



## HEALTH PROMOTION

# University students in Central Italy: do they follow proper dietary habits?

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## Keywords

University students • Food habits • Diet • Food frequency questionnaire • Lifestyle

## Summary

**Background.** Eating a healthy diet is acknowledged as one of the main factors in preventing malnutrition and non-communicable diseases. As young students represent a group more prone to poor dietary habits, the aim of this study was to analyse the dietary habits of a group of undergraduate students attending university in a city of central Italy, Siena.

**Methods.** 4,700 students were invited to participate in a cross-sectional study completing an online self-administered questionnaire about their food habits. The obtained data were analysed by Microsoft Excel 2021 and Stata 17 software, through the Mann-Whitney and the Kruskal-Wallis test; a *p*-value < 0.05 was considered statistically significant.

**Results.** The students living at home consumed more fruit, vegetables, pasta, meat, fish, packaged foods, fruit juices, beer and wine; the only statistically significant differences were found for pizza and snacks. Even the gender influenced the consumption of many foods; women consumed more vegetables and coffee/tea, while males ate more pasta, meat, packaged foods, pizza, fries and beer.

**Conclusions.** With the transition from secondary school to university, students are continuously challenged to make healthful food choices and they must be self-disciplined to take care of themselves. It would be important for health campaigns to be promoted in young adults to help them make the right choices.

## Introduction

Eating a healthy diet is universally acknowledged as one of the main factors in preventing malnutrition and non-communicable diseases (NCDs) such as type 2 diabetes and cardiovascular diseases [1], therefore a healthy and balanced lifestyle should be promoted across all age groups [2]. According to the World Health Organization (WHO) Healthy Diet Fact Sheet a healthy diet should include at least 400 g (*i.e.* five portions) of fruit and vegetables per day, pulses, nuts and whole grains, less than 10% of the total energy intake should come from free sugars, less than 30% of total energy intake should come from fats and lastly, we should consume less than 5 g of salt per day.

As many health habits are formed at a very young age, the promotion of a proper lifestyle should be focused among adolescents and young adults [3]. In fact, numerous studies show that poor dietary habits appear to be very popular between both high school and university students, in particular the consumption of fast food is high and it could be associated with a weight gain from adolescence to adulthood [4-6].

During the critical passage from high school to university, as the students independence increases and the living situation changes [7], young adults are repeatedly put to the test with making wholesome food choices [8].

Choices inherent eating habits during the university years are influenced by several factors, such as peers ascendancy, class schedule, alcohol consumption, nightlife and even economic situation [9, 10]. In fact, once they start university, not only they start having poor dietary habits, but they also start consuming excessive quantity of alcohol and decreasing their physical activity [11]. Consequently, the years spent at university represent a very critical era that is able to influence both the lifestyle and the eating habits of the following adulthood and, as this age group might soon play a parental role, their health is closely related to the one of new generations [12, 13].

University students can be divided into two groups, those who continue living at home with their parents and those that are attending universities far from their usual residence and are forced to live away from home, known as displaced students. Special attention should be paid to university students, as they represent a group that is particularly prone to poor dietary habits [14]. In Italy, a study showed that non-displaced students consumed higher quantities of cooked vegetables, fish, meat products, chips, bread/cereals, pulses, cooked meals and sandwiches, while displaced students consumed more raw vegetables, beer and other alcoholic drinks, raw/cold meals, frozen meals and ready meals [15]. The same results were observed in Spain where it was noted that

displaced students consumed fast food more frequently compared to before they started university [9].

University students should be considered as a vulnerable group, especially the displaced ones, as they seem to move towards unfavourable food choices. Thus, it is important to assess the issue and to implement strategies to promote long-term health in this particular population [9].

The aim of this study was to analyse the dietary habits and the changes in eating patterns of a group of undergraduate students attending university in a city of central Italy, Siena.

## Materials and methods

From May to June 2023, four thousand seven hundred students attending different degree courses at the University of Siena received an email and were invited to participate in a cross-sectional study about their food habits. The students had to complete an online questionnaire that had been revised by two committees, the first one was Careus (Committee for Ethical Research in the Humanities and Social Sciences), which reviewed the questions from an ethical point of view, and the second one was SPC (The University Survey Policy Committee), which selected the sample and then sent the questionnaire. SPC selected the sample randomly by matriculation number, selecting all students with one or more final matriculation numbers that had not already been used for the last carried out surveys until a sample size of 20/25% of the population, considered to be representative of all the students, was reached. The undergraduate students, who were selected, received an email with the self-administered questionnaire and the instructions and were asked to complete it online; the enrolment was voluntary and anonymous. Preliminary information was provided about the purpose, the protocol and the method of the study including the guarantee of anonymity (according to the Legislative Decree no. 196/2003 "Code concerning the protection of personal data"). The survey remained open for 21 days and two reminder emails were sent after 7/10 days (for the first reminder) and after 10/15 (for the second) to those who did not respond.

The research was carried out in accordance with the World Medical Association Declaration of Helsinki; it does not report any experiment on human or biological human samples, nor research on identifiable human material and data because it is an observational survey conducted by an anonymous questionnaire among university students. Indeed, in order to protect the privacy of subjects and confidentiality of their personal information and to minimize the impact of the study on their physical, mental and social integrity (stated in the article n. 23 of the above-mentioned Helsinki declaration) the research was wholly conducted anonymously; thus, no identifiable personal data are reported.

## CHARACTERISTICS OF THE QUESTIONNAIRE

The survey consisted of 15 questions, and it allowed us to obtain information about age, weight, sociodemographic characteristics, as well as dietary habits.

The first part was dedicated to the demographic aspects, with questions regarding age, weight, height, parents' educational qualifications and students' socioeconomic status. The second section investigated the socio-cultural backgrounds to learn whether the students were living at home with their families or not. The third one was the part about the eating habits, in particular it was asked where the meals were eaten and it also included the validated Food Frequency Questionnaire (FFQ), developed on the model used by Papadaki and Scott [16]. The FFQ list contained fresh fruit, cooked and raw vegetables, potatoes, rice and pasta, chips, pulses, meat products, fish, snacks, sauces, meat and poultry, bread and cereals, dairy, cakes (including sweets, sugar, chocolates, biscuits, ice cream, cakes, scones and pastries), eggs and pizza. While for the beverages it included fresh fruit juice, milk, non-alcoholic beverages, wine, beer, spirits and coffee/tea. Consumption frequency for each food item was measured as "never", "1-3 times per month", "1-2 times per week", "3-4 times per week", "5-6 times per week", "once per day", "more than once per day". The participants were also asked whether they perceived that their eating habits had changed since starting university or not.

## STATISTICAL ANALYSIS

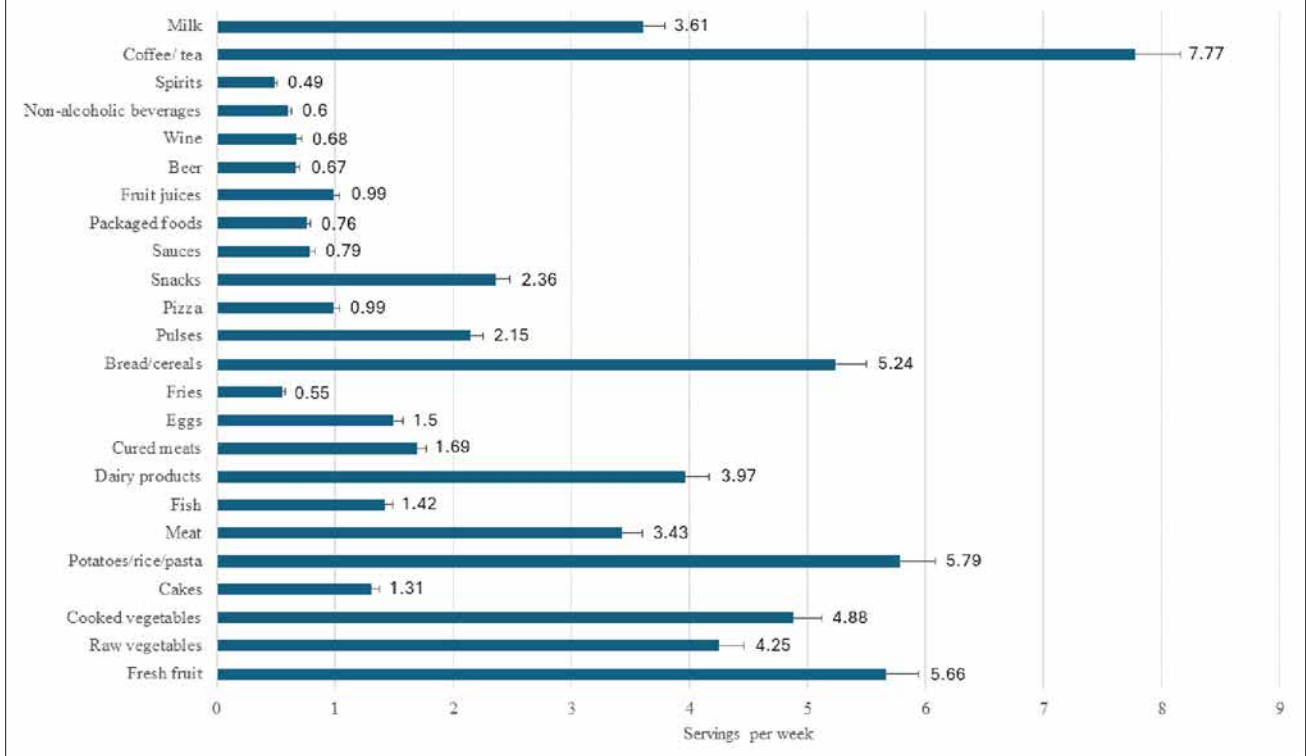
The answers provided in the questionnaire had been collected in a database using Microsoft Excel 2007. Data for individual food items in the food frequency questionnaire were transformed to servings per week (servings/week). As in the study by Papadaki and Scott, it was assumed that "times" could be equated to "portions", therefore "never" was transformed to "0 times per week", "1-3 times per month" was transformed to "0.5 times per week", "1-2 times per week" was transformed to "1.5 times per week", "3-4 times per week" became "3.5 times per week", "5-6 times per week" became "5.5 times per week", "once per day" became "7 times per week" and "2 times per day" became "14 times per week".

The per capita weekly consumption of each food or beverage was then calculated by taking the sum of the values for all students in the population of reference and dividing the result by the total number of individuals. The obtained data were analysed by Stata17 software. The Mann-Whitney test was used to detect changes in food intake for students living at and away from home, while the Kruskal-Wallis test was used to track dietary intake changes according to gender and mean and SD were calculated; a p-value < 0.05 was considered statistically significant.

## Results

The survey closed with only 508 completed questionnaires out of 4,700 invitations sent out (10.8%), of whom 321

Fig. 1. Mean weekly consumption of foods and beverages.



students (63.2%) still lived at home with parents during their studies and 187 students (36.8%) lived away from their families. The students were classified by age, specifically 71 (14%) were 19 or 20 years old (yo), 144 (28.3%) were 21 or 22 yo, 190 (37.4%) were between 23 and 25 yo and finally 103 (20.3%) were older than 26 yo, and by gender, 126 (24.8%) were male, 379 (74.6%) were female, 2 (0.4%) would rather not answer and 1 (0.2%) did not identify with either gender.

BMI ( $\text{kg}/\text{m}^2$ ) was calculated with data regarding weight and height and the mean resulted 22.65, with a statistically significant difference between the two genders (female students BMI = 22.16 vs male students BMI = 23.93,  $p = 0.0001$ ), but no differences between displaced and non-displaced students were observed.

As concerns the main meals, the majority of the students (86.4%) stated they have breakfast at home; only a small group (8.8%) said they don't have it, while the rest have breakfast at the bar (4.7%). The 25.3% of the students declared to have lunch at home, the 31.1% eats at university food prepared at home, the 38.9% has lunch in the canteen and lastly a proportion of students (2.5%) claimed to choose other solutions (bars, takeaways, etc.), with no differences between the two groups. Finally, almost all the students consumed dinner at home.

The most consumed foods, as shown in Figure 1, were potatoes/rice (5.79 servings/week), fresh fruit (5.66 servings/week), bread/cereals (5.24 servings/week), cooked vegetables (4.88 servings/week), while the most consumed drinks were coffee/tea (7.77 servings/week) and milk (3.61 servings/week). The students reported a

lower consumption of fish (1.42 servings/week), pizza (0.99 servings/week), packaged foods (0.76 servings/week), fries (0.55 servings/week).

The students that lived at home reported a larger (even if not statistically significant) consumption of fresh fruit, cooked and raw vegetables, pasta/rice, meat, fish, cured meats, bread/cereals, pulses, packaged foods, fruit juices, beer, wine than student living away from family as shown in Table I. The only statistically significant difference was found for pizza (1.03 servings/week vs 0.92,  $p = 0.0422$ ). In contrast, the students living away from home consumed significantly more sauces and spirits but only the difference between the snacks consumption was statistically significant (2.66 servings/week vs 2.19,  $p = 0.0424$ ). The frequency of consumption of milk, coffee/tea, non-alcoholic beverages, fries, eggs, dairy products, cake were similar in the two groups of students.

Referring to changes in dietary habits, 89.5% of the students noted some modification since starting university with no significant differences between students living at home (86.6%) or far away from it (94.6%), as shown in Figure 2, or between males and females.

The gender appeared to influence the frequency of consumption of many foods as it can be seen in Table II. Women demonstrated to consume, with statistically significant differences, a greater amount of raw vegetables (4.6 servings/week vs 3.2,  $p = 0.002$ ), cooked vegetables (5.3 servings/week vs 3.7,  $p = 0.0001$ ) and coffee/tea (8.1 servings/week vs 6.8,  $p = 0.025$ ).

**Tab. I.** Mean weekly consumption of food and beverages of students living at and away from home.

|                         | Students living away from home |      | Students living at home |      | p-value |
|-------------------------|--------------------------------|------|-------------------------|------|---------|
|                         | Mean                           | SD   | Mean                    | SD   |         |
| Fresh fruit             | 5.55                           | 4.6  | 5.73                    | 4.7  | 0.63    |
| Raw vegetables          | 4.1                            | 3.54 | 4.34                    | 3.66 | 0.43    |
| Cooked vegetables       | 4.75                           | 3.56 | 4.96                    | 3.65 | 0.46    |
| Cakes                   | 1.31                           | 1.56 | 1.3                     | 1.5  | 0.89    |
| Potatoes/rice/pasta     | 5.63                           | 3.02 | 5.88                    | 3.1  | 0.35    |
| Meat                    | 3.3                            | 2.41 | 3.5                     | 2.66 | 0.5     |
| Fish                    | 1.37                           | 1.21 | 1.44                    | 1.15 | 0.34    |
| Dairy products          | 3.93                           | 3.09 | 3.99                    | 3.11 | 0.88    |
| Cured meats             | 1.56                           | 1.43 | 1.77                    | 1.94 | 0.76    |
| Eggs                    | 1.51                           | 1.02 | 1.5                     | 1.13 | 0.51    |
| Fries                   | 0.53                           | 0.66 | 0.56                    | 0.65 | 0.63    |
| Bread/cereals           | 4.9                            | 3.38 | 5.44                    | 3.55 | 0.11    |
| Pulses                  | 1.93                           | 1.56 | 2.28                    | 2.05 | 0.13    |
| Pizza                   | 0.92                           | 0.63 | 1.03                    | 0.64 | *0.04   |
| Snacks                  | 2.66                           | 2.89 | 2.19                    | 2.58 | *0.04   |
| Sauces                  | 0.85                           | 1.21 | 0.76                    | 1.08 | 0.23    |
| Packaged foods          | 0.69                           | 0.95 | 0.8                     | 1.41 | 0.3     |
| Fruit juices            | 0.87                           | 1.56 | 1.07                    | 1.94 | 0.4     |
| Beer                    | 0.62                           | 1.04 | 0.69                    | 1.26 | 0.39    |
| Wine                    | 0.59                           | 0.86 | 0.73                    | 1.12 | 0.16    |
| Non-alcoholic beverages | 0.62                           | 1.1  | 0.59                    | 1.09 | 0.49    |
| Spirits                 | 0.54                           | 0.79 | 0.46                    | 0.6  | 0.54    |
| Coffee/ tea             | 7.93                           | 4.61 | 7.67                    | 4.54 | 0.5     |
| Milk                    | 3.51                           | 3.4  | 3.66                    | 3.26 | 0.67    |

SD: standard deviation. Levels of significance were assessed by the Mann-Whitney test, a p-value < 0.05 was considered significant and marked with an asterisk in the table.

In contrast, males consumed significantly more potato/ rice/pasta (6.9 servings/week vs 5.4,  $p = 0.0002$ ), meat (4.3 servings/week vs 3.1  $p = 0.0001$ ), packaged foods (1.1 servings/week vs 0.6,  $p = 0.016$ ), pizza (1.2 servings/ week vs 0.9,  $p = 0.024$ ), fries (0.7 servings/week vs 0.5,  $p = 0.013$ ), beer (1.2 servings/week vs 0.5,  $p = 0.0001$ ) and non-alcoholic beverages (0.9 servings/week vs 0.5,  $p = 0.010$ ).

Lastly, statistically significant differences were found among the students living away from home depending on their gender, as female students consumed more raw vegetables ( $p = 0.001$ ) and cooked vegetables ( $p = 0.0003$ ), while male students consumed more meat ( $p = 0.008$ ), fish ( $p = 0.012$ ) and beer ( $p = 0.009$ ). Instead, the male students who lived at home with their families showed a significantly higher frequency of consumption of potato/rice/pasta ( $p = 0.0007$ ), meat ( $p = 0.0018$ ), fries ( $p = 0.016$ ), packaged foods ( $p = 0.045$ ), beer ( $p = 0.0002$ ) and non-alcoholic beverages ( $p = 0.048$ ), while female students consumed more cooked vegetables ( $p = 0.0356$ ) and coffee/tea ( $p = 0.019$ ).

Regarding the students' socioeconomic status and their parents' educational qualifications, the students that have preferred not to respond to the first question showed a higher consumption of fries ( $p=0.006$ ) and pizza ( $p=0.015$ ), while those who make ends meet easily consume a higher quantity of spirits ( $p = 0.0037$ ). Regarding the parents' educational

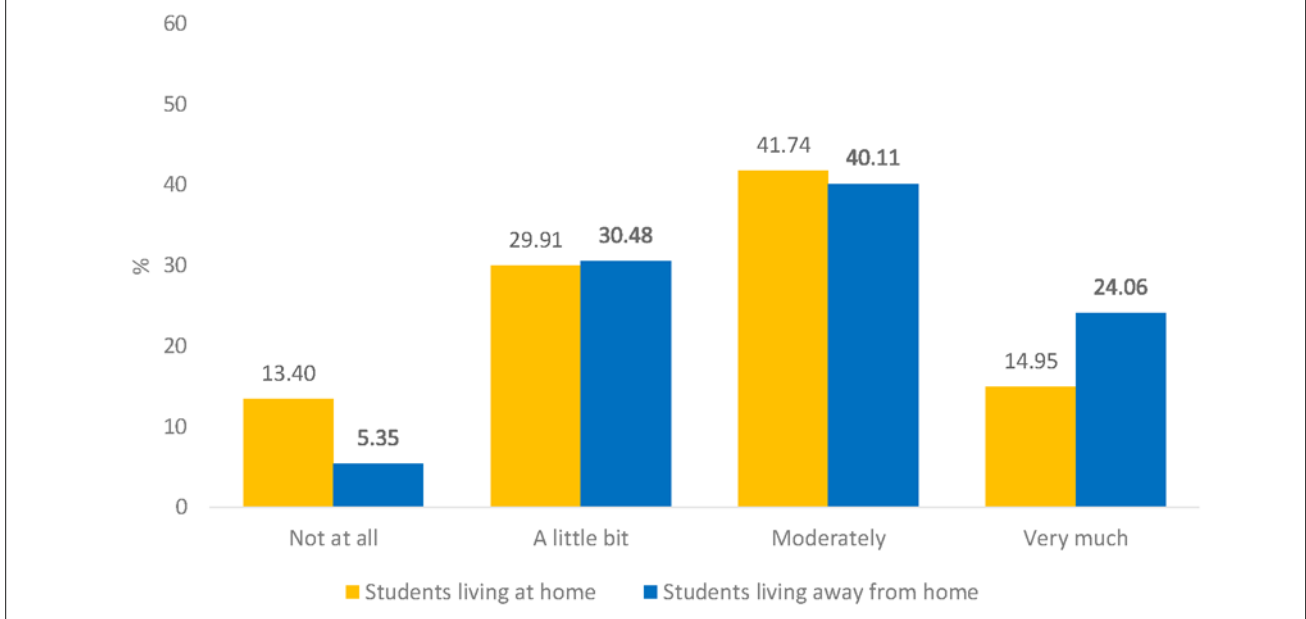
qualifications, the students whose father has a post graduate degree consumed more meat ( $p = 0.01$ ), more wine ( $p = 0.0003$ ) and more pizza ( $p = 0.039$ ), pizza was more eaten also between students whose father stopped after elementary school; while the students whose mother has a post graduate degree consumed more wine ( $p = 0.0014$ ).

## Discussion

This study found out that university students did not show much interest in the questionnaire topics as only 10.8% responded to the survey and the ones that did it, despite improvements in recent years maybe due to health promotion campaigns such as OKkio alla salute for children and Health Behaviour in School-aged Children-HBSC for adolescents [17], showed some difficulties in following a proper lifestyle. Healthy and unhealthy eating habits influence the Quality of Life (QOL), a concept that indicates the general wellness of person and societies [18].

The majority of the students reported to consume their meals at home or at university with homecooked food; this could represent a money saving method or it could be related to the quality of canteen food as reported in other studies [19]. In contrast with what can be read in the literature, in this study it emerged that only 8.8% of

Fig. 2. Differences in how much dietary habits have changed since starting university between students living at and away from home.



students did not eat breakfast, unlike a group of Italian adolescents, in which more than 40% skipped this meal, highlighting an improvement in eating habits growing up [20].

The results of this study are in agreement with others reporting the adoption of unhealthy food habits among college students, especially with regard to the low consumption of fruit and vegetables, fish, eggs, and the excessive consumption of cured meats and dairy products [21, 22]. The difficulties to adopt a diet complying with the guidelines are a problem that affects many college students from several origins and with different dietary habits.

However, it is crucial to understand that some of these wrong dietary habits can already be established in children and adolescents; this could make bad habits persist in young adults and make it even more difficult to change them. As a matter of fact, an Italian study about adolescents reported that 7 out of 10 adolescents did not consume vegetables daily and 1 in 2 did not consume both fruit and vegetables daily, moreover boys had a higher prevalence of incorrect dietary habits than girls [20].

Most of the statistically significant differences in this survey were linked to the gender. In particular, the women in our study, in agreement with previous studies [15, 21, 23-25], consumed significantly more fruits and vegetables and less ready meals and alcoholic beverages than men; this could be because they are better informed about the nutritional value of foods, or maybe because they are more attentive and sensitive to weight control [26, 27]. As shown in a previous study, also during adolescence, girls tend to have a healthier diet, in fact it was reported that 67,5% of girls did not consume vegetables daily versus 77,9% of boys [20]. Moreover, females consume more coffee/tea than male students,

as it was found also in other studies and this could be linked to women faster metabolism of caffeine [28]. However, in general, both females and males consumed high quantity of caffeine both for social reasons and to increase mood and alertness [29].

Although the changes in dietary habits involved a significant number of students, the phenomenon mainly affected those who lived away from family [30]. The university students who lived with their parents declared to eat a lot more fruits, vegetables, pasta/rice, meat, fish, cured meats, bread/cereals, pulses, packaged foods, fruit juices, beer, wine. Students living with families seemed to have a better diet, and this could be due to family support both financially and in terms of food choices; a cross national study about adolescents showed that, already in that age group, the family' socioeconomic status can influence dietary habits and could be related to a higher prevalence of obesity [31]. Otherwise, displaced students, maybe because of a lack of time or inexperience in the kitchen, tend to eat healthy foods less frequently [15, 21].

The reasons that could influence university students in making food choices are numerous: comfort and convenience of fast food, taste, self-discipline, physical and social environment surrounding them (availability and accessibility, appeal and prices of food products), gender, attention to weight and beliefs, time and convenience. Another important reason could be the budgetary constraints that the whole world is facing right now [32-36].

Compared with other surveys conducted a few years back in northern and southern Italy [15, 21], we have noticed fewer statistically significant differences between students who lived with or without their parents and it could be interesting to carry out further studies to understand the reason for this divergence. In particular,

**Tab.II.** Mean weekly consumption of food and beverages of students based on the gender.

|                         | Female students |      | Male students |      | I'd rather not answer |      | I don't identify with either gender |    | p-value |
|-------------------------|-----------------|------|---------------|------|-----------------------|------|-------------------------------------|----|---------|
|                         | Mean            | SD   | Mean          | SD   | Mean                  | SD   | Mean                                | SD |         |
| Fresh fruit             | 5.73            | 4.74 | 5.52          | 4.47 | 3.5                   | 2.82 | 1.5                                 | -  | 0.76    |
| Raw vegetables          | 4.61            | 3.8  | 3.2           | 2.77 | 3.5                   | 2.82 | 0.5                                 | -  | *0.002  |
| Cooked vegetables       | 5.29            | 3.74 | 3.71          | 2.96 | 3.5                   | 0    | 1.5                                 | -  | *0.0001 |
| Cakes                   | 1.26            | 1.35 | 1.46          | 1.96 | 0.25                  | 0.35 | 0.5                                 | -  | 0.32    |
| Potatoes/rice/pasta     | 5.42            | 2.99 | 6.89          | 3.09 | 6.25                  | 1.06 | 5.5                                 | -  | *0.0002 |
| Meat                    | 3.13            | 2.38 | 4.34          | 2.9  | 4.5                   | 1.41 | 0.5                                 | -  | *0.0001 |
| Fish                    | 1.35            | 1.11 | 1.61          | 1.27 | 2.75                  | 3.88 | 0.5                                 | -  | 0.17    |
| Dairy products          | 3.83            | 3.12 | 4.33          | 3.02 | 5.25                  | 2.47 | 7                                   | -  | 0.1     |
| Cured meats             | 1.63            | 1.76 | 1.83          | 1.76 | 2.5                   | 1.41 | 7                                   | -  | 0.15    |
| Eggs                    | 1.44            | 1.01 | 1.68          | 1.24 | 3.5                   | 2.82 | 0.5                                 | -  | 0.07    |
| Fries                   | 0.47            | 0.49 | 0.74          | 0.88 | 2.75                  | 3.88 | 1.5                                 | -  | *0.012  |
| Bread/cereals           | 5.26            | 3.49 | 5.22          | 3.53 | 6.25                  | 1.06 | 0                                   | -  | 0.31    |
| Pulses                  | 2.15            | 1.94 | 2.16          | 1.74 | 2                     | 2.12 | 1.5                                 | -  | 0.99    |
| Pizza                   | 0.93            | 0.54 | 1.18          | 0.85 | 1                     | 0.7  | 1.5                                 | -  | *0.02   |
| Snacks                  | 2.39            | 2.8  | 2.28          | 2.44 | 2.5                   | 1.41 | 1.5                                 | -  | 0.92    |
| Sauces                  | 0.73            | 1.04 | 0.99          | 1.32 | 1.75                  | 2.47 | 1.5                                 | -  | 0.34    |
| Packaged foods          | 0.63            | 0.95 | 1.09          | 1.84 | 2.5                   | 1.41 | 3.5                                 | -  | *0.016  |
| Fruit juices            | 0.93            | 1.08 | 1.14          | 1.8  | 3.5                   | 4.94 | 0.5                                 | -  | 0.31    |
| Beer                    | 0.49            | 0.74 | 1.16          | 1.83 | 3.5                   | 4.94 | 0.5                                 | -  | *0.0001 |
| Wine                    | 0.66            | 0.97 | 0.75          | 1.18 | 1.75                  | 2.47 | 0.5                                 | -  | 0.97    |
| Non-alcoholic beverages | 0.51            | 0.98 | 0.88          | 1.38 | 0.25                  | 0.35 | 0.5                                 | -  | *0.01   |
| Spirits                 | 0.46            | 0.65 | 0.52          | 0.61 | 2.75                  | 3.88 | 0.5                                 | -  | 0.33    |
| Coffee/ tea             | 8.11            | 4.5  | 6.76          | 4.61 | 7.75                  | 8.83 | 7                                   | -  | *0.025  |
| Milk                    | 3.52            | 3.36 | 3.86          | 3.2  | 5.5                   | 0    | 0.5                                 | -  | 0.66    |

SD: standard deviation. Levels of significance were assessed by the Kruskal Wallis test, a p-value < 0.05 was considered significant and marked with an asterisk in the table.

it would be useful to understand why the diets of the two groups of students have become more similar over the years.

It is important to consider that this study has some limitations. One of them could be that, even if the initial sample could have been representative of all the university students, the answers were not as many as we expected as only 10.8% of the students responded. Another thing to take in consideration is that the majority of the respondents were female, usually more attentive and sensitive about healthy eating habits, so the male population could not have been represented properly. Lastly, it would have been useful to know which faculty the students were attending as some of them may include nutrition courses and this may have influenced some answers.

## Conclusions

With the transition from secondary school to university, when independency increases, students are continuously challenged to make healthful food choices and they must be self-disciplined to take care

of themselves. According to data from the World Health Organization, 86% of deaths and 77% of the loss of healthy life years in Europe are caused by chronic diseases [37]. Modifiable risk factors, combined with other non-modifiable causes such as age or genetic predisposition, are responsible for the majority of deaths from chronic diseases worldwide; therefore, it is important for health promotion campaigns to be promoted in young adults to help them make the right choices regarding eating healthy. To design appropriate health promotion campaigns in universities, to improve the students' lifestyle and to prevent many chronic degenerative diseases, it is fundamental to plan harmonized surveillance systems designed to detect risk factors. Since the lack of harmonized measurements and methodologies among countries, it is useful to develop more effective and internationally applicable policies [38].

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## Data availability statement

The data that support the findings of this study are available from the corresponding author, E.F., upon reasonable request.

## Conflicts of interest statement

None declared.

## Authors' contribution

NV, EF and EF: conceptualisation of the study; EF and EF: data curation; EF and EF: formal analysis; EF and EF: investigation; EF and EF: methodology; NN: project administration; EF and EF: resources; EF and EF: software; NV, CQ, GM and NN: NV, CQ, GM and NN: supervision; EF and EF: validation; writing-original draft preparation; EF, EF, NV, GM and NN: writing-review and editing. All authors have read and agreed to the published version of the manuscript.

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