Clinical Nutrition ESPEN 73 (2026) 103317

Contents lists available at ScienceDirect

Clinical Nutrition ESPEN

journal homepage: http://www.clinicalnutritionespen.com

Short Communication

Exploring the mediterranean diet among medical students: A multicenter PREDIMED survey

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ARTICLE INFO

Article history:
Received 13 February 2026
Accepted 26 April 2026

Keywords:
PREDIMED
Medical students
Nutrition
Obesity
Mediterranean diet

SUMMARY

Background & aims: This study explored Mediterranean diet (MD) adherence, familiarity with dietary tools and exposure to nutrition-related topics among Italian medical students.
Methods: 1074 medical students participated in the study by completing the PREDIMED questionnaire. The questionnaire was administered via Google Form and distributed through social media.
Results: Only 40 participants (4%) reported familiarity with the PREDIMED or KIDMED questionnaires. Overall, moderate adherence to the MD was common (68%), particularly in the South (54%) and North (34%). High adherence was reported only by 20% of participants. Exposure to formal nutritional teaching was not associated with adherence to the MD.
Conclusion: Adherence to the Mediterranean diet among Italian medical students was generally moderate, with significant differences according to geographic area and sex. No significant association emerged between exposure to nutrition-related teaching and adherence to the Mediterranean diet.

1. Introduction

Obesity is a chronic disease representing a widespread global problem with a worldwide prevalence estimated at 13.1%. This is particularly worrisome as it is associated with the development of a number of related non-communicable diseases as cardiovascular diseases, diabetes, metabolic dysfunction associated steatotic liver disease (MASLD), and cancers [1].

Nutritional behaviour plays a key role as modifiable risk factor in the development of obesity. In this context, it is worthwhile acknowledging that most available evidence suggests that greater adherence to a traditional Mediterranean balanced and healthy dietary pattern protects against both weight gain and several health conditions [2–4].

Particularly, strict adherence to the Mediterranean diet (MD) is associated with positive metabolic effects such as the improvement of insulin sensitivity and the reduction in markers of low-grade chronic inflammation, and the reduced risk of developing metabolic syndrome related conditions [5,6].

Nevertheless, adherence to the MD remains stunted, even in Mediterranean countries [1,2].

Considering the key impact of non-communicable diseases' prevention strategies on public health, and the pivotal role played by doctors [7], the objective of this study was to assess the adherence to MD among Italian medical students using PREDIMED questionnaire. In addition, the study explored students' familiarity with tools like PREDIMED and KIDMED and investigated their exposure to nutrition-related topics during medical training.

2. Material & Methods

1074 medical students (787 females and 287 males) from 45 out of 48 Italian Universities with a Medicine and Surgery programme volunteered to participate in the study by filling anonymously the PREDIMED questionnaire. The PREDIMED

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https://doi.org/10.1016/j.clnesp.2026.103317

questionnaire is a validated survey used in research to gauge adherence to the MD [5,8]. It was originally used to examine the prevention of cardiovascular disease by measuring intake of fruits, vegetables, fish, nuts, olive oil, whole grains, and limiting red meat, sweets, and sugar-filled beverages. It rates dietary practices to determine how closely people adhere to this heart-healthy eating pattern; higher scores denote greater adherence. Based on particular consumption thresholds, each of the 14 items is given a score of either 0 or 1. E.g., a point for eating fish at least three times a week, and a point for using olive oil as the primary cooking fat.

Before accessing the questionnaire, participants were provided with an information sheet describing the survey objectives, the voluntary nature of participation, the anonymity of the survey, and the anonymous processing of the collected data. Participants were required to read and accept this information before proceeding with the questionnaire.

The first section of the survey assessed students' familiarity with PREDIMED and also about KIDMED. The latter is a 16-item questionnaire used to assess adherence to the MD in patients aged 2–24 years [4,9]. The overall score falls between 0 and 14. Generally speaking, adherence is divided into three categories: Low (0–5), Average/Moderate [6–9], and High (≥10).

To facilitate the administration of the PREDIMED questionnaire, we created a Google Form, a platform that allows the creation of tests to be distributed via a link and provides real-time results (Supplemental Table 1). Although our proposed rewording has not been formally validated, it does not affect the scoring process, as score assignment was still based on the original scoring system and each item retained its original cut-off values. The dichotomous rewording was introduced solely to facilitate online compilation. No incomplete questionnaires were included in the dataset. The survey was configured so that all questions were mandatory, preventing participants from proceeding to the next item without providing an answer. To minimize the risk of duplicate submissions, the Google Forms setting "limit to one response" was activated.

The questionnaire was distributed via social media (i.e. Instagram stories, Facebook groups, WhatsApp groups, etc.) and, in collaboration with the student association and students representatives from the University of Salerno, we engaged all university communities across Italy. The link form was subsequently shared in class groups on various platforms that students commonly use for communication and interaction. Because the exact number of medical students who were reached through the dissemination channels (social media platforms and student groups) could not be determined, it was not possible to calculate a response rate.

The questionnaire included also information on the students' university, the academic year, the province of origin, age, gender and whether for their studies they were living in their hometown (resident) or away from home (non resident). Descriptive statistics were used to summarize participants' characteristics and questionnaire responses. Continuous variables were reported as mean and standard deviation (SD), while categorical variables were summarized as counts and percentages. Adherence to the Mediterranean diet was assessed using the PREDIMED questionnaire. Based on the total score, participants were classified into three adherence categories: low adherence (0–5 points), moderate adherence (6–9 points), and high adherence (≥10 points). Associations between categorical variables (e.g., sex, residence status, year of study, and geographical area of origin) and adherence categories or individual questionnaire items were evaluated using the Pearson chi-square test. When significant associations were identified in contingency tables with more than two categories, post-hoc analyses were performed using standardized residuals and Bonferroni-adjusted pairwise comparisons to identify the cells contributing most to the association. Comparisons of proportions between groups were further explored using tests for equality of proportions where appropriate. Differences in adherence patterns were explored by grouping provinces into three macro-areas of Italy (North, Centre, and South) based on the participants' province of origin. A multivariable linear regression model was performed to identify independent predictors of Mediterranean diet adherence. The total PREDIMED score was used as the dependent variable, adjusting for sex, age, academic year, residence status, and macro-area of origin. The level of statistical significance was set at $p < 0.05$. When multiple post-hoc comparisons were performed, Bonferroni correction was applied to adjust for multiple testing.

Data processing and analysis were performed using R version 4.2.1 (R Core Team, 2022) developed by the R Foundation for Statistical Computing, Vienna, Austria. Available at: https://www.R-project.org.

3. Results

The participating students came from all over Italy, representing 45 universities. Sample's demographical and academic characteristics are shown in Table 1 and Fig. 1, respectively.

The sample was based on voluntary participation and therefore reflects a self-selection process. As a consequence, the geographical distribution of respondents was not uniform, with an involuntary higher proportion of participants from Southern Italy compared with Central and Northern regions (36% North Italy vs 12% Center Italy vs 52% South).

The average age of participants was similar across the three macro areas (Northern, Central, and Southern Italy), with a slightly lower mean age in the Northern area.

Although female gender was statistically prevalent ($p < 0.001$***) over male gender, the distribution across the three macro areas differed significantly between genders ($p = 0.04$). Post-hoc analysis of standardized residuals indicated that the significant association between gender and macro-area was mainly driven by an over-representation of males and an under-representation of females in Southern Italy ($p = 0.04$*).

Regarding year of study, participants were distributed across all academic years, with 160 students enrolled in the first year, 156 in the second year, 154 in the third year, 174 in the fourth year, 177 in the fifth year, and 146 in the sixth year; additionally, 107 students were classified as out-of-course. The sample included an equal number of out-of-town and local students ($n = 537$ each).

Regarding the familiarity of PREDIMED or KidMed, only 40 participants (4%) declared being aware of them, while the remaining 1034 were not.

A total of 524 students (49%) reported having one or more university course credits dedicated to nutrition education, while the remaining 550 (51%) did not. Moreover, during their studies, topics related to nutrition and the MD were reported in other courses by 907 participants (84%), while the remaining 167 (16%) had not encountered them.

The presence of more than one university credit dedicated to nutrition education was significantly higher among students in the South (54.3%) compared to those in the North (46.4%) and the Center (32.6%) ($p < 0.001$). Similarly, topics related to nutrition and the MD were more frequently reported in other courses by students from the South (87.1%) than those from the North (81.5%) and the Center (81.8%) ($p = 0.04$). The regional analysis of PREDIMED scores revealed significant geographic heterogeneity across the country, ($p = 0.017$, Kruskal–Wallis test). To investigate geographical variability at a finer level, analyses were conducted at the regional (province) level. As shown in Fig. 2, mean adherence

Table 1
Description and distribution of the 1074 medical students sample participating in the survey. Significance levels are indicated as follows: $p < 0.05$ (*), $p < 0.01$ (**), and $p < 0.001$ (***).

Macroarea of origin	All partecipants (n= 1074)	Age (mean ± SD)	Residence			Gender		
			Resident (n= 537)	Non Resident (n = 537)	p-value	Male (n= 287)	Female (n= 787)	p-value
North–Italy	390 (36%)	23.09 ± 4.34	161 (30%)	229 (43%)	<0.0001***	91 (32%)	299 (38%)	0.07
Center–Italy	132 (12%)	23.27 ± 2.95	72 (13%)	60 (11%)	0.30	30 (10%)	102 (13%)	0.31
South – Italy	552 (52%)	23.15 ± 3.49	304 (57%)	248 (46%)	<0.001***	166 (58%)	386 (49%)	0.01*

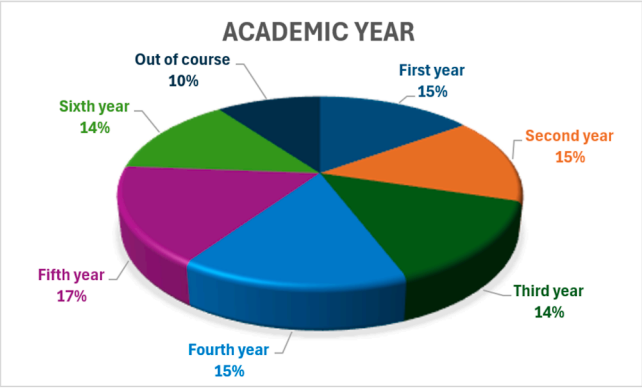

Fig. 1. Distribution of the study sample across the different academic years.

Fig. 2. Average Adherence Score by individual Region
Legend: The circled numbers indicate the PREDIMED average adherence score of medical students by region (adherence is divided into three categories: Low (0–5), Average/Moderate [6–9], and High (≥10).

levels varied by region, the regional analysis of PREDIMED scores revealed significant geographic heterogeneity across the country ($p = 0.017$, Kruskal–Wallis test). Post-hoc comparisons using Dunn's test with Bonferroni correction identified several regions with significantly lower scores compared to the reference.

Consistently, a linear regression model including region of origin as the sole predictor confirmed that geographical variability at the regional level significantly influenced the PREDIMED score. Using Abruzzo as the reference category, regions such as Calabria ($\beta = -2.14$, $p = 0.003$), Liguria ($\beta = -2.53$, $p = 0.008$), Piemonte ($\beta = -1.99$, $p = 0.004$), and Molise ($\beta = -2.50$, $p = 0.019$) showed significantly lower adherence scores.

To better understand the differences between the three Italian macro-areas, a geographical stratification of the participants was conducted to assess dietary habits, attitudes toward the MD, and nutrition education. This analysis identified significant differences among the three areas, both in terms of eating practices and exposure to nutritional topics during university education.

As shown in Table 2, the majority of participants exhibited moderate adherence (68%), particularly in the Southern (54%) and Northern (34%) macro areas. The overall median PREDIMED score was 8 [IQR: 7–9]. High adherence was reported only by 20% of participants, with the highest proportion in the South (44.19%) and North (41.40%), while it was lower in the Center (14.41%). Low adherence was observed in 12% of participants, with the highest percentage in the South (53.13%), followed by the North (37.72%) and the Center (10.16%).

Exposure to formal nutritional teaching was not significantly associated with adherence to the Mediterranean Diet, as assessed by the PREDIMED score ($p = 0.89$).

A highly significant association was found between gender and MD adherence ($p < 0.001$). Specifically, male students were significantly more represented in the high adherence category compared to their representation in the overall sample (38.14% vs. the expected distribution), whereas female students predominantly fell into the moderate (75.65%) and low (78.91%) adherence groups.

Male students exhibited higher adherence to the MD than female students, both in terms of the proportion of high adherence (28.5% vs 16.9%) and mean PREDIMED score (8.2 ± 2.1 vs 7.6 ± 1.9). Although the association between test adherence and year of study reached statistical significance (χ^2 test, $p = 0.04$), post-hoc analyses showed that the effect was primarily attributable to the low-adherence group, which was more frequent among first- and second-year students and less frequent among fifth- and sixth-year students.

To further evaluate the independent contribution of demographic and geographical factors, a fully adjusted multivariable linear regression model was performed. The presence of nutrition-related teaching credits was not significantly associated with the PREDIMED score ($\beta = -0.05$, $p = 0.68$). Female students showed

Table 2
PREDIMED Index for total students and by categories. Note: Percentages are column-based. P-values refer to the Pearson Chi-square test (for categorical variables) and the Kruskal–Wallis test (for the continuous PREDIMED score), evaluating whether the proportions or distributions differ significantly across the three adherence levels.

PREDIMED Index	All participants (n = 1074)	Macroarea of origin			p-value	Residence		p-value	Gender		p-value	Exposure to nutritional courses during university education		p-value
		North Italy (n = 390)	Center Italy (n = 132)	South Italy (n = 552)		Resident (n = 537)	Non Resident (n = 537)		Male (n = 287)	Female (n = 787)		YES (n = 524)	NOT (n = 550)	
Low (0–5)	12.00%	47 (37.72%)	13 (10.16%)	68 (53.13%)	0.72	64 (50.00%)	64 (50.00%)	0.99	27 (21.09%)	101 (78.91%)	0.15	48.43%	51.62%	0.90
Moderate [6–9]	68.00%	254 (34.75%)	88 (12.04%)	389 (53.21%)	0.20	374 (51.16%)	357 (48.84%)	0.29	178 (24.35%)	553 (75.65%)	0.01*	49.25%	50.75%	0.70
High (≥10)	20.00%	89 (41.40%)	31 (14.41%)	95 (44.19%)	0.06	99 (46.05%)	116 (53.95%)	0.22	82 (38.14%)	133 (61.86%)	<0.001***	47.44%	52.55%	0.71
Median [IQR]	8 [7–9]	8 [7–9]	8 [7–9]	8 [7–9]		8 [7–9]	8 [7–9]		8 [6–10]	8 [6–10]		8 [6–10]	8 [7–9]	
Mean ± SD	7.80 ± 1.95	7.83 ± 2.01	8.05 ± 1.88	7.73 ± 1.98		7.88 ± 2.0	7.74 ± 1.90		8.25 ± 2.01	7.64 ± 1.83		7.76 ± 1.93	7.85 ± 1.93	

significantly lower PREDIMED scores compared with male students ($\beta = -0.59$, $p < 0.001$). Academic year was also significantly associated with adherence, with first-year ($\beta = -1.07$, $p < 0.001$) and second-year students ($\beta = -0.96$, $p < 0.001$) reporting lower scores compared with students in later years. No significant associations were observed for age or residence status. Importantly, no significant association was found between macro-area of origin (North, Center, South) and PREDIMED score.

4. Discussion

Several studies have demonstrated that adherence to the MD in Italy is generally low and is strongly linked to nutritional awareness [1]. The role of proper education of medical students on nutritional topics may be therefore central in improving population awareness of health benefits throughout life time [7].

Our study represents the first survey conducted across Italian universities assessing the adherence to the MD among medical students using the PREDIMED questionnaire, while also examining their familiarity with dietary assessment tools and their reported exposure to nutrition-related topics during medical training. PREDIMED was considered a more appropriate and representative tool than KIDMED, although KIDMED can still be used up to the age of 25 years. In fact, PREDIMED is a more detailed questionnaire, assessing MD adherence with greater emphasis on portion sizes, nutrient quality, and cardiometabolic risk.

A key finding of this study is the limited familiarity with commonly used dietary assessment tools, with only 4% reporting that they were aware of the PREDIMED or KIDMED questionnaires. This finding should not be interpreted as reflecting overall nutritional knowledge, but rather as an indication of limited exposure to specific dietary assessment instruments that are commonly used in research and clinical practice. Increased familiarity with these tools may help future physicians to more effectively assess and monitor dietary patterns in their clinical work.

Moderate adherence to the MD was predominant among participants (68%), with the highest score observed in the South (54%) and North (34%). High adherence was reported only by 20% of students, particularly in the South of Italy (44%).

According to our results, universities of South Italy dedicate more academic credits on nutritional topics compared with those in Northern and Central Italy. However, exposure to formal nutritional teaching was not associated with better adherence to the Mediterranean Diet, as assessed by the PREDIMED score.

Lower adherence levels observed among students from Central Italy, may reflect differences in dietary habits, cultural contexts, or food environments across regions. The significant variations in dietary observed among students from different regions may reflect regional dietary traditions and accessibility to specific food products.

Unlike the study conducted by Fiore et al. [9] which included students from a single Italian University, our sample is more extensive and includes participants from across the entire country. Although the medical programme is mostly standardized nationwide, the number of hours dedicated to nutrition differs among universities.

The study conducted on 354 medical students of Kocaeli University in Turkey highlighted that Turkish students do not adhere to the MD diligently. In their study, 42.7% of the cohort had a low KIDMED score, while in our study only 12.0% of Italian medical students had a low adherence to the MD as stated by PREDIMED questionnaire [4].

In contrast, in a study conducted on 589 Spanish medical students at University de Las Palmas de Gran Canaria [3], PREDIMED questionnaire was administered and showed a mean score of

8.9 ± 1.9 which was slightly higher than mean score observed in our study (7.80 ± 1.95). Together with our research, these two studies demonstrate that medical students in Italy and Spain, i.e. two countries where the MD appears to be more deeply rooted [10], tend to report moderate to high adherence to this dietary pattern.

Our study found a higher adherence to the MD among male students compared to females (28.5% vs 16.9%), with higher average PREDIMED scores as well (8.25 ± 2.01 in males vs 7.64 ± 1.83 in females). This is in contrast with the findings of the study conducted at the School of Medicine of the University of Catania in Italy [9] and from the study on medical students at Kocaeli University in Turkey [4], where female students showed greater adherence. However, further research is needed to understand the underlying reasons for these differences and to determine whether they are statistically and clinically significant.

Moreover, similar scores were observed when comparing students "resident" (7.88 ± 2.0) with those "non resident" (7.74 ± 1.90). In contrast, Baydemir et al. [4] reported lower adherence to the MD among students living in dormitories. This difference might be explained by greater nutritional awareness among Italian students compared to the Turkish ones.

Furthermore, the PREDIMED questionnaire has been applied to populations of healthcare professionals. In a sample of 422 Spanish General Practitioners Sentenach-Carbo et al. [6], only 3% of sample had an high adherence to MD. Our data exhibits a higher adherence to the MD in medical students (20%). Spanish general practitioners exhibit lower adherence to the MD compared to Italian and Spanish medical students.

However, our study has several limitations. First of all, the sample was not randomly selected but was based on voluntary participation. Additionally, we do not have a full awareness of the participants' prior knowledge of nutrition-related topics. In terms of sample size, the number of participants is not proportionated to the total number of attended students at each university. Also, some universities are not represented in the study.

Another limitation to consider is the use of a reformulated yes/no version of the PREDIMED questionnaire. While this adaptation did not alter the scoring method, the version used in our study has not been formally validated. Therefore, the results should be interpreted with appropriate caution.

It is important to note that, unlike other studies, our study used the PREDIMED questionnaire, which is validated for adults, whereas some studies involving university students administered the KIDMED pediatric questionnaire [4,9].

For future research, it would be interesting to correlate the PREDIMED score with participants' BMI, as well as with a structured and objective test administered beforehand to assess their baseline level of nutritional knowledge.

5. Conclusions

While moderate adherence among Italian medical students is common, statistically significant differences exist between geographic areas and gender. Given the cross-sectional design and the convenience sampling strategy, these findings should be interpreted with caution. In our study, no significant association emerged between exposure to nutrition-related teaching and adherence to the Mediterranean diet. Nevertheless, greater familiarity with dietary assessment tools and nutrition-related topics may help future physicians better understand and address diet-related issues in clinical practice. In this context, professors in medical schools may contribute to improving nutrition-related competencies among future healthcare professionals. Attention should also be given to postgraduate training, especially for general practitioners, as this would significantly enhance the transfer of knowledge to patients.

Future research should explore the factors influencing dietary choices among university students, including socioeconomic status, food availability, and cultural influences.

Author contribution

Pietro Aliberti and Annalaura Giordano contributed to the conception of the work and to write the first version of the manuscript. Carmela Pia Senatore was responsible for statistical analysis. Marta Giovengo, Angelo Colucci and Rossella Colantuono contributed to recruitment and data acquisition. All authors contributed to the interpretation of data, revisited the manuscript and gave approval to submit. Authors had full access to the data in the analysis. Claudia Mandato coordinated the work group and provided critical revision of the manuscript.

Conflict of interest

None.

Acknowledgements

The authors gratefully acknowledge Prof. Pietro Vajro for his invaluable contribution to this work. His extensive expertise in pediatric nutrition provided critical insights that substantially strengthened the scientific quality of the study. We sincerely thank him for his generous support and guidance throughout this project.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.clnesp.2026.103317.

References

[1] Aureli V, Rossi L. Nutrition knowledge as a driver of adherence to the mediterranean diet in Italy. Front Nutr 2022 Mar 21;9:804865.
[2] Obeid C, Oenema A, Jaalouk D, Kremers SPJ, Gubbels JS. Determinants of adherence to the mediterranean diet among adults in mediterranean countries: a systematic literature review. Public Health Nutr 2025;28(1):e194.
[3] González-Sosa S, Ruiz-Hernández JJ, Puente-Fernández A, Robaina-Bordón JM, Conde-Martel A. Adherence to the mediterranean diet in medical students. Public Health Nutr 2023 Sep;26(9):1798–806.
[4] Baydemir C, Ozgur EG, Balci S. Evaluation of adherence to mediterranean diet in medical students at Kocaeli university, Turkey. J Int Med Res 2018 Apr;46(4):1585–94.
[5] Martínez-González MA, García-Arellano A, Toledo E, Salas-Salvadó J, Buil-Cosiales P, Corella D, et al. A 14-Item mediterranean diet assessment tool and obesity indexes among high-risk subjects: the PREDIMED trial. In: Peiró C, editor. PLoS ONE, vol. 7; 2012 Aug 14. p. e43134. 8.
[6] Sentenach-Carbo A, Batlle C, Franquesa M, García-Fernandez E, Rico L, Shamirian-Pulido L, et al. Adherence of Spanish primary physicians and clinical practise to the mediterranean diet. Eur J Clin Nutr 2019 Jul;72(S1):92–8.
[7] Martínez-González MÁ, Hernández Hernández A. Effect of the mediterranean diet in cardiovascular prevention. Rev Esp Cardiol Engl Ed 2024 Jul;77(7):574–82.
[8] Schröder H, Fitó M, Estruch R, Martínez-González MA, Corella D, Salas-Salvadó J, et al. A short screener is valid for assessing mediterranean diet adherence among older Spanish men and women. J Nutr 2011 Jun;141(6):1140–5.
[9] Fiore M, Ledda C, Rapisarda V, Sentina E, Mauceri C, D'Agati P, et al. Medical school fails to improve mediterranean diet adherence among medical students. Eur J Public Health 2015 Dec;25(6):1019–23.
[10] Yesildemir O, Guldas M, Boqué N, Calderón-Pérez L, Degli Innocenti P, Scazzina F, et al. Adherence to the mediterranean diet among families from four countries in the Mediterranean Basin. Nutrients 2025 Mar 27;17(7):1157.