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Original article

Nutritional habits in Spanish female students of childbearing age

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ABSTRACT

Aim: To analyse the dietary habits, alcohol consumption, healthy eating index and student performance of a sample of students at a Spanish university to determine if their intake of nutrients reach optimal levels for fertility.

Methods: Descriptive cross-sectional study of female university students in Madrid, data were collected in Nutrition classes. Participants were 470 women nursing studying at a private university in Madrid, non-random sample was used. An AUDIT test was conducted to determine alcohol consumption. Habits and dietary assessment with a three-day record using DIAL® program to know main nutrients intake. Quantitative variables appeared as mean ± standard deviation, adjusted for all pairwise comparisons using the Bonferroni correction Statistical analysis was performed using SPSS 25®.

Results: The majority of the Spanish university women of reproductive age participating in the study did not have the recommended intake of some macro and micronutrients carbohydrates, vitamins D and B9, Mg, Fe, and I.

Conclusions: This study opens further lines of research. It is necessary to carry out qualitative research into students' self-perception and their dietary and sleeping habits. Addressing ways to improve food access, dietary quality, and healthy lifestyle, should be focused on future intervention programs and policies for college students.

1. Introduction

A healthy lifestyle at a young age is an important factor in enjoying a long and healthy life. This lifestyle includes a healthy diet, consuming the appropriate number of healthy foods with an optimum protein-carbohydrate ratio, regular physical activity, and moderate alcohol consumption (Capurso, 2021). The eating habits of university students often depart from the recommendations of medical authorities and nutrition experts and their nutritional habits were moving away from the traditional Mediterranean diet towards a more western type of diet during the transition from adolescence to adulthood. The Mediterranean diet is characterised mainly by high intake of vegetables, fruits, nuts, cereals, legumes and fish, and low consumption of meat and poultry (Trichopoulos & Costacou, 2003).

Diet is a modifiable lifestyle factor linked with fertility (Gaskins & Chavarro, 2018). The adequate intake of monounsaturated fatty acids, the choice of plant rather than animal proteins, the use of dietary supplements containing iron and folic acid, vitamin B12, the sufficient intake of antioxidants and a well-balanced diet all seem to play an important role in preventing infertility in women of reproductive age and may help to prevent gynecological disorders (Castelló et al., 2014)(Smits et al., 2018)(Gaskins & Chavarro, 2018). It appears that higher intake of Polyunsaturated Fatty acids (PUFA), specifically omega 3 fatty acids, can enhance female fertility (Gaskins & Chavarro, 2018). It has also been observed that high intake of saturated fats, trans fatty acids and animal proteins can be detrimental to fertility, while the intake of complex carbohydrates, fiber, monounsaturated fats and omega-3 fatty acids can be beneficial. Also, it is essential to have an adequate intake of folic acid, vitamins B12, A, D, C, E, calcium, iron, zinc, selenium and iodine to prevent impairments in fertility (González et al., 2018). Adherence to a Mediterranean dietary pattern was associated with better fertility; regarding other gynecological disorders(Onieva et al., 2020)(Fernández et al., 2018), observed that the risk of

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endometriosis was inversely related to vegetable and fruit consumption in the Italian population(Parazzini et al., 2004). For women with pelvic pain has been observed that those who received vitamins C and E reported less pain or dysmenorrhea compared to the placebo group(Santanam et al., 2013) while for vitamin D there were heterogeneity of results(Gaskins & Chavarro, 2018). Specifically in Spanish university students, an association has been found between lifestyle and menstrual problems; typical Spanish foods part of a Mediterranean diet, such as extra virgin olive oil and strawberries, may influence in menstrual cycles and menstrual pain (Onieva et al., 2020) (Fernández et al., 2018), although more study is necessary.

There are several barriers to following a healthy lifestyle for nursing students, especially the lack of time and motivation due to their stressful academic studies, even though they recognize the importance of a healthy diet (Fernández et al., 2020). Some studies found a relationship between short sleep duration and poor diet: fewer servings of fruits and vegetables, whole grains and beans and overall poorer dietary quality (Kim et al., 2011). It has also been observed that compared to normal sleepers (7–8 h), short sleepers (5–6 h) reported higher intakes of absolute protein, carbohydrate, and total fat but a lower intake of dietary fibre, whereas very short sleepers (<5h) reported lower intakes of protein, carbohydrates, dietary fibre, and total fats (Grandner et al., 2013). In a study of adolescents across several European countries, those who slept < 8 h were more sedentary and demonstrated a decrease of healthy food intake (Bel et al., 2013). In Spanish study 25% of women skipped breakfast, mainly young women, with no differences between weekdays and weekend days(Ruiz et al., 2018). It has been observed that shorter sleep durations are associated with unhealthier dietary habits or skipping breakfast (Dashti et al., 2015) (Otsuka et al., 2019). Skipping breakfast has been associated with menstrual problems (Onieva et al., 2020). The number of studies investigating the role of individual dietary factors and overall dietary patterns in cases of sleep disorders provide an interesting body of evidence. The intake of specific nutrients such as n-3 polyunsaturated fatty acids, B vitamins, zinc, and magnesium have also been linked to brain functions. B-group vitamins may modulate cognitive performance and improve cerebral and cognitive functions and calcium, potassium, and magnesium can modulate sleep (Lassale et al., 2019) (Smith & Refsum, 2016).

Nursing students tend to be predominantly women of childbearing age and during their training they acquire knowledge about nutrition and a healthy lifestyle, although they may depart from the recommendations received in their academic training (Rizo, 2014) (Sánchez et al., 2015) (Montero & Úbeda, 2006).

The objective was to to determine if nutrient intake reach an optimal value in terms of fertility in nursing female students.

2. Methods

2.1. Study, participants and procedure

This descriptive cross-sectional study was conducted in Nursing students at a private university in Madrid, a non-random sample was used. The students were recruited at classes and the Nutrition professor provided information about the purpose of the study. Those who wished to voluntarily take part in the study, provided a written consent before the starting. The data was collected during class time and analyzed anonymously. The study was conducted in March-April 2021.The data was uploaded onto a database for analysis (Fig. 1).

Inclusion criteria was to be a female Nursing student. Exclusion criteria were based on age (>30 years), missing data, as well as unusual energy intake (either too low or too high). The total initial sample consisted of 581 students and after discarding students and uncompleted tests, a final simple of 470 women were included in the study.

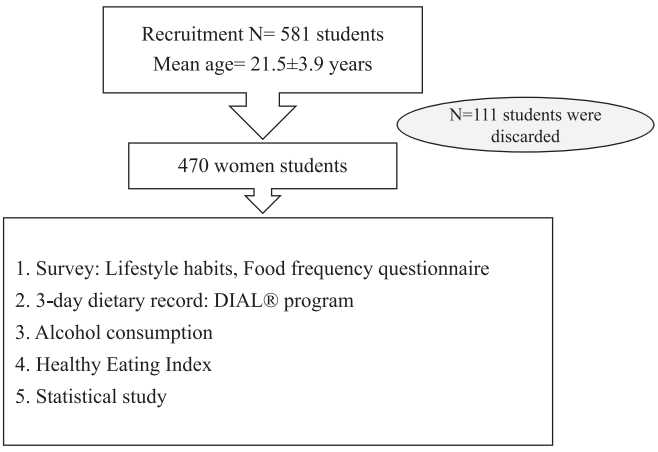

Fig. 1. Flow chart of the study.

Questions relating to daily hours of sleep were also included in this section and are divided into: > 7, 6–7 and < 6 h sleep (Jahrami et al., 2019).

Participants completed self-reported sociodemographic information on their age, course, nationality, height, weight. The participants took themselves their height, weight, waist and hip measurements and entered the results into the questionnaires. These variables were used for the body mass index (BMI) analysis (Table 1). The mean age of the students was 21.2 ± 3.0 (18–30 years).

2.2. Dietary assessment and healthy eating index

Food intake was assessed using three-day food records (two weekdays and one weekend day/holiday), after receiving instructions during class time. The dietary intake of some nutrients was compared with age and sex-specific requirements of these, according to the dietary recommended index (DRI) for Spanish population (Moreiras et al., 2016). The number of nutrients with inadequate intake was determined for each participant. Nutrient intakes and

Table 1
Anthropometric characteristics, sleep hours, academic performance and physical activity of nursing students.

		N	*%*
BMI (kg/m²)		21.8 ± 2.5*	
Underweight		36	7.7
Normal weight		384	81.7
Overweight obesity		50	10.6
WHR		0.79 ± 0.9*	
≤0.85		285	60.6
≥0.85		185	39.4
Sleep hours		6.5 ± 0.1*	
≤ 6		295	32.6
6–7		153	62.8
≥8		22	4.7
Academic performance		6.1 ± 1.3*	
Excellent grades		135	28.7
Average grades		227	48.3
Poor grades		108	23
Physical activity	*low*	183	38.9
	moderate	183	38.9
	high	104	22.1

* Mean value ± SD; SD: standard deviation; BMI: body mass index; WHR: waist hip ratio.

healthy eating index were then determined using Spanish DIAL® software (Ortega et al., 2007). The HEI score is: 50 inadequate, 50–70 acceptable-good and 70 very good–excellent.

2.3. Habits and food consumption

We used the following questions: Are you following a diet?; Do you have breakfast every day?; Do you reduce consciously your food intake?; Are you on diet now or during last months?; Do you take something to reduce appetite?. Participants give a response with answers where Yes (1), No (2) and Sometimes (3). Other questions were: How do you consider your weight? and participants give a response with dichotomic answers where: overweight (1), slightly overweight (2), normal (3), slim (4), very slim (5). How do you consider your lifestyle?: (0) unhealthy, (1) healthy and (2) very healthy. The frequency of consuming foods was assessed on an ordinal scale: never (0), 1–3 times a month (1), once a week (2), few times a week (3); once a day (4) and few times a day (5) of different food groups (Robledo et al., 2014).

2.4. Alcohol consumption

To assess alcohol consumption and behavior, the 10-question AUDIT was used (Saunders et al., 1993, Bador et al., 2001) The AUDIT test was used to determine the alcohol consumption habits of the participants. The test consists of 10 items, 8 of which are on a Likert scale of 5 categories from 0 (never/1 or 2 units) to 4 (daily/10 or more units). The two remaining items also use a Likert scale but with 3 categories ordered from 0 to 2. The response from participants allows them to be classified into three levels: without risk of dependence, at risk consumption and probable alcohol dependence syndrome (ADS).

2.5. Ethical consideration

The study was approved by the Ethical Committee of University (16/2021), and it fully complied with the Helsinki Declaration.

2.6. Statistical analysis

The qualitative variables were presented as frequencies and percentages while quantitative variables appeared as mean ± standard deviation, adjusted for all pairwise comparisons using the Bonferroni correction All analyses were performed using the IBM SPSS statistical software package, version 25®.

3. Results

A total of 470 female university students participated in this study with an average age of 21.2 ± 3.0. The average BMI was 21.8 ± 2.5 (Table 1), 7.7 % of participants were classified as underweight, 10.6% as overweight-obese and 81.7% as normalweight. Waist/hip ratio (WHR) was 0.79 ± 0.9; 60.6% students had healthy ratios while 39.3% had unhealthy ratios. With respect to academic performance, 48.3% obtained average grades, 28.7% had excellent grades and 23% had failing grades. (Table 1).

Regarding the intake of breakfast (Table 2) we found that 47.6% of nursing students do not have breakfast every morning. HEI was acceptable, representing 60.2% of the total students (Table 2).

Table 3 shows the energy, macronutrient and micronutrient intake of female nursing students. Details of the findings are shown in Table 3.

Table 4 shows the intake of nutrients with respect to the BMI of nursing students. We note that those who were underweight have less intake of: total energy, % fat, vitamin B9, Fe, Mg and I. When the students were overweight, we observed higher intakes than normal of total energy, proteins and fat %E, trans fatty acids, Na and K and less intake of vitamin A, Fe and Mg.

Table 2
Descriptive data of breakfast habits, reduce intake of food or take substances to help weight control and personal considering the weight.

		N	*%*
Have breakfast	Yes	246	52.3
	No	104	47.6
Reduced consciously the intake of food	Yes	161	14.9
	No	239	50.9
	Sometimes	70	14,9
On a diet	Yes	94	20
	No	377	80
Do you take something to reduce hunger?	Yes	7	1.5
	No	454	96.6
	Sometimes	9	1.9
Do you take something with diuretic effect	Yes	13	2.8
	No	448	95.3
	Sometimes	9	1.9
Do you take something to seep-up gut transit?	Yes	9	1.9
	No	451	96
	Sometimes	10	2.1
How do you consider your weight?	normal weight	305	64.9
	overweight	154	32.8
	slim-very slim	11	2.3
Lifestyle	Unhealthy	67	14.3
	Healthy	294	62.6
	Very healthy	109	23.2
HEI	59.2 ± 1.3*		
	Inadequate	104	22.1
	Acceptable	283	60.2
	Good-very good	83	17.7

HEI: healthy eating index; *mean ± standard deviation.

Table 5 shows the results of AUDIT test. Most students need alcohol education (68.7%) and only 10% were non-drinkers. We also observed that 58.7% were binge drinkers. According to the question 3 of AUDIT test on hazardous drinking, we observed that monthly 27.2% of the students had $\geq$ 6 alcoholic drinks. We found a correlation ($p < 0.05$) between students with worse academic marks who drank more alcoholic beverages (data not shown). See more details in Table 5.

The pattern of food intake was characterized by high daily intakes of fruits and cereals, 1–3 times/week of vegetables, meat, fish, legumes and soft drinks and sometimes-never for nuts. See Table 6 for more details.

In Table 7 we observed that BMI is significative correlated ($p < 0.05$) with HEI and we observed significative correlations between macronutrients. Table 8 shows sleep time and nutrients, details of the findings of each dimension are shown in Table 8.

4. Discussion

The aim of the study was to evaluate the nutritional habits of female university students of childbearing age. In our study, participants were generally of normal weight; 7% of the students were underweight, 10.6% overweight/obese and 81.7% were of normal weight, these figures were similar to previous studies carried out in Madrid in both private and public universities in terms of weight perception, some 64% of the students perceived they had a normal weight, like results generally found among university students in Madrid. (Robledo et al., 2014). In the present study AUDIT test 58.7% of women were binge-drinkers and 68.7% need alcohol education. Mean time of sleep of the students were $\leq$ 6 h/day.

With respect to their lifestyle, 14.3% answered that it was inadequate and 47.6% did not breakfast every day. According to their food intake, over a quarter eat fruit every day, less than a quarter eat vegetables and around the half of the students eat cereals daily.

Table 3
Mean daily intakes of macro and micronutrients from the 3-day food diary record.

Nutrient	*Mean (SD)*	*RDI*	*%RDI*	≤30% RDI	≤80% RDI
Energy (kcal)	1675	2300	72,8	0.4	64.7
Protein %E	17.3 (3.8)	15	115,3	0	6.2
CH %E	40.1 (8.9)	55	72,9	0.6	71.1
Fibre (g)	20.9 (8.5)	25	83,6	0	30.0
Fat %E	35.4 (7.6)	30	118,0	0	9.1
SFA%E	13.0 (4.0)	<10	130,0	0	9.8
MUFA %E	17.0 (3.6)	20	85,0	0	40.6
PUFA %E	5.5 (1.7)	5	110,0	0	17.0
*TFA: %E	0.2	<1	20,0	68.9	90.4
PUFA/SFA	2.0 (1.4)	≥ 0.5			
PUFA + MUFA/SFA	1.0 (0.9)	≥ 2			
Cholesterol (mg)	270.3 (59.6)	< 300	90,1	0	34.5
Omega-3 (g)	0.27 (0.37)	0.8	33,8	63.6	92.3
Vitamin D (μg)	5.9 (3.2)	15	39,3	44.4	93.6
Vitamin A (μg)	645.9 (201.1)	800	80,7	0	54.5
Vitamin E (mg)	6.0 (2.0)	8	75,0	0	63.0
Vitamin C (mg)	77.5 (33.1)	60	129,2	1.1	19.6
Vitamin B9 (μg)	279.5 (87.6)	400	69,9	0	71.5
Vitamin B_{12} (μg)	4.9 (1.8)	2	245,0	0	0
Ca (mg)	794.5 (222.3)	1000	79,5	0	57.9
Mg (mg)	249.5 (90.0)	350	71,3	0.2	71.3
P (mg)	757.4 (239.7)	700	108,2	0	23.0
Fe (mg)	14.2 (8.1)	18	78,9	0	62.6
Na (mg)	2436.7 (1113.2)	2000	121,8	0	25.7
K (mg)	2580.0 (954.3)	3500	73,7	1.7	66.2
Zn (mg)	8.7 (3.1)	12	239,2	3.2	65.7
Se (μg)	72.9 (21.3)	55	132,5	0	7.7
I (μg)	105.9 (37.5)	150	70,6	0	64.3

Data shows Mean (SD). %E: percentage of total energy; RDI: recommended dietary intake. %RDI: disparity between reported consumption and the level needed for adequacy, calculated comparing with 80% of the Spanish dietary reference value (RDI) [43].CH, Carbohydrate; SFA, saturated fatty acids; MUFA, monounsaturated fatty acids; PUFA, polyunsaturated fatty acids; TFA, trans fatty acids; HEI, healthy eating index [37].

Some 85.7% eat meat and fish and less than a quarter eat legumes 1–3 times/week. Nearly half of the students drink soft drinks with 45% reporting they have soft drinks sometimes-never. Nutrients with intakes ≤ 30% RDI: vitamin D and omega 3. Intakes ≤ 80% RDI: omega 3, vitamins D, E and B9, minerals: Mg, Fe, K, Zn and I. Our findings show that half of the students breakfasted daily, Fujiwara et al. reported that skipping food for aesthetic reasons during adolescence could have future negative effects on their fertility(Fujiwara et al., 2009). >50% considered that they had a healthy lifestyle, with an acceptable HEI and normal weight. It is important to note that one third of students considered themselves overweight. Regarding alcohol consumption, the AUDIT score was like a study conducted in Madrid with health sciences students (Marchena et al., 2020). Both found female students drink large quantities of alcohol, which may impact their fertility. A high percentage of university students sleep less than recommended for this populations, and this may also affect their fertility (Stocker et al., 2021).

For body weight, no association was observed in this study. Similar results were obtained in a recent study of nursing students(López-Moreno et al., 2021a) and among Moroccan students(Benaich et al., 2020).

Alcohol consumption has been increasing among women, The AUDIT score was like that of a study conducted in Madrid (Marchena et al., 2020). The results show that 68.7% are not at risk of problematic alcohol consumption and 3.6% have a high risk of having alcohol dependence. Among this group it is necessary to suggest the need to reduce their alcohol intake. Women have greater vulnerability to the effects of alcohol and the association found between alcohol consumption and difficulties in getting pregnant deserves further attention (Míguez & Permuy, 2017). Due to the pandemic situation, university students spent less time at the university which may have affected their alcohol consumption, leading to a higher risk of drinking.

Binge drinking refers to drinking of ≥ 4 alcoholic beverages in a single session. Our students showed a rate of binge drinking of 10.2% compared with data from Madrid, which showed a mean score for binge drinking of 15.6% (Observatorio Español de las Drogas y las Adicciones, 2021). Among our sample we found an inverse relationship between alcohol intake and academic performance (López-Moreno et al., 2021).

Overall, our data presents acceptable values and, in many cases, lower values than those observed in the survey carried out among young people in Madrid (Robledo et al., 2014); in this study, the average intake of fruit and vegetables was 2.4 times/week, with a daily consumption of 31.8%, compared to 5.2 in the regional survey and with 57.7% consuming them daily. Regarding vegetables, women ate they 2.4 times/week and 18.4% ingested them daily, data that contrasts with those observed in university students of Madrid, which was 4.4 times/week and 33.3% of them took them daily. Cereal consumption was 1.8 times/week, with 53.1% reporting daily consumption; this intake is lower than that obtained in the survey of the Community of Madrid showing consumption by university students of 5.4 times/week and 60.4% daily consumption (Robledo et al., 2014). For meat consumption, our findings were like the Community survey of 2.8 times/week. Legume consumption was slightly higher in our study at 2.9 times/week compared to 2 times/week in the Community survey. This was also the case with the consumption of fish, slightly higher in our study at 3 times/week compared to 1.6 according to the Community survey. For nuts, our findings were higher at 3.2 times/week compared to 1.1 times/week for university students from Madrid (Robledo et al., 2014). The consumption of soft drinks was similar, with an average intake of 3.1 times/week. However, unlike the previous survey, 9.6% of our students consumed soft drinks daily compared to 22.7% of our students.

Table 4
Macro and micronutrient intake with respect Body Mass Index (BMI) in nursing female students.

	BMI (Kg/m^2)		
	underweight (N = 40)	normal weight (N = 384)	overweight/obesity (N = 46)
Energy (kcal)	**1565.9 ± 680.5***	1676.6 ± 516.1	1717.8 ± 512.2
Protein %E	16.6 ± 3.4	17.3 ± 3.8	18.3 ± 4.1
Carbohydrates % E	39.4 ± 8.0	40.3 ± 9.2	39.0 ± 7.1
Fiber	22.0 ± 4.2	23.0 ± 5.2	22.2 ± 4.3
Fat %E	33.5 ± 7.9	35.5 ± 7.6	36.2 ± 7.1
SFA %E	13.1 ± 3.6	13.0 ± 4.2	13.3 ± 2.9
MUFA %E	16.6 ± 3.5	17.15 ± 3.6	16.3 ± 3.7
SFA/PUFA	2.0 ± 1.3	2.0 ± 1.5	2.2 ± 1.4
SFA/			(MUFA + MUFA)
1.0 ± 0.7	1.0 ± 0.9	0.98 ± 0.7	
Cholesterol (mg)	270.3 ± 59.5	270.2 ± 60.3	271.3 ± 55.5
omega 3 (mg)	0.21 ± 0.18	0.28 ± 0.39	0.26 ± 0.27
Trans fatty acids (mg)	0.15 ± 0.19	0.34 ± 0.63	**0.39 ± 0.48***
Vitamin B9 (μg)	274.1 ± 84.2	304.6 ± 101.2	303.1 ± 99.6
Vitamin B12 (μg)	4.8 ± 1.8	4.9 ± 1.8	5.0 ± 1.9
Vitamin D (μg)	5.7 ± 2.9	5.9 ± 3.3	5.4 ± 3.2
Vitamin A (μg)	648.4 ± 270.8	651.1 ± 206.0	620.3 ± 184.4
Vitamin E (mg)	5.9 ± 2.0	6.0 ± 2.0	6.2 ± 1.9
Vitamin C (mg)	80.3 ± 33.8	77.0 ± 32.6	79.7 ± 37.1
Ca (mg)	787.5 ± 219.6	798.9 ± 220.2	849.0 ± 243.06
Fe (mg)	**13.7 ± 4.1***	17.1 ± 24,3	15.2 ± 4.5
Mg (mg)	240.4 ± 85.9	270.6 ± 98.3	247.9 ± 89.3
Na (mg)	2190.2 ± 936.5	2454.2 ± 1136.3	2505.6 ± 1050.3
K (mg)	2537.6 ± 704.6	2554.1 ± 956.0	2832.6 ± 1100.0
P (mg)	743.6 ± 222.7	758.9 ± 241.7	756.4 ± 242.4
Zn (mg)	8.8 ± 2.8	8.6 ± 3.1	9.1 ± 3.0
Se (μg)	72.6 ± 21.2	73.2 ± 22.2	75.0 ± 21.6
I (μg)	103.9 ± 34.2	105.9 ± 38.3	108.1 ± 34.0

Data shows mean ± SD. SFA, saturated fatty acids; MUFA, monounsaturated fatty acids; PUFA, polyunsaturated fatty acids. * Test are adjusted for all pairwise comparisons within a row of each innermost suitable using the Bonferroni correction; Bold indicates statistical significance ($p < 0.05$).

Table 5
AUDIT test, AUDIT-C test and AUDIT-3 in female nursing students.

		N	*%*
AUDIT	4.8 ± 4.2		
	Alcohol education	370	68.7
	Simple advice	83	17.7
	Therapy	17	3.6
	Nondrinker	47	10
AUDIT-C	3.1 ± 0.9		
*AUDIT 1**	never	49	10.4
	≤1 drink per month	129	27.4
	2–4 times/week	197	41.9
	2–3 times/week	72	15.3
	≥4 times/week	23	4.9
*AUDIT 2**	1 or 2	289	61.5
	3 or 4	122	26.0
	5 or 6	42	8.9
	7,8 or 9	17	3.6
	never	245	52.1
*AUDIT 3**			
	≤1 drink per month	128	27.2
	weekly	51	10.9
	daily	46	9.8

* AUDIT: AUDIT: Alcohol Use Disorders Identification Test AUDIT-C questions 1, 2 and 3.

Mean sleep time in our study was ≤ 6 h, similar results were obtained in other studies (de la Portilla Maya et al., 2019; Özdişli and Yıldız, 2021; Peltzer and Pengpid, 2019). Our study also observed a lack of association of BMI with short and adequate sleepers, similar results were observed by others (Mondin et al., 2019). That non-significant relationship between BMI-sleep time, may be because short sleepers were more actives students (data not shown). Sleep is very important to physical and emotional health. We did not detect differences between sleep duration and the intake of nutrients. Nevertheless, individuals who slept<6 h had significantly higher intakes of vitamin A, folic acid, iron, selenium and iodine, than those who slept more hours. Some aspects of health and student functionality are related with sleep disorders as explained above, but there has been little study into the relation between poor sleep and fertility (Kloss et al., 2015). Sleep and sleep disturbances are among the most significant health and wellbeing factors related to menstruation, pregnancy and menopause. If sleep directly affects reproductive hormones and/or related physiological process, a direct relation may be expected between sleeplessness and fertility, perhaps because sleep quality is important to oocyte health (Stocker et al., 2021; Yanık and Alus Tokat, 2021).

Sleep has been studied in young adults in relation to nutrition and physical activity, and adult cardiometabolic risk (RCM) (Ames et al., 2018). Follow-up was conducted before and after university graduation, finding that the duration of sleep, nutrition and physical activity could predict adult RCM. The levels of physical activity and nutrition predicted the RCM for women and men, and in women the duration of sleep was also a predictor. Short, poor-quality sleep is associated with high blood pressure. High consumption of fruit, vegetable, and salt during adolescence is associated with lower systolic blood pressure in young adulthood and the duration of sleep with lower RCM risk (Ames et al., 2018).

Diet is known as modifiable lifestyle factor related with fertility (Gaskins & Chavarro, 2018; Panth et al., 2018); it has been observed that higher protein intake is associated with an increased risk of ovulatory infertility; higher intake of unsaturated fat instead of carbohydrates, is associated with an increased risk of ovulatory

Table 6
Food frequency intakes of different foods in nursing female students.

Food	*Food-frequency*	*N*	*%*
fruits	daily	149	31,8
	4–6 times/week	97	20,7
	1–3 times/week	127	27,1
	sometimes-never	96	20,5
vegetables	daily	87	18,4
	4–6 times/week	113	24,1
	1–3 times/week	270	57,5
	sometimes-never	0	0
cereals	daily	250	53,1
	4–6 times/week	78	16,6
	1–3 times/week	142	30,3
	sometimes-never	469	0
meat	daily	8	1,7
	4–6 times/week	59	12,6
	1–3 times/week	403	85,7
	sometimes-never	0	0
fish	daily	11	2,3
	4–6 times/week	61	13,0
	1–3 times/week	298	63,4
	sometimes-never	100	21,3
legumes	daily	12	2,6
	4–6 times/week	64	13,6
	1–3 times/week	336	71,6
	sometimes-never	57	12,2
nuts	daily	44	9,4
	4–6 times/week	38	8,1
	1–3 times/week	149	31,7
	sometimes-never	239	50,9
soft drinks	daily	45	9,6
	4–6 times/week	48	10,2
	1–3 times/week	163	34,7
	sometimes-never	214	45,5

Table 7
Bivariate correlations between BMI, %E of macronutrients, AUDIT and Healthy eating Index.

	1	2	3	4	5	6	7	8	9	10	11	12
BMI	–	-,023	,073	-,005	-,033	,089	,052	,004	-,111	,005	-,019	**,094***
Energy	-,023	–	**-,155****	-,029	,039	**-,317****	-,027	,013	-,066	**,314**	,080	-,010
P %E	,073	-,155**	–	**-,103***	-,107*	**,108***	,023	-,008	**,172****	-,058	,012	,029
CH %E	-,005	-,029	-,103*	–	,052	**-,257****	**-,324****	**-,384****	-,321**	-,047	-,010	,021
Fiber	-,033	,039	-,107*	,052	–	,067	,032	-,020	-,024	-,009	,109	,007
Fat %E	,089	-,317**	,108*	-,257**	,067	–	,196**	,242**	,220**	-,001	,039	-,023
SFA %E	,052	-,027	,023	-,324**	,032	,196**	–	,222**	,025	,105*	,035	-,006
MUFA %E	,004	,013	-,008	-,384**	-,020	,242**	,222**	–	,225**	,109*	,012	-,079
PUFA%E	-,111	-,066	,172**	-,321**	-,024	,220**	,025	,225**	–	-,018	-,070	-,013
Cholesterol	,005	,314	-,058	-,047	-,009	-,001	,105*	,109*	-,018	–	,028	-,017
AUDIT	-,019	,080	,012	-,010	,109	,039	,035	,012	-,070	,028	–	-,007
HEI	**,094***	-,010	,029	,021	,007	-,023	-,006	-,079	-,013	-,017	-,007	–

* Significative correlation < 0.05.
** significative correlation < 0.01; CH: carbohydrates; SFA: saturated fatty acids; MUFA: monounsaturated fatty acids; PUFA: polyunsaturated fatty acids; HEI: healthy eating index.

Table 8
Sleep time in university students, macro and micronutrients intake.

Nutrient	Sleep time per day		
	< 6 h	7–8 h	> 7 h
Energy (kcal)	1677,7 ± 523.2	1659.4 ± 529.4	1747.5 ± 500.3
Proteins %E	17.4 ± 3.8	17.2 ± 4.1	17.2 ± 3.3
Carbohydrates %E	40 ± 8.9	40.5 ± 9.2	38.8 ± 7.4
Fibre	23 ± 5.1	22.6 ± 4.8	22.3 ± 6.1
Lipids %E	35,6 ± 7.4	34.8 ± 8	35.9 ± 7.5
Cholesterol (mg)	272.7 ± 60	265.6 ± 59.2	269,71 ± 59
Omega 3	0.29 ± 0.39	0.26 ± 0.34	0.22 ± 0.21
Trans fatty acids	0.29 ± 0.41	0.41 ± 0.87	0.26 ± 0.24
Vitamin B9	284.4 ± 91.9	271.8 ± 78.4	268.3 ± 97.7
Vitamin B12	4.8 ± 1.8	4.9 ± 1.9	5.7 ± 2
Vitamin D	5.9 ± 3.2	5.9 ± 3.3	5.2 ± 3.3
Vitamin A	**662.7 ± 200.4***	**610.6 ± 197.4**	665.1 ± 213
Vitamin E	6.1 ± 2.1	5.7 ± 2	6.7 ± 2
Vitamin C	78.6 ± 33.5	74.9 ± 33.4	80.3 ± 25.8
Calcium (mg)	795 ± 222.3	803.5 ± 217.2	724.7 ± 199.5
Iron (mg)	14.5 ± 9.7	13.7 ± 4.1	13.1 ± 2.9
Magnesium (mg)	251.5 ± 90	250 ± 92	219.4 ± 72.1
Natrium (mg)	2455.4 ± 1168.5	2433 ± 1012.7	2211.6 ± 1037.4
Kalium (mg)	2592.5 ± 837.3	2570.2 ± 1177.9	2479.5 ± 684.5
Phosphor (mg)	746.6 ± 235.6	779.8 ± 248.5	745.6 ± 233.1
Zinc (mg)	8.8 ± 3.2	8.4 ± 2.9	9.6 ± 3.1
Selenium (	73.8 ± 21.1	71.2 ± 21.9	72.4 ± 19.9
Iodine	107.3 ± 38.8	104.4 ± 35.5	97.5 ± 32.7

Data shows Mean ± SD.
* Test are adjusted for all pairwise comparisons within a row of each innermost suitable using the Bonferroni correction; Bold indicates statistical significance ($p < 0.05$).

infertility. In this study, the students had high intake of protein (115%) and lipids (118%), above recommendations. The intake of carbohydrates, depending on quantity and quality, can have an impact on ovulatory infertility. Carbohydrate intake with a high dietary glycemic load is associated an increased risk of infertility due to anovulation in healthy women(Chavarro et al., 2009). However, there is no data on the intake of simple carbohydrates which are deleterious to fertility. Omega 3 fatty acids are also important in improving fertility in women (Panth et al., 2018), others noted that high intake of PUFA (omega 3 fatty acids) and low intake of trans fatty acids may enhance female fertility (Gaskins & Chavarro, 2018).

According to micronutrients, the intake of vitamin B9, was insufficient in this study and it has been reported that lower intake of this vitamin is related with sporadic anovulation among young healthy women (Gaskins et al., 2012). With respect folic acid, we found negative correlation with soft drinks ($p < 0.05$) and positive with iron and magnesium ($p < 0.001$). According to vitamin D, 39.3% only have the recommended intake and its deficiency may be detrimental to fertility.

Adherence to healthy diet is related to better fertility in women (Gaskins & Chavarro, 2018). A diet rich in fruit and vegetables may help to prevent gynecological disorders, compared to a diet high in animal or dietary fats, red meat, and alcohol (Harris et al., 2018). There is evidence that oxidative stress plays an important role in female fertility and could be an inexpensive treatment to improve fertility outcomes (Smits et al., 2018). Vitamins play an essential role in maintaining health and preventing disease. The intake of vitamins in this study was vitamin C > vitamin A > vitamin E. Our students reach 78.9% RDI and thus may have problems with their future fertility if their iron intake remains insufficient.

The interrelation between different nutritional habits and lifestyles and their potential in improving health and fertility has been demonstrated, and several studies with university students have been conducted with novel approaches discussed below (Semsarian et al., 2021).

The study has certain limitations. It was only conducted with women and some data were self-reported. Another potential limitation was that the results cannot be generalized, and it is necessary to extent research to students of different degree programs. One strength of our study is that includes dietary intake and lifestyle characteristics collected prior to attempting pregnancy. As future lines of research, it would be interesting to explore the self-perception of participants of their own habits and to analyze the habits of young men, also involved in the issue of fertility. It is possible to improve the health and wellbeing of female students. Physical activity and better nutritional habits can lead to improved fertility although more research is necessary. Further recommendations are the implementation of awareness campaigns on the importance of diet through multi-level nutritional educational intervention promoting healthy behaviour.

5. Conclusions

Most Spanish university women of reproductive age participating in the study did not have recommended intake of carbohydrates, vitamins D and B9, Mg, Fe and I. This is despite that fact that as nursing students they have knowledge about nutrition and should have higher scores than other groups of similar age.

Given the importance of diet to fertility and gestation it may be necessary to develop strategies to raise awareness of these issues both among healthcare professionals and the general population. Messages should emphasize the importance of a healthy lifestyle, diet and sleep patterns to fertility and motherhood. Further studies are warranted to confirm and extend these findings.

This study opens further lines of research. It is necessary to carry out qualitative research into students' self-perception and their dietary and sleeping habits. It is also important to include male students in these studies given that fertility is an issue for both sexes. Similarly, further research into sleep and fertility is recommended to better understand the complex relationship between these two issues.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Authorship

All authors have contributed equally in this paper.

Appendix A. Supplementary data

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