutritional advantages of millet-based foods; however, awareness alone does not consistently translate into regular consumption behaviour. The study identifies significant associations between nutritional knowledge, perceived health benefits, accessibility, and willingness to consume millet-based foods. Factors such as taste preference, availability, and familiarity with millet-based recipes were observed to influence adoption behaviour.
Practical implications
The study provides important implications for nutrition educators, healthcare professionals, policymakers, and food product developers. The findings suggest the need for adolescent-focused nutrition awareness programmes, innovative millet-based food products, and improved promotion strategies to increase acceptance and consumption of millet-based foods among younger populations.
Originality/value
This study contributes to the existing literature by integrating nutritional awareness with behavioural assessment among adolescents. Unlike previous studies focusing mainly on the nutritional composition or general awareness of millets, this research examines the relationship between knowledge, perception, and actual dietary adoption behaviour. The findings provide a framework for promoting millet-based foods as sustainable and health-oriented dietary alternatives among adolescents.
Keywords: Millets; Adolescents; Nutritional Awareness; Perceptions; Food Choice; Functional Foods; Sustainable Nutrition

1. Introduction

1.1 Background of the Study

Adolescence is a critical stage of human development characterized by rapid physical growth, psychological changes, increased nutritional requirements, and the establishment of lifelong perceptionss. Adequate intake of essential nutrients during this period is important for maintaining optimal growth, cognitive development, immune function, and overall health. However, recent changes in food preferences, increased consumption of processed foods, sedentary lifestyles, and reduced intake of traditional nutrient-rich foods have contributed to nutritional concerns among adolescents.

Cereal-based foods constitute a major component of human diets worldwide. Among traditional cereals, millets have gained increasing scientific and public attention due to their high nutritional value, environmental adaptability, and potential health-promoting properties. Millets are small-seeded grains belonging to the Poaceae family and are considered ancient grains that have been traditionally consumed in many Asian and African countries. They are recognized as "nutri-cereals" due to their rich composition of dietary fibre, proteins, minerals, vitamins, antioxidants, and bioactive compounds.

Different varieties of millets, including finger millet, pearl millet, foxtail millet, barnyard millet, little millet, and sorghum, possess unique nutritional characteristics. Finger millet is particularly known for its high calcium content, while pearl millet contributes significantly to dietary iron intake. The presence of dietary fibre and slow-digesting carbohydrates in millets contributes to improved glycaemic regulation, digestive health, and better satiety, making them valuable components of a balanced diet.

The growing prevalence of lifestyle-related disorders, nutritional deficiencies, and concerns regarding sustainable food systems has increased global interest in millet-based foods. The recognition of millets as climate-resilient crops further strengthens their importance in achieving sustainable nutrition security. The declaration of the International Year of Millets 2023 by the Food and Agriculture Organization (FAO) has further encouraged research, production, and consumption of millet-based foods globally.

Despite their nutritional advantages, the inclusion of millets in adolescent diets remains limited. Younger populations often demonstrate preference towards refined cereals and processed foods due to changing lifestyle patterns, taste preferences, convenience factors, and limited awareness about traditional grains. Therefore, understanding adolescents' awareness, perception, and behavioural factors influencing millet consumption is essential for promoting healthier dietary choices.

1.2 Millet-Based Foods and Adolescent Nutrition

The nutritional requirements of adolescents are higher compared to many other life stages due to accelerated growth and development. Deficiencies of essential nutrients such as iron, calcium, protein, and dietary fibre can negatively affect physical performance, immunity, and cognitive functions.

Millet-based foods provide an opportunity to improve dietary quality among adolescents because of their:

- High dietary fibre content supporting digestive health
- Plant-based protein contribution supporting growth and tissue development
- Mineral content including calcium, iron, magnesium, and zinc
- Antioxidant properties supporting protection against oxidative stress
- Lower glycaemic response compared with refined cereal products

Furthermore, the versatility of millets allows their incorporation into modern food products such as bakery items, snacks, breakfast cereals, beverages, and ready-to-eat products, which may improve acceptance among adolescents.

1.3 Changing Food Behaviour Among Adolescents

Food selection among adolescents is influenced by multiple psychological, social, and environmental factors. Taste preference, peer influence, family dietary practices, food availability, affordability, and perceived health benefits play significant roles in shaping food choices.

Although awareness is considered an important determinant of healthy eating behaviour, previous research indicates that knowledge alone may not always result in behavioural change. Therefore, examining the relationship between awareness and actual dietary practices provides deeper understanding of food adoption behaviour.

The transition from awareness to consumption requires acceptance, accessibility, and positive perception towards the food product. In the context of millet-based foods, identifying these behavioural factors is essential for developing effective strategies to increase consumption among adolescents.

1.4 Research Gap

The scientific literature has established that millets are nutrient-dense cereals with significant health, nutritional, and environmental benefits. Recent research has primarily focused on their nutritional composition, bioactive compounds, functional properties, product development, sensory evaluation, and role in promoting sustainable food systems. Intervention studies have further demonstrated the potential of millet-based diets to improve micronutrient intake and support the prevention of nutrition-related disorders.

Despite these important contributions, the existing literature reveals several unresolved issues. First, most studies have examined the nutritional and functional attributes of millets from a food science or public health perspective, with relatively limited emphasis on the behavioural factors that influence millet consumption. Second, consumer-based investigations have largely focused on the general adult population, whereas adolescents have received comparatively little research attention, despite representing a critical life stage during which dietary habits, food preferences, and health behaviours are established. Third, previous studies have generally examined awareness, consumer perception, product acceptability, or health benefits as independent constructs rather than investigating their interrelationships within a single conceptual framework.

Consequently, there is limited empirical evidence explaining whether adolescents' nutritional awareness of millet-based foods influences their perceptions of these products, their perceived health benefits, and ultimately their willingness to consume millet-based foods. Understanding these relationships is essential for designing effective nutrition education programmes, developing acceptable millet-based food products, and promoting healthier dietary choices among adolescents.

The present study addresses these gaps by examining the relationships among nutritional awareness, perceptions towards millet-based foods, perceived health benefits, and consumption intention among adolescents. By integrating these constructs within a unified framework, the study contributes to the existing literature by providing a comprehensive understanding of the behavioural determinants of millet consumption. The findings are expected to support researchers, food manufacturers, nutrition educators, and policymakers in developing evidence-based strategies that encourage the adoption of nutrient-rich and sustainable millet-based foods among adolescents.

1.5 Contribution of the Study

This study contributes to the existing body of knowledge by developing an integrated understanding of how awareness and perception influence millet consumption behaviour among adolescents.

The findings provide evidence-based insights for:

- nutrition education programmes,
- adolescent health interventions,
- food product innovation,
- and promotion of sustainable dietary practices.

By identifying factors influencing millet adoption, this research supports strategies to position millet-based foods as nutritious and acceptable dietary alternatives for younger generations.

1.6 Objectives of the Study

The present study aims to examine the role of millet-based foods in adolescent nutrition by assessing awareness, perceptions, and health perceptions among adolescents. The specific objectives of the study are:

1. To assess the level of awareness among adolescents regarding the nutritional and health benefits of millet-based foods.
2. To evaluate the consumption patterns and perceptions related to millet-based foods among adolescents.
3. To identify the factors influencing adolescents' acceptance and adoption of millet-based foods, including taste preference, availability, and perceived health benefits.
4. To examine the relationship between nutritional awareness and consumption behaviour towards millet-based foods among adolescents.
5. To analyse the influence of awareness, perception, and accessibility factors on adolescents' intention to consume millet-based foods.

1.7 Research Hypotheses

H1: Nutritional awareness regarding millet-based foods has a significant positive relationship with adolescent consumption behaviour.

H2: Demographic characteristics significantly influence adolescents' awareness regarding millet-based foods.

H3: Perceived health benefits significantly influence adolescents' intention to consume millet-based foods.

H4: Awareness, perception, and accessibility factors significantly predict millet consumption behaviour among adolescents.

2. Literature Review

2.1 Nutritional Importance of Millets

Millets have gained considerable attention in recent years because of their nutritional richness, climate resilience, and potential contribution to sustainable food systems. Unlike refined cereals, millets contain higher concentrations of dietary fibre, quality protein, essential minerals, resistant starch, vitamins, and bioactive phytochemicals that collectively support human health. Their ability to grow under drought-prone conditions with minimal agricultural inputs further positions them as important crops for improving global food and nutrition security (Anitha et al., 2022; Kane-Potaka et al., 2021).

Recent systematic evidence indicates that regular millet consumption contributes to improved nutritional status and may reduce the risk of several non-communicable diseases. In their systematic review and meta-analysis, **Anitha et al. (2022)** concluded that millet-based diets improve growth outcomes and dietary quality, particularly among children and adolescents, by increasing the intake of essential micronutrients and dietary fibre. Similarly, **Sharma et al. (2022)** reported that millets possess superior nutritional characteristics compared with commonly consumed refined cereals due to their high concentrations of calcium, iron, magnesium, zinc, antioxidants, and slowly digestible carbohydrates. These nutritional attributes make millets suitable ingredients for promoting balanced diets among growing adolescents.

Although previous studies consistently acknowledge the nutritional superiority of millets, researchers differ in their interpretation of how these nutritional advantages influence actual food consumption. Kane-Potaka et al. (2021) argued that awareness of nutritional benefits alone does not necessarily increase millet consumption because perceptions is also influenced by accessibility, affordability, taste preferences, and cultural food habits. Their large-scale survey demonstrated that despite positive perceptions regarding millet nutrition, many consumers continued to prefer refined cereals because of convenience and familiarity. These findings suggest that nutritional value alone is insufficient to ensure widespread dietary adoption.

Conversely, intervention-based research provides evidence that when millet-based foods are regularly incorporated into diets, measurable improvements in nutritional outcomes can be achieved. **Pompano et al. (2021)** demonstrated that the consumption of iron-biofortified pearl millet significantly improved iron status and physical activity indicators among Indian adolescents participating in a controlled feeding programme. Similarly, **Saikat et al. (2024)** reported that school-based millet–pulse nutritional interventions improved dietary diversity and nutrient intake among school-aged children, highlighting the effectiveness of structured dietary programmes in promoting healthier eating behaviours. These findings indicate that millet-based interventions can produce positive health outcomes when supported by appropriate educational and institutional environments.

Beyond their nutritional significance, millets have also been recognised as important components of sustainable food systems. **Borah et al. (2026)** emphasised that millets possess both nutritional and environmental advantages because they require comparatively lower water resources, tolerate adverse climatic conditions, and contribute to sustainable agricultural production. Likewise, the **Food and Agriculture Organization (FAO, 2023)** identified millets as climate-resilient crops capable of improving food security while reducing environmental pressures associated with conventional cereal production. Their promotion therefore supports both public health objectives and global sustainability initiatives.

Despite the growing body of scientific evidence highlighting the nutritional and environmental benefits of millets, important research gaps remain. Most existing studies have concentrated on nutritional composition, agronomic characteristics, or intervention-based outcomes, while comparatively fewer investigations have examined adolescents' awareness of millet nutrition or the behavioural factors influencing their consumption. Adolescence represents a critical stage for establishing lifelong dietary habits; however, evidence regarding how

nutritional knowledge influences millet consumption among this population remains limited. Addressing this gap is essential for designing effective nutrition education strategies and promoting healthier dietary practices among younger generations.

Therefore, the present study extends previous research by investigating adolescents' awareness of the nutritional benefits of millet-based foods and examining how this awareness influences perceptions, perceived health benefits, and millet consumption patterns. By integrating nutritional awareness with behavioural determinants, the study provides a more comprehensive understanding of factors influencing millet adoption among adolescents.

2.2 Awareness and Knowledge of Millet-Based Foods

Nutritional awareness is widely recognised as a key determinant of healthy perceptions and plays an important role in influencing consumers' food choices. Increased awareness regarding the nutritional composition, health benefits, and sustainability of foods has been associated with greater willingness to adopt healthier dietary practices. However, previous research indicates that awareness alone is insufficient to ensure regular consumption, as food-related decisions are influenced by multiple behavioural, social, and environmental factors (Kane-Potaka et al., 2021; Hadi et al., 2025).

Several studies have demonstrated that consumers with greater nutritional knowledge are more likely to exhibit positive attitudes towards millet-based foods. **Kane-Potaka et al. (2021)** reported that urban consumers in India were generally aware of the nutritional and environmental advantages of millets; however, this awareness was not consistently reflected in their purchasing and consumption behaviour. The authors concluded that although knowledge increased interest in millet-based foods, barriers such as limited product availability, unfamiliar preparation methods, cultural preferences, and convenience reduced their regular dietary inclusion. These findings suggest that awareness represents only one component of consumer decision-making and must be supported by favourable market and behavioural conditions.

Similarly, Rizwana et al. (2023) observed that increased awareness regarding the nutritional benefits of millets significantly improved consumers' willingness to purchase millet-based products. Their findings indicated that individuals with higher levels of nutrition knowledge demonstrated more positive perceptions regarding the health value of millets and were more receptive to incorporating them into daily diets. However, the study also reported that sensory characteristics, product familiarity, and affordability continued to influence consumer acceptance. This supports the argument that educational interventions alone may not be sufficient to achieve sustained perceptions change.

Research focusing specifically on younger populations further emphasises the complexity of food choice behaviour. **Chande et al. (2021)** found that awareness among school-aged children positively influenced acceptance of millet-based foods, but consumption behaviour was simultaneously affected by taste preferences, family eating habits, peer influence, and accessibility. These findings highlight that adolescents often make food choices within broader social environments where nutritional knowledge competes with convenience, marketing influences, and personal preferences.

The importance of nutrition education has also been highlighted in studies examining adolescent dietary practices. **Hadi et al. (2025)** reported that nutritional knowledge significantly improved healthy eating behaviours among adolescents, particularly when combined with positive attitudes towards healthy foods and supportive educational environments. Likewise, **Maneschy et al. (2024)** concluded that nutrition literacy contributes to healthier dietary patterns among adolescents, although behavioural outcomes depend on the interaction of individual, family, and environmental influences. These studies suggest that nutrition education should extend beyond information dissemination and include practical strategies that encourage healthier food choices.

Despite increasing public awareness regarding the nutritional importance of millets following the **International Year of Millets 2023**, evidence regarding adolescents' awareness remains limited. Most previous studies have investigated adult consumers, household purchasing behaviour, or general nutrition awareness, while relatively few have specifically examined adolescent populations. Furthermore, existing research has generally assessed awareness independently without simultaneously evaluating its relationship with perceived health benefits, accessibility, and actual consumption behaviour.

This limitation represents an important research gap because adolescence is a critical developmental period during which lifelong dietary habits are established. Understanding how nutritional awareness influences millet consumption behaviour among adolescents can provide valuable evidence for designing school-based nutrition programmes, public health interventions, and consumer education strategies. Therefore, the present study investigates adolescents' awareness regarding millet-based foods and examines its relationship with perceptions, health perception, and consumption patterns within an integrated conceptual framework.

2.3 Perceptions and Food Choice Among Adolescents

Dietary behaviour established during adolescence has significant implications for lifelong health, nutritional status, and the prevention of chronic diseases. Adolescence is characterized by rapid physical growth, psychological development, and increasing independence in food selection, making this stage particularly important for developing healthy eating habits. However, globalization, urbanization, and the increasing availability of processed and convenience foods have substantially altered adolescents' dietary patterns, leading to reduced consumption of traditional and nutrient-dense foods such as millets (Hargreaves et al., 2021; Maneschy et al., 2024).

Previous studies consistently demonstrate that adolescent food choices are influenced by a combination of individual, social, economic, and environmental factors. Maneschy et al. (2024) reported that perceptionss among children and adolescents are shaped not only by nutritional knowledge but also by taste preferences, food accessibility, family eating practices, peer influence, socioeconomic status, and media exposure. Similarly, Khoerunida et al. (2024) found that healthier eating behaviours were positively associated with better nutritional status, emphasizing the importance of developing healthy dietary habits during adolescence.

Although nutrition awareness is considered an important predictor of healthy food choices, several researchers have reported that awareness alone does not necessarily result in healthier eating behaviour. **Hadi et al. (2025)** demonstrated that adolescents possessing higher nutritional knowledge generally exhibited healthier dietary practices; however, behavioural change was more evident when nutrition education was supported by positive attitudes, parental encouragement, and supportive school environments. These findings indicate that knowledge serves as a necessary foundation but may not independently predict actual food consumption.

Research specifically examining millet-based foods has produced similar observations. **Chande et al. (2021)** reported that while school-aged children expressed positive attitudes toward millet-based foods after receiving nutritional information, actual consumption remained dependent on product acceptability, taste, convenience, and household food preferences. Likewise, **Kane-Potaka et al. (2021)** observed that consumer awareness significantly improved attitudes towards millets but did not completely overcome barriers related to availability, affordability, and culinary familiarity. These studies collectively suggest that food choice behaviour is multidimensional and extends beyond nutritional knowledge alone.

Behavioural theories provide further explanation for these findings. According to the Theory of Planned Behaviour (Ajzen, 2020), food consumption behaviour is determined by behavioural intentions, which are influenced by attitudes, subjective norms, and perceived behavioural control. Similarly, the Health Belief Model (Rosenstock et al., 2020) proposes that individuals are more likely to adopt healthy perceptionss when they perceive greater health benefits and fewer barriers to action. These theoretical frameworks suggest that adolescents are more likely to consume millet-based foods when they recognize their nutritional value, perceive positive health outcomes, and experience minimal barriers related to accessibility and acceptability.

Despite the growing body of literature on adolescent nutrition and food choice behaviour, relatively few studies have specifically investigated millet consumption among adolescents using behavioural theories. Existing research has primarily focused on general healthy eating patterns or consumer acceptance among adults, with limited attention given to the combined influence of nutritional awareness, perceived health benefits, accessibility, and perceptions in adolescent populations. Furthermore, previous studies have rarely integrated these behavioural determinants within a single conceptual framework capable of explaining millet consumption behaviour.

This represents a significant research gap because adolescence is a critical period during which lifelong dietary habits are formed. Understanding the behavioural factors influencing millet consumption can assist educators, nutritionists, policymakers, and food manufacturers in designing effective interventions that encourage healthier and more sustainable dietary practices. Therefore, the present study investigates the relationship between nutritional awareness, perceived health benefits, accessibility, and millet consumption behaviour among adolescents to provide evidence-based recommendations for improving adolescent nutrition and promoting millet-based foods as sustainable dietary alternatives.

2.4 Health Perception and Acceptance of Functional Foods

The increasing prevalence of nutrition-related disorders and growing consumer interest in preventive healthcare have accelerated the demand for functional foods worldwide. Functional foods are defined as foods that provide physiological and health benefits beyond basic nutritional requirements through the presence of bioactive compounds, dietary fibre, antioxidants, vitamins, and essential minerals. Millets are increasingly recognized as functional grains because of their rich nutritional composition, low glycaemic index, antioxidant

activity, and potential role in reducing the risk of non-communicable diseases such as obesity, diabetes, and cardiovascular disorders (Sharma et al., 2022; Borah et al., 2026).

Several studies have demonstrated that consumers who perceive functional foods as beneficial for health are more likely to incorporate them into their regular diets. **Verbeke (2021)** reported that perceived health benefits significantly influence consumer acceptance of functional foods, particularly among individuals with higher nutrition awareness and positive attitudes towards healthy eating. Similarly, **Annunziata and Vecchio (2022)** found that health consciousness was a strong predictor of consumers' willingness to purchase functional food products, indicating that perceived nutritional value positively affects food selection decisions.

Although these studies consistently emphasize the importance of health perception, researchers have also identified additional factors influencing functional food acceptance. **Kaur et al. (2023)** observed that adolescents often prioritize taste, convenience, affordability, and product familiarity over nutritional value when selecting food products. Their findings suggest that even when adolescents recognize the health benefits of functional foods, sensory attributes remain critical determinants of consumption behaviour. These observations indicate that successful promotion of functional foods requires balancing nutritional quality with sensory acceptability.

Research focusing specifically on millet-based foods has reported similar findings. **Rizwana et al. (2023)** demonstrated that increased awareness regarding the nutritional benefits of millets significantly improved positive perceptions towards millet-based products and increased consumers' willingness to purchase them. However, the study also revealed that limited familiarity with millet recipes and concerns regarding taste reduced regular consumption. Likewise, **Kane-Potaka et al. (2021)** reported that while consumers generally acknowledged the nutritional advantages of millets, product accessibility, culinary practices, and convenience remained important barriers affecting acceptance. These findings suggest that positive health perception alone is insufficient to ensure sustained dietary adoption.

From a behavioural perspective, consumer acceptance of functional foods can be explained through established health behaviour theories. According to the **Theory of Planned Behaviour (Ajzen, 2020)**, favourable attitudes towards healthy foods contribute to stronger behavioural intentions, which subsequently influence actual consumption behaviour. Similarly, the **Health Belief Model (Rosenstock et al., 2020)** proposes that individuals are more likely to adopt healthier dietary practices when they perceive greater health benefits and fewer barriers associated with food consumption. These theoretical perspectives support the assumption that adolescents who perceive millet-based foods as beneficial for their health are more likely to include them in their regular diets.

Despite the growing scientific interest in functional foods, important research gaps remain regarding adolescent acceptance of millet-based products. Most previous studies have investigated functional food consumption among adults or general consumer populations, whereas relatively limited research has focused specifically on adolescents. Furthermore, existing studies have often examined health perception independently without simultaneously investigating its interaction with nutritional awareness, accessibility, and consumption behaviour. Such an integrated approach is necessary because adolescent food choices are influenced by multiple psychological, social, and environmental factors rather than by health perception alone.

Therefore, the present study addresses this gap by examining the influence of perceived health benefits on adolescents' acceptance and consumption of millet-based foods within a broader behavioural framework. By integrating nutritional awareness, health perception, accessibility, and perceptions, the study provides a more comprehensive understanding of the factors influencing millet consumption among adolescents. The findings are expected to contribute to the development of effective nutrition education programmes, consumer awareness strategies, and innovative millet-based functional food products that support both adolescent health and sustainable dietary practices.

2.5 Literature Summary and Conceptual Framework Development

The reviewed literature demonstrates that millets are nutrient-rich, climate-resilient cereals with significant potential to improve adolescent nutrition and contribute to sustainable food systems. Previous studies consistently report that millets are excellent sources of dietary fibre, quality protein, essential minerals, antioxidants, and bioactive compounds, making them valuable functional foods for promoting health and preventing nutrition-related disorders (Anitha et al., 2022; Sharma et al., 2022; Borah et al., 2026). In addition to their nutritional advantages, millets have been recognised globally for supporting sustainable agriculture because of their low water requirements, adaptability to adverse climatic conditions, and contribution to food and nutrition security (FAO, 2023; Kane-Potaka et al., 2021).

The literature further indicates that nutritional awareness positively influences consumers' attitudes towards healthy foods; however, awareness alone does not necessarily result in regular dietary adoption. Several researchers have reported that consumer behaviour is shaped by a combination of nutritional knowledge,

perceived health benefits, food preferences, accessibility, affordability, and social influences (Kane-Potaka et al., 2021; Chande et al., 2021; Rizwana et al., 2023). Similarly, studies focusing on adolescent nutrition suggest that food choices are strongly influenced by family practices, peer influence, school environments, and individual perceptions of health rather than nutritional knowledge alone (Hargreaves et al., 2021; Maneschy et al., 2024; Hadi et al., 2025). These findings demonstrate that perceptions is multidimensional and cannot be adequately explained by a single determinant.

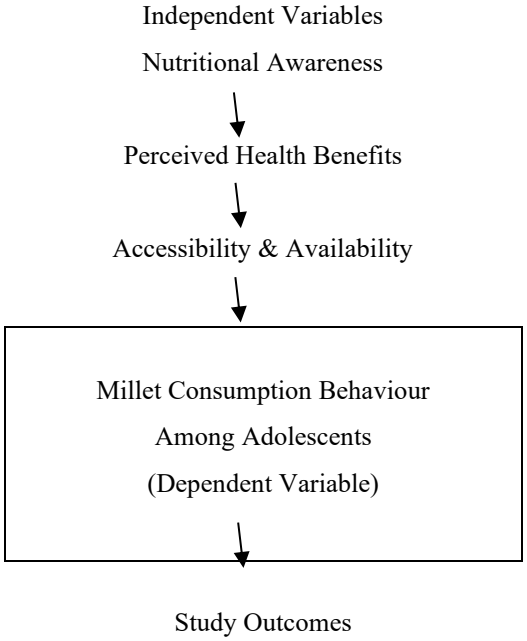
Although substantial research has examined the nutritional composition of millets and their health-promoting properties, relatively few studies have investigated the behavioural factors influencing millet consumption among adolescents. Existing research has primarily focused on adult consumers, household purchasing behaviour, or general dietary practices, with limited emphasis on adolescents despite this group's critical role in establishing lifelong eating habits. Furthermore, previous investigations have generally examined awareness, health perception, or food acceptance independently, whereas limited evidence is available regarding the combined influence of these factors on millet consumption behaviour. This limitation highlights the need for an integrated behavioural framework capable of explaining adolescents' adoption of millet-based foods.

To address these gaps, the present study adopts concepts from the **Theory of Planned Behaviour (Ajzen, 2020)** and the **Health Belief Model (Rosenstock et al., 2020)**. These behavioural theories propose that individuals are more likely to adopt healthy dietary practices when they possess positive attitudes, perceive meaningful health benefits, and experience fewer barriers to behaviour. Drawing upon these theoretical perspectives and the reviewed literature, the present study proposes that **nutritional awareness**, **perceived health benefits**, and **accessibility and availability** serve as the principal determinants influencing **millet consumption behaviour among adolescents**.

Accordingly, the conceptual framework developed for this study positions **nutritional awareness**, **perceived health benefits**, and **accessibility and availability** as independent variables influencing the dependent variable, **millet consumption behaviour among adolescents**. The framework further proposes that increased consumption of millet-based foods may contribute to improved nutritional status, healthier dietary practices, and the promotion of sustainable food choices. Demographic characteristics, including age, gender, educational level, and previous exposure to millet-based foods, are recognised as contextual factors that may influence these relationships.

Based on the reviewed literature and the proposed conceptual framework, the study formulates four research hypotheses. It is hypothesised that nutritional awareness positively influences millet consumption behaviour (**H1**), demographic characteristics significantly affect awareness levels (**H2**), perceived health benefits positively influence adolescents' intention to consume millet-based foods (**H3**), and nutritional awareness, health perception, and accessibility collectively predict millet consumption behaviour (**H4**). These hypotheses provide the theoretical foundation for the empirical investigation presented in the subsequent sections of the study.

Figure 1. Conceptual Framework of the Study



- Healthier Perceptions
- Sustainable Food Choices

Moderating Variables:

- Age
- Gender
- Educational Level
- Previous Exposure to Millets

3. Research Methodology

3.1 Research Design

The present study adopted a quantitative cross-sectional research design to assess adolescents' awareness, perceptions, and health perceptions regarding millet-based foods. A cross-sectional survey design was considered appropriate because it facilitates the systematic collection of data from a defined population at a single point in time and enables the examination of relationships among awareness, perceptions, accessibility, and consumption behaviour. The quantitative approach was selected to obtain objective measurements of the study variables and to allow the application of statistical techniques for hypothesis testing.

The study was guided by the Theory of Planned Behavior (TPB) and the Health Belief Model (HBM), which suggest that behavioural intentions and food choices are influenced by nutritional awareness, perceived health benefits, and environmental factors. These theoretical frameworks provided the basis for examining the determinants of millet consumption behaviour among adolescents.

3.2 Study Setting

The present study was conducted in Nagpur, Maharashtra, India, among adolescents aged 13–19 years enrolled in secondary schools, higher secondary schools, and undergraduate institutions. Nagpur is a major educational and urban centre in Central India, providing a diverse adolescent population representing different socioeconomic backgrounds.

The selection of Nagpur as the study area was based on its accessibility, the presence of educational institutions representing varied demographic groups, and the increasing relevance of nutrition-related public health initiatives in the region. The research was undertaken as part of the Ph.D. programme in the Department of Hotel Management and Catering Technology, Rashtrasant Tukadoji Maharaj Nagpur University, through the recognized Ph.D. centre at L.A.D. College of Hotel Management and Catering Technology, Nagpur.

3.3 Study Population and Sample Size

The study population comprised adolescents aged 13–19 years enrolled in secondary schools, higher secondary schools, and undergraduate institutions in Nagpur, Maharashtra. Adolescence is a critical developmental stage characterized by rapid physical growth, cognitive development, and increased nutritional requirements. Dietary habits established during this period often continue into adulthood, making adolescents an important target population for nutrition-related research and interventions.

A total sample of 250 adolescents participated in the study. The sample size was considered adequate to achieve the objectives of the study and to provide sufficient statistical power for descriptive and inferential analyses, including chi-square tests, correlation analysis, one-way ANOVA, multiple regression analysis, and hypothesis testing.

The participants represented different educational levels and socioeconomic backgrounds, thereby providing a comprehensive understanding of adolescents' awareness, perceptions, health perceptions, and consumption of millet-based foods.

Table 1. Distribution of Study Participants (n = 250)

Category	Number of Respondents
Adolescents (13–19 years)	250
Total Sample Size	250

3.4 Sampling Technique

A non-probability purposive sampling technique was employed to select participants who met the predefined inclusion criteria. This sampling approach was considered appropriate because the study specifically focused on adolescents aged 13–19 years and aimed to evaluate their awareness, perceptions, and perceptions regarding millet-based foods.

Inclusion Criteria

- Adolescents aged 13–19 years
- Students enrolled in secondary schools, higher secondary schools, and undergraduate institutions
- Participants willing to participate voluntarily
- Participants able to understand and complete the questionnaire

Exclusion Criteria

- Individuals outside the selected age group
- Incomplete questionnaire responses
- Respondents unwilling to participate

3.5 Research Instrument and Questionnaire Development

Data were collected using a structured self-administered questionnaire developed after an extensive review of the literature on adolescent nutrition, millet consumption, nutritional awareness, perceptions, and functional foods.

The questionnaire was reviewed by experts in nutrition, food science, and hospitality management to establish content validity and to ensure the relevance, clarity, and appropriateness of each item for the target population.

The questionnaire consisted of four sections:

Section A: Demographic Profile

- Age
- Gender
- Educational level
- Dietary preference
- Previous exposure to millet-based foods

Section B: Nutritional Awareness

Items assessed adolescents' knowledge regarding:

- Nutritional composition of millets
- Dietary fibre
- Essential minerals
- Health benefits
- Prevention of lifestyle-related disorders

Section C: Health Perception

Items measured:

- Perceived health benefits
- Taste acceptance
- Willingness to consume millet-based foods

- Perceived suitability of millet-based foods for adolescent nutrition

Section D: Consumption Behaviour

Items assessed:

- Frequency of millet consumption
- Preferred millet-based products
- Factors influencing purchase and consumption
- Intention to include millet-based foods in the regular diet

A five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree) was used to measure awareness, perceptions, and behavioural responses. Higher scores indicated greater awareness, more positive perceptions, and stronger intentions to consume millet-based foods.

3.6 Data Collection Procedure

Prior to data collection, formal permission was obtained from the principals of the selected secondary schools, higher secondary schools, and undergraduate institutions in Nagpur, Maharashtra, India. For participants below 18 years of age, parental or guardian consent was obtained through the respective educational institutions before administering the questionnaire. The objectives and purpose of the study were explained to all participants, and their voluntary willingness to participate was confirmed before data collection. Respondents were assured that their responses would remain confidential and anonymous and would be used solely for academic research. Completed questionnaires were screened for completeness, coded, entered into Microsoft Excel, and analysed using IBM SPSS Statistics Version 26.0.

3.7 Reliability and Validity of the Instrument

The content validity of the questionnaire was established through expert evaluation by academicians specializing in nutrition, food science, and hospitality management. Suggestions received during the review process were incorporated to improve the clarity, relevance, and comprehensiveness of the questionnaire.

The reliability of the research instrument was assessed using Cronbach's alpha coefficient. A Cronbach's alpha value of 0.70 or higher was considered acceptable for behavioural and social science research. The obtained reliability coefficients demonstrated satisfactory internal consistency for all study constructs, confirming that the questionnaire was suitable for assessing adolescents' awareness, health perceptions, and millet consumption behaviour.

3.8 Statistical Analysis

Data were analysed using IBM SPSS Statistics Version 26.0.

Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize respondents' demographic characteristics and awareness, perception, and consumption behaviour regarding millet-based foods.

Inferential statistical analyses included:

- Frequency and Percentage Analysis
- Mean and Standard Deviation
- Cronbach's Alpha Reliability Analysis
- Chi-square Test
- Pearson Correlation Analysis
- One-way Analysis of Variance (ANOVA)
- Multiple Regression Analysis

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

Prior to regression analysis, assumptions of normality, linearity, homoscedasticity, independence of errors, and multicollinearity were examined to ensure the suitability of the data for parametric statistical analysis. Where appropriate, standardized regression coefficients, confidence intervals, and standard errors were considered to facilitate interpretation of the findings.

3.9 Ethical Considerations

The study was conducted in accordance with accepted ethical principles for research involving human participants. Formal permission to conduct the study was obtained from the principals of the participating educational institutions before data collection. For participants below 18 years of age, parental or guardian consent was obtained through the respective educational institutions, while participants aged 18 years and above provided informed consent before participation. Participation was voluntary, and respondents were informed about the objectives of the study and their right to decline or withdraw at any stage without any consequences. Confidentiality and anonymity were maintained throughout the research, and no personally identifiable information was collected. The information obtained was used exclusively for academic and research purposes.

4. Results and Findings

The present study analysed responses collected from 250 adolescents to assess awareness, perceptions, and health perceptions related to millet-based foods. The data were analysed using descriptive statistics, reliability analysis, chi-square test, correlation analysis, ANOVA, and regression analysis.

4.1 Demographic Characteristics of Respondents

Table 1: Demographic Profile of Respondents (n = 250)

Variable	**Category**	***n***	**%**
Gender	Male	118	47.2
	Female	132	52.8
Age Group (years)	13–15	92	36.8
	16–17	98	39.2
	18–19	60	24
Educational Level	Secondary School	110	44
	Higher Secondary	95	38
	Undergraduate	45	18
Previous Exposure to Millet-Based Foods	Yes	178	71.2
	No	72	28.8

Interpretation

The demographic analysis indicates that female respondents represented a slightly higher proportion (52.8%) compared with males (47.2%). The majority of participants belonged to the 16–17 years age group (39.2%). Around 71.2% of adolescents reported previous exposure to millet-based foods, indicating familiarity with millet products among respondents.

4.2 Awareness Level Regarding Millet-Based Foods

Table 2: Awareness Scores Related to Nutritional and Health Benefits of Millets

Awareness Statement	Mean ± SD
Millets are rich in dietary fibre	4.21 ± 0.76
Millets contain essential minerals	4.05 ± 0.81

Awareness Statement	Mean ± SD
Millets support digestive health	3.98 ± 0.85
Millets help in maintaining healthy weight	3.74 ± 0.92
Millets have a low glycaemic response	3.62 ± 0.96
Millets can contribute to prevention of lifestyle diseases	3.69 ± 0.89

Overall Awareness Mean Score: 3.88 ± 0.71

Interpretation

The findings demonstrate that adolescents showed a moderate-to-high awareness level regarding the nutritional advantages of millets. Awareness was highest regarding fibre content, whereas knowledge related to glycaemic properties and disease prevention was comparatively lower.

4.3 Consumption Behaviour of Millet-Based Foods

Table 3: Frequency of Millet Consumption Among Adolescents

Consumption Frequency	Frequency (n)	Percentage (%)
Daily	28	11.2
2–3 times/week	72	28.8
Occasionally	108	43.2
Never	42	16.8

Interpretation

Although awareness regarding millet benefits was observed among adolescents, regular consumption remained limited. Only 11.2% reported daily consumption, while the majority consumed millet-based foods occasionally. This indicates a gap between awareness and actual dietary practice.

4.4 Reliability Analysis

Table 4: Cronbach's Alpha Reliability Test

Construct	Number of Items	Cronbach's Alpha
Nutritional Awareness	6	0.84
Health Perception	5	0.81
Consumption Behaviour	5	0.79
Overall Questionnaire	16	0.86

Interpretation

The reliability analysis showed Cronbach's alpha values above 0.70 for all constructs, confirming acceptable internal consistency of the questionnaire.

4.5 Association Between Demographic Variables and Awareness Level (Chi-Square Test)

Table 5: Chi-square Analysis

Variable	χ^2 Value	p-value	Result
Gender and Awareness Level	6.214	0.013	Significant
Age Group and Awareness Level	8.746	0.033	Significant
Previous Millet Exposure and Awareness Level	18.542	<0.001	Significant

Interpretation

The chi-square analysis revealed significant associations between demographic factors and awareness level. Adolescents with previous exposure to millet-based foods demonstrated significantly higher awareness.

4.6 Correlation Analysis

Table 6: Relationship Between Awareness, Health Perception and Consumption Behaviour

Variables	Correlation (r)	p-value
Awareness and Consumption Behaviour	0.624	<0.001
Health Perception and Consumption Behaviour	0.581	<0.001
Awareness and Health Perception	0.547	<0.001

Interpretation

A significant positive correlation was observed between awareness and consumption behaviour ($r = 0.624$, $p < 0.001$). This indicates that higher awareness levels are associated with increased adoption of millet-based foods.

4.7 Regression Analysis: Predictors of Millet Consumption Behaviour

Table 7: Multiple Regression Analysis

Dependent Variable: Millet Consumption Behaviour

Predictor Variable	Beta (β)	p-value
Nutritional Awareness	0.382	<0.001
Perceived Health Benefits	0.295	<0.001
Accessibility	0.214	0.002

Model Summary:

$R^2 = 0.56$
Adjusted $R^2 = 0.55$
F-value = 103.42
$p < 0.001$

Interpretation

The regression model explains 56% of the variation in millet consumption behaviour. Nutritional awareness emerged as the strongest predictor, followed by perceived health benefits and accessibility.

4.8 ANOVA Analysis

Table 8: Difference in Awareness Levels Across Age Groups

Source	F-value	p-value
Age Group Differences	5.82	0.004

Interpretation

ANOVA results indicate significant differences in awareness levels among different age groups. Older adolescents showed comparatively higher awareness regarding millet-based foods.

4.9 Hypothesis Testing

Hypothesis	Result
H1: Awareness significantly influences consumption behaviour	Supported
H2: Demographic characteristics influence awareness	Supported
H3: Perceived health benefits influence consumption intention	Supported
H4: Awareness, perception and accessibility predict millet consumption behaviour	Supported

5. Discussion

The present study aimed to examine the role of millet-based foods in adolescent nutrition by assessing awareness, perceptions, and health perceptions among 250 adolescents. The findings provide important insights into the relationship between nutritional knowledge and actual consumption behaviour of millet-based foods.

The demographic findings revealed that a majority of adolescents had previous exposure to millet-based foods; however, regular consumption was comparatively low. This indicates that familiarity with millets does not necessarily result in frequent dietary inclusion. Similar observations have been reported by Kane-Potaka et al. (2021), who highlighted that although consumers recognize the health benefits of millets, factors such as food habits, accessibility, preparation practices, and preference influence actual consumption patterns.

The study observed a moderate-to-high awareness level among adolescents regarding the nutritional properties of millets, particularly their fibre, mineral, and nutrient content. However, awareness regarding specific functional benefits such as glycaemic regulation and prevention of lifestyle-related disorders was comparatively lower. These findings are consistent with the observations of Anitha et al. (2022), who reported that millets possess significant nutritional and health-promoting properties but require greater consumer awareness to improve acceptance and utilization.

The positive relationship identified between awareness and millet consumption behaviour suggests that nutritional knowledge plays an important role in influencing food choices. The correlation analysis demonstrated that adolescents with higher awareness levels were more likely to consume millet-based foods. This supports the findings of Chande et al. (2021), who emphasized that knowledge and perception significantly influence acceptance of millet-based foods among younger populations.

The findings further revealed that perceived health benefits significantly influenced adolescents' intention to consume millet-based foods. This indicates that adolescents are more likely to adopt healthier food choices when they understand the relationship between food intake and health outcomes. Similar results were reported by Rizwana et al. (2023), who found that awareness of nutritional and health values positively affected consumer intention towards millet-based products.

Although adolescents demonstrated awareness of millet benefits, consumption frequency remained limited, indicating an awareness–practice gap. This gap may be attributed to several factors, including taste preferences, lack of attractive millet-based food options, limited availability, and stronger preference for refined cereal products. Previous studies have identified sensory acceptability and convenience as important determinants influencing the adoption of functional foods among younger consumers.

The regression analysis indicated that nutritional awareness was the strongest predictor of millet consumption behaviour, followed by perceived health benefits and accessibility. This highlights that improving knowledge alone may not be sufficient; successful promotion of millet-based foods requires a combination of nutrition education, product innovation, and improved availability.

The significant differences observed across age groups suggest that older adolescents may possess greater awareness due to increased exposure to nutrition information and independent food decision-making. These findings support the importance of implementing nutrition education programmes at school and community levels to establish healthier dietary practices during adolescence.

Overall, the study demonstrates that millet-based foods have strong potential as nutritious dietary alternatives for adolescents. However, strategies focusing on awareness creation, improved product development, and increased accessibility are required to transform positive perceptions into regular consumption practices.

6. Practical Implications

The findings of the present study provide several important practical implications for stakeholders involved in adolescent nutrition, public health, education, and food product development. Since the study identifies a clear gap between awareness and actual consumption of millet-based foods, targeted interventions are required to translate knowledge into dietary practice.

6.1 Implications for Nutrition Educators and Schools

The moderate awareness levels observed among adolescents indicate the need for structured nutrition education programs in schools. Educational institutions should integrate millet-based nutrition topics into health science curricula to improve knowledge regarding their nutritional and functional benefits. Interactive sessions such as workshops, cooking demonstrations, and awareness campaigns can enhance interest and acceptance of millet-based foods among adolescents.

6.2 Implications for Public Health Authorities

Public health agencies can utilize the findings to design adolescent-focused nutrition promotion strategies. Since awareness significantly influences consumption behaviour, health campaigns emphasizing the benefits of millet-based foods can help improve dietary diversity and reduce the risk of lifestyle-related disorders. Government-led initiatives such as school nutrition programmes and mid-day meal diversification can incorporate millet-based dishes.

6.3 Implications for Food Industry and Product Development

The study highlights that despite awareness, consumption of millet-based foods remains limited, largely due to taste preference, familiarity, and accessibility. This presents an opportunity for the food industry to develop innovative millet-based products such as ready-to-eat snacks, bakery items, breakfast cereals, and beverages that are more appealing to adolescents. Product reformulation focusing on taste, texture, and convenience can significantly enhance acceptance.

6.4 Implications for Parents and Household Dietary Practices

Family food habits play an important role in shaping adolescent perceptions. Parents can encourage the inclusion of millet-based foods in daily meals by introducing familiar and palatable millet recipes. Early exposure to millet-based foods at home can help develop long-term healthy eating habits among adolescents.

6.5 Implications for Policy Makers

Policy makers can use these findings to strengthen nutritional security initiatives by promoting millets as part of national dietary guidelines. Subsidies, awareness campaigns, and inclusion of millets in public food distribution systems can improve their availability and affordability. Strengthening millet value chains can further support sustainable food consumption patterns.

6.6 Implications for Sustainable Nutrition

Millets are climate-resilient crops that contribute to sustainable agriculture and environmental protection. Promoting millet-based diets among adolescents not only improves nutritional outcomes but also supports sustainable food systems. Encouraging millet consumption can therefore contribute to both public health improvement and environmental sustainability goals.

7. Limitations and Future Research Directions

7.1 Limitations of the Study

While the present study provides valuable insights into adolescents' awareness, perceptions, and health perceptions regarding millet-based foods, certain limitations should be acknowledged.

7.1.1 Geographical Limitation

The study was conducted among a specific group of adolescents, which may limit the generalizability of the findings to broader adolescent populations across different geographical regions, cultural settings, and socioeconomic backgrounds. Dietary habits and food preferences may vary significantly across locations.

7.1.2 Cross-Sectional Research Design

The study adopted a cross-sectional research design, capturing responses at a single point in time. Therefore, causal relationships between awareness, perception, and consumption behaviour cannot be established with certainty. The findings only indicate associations among the study variables.

7.1.3 Self-Reported Responses

Data were collected through self-administered questionnaires, which may be subject to response bias, recall bias, and social desirability bias. Participants may have overestimated or underestimated their awareness levels and consumption practices.

7.1.4 Limited Behavioural Variables

Although the study examined awareness, health perception, and accessibility factors, other important determinants such as parental influence, peer influence, media exposure, food marketing, and economic considerations were not comprehensively investigated.

7.1.5 Consumption Frequency Assessment

The study focused primarily on self-reported consumption frequency rather than detailed dietary intake assessment. Actual nutrient intake derived from millet-based foods was not quantified through dietary records or nutritional analysis.

7.1.6 Product-Specific Evaluation

The research assessed general millet-based food consumption and did not evaluate consumer acceptance of specific millet products such as cookies, muffins, breakfast cereals, beverages, or other value-added functional foods.

7.2 Future Research Directions

Based on the findings and limitations of the present study, several opportunities exist for future research.

7.2.1 Large-Scale Multi-Regional Studies

Future studies should include larger and more diverse samples from different regions to improve the external validity and generalizability of findings. Comparative studies between urban and rural adolescents may provide additional insights into consumption behaviour.

7.2.2 Longitudinal Research

Longitudinal studies are recommended to examine changes in awareness, attitudes, and consumption behaviour over time. Such studies can better establish causal relationships between nutrition education interventions and perceptions.

7.2.3 Intervention-Based Studies

Future research may investigate the effectiveness of nutrition education programmes, awareness campaigns, and school-based interventions in improving millet consumption among adolescents. Experimental studies can evaluate the impact of structured educational initiatives on behavioural change.

7.2.4 Product Development and Sensory Evaluation

Further research should focus on the development of innovative millet-based food products specifically designed for adolescents. Sensory evaluation studies assessing taste, texture, appearance, and overall acceptability of millet-based snacks, bakery products, and ready-to-eat foods can provide valuable industry insights.

7.2.5 Nutritional and Health Outcome Assessment

Future studies should investigate the direct impact of millet consumption on nutritional status, growth indicators, dietary quality, and health outcomes among adolescents. Clinical and community-based intervention studies may provide stronger evidence regarding the health benefits of millet-based diets.

7.2.6 Advanced Behavioural Models

Researchers may incorporate theoretical frameworks such as the Theory of Planned Behaviour (TPB), Health Belief Model (HBM), or Social Cognitive Theory (SCT) to better understand the psychological determinants influencing millet consumption behaviour among adolescents.

7.2.7 Structural Equation Modelling (SEM) Approaches

Future studies may utilize advanced statistical techniques such as Structural Equation Modelling (SEM) to examine the direct and indirect relationships among awareness, attitudes, perceived health benefits, food preferences, and consumption behaviour. Such approaches can provide a more comprehensive understanding of millet adoption mechanisms.

8. Conclusion

The present study examined the role of millet-based foods in adolescent nutrition by assessing awareness, perceptions, consumption patterns, and perceived health implications among 250 adolescents aged 13–19 years. The findings indicate that adolescents possess a moderate to high level of awareness regarding the nutritional benefits of millets, particularly their fibre, mineral, and health-promoting properties. However, despite this awareness, regular consumption of millet-based foods remains relatively limited, highlighting a significant gap between knowledge and dietary practice.

The study demonstrated that nutritional awareness, perceived health benefits, and accessibility significantly influence adolescents' consumption behaviour towards millet-based foods. The correlation and regression analyses revealed that awareness emerged as the strongest predictor of millet consumption behaviour, confirming that increased knowledge regarding the nutritional value of millets positively contributes to their dietary adoption. Furthermore, significant differences in awareness levels across demographic groups suggest that exposure and educational experiences play an important role in shaping food-related decisions among adolescents.

The findings support all proposed hypotheses and reinforce the importance of awareness-based interventions in promoting healthier dietary choices. The results also indicate that awareness alone is insufficient to ensure regular millet consumption. Factors such as taste preferences, product availability, convenience, and familiarity with millet-based foods continue to influence adolescents' food choices. Therefore, improving acceptance requires a combination of nutrition education, product innovation, and supportive food environments.

From a practical perspective, the study provides valuable insights for nutrition educators, public health professionals, policymakers, and food manufacturers. School-based nutrition programmes, targeted awareness campaigns, and the development of appealing millet-based products may contribute to greater acceptance and consumption among adolescents. Such initiatives can support improved dietary quality and encourage healthier eating behaviours during a critical stage of growth and development.

The study also highlights the broader significance of millets in achieving sustainable nutrition goals. As climate-resilient and nutrient-dense crops, millets offer a promising solution for addressing nutritional challenges while supporting environmentally sustainable food systems. Promoting millet-based foods among adolescents can therefore contribute not only to improved health outcomes but also to long-term food and nutrition security.

In conclusion, millet-based foods represent a valuable dietary resource for adolescents due to their nutritional richness and potential health benefits. Strengthening awareness, improving accessibility, and enhancing product acceptability are essential for increasing millet consumption among younger populations. The findings of this study contribute to the growing body of literature on adolescent nutrition and provide evidence-based recommendations for promoting millets as an integral component of healthy and sustainable dietary practices.

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