The Hidden Deficit- high impact of protein and fiber consumption among students

S.Ramalakshmi [*], Anjana sri. S [2], V.R.Dheepan [3], Lakshmipriya.N [4], Siddarthanan.U.S [5], Yaswanth.S [6]

[1] Assistant professor, [2,3,4,5,6] UG Students, Department of Food Technology,

Sri Shakthi Institute of Engineering and Technology, L&T bypass, chinniyamapalyam, Coimbatore ,Tamil Nadu, India

ABSTRACT:

A survey was conducted among 407 college students to assess their daily intake of protein and fiber and compare it with recommended levels. Data were collected through the Survey Heart app, including dietary patterns based on daily, rare, and no workout activity. The responses were exported to Microsoft Excel for calculating group and overall averages, consumption percentages, and nutrient deficits. The average recommended protein intake was 91.6 g/day, while the actual average intake was 74.97 g/day, showing a deficit of 16.62 g/day (15.47%). For dietary fiber, the recommendation was 30 g/day, but the average consumption was only 20 g/day, resulting in a deficit of 10 g/day (33%). The findings reveal a significant shortfall in both protein and fiber intake among students, leading to reduced energy, impaired muscle recovery (especially for those who exercised), poor digestion, and adverse effects on concentration, mood, and academic performance. The larger gap in fiber intake is particularly concerning due to its role in digestive health and long-term disease prevention. This study highlights a considerable nutritional imbalance, emphasizing the need for increased awareness, promotion of healthier eating habits, and improved access to protein- and fiber-rich foods on campus.

INTRODUCTION

Nutrition during adolescence and young adulthood is vital for growth, emotional stability, and academic performance (Burrows et al., 2017). Protein and dietary fiber are especially important as they directly support physical development, digestion, energy levels, and cognitive function (Ghosh et al., 2019; Slavin, 2013). However, many students consume less than recommended levels, creating a hidden nutritional gap (WHO & FAO, 2007).

Protein acts as the body's building block, essential for muscle repair, hormone regulation, and maintaining focus and stamina (WHO & FAO, 2007; Lieberman et al., 2016). Fiber supports digestive health, gut microbiota, and cognitive clarity through the gut–brain axis (Slavin, 2013; Reynolds et al., 2020). Insufficient intake leads to fatigue, irritability, reduced concentration, and stress (Adolphus et al., 2019; Hiza et al., 2013).

NEED AND IMPORTANCE OF THE STUDY

Modern dietary habits involving processed and fast foods increase the risk of metabolic disorders while being low in protein and fiber (Musaiger & Al-Khalifa, 2018). Poor intake negatively affects emotional balance, mood regulation, and academic efficiency (O'Neil et al., 2015; Burrows et al., 2017).

Evaluating protein and fiber consumption among students is crucial to identify dietary deficits and promote behaviour change. Encouraging access to pulses, whole grains, fruits, and vegetables on campus can improve students' physical health, mental resilience, and overall performance (Lieberman et al., 2016; Reynolds et al., 2020).

OBJECTIVES OF THE STUDY

1. To find out how much protein college students actually consume in a day and whether it matches what their body needs.
2. To measure their daily fiber intake and check if it reaches the healthy recommended level.
3. To identify how many students are falling short in both nutrients and by what margin.
4. To understand how these nutritional gaps might be affecting their energy levels, digestion, mood, and performance in academics or physical activities.
5. To encourage students to follow healthier eating habits by highlighting the importance of including more protein- and fiber-rich foods in their routine diet.

MATERIALS AND METHODOLOGY

Sampling Method:

The study was conducted exclusively among college students, with a target sample size of 400 participants. This number was chosen to ensure that the findings would be both representative and reliable. The data collection process was completed once the target was successfully reached. The students were cooperative, responding to the survey at their convenience, while also respecting the instructions provided by the researchers.

Sample Data Collection:

At the initial stage, responses were gathered through printed questionnaires where students manually filled in their choices. This allowed us to collect some baseline data and test the feasibility of the questions. However, to make the process more efficient and accessible, the data collection soon shifted to an online platform. For this, the application SurveyHeart was chosen, as it provided a user-friendly interface for both researchers and respondents. Once adopted, all subsequent data was gathered digitally through the app.

Data Collection Tool:

A structured questionnaire was designed within the SurveyHeart platform. The survey included a combination of multiple-choice questions and open-ended responses, giving participants the freedom to either select predefined answers or express their own perspectives. A link to the questionnaire was generated and distributed via WhatsApp, ensuring that the survey reached students quickly and conveniently on their personal devices.

Data Collection Procedure:

Students were invited to participate through a survey link shared via WhatsApp, allowing them to access the questionnaire easily on their devices. Once a student submitted their response, the SurveyHeart application automatically recorded and saved the data. This system minimized the possibility of errors and duplication, while also capturing important metadata such as the date and time of submission. The automation built into the tool enhanced the accuracy of the collected data and ensured smooth management of responses.

Data Analysis:

After the survey period concluded, the collected responses were exported from Survey Heart into an Excel spreadsheet. The data was then carefully examined using descriptive statistics. Pie charts, frequencies, and percentages were generated in Excel to visually represent patterns and distributions in the responses. These visualizations made it easier to interpret the findings and present them in a clear and accessible format.

Ethical Considerations:

The research was carried out with careful attention to ethical standards. Taking part in the survey was completely voluntary, and students were clearly informed beforehand that their answers would remain private. They were also reassured that the information collected would be used only for academic purposes, not for profit or any other personal use. By being open and respectful of participants' privacy, the study maintained honesty and integrity throughout the process.

RESULTS AND DISCUSSION

For female students, the average protein requirement shown in Table 1.1 varies according to their level of physical activity.

Daily Workout (Female Students)

Female students who exercise regularly form the most active category. Their workouts increase muscle use, which raises the need for protein to support muscle repair and recovery (Pasiakos et al., 2015). The recommended intake for this group is about **98 g/day**, but the survey shows they consume only around **79 g/day**, indicating a shortage of nearly **19 g/day** (MDPI, 2016). This suggests that even active individuals may not be meeting their increased nutritional needs (Ghosh et al., 2018).

Rare Workout

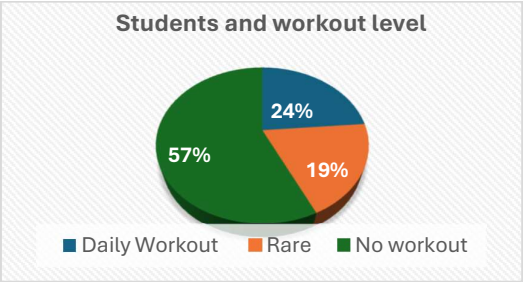
This group includes students who exercise occasionally. Their bodies still need enough protein to support muscle function and energy levels (WHO, 2020). Their requirement is around 73 g/day, while their actual intake is only 43 g/day, resulting in the largest gap of nearly 31 g/day (FAO, 2019; Harvard Health Publishing, 2022).

No Workout

students who do not engage in physical activity have a lower protein requirement of about **49 g/day**, which

supports basic functions like metabolism, tissue maintenance, and immunity (CDC, 2021; NIN, 2021).

Fig 1.1 number of female students and their workout level



The survey data shows that non-active female students consume about 43.4 grams of protein per day, which is slightly below their requirement. Even a small daily deficiency can gradually impact energy levels, immunity, concentration, and the body's ability to repair tissues (Leidy et al., 2015; ICMR, 2020).

For students who do not engage in exercise, maintaining a balanced diet is still essential. The body needs a minimum amount of protein every day to support metabolism, muscle maintenance, and overall health (WHO, 2020). Simple additions such as milk, eggs, lentils, soy products, paneer, or yogurt can help them meet their daily needs without major dietary changes (FAO, 2013).

Table 1.1. Difference in percentage of required and consumed protein by female students

Required and consumed protein by a female student	Daily workout	Rare workout	No workout	Total average
Average protein required	98.04	73.3	48.5	73.28
average protein consumed	83.3%	58.25%	89.4%	76.98%
missing protein	16.70%	41.75%	10.60%	23.02%

The average protein requirement for male students varies according to their physical activity level, as shown in Table 1.2 (ICMR, 2020).

Daily / Regular Workout (Male Students)

Male students who exercise daily—such as through gym workouts, sports, running, cycling, or weight training—form the most active group. These activities increase muscle breakdown and therefore require more protein for rebuilding and strength maintenance (Pasiakos et al., 2015). Their average requirement is **128.8 g/day**, but they consume only **95.87 g/day**, leaving a deficit of about **33 g/day** (MDPI, 2016; Ghosh et al., 2018). This shortage may reduce recovery efficiency and overall performance.

Rare Workout (Male Students)

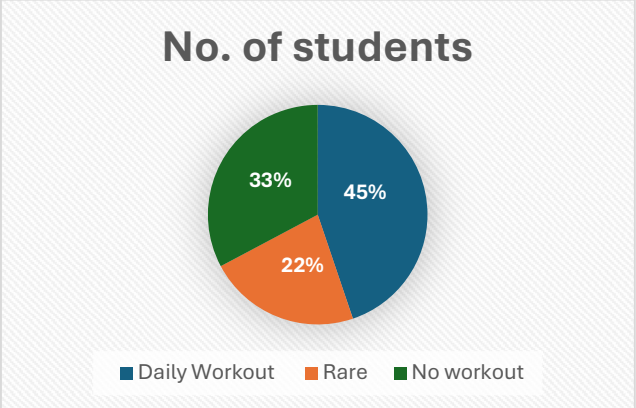
These students engage in physical activity only occasionally. Their protein needs are moderately higher than non-active individuals (NIN.,2021). They require about **87.85 g/day**, while their actual intake is **77.93 g/day**, showing a shortfall of nearly **10 g/day**. Even a small deficiency over time can contribute to fatigue, slower recovery, and reduced focus (ICMR, 2020; Leidy et al., 2015).

No Workout (Male Students)

Students without any workout routine have the lowest protein needs, as their muscles are not frequently strained. Their requirement is around **58.15 g/day**, mainly for essential functions such as metabolism and immune health (WHO, 2020; FAO, 2013).

Male students without a workout routine consume an average of 54.13 g/day of protein, which remains slightly below the recommended intake for maintaining basic body functions (NIN, 2021). Even a small deficit of around 4 grams each day can gradually affect strength, immunity, and concentration if it continues over time (ICMR, 2020; Leidy et al., 2015).

Fig 1.2. Number of male students and their workout level



Across all activity groups together, the overall average protein requirement for students is 91.6 g/day (MDPI, 2016). However, their actual intake reaches only 74.97 g/day, resulting in a daily shortage of about 16.62 grams (Ghosh et al., 2018).

In short, male students also fall short of their protein needs *(NIN, 2021)*. The gap is most striking in those who exercise daily — while they need about **129 g/day**, they consume only about **96 g/day**, leaving a deficit of more than **30 g** *(Pasiakos et al., 2015)*. Those with rare or no workouts are closer to their requirements but still under-consuming *(ICMR, 2020; Leidy et al., 2015)*.

Table 1.2. Difference in percentage of required and consumed protein by male students:

Required and consumed protein by a male student	Daily workout	Rare workout	No workout	Total average
Average protein required	128.8	87.85	58.15	91.6
Average protein consumed	74.90025	85.3%	93.4%	84.53%
Missing protein	25.10%	14.70%	6.60%	15.47%

The survey highlights that both male and female students are not meeting their daily protein requirements, regardless of their workout levels (NIN, 2021). This deficiency has wide-ranging effects on different aspects of student life. Academically, protein plays a vital role in fuelling concentration, memory, and alertness, and its lack often leads to mental fatigue, poor focus, and reduced productivity, ultimately lowering academic performance (Taras, 2005; Burkhalter & Hillman, 2011). Physically, students who are active experience slower muscle recovery, less stamina, and restricted growth, while less active students face risks such as muscle loss and general weakness (Pasiakos et al., 2015). Over time, these effects reduce overall fitness and vitality (Leidy et al., 2015).

Protein deficiency also weakens immunity, making students more prone to frequent illnesses, slow wound healing, and constant tiredness, which interfere with their ability to study effectively and manage daily routines (ICMR, 2020; FAO, 2013). In terms of appearance, low protein intake can lead to hair fall, dull skin, and brittle nails, while also affecting muscle tone (WHO, 2020). These visible changes, combined with reduced strength and endurance, can damage self-image and lower self-confidence in social and academic environments (Wardle et al., 2000).

Beyond physical effects, protein also influences emotional well-being. It provides amino acids like tryptophan and tyrosine, which are essential for producing mood-regulating neurotransmitters such as serotonin and dopamine (Ghosh et al., 2018). When protein intake is insufficient, students may experience irritability, mood swings, heightened stress, and even mild depressive symptoms (Yahia et al., 2016). This can leave them feeling demotivated, socially withdrawn, and less resilient, further affecting their studies, relationships, and overall confidence (Nelson et al.,

2008).

Fiber Consumption Analysis of Female and Male students:

The study of fiber consumption among students in Table (2.1) highlights a noticeable nutritional gap when compared with the recommended daily intake of 30 grams *(WHO, 2020)*. Among female students, the results were particularly concerning. Those who exercised regularly consumed around 21.5 grams of fiber per day, which meets only about 71.7% of the recommended level *(NIN, 2021)*. Students who exercised only on rare occasions consumed an average of 16.8 grams, while non-exercisers recorded the lowest intake at approximately 14.1 grams—less than half of the amount required for maintaining good digestive and metabolic health *(FAO, 2019)*. Overall, female students consumed an average of just 17.46 grams of fiber

per day, reaching only 58.6% of their daily requirement and leaving a significant shortfall of nearly 12.5 grams *(ICMR, 2020)*.

Table 2.1. Table representing required and consumed amount of fiber among female student:

Amount of fiber required and consumed	Daily workout	Rare workout	No workout	Total average
Average fiber required	30 g	30 g	30 g	30 g
Average fiber consumed	71.70%	56.30%	48%	58.60%
Missing fiber	28.30%	43.70%	52%	41.33%

Male students, according to Table (2.2), performed slightly better in meeting their fiber needs across all activity levels (NIN, 2021). Those who exercised daily consumed an average of 24 grams, covering about 80% of the recommended intake (WHO, 2020). Students who worked out occasionally consumed around 19 grams, while non-exercisers still reached roughly 17 grams (FAO, 2019). Overall, male students averaged 20 grams of fiber per day, meeting about two-thirds (66.6%) of the recommended daily intake. Despite this, there remains a notable shortfall of nearly 10 grams, highlighting the need for dietary improvements (ICMR, 2020).

Table 2.2. Table representing required and consumed amount of fiber among male student:

Amount of fiber required and consumed	Daily workout	Rare workout	No workout	Total average
Average fiber required	30 g	30 g	30 g	30 g
Average fiber consumed	80.00%	63.30%	56.60%	56.63%
Missing fiber	20.00%	36.70%	43.40%	33%

When comparing the two groups, male students generally performed better than female students in meeting their fiber requirements (ICMR, 2020). This difference was most notable among daily exercisers, with males achieving about 80% of the recommended intake, while females reached 71.7% (WHO, 2020). A similar trend appeared among those who exercised rarely or not at all, though the gender gap was smaller in these categories (FAO, 2019).

Despite this, even the best-performing group—male students who exercised daily—did not reach the recommended 30 grams per day (NIN, 2021). This indicates that inadequate fiber

intake was a widespread concern affecting all students, regardless of gender (Harvard Health Publishing, 2022).

Another observation was the link between physical activity and fiber consumption: students who exercised more regularly tended to consume higher amounts of fiber than those with little or no activity (CDC, 2021; FAO, 2019).

However, the consistent shortfall across all groups highlights a larger issue: students, irrespective of gender or activity level, were not meeting their daily fiber needs. This underscores the importance of nutrition awareness and targeted interventions that encourage healthier eating patterns and greater fiber intake among young adults (WHO, 2020; NIN, 2021).

Implications of Fiber Deficiency on Health, Academic Performance, and Well-Being

1. Digestive Health: Dietary Fiber is essential for maintaining a healthy digestive system. It adds bulk to the stool and supports smooth bowel movements, preventing constipation. Insufficient fiber intake can lead to bloating, irregular bowel movements, abdominal discomfort, and even long-term conditions like irritable bowel syndrome (IBS) *(Slavin, 2013)*. Digestive discomfort not only causes physical unease but also affects daily functioning, making it harder for students to stay active, focused, and comfortable. Over time, poor digestion can reduce nutrient absorption, negatively impacting overall health and vitality *(Reynolds et al., 2020)*.

2. Energy and Concentration: Fiber helps regulate blood sugar levels by slowing glucose absorption, providing a steady energy supply rather than rapid spikes and drops *(Reynolds et al., 2020)*. Low fiber intake can cause fluctuations in energy, leading to fatigue, sluggishness, and difficulty maintaining alertness during lectures or completing academic tasks. This instability affects mental clarity, problem-solving, and cognitive performance, indirectly reducing academic outcomes *(Lieberman et al., 2016; Burrows et al., 2017)*.

3. Emotional Well-Being The gut–brain axis links digestive health to emotional regulation. Fiber supports beneficial gut bacteria, which help produce neurotransmitters like serotonin, the "feel-good hormone" *(Slavin, 2013)*. Low fiber intake may result in irritability, mood swings, anxiety, and higher stress levels, affecting social interactions, self-confidence, and academic focus *(Lieberman et al., 2016; Reynolds et al., 2020)*. Maintaining a fiber-rich diet promotes emotional resilience, calmness, and a positive mindset.

4.Overall Impact: Fiber deficiency is not a minor dietary concern—it impacts physical health, mental sharpness, and emotional balance, all of which are essential for academic success and daily life *(Hiza et al., 2013)*. Consuming sufficient fiber through fruits, vegetables, whole grains, and legumes improves digestion, stabilizes energy, sharpens concentration, and supports emotional well-being. Collectively, these benefits enhance classroom engagement, academic outcomes, and overall quality of life *(Burrows et al., 2017; Adolphus et al., 2019)*.

A Fiber-rich diet thus nurtures the mind, body, and emotional health of students, helping them reach their full potential.

CONCLUSION

This study highlights how unbalanced nutrition affects college students, particularly regarding protein and fiber intake. The findings show that many students, regardless of gender or activity level, do not meet their daily requirements. On average, there is a shortfall of about **16.6 grams of protein** and **10 grams of fiber** per day, revealing a significant issue that impacts physical, mental, and emotional health.

Protein, the body's "building block," supports muscle strength, hormone and enzyme function, and immunity. Even physically active students often fall short of their needs, leading to fatigue, slower recovery, reduced stamina, and impaired focus. Over time, these deficits can affect learning, motivation, and overall academic performance.

Fiber plays a similar role by aiding digestion, maintaining steady energy levels, and supporting mood through the gut–brain connection. Yet, many students rely on fast food and processed snacks, which are low in fiber and high in empty calories. This can cause digestive discomfort, fatigue, and reduced mental clarity, increasing stress and anxiety.

Lifestyle factors also contribute to poor nutrition. Busy schedules, late nights, peer pressure, and easy access to unhealthy foods make it harder to maintain balanced diets. While male students consumed slightly more protein and fiber than females, both groups were far from meeting ideal intakes, showing that this is a widespread problem.

Addressing this gap is achievable with awareness and support. Colleges can help by introducing nutrition programs, providing healthy and affordable meal options, and encouraging simple food swaps, such as adding pulses, eggs, milk, paneer, soy products, fruits, vegetables, and whole grains to daily meals. These small changes can significantly improve health over time.

Ultimately, balanced nutrition is about more than eating well—it is about living well. Protein and fiber deficiencies may seem minor, but they quietly affect health, energy, emotions, and academic performance. By choosing nourishing foods, understanding bodily needs, and fostering supportive food environments, students can grow stronger physically, mentally, and emotionally. Bridging this nutritional gap helps build a healthier, more confident, and future-ready generation.

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