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Dietary differences in health sciences students

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ABSTRACT

Introduction: The impact of nutrition on human health has become a central topic in modern research. The Mediterranean diet, rich in fruits, vegetables, fish, whole grains, and olive oil, has been associated with a lower risk of cardiovascular diseases. However, the effects of non-Mediterranean diets, particularly among students, remain insufficiently explored. This study aimed to examine differences in the dietary habits of health sciences students in two cities in Bosnia and Herzegovina (Mostar and Sarajevo) and Split, Croatia.

Methods: A cross-sectional descriptive study was conducted between February and November 2024, including 473 students (Mostar: 125, Sarajevo: 230, Split: 118). Dietary habits were assessed using a validated food frequency questionnaire and the Mediterranean Diet Adherence Screener. Statistical analysis included Pearson's chi-square test, with significance set at $p < 0.05$.

Results: Students from Split showed significantly higher adherence to Mediterranean dietary habits, including greater consumption of vegetables ($p = 0.009$), fish ($p = 0.035$), legumes ($p = 0.036$), and tomato sauce ($p = 0.022$). Students in Sarajevo reported the highest intake of sugary drinks ($p < 0.01$), while those in Split consumed the least margarine and cream-based fats ($p = 0.003$). No significant differences were found in fruit consumption.

Conclusion: Given the importance of diet in preventing chronic diseases, targeted nutrition education programs are needed to promote healthier eating habits among students. Future research should explore the underlying causes of these dietary differences and their long-term health implications.

Keywords: Mediterranean diet; students; dietary habits

INTRODUCTION

In the modern research landscape, nutrition and its effects on human health occupy a central place in numerous studies around the world. The type of food we eat influences both the quality of our diet and our quality of life (1). The Mediterranean diet, which has its roots in the traditional areas and cultural cultivation of olive trees in Greece, Spain, and southern Italy, is rich in fiber from fruits, vegetables, fish, whole grains, and olive oil and is associated with a lower risk of cardiovascular disease, which has been confirmed by numerous epidemiological studies (2). Research suggests that the synergistic effect of components from fruits, vegetables, and protein-rich foods promotes the provision of muscle mass, the maintenance of cognitive abilities and the protection of health by optimizing the intestinal microbiota with the timely action of the immune system (3,4).

The Mediterranean diet model takes into account seasonality and local production and excludes the consumption of alcohol and sugary snacks, with a particular emphasis on the use of carbohydrates with a low glycemic index (5). On the other, non-Mediterranean dietary habits, which include dairy products, meat, vegetables, and fruit, as well as certain methods of food preparation and consumption, have not yet been sufficiently studied in terms of their impact on cardiovascular health (2). In this context, studies have linked them to an increase in the prevalence of non-communicable diseases, particularly of the digestive tract and the function of the gut microbiota, a mechanism that is crucial for maintaining the immune system and protecting against pathogens (6).

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Modern lifestyles, especially in students far from their place of birth, indicate altered dietary patterns that are increasingly irregular and away from Mediterranean dietary guidelines, even in students of Mediterranean origin (7). Therefore, the period of adolescence represents a critical phase in their development, which classifies them as a target group for the promotion of a healthy lifestyle to prevent the risk of developing non-chronic infectious diseases later in life. Away from home, students face a number of barriers to proper nutrition, from self-preparation of meals and food choices to the fast food environment and its easier availability, as well as a sedentary lifestyle (8,9). A particular challenge today is the poor eating habits and sedentary lifestyles of young people, which are contributing to an increase in obesity rates and the incidence of cardiovascular and other obesity-related diseases (10). Recent studies conducted among children and college students in our country have shown insufficient physical activity and increased consumption of sweets, snacks, and sweetened beverages (11-13).

Bonaccorsi and colleagues pointed out that proper dietary habit with timely coordination of physical activity prevent obesity, which is on the rise today. The authors point out that an irregular dietary pattern is characterized by changes in laboratory parameters, such as triglycerides, high-density lipoproteins, cholesterol, fasting glucose, and arterial blood pressure. With the exception of these parameters, the changes in body composition, especially waist circumference, are significantly higher than the reference values, which, together with the laboratory parameters, favors the development of the increasingly common metabolic syndrome, also known as "X" syndrome (14,15).

In this context, Mieziene et al. emphasize that the sustainability of young people's lifestyles is ensured by combining proper dietary patterns with physical activity, which is the first model of a sustainable Mediterranean lifestyle (16). The accelerated pace of life requires changes at the level of economic, social, and cultural determinants. Among them, the economic determinant is the most pronounced, which, from a global perspective, implies a neglect of product consumption in the local region, resulting in a tendency toward changes in the household, a reduction in the quality and quantity of food, as well as food choices in educational institutions (15). Considering that the time spent in educational institutions is longer than at home, educational staff should be socially responsible and encourage students to raise awareness of proper nutrition during adolescence, all with the aim of minimizing chronic non-communicable diseases and the burden on the social and economic system (15).

According to previous research, Tomas-Gallego points out in a meta-analysis that up to 65% and 55% of college students poorly adhere to the Mediterranean diet because of time constraints, practicality, and economic opportunity to practice new patterns (17). Previous studies conducted among female college students have also shown encouraging data when it comes to students studying health-related courses. However, general knowledge about healthy lifestyles was found to be insufficient (18,19). Considering the benefits of the Mediterranean diet, especially in relation to physical health, the authors emphasize its positive effect on students' mental health as well as improving quality of life and cognitive functioning to achieve the best possible academic results (20).

The aim of this study was to investigate the differences in the dietary habits of health science students in two cities in Bosnia and Herzegovina (Mostar and Sarajevo) and the city of Split in Croatia.

METHODS

This is a descriptive cross-sectional study conducted on a population of health sciences students. The research was carried out in two cities in Bosnia and Herzegovina (Mostar and Sarajevo) and the city of Split, Croatia, between February and November 2024. A total of 473 students participated (Mostar 125, Sarajevo 230, Split 118). The survey was conducted anonymously across all years of study, and students were informed about the research objectives before participation, which was entirely voluntary. The entire study was conducted in accordance with the principles of the Helsinki Declaration. The study examined the frequency of consumption of key components of the Mediterranean diet (fruits, vegetables, fish, olive oil, legumes, and tomato sauce) as well as the consumption of sugary drinks and margarine as non-Mediterranean dietary habits.

Dietary patterns were assessed using a questionnaire specifically designed for this study, following the recommendations given by Yaddanapudi and Yaddanapudi (21). The questionnaire includes validated tools for assessing dietary patterns, such as the Food Frequency Questionnaire and the Mediterranean Diet Adherence Screener. The questionnaires were in English and were translated into the local language.

The criterion for participation was that the person was over 18 years of age, be students of the Faculty of Health Studies and that they voluntarily gave their consent to participate in the study. The exclusion criteria are, being under 18 years of age, not consenting to participate in the study, and an incorrectly or incompletely completed questionnaire.

The Ethics Committee of the Faculty of Health Studies in Sarajevo, Mostar, and Split approved the implementation of this study. Before the start of the research, each respondent signed an informed consent, and they were guaranteed anonymity during the research.

The questionnaire contained 26 questions covering demographic characteristics of the study population, family history, anthropometric and laboratory parameters, and lifestyle habits in the context of diet and physical activity. Dietary habits were categorized depending on the frequency of consumption of certain foods on a daily and weekly basis.

For statistical data analysis, standard descriptive statistical methods were applied. To test for statistically significant differences between male and female participants, as well as differences in dietary habits among students from the three cities, the χ^2 test (Pearson Chi-square) was used. Results were considered statistically significant for $p < 0.05$.

RESULTS

The study included 473 students who met the criteria for inclusion in the study: Mostar 125 (26.5%), Sarajevo

230 (48.6%), and Split 118 (24.9%). Of the total sample, 413 women (87.3%) and 60 (12.7%) men participated (Table 1).

Figure 1 shows the frequency of daily vegetable consumption of the respondents. Of the total number of respondents, only 32 respondents (6.8%) do not consume vegetables daily, while most respondents, 337 (71.2%), consume vegetables once a day. The analysis shows a statistically significant difference in vegetable consumption between the cities (p = 0.009), with the highest consumption recorded in Split (33.9%) and the lowest in Sarajevo (6.5%).

The results showed that of the total number of students, 254 (56.1%) consumed fish once a week, while 125 (27.6%) students did not consume fish at all. A statistically significant difference in fish consumption was found between the cities (p = 0.035), with the lowest consumption recorded in Sarajevo, where 73 students (33.2%) consumed fish once a week, while the highest consumption was recorded in Split, where 69 students (61.1%) ate fish at least once a week (Figure 2).

Figure 3 shows the weekly consumption of legumes. The results show that most of the respondents, 198 (41.9%), consume legumes once a week, while 70 students (14.8%) do not consume legumes at all. A statistically significant difference in legume consumption was found, with the lowest consumption in Sarajevo (18.7%) and the highest consumption in Split (15.3%) (p = 0.003).

When asked about the use of olive oil in their diet, a total of 187 (39.5%) students consume olive oil compared to 286 (60.5%) who do not consume olive oil at all in their diet. The highest percentage of olive oil consumption was analyzed in Split (55.9%), while the lowest percentage was found in Sarajevo (70%) (p < 0.001) (Table 2).

Among non-Mediterranean dietary habits, a statistically significant difference was found in the consumption of sweet drinks (Figure 4). The highest consumption was recorded in Sarajevo, where 37 respondents (16.1%) frequently consumed sweet drinks, while consumption was lowest in Mostar, where them 55 (44%) consumed them regularly (p < 0.01).

Figure 5 shows the daily consumption of fats such as margarine and cream. The lowest intake was recorded in Split, where 49 respondents (41.5%) consume margarine and cream daily. In contrast, the highest intake was recorded in Sarajevo, where 157 respondents (68.3%) consume margarine and cream once a day, while in Mostar only 75 (60.0%) consume margarine and cream once a day (p = 0.003).

When asked about the daily consumption of red meat, 282 students (62.5%) answered that they consume red meat once a week, while only 56 (12.4%) do not consume red meat at all. In terms of spatial distribution, respondents in Sarajevo consume the most meat once or twice a day (95%), while in Mostar they consume the least red meat (18.3%), with the difference in red meat consumption being statistically significant (p = 0.003) (Figure 6).

TABLE 1. General characteristics of the population studied

City	Male		Female		Total	
	n	(%)	n	(%)	n	%
Mostar	11	18.3	114	27.6	125	26.43
Sarajevo	33	55.0	197	47.7	230	48.63
Split	16	26.7	102	24.7	118	24.95
Total	60	100.0	413	100.0	473	100.0

TABLE 2. The use of olive oil as the main source of fat in the preparation of daily meals

City	Yes		No		Total	
	n	(%)	n	(%)	n	%
Mostar	52	41.6	73	58.4	125	100.0
Sarajevo	69	30.0	161	70.0	230	100.0
Split	66	55.9	52	44.1	118	100.0
Total	187	39.5	286	60.5	473	100.0

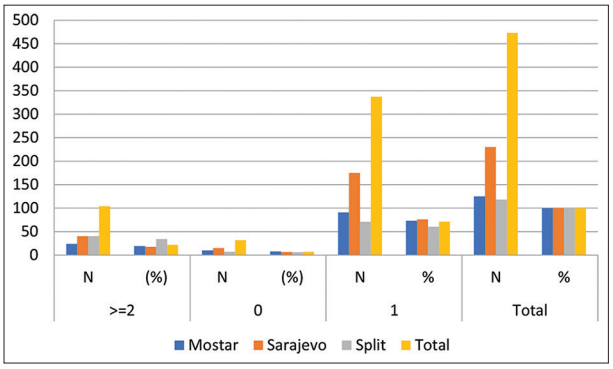

FIGURE 1. Daily vegetable consumption. χ^2 test, p = 0.009.

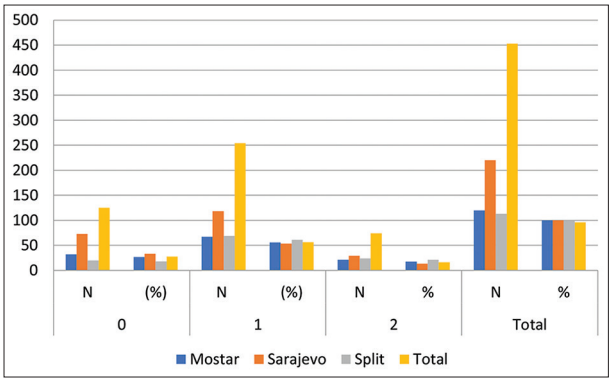

FIGURE 2. Weekly fish consumption. χ^2 test, p = 0.035.

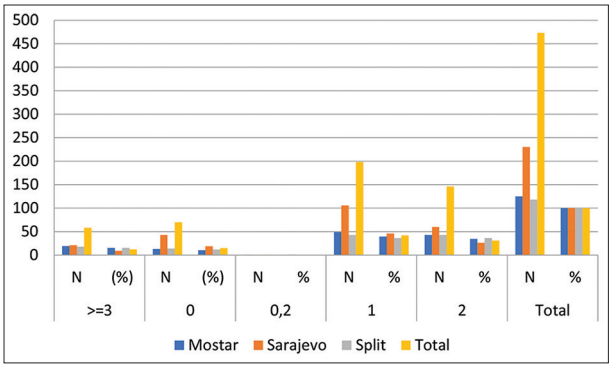

FIGURE 3. Weekly consumption of legumes. χ^2 test, p = 0.003.

DISCUSSION

This study shows statistically significant differences in the eating habits of health science students living in Split (Croatia), Mostar, and Sarajevo (Bosnia and Herzegovina). The students from Split adhered better to the Mediterranean

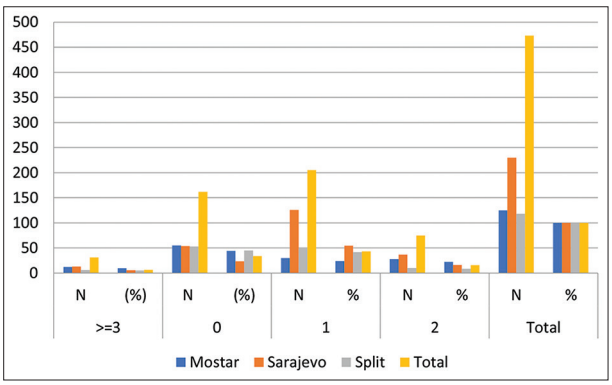

FIGURE 4. Daily consumption of sweetened beverages. χ^2 test, $p < 0.001$.

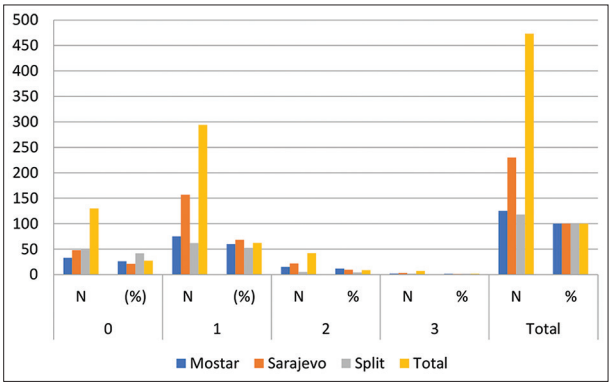

FIGURE 5. Consumption of margarine and cream as sources of fat. χ^2 test, $p = 0.003$.

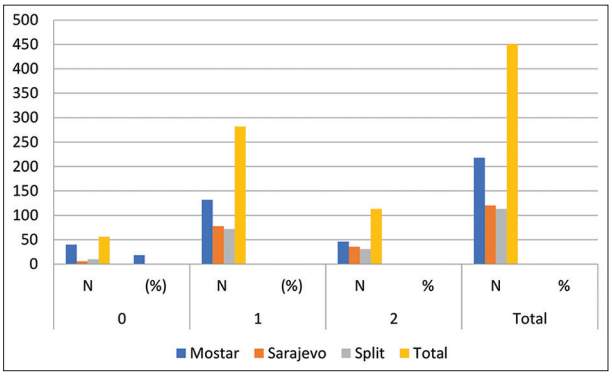

FIGURE 6. Daily consumption of red meat portions. χ^2 test, $p = 0.003$.

dietary habits than the students from Sarajevo and Mostar. The results show that Mediterranean dietary habits, such as the consumption of fish, olive oil, fruit, vegetables, legumes, and tomato sauce, are more common among students in Split (Croatia) than among students from Bosnia and Herzegovina.

The study conducted by Pavičić Žeželj et al. in Croatia in 2018 included 455 students from the College of Rijeka (336 women and 119 men). The average diet quality score, determined using the Mediterranean Diet Quality Index, was 9.61, indicating moderate to inadequate diet quality (19). Many studies suggest that modern lifestyles, characterized by poor nutrition and insufficient physical activity, have led to an increasing number of overweight and obese children and adolescents, who are associated with a variety of health problems (22,23). A study conducted at the College of Las Palmas de Gran Canaria (Spain) among 1st to 6th year medical students in the 2018-2019 academic year (with a total of 589 participants) showed that half of all medical students did not adhere well to the Mediterranean diet (24). Similar results were found in a study at Kocaeli College in northwestern Turkey, which involved 354 medical students. The results showed that 59.1% of women and 40.9% of men moderately adhered to the Mediterranean diet (18). According to a literature review by El Bilali et al. in 2021, which examined the Mediterranean dietary habits of the inhabitants of the Western Balkans, it was found that adherence to the Mediterranean diet is insufficient even in the Mediterranean-Adriatic regions (25).

In a Lebanese study by El Hajj and Julien, the results showed that as many as 18.8% of respondents emphasized the use of the Mediterranean diet. Based on the results, the authors emphasize that the frequency and timing of breakfast, as well as the timing and skipping of other meals, significantly influence adherence to the Mediterranean diet. In this context, they point out that the world of nutrition in adolescence depends on the educational environment, which means an impact on school performance and the possibility of preventing or creating a risk for the development of diseases later in life (26). In a study by Matana et al. involving 2,722 people from Croatia, adherence to the Mediterranean diet was extremely poor in 19.2% of respondents and averaged 60.8%, indicating changes in dietary habits in recent years. The prevalence rate of non-adherence to the Mediterranean diet was highest among students at 39.3%, confirming the need to promote and improve healthy lifestyles in the population studied (27).

Previous studies have confirmed a low consumption of fish, which is also confirmed by a study by González-Sosa et al. investigating the use of the Mediterranean diet in medical students (24). Considering the benefits of the Mediterranean diet in relation to physical and mental health and ensuring cognitive function, Antonopoulou et al. show that the health status of students with lower academic achievement is closely related to poor nutrition. In this context, greater adherence to the Mediterranean diet was associated with a lower risk of developing depression or other forms of mental illness. Regardless of professional orientation, students from all faculties showed insufficient knowledge in the area of proper dietary habits, which calls for a shift in focus to the promotion and prevention of negative outcomes (20).

In Syria, the average adherence to the Mediterranean diet was 49.14 ± 8%, with women being particularly underrepresented. Dehneh et al. clearly emphasize that young woman in Syria need to be educated to maintain their physical and mental health (28).

In the study population at the College of Cyprus, the mean score for adherence to proper dietary habits was 6.0 (IQR 4-8), with 26.9% of students having very good adherence, while 21.8% did not adhere to proper dietary habits. According to the results, 32% of the students consumed fruit and vegetables more than once a day and 31% of them consumed refined sugar several times a day. On a positive note, 88% of students used olive oil at home (29). Studies on the Mediterranean diet have consistently shown that it is associated with positive health outcomes, including a lower incidence of heart disease, hypertension, type 2 diabetes, and improved lipid profiles. On the other hand,

studies looking at non-Mediterranean diets are scarcer, but preliminary data suggest that they may have beneficial effects, especially when based on plant sources and traditional preparation methods that minimize the use of processed foods (30).

The aim of our study was to show differences in the dietary habits of health science students. This is one of the first studies conducted among students in Sarajevo. The strength of this research is that it contributes to the understanding of the dietary habits of the student population, with the goal of developing guidelines that promote healthy eating habits adapted to the needs of students and the cultural context. This study can help in the implementation of educational programs and workshops that inform students and the general public about the importance of a healthy diet.

CONCLUSIONS

The students in Split adhered better to the Mediterranean diet than the students in Bosnia and Herzegovina. Given the importance of diet in the prevention of chronic diseases, targeted nutrition education programs are needed to encourage students to adopt healthier eating habits. Future research should investigate the causes of these dietary differences and their long-term health consequences.

Study limitation

A limitation of the study is its cross-sectional design, which means that we did not investigate the causes of these dietary habits. Furthermore, as with other studies based on surveys, the accuracy of participants' responses is uncertain. The study was conducted in Sarajevo, Mostar, and Split, which may limit the generalizability of the results to other parts of Bosnia and Herzegovina and Croatia. Although the sample included three cities, the results cannot be generalized to all healthcare students in the region. It is therefore recommended that similar studies should be conducted in other parts and regions of Bosnia and Herzegovina and Croatia to achieve better representativeness.

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DECLARATION OF INTERESTS

Authors declare no conflict of interest.

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