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RESEARCH ARTICLE

RELATIONSHIP BETWEEN THE PRESENCE OF CHRONIC PAIN AND ADHERENCE TO THE MEDITERRANEAN DIET IN UNIVERSITY STUDENTS

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ABSTRACT

Purpose: This study evaluated the presence of chronic pain and adherence to the Mediterranean diet and to examined the relationship between diet and pain among university students.
Material and Methods: This descriptive cross-sectional study was conducted with volunteer students from November-December 2019. Students' demographic and health information, nutritional habits were questioned, 24-hour retrospective food consumption was recorded, they were asked to fill in the pain assessment form, the Mediterranean diet adherence scale, and the international physical activity questionnaire, finally, their measurements (height, weight) were evaluated.
Results: The study included 595 students (87.2% female) with a mean age of 20.2±1.48 years. The prevalence of chronic pain was 37.8%. The majority of these students (58.7%) had moderate pain intensity (5-7 points). In the Mediterranean diet adherence score, 75% of students had <7 points. There was no significant association between chronic pain status and adherence to the Mediterranean diet.
Conclusion: This study was not significantly found the relationship between the presence of chronic pain and adherence to the Mediterranean diet. It is thought that, since the majority of students with chronic pain had poor adherence to the Mediterranean diet, observing a relationship between pain and compliance may have resulted in a negative result. To better understand the connection between chronic pain and diet, more research is needed.
Keywords: Chronic pain, mediterranean diet, university student, pain measurement.

INTRODUCTION

While pain is defined as an “unpleasant sensory or emotional experience with actual or potential tissue damage”, persistence of this pain for over 3 months is referred to as chronic pain (CP) and today, it is addressed as a disease per se rather than being considered a symptom (1). It has been observed that there is a worldwide lack of wide-ranging studies examining the prevalence of CP and that there are great differences from society to society. However, with increasing evidence, it has been reported that the prevalence of CP is gradually increasing in children, adolescents, and young adults (18-25 years of age) (2).

CP studies have generally focused on middle-aged and elderly adults. But it is important to determine the condition that the prevalence of CP in university students, who are quite immobile nowadays and spend most of their time in front of the computer. In a study carried on with young people, it was determined that pain affects daily life, academic success, and productivity (3). It has been shown in students that

studying for long hours in the same position often creates physical stress, and their efforts to achieve academic success create psychological stress and these stresses cause musculoskeletal pain (4). In another study, which reported that CP is common among university students, it was found that the students mostly experienced CP in the musculoskeletal system, with upper back pain in 49.2%, neck pain in 43.7%, and lower back pain in 40.2% (5).

Like most diseases, CP is often caused by a combination of multiple or a series of events. There are a number of factors that affect intensity, the duration, and effects (social, psychological, physical, and emotional) of CP, even if it is an accelerant event alone (e.g., injury) (6). Nutrition can be one of them. There are meta-analyses and systematic reviews showing that diet therapy can have beneficial effects on CP (7-9). In these studies, it was determined that supplementing the diet with certain foods such as vitamin B12, magnesium, omega-3, vitamin D can relieve pain. At the same time, an anti-inflammatory diet pattern (such as the Mediterranean-style diet), in which daily consumption of olive oil, oilseeds, fruits and vegetables, and legumes are high, and consumption of processed foods and meat is low, has been found to have potential benefits for CP patients, including reduced analgesic intake.

This study was carried out to assess CP status with adherence to the Mediterranean diet (AMD) and to investigate the relationship between diet and pain among university students, who are young adults.

MATERIAL AND METHODS

This descriptive cross-sectional study was carried out with students at University of Health Sciences. It was completed with 595 students between the ages of 18 and 27. The population of the faculty consisted of 2053 students enrolled in the 2019 fall semester.

The voluntary consent of the participating students was obtained. Pregnant or lactating students or those with psychiatric illnesses were excluded. In addition, the study's exclusion criteria were students who had undergone any surgery involving the musculoskeletal system.

Data Collection

The study data were collected face-to-face in November-December 2019. In total 608 students volunteered to participate in the study. Due to missing data and the exclusion criteria, 13 students were excluded. The study was thus conducted with 595 students.

The students' demographic and general health information, dietary habits, and 24-hour retrospective food consumption records were obtained through a questionnaire developed by the researchers. The height and body weight measurements of the students were recorded by the researchers with a portable stadiometer (Mesitaş®) and a portable digital scale (Tanita HD 366). “Body mass index (BMI) [body weight (kg)/height (m2)] was calculated according to the height and bodyweight of the students”. “The BMI values are classified in accordance with the The World Health Organization (WHO) <18.5 kg/m2 underweight; 18.5-24.9 kg/m2 normal; 25.0-29.9 kg/m2 overweight; ≥30.0 kg/m2 obese”.

Expert researchers recorded all students' 24-hour retrospective food intake. The Nutrition Information System (BeBIS 8.2®) program was used to calculate the energy and nutrient values.

With the pain assessment form, they were asked to mark the pain location on the pain area drawing, and they were questioned about the frequency and duration of the pain they experienced, whether they saw a physician due to pain and whether they had received a diagnosis. Pain intensity was evaluated with the “Numeric Pain Rating Scale (NPRS) scale with a score of 0-10 (no pain… unbearable pain)” (10). “Pain levels were classified as mild (1-3 score), moderate (4-6 score), and severe (7-10 score)” (11). The pain location and the information about the pain were reviewed and evaluated together with the physiotherapist. This is mentioned in the acknowledgments section.

AMD was determined by the “Mediterranean Diet Adherence Screener (MEDAS)”. The MEDAS consists of 14 questions. The total score is calculated by giving 1 or 0 points for each question asked according to the amount of consumption. “A total score of 7 or above shows acceptable AMD and 9 or above shows strict AMD”. The validity and reliability of the Turkish version of the scale were confirmed (12).

“The International Physical Activity Questionnaire (IPAQ-Short Form)” was used to determine the students' physical activity status (13). This form, which determines the level of physical activity, is answered for the last 7 days, and consists of 7 main questions. Three types of activities are identified. These are walking, moderate-intensity, vigorous-

Table 1: Descriptive features of the student (n=595)

	Mean ± SD or n (%)
Age (year)	20.2 ± 1.48
Gender	
Male	76 (12.8)
Female	519 (87.2)
Pain status	
No pain	333 (56.0)
Acute pain (≤3 month)	37 (6.2)
CP (>3 month)	225 (37.8)
Duration of chronic pain (month)	25.6 ± 25.27
NPRS for chronic pain	5.1 ± 1.85
Chronic pain intensity (n=225)	
Mild (1-4 point)	42 (18.7)
Moderate (5-7 point)	132 (58.7)
Severe (8-10 point)	51 (22.7)
Chronic pain location*	
Waist	72 (32.0)
Back	69 (30.7)
Neck	65 (28.9)
Knee	20 (8.9)
Leg	12 (5.3)
Shoulder	11 (4.9)
Thigh	6 (2.7)
Feet	6 (2.7)
Arm	4 (1.8)
Ankle	4 (1.8)
Hip	2 (0.9)
Calf	1 (0.4)
Forearms	1 (0.4)
Not musculoskeletal (head, pelvic, etc.)	47 (20.9)
BMI (kg/m^2)	21.6 ± 3.06
BMI classification	
Underweight (< 18.5 kg/m^2)	89 (15.0)
Normal (18.5-24.9 kg/m^2)	421 (70.8)
Overweight (25.0-29.9 kg/m^2)	80 (13.4)
Obese (≥ 30.0 kg/m^2)	5 (0.8)
MEDAS score	5.6 ± 1.82
Adherence to the Mediterranean diet	
Not adherence (< 7 point)	413 (69.4)
Acceptable adherence (7-8 point)	146 (24.5)
Strict adherence (≥ 9 point)	36 (6.1)

*Evaluation was made on more than one answer.

NPRS: Numerical Pain Rating Scale; MEDAS: Adherence to the Mediterranean diet Scale; BMI:Body Mass Index

intensity activity. The IPAQ technique was used to score physical activity (13). According to this technique, The Metabolic Equivalent Minutes (MET) value determined for the three types of activities is calculated by multiplying the frequency and duration of the activity.

"Total MET-min/week = (Walking METs*min*days) + (Moderate METs*min*days) + Vigorous METs*min*days)".

Students with a total score of "<600 MET on the physical activity scale were classified as sedentary, students with 600-3000 MET were classified as

moderate active, and students with >3000 MET were classified as very active"(13).

Statistical Analysis

Categorical variables were summarized by number and percentage, and numerical variables by mean and standard deviation. “Student's t test” was used for comparisons between pain groups. The “Mann-Whitney U test” was used for the continuous variable with a discrete structure. The “chi-square test and Fisher’s exact test” were used in the analysis of categorical data. “Pearson correlation coefficients” were calculated to examine the linear correlation between continuous variables. The data were analyzed using “SPSS 21 and the statistical significance level was set at 0.05”.

Ethical Consideration

The study was approved by the University of Health Sciences, Hamidiye Non-Interventional Research Ethics Committee on 08.11.2019 with decision number 19/145.

RESULTS

The study included 595 students (87.2% female). The prevalence of CP was 37.8%. The most painful areas of the students with CP were the waist (32.0%), back (30.7%), and neck (28.9%). Most of these students (58.7%) had moderate pain levels. Only 30.6% of all students adhered to the Mediterranean diet (MD) (Table 1).

Table 2 demonstrates that there is no significant difference in the mean age, BMI, MEDAS scores between students with and without CP. Looking at Table 2, it is seen that students with CP had lower MET scores than those without (p>0.05). MEDAS scores were similar for both groups (p>0.05) (Table 2).

As shown in Table 3, it was determined that students with CP received 1626.1 ± 604.85 kcal/day energy, and those without CP received 1643.8 ± 700.22 kcal/day energy (p>0.05). When the daily carbohydrate values were examined, it was seen that the students without CP have the higher mean of amount and percentage compared to the students with CP (p>0.05). The daily protein amount and percentages of students without CP were higher than those with CP, daily fat amount and percentages were found to be lower compared to those with. Fiber consumption means are similar in both student groups (p>0.05). When the mineral intake means of the students were examined, the sodium intake mean was found to be higher in the group without CP, and the iron intake mean was found to be similar in both groups. The mean intakes of other minerals were higher in the group with CP (p>0.05). The mean intake of fat-soluble vitamins A and D was higher in the student group without CP, and the mean of vitamin E and K intake was higher in those with CP (p>0.05). As for the water-soluble vitamins, the mean intake of thiamine, riboflavin, and pyridoxine vitamins was similar in both groups, and the mean intake of vitamin B12 and total folate was higher in students without CP (p>0.05) (Table 3).

It was determined that 30.9% of those without CP followed MD, and 29.8% of those with CP followed the MD (p>0.05). A significant relationship between the presence of CP and the level of physical activity was determined (p=0.024). While 37.8% of those with CP were sedentary, 30.3% of those without CP were sedentary. While the rate of very active students without pain is 19.5%, it is 11.6% for those with pain. In addition, of those with CP, 15.6% were underweight, 69.8% were normal weight, and 14.7% were more than normal BMI. Of the group without CP, 70.6% had a normal BMI. The association with the presence of CP between BMI groups was not significant (Table 4).

In Table 5, the comparison of the questions of AMD according to the presence of CP and the level of pain is presented. The proportion of those who consumed < 48 grams of olive oil per day was found to be higher in the group with and without CP than those who consumed >48 grams per day (p>0.05). Similarly, the proportion of those consuming < 3 or >3 servings of vegetables and < 2 or >2 servings of fruit per day did not differ significantly according to the presence of CP and the severity of CP. The proportion of students reporting >100 or <100 grams of red meat per day significantly differed by CP status, with lower consumption of red meat being more common in those with CP (p=0.004). When the daily consumption of red meat is examined according to the degree of CP, the proportion of students with mild, moderate, and severe CP who consume > 100 grams of meat per day was found to be higher than the students with mild, moderate, and severe CP who consume < 100 grams of meat per day (p>0.05). While the rate of the students who consumed < 3 servings of legumes per week was higher in those with CP, the proportion of those who consumed >3 servings was found to be higher in those without CP

Table 2: Comparison of the mean of continuous variables according to the presence of chronic pain

	Presence of chronic pain				
	No (n=333)		Yes (n=225)		p
	Mean ± SD	Min-Max (Median)	Mean ± SD	Min-Max (Median)	
Age (year)	20.2 ± 1.46	18-27 (20)	20.4 ± 1.49	18-26 (20)	0.086†
Height (m)	1.7 ± 0.08	1.5-1.87 (1.65)	1.7 ± 0.08	1.48-1.88 (1.65)	0.881†
Weight (kg)	59.7 ± 10.63	39-100 (58)	59.4 ± 11.17	39-95 (57)	0.753†
BMI (kg/m^2)	21.7 ± 3.05	15.63-35.43 (21.3)	21.6 ± 3.18	15.60-35.76 (20.98)	0.733†
MET score (min/week)	1693.5 ± 1653.27	49.5-6264.0 (1132.5)	1643.6 ± 1446.67	132-7011 (1113)	0.541‡
MEDAS score	5.6 ± 1.75	1-10 (6)	5.6 ± 1.93	1-11 (6)	0.753†
The amount of water (L/day)	1.4 ± 0.72	0-4 (1.4)	1.4 ± 0.67	0-3 (1.2)	0.569†
Number of main meals	2.5 ± 0.59	1-4 (3)	2.6 ± 0.56	1-4 (3)	0.055‡
Number of snacks	1.5 ± 0.87	0-5 (1)	1.5 ± 0.95	0-6 (2)	0.298‡

*p<0.05; †Student t test; ‡ Mann-Whitney U test

MET: Metabolic Equivalent Minutes; MEDAS: Adherence to the Mediterranean diet Scale; BMI:Body Mass Index

(p>0.05). The proportion of students consuming < 3 or ≥ 3 servings of fish or shellfish per week did not differ significantly by chronic presence but differed significantly by level of CP. Less fish or shellfish consumption was more common in those with moderate CP (p<0.05). The students who reported that they consumed cake, cookies, biscuits or pudding, pastries (not homemade) < 3 times a week were more common in those with CP (p>0.05). The rate of those who prefer white meat (chicken, turkey, fish) instead of red meat (beef, mutton, lamb, etc.) was higher in the CP group than in the non-group (p>0.05) (Table 5).

DISCUSSION

The present study determined the frequency of CP and the correlation between CP and AMD in university students. A significant relationship between the presence of CP and AMD was not found. In addition, among the two groups, among the MEDAS items, a significant difference was determined between the consumption of meat and those who consumed tomato or tomato paste with olive oil, onion, and garlic/leek sauce together with their meals. It is known in clinical practice that usually it is difficult to cope with chronic musculoskeletal pain. Integrating lifestyle factors into an individually designed treatment can be a promising strategy for these patients because research examining lifestyle factors such as obesity, unhealthy diet, and stress has shown that patients under the same biological conditions experience different pain experiences and report different pain results (14). Among these lifestyle factors, nutrition has received little attention in pain research thus far. However, it has a great potential to be a key factor in pain treatment. WHO explains and emphasizes the importance of diet regarding chronic disease management as follows: “Nutrition is coming to the fore as a major modifiable determinant of chronic disease, with scientific evidence increasingly supporting the view that alterations in diets have strong effects (both positive and negative) on health throughout life” (15). In addition, a study states that there is a versatile correlation between pain and nutrition (16).

The antioxidant content of foods and the vasodilators they contain; the effects of nutrition on inflammatory, biochemical, and oxidative pathways; and the neurophysiological roles of some nutrients in pain pathways are the main factors in the correlation between nutrition and pain (17). Studies examining the effect of diet on inflammatory markers have shown that diets rich in fiber, healthy fats, fruits, and vegetables and low in sugar, starchy carbohydrates, and unhealthy fats can decrease inflammation and pain (18, 19). The MD is a good example of this type of diet. This diet consists of fresh vegetables and fruits rich in antioxidant vitamins, fish rich in n-3 polyunsaturated fatty acids with anti-inflammatory characteristics, and olive oil rich in antioxidants such as oleic acid, vitamin E, carotenes, and flavonoids. It also contains red wine rich in polyphenolic compounds that have been found to have a protective effect on acute and chronic inflammation models.

Table 3: Comparison of the mean of energy and macro-micronutrients according to the presence of chronic pain

	Presence of chronic pain				
	No (n=333)		**Yes (n=225)**		
	Mean ± SD	**Min-Max (Median)**	**Mean ± SD**	**Min-Max (Median)**	**p**
Energy (kcal)	1643.8 ± 700.22	657.3-3745.3 (1545.9)	1626.1 ± 604.85	511.6-4088.9 (1688.5)	0.792†
Carbohydrate (g)	182.7 ± 94.77	59.7-457.4 (157.3)	178.3 ± 79.99	37.8-464.2 (169.9)	0.876†
Carbohydrate (%)	44.8 ± 8.90	24-62 (45)	44.1 ± 8.98	30-67 (44.0)	0.619†
Protein (g)	62.6 ± 30.32	21.2-146.4 (60.6)	61.9 ± 27.77	11.1-172.8 (60.3)	0.964†
Protein (%)	15.8 ± 5.14	8-29 (15)	15.7 ± 4.52	9-29 (15)	0.833†
Fat (g)	70.8 ± 31.69	20.1-157.8 (63.5)	72.7 ± 30.9	20.9-166.7 (66.2)	0.785†
Fat (%)	38.7 ± 8.13	17-54 (39.5)	40.1 ± 9.10	20-61 (39)	0.402‡
Alcohol (%)	0.67 ± 3.89	0-26 (0.0)	0±0	0-0 (0)	0.091†
Fiber (g)	18.5 ± 11.74	5.1-63.3 (15.4)	18.7 ± 10.29	3.7-64.9 (17.1)	0.566†
Cholesterol (mg)	290.6 ± 215.10	25.9-1156.7 (256.8)	279.1 ± 157.76	56.0-742.9 (243.2)	0.862†
PUFA (g)	13.3 ± 9.53	1.5-43.7 (10.1)	13.7 ± 8.02	3.4-42.6 (12.0)	0.405†
MUFA (g)	23.6 ± 11.95	6.7-56.3 (19.5)	25.3 ± 11.89	7.6-63.8 (22.9)	0.292†
Sodium (mg)	6161.9 ± 12510.74	859.9-55417.4 (2739.5)	4630.9 ± 8815.91	569.4-53124.1 (2836.8)	0.706†
Potassium (mg)	2003.4 ± 840.98	808.6-4904.3 (1726.6)	2065.9 ± 771.43	633.9-4692.9 (1983.6)	0.686‡
Calcium (mg)	603.0 ± 223.06	196.7-1159.1 (565.8)	640.6 ± 240.9	99.4-1194.6 (611.3)	0.406‡
Magnesium (mg)	257.3 ± 114.15	104.8-631.4 (218.4)	265.9 ± 118.85	62.3-832.8 (249.4)	0.409†
Phosphorus (mg)	1030.0 ± 498.57	440.3-2821.9 (934.4)	1040.2 ± 468.9	248.6-2972.9 (958.2)	0.624†
Iron (mg)	9.5 ± 4.97	2.6-23.9 (8.5)	9.5 ± 4.33	2.3-27.4 (9.6)	0.555†
Zinc (mg)	8.2 ± 4.36	1.7-26.5 (7.9)	8.8 ± 4.4	2.3-33.5 (8.1)	0.332†
Vitamin A (µg)	1584.7 ± 4211.78	130.0-25483.1 (732.5)	802.9 ± 536.81	160.4-3858.9 (679.7)	0.853†
Vitamin D (µg)	2.8 ± 7.70	0.1-53.4 (1.7)	2.5 ± 5.99	0.3-46.8 (1.6)	0.907†
Vitamin E (mg)	9.4 ± 7.39	1.5-38.0 (7.3)	10 ± 6.39	2.5-39.4 (8.6)	0.209†
Vitamin K (µg)	89.6 ± 88.30	7.9-408.6 (57.8)	92.3 ± 81.74	10.6-418.8 (60.3)	0.491†
Vitamin C (mg)	96.7 ± 73.67	0.8-276.2 (73.5)	76.2 ± 61.86	8.2-308.7 (62.8)	0.175†
Thiamine (mg)	0.8 ± 0.55	0.3-3.6 (0.7)	0.8 ± 0.41	0.2-2.8 (0.8)	0.528†
Riboflavin (mg)	1.3 ± 0.90	0.4-5.4 (1.2)	1.2 ± 0.46	0.2-2.8 (1.1)	0.774†
Pyridoxine (mg)	1.3 ± 0.91	0.3-5.9 (1.1)	1.1 ± 0.54	0.3-3.4 (1.0)	0.658†
Vitamin B12 (µg)	5.8 ± 15.34	0.1-91.9 (2.1)	3.2 ± 2.26	0.4-13.2 (2.8)	0.195†
Total Folate (µg)	290.8 ± 274.14	86.9-1695.5 (226.6)	245.1 ± 132.21	65.6-876.7 (222.2)	0.981†

*p<0.05; † Mann-Whitney U test; ‡ Student t test
PUFA: Polyunsaturated fatty acid; MUFA: Monounsaturated fatty acid

One intervention study found that herbal-based dietary intervention reduced pain and improved quality of life (20).

In Mediterranean countries (Italy, Spain, and Greece,), AMD among students was found to be 20-30% (21), > 40% (22), and > 70% (23), respectively. In our study, AMD was 30.6%. Today, there are studies indicating that young people are moving away from healthy lifestyle habits and tend to abandon the MD (24, 25). The reason for the lack of a correlation between the presence of pain and AMD in the present study may have been the low adherence to the diet. When the daily olive oil consumption of the students was evaluated, it was determined that 91.0% of the

Table 4. Comparison of adherence to the Mediterranean diet, body mass index, and physical activity according to chronic pain status

	Presence of chronic pain		
	No (n=333)	Yes (n=225)	
	n (%)	n (%)	p
The Mediterranean diet			
Not adherence	230 (69.1)	158 (70.2)	0.772
Adherence	103 (30.9)	67 (29.8)	
Physical activity level			
Sedentary (<600 MET)	101 (30.3)	85 (37.8)	
Moderate active (600-3000 MET)	167 (50.2)	114 (50.7)	0.024*
Very active	65 (19.5)	26 (11.6)	
BMI classification			
Underweight	50 (15.0)	35 (15.6)	
Normal	235 (70.6)	157 (69.8)	0.978
Overweight and obese	48 (14.4)	33 (14.7)	

*p<0.05. MET: Metabolic Equivalent Minutes; BMI:Body Mass Index

group without pain and 88.4% of the group with pain consumed less than 48 grams of olive oil (p>0.05). However, the rate of those who consumed tomatoes with olive oil, tomato paste, onion, and garlic/leek sauce in addition to vegetables, rice, pasta, and other dishes more than twice a week was higher in the group without CP, and the difference between the two groups was significant. It has been determined that olive oil polyphenols in the MD reduce inflammatory biomarkers, and plasma oxidative stress. Therefore, olive oil consumption in the MD has been shown to be an important factor in reducing oxidative stress and inflammation (26). Furthermore, extra virgin olive oil contains oleocanthal, a natural anti-inflammatory compound that inhibits cyclooxygenase enzymes, which are known to increase the production of prostaglandins, which are important in the inflammatory response and pain pathway in the prostaglandin biosynthesis pathway. This compound has been shown to be as effective as the nonsteroidal anti-inflammatory drug ibuprofen. 50 g of extra virgin olive oil contains 200 g/ml of oleocanthal, 60-90% of which is absorbed, equating to 9 mg per day. This amount is equivalent to 10% of the adult ibuprofen dosage for pain relief. This amount, however, may be beneficial because low-dose aspirin is also known to provide cardiovascular health benefits (27,28). Although Turkey is one of the leading countries in olive oil production, it is thought that the effects of olive oil on health are not fully understood by the public and this situation is reflected in consumption. However, it should be kept in mind that economic and cultural effects on nutrition affect food preferences.

Consumption of diets containing high animal protein and fat is common among students and these diets have been associated with inflammation and CP (29, 30). It is generally believed that people who stay away from these products might feel less pain. The prevalence of CP and inflammation is significantly lower in individuals who eat a plant-based diet than in those who eat an average American diet (29). In our study, lower consumption of red meat being more common in those with CP. There are many mechanisms by which a plant-based diet can reduce chronic skeletal muscular system pain. These include reduced exposure to inflammatory precursors, free radical neutralization, increased vascularization via lipid profile reduction, weight loss, and thus reduced mechanical load (20).

In the current study, majority of the students (70.8%) had a normal BMI, and CP did not significantly differ between the BMI groups. A study examining the correlation between obesity and pain reported that there was no direct correlation between BMI and pain; however, various factors such as inflammatory mediators, obesity-related structural changes, and lifestyle characteristics might have an effect (31). One of the most recent population-based studies documented a consistent association between obesity and CP (32). There is evidence that pain symptoms increase due to increases in BMI. In fact, it is not surprising that there is a strong association between obesity and pain, as obesity reflects a chronic systemic inflammatory state. In the presence

Table 5: Comparison of Mediterranean diet adherence questions according to pain level and the presence of chronic pain

		Presence of chronic pain			Level of chronic pain (*n*=225)			
		No (n=333)	Yes (n=225)	*p*	Mild (n=42)	Moderate (n=132)	Severe (n=51)	*p*
		n (%)	n (%)		n (%)	n (%)	n (%)	
1. Do you use olive oil as main culinary fat?	≤ 2 times/week	189 (56.8)	145 (64.4)	0.069	27 (64.3)	84 (63.6)	34 (66.7)	0.929
	> 2 times/week	144 (43.2)	80 (35.6)		15 (35.7)	48 (36.4)	17 (33.3)	
2. How much olive oil do you consume in a given day (including oil used for frying, salads, out-of-house meals, etc.)? (1 tbs. = 13.5 g)	< 48 g	303 (91.0)	199 (88.4)	0.326	36 (85.7)	117 (88.6)	46 (90.2)	0.793
	> 48 g	30 (9.0)	26 (11.6)		6 (14.3)	15 (11.4)	5 (9.8)	
3. How many vegetable servings do you consume per day? (1 portion: 200 g)	< 2 portions	238 (71.5)	160 (71.1)	0.926	33 (78.6)	93 (70.5)	34 (66.7)	0.437
	≥ 2 portions	95 (28.5)	65 (28.9)		9 (21.4)	39 (29.5)	17 (33.3)	
4. How many fruit units (including natural fruit juices) do you consume per day? 1 portion fruit = 80 g 1 portion fruit juice=100 mL	< 3 portions	269 (80.8)	183 (81.3)	0.870	38 (90.5)	106 (80.3)	39 (76.5)	0.202
	≥ 3 portions	64 (19.2)	42 (18.7)		4 (9.5)	26 (19.7)	12 (23.5)	
5. How many portions of red meat, do you consume per day?	> 100 g	130 (39.0)	61 (27.1)	0.004*	8 (19.0)	33 (25.0)	20 (39.2)	0.065
	< 100 g	203 (61.0)	164 (72.9) ‡		34 (81.0)	99 (75.0)	31 (60.8)	
6. How many servings of butter, margarine, or cream do you consume per day? (1 tbs. = 12 g)	> 1 portion	100 (30.0)	79 (35.1)	0.207	12 (28.6)	52 (39.4)	15 (29.4)	0.276
	< 1 portion	233 (70.0)	146 (64.9)		30 (71.4)	80 (60.6)	36 (70.6)	
7. How many sweetened and/or carbonated beverages do you drink per day? (1 tbs. = 100 mL)	> 1 portion	87 (26.1)	59 (26.2)	0.980	9 (21.4)	38 (28.8)	12 (23.5)	0.566
	< 1 portion	246 (73.9)	166 (73.8)		33 (78.6)	94 (71.2)	39 (76.5)	
8. How much wine do you drink per week? (1 glasses = 125 mL)	< 7 glasses	332 (99.7)	224 (99.6)	1.00†	42 (100.0)	131 (99.2)	51 (100.0)	0.702
	≥ 7 glasses	1 (0.3)	1 (0.4)		-	1 (0.8)	-	
9. How many portions of legumes do you consume per week? (1 portion = 150 g)	< 3 portions	206 (61.9)	145 (64.4)	0.536	30 (71.4)	85 (64.4)	30 (58.8)	0.450
	≥ 3 portions	127 (38.1)	80 (35.6)		12 (28.6)	47 (35.6)	21 (41.2)	
10. How many portions of fish or shellfish do you consume per week? (1 portion = 100-150 g)	< 3 portions	322 (96.7)	220 (97.8)	0.607†	39 (92.9)	132 (100.0)	49 (96.1)	0.015*
	≥ 3 portions	11 (3.3)	5 (2.2)		3 (7.1)	-	2 (3.9)	
11. How many times per week do you consume commercial sweets or pastries (not homemade), such as cakes, cookies, biscuits, or custard?	> 3 times	155 (46.5)	110 (48.9)	0.587	18 (42.9)	68 (51.5)	24 (47.1)	0.593
	< 3 times	178 (53.5)	115 (51.1)		24 (57.1)	64 (48.5)	27 (52.9)	
12. How many servings of nuts (including peanuts) do you consume per week? (1 portion = 30 g)	< 3 portions	200 (60.1)	129 (57.3)	0.521	28 (66.7)	75 (56.8)	26 (51.0)	0.309
	≥ 3 portions	133 (39.9)	96 (42.7)		14 (33.3)	57 (43.8)	25 (49.0)	
13. Do you preferentially consume chicken, turkey, or fish meat instead of beef, mutton, lamb?	White < red	159 (47.7)	95 (42.2)	0.199	20 (47.6)	52 (39.4)	23 (45.1)	0.575
	White > red	174 (52.3)	130 (57.8)		22 (52.4)	80 (60.6)	28 (54.9)	
14. How many times per week do you consume vegetables, pasta, rice, or other dishes seasoned with sofrito (sauce made with tomato and onion, leek or garlic and simmered with olive oil)?	< 2 times	101 (30.3)	88 (39.1)	0.032	16 (38.1)	51 (38.6)	21 (41.2)	0.941
	≥2 times	232 (69.7) ‡	137 (60.9)		26 (61.9)	81 (61.4)	30 (58.8)	

*p<0.05; †Fisher Exact test; ‡Refers to the higher ratio; tbs: tablespoon

of chronic pain, the body produces more C-reactive protein and proinflammatory mediators such as interleukin-6. Furthermore, adults with chronic pain were found to gain more weight due to changes in appetite, with leptin levels increasing over time. However, there is a lack of data on how obese and chronic pain patients respond to weight loss treatments (33). However, following bariatric surgery, it was discovered that the majority of patients with preoperative chronic pain experienced significant improvement (34). Despite studies indicating that the presence of chronic pain prevents individuals from losing weight, it should be aimed to provide positive benefits by adopting a more comprehensive, team-based approach that addresses both weight and pain management (35,36).

There was a significant relationship between the presence of CP and activity level. A lower proportion of students with CP were very active. Although we cannot infer cause and effect in this study, it can be predicted that CP may affect the activity level, which will be more negative for health in older ages.

Limitations

This is a cross-sectional study and cannot establish a cause-and-effect relationship. So, there is no way to know whether the dietary habits preceded the pain or vice versa. In addition, in this study, the presence, location, duration, and intensity of pain were entirely based on self-report. So, further studies can be planned in which clinical and biochemical findings are also evaluated, and advanced research should be planned in which we can establish a cause-and-effect relationship. On the other hand, the fact that fewer male students volunteered than female students limited the possibility of evaluating the difference between the sexes. Finally, AMD was very low among all students.

CONCLUSION

CP and especially musculoskeletal pain are quite common. Especially young adult university students are likely to experience a negative impact on their quality of life in the following years. However, the correlation between dietary patterns or dietary components and CP is not yet clear. Numerous studies including interventions testing the nutritional advice or support in populations with CP are needed.

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