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**AT: Original Article**

**RH: MEDITERRANEAN DIET AND CLINICAL PRACTISE**

**ADHERENCE OF SPANISH PRIMARY PHYSICIANS AND CLINICAL PRACTISE TO THE MEDITERRANEAN DIET**

**AUTHORS:** ARES SENTENACH-CARBO<sup>1</sup>, CARMEN BATLLE<sup>1</sup>, MARCELLA FRANQUESA<sup>1,2</sup>, ELENA GARCÍA-FERNANDEZ<sup>1,3</sup>, LAURA RICO<sup>1</sup>, LAIA SHAMIRIAN-PULIDO<sup>1</sup>, MONTSE PÉREZ<sup>1</sup>, Eva Deu-Valenzuela<sup>1</sup>, ESTHER ARDITE<sup>1</sup>, ANNA FUNTIKOVA<sup>4</sup>, RAMÓN ESTRUCH<sup>5,6,7</sup>, ANNA BACH-FAIG<sup>1,5,8</sup>

<sup>1</sup>Faculty of Health Sciences, Universitat Oberta de Catalunya (UOC), Barcelona, Spain;

<sup>2</sup>REMAR-IVECAT Group, Health Science Research Institute Germans Trias i Pujol, Can Ruti Campus, Badalona, Spain;

<sup>3</sup>Hospital de Mollet, Mollet del Vallès, Barcelona, Spain;

<sup>4</sup>Hospital del Mar Medical Research Institute (IMIM), Barcelona, Spain;

<sup>5</sup>Mediterranean Diet Foundation, Barcelona, Spain;

<sup>6</sup>Department of Internal Medicine, Hospital Clinic, August Pi Sunyer Biomedical Research Institute (IDIBAPS), Barcelona, Spain;

<sup>7</sup>CIBEROBN (Center for Research on Obesity and Nutrition), Instituto de Salud Carlos III, Madrid, Spain;

<sup>8</sup>Food and Nutrition Area, Barcelona Official College of Pharmacists, Barcelona, Spain;

Correspondence: Address correspondence to ANNA BACH-FAIG, Johann Sebastian Bach street nº 8 entres. 2<sup>a</sup>. 08021-Barcelona; E-Mail: abachf@uoc.edu; Tel.: +34-93-285-64-16; Fax: +34-932-099-407;

**ABSTRACT:**

1 **Background/Objectives:** The primary objective of this study was to explore physicians'  
2 adherence to the dietary pattern known as the Mediterranean diet (MD). As a secondary  
3 objective we assessed physicians' awareness on the benefits of the MD and of the  
4 possibility of prescribing it.

5 **Subjects/Methods:** Physicians' adherence to the MD was evaluated through the Spanish  
6 associations SEMERGEN and CAMFIC, who sent the validated PREDIMED screener to  
7 their affiliates. The results reflected a high, medium, low or very low level of adherence  
8 depending on total score. The sample was drawn between 2014 and 2016. The second  
9 questionnaire evaluated the physicians' knowledge of the MD and their opinion about  
10 recommending it.

11 **Results:** The PREDIMED test was answered by 422 Spanish physicians. In 8 out of 14  
12 questions, more than 50% of the individuals scored only 1 point. However, 3 questions  
13 resulted in 1 point being scored by almost all physicians. Thus, on average, 55% of  
14 questions obtained 1-point scoring. The second questionnaire was answered by 212  
15 physicians; 70% of them considered themselves to be aware of the benefits of the MD.  
16 More than 60% said they could invest 5 minutes of their time to recommend the MD.

17 **Conclusions:** Primary care physicians do not show a high level of adherence to the MD  
18 and emphasize the need for creating tools to evaluate it in their patients. This research  
19 can be useful as both a database and a justification for the creation of a new protocol to  
20 help physicians increase their own and their patients' MD adherence.

21 **KEYWORDS:** Mediterranean diet, dietary pattern, adherence, nutrition knowledge, nutritional  
22 advice

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## INTRODUCTION

The Mediterranean diet (MD) has been studied extensively as one of the best diets to follow in order to prevent non-communicable diseases (1-4) (1-4). MD has been promoted as a model of health promotion, proper eating habits and a healthy lifestyle. It is also a measure to control and prevent the effects of cardiovascular disease as well as obesity and diabetes (1). The MD pattern also combines a proper ratio of macronutrients, low energy density foods and low glycemic index meals (2-5). It also has a low environmental footprint and is economically accessible in Mediterranean countries (1).

The dietary pattern has been described in the Mediterranean diet pyramid (6). Most of the studies reviewed provide strong evidence of the association between adherence to the MD and a low risk of cardiovascular disease (CVD), type-2 diabetes (T2DM), metabolic syndrome (MetS) and obesity (1). Since the relationships between all these illnesses is remarkable, we now refer to cardiometabolic disease. The most recent scientific evidence supports the fact that cardiometabolic disease can be prevented through the adherence to the MD (1-4).

Although doctors and other health professionals in general are considered the most reliable and trusted sources of information on diet and nutrition issues (7), primary care doctors are the first line of contact within the health system for the general population. One of their duties is to work and assist people in improving or maintaining their health. Given the solid evidence of the advantages and benefits of the MD, it should be ensured

47 that doctors know all the benefits of the MD and share the right advice about this dietary  
48 pattern with their patients.

49 Currently, there is a mismatch between the attitude of the population, apparently  
50 willing to accept dietary advice from primary care professionals, and that of these  
51 professionals, who are reluctant to meet this demand. A low quality of nutritional  
52 education received by those working in primary care is often cited as a barrier to  
53 providing proper dietary advice to patients (8).

54

55 Moreover, there is growing empirical evidence about the association between  
56 physicians' own level of wellness and their ability to deliver good-quality healthcare.  
57 Physicians are often unable to attend to their own health because of their duties and  
58 schedule. Research has also shown an association between workplace nutrition and  
59 knowledge of physicians (9). Physicians' lives are full of meetings, hospital rounds,  
60 seminars, research meetings and medical conferences with few breaks, where the  
61 quality of food served is not always the best (10). Several studies have approached the  
62 problems behind "away from home" eating, including restaurant and fast food  
63 consumption, which have been shown to be associated with poor diet quality, weight  
64 gain and increased BMI of physicians (11). For this reason, the environment in which  
65 physicians work has an important impact on their nutrition dietary intake.

66 Therefore the primary objective of this study is to explore Spanish physicians' adherence  
67 to the Mediterranean dietary pattern. As a secondary objective, we aim to determine if  
68 the physicians are aware of the MD's benefits and if they can prescribe it to their  
69 patients.

70

71 **MATERIALS AND METHODS**

72 MD adherence assessment

73 In order to assess MD adherence, we used the validated 14-point MD adherence  
74 screener used in the PREDIMED study (12-13). This MD screener consists of fourteen  
75 questions based on the number of servings and frequencies of consumption for typical  
76 foods or food groups of the MD (3), such as olive oil, nuts, fruits, wine, seafood,  
77 legumes, and poultry. It also contains questions about the low consumption of foods  
78 that are not part of the traditional MD, such as red or processed meats, sweetened  
79 beverages and sweets, commercial bakery goods or sugary desserts. The questions  
80 have criteria for servings or frequencies that have to be met in order to obtain one  
81 point. Each point obtained corresponds to an increase in compliance with the MD, so  
82 scores closer to 14 reflect a high level of adherence; total scores between 8 and 11  
83 points indicate a medium level of adherence; scores between 5 and 7, a low level of  
84 adherence; and 5 or less reflect very low adherence (14).

85 The MD screener was answered by 422 Spanish physicians, all of them having  
86 volunteered for the study. The sample was obtained between the end of 2014 and the  
87 beginning of 2016, from the online distribution of the questionnaire. The Spanish  
88 associations SEMERGEN and CAMFIC collaborated, sending the test and a presentation  
89 letter about the project to each of its affiliates. The results obtained were processed  
90 using statistical calculations.

91

92 Assessment of MD knowledge among physicians

93 In order to ascertain if primary care physicians are aware of the benefits of the  
94 Mediterranean diet for the health of their patients and to assess whether they can

95 address the Mediterranean diet during a visit, an opinion survey was prepared (see  
96 Table 1). The survey consisted of a battery of eleven questions to be answered either on  
97 a scale of 1 to 10, marking the most appropriate option, with 1 meaning “totally  
98 disagree” and 10 “totally agree”, or by choosing the option considered most correct. A  
99 total of 212 responses were obtained.

100

## 101 **RESULTS**

### 102 Adherence of physicians to the MD

103 The PREDIMED test was answered by 422 Spanish physicians. In 8 out of 14 questions,  
104 more than 50% of the individuals scored only 1 point according to the MD screener.  
105 However, there were 3 questions for which almost all physicians scored 1 point. Thus,  
106 on average, 55% of the questions obtained a 1-point scoring.

107

108 Olive oil is the main culinary fat for nearly 100% of the doctors, and less than 1 serving  
109 per day of butter, creams and margarine are consumed by nearly 100% of doctors as  
110 well. Less than 1 serving per day of red and processed meats is consumed by 83% of the  
111 individuals. Moreover, 80% of the doctors show a preference for poultry over red meat.  
112 Less than 1 serving per day of soda drinks are consumed by more than 80% of the  
113 individuals and less than 2 servings per week of commercial sweets and confectionery  
114 are consumed by 75.59% of the physicians. About 54% of them eat fish or seafood 3 or  
115 more times per week. Two servings or more of vegetables per day are consumed by 55%  
116 of the physicians and 30% indicate consuming  $\geq 3$  servings of fruit per day. *Sofrito* (a  
117 typical Mediterranean sauce made of fried onion, garlic and tomato which is the base  
118 for many Mediterranean dishes) is eaten  $\geq 2$  times per week by 34.60% of the physicians

119 interviewed. Around 30% of them claim that they consume tree nuts and legumes  $\geq 3$   
120 times per week and 5% of individuals drink  $\geq 7$  glasses of wine per week.

121

122 Table 2 shows the results for the questions answered according to the MD screener.

123 These values reflect the number of participants that are following the MD pattern.

124 The MD resembles a healthy diet. In addition MD also represents a lifestyle determined

125 by the environment, e.g. by climate and territory (15). The use of virgin olive oil, the

126 primary source of fat, along with plant foods and nuts, makes the MD ideal because

127 these fresh foods undergo minimal processing and are rich in fiber, antioxidants and

128 essential micro and macronutrients (3). That is why the use of olive oil as the main

129 culinary fat is the most positively answered question in the PREDIMED test. It reflects

130 the tradition, availability and consumption of this food in Spain. However, the fact that

131 other typical regional products such as seeds, nuts or legumes (questions 9 and 12) are

132 only consumed by 50% of the participants cannot be ignored. Similarly, vegetable

133 (question 3) and fish (question 10) consumption barely exceeds this percentage. Finally,

134 only 30% of the physicians surveyed follow the proper intake of fruit and tree nuts

135 (questions 3 and 13).

136

137 From the overall scores obtained, the survey also shows the degree of adherence to the

138 MD.

139 As depicted in Figure 1, only 3% of the physicians have a high level of adherence to the

140 MD, 52% have medium-level adherence, 33% a low level of adherence and 12% a very

141 low level of adherence to the diet.

142



143 MD knowledge among physicians

144 The results from the anonymous survey showed that 70% of physicians considered  
145 themselves to be highly knowledgeable about the Mediterranean diet's benefits and the  
146 related scientific evidence, with a score of 7.67 out of 10. In addition, 77% believed that  
147 their team was also very knowledgeable, with an average score of 7.09 out of 10.

148 With respect to helping to change the eating habits and lifestyle of their patients, about  
149 46% gave a positive answer, with an average score of 6.99 out of 10.

150

151 Medical prescription of MD: ease and difficulties

152 Reviewing the difficulties involved in prescribing the Mediterranean diet, the doctors  
153 thought that it was due to: lack of time (29%), difficulty in motivating patients (29%),  
154 lack of interest (14%), lack of adequate material (9%) and lack of specific training (19%).  
155 62% of the physicians feel that the time that they can devote to their patients to explain  
156 the benefits of the MD is about 5 min. However 87% of the physicians indicated that the  
157 nurses could spend between 10 and 20 min of their time explaining the MD. Finally, 54%  
158 of the physicians (with an average score of 7.98) believed that having a survey (such as  
159 the PREDIMED test) could be useful in assessing if the dietary habits of their patients  
160 reflected those of the Mediterranean diet.

161

162 Physicians considered that the most important nutritional aspect on which to advise  
163 patients at risk of cardiometabolic disease was the type of fat ingested (20.66%), followed by the  
164 consumption of sugars (16.55%) and the consumption of fruits and vegetables (15.61%)  
165 (Figure 2). The type of fat ingested (19.27%) and the consumption of fruits and  
166 vegetables (17.82%) were considered to be the easiest to reach objectives for patients.

167 By contrast control of calorie consumption (23.64%) and the consumption of simple  
168 sugars (17.97%) were considered as most difficult to incorporate into their lifestyle. Sixty  
169 per cent of physicians thought that between 50% and 70% of their patients had some  
170 cardiometabolic risk factor and could therefore benefit from the MD to improve their  
171 health.

172

## 173 **DISCUSSION**

### 174 MD adherence

175 Among the studies assessing MD adherence through the PREDIMED test, several have  
176 been applied to different Spanish regions. However, no study, in Spain or elsewhere,  
177 had been conducted to analyze the medical community's adherence to the MD using  
178 the MD screener.

179 Comparing the results of our study and the ones from other population groups, it could  
180 be said that primary care physicians are within the Spanish average in terms of  
181 adherence to the MD, namely because, for most of the groups studied, the average level  
182 for MD adherence appears to be medium. Doctors as well as vocational training students  
183 and nursing students had a higher level of education and most of the respondents in  
184 these groups were in the upper-middle range. This means that the physicians' MD  
185 adherence wasn't better than that of other population groups previously studied (Table  
186 3) (16-22).

187

188 Most studies linked the attitudes and practices of primary care physicians based on  
189 nutrition knowledge, and knowledge and practice are more or less positively related  
190 depending on the region. For example, a study of physicians in Saudi Arabia showed that

191 doctors were up-to-date with everything published on nutrition in its more technical  
192 sense. However, in terms of basic knowledge, such as the idea of recommending diets,  
193 knowing how much fat olive oil has, etc., they overestimated their own knowledge of  
194 nutrition (23-24). Furthermore, doctors in the US had less knowledge of nutrition than  
195 those from other countries, and less than 50% of US physicians reported regular  
196 provision of specific guidance on diet, physical activity or weight control to their patients  
197 (25). Even though in the USA medical students felt prepared and confident in regard to  
198 their nutritional training, they often used websites that were not officially recognized as  
199 sources of information to resolve doubts (26). In addition German physicians showed  
200 high levels of involvement in dietary counseling but a low perception of the possible  
201 success rate of dietary intervention (27). Finally, as this research shows, approximately  
202 70% of Spanish physicians claimed to have a remarkable amount of knowledge of the  
203 benefits of the Mediterranean diet and scientific evidence in this regard.

204

205 It cannot be determined whether physician's responses reflect the behaviors and  
206 attitudes of the entire population of primary care physicians in Spain. However, this  
207 survey has provided some first insights into the attitudes and practices of the 422  
208 clinicians who did reply. The research allowed their adherence to the MD to be  
209 evaluated critically.

210

211 If there was a self-selection bias, then it would probably be that the physicians who did  
212 respond were those who already had an interest in nutrition and who would therefore  
213 tend to report more favorable attitudes and appropriate performance than those who  
214 did not respond. There could also be an overestimation of appropriate attitudes and

215 behaviors due to clinicians reporting apparently correct answers. Furthermore, the  
216 questionnaire did not include questions about participants' personal condition (e.g. age,  
217 sex or BMI), which would have provided more information about each doctor and  
218 helped to relate their answers to other variables. Since it was an online questionnaire,  
219 it could have been completed by nurses or other health professionals on behalf of the  
220 doctors, thus distorting the sample.

221

222 Regarding the results, the total score for the second question of the PREDIMED screener  
223 was modified because the value to be scored was included in two answers:  $\geq 4$   
224 tablespoons and 2-4 tablespoons. For this reason, it was an extrapolation of a third of  
225 the responses of "2-4 tablespoons", as this option was believed to also include people  
226 who use olive oil 4 times a day, resulting in the right answer to be scored according to  
227 the PREDIMED test.

228

229 What is the role of primary physicians?

230 Health professionals are under the impression that media are the most important source  
231 of information about what a healthy dietary pattern is for the population (28). Patients  
232 demand nutritional education but 78.5% of physicians consider that they do not have  
233 the necessary training to give good nutritional advice (29). The MD can be correctly  
234 prescribed to patients if primary care physicians are also skilled as dieticians and  
235 psychologists, with specific training in the management of their patients' eating  
236 behavior (30-31). It may be assumed that the greater a physician's knowledge and the  
237 healthier his or her own eating habits, the more confidence he or she will have in  
238 prescribing the MD (32-33).

239

240 A high percentage of primary care patients with unhealthy lifestyles do not feel that  
241 they need to change their habits (34). This should be taken into account when setting  
242 the training goals for doctors in nutritional counseling, since a lack of motivation  
243 makes it even more difficult to successfully prescribe the MD. That is why using leaflets  
244 or informational material in electronic format could help motivate users and give them  
245 clear and precise guidelines in moments of doubt, when the doctor is not with them  
246 (35).

247

248

249

## 250 **CONCLUSIONS**

251 Although multiple studies have demonstrated the efficacy of the MD to prevent and  
252 treat cardiometabolic disease, primary care physicians do not show a high level of adherence to  
253 it. The fact that most of the physicians interviewed do not show a high level of MD  
254 adherence suggests that the medical community follows a less healthy pattern than it  
255 should do in terms of diet. There is a need to encourage the medical community to  
256 improve their knowledge, attitudes and skills related to the MD and disease prevention.  
257 In addition nurses should be included in dietary counselling to improve MD knowledge  
258 and adherence of the patients. Finally providing a healthy work environment will add to  
259 the promotion of MD. The results of our study characterize the nutritional habits and  
260 knowledge of primary health physicians in Spain. Obviously there is need to develop  
261 clinical guidelines, to improve doctors' and the general population's MD adherence in  
262 future.

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Table 1. Opinion Survey

1. Indicate your knowledge of the Mediterranean diet and scientific evidence in relation to it.
2. Do you think it could be useful to have a questionnaire (like PREDIMED) to assess if the dietary habits of your patients reflect those of the Mediterranean diet?
3. How long do you think you could devote to the patient to perform the questionnaire and explain the benefits associated with the pattern of the Mediterranean diet? 5 min – 10 min – 15 min – 20 min – 30 min
4. Do you think you could help change the eating habits and lifestyle of your patients?
5. What reason do you feel can make it difficult to acquire better food-related habits? <ul style="list-style-type: none"> <li>• Lack of protocol in this regard.</li> <li>• Lack of time in the office.</li> <li>• Lack of specific training.</li> <li>• It is not my job to do so.</li> <li>• Difficulty in making an objective follow-up.</li> <li>• Need for greater consensus on the issue.</li> <li>• Lack of patient interest.</li> <li>• Lack of appropriate support material.</li> <li>• Difficulty in motivating the patient to change habits.</li> <li>• Other</li> </ul>
6. How much time do you think NURSES could dedicate to the patient to carry out the questionnaire and the explanation of the benefits associated with the pattern of the Mediterranean diet? (5 min - 10 min - 15 min - 20 min - 30 min)
7. What dietary aspect is the most important in advising patients at risk of cardiometabolic disease?
8. What do you think is the easiest thing for patients to adapt to improve their diet?
9. What do you think is the most difficult? <ul style="list-style-type: none"> <li>• Consumption of calories.</li> <li>• Type of fats ingested (saturated, trans, monounsaturated, etc.).</li> <li>• Meat consumption.</li> <li>• Blue fish consumption.</li> <li>• Consumption of simple sugars (sweets, drinks, etc.).</li> <li>• Nut consumption.</li> <li>• Wine consumption.</li> <li>• Vegetable consumption.</li> <li>• Fruit and vegetable consumption.</li> </ul>
10. What level of knowledge on the subject do you think the team has?
11. What percentage of your patients do you believe have a risk factor or condition that could make them eligible for improved adherence to the Mediterranean diet?

Table 2. Results in terms of total values and percentage of individual scores per question according to PREDIMED test

Question	Total number of correct answers among the 422 physicians	% total
1. Use of olive oil as main culinary fat	414	98.10%
2. Olive oil $\geq 4$ tablespoons	105	24.88%
3. Vegetables $\geq 2$ servings/d	233	55.21%
4. Fruits $\geq 3$ servings/d	127	30.09%
5. Red/processed meats $< 1/d$	353	83.65%
6. Butter; Cream; Margarine $< 1/d$	411	97.39%
7. Soda drinks $< 1/d$	381	90.28%
8. Wine glasses $\geq 7/wk$	22	5.21%
9. Legumes $\geq 3 /wk$	135	31.99%
10. Fish/seafood $\geq 3/wk$	228	54.03%
11. Commercial sweets and confectionery $< 2/wk$	319	75.59%
12. Tree nuts $\geq 3/ wk$	116	27.49%
13. Poultry more than red meats	338	80.09%
14. Use of <i>sofrito</i> sauce $\geq 2/wk$	146	34.60%
<i>Average</i>	233.21	56.33%

Source: own elaboration.

Table 3. Results of PREDIMED studies with different target populations in Spain

RESEARCH	TARGET POPULATION	SAMPLE	REGION	YEAR OF THE STUDY	MD* ADHERENCE
Sentenach-Carbo <i>et al.</i> 2016	Primary care physicians	422	Spain	2015-2016	High 2% Medium 50% Low 43% Very low 5%
O. Miró <i>et al.</i> 2016	Patients with heart failure	411	Madrid and Barcelona	2014-2015	Medium 60% Low and very low 40%
Carratalá <i>et al.</i> 2014	Vocational training students	86	Valencia	2012-2014	High 36% Medium 36% Low 18% Very low 10%
Hergueta <i>et al.</i> 2014	Nursing students	60	La Rioja	2013-2014	High 11.6% Medium 41.6% Low and very low 46.6%
Carral <i>et al.</i> 2011	Diabetes type 1	132	Cádiz	2009	High 11.4% Medium 65.9% Low 17.4% Very low 5.3%
Zaragoza <i>et al.</i> 2015	Obese people	7.447	Alicante	2015	High and medium 49% Low and very low 51.7%
López <i>et al.</i> 2012	Web of the Plan for Physical Activity and Health Sports	1.376	Spain	2012	High 12.5% Medium 67.2% Low and very low 20.3%

Hu EA <i>et al.</i> 2013	Adults aged 55 to 80	7.305	Spain	2009	<p>High: Former smokers, non-smokers, higher education, regular physical activity</p> <p>Low: Current smokers, people who have a larger waist-to-height ratio, diabetes, single/divorced/separated</p>
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\*MD: Mediterranean diet.

Source: own elaboration.

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388 Figure 1. Physician's Mediterranean diet adherence level, according to PREDIMED test.

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390 Figure 2. Physicians' opinion on the importance of dietary aspects on which to advise

391 patients.

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