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RESEARCH ARTICLE

Exploring attitudinal shifts in students' lifestyle and dietary habits: The impact of formal education in nutrition and dietetics

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Objective: The study aimed to evaluate the lifestyle and dietary habit changes among students enrolled in the Nutrition and Dietetics program at the George Emil Palade University of Medicine, Pharmacy, Science, and Technology of Târgu Mureș. Specifically, we examined the influence of academic progression on stress levels, dietary choices, purchasing habits, and physical activity.

Methods: A cross-sectional questionnaire-based pilot study was conducted among 55 Nutrition and Dietetics students across different academic years. Data were collected using a structured questionnaire assessing dietary habits, lifestyle factors, and stress levels. The responses were analyzed for trends across academic years and body mass index categories, with statistical comparisons performed to determine significant differences.

Results: Final-year students demonstrated healthier dietary habits, increased water consumption, and more fruit and vegetable intake compared to their younger peers, while also exhibiting higher stress levels. Differences in nutritional behaviors were also observed based on BMI categories, with normal-weight students more likely to adopt healthier eating patterns. An overall increased dietary awareness was observed, which was correlated with the accumulated nutritional knowledge.

Conclusions: The findings suggest that formal education in nutrition plays a significant role in shaping healthier behavior. However, challenges remain regarding stress management, physical activity, and unhealthy dietary habits. Targeted interventions and institutional policies may be beneficial in supporting sustainable lifestyle changes among students.

Keywords: dietary habits, healthy lifestyle, formal education in nutrition, physical activity, student health

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Introduction

A well-balanced lifestyle is essential for overall health and well-being, influencing both physiological and psychological processes. A healthy lifestyle includes optimal nutrition, consistent physical activity, adequate rest, stress management and avoidance of tobacco and alcohol products [1, 2]. Among these factors, dietary habits are particularly relevant, as they play a crucial role in reducing the risk of non-communicable diseases (NCDs) such as type 2 diabetes, cardiovascular diseases, and cancer [3]. The World Health Organization (WHO) guidelines for healthy dietary habits recommend a predominantly plant-based and varied diet that meets the energy requirements of the body, with legumes and wholegrain cereals as the primary sources of carbohydrates, complemented by daily consumption of fruits and vegetables [4].

Regular, moderate physical activity is another key component of a healthy lifestyle as it has a substantial role in maintaining both physical and mental health, by reducing the risk of NCDs, improving cognitive abilities and managing the symptoms of anxiety and depression [5]. Quality sleep is also essential, significantly improving cardiovascular and mental health, immunity and hormone regulation. Adequate sleep hygiene includes proper sleep duration, regularity and stress management, among other recommendations [6, 7].

Lifestyle choices are influenced by sociocultural norms, environmental factors, and knowledge level [8]. Formal education, particularly in health sciences, leads to increased access to evidence-based information regarding healthy living, and enhances the ability to understand and apply this information [9]. In this regard, the transition to young adulthood, especially if accompanied by enrollment in university studies, is especially relevant, as established health behaviors might undergo significant transformations due to increased autonomy, new social environments, and time or financial constraints [10, 11]. These factors may influence health behaviors, particularly dietary habits in two opposing directions [12]. On one hand, exposure to health-related information and peer education, especially among students in health sciences, can lead to the adoption of evidence-based dietary and lifestyle choices [10, 13]. On the other hand, the transition to self-managed

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nutrition often results in increased consumption of convenient, ultra-processed foods and fast-food type meals. These maladaptive behaviors are frequently exacerbated by erratic meal timing, limited physical activity due to time constraints, inadequate sleep patterns and increased stress levels [14, 15].

Given the complex associations between theoretical education in nutrition and students' dietary habits, our pilot study aimed to evaluate the extent to which acquired nutritional knowledge influences short-term health behaviors in students by assessing positive and negative attitudinal shifts in lifestyle and diet during academic years. Furthermore, our research seeks to underscore the need for targeted interventions through educational programs, institutional policies that promote balanced lifestyle choices, as well as psychological support to address disordered eating tendencies among university students.

Methods

Study Design

The cross-sectional, questionnaire-based pilot study surveyed undergraduate and graduate Nutrition and Dietetics specialization students from George Emil Palade University of Medicine, Pharmacy, Science, and Technology of Târgu Mureș on their attitude toward a healthy lifestyle. Data collection occured in March 2024 via an anonymous online survey distributed through the Google Forms platform. Participation in the study was entirely voluntary, and respondents were informed at the beginning of the questionnaire about the study's purpose, the anonymity of their responses, and compliance with the General Data Protection Regulation (GDPR). The study was approved by the Ethics Committee for Scientific Research of the George Emil Palade University of Medicine, Pharmacy, Science, and Technology of Târgu Mureș (Decision No. 2936/18.03.2024).

Questionnaire Structure

The questionnaire was structured into two main sections. The first section comprised six questions (I-VI) focusing on anthropometric and socio-demographic data, including age, gender, study year, place of residence, weight, and height. Study years were categorized into three levels: foundational studies (Years I-II), intermediate studies (Year III), and advanced studies (master's level). Self-reported weight and height data were utilized to calculate body mass index (BMI) by dividing weight (kg) by the square of height (m). The second section contained 23 questions covering five key elements: dietary restrictions (Q1-Q4), changes in attitude towards a healthy lifestyle since enrollment to the University (Q5-Q15), modifications in nutritional habits since enrollment (Q16-Q19), emotions influencing food choices (Q20-Q21), and subjective assessment of how the acquired nutritional knowledge is effectively applied (Q22-Q23). In addition to dietary and lifestyle variables, the questions were intended to detect signs of disordered eating patterns, behavioral shifts, and high perceived stress that may warrant targeted educational or psychological interventions. Stress levels were assessed using self-reported perceptions based on Likert-scale items integrated into the questionnaire. While this provided general insight into perceived stress, no standardized psychological instrument was employed.

Data Analysis

Data collection and evaluation were conducted using Microsoft Excel (Microsoft Corporation, Redmond, WA, USA). Statistical analysis was performed using GraphPad v3.06 (GraphPad Software Inc., Boston, MA, USA), applying a significance threshold of $p < 0.05$. For multivariate data analysis (MVDA), SIMCA® 18 (Sartorius Stedim Biotech, Göttingen, Germany) was used. The MVDA approach included principal component analysis (PCA-X) to identify patterns and cluster data, along with orthogonal partial least squares discriminant analysis (OPLS-DA) to examine class differences.

Results

Anthropometric and Demographic Data: The questionnaire was completed by 55 students enrolled in the Nutrition and Dietetics bachelor program at the George Emil Palade University of Medicine, Pharmacy, Science, and Technology of Târgu Mureș. The average age of the respondents was 24.5 years, ranging from 18 to 47 years. Three-quarters of respondents (74.5%, n = 41) were younger than 24, while the remaining 25.5% (n = 14) were 25 years or older. Regarding gender distribution, female respondents accounted for 90% (n = 50), while only 5 participants were male.

Regarding academic level, 81.8% of the respondents were enrolled in BSc studies, with 10 students in each of the first two years and 25 in their final year. The remaining 18.2% (n = 10) were pursuing master's studies. Additionally, 41 respondents resided in urban areas, while 14 lived in rural areas. Regarding the BMI classification, 12.7% (n = 7) were underweight, 67.3% (n = 37) had a normal weight, and 20.0% (n = 11) were overweight or obese.

Dietary Restrictions (Q1-Q4): No statistically significant differences were found between dietary restrictions and any of the anthropometric or demographic data analyzed. Among the respondents, 43 individuals reported no chronic disease-related dietary restrictions. The remaining 12 respondents noted endocrine disorders (n = 6), obesity (n = 3), and gastrointestinal, renal, or cardiovascular disorders (n = 1) (Q1a, Q1b). Only one participant reported dietary restrictions due to religious beliefs (Q2).

Regarding restrictive diets (Q3a, Q3b), 10 individuals followed specific dietary patterns, mainly lactose-free (n = 4), vegetarian, gluten-free, or fasting diets (n = 2). Additionally, 6 participants reported food allergies or intolerances, such as lactose intolerance and seed allergies (Q4a, Q4b).

Changes in Attitude Toward a Healthy Lifestyle Since Enrollment (Q5-Q15): Significant lifestyle changes were iden-

tified based on study level, place of residence, and BMI category. Regarding the study level, most students reported increased stress levels (Q12) since enrollment (n = 35), while 10 respondents indicated no change and 10 reported a decrease in stress levels χ^2 (6, n = 55) = 24.31, p < 0.001. Notably, increased stress levels were most prevalent among final-year BSc students (Figure 1), suggesting a potential need for lifestyle counselling and psychological support.

Statistically significant differences were also observed in changes in water consumption according to the study year, χ^2 (6, n = 55) = 24.48, p < 0.001. Similar to Q12, increased water consumption (Q13) was more frequent among final-year BSc students (Figure 2). Furthermore, differences in physical activity levels (Q6) were significant between urban and rural residents, χ^2 (3, n = 55) = 8.23, p = 0.042.

Modifications in Dietary Habits Since Enrollment (Q16-Q19): Statistically significant dietary changes were mainly observed according to BMI categories. The consumption of nuts and seeds as healthier, alternative protein sources varied significantly across BMI groups, χ^2 (6, n = 55) = 12.61, p = 0.050 (Q19e – nuts) and χ^2 (6, n = 55) = 26.11, p < 0.001 (Q19f – seeds). The increase in consumption was most notable among normal-weight individuals, as shown in Figure 3. Notable differences in energy drink consumption were also observed, χ^2 (8, n = 55) = 17,92, p = 0.022, however, when only bidirectional responses were considered, the differences between the groups diminished, χ^2 (6, 27) = 8.949, p = 0.177. This was mainly because 59.5% (n = 22) of normal-weight individuals and 45.5% (n = 5) of overweight individuals did not consume energy drinks in the first place. In the normal-weight group, approximately

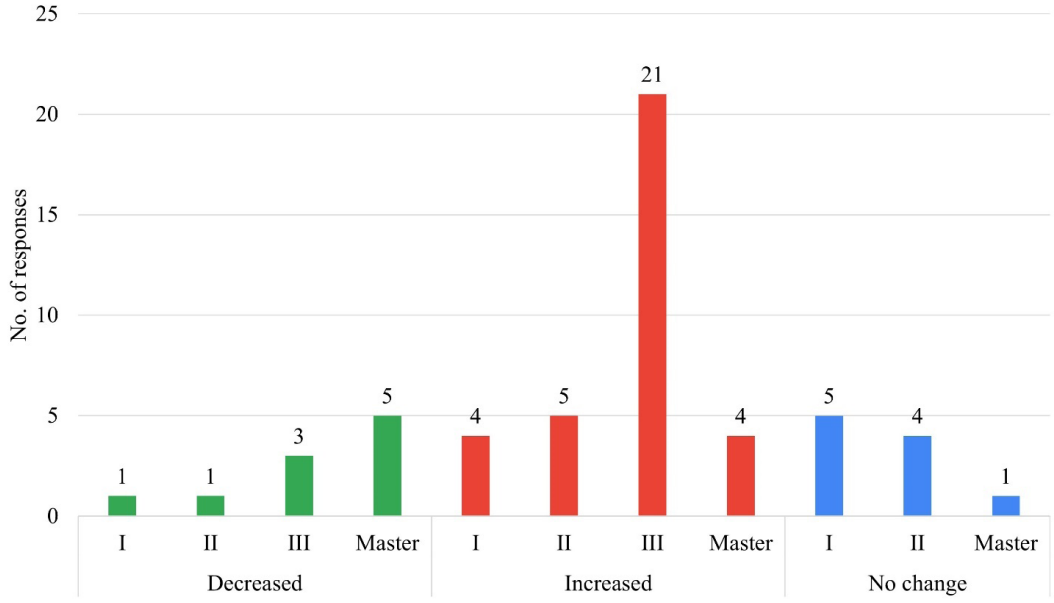

Fig. 1. Distribution of responses given to Q12 based on study year. (Q12 – Change in stress level since enrollment)

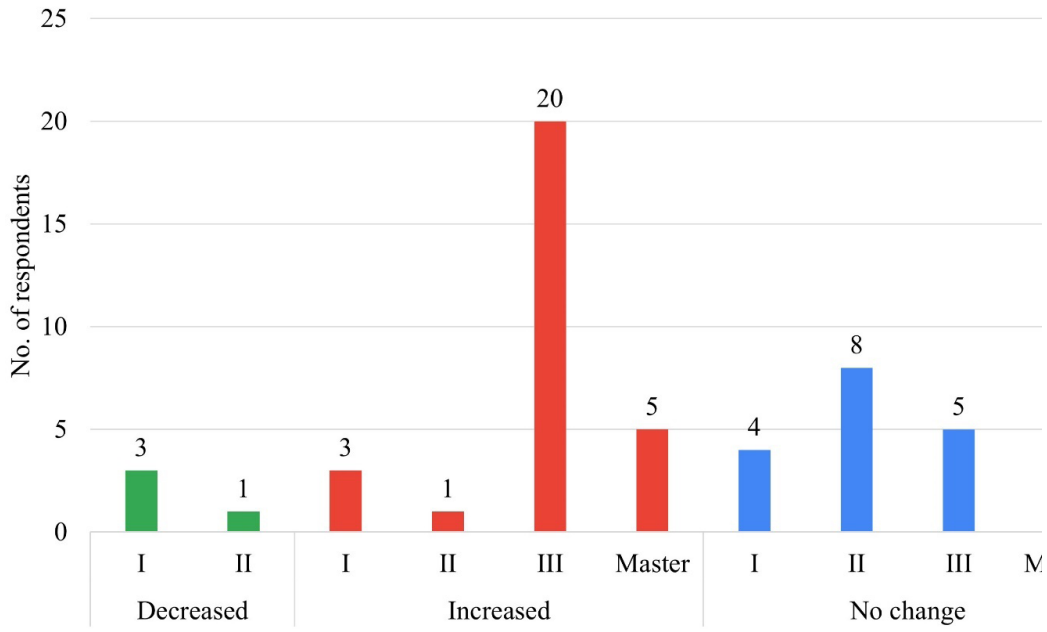

Fig. 2. Distribution of responses given to Q13 based on study year. (Q13 – Change in water consumption since enrollment)

20% (n = 7) reported no change in their consumption habits, while 22% (n = 8) reported a decrease or significant decrease in consumption.

In terms of fruit consumption since enrollment (Q19a), significant differences were observed according to study year, χ^2 (6, 55) = 18.85, p = 0.004 (Figure 4).

Sentiments on Food Choices (Q20-Q21): Significant differences were found according to study year regarding healthier food choices (Q20d), χ^2 (12, 55) = 22,53, p = 0.032, and decisiveness in food selection (Q20g), χ^2 (12, 55) = 21.23, p = 0.047. Furthermore, differences were observed in food purchasing habits, with students making swifter (Q21d), χ^2 (9, 55) = 17.24, p = 0.045, and more quality-oriented (Q21e), χ^2 (12, 55) = 24.72, p = 0.016, food choices according to their study level. Analysis of the distribution of responses given to Q20d and Q21e indicated a gradual shift toward healthier and higher-quality food choices, possibly correlated with the expanding knowledge in the field of nutritional studies. The "Does not apply" response progressively recedes in favor of positive reactions, such as "Generally applies" or "Fully applies", indicating that terminal-year and master's students are more health-oriented in their decisions (Figure 5).

Application of Knowledge (Q22, Q23): No statistically significant differences were observed based on the input variables. However, almost 90% of respondents (n = 48) reported applying the knowledge gained during their studies, while 58.2% (n = 32) expressed intent to work in the field of Nutrition and Dietetics. Meanwhile, 10 were undecided, and 6 stated they did not plan to pursue a career in this field.

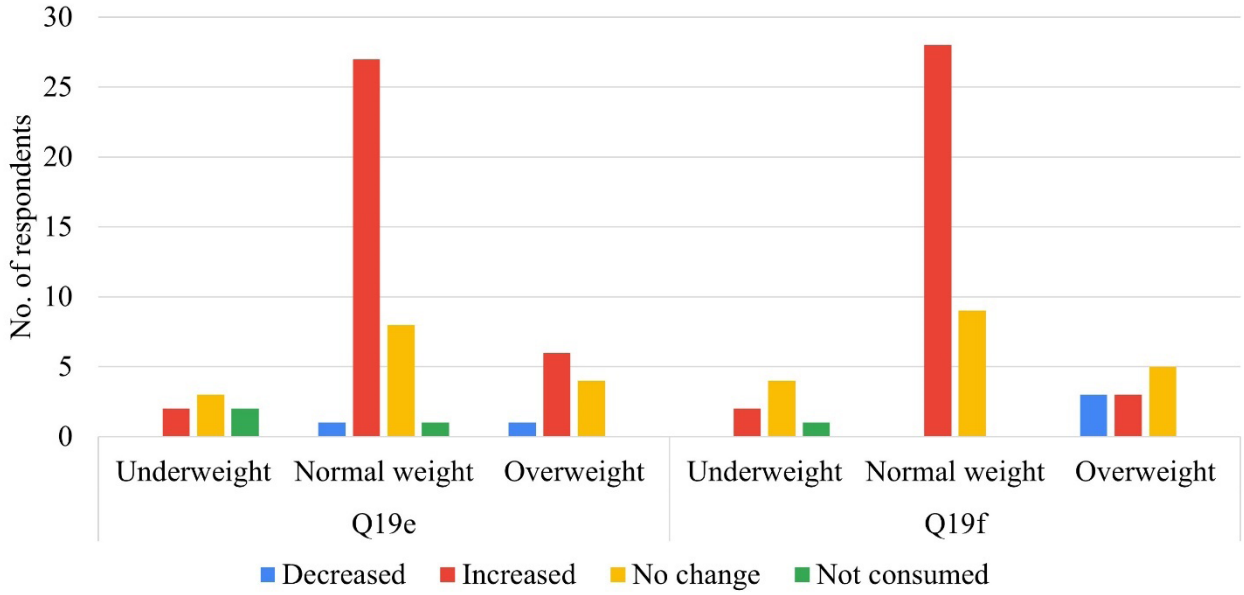

Fig. 3. Change in consumption of nuts (Q19e) and seeds (Q19f) based on BMI categories. (Q19e – Frequency of nuts consumption since enrollment; Q19f – Frequency of seeds consumption since enrollment)

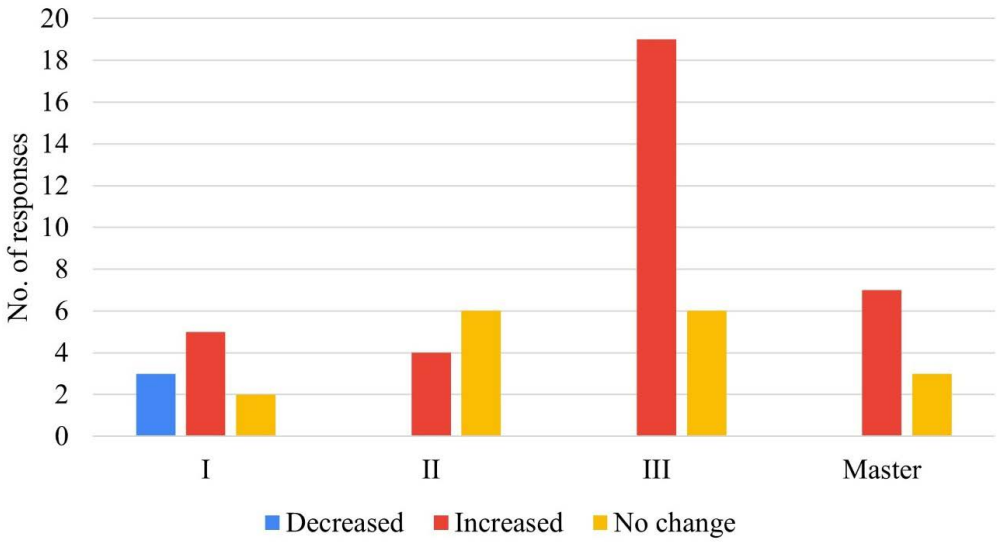

Fig. 4. Change in fruit consumption (Q19a) according to study year (Q19a – Frequency of fruit consumption since enrollment)

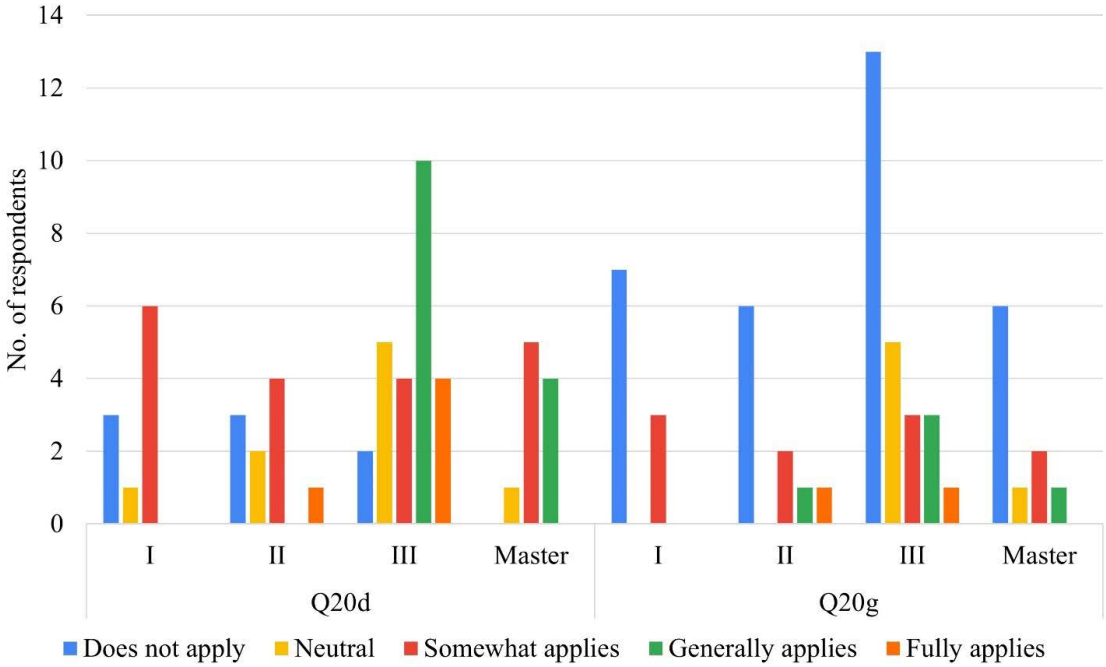

Fig. 5. Change in food choices regarding healthier (Q20d) and more confident (Q20g) purchasing habits according to study year (Q20d – Sentiments regarding healthier food choices; Q20g – Sentiments regarding more decisive food choices)

Exploratory Data Analysis: Given the complexity of students' lifestyle habits and changes, daily challenges, and accumulated knowledge, we have conducted a principal component analysis-driven hierarchical clustering analysis to elucidate data grouping and to observe response patterns. Differences based on age and study year were evident, as presented in Figure 6 (only statistically significant relationships are shown).

As previously discussed, significant differences were observed in dietary habits among the respondents (Q1-Q4). Changes in lifestyle habits (Q5-Q15) (Figure 6, aqua-colored bars) were prominent among final-year students, who exhibited improved dietary habits, increased physical activity (Q6), reduced prevalence of disordered eating behaviors (Q10), more mindful eating (Q14), and more significant interest in food labelling (Q15) compared to junior-year students. However, they also reported heightened stress levels (Q12).

Regarding modifications in dietary habits (Q16-Q19) (Figure 6, rose-colored bars), a clear pattern of healthier eating could be observed with academic progression. Final-year students reported decreased consumption of discretionary foods such as snacks (Q16), fast foods (Q17), sugary beverages (Q18b), and alcohol (Q18e), while increasing their intake of core foods such as fruits (Q19a), vegetables (Q19b), legumes (Q19c), nuts (Q19e), and seeds (Q19f). In contrast, students in the first two years of study were more likely to report no change in their dietary habits.

This transition toward healthier eating habits and lifestyle choices was also reflected in food selection behavior, with final-year students reporting more relaxed (Q20b), healthier (Q20d), and more decisive (Q20f) food choices. Furthermore, they demonstrated faster (Q21d), yet more quality-oriented (Q21e) purchasing habits, while junior-year students were more inclined to respond with "Does not apply" or "Somewhat applies" to these questions.

As revealed by complex data analysis, these changes may be attributed to the accumulation of nutritional knowledge throughout university studies, as final-year students generally reported effectively applying the knowledge acquired during study years (Q22) (Figure 6, green bars).

Discussions

The present study evaluated the dietary habits and lifestyle changes among students enrolled in the Nutrition and Dietetics program at the George Emil Palade University of Medicine, Pharmacy, Science, and Technology of Târgu Mureș, Romania. Our findings indicate significant variations in dietary habits, stress levels, and physical activity across academic years, place of residence and BMI categories.

Dietary Habits and Nutritional Knowledge

Our study showed that final-year students had healthier dietary habits than their junior colleagues, such as an increased consumption of water, fruits, vegetables, nuts, and seeds, and reduced intake of snacks, fast foods, and sugary beverages. This suggests a positive correlation between the acquired nutritional knowledge and adopting healthier eating behaviors. Similarly, a study conducted in Lima, Peru, comparing the dietary regimens of nutrition majors with peers from other fields found that those studying human nutrition had a lower intake of unhealthy food options, although no significant differences were observed in overall diet quality and overweight or obesity prevalence between

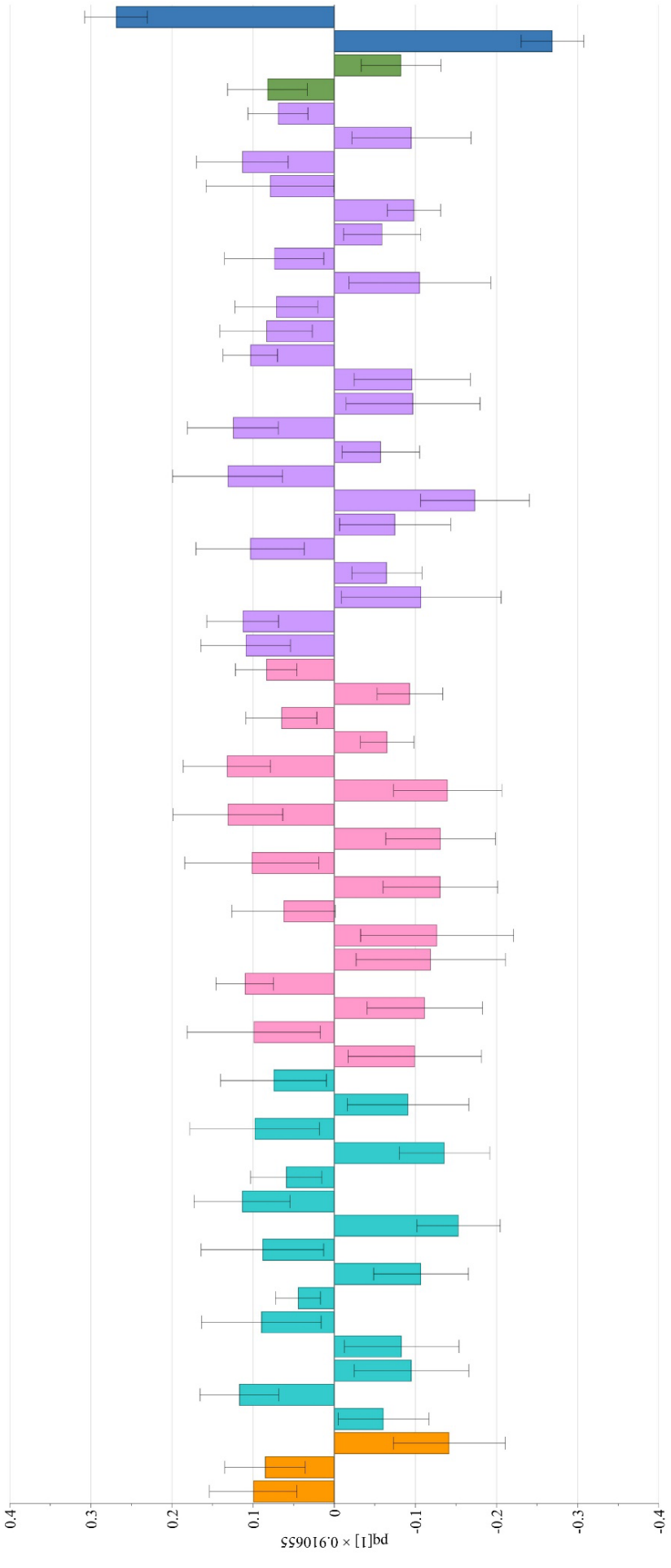

Fig. 6. Loading plot of the hierarchical data analysis, considering all data of the questionnaire. Orange bars indicate clusters according to study years. Aqua bars denote lifestyle changes since enrollment to university studies (Q5-Q15). Rose bars reflect modifications in dietary habits since enrollment (Q16-Q19). Lavender bars denote sentiments on food choices (Q20-21). Green bars indicate the application of the accumulated knowledge (Q22). Blue bars indicate clusters of data.

the two groups [16]. Interestingly, a study assessing nursing students' eating habits and nutritional knowledge revealed that novice students had better eating habits than their advanced and senior peers. This contradictory finding may be attributed to the absence of a significant difference in subjective nutritional knowledge, as all three groups expressed a moderate to high level of knowledge [17].

A significant association was found between fruit and vegetable consumption and academic year, with final-year students reporting higher intake. This trend has been documented in other studies examining dietary changes over time among university students [18]. However, despite the positive trend observed in our study, fruit and vegetable intake among university students often falls below recommended levels [19, 20]. Nutrition programs targeting university students should reinforce the benefits of fruit and vegetable consumption, ensuring that students develop lifelong habits. Universities should also provide greater access to fresh and accessible produce on campus to facilitate healthier food choices.

Our study also revealed significant differences in dietary habit changes according to BMI groups. Notably, the consumption of nuts, seeds, and other plant-based protein sources increased among normal-weight individuals, while overweight and obese students were less likely to adopt these changes. One possible explanation for this trend is that individuals with normal BMI may already have a healthier eating pattern, making them more likely to integrate additional healthy foods into their diets. On the other hand, overweight and obese individuals may face psychological or behavioral barriers that prevent them from adopting a more nutritious, improved diet [21].

Stress and Lifestyle Changes Among Nutrition Students

One of the most notable findings of our study was the increase in stress levels among students, particularly those in their final year. This trend is consistent with research indicating that academic pressure intensifies as students advance in their studies, impacting their overall well-being [22]. Elevated stress levels can negatively influence dietary habits, leading to irregular meal patterns, emotional eating, and reliance on convenience foods [23]. However, our findings showed that final-year students made healthier food choices despite increased stress, suggesting that theoretical education in nutrition may mitigate some negative impacts of stress on dietary habits. Furthermore, these results emphasize the importance of integrating stress management strategies into the Nutrition and Dietetics Program curricula to ensure that students can maintain healthy dietary habits even under academic pressure.

Our study also noted significant differences in physical activity according to the place of residence, with urban residents reporting higher engagement in physical activities. This disparity may be attributed to differences in available infrastructure and sociocultural norms between urban and rural settings. Encouraging physical activity among all students is essential, as regular exercise complements healthy eating habits, contributes to the overall well-being, and reduces the incidence of non-communicable diseases [24, 25].

Energy drink consumption patterns varied significantly among BMI groups, with normal-weight individuals showing greater reduction in intake compared to overweight students. This decrease in consumption might also be correlated with the nutritional knowledge, as other studies found that energy drink consumption is high among students, including those in health-related fields [26, 27]. Excessive consumption of energy drinks is a growing concern among adolescents and young adults, as it has been linked with a tendency for anxiety, depression, impulsivity, sleep disturbances, as well as poor academic performance [28]. Given these risks, formal education in nutrition and dietetics should promote healthy strategies for maintaining energy levels, such as improved sleep hygiene and balanced meals. Universities could also implement policies limiting the availability of energy drinks on campus to encourage healthier choices among students.

Application of Nutritional Knowledge

Final-year students exhibited more health-conscious food purchasing behavior than their younger peers, indicating a gradual shift toward a more mindful eating. Interestingly, our study found that students made quicker and more quality-oriented choices over time. This reflects an increased confidence in their ability to identify nutritious foods, a skill relevant for future dietitians and nutritionists. University programs should build on this confidence by incorporating practical food selection exercises into their curricula, allowing students to apply their theoretical knowledge in a practical, real-world setting.

A further notable finding of our study is that nearly 90% of respondents reported applying the nutritional knowledge gained during their studies, and a majority expressed their intent to pursue careers in nutrition sciences. This active application of knowledge is encouraging, as nutritionists and dieticians play a crucial role in promoting healthy lifestyle habits among the general population. However, a key challenge remains to ensure that students apply their nutritional knowledge in practice, following their graduation, as some studies suggest that dietetics professionals may have similar dietary habits to the general population, failing to implement the theoretical knowledge used to guide the patients in their own lifestyle choices [25]. Future research should explore the long-term impact of formal education in nutrition on graduates' dietary behavior, to determine if post-graduation these habits are maintained, adjusted or regress.

Nutritional Awareness and Orthorexia

An emerging concern among nutrition and dietetics students is the potential for orthorexia nervosa. Orthorex-

ia is a condition characterized by an obsessive focus on healthy eating. In its milder form, orthorexia is defined as an extreme fixation on consuming only healthy foods, with an emphasis on quality and purity. It is characterized by strict dietary restrictions with the elimination of entire food groups and obsessive concern over the source, preparation methods and nutritional content. In severe cases, described as orthorexia nervosa, these behaviors are accompanied by severe anxiety and extreme dietary restrictions that significantly impair daily life and overall well-being [29–31].

A substantial body of research has explored the correlation between student's field of study and the prevalence of eating disorders and maladaptive fixations. A trend observed in these studies is the higher incidence of eating disorders, including orthorexia, among students in health sciences, particularly those enrolled in nutrition and dietetics programs [32]. Current evidence suggests that individuals with increased knowledge of healthy eating are at an increased risk of developing maladaptive eating habits, placing dieticians and nutrition students in a particularly vulnerable situation [33, 34]. However, our study did not find evidence of orthorexia among participants, as dietary improvements appeared to be balanced rather than overly restrictive and obsessive.

The results of this study have implications for both educational practice and public health promotion. By examining how lifestyle and dietary habits evolve throughout the academic progression of Nutrition and Dietetics students, our findings provide evidence that formal education in this field can positively influence personal health behaviors. This underscores the dual role of academic programs, a source of both theoretical knowledge and personal development. These insights can form the basis of targeted interventions within university curricula and wellness initiatives, serving the well-being of students and preparing them for their role as health promoters in their future profession.

Limitations and Recommendations

While our pilot study provides valuable insight into the dietary habits and lifestyle changes of Nutrition and Dietetics students, certain limitations should be acknowledged. The sample size was relatively small and limited to a single institution, which may affect the generalizability of the findings. Additionally, self-reported data are subject to biases, such as social desirability and recall inaccuracies.

It is important to note that our study did not aim to diagnose or directly assess eating disorders using a validated instrument. As such, observations regarding potentially disordered eating patterns or lack thereof were made in the context of general dietary habits and cannot substitute appropriate clinical evaluation.

Future research should consider larger, more diverse population groups across multiple institutions to enhance generalizability. Furthermore, longitudinal studies observing students throughout their academic careers could provide a deeper understanding of how theoretical education in nutrition influences lifestyle choices over time.

Conclusion

The findings of this pilot study highlight the evolving dietary habits and lifestyle behaviors of Nutrition and Dietetics students as they progress through their academic studies. While increased stress levels were observed, students significantly improved their nutritional choices and food selection behaviors. These trends align with existing literature, suggesting that formal education in nutrition and dietetics provides the theoretical foundation that supports the development of healthier personal dietary habits, while also preparing students to deliver effective nutritional education in their future roles as health professionals. However, challenges remain, particularly regarding the dietary habits of overweight students, and the sustainability of healthy behaviors post-graduation. To support students' well-being and better prepare them to serve as effective health promoters, universities should consider both curricular and extracurricular interventions. Curricular measures may include the integration of stress management modules and nutrition-focused coursework, while extracurricular initiatives could involve campus wellness programs, peer support groups, and hands-on workshops promoting healthy lifestyle habits.

Authors' contribution

FAB (Conceptualization, Funding acquisition, Writing – original draft)
BK (Data curation, Formal analysis, Software, Visualization)
JB (Conceptualization, Investigation, Writing – original draft)
HB (Data curation, Formal analysis, Writing – review & editing)
EM (Conceptualization, Methodology, Writing – review & editing)

Conflict of interest

None to declare.

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