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Factors associated with adherence to the Mediterranean diet among medical students at a private university in Lima, Peru

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ARTICLE INFO	ABSTRACT
	Introduction: The Mediterranean diet (MedD)is a characteristic eating pattern of the countries of the Mediterranean region. Nonetheless, is unknown its adherence in medical students. We aimed to determine the prevalence of adherence to the Mediterranean diet (AMedD) and associated factors in medical students from Peru. **Material and methods**: Analytical cross-sectional study carried out by means of a virtual survey. PREDIMED scale was used to evaluate AMedD. The factors assessed were age, sex, academic year, body mass index (BMI), place of lunch consumption, cigarette smoking, and physical activity. Poisson regression with robust variance was used to present it in crude and adjusted prevalence ratios (PRa). **Results:** High AMedD was present in 38.50%. Statistically significant association was found for sex (PRa: 0.623; 95%CI 0.488-0.796); for overweight (PRa: 0.417; 95%CI 0.270-0.644), obesity (PRa: 0.591; 95%CI 0.400-0.874) versus normopese; cigarette smoking (PRa: 0.450; 95%CI 0.263-0.773); and high physical activity (PRa: 1.652; 95%CI 1.233-2.215). **Conclusions**: AMedD was low. The related factors were sex, BMI, consumption of lunch outside the home, cigarette smoking, and a high level of physical activity. If this is confirmed in future studies, it would be necessary to consider these elements to encourage greater consumption of MedD components by students, which would help to improve their long-term health. **Keywords:** diet, Mediterranean, students, medical, association, epidemiologic factors

INTRODUCTION

The Mediterranean diet (MedD) is a characteristic dietary pattern of the countries of the Mediterranean region and its popularity has grown in recent decades since the reports on its benefits for the prevention of different chronic diseases such as cardiovascular, metabolic, cancer, as well as Alzheimer's, depression, among others [1, 5].

Although differences between the countries of the Mediterranean basin, this dietary pattern has as common features the consumption of a wide variety of regional vegetables and fruits, legumes, nuts, whole grains, fish, sources of unsaturated vegetable oils such as olive, moderate consumption of dairy products and low red meat intake [6, 7].

Although a variety of benefits to adherence to the Mediterranean diet (AMedD) has been previously reported [5-8, 10] a decrease in its adherence has been documented in countries of the Mediterranean region in favor of Western

dietary patterns among the general population, as well as in young adults between 18 and 25 years old [6-11].

The latter is a transition period between adolescence and adulthood [12, 13] in which autonomy is gained in the decision-making process [14] and health behaviors that are formed and established [15] have a long-term impact on adult life. Because of this is critical to understand the factors that are associated with greater adherence to beneficial health behaviors, such as the balanced eating pattern that MedD represents.

Globally, it has been reported that AMedD is particularly low among young populations with high variations between countries in the Mediterranean region, ranging from 1.8% in Spanish children to 62.8% in Greek adolescents [16]. In fact, a decreasing trend regarding AMeD has been reported [6].

Information on adherence for countries outside the Mediterranean region, including Latin American countries, remains scarce, with only a few studies reporting adequate adherence between 2.3 and 42% [17, 18] for adults and young adults, respectively.

Likewise, the factors associated with good adherence in university populations have been mainly studied in countries of the Mediterranean region, among which the level of physical activity, sex, age, educational level, place of origin, the physical location of the university campus, academic performance, academic and body self-confidence, knowledge about food and nutrition topics, aerobic capacity and muscular strength are stressed out [19-23]. In general, research in the field of MedD has steeply increased since 2012, being the USA and European countries that carried out the most of the studies and with the major research production in MedD topic [24]. This reflects a disparity with Latin American scientific production in this issue. Particularly, in Peru, except for a study carried out in the adult population in which it was reported that dysglycemia was negatively associated with AMedD [25], the information is null.

Therefore, with the purpose of closing this knowledge gap, this study aimed to determine the prevalence of AMedD and associated factors in medical students at a private university in Lima, Peru.

METHODS

Design and Context of the Study

Cross-sectional analytical study was carried out through a virtual survey distributed during the period from August 19 to 23, 2022.

Population, Sample, and Eligibility Criteria

The population was conformed of medical students from a medical school in Lima-Peru. The sample included those who agreed to participate in the study. Those who were under 18 years old, if they entered the wrong data, or if they had a specific type of diet (for example, vegetarian, vegan, paleo, ketogenic, among others) were excluded. Consecutive non-probabilistic sampling was carried out.

Variable Definition

The data collection instrument consisted of three sections. The first were sociodemographic factors, which included gender (male vs. female); age (18 to 25 years old and 26 years old or older); academic year (1st and 2nd year, 3rd and 4th year, and 5th and 6th year); body mass index (BMI) (normal weight, overweight and obesity) obtained through self-reported weight in kilograms and height in meters; main place of food consumption (home vs. away from home); and cigarette smoking in the last 30 days (yes vs. no).

The second section was designed to evaluate physical activity according to the international physical activity questionnaire (IPAQ) short version. This consists of seven questions about the intensity of physical activity walking and time sitting, frequency and duration of this, performed in the last seven days. A mathematical formula provided by IPAQ was used to obtain the results. The questionnaire presents the following cut-off points: high, moderate, and low level of physical activity. This questionnaire was validated in Spain [26] and in Peru [27], with a Cronbach's alpha of 0.88 and 0.90, respectively.

The third section was to measure the AMedD, through PREDIMED scale. This consists of 12 questions about the frequency of food consumption and two questions about the seven food intake habits considered classic characteristics of the Spanish MedD. Each question was scored 0 or 1. The final score ranged from 0 to 14. In turn, it has optimal psychometric properties: Pearson's correlation coefficient=0.538; Cronbach's alpha=0.699), as well as good reliability with an intraclass correlation coefficient=0.931 [28]. Thus, it was operationally defined as a score from 0 to 14 points. Adequate adherence was considered if it had 9 points or more.

Data Collection and Procedure

The data collection took place through the application of the selected students, through a sociodemographic record, which contained the aforementioned factors, IPAQ, and PREDIMED scale. This was done during the aforementioned time. The duration of the filling was on average 10 minutes.

A virtual informed consent document was assigned to the participant. This included the description of the research, objectives, possible benefits, risks, information on the principal investigator, and elements of the voluntary and anonymous nature of the survey. The consent was approved when clicking to start filling out the survey.

Statistical Analysis

The STATA version 17 program was used. Categorical variables were expressed as absolute and relative frequencies, while numerical variables as mean and standard deviation (SD). For comparisons, the chi-square of independence was used. To assess the strength and magnitude of association, Poisson regression with robust variance was used.

The results were presented in crude prevalence ratios (PRc) and adjusted prevalence ratios (PRa), by the aforementioned factors. These were presented with their p-value with a significance level of less than 0.05 and a 95% confidence interval (95% CI).

Ethical Aspects

The information was collected with the prior acceptance of informed consent, and the privacy of the students was respected by using codes, so no one had access to any name or surname of the study subjects, guaranteeing their anonymity in the research project. During the development of the investigation, compliance with the investigation requirements was maintained. At all times, compliance with the Declaration of Helsinki was carried out.

RESULTS

We worked with 387 students. High AMedD was 38.50%. 52.71% were female. While only 9.82% were 25 years old or older. The prevalence of obesity was 19.90%. A little more than half (52.71%) prepared their food at home. Only 13.18% had smoked cigarettes in the last 30 days. Physical activity was mostly low (43.41%). Regarding the bivariate analysis, no statistically significant association was found between MedD with categorized age (p=0.356) and academic year (p=0.299) (**Table 1**).

In addition, 82.69% of students reported consuming non-homemade pastries more than three times a week, while 21.71% only had less than one carbonated drink a day. However, 67.70% reported preferring to consume chicken, turkey, or rabbit meat instead of other types of meat, and to consume nuts once or more a week (**Figure 1**).

Table 1. Descriptive and bivariate characteristics of factors associated with adherence to the Mediterranean diet

| | Adherence to the Mediterranean diet [n (%)] | | | p* |
	Total	Low	High	
Gender				
Female	204 (52.71)	109 (53.43)	95 (46.57)	**0.001**
Male	183 (47.29)	129 (70.49)	54 (29.51)	
Categorized age				
18 to 24 years old	349 (90.18)	212 (66.74)	137 (39.26)	0.356
25 years and older	38 (9.82)	26 (68.42)	12 (31.58)	
Academic year				
1st and 2nd year	110 (28.42)	74 (67.27)	36 (32.73)	
3rd and 4th year	125 (32.30)	72 (57.60)	53 (42.40)	0.299
5th and 6th year	152 (39.28)	92 (60.53)	60 (39.47)	
Body mass index				
Normal weight	215 (55.56)	102 (47.44)	113 (52.56)	
Overweight	95 (24.55)	78 (82.11)	17 (17.89)	**<0.001**
Obese	77 (19.90)	58 (75.32)	19 (24.68)	
Lunch consumption				
Prepared at home	104 (52.71)	101 (49.51)	103 (50.49)	**<0.001**
Prepared away from home	183 (47.29)	137 (74.86)	46 (25.14)	
Cigarette smoking				
No	336 (86.83)	198 (58.93)	138 (41.07)	**0.008**
Yes	51 (13.18)	40 (78.43)	11 (21.57)	
Physical activity level				
Low	168 (43.41)	116 (69.05)	52 (30.95)	
Moderate	130 (33.59)	81 (62.31)	49 (37.69)	**0.001**
High	89 (23.00)	41 (46.07)	48 (53.93)	

Note. *Analysis performed with the chi-square test of independence
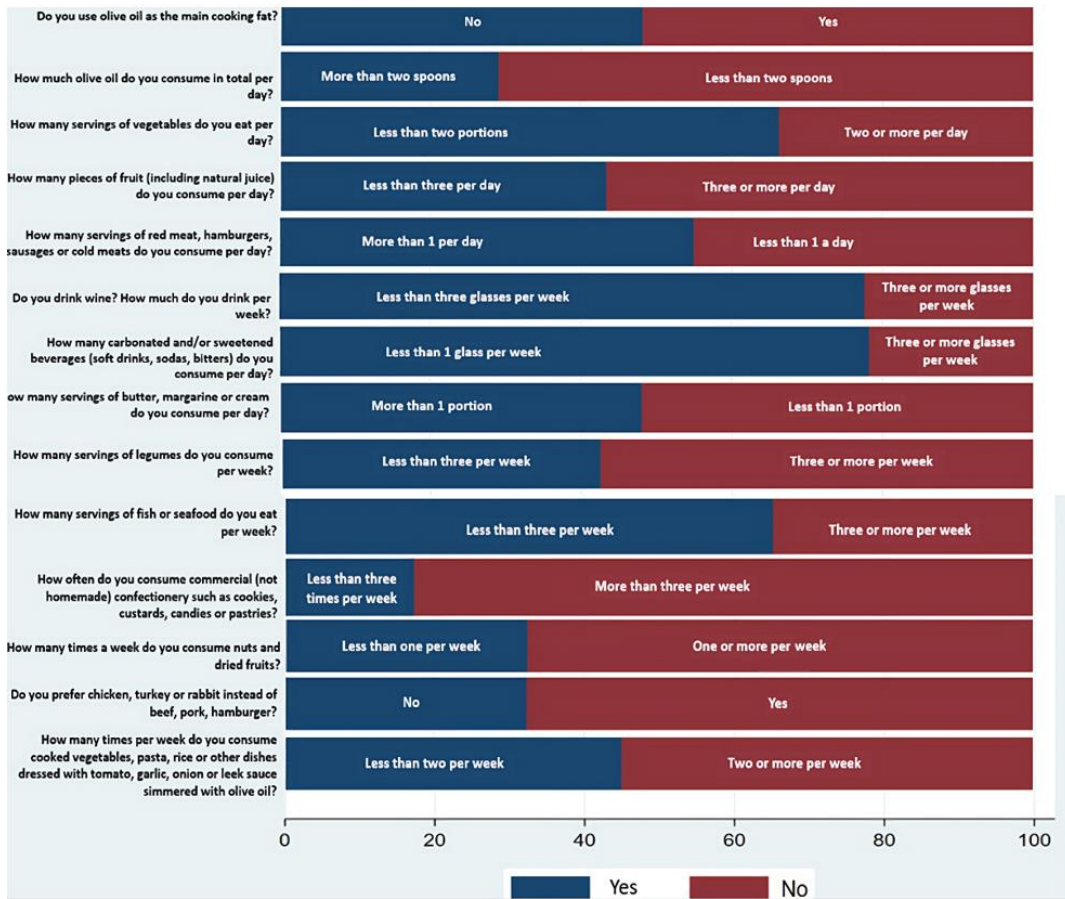
Figure 1. Responses regarding adherence to the Mediterranean diet (Source: Authors' own elaboration)

Table 2 shows the multivariate analysis of the factors associated with AMedD. A statistically significant association was found for gender (PRa: 0.623; 95% CI 0.488-0.796); for overweight (PRa: 0.417; CI 0.270-0.644), obesity (PRa: 0.591; 95% CI 0.400-0.874) versus normal weight; consumption of lunch away from home (PRa: 0.614; CI95% 1.719-1.326), cigarette smoking (PRa: 0.450; CI95% 0.263-0.773); and high level of physical activity (PRa: 1.652; 95% CI 1.233-2.215).

Table 2. Adjusted simple multivariate regression analysis of factors associated with adherence to the Mediterranean diet

	Bivariate analysis			Multivariate regression		
	RPc	CI 95%	p	RPa	CI 95%	p
Gender						
Female	Ref.			Ref.		
Male	0.634	0.485-0.829	**0.001**	0.623	0.488-0.796	**<0.001**
Categorized age						
18 to 24 years old	Ref.			Ref.		
25 years and older	0.804	0.495-1.308	0.381	1.025	0.676-1.553	0.908
Academic year						
1st and 2nd year	Ref.			Ref.		
3rd and 4th year	1.296	0.925-1.815	0.133	1.004	0.726-1.389	0.978
5th and 6th year	1.206	0.865-1.683	0.270	1.028	0.752-1.406	0.869
Body mass index						
Normal weight	Ref.			Ref.		
Overweight	0.340	0.217-0.533	**<0.001**	0.417	0.270-0.644	**<0.001**
Obese	0.469	0.311-708	**<0.001**	0.591	0.400-0.874	**0.008**
Lunch consumption						
Prepared at home	Ref.			Ref.		
Prepared away from home	0.525	0.306-0.901	**0.019**	0.614	1.719-1.326	**0.001**
Cigarette smoking						
No	Ref.			Ref.		
Yes	0.498	0.374-0.662	**<0.001**	0.450	0.263-0.773	**0.004**
Physical activity level						
Low	Ref.			Ref.		
Moderate	1.218	0.887-1.670	0.222	0.976	0.719-1.325	0.879
High	1.742	1.295-2.344	**<0.001**	1.652	1.233-2.215	**0.001**

Note. *Adjusted for sex, age categorized, academic cycle, body mass index, lunch consumption, cigarette smoking, & physical activity; *Significant p-value<0.05; RPc: Crude prevalence ratio; RPa: Adjusted prevalence ratio; & 95% CI: 95% confidence interval

DISCUSSION

Prevalence of AMedD and Food Consumption

This study claims that AMedD among students was less than 40%. In addition, gender (being male), BMI (overweight, obese), being smoker decreased the AMedD, while high physical activity were associated with AMedD among medical university students.

The AMedD was 38.50%. These results are consistent with previous studies that reported that in the Mediterranean population, AMeD among university students fluctuates between 20 to 51.5% and it is outpowered by Western dietary patterns, especially in the group of young adults between 18 and 25 years old [6, 24]. Although the scientific literature shows a downward trend in the ADMed, the variability reported between studies is partly attributable to the difference in instruments used to assess adherence (KIDMED score and MEDAS score) [22, 29-31]. In the case of AMedD in Latin American countries, a prevalence between 2.3 and 42% has been reported [17, 18, 25], which is in line with the results of this study.

The frequency of consumption of confectionery and bakery food groups was high in this study. This is in line with previous studies among Peruvian university students, that found a high-frequency intake of foods such as bread, commercial pastries, ultra-processed products such as cookies, soft drinks, and packaged juices [32], a low fruits and vegetables intake and high content of saturated fats food consumption [33, 34]. It is noteworthy that these eating patterns are not exclusive to our environment but rather represent a global phenomenon of the westernization of the diet, as has been previously reported elsewhere [35]. Factors that potentially influence the adoption of these eating patterns are related to the economic factor, palatability, and accessibility [36, 37], among others.

Regarding the consumption of meat, in Peru, chicken meat intake is very common, meanwhile red meat consumption has been reported as low [38].

Factors Associated With AMedD

Regarding gender, being a woman was found to be associated with a higher AMedD. These results are consistent with those reported by a study carried out at the University of Galicia in which a significant association was found between AMedD and gender, with women having greater adherence [39]. This sex-related association could be explained by biological, cultural, and also psychosocial factors that explain the higher prevalence of AMedD compared to men [40].

The present study found that a high level of physical activity is related to a higher AMedD. These findings are congruent with those of [20], found that among students who registered high levels of physical activity, 82.3% also had high AMedD. Similar results have been reported in other studies [41, 42]. A possible explanation for this finding lies in the fact that the practice of physical activity encourages those who do it to follow eating patterns with higher nutrient density and better quality to obtain better results in terms of health, aesthetics, or performance [43].

Due to the AMedD has been related to a lower prevalence of obesity [44, 45], the finding of a negative association between overweight/obesity and AMedD is not unexpected. Possible explanations for this phenomenon lie in the modification of the activity of the dorsolateral prefrontal cortex in subjects with excess adiposity, in whom this adiposity alters the function of this area that regulates eating behavior [46], making it more susceptible to these individuals to make less healthy food choices. Additionally, another component that has been highlighted is the knowledge about adequate eating habits. This idea is reinforced by the study [47], where a

negative association between BMI and greater knowledge about healthy eating habits was evidenced.

The results indicate that harmful health habits, such as cigarette smoking, are negatively associated with AMedD. Sustaining this type of habit may be related to less concern and awareness for maintaining healthy eating habits, which would explain the low adherence [48]. In addition, it has been previously reported in the Peruvian population that harmful habits such as smoking are not considered a problem that impairs health, this is, there is a normalization of these conditions that means that the population does not have the level of awareness that allows them to reflect on their health status [49].

Although the level of knowledge about healthy eating is important, it is accepted that it is ultimately the environments that modify health behaviors, including eating [50]. In this sense, the assessment of environments for the promotion of healthy eating patterns is transcendent. In fact, a study carried out in food courts of shopping centers in Peru found that of all the food services available, only 25% offered the option of consuming vegetables in the form of a salad and that of all the menus available, only four, 7% offered this type of preparation [51]. Since fruits and vegetable intake is a distinctive element of healthy eating patterns, such as that of the Mediterranean, not having available options that promote a varied and balanced diet makes it difficult to achieve high levels of AMedD.

Furthermore, eating mainly away from home implies not always being able to choose the ingredients with which the food dishes are prepared [52], in addition to the high cost that their ingredients may have [53].

Study Limitations

This research has certain limitations. First, it is a cross-sectional study, so these results do not allow us to determine the temporal direction of the associations. Second, considering that it is a non-probabilistic sample, it is unknown if our findings are representative of all university students. Third, all the data is self-reported instead of measured independently, so in the case of variables that can be measured objectively, such as the BMI, there may be variations.

An important strength of this study is based on the assessment of the AMedD level through the PREDIMED test, a validated tool and adopted in several studies carried out in the Mediterranean area, which allows the results to be compared with other countries.

CONCLUSIONS

In conclusion, the AMedD was low. The related factors were sex, BMI, consumption of lunch away from home, smoking, and high physical activity. If these results are confirmed in future studies, it would be necessary to consider these elements to encourage greater consumption of the components of MedD by students, which would help improve their long-term health.

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