

Original Research Article

Dietary transition and its association with metabolic health trends among Khasi tribes in Shillong, Meghalaya: a cross-sectional study

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ABSTRACT

Background: Urbanisation and globalisation have rapidly altered the traditional dietary landscape of the indigenous Khasi tribe in Meghalaya, shifting preferences toward a Westernised diet. This dietary transition is increasingly linked to a rising incidence of metabolic disorders. This study assessed the transition in eating habits among Khasi adolescents, evaluating their perceptions of fast food and the broader regional burden of metabolic health issues.

Methods: A cross-sectional survey was conducted among 300 Khasi adolescents (150 boys, 150 girls) in the East Khasi Hills district, Meghalaya. A structured questionnaire gathered data on perceptions, preferences, and consumption frequencies regarding traditional versus non-traditional fast foods. Concurrently, retrospective clinical data from 2019 to 2022 were collected from regional hospitals, Primary Health Centres (PHCs), and Non-Communicable Disease (NCD) clinics to analyse the regional incidence of diabetes and hypertension.

Results: Dietary perceptions shifted significantly, with both genders agreeing that fast food tastes better than traditional cuisine. Males demonstrated a significantly higher preference for fast food over traditional meals compared to females ($p < 0.05$). Alarming, 40% of males and 49.33% of females perceived fast food as generally healthy, while 50.67% of adolescent girls believed there was no scientific evidence of its detrimental health effects. Clinical data over the 3 years ($N = 75,673$) revealed a substantial metabolic disease burden, with 4.04% of patients diagnosed with diabetes and 8.23% with hypertension.

Conclusions: Khasi adolescents exhibit a pronounced dietary shift from traditional whole foods toward commercial fast foods, driven by taste preferences and widespread health misconceptions. This dietary transition correlates with a high and rising regional incidence of diabetes and hypertension in the East Khasi Hills district, highlighting an urgent need for targeted school and community-based nutritional interventions.

Keywords: Adolescents, Fast-food, Khasi tribe, Diabetes, Hypertension, India

INTRODUCTION

Globalisation, rapid urbanisation, and economic expansion have dramatically transformed the socio-cultural landscape of Shillong, the capital city of Meghalaya. These macro-environmental shifts have fundamentally altered local lifestyles, consumer mindsets and urban food selection behaviors. Empirical data regarding dietary transitions across India indicate that

modern eating patterns are rapidly changing due to a convergence of socio-economic factors.¹ These global forces threaten not only the wider cultural fabric, language, and traditions of indigenous communities, but also their foundational culinary practices. Historically dictated by tight cultural traditions, regional eating habits have undergone dynamic variations over the past few decades, resulting in a systemic shift from traditional food systems toward highly processed options. Mirroring this

national trend, Shillong has witnessed a massive proliferation of commercial fast-food establishments catering to changing generational preferences, offering a wide array of energy-dense convenience foods that pose severe public health risks.

Traditionally, localized food heritages have formed the cultural baseline for the indigenous Khasi people. Historically sourced directly from the natural environment, these native food items constitute an integral component of the daily diet. Khasi culinary traditions are culturally simple, highly nutritious, and easy to prepare, featuring balanced non-vegetarian items, unique wild edible plants, indigenous fruits, fermented chutneys, and unpolished rice as the core dietary staple. Indigenous Khasi foods serve as exceptional sources of macro- and micronutrients, offering dense concentrations of vitamins A, D, and C, alongside essential minerals such as calcium, iron, and zinc. Multiple nutritional audits have confirmed that these wild, native cultivars are structurally comparable or significantly superior in nutrient density to mainstream commercial crops.²⁻⁵ This extensive variety of wild, nutrient-dense edibles historically provided the indigenous Khasi population with a natural buffer of dietary diversification and robust baseline health status.⁶

However, transitioning from a traditional whole-food diet to a commercialized pattern has triggered severe nutritional imbalances. Once core dietary behaviors are altered, long-term physiological health is invariably compromised. Nutrition plays a fundamental role in maintaining metabolic homeostasis, acting as a primary determinant in the prevention and management of chronic pathology.⁷ Emerging evidence demonstrates that the consumption of traditional foods is declining sharply across indigenous Khasi communities, with modern commercial snacks frequently replacing conventional alternatives.⁸ The deliberate consumption of nutrient-dense wild herbs such as *jamyrdoh*, *jaut*, and *khlein syiar* which previously formed an indispensable element of the Khasi diet, is gradually diminishing. This decline is heavily accelerated by a rapidly growing "dining-out" culture and an exponential increase in commercial food venues across urban Shillong. Sociological data confirms that shifts in eating practices serve as a primary proxy for broader cultural changes within transitioning populations.⁹⁻¹¹ Ultimately, these dietary shifts, coupled with increasingly sedentary lifestyles, are directly linked to altered metabolic profiles and a surging prevalence of chronic diseases.¹¹

Adolescent dietary intake establishes the structural foundation for physiological health during adulthood; however, modern teenage nutritional patterns are highly vulnerable to external environmental determinants. Adolescents are increasingly abandoning conventional diets in favor of non-traditional eating habits a shift consistently highlighted by public health studies evaluating youth nutrient intake and overall health

outcomes.¹²⁻¹⁴ The rising consumption of ultra-processed, calorie-dense foods is recognized as a major driver of this trend, heavily reinforced by peer conformity, taste optimization, and aggressive commercial advertising.¹⁵ Branding, marketing, and the economic affordability maintained by the fast-food industry act as the primary catalysts driving fast-food dependence among late adolescents.¹⁶ Consequently, establishing strong nutritional awareness early in life is an urgent public health priority to prevent the onset of irreversible metabolic disorders. Late adolescents must build health-seeking eating behaviors to mitigate the escalating global and local burden of metabolic diseases.¹⁷ Therefore, substantial empirical evidence is required to contextualize adolescent food choices and design impactful public health interventions.

Nutritional composition dictates long-term metabolic homeostasis; conversely, the excessive intake of calorie-dense, nutrient-poor foods leads to double-burden malnutrition, establishing a direct etiology for metabolic disorders.^{18,19} Globally, the prevalence of chronic, non-communicable diseases (NCDs) is escalating at an alarming rate.²⁰ Over the past few decades, a striking global rise in the consumption of dietary saturated fats, refined carbohydrates, and high-fructose beverages has led to a major increase in metabolic syndrome and associated chronic pathologies.²¹⁻²³ Driven by rapid socio-demographic and nutritional transitions, NCDs have become the primary cause of morbidity and mortality both worldwide and across India.²⁴ In the context of Meghalaya, these profound dietary changes have negatively impacted the etiology of metabolic disorders, severely threatening the health status of the local population.⁸ Therefore, an urgent need exists to investigate the current dietary patterns of indigenous youth, highlighting the clinical importance of traditional food preservation against the backdrop of rising regional metabolic disease rates.

METHODS

Study setting and population

This cross-sectional study was conducted in Shillong, the capital city of Meghalaya, located in northeastern India. The population of Meghalaya is predominantly tribal, with the Khasi, Jaintia, and Garo communities constituting the primary ethnic groups. According to the Census of India, the state has a population of approximately 29.67 lakhs. The target population for this research specifically comprised the indigenous Khasi tribe, an ethnic group native to the East Khasi Hills district.

Study design and sample selection

A cross-sectional survey design was deployed to examine the dietary transitions, eating behaviours, and socio-environmental factors influencing food selection among

late adolescents. A total sample of 300 college-going Khasi adolescents consisting of 150 males and 150 females was recruited from local educational institutions within the district using convenience sampling. The colleges located in Shillong city were identified, and participants from these institutions were selected for the study.

To ensure a homogeneous sample, the following eligibility criteria were applied

Inclusion criteria

College-going students aged between 18 and 24 years; Those belonging to the indigenous Khasi tribe by ethnicity; Students who are currently enrolled as regular students in the selected educational institutions and are willing to participate in the study.

Exclusion criteria

Students who were absent on the days of data collection; Students with pre-existing chronic medical conditions that strictly dictate daily dietary intake; Students belonging to non-Khasi ethnic groups.

Data collection tools

Primary data were gathered using a self-administered, structured questionnaire designed to evaluate participant attitudes, perceptions, and structural preferences regarding traditional Khasi cuisine versus non-traditional commercial fast foods. The data were collected from May 2025 to June 2026. The instrument captured the respondents' choices, taste preferences, and nutritional awareness. Key perceptual metrics were quantified using a standard 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree).

Statistical analysis

We analysed the data using SPSS (version 20), with descriptive statistics and frequencies and percentages for categorical variables. We evaluated the male and female

perceptions towards fast food using a chi-square test for categorical data.

Ethical considerations

The study protocol adhered strictly to ethical research standards. Before data collection, the survey objectives were thoroughly explained to all participants. All participating students provided written informed consent, ensuring complete confidentiality and voluntary participation throughout the evaluation.

Secondary epidemiological data assessment

Metabolic disorders and associated risk factors are escalating public health concerns in the East Khasi Hills district. We evaluated secondary clinical data to contextualise the regional metabolic health burden. We compiled a retrospective, three-year epidemiological report (2019-2022) from the district's Non-Communicable Disease (NCD) cell, Directorate of Health Services (DHS), Meghalaya. This secondary dataset aggregates newly diagnosed cases of diabetes mellitus and hypertension recorded across major public healthcare delivery networks in the district including Civil Hospital Shillong, Ganesh Das Maternal and Child Health Hospital, and affiliated local Primary Health Centres (PHCs) to track prevailing health trends.

RESULTS

Demographic profile of the participants

The study sample comprised 300 undergraduate students randomly selected from various collegiate institutions across Shillong city to minimise selection bias. The sample was equally distributed by gender, consisting of 150 males ($n=150$) and 150 females ($n=150$). The mean age of the male cohort was 18.38 ± 1.71 years, with the highest concentration observed at 18 years of age (24.00%), followed by 17 years (18.67%) and 19 years (18.00%) (Figure 1). The mean age of the female cohort was slightly higher at 19.14 ± 1.22 years (Figure 2).

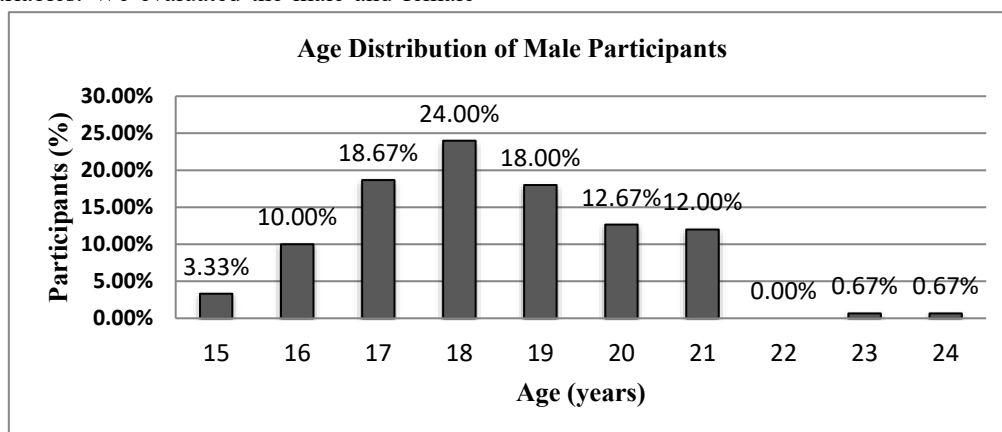


Figure 1: Percentage distribution of male participants by age.

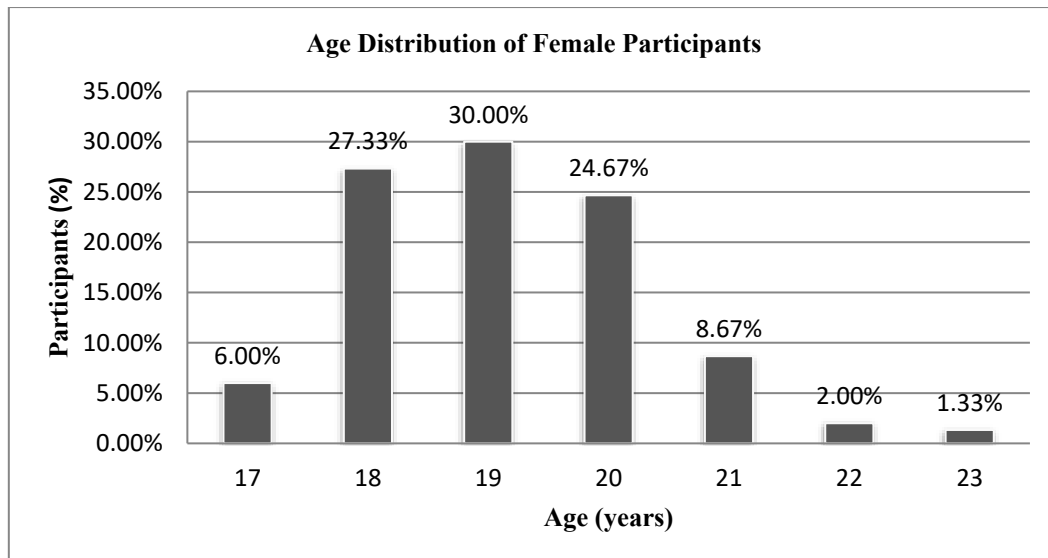


Figure 2: Percentage distribution of female participants by age.

Perceptions of fast-food health risks

The ongoing dietary transition among local adolescents shows a notable shift toward non-traditional food options. No statistically significant variance was observed between genders regarding individual concerns over the health consequences of fast-food consumption. Approximately 35.33% of males and 31.33% of females agreed with the notion that fast-food products do not pose significant, long-term risks to their personal health (Figure 3 and Figure 4). Conversely, a minor fraction of the cohorts consisting of 14.00% of males and 4.67% of females strongly disagreed with the premise that fast food is risk-free.

When presented with the specific statement "Fast foods are generally healthy," a substantial baseline of agreement emerged, driven largely by persuasive marketing, affordability, and commercial accessibility. Specifically, 40.00% of male participants and 49.33% of female participants explicitly agreed with this statement (Figure 5). A substantial proportion of both cohorts maintained a completely neutral stance, indicating a prevailing perception among late adolescents that fast-food items carry negligible toxicological or metabolic health implications.

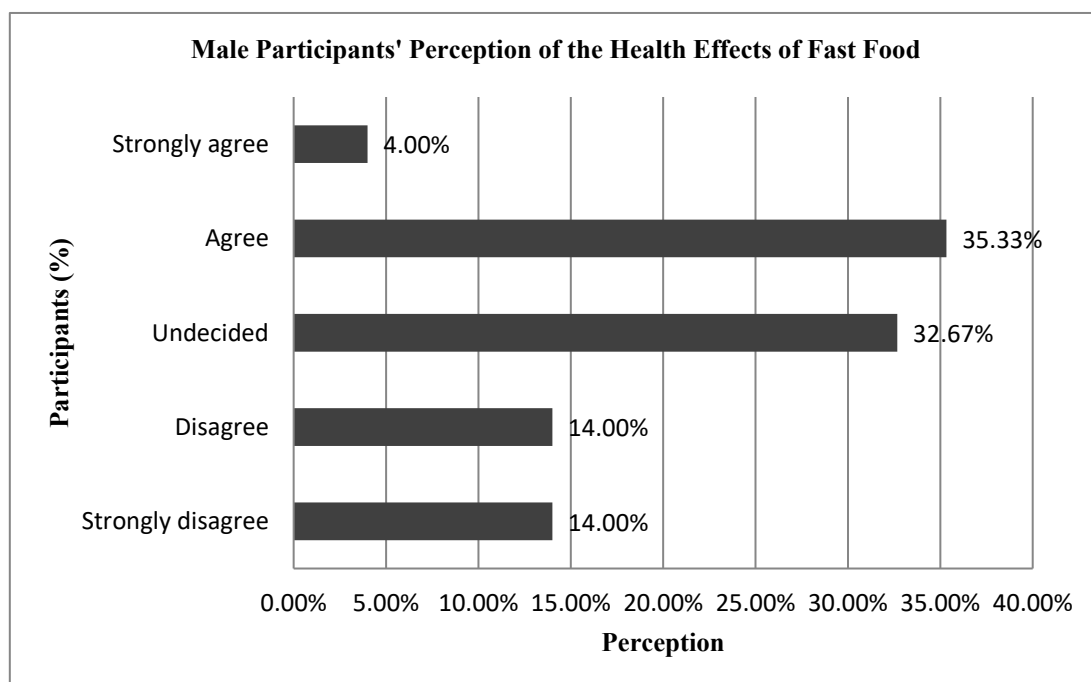


Figure 3: Male participants perception of the health effects of fast food.

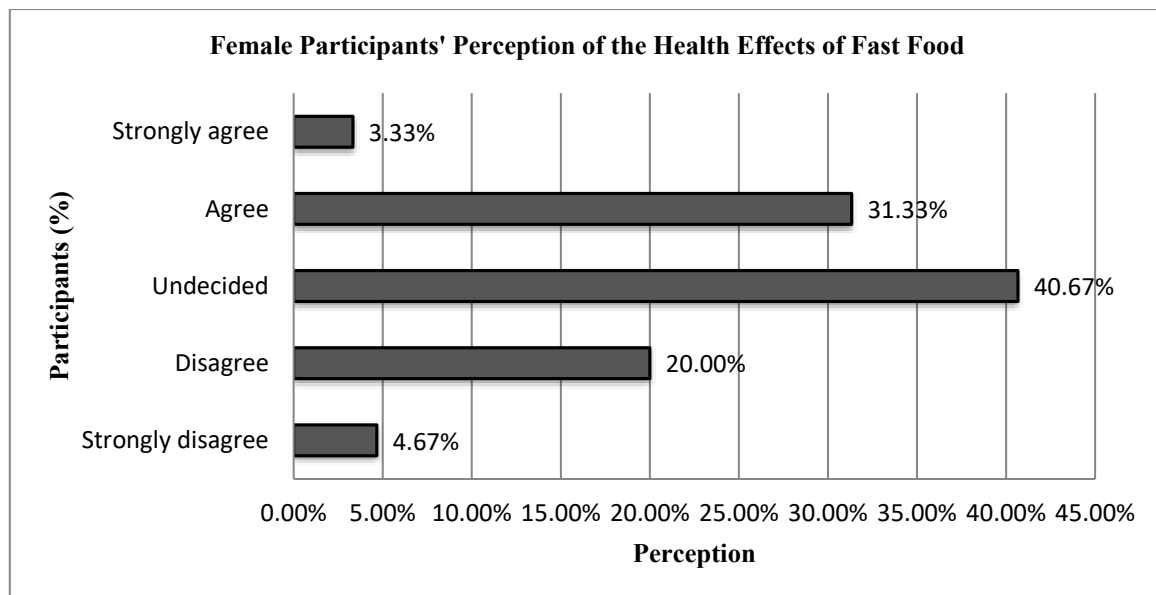


Figure 4: Female participants perception of the health effects of fast food.

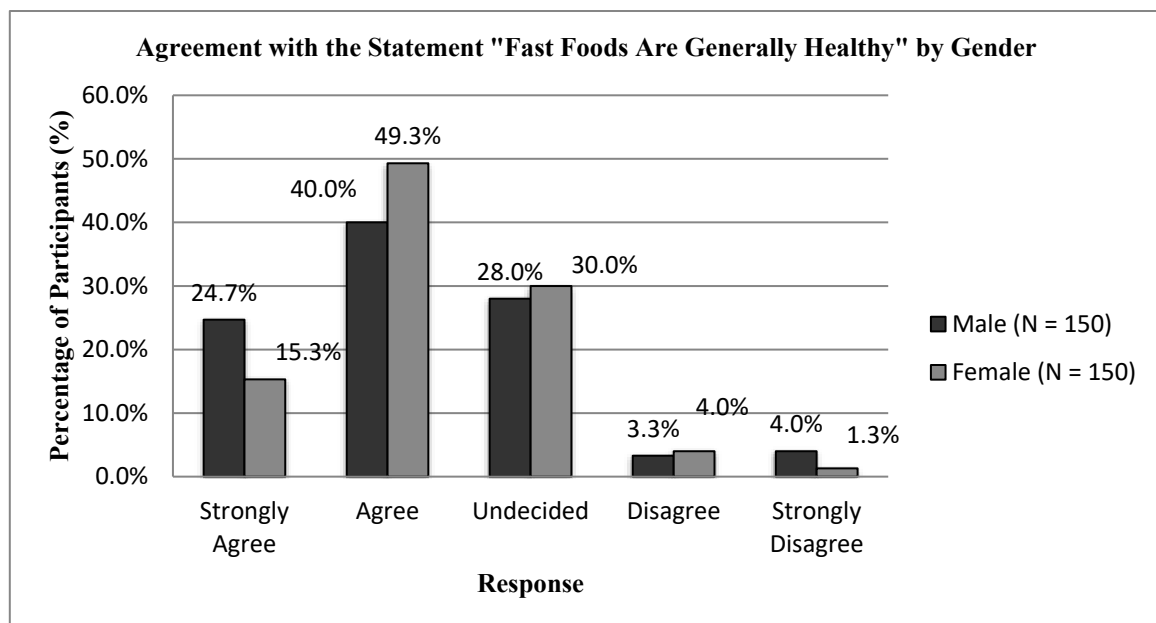


Figure 5: Agreement with the statement "fast foods are generally healthy" among male and female participants.

Attitudes toward policy regulation and consumer safety

A clear demographic divergence was identified regarding the implementation of regulatory public health policies for consumer safety. A highly significant statistical association was found between gender and baseline perceptions concerning the strict legal regulation of fast-food products ($\chi^2=18.398$, $df=4$, $p=0.001$), as detailed in Table 1.

Male respondents exhibited stronger opposition to legal restrictions, with 56.67% disagreeing and 24.67% strongly disagreeing with product regulation measures. In contrast, female respondents showed a higher tendency

toward indecision (22.67%) or baseline policy support, with 9.33% agreeing that strict oversight is necessary to protect public health frameworks.

Scientific scepticism regarding dietary risk evidence

The study evaluated degrees of scepticism regarding clinical and empirical data warning against fast-food properties. A highly significant statistical association emerged between participant gender and their response to the premise that the public health risks of fast-food consumption are merely media hype lacking structural scientific backing ($\chi^2=21.243$, $df=4$, $p<0.001$), as shown in Table 2.

A majority of adolescent female participants (50.67%) were completely undecided on whether empirical scientific proof exists confirming the detrimental physiological impacts of fast food. Concurrently, 26.67%

of adolescent males explicitly agreed that documented health warnings are exaggerated hype without real scientific validation.

Table 1: Association between gender and perceptions regarding strict regulation of fast-food products for consumer health and safety.

Perception	Male (n=150)	Female (n=150)	Overall (n=300)	χ^2	P value
Strongly agree	6 (4.00)	0 (0.00)	6 (2.00)	18.398	<0.001
Agree	6 (4.00)	14 (9.33)	20 (6.67)		
Undecided	16 (10.67)	34 (22.67)	50 (16.67)		
Disagree	85 (56.67)	77 (51.33)	162 (54.00)		
Strongly disagree	37 (24.67)	25 (16.67)	62 (20.67)		
Total	150 (100.00)	150 (100.00)	300 (100.00)		

Table 2: Gender differences in responses to the statement that the health impact of fast-food consumption is merely hype without scientific evidence.

Response category	Male (n=150)	Female (n=150)	Overall (n=300)	χ^2	P value
Strongly agree	11 (7.33)	2 (1.33)	13 (4.33)	21.243	<0.001
Agree	40 (26.67)	29 (19.33)	69 (23.00)		
Undecided	47 (31.33)	76 (50.67)	123 (41.00)		
Disagree	37 (24.67)	39 (26.00)	76 (25.33)		
Strongly disagree	15 (10.00)	4 (2.67)	19 (6.33)		
Total	150 (100.00)	150 (100.00)	300 (100.00)		

DISCUSSION

The findings of this study highlight a significant dietary transition among indigenous Khasi adolescents in Shillong, driven primarily by the forces of urbanisation and cultural Westernisation.^{11,25,26} This nutritional shift away from traditional whole-food diets toward high-calorie, commercially processed fast foods corresponds with a rising regional burden of metabolic NCDs.^{8,24}

Adolescent risk perceptions and market influences

A critical finding of this study is the high baseline of neutral or permissive attitudes toward fast-food health risks among both male and female undergraduate students. Approximately one-third of the participants believed that convenience foods do not pose serious health risks. This collective cognitive dissonance suggests that while general health campaigns have raised baseline awareness about the risks of fast food, commercial marketing strategies successfully counteract this awareness by emphasising affordability, convenience, and modern lifestyle associations.^{15,16}

This trend aligns with broader epidemiological observations noted by Shrivastava et al and Ghosh, who documented that tribal communities transitioning into urban environments become uniquely vulnerable to nutritional shifts due to the sudden availability of packaged dietary options.^{26,27} The lack of a statistically

significant gender variance regarding risk perception suggests that modern food environments in urban Shillong influence young adults uniformly, creating a shared vulnerability to long-term metabolic complications.

Gender-divergent preferences and traditional dietary decline

Despite shared risk perceptions, the study revealed a highly significant gender divergence regarding taste preferences and cultural orientation. Male adolescents demonstrated a significantly stronger preference for commercial fast foods over traditional Khasi meals compared to their female counterparts. Furthermore, males were more likely to favor fast food due to its palatability and social appeal.¹⁶

This trend places the nutritional status of the youth at risk. Traditional Khasi dietary components comprising local vegetables, lean meats, wild edible plants, and fresh fish paired with staple rice are inherently nutrient-dense, providing vital vitamins, minerals, and proteins that maintain metabolic homeostasis.⁶ The growing preference for ultra-processed foods among late-adolescent males suggests an imminent decline in traditional dietary protective factors, which could lead to early-onset metabolic disorders.⁸

Regional epidemiological burden and metabolic trends

The alarming shift in adolescent dietary preferences is mirrored by the retrospective clinical data evaluated in this study. Analysis of 75,673 patient records from the East Khasi Hills district NCD cell over a three-year period (2019-2022) revealed a striking regional burden of metabolic illness, with an overall incidence of 4.04% for diabetes and 8.23% for hypertension.²⁷

These numbers indicate a sharp and worrying upward trajectory when compared with older baseline data from the region. For context, historical hospital audits conducted between 2003 and 2007 by Syiem et al recorded a diabetic prevalence of 9.89% among urban Khasis, concentrated heavily (over 80%) in individuals aged 40 years and older.²⁸ The current rising incidence across all age groups indicates that metabolic diseases are no longer confined to older generations. Instead, the early onset of these diseases is likely driven by the lifelong accumulation of poor dietary habits and urbanised lifestyles initiated during adolescence.²⁴

Public health implications and future research

The intersection of adolescent nutritional misconceptions and rising hospital admission rates for hypertension and diabetes highlights an urgent public health challenge in Meghalaya.^{8,27} Immediate school and college-based nutritional interventions are required to reshape risk perceptions among late adolescents.¹⁷

Furthermore, comprehensive, large-scale epidemiological studies are critically needed to map the exact causality of these metabolic shifts across both rural and urban sectors of the East Khasi Hills. Future tracking must focus on identifying the distinct socio-environmental drivers of diabetes and hypertension to implement effective, culturally tailored preventive health policies for the indigenous population.²⁴

Limitations

The study is entirely based on self-reported survey metrics. It lacks physiological or anthropometric measurements such as Body Mass Index, waist-to-hip ratio or lipid profiles to correlate fast-food consumption with individual metabolic risk factors directly. The sample was restricted to college-enrolled adolescents in an urban setting, who likely have higher disposable income and greater access to commercial food than non-schooling or rural Khasi youth, thereby skewing the demographic's socioeconomic representation.

CONCLUSION

This study demonstrates that the cultural and dietary landscape of the indigenous Khasi population is undergoing a profound transition, marked by a decline in traditional whole-food consumption and a corresponding

rise in ultra-processed convenience diets among late adolescents. Traditional Khasi food systems, anchored in fresh, locally sourced, and nutrient-dense ingredients, serve as a historical baseline for optimal metabolic health. The systematic displacement of these nutritional practices by commercial fast foods introduces a severe vulnerability to long-term health degradation, directly correlating with the rising regional incidence of early-onset metabolic disorders such as diabetes mellitus and hypertension.

The findings of this empirical research serve as a critical foundational baseline for future public health frameworks seeking to mitigate nutritional shifts within indigenous youth cohorts. Understanding the behavioural and perceptual drivers of fast-food selection among late adolescents is imperative, as these early-stage dietary choices definitively dictate metabolic health outcomes and chronic disease trajectories moving into adulthood. Consequently, strategic policy initiatives must prioritise the preservation of traditional dietary literacy alongside aggressive, school-based nutritional interventions. Re-establishing the cultural and clinical value of localised food heritages is paramount to reversing the escalating burden of non-communicable diseases in the East Khasi Hills district.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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