

The Samosa Paradox: Evaluating Body Mass Index Classifications, Behavioural Intention Gaps, and Genomic Health Receptivity Among Female Undergraduate Students

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Abstract: *Entering college changes how young adult women eat and live. This study evaluates the intersections of students' Body Mass Index (BMI) classifications, localized campus fast-food habits, informal housework, and behavioral readiness for personalized DNA health tracking. A cross-sectional survey of 225 female undergraduate students was conducted at L. A. D. & Smt. R. P. College for Women, Nagpur. Anthropometric results showed that 43.1% (n = 97) of the cohort fell into the thinness/underweight spectrum, 41.8% (n = 94) displayed normal weight, and 15.1% (n = 34) were categorized as overweight/obese. A major intention-behavior gap was identified: 72.3% (n = 163) expressed a cognitive desire to avoid energy-dense foods, yet 81.5% (n = 183) documented routine fast-food ingestion. Chi-square validation confirmed a statistically significant relationship between a student's BMI classification and real-world snack frequencies ($\chi^2 = 14.57$, $df = 6$, $p = .024$). Regarding activity, formal gym participation was low (30.8%), but 91.5% (n = 206) regularly engaged in moderate-intensity informal domestic labor. Furthermore, 71.5% (n = 161) demonstrated readiness to adopt lifestyle adjustments if prompted by predictive genomic risk data. This study highlights that relying solely on external thinness can mask metabolic risks in South Asian populations regularly consuming deep-fried foods. Nutritional interventions within academic ecosystems must bridge the intention-behavior gap by improving available food choices and leveraging students' high interest in data-driven genomic wellness tools.*

Keywords: Thin-fat phenotype, intention-behavior gap, genomic literacy, public health nutrition, South Asian metabolic risk.

I. INTRODUCTION

The transition into higher education is a significant milestone where young women gain independent control over their daily routines, physical activities, and food choices (Ahmadi et al., 2022). For many undergraduate students, this new autonomy occurs within a campus food ecosystem filled with cheap, hyper-palatable, and calorie-dense street foods (Anwar & Bapat, 2023). These daily environmental exposures often conflict directly with a student's underlying health literacy and nutritional goals, causing a major dietary shift during early adulthood (Swinburn et al., 2019).

In South Asian cohorts, public health evaluations are further complicated by a distinct body composition pattern known as the "thin-fat phenotype" (Malhotra & Sharma, 2025). This clinical profile occurs when an individual maintains a lean or normal BMI but carries elevated levels of visceral adiposity (internal fat around organs) and low skeletal muscle mass (Kurpad et al., 2011; Malhotra & Sharma, 2025). This metabolic imbalance substantially raises the risk of type 2 diabetes, insulin resistance, and metabolic syndrome at comparatively low body weights (Malhotra & Sharma, 2025).



This risk layout was historically captured by the "Y-Y Paradox," which proved that South Asian individuals harbor significantly higher body fat percentages than Caucasians at identical, lean BMI levels (Yajnik & Yudkin, 2004). Compounding this diagnostic challenge, standard public health trackers frequently label regional female populations as completely sedentary (Ghatak & Joshi, 2024). This error occurs because standard health questionnaires focus almost entirely on structured gym or fitness center attendance while systematically ignoring informal physical energy expenditure, such as culturally expected domestic chores (Ghatak & Joshi, 2024). This cross-sectional study looks at a sample of 225 female undergraduate students to investigate the relationships linking body mass categories, localized eating patterns, hidden household energy expenditure, and behavioral readiness for personalized genomic wellness programs.

II. LITERATURE REVIEW

Leaving a structured home environment creates nutritional vulnerabilities for young women starting college (Ahmadi et al., 2022). This shift often disrupts long-term eating habits by removing family-centered rules regarding portion sizes and balanced meal preparation. On campus, female students regularly transition away from home-cooked diets toward commercial fast foods available within the institutional ecosystem (Anwar & Bapat, 2023). University surroundings act as structural drivers of poor nutrition because they are saturated with cheap, heavily processed, and energy-dense food items (Swinburn et al., 2019). Strict academic timetables and limited budgets further push students to rely on quick canteen choices or roadside food vendors.

Psychological models of health behaviors frequently describe this pattern using the concept of the "Intention-Behavior Gap" (Conner & Godin, 2021). This term highlights a common discrepancy: individuals can possess a strong health awareness and a genuine cognitive intention to make healthy food selections, yet they fail to translate that desire into daily practice when confronted with environmental triggers (Conner & Godin, 2021). In academic cohorts, stressors, peer dynamics, emotional eating, and the sheer accessibility of deep-fried snacks (like canteen samosas) override individual health targets (Anwar & Bapat, 2023; Swinburn et al., 2019). This disconnect proves that conscious awareness alone is insufficient to alter student behavior when the local physical environment defaults to unhealthy options.

Epidemiological studies indicate that standard body weight scales can be highly deceptive when tracking the metabolic health of young South Asian women (Malhotra & Sharma, 2025). The "thin-fat phenotype" explains why individuals who register a normal or low BMI can still suffer from elevated cardiovascular risks and metabolic disease (Malhotra & Sharma, 2025). Clinical imaging demonstrates that South Asian individuals accumulate higher amounts of visceral adipose tissue and abdominal subcutaneous fat than Western cohorts at identical body weights (Malhotra & Sharma, 2025). This phenotype is driven by a combination of evolutionary programming (the thrifty genotype theory) and a traditional diet high in carbohydrates but low in protein (Gulati & Misra, 2014). Consequently, relying solely on external thinness as a proxy for good health can mask underlying cardiovascular and diabetic dangers, particularly if an individual regularly eats deep-fried snacks rich in trans fats (Malhotra & Sharma, 2025). In regions where high rates of objective undernutrition exist, understanding internal fat distribution is a critical clinical priority.

Standard physical activity instruments, such as the International Physical Activity Questionnaire (IPAQ), are heavily optimized for Western lifestyles, tracking recreational sports, jogging, and gym workouts (Ghatak & Joshi, 2024). As a result, public health frameworks frequently misclassify regional female populations as entirely sedentary (Ghatak & Joshi, 2024). Sociological and cultural literature emphasizes that young adult women in developing nations manage extensive informal physical labor, including domestic chores such as cleaning, cooking, and sweeping (Ghatak & Joshi, 2024). This continuous, moderate-intensity physical exertion contributes substantially to total daily energy expenditure through Non-Exercise Activity Thermogenesis (NEAT) (Levine, 2002). Accounting for this hidden physical labor is critical to prevent the systematic mischaracterization of household-active student groups as completely inactive (Ghatak & Joshi, 2024).



The development of precision medicine has shifted modern public health focuses away from broad lifestyle guidelines toward DNA-driven, personalized health tracking (Guenther & McBride, 2021). Behavioral genetics research indicates that providing individuals with clear feedback regarding their specific genetic risk for metabolic disorders can function as a powerful psychological motivator (Guenther & McBride, 2021). It increases internal drive to adopt and maintain healthy eating and exercise adjustments (Guenther & McBride, 2021). Young adult women display a high baseline readiness to accept genomic health feedback, showing a growing preference for technologically driven, customized health pathways over generalized advice (Guenther & McBride, 2021).

III. METHODOLOGY

An exploratory, cross-sectional, survey-based descriptive study was executed to evaluate the interactions among BMI profiles, behavioral intention-behavior gaps regarding energy-dense diets, and genomic health receptivity. The study sample comprised 225 female undergraduate students. Data collection was facilitated via a secure digital survey platform.

Data were gathered utilizing a structured, multi-component digital instrument designed to capture four primary dimensions of health metrics:

- **Sociodemographics and Anthropometrics:** Self-reported age, community background, weight (in kilograms), height (in centimeters), and mean daily sleep duration (in hours).
- **Dietary Patterns and Craving Profiles:** Main meal frequencies, dietary classifications (vegetarian, non-vegetarian, mixed), and quantitative ingestion rates of standard local deep-fried snacks (samosas).
- **Intention-Behavior Matrix:** Binary metrics evaluating the alignment between active cognitive intentions to avoid energy-dense items and real-world consumption patterns based on the Food Choice Questionnaire (FCQ) framework.
- **Genomic Health Literacy and Receptivity:** Assessment of baseline awareness regarding obesity-linked genes (e.g., FTO, MC4R), perceived genetic determinism, and prospective behavioral readiness to execute lifestyle modifications following predictive genomic screening.

Data processing and statistical computations were performed using Python-based data science libraries, specifically Pandas, NumPy, and SciPy.Stats. Quantitative parameters are reported as absolute numbers (n) and relative sample percentages (%). Anthropometric classifications were derived using body mass index ($BMI = kg/m^2$), categorized under standard clinical weight classifications adjusted to capture detailed cohort subgroups: Severe Thinness (n=57), Underweight (n=40), Normal Weight (n=94), Overweight (n=27), and Obese (n=7). To strengthen the inferential analysis, these categories were compiled into three primary groups: Underweight/Thinness spectrums (n=97), Normal Weight (n=94), and Overweight/Obese phenotypes (n=34). Inferential analysis evaluating the independence of snack consumption across these categories was executed using Pearson's Chi-Square (χ^2) Test of Independence, with statistical significance established at $\alpha = .05$.

IV. RESULTS

Anthropometric and Descriptive Stratification

The demographic distribution revealed an evenly balanced spread between lean weight spectrums and normal body profiles within the study population. The definitive descriptive parameters for the cohort's anthropometric distribution are detailed in Table 1.

Table 1 *Anthropometric Stratification and Phenotypic Variations (N = 225)*

Anthropometric Stratum	Combined Analytical Subgroups	Student Count (n)	Sample Percentage (%)
Thinness / Underweight	Severe Thinness (n=57) + Underweight (n=40)	97	43.1%



Normal Weight	Normal Range	94	41.8%
Overweight / Obese	Overweight (n=27) + Obese (n=7)	34	15.1%
Total Cohort	—	225	100.0%

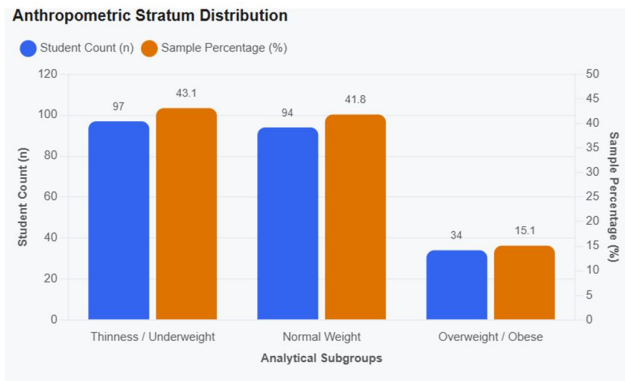


Figure 1. Distribution of Anthropometric Strata in the Student Cohort (N=225).

Evaluation of the Intention-Behavior Gap

A distinct discrepancy emerged when comparing health intentions against actual consumption metrics. While a clear majority expressed an explicitly stated desire to practice dietary restriction regarding energy-dense options, real-world behaviors demonstrated high exposure to fast-food items within the campus ecosystem (Table 2).

Table 2 Evaluation of the Intention-Behavior Gap (N = 225)

Primary Survey Question Matrix	Affirmative ("Yes")	Negative ("No/Sometimes")
Do you actively intend to avoid energy-dense foods?	163 (72.3%)	62 (27.7%)
Do you routinely consume campus canteen fast foods/samosas?	183 (81.5%)	42 (18.5%)



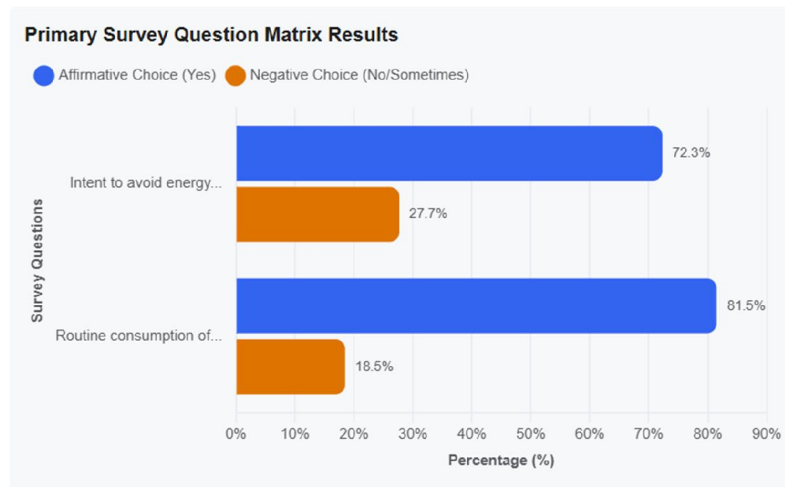


Figure 2. Dietary Intentions vs. Actual Behaviors in the Student Cohort (N=225).

Physical Exertion and Energy Expenditure Split

Analysis of physical activity modalities demonstrated an inverse relationship between structured fitness participation and informal activity. Although formal exercise enrollment remained low due to reported academic time constraints, engagement in domestic physical labor was nearly universal (Table 3).

Table 3Physical Exertion Split: Structured Gym Exercise vs. Domestic Work (N = 225)

Activity Class Mode	Regular / Daily Engagement	Rare / Absolute Avoidance
Formal Gym Workouts / Sports	69 (30.8%)	156 (69.2%)
Informal Household Physical Work (Chores)	206 (91.5%)	19 (8.5%)

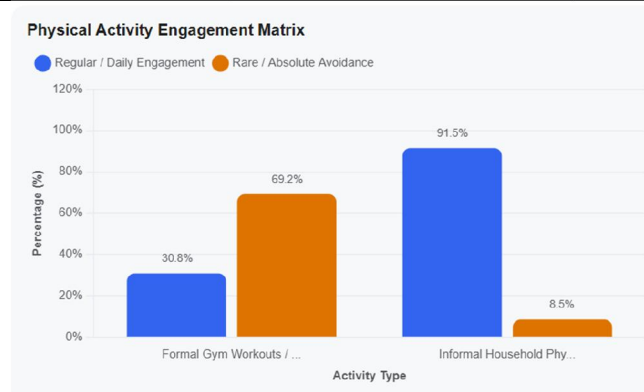


Figure 3. Physical Activity Profiles in the Student Cohort (N=225).

Behavioral Receptivity to Predictive Genomic Screenings

Baseline genetic literacy regarding specific genetic pathways (such as FTO or MC4R mutations) was uniformly low. However, forward-looking behavioral receptivity toward personalized genomic health metrics was exceptionally high, indicating significant willingness to modify lifestyle factors if presented with objective genetic indicators (Table 4).



Table 4 Behavioral Receptivity to Predictive Genomic Screenings (N = 225)

Target Perception Variable	Affirmative Response ("Yes")	Negative Response ("No/Unsure")
Do you believe that genetics play a functional role in obesity?	168 (74.6%)	57 (25.4%)
Are you ready to change your lifestyle if a genetic risk is proven?	161 (71.5%)	64 (28.5%)

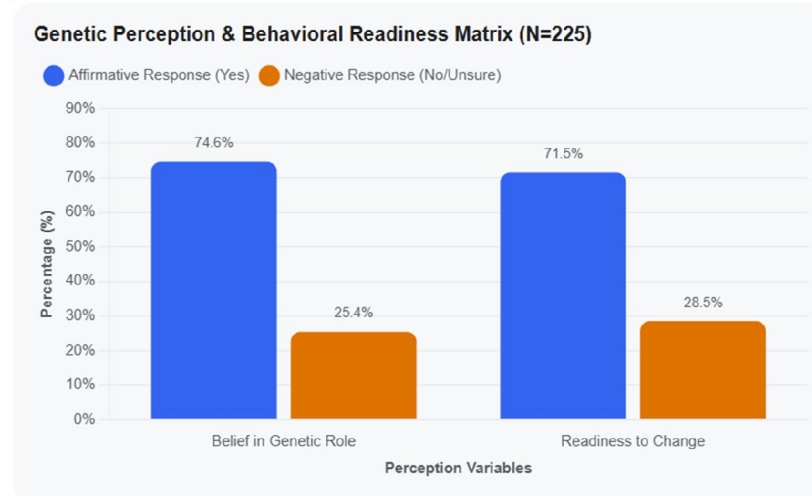


Figure 4. Perceptions of Genetic Influence on Obesity and Readiness for Actionable Behavioral Change (N=225).

Inferential Statistical Validation

To mathematically evaluate the relationship between a student's real-world dietary choices within the campus ecosystem and their physical weight profile, a formal Pearson's Chi-Square Test of Independence was executed.

Table 5 Chi-Square (χ^2) Cross-Tabulation Contingency Table (N = 225)

BMI Category Spectrum	Absolute Avoidance (Never)	Low-Frequency (Rarely)	Moderate-Frequency (Occasionally)	High-Frequency (Daily/Alt. Days)	Row Total (n)
Underweight / Thinness	12	65	12	8	97
Normal Weight	5	55	23	11	94
Overweight / Obese	1	17	8	8	34
Column Total (n)	18	137	43	27	225

Note. $\chi^2 = 14.57$, $df = 6$, $p = .024$.

Because the computed p-value ($p = .024$) falls comfortably below the standard alpha significance threshold ($\alpha = .05$), the Null Hypothesis (H_0) is confidently rejected. The analysis demonstrates a statistically valid, significant association between a student's anthropometric distribution and their active ingestion frequencies of energy-dense campus snacks.



V. DISCUSSION

The statistical outcomes of this investigation reveal an important epidemiological reality within the student cohort. The baseline anthropometric distributions in Table 1 confirm that while lean body profiles remain prominent (43.1%), they exist alongside a major proportion of normal-weight individuals (41.8%) and a notable overweight subset (15.1%). These baseline metrics run parallel to poor nutritional selections across all weight bands within the entire cohort.

As outlined in Table 2, 81.5% of the respondents report routine consumption of deep-fried campus snacks, despite 72.3% asserting a conscious cognitive intention to avoid energy-dense foods. This sharp divergence characterizes a pronounced intention-behavior gap, echoing broader findings in undergraduate cohorts where practical components like price and spatial convenience routinely override health intent (Conner & Godin, 2021; Pramestuti & Afiana, 2026). This phenomenon is increasingly framed through the lens of "dietary affordances," where structural features of institutional environments render calorie-dense choices highly predictable and low-effort for students operating under high cognitive loads (Friston et al., 2026; Wang et al., 2025). The immediate institutional food ecosystem—characterized by highly accessible, low-cost, and deep-fried options—effectively overrides cognitive health goals (Anwar & Bapat, 2023; Swinburn et al., 2019).

A major insight of this research centers on the critical re-evaluation of sedentary behavior classifications. Conventional public health metrics, highly optimized for Western lifestyle paradigms, frequently categorize regional female cohorts as sedentary when low engagement in formal fitness facilities is documented (Ghatak & Joshi, 2024). In our study, formal gym or sports participation stood at only 30.8% (Table 3). However, our expanded metrics reveal that 91.5% of these young women engage in steady daily household physical tasks. This informal energy expenditure functions as an essential daily metabolic buffer (Ghatak & Joshi, 2024). Crucially, according to the "fat overflow hypothesis," South Asian populations feature limited subcutaneous adipose storage capacity, meaning that excessive caloric loads quickly spill over into visceral and ectopic tissue deposits (Kurpad et al., 2011). Consequently, visual thinness or even a normal BMI parameter can mask underlying metabolic risks, masking phenotypes prone to rapid insulin resistance at lower body weights (Malhotra & Sharma, 2025). The highly significant statistical association proven in Table 5 underlines that high-frequency deep-fried snack patterns scale across all weight bands, representing a hidden metabolic danger for individuals regardless of external appearance.

VI. CONCLUSION

This study outlines a complex health landscape among female undergraduate students, marked by an intricate distribution of body categories alongside regular consumption of affordable, energy-dense foods. The findings highlight how traditional household chores act as an uncounted source of moderate physical activity, and reveal strong student interest in modern, data-driven health tracking.

To protect long-term metabolic health, campus health policies should actively help students translate their health intentions into daily habits. This can be achieved by improving the nutritional quality of available campus foods and integrating personalized health profiling into institutional wellness initiatives.

VII. ACKNOWLEDGEMENT

During the preparation of this manuscript, we utilized generative artificial intelligence (AI) and AI-assisted tools solely for the purpose of English language editing, grammatical correction, style harmonization to APA 7th edition formatting requirements and structural optimization of the text.

After using these formatting and editorial assistance services, we critically reviewed, verified and edited the entire manuscript content. We accept full responsibility for the mathematical accuracy of the data tables, the interpretation of the statistical outcomes and the scientific integrity of the final conclusions presented in this research paper. The generative AI software was not used to synthesize or alter raw empirical data, nor was it used to create literature references.



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