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Original Research

Adherence to a Mediterranean dietary pattern in Moroccan type 2 diabetes patients

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Abstract

Background and aims: Adherence to the Mediterranean diet (MED) improves the health and physical function of type 2 diabetes (T2D) patients. This study aimed to evaluate adherence to the MED in T2D patients, and identify the relationship with MED adherence, demographic, socioeconomic, and other lifestyle parameters. **Material and method:** This cross-sectional study concerned 343 T2D patients with complete dietary data. The survey was conducted from April to July 2019. Data collection was performed using a questionnaire including sociodemographic and lifestyle factors. The dietary intake was assessed by the Mediterranean Diet Adherence Screener (MEDAS). **Results:** Participants showed a moderate adherence to the Mediterranean dietary pattern (7.8±1.2). Among 343 participants, high adherence to the MED was associated with elderly patients, suburban habitation, poor quality of life, physical activity, oral antidiabetic drugs, hypertension, and diabetes complications. Diabesity, diabetes phytotherapy, diabetes duration, controlled diabetes, and using honey are not associated with adherence to the MED. **Conclusions:** The application of the MEDAS makes it possible to identify which aspects require improvement and provides the opportunity to develop health education programs.

Keywords: Mediterranean diet, Mediterranean diet adherence screener, type 2 diabetes, Morocco.

Background and aims

Diabetes is a chronic disease inflicting devastating health problems, permanent disability, considerable suffering, and a high rate of morbidity and mortality worldwide. It accounts for, nearly 11.3% of deaths [1]. Diabetes prevalence is increasing more rapidly in low- and middle-income countries [2]. Though the attempts to promote population health and extend life expectancy, diabetes is still reducing global health adjusted life expectancy worldwide, regardless of the attempts devoted to promoting population health and extending life expectancy [3]. However, several studies [4–9] have provided evidence of a beneficial association of Mediterranean diet (MED) intake with reduced risk of type 2 diabetes (T2D).

The MED differs from region to region, country to country. Overall, it consists of vegetables, fruits, legumes, seeds, fish, and olive oil. It usually comprises a low intake of meat and dairy foods. In the Women's Health Study [7], higher MED intake scores were positively correlated with a 30% relative risk reduction in T2D during 20 years. This is explained in large part by biomarkers of insulin resistance, obesity, lipoprotein metabolism, and inflammation.

Meta-analysis studies [5, 6] have reported a significant association between MED adherence and diabetes risk reduction (19–23%). Regarding the overall management of T2D, the MED was associated with better glycemic control and cardiovascular risk factors compared with control diets, or a lower-fat diet [10]. Another meta-analysis study, comparing nine dietary approaches in the management of T2D dyslipidemia, has demonstrated that the MED was the most effective dietary approach to manage diabetic dyslipidemia by raising HDL and decreasing TG levels [11].

Morocco, as a southern Mediterranean Sea country, is undergoing a nutritional transition [12, 13]. Up to our knowledge, there are no previous published studies reporting the association between MED adherence and T2D or other chronic diseases among Moroccans. Nonetheless, in the Moroccan population, a study conducted in 2008 using a simplified Mediterranean-diet score, showed that it was far from being a universal pattern in the Moroccan population [14]. In the PREDIMED study, the Mediterranean Diet Adherence Screener (MEDAS) was reported to be a valid tool for rapidly assessing and providing advice on MED adherence among high-CVD-risk patients when compared to an extensive, full-length Food Frequency Questionnaire (FFQ) [15]. This study aimed to evaluate adherence to MED in T2D patients by using the MEDAS instrument, and identify the relationship with MED adherence, demographic, socioeconomic, and other lifestyle parameters.

Material and method

Study design and patients

Eligible participants of both sexes, aged above 18-years-old were recruited from University Hospital Hassan II of Fez, especially outpatients from the diabetes department, and other diabetes associations located in Taza, Sefrou, and Fez cities. The survey was conducted from April to July 2019. Participants were asked to report their sex, age, last clinical and biological measurements as well as their weight, and height. BMI index (BMI=kg/m^2) was also calculated, and a value of BMI ≥0 kg/m^2 was used to define obesity. Subjects were considered hypertensive if they were under antihypertensive drugs treatment, or had blood pressure values ≥140/90 mmHg. Quality of life was evaluated by using a visual analogic scale through 10 units.

Participation was voluntary, and all participants provided written consent before data collection commenced. In addition, participants were assured that their responses would be treated confidentially. The study was conducted following the Declaration of Helsinki.

Study instrument

The Mediterranean Diet Adherence Screener (MEDAS) was adopted as a tool for measuring the MED adherence of patients. The instrument was proved to be associated with better cardiovascular health outcomes, including clinically meaningful reductions in rates of coronary heart disease, ischemic stroke, and total cardiovascular disease [16]. This short screener is useful in clinical practice as a valid tool for quick assessment of adherence to the MED. Its relative and construct validity was assessed by comparing it with the FFQ.

The MEDAS consists of 14-items, 2 items on habits of food intake, and 11 items about food consumption frequency. The scoring method is to give one point for each fulfilled condition-related item. If the condition was not met, no points were recorded. The final score ranged from 0 to 14, which is the sum of the items' scores. Adherence to the Mediterranean diet pattern was defined as low (score of 0–7 points) or high (score of 8–14 points) [15]. Translation and back-translation were done by bilingual experts. Its psychometric property was assessed. Its face validity was examined in a pilot study among 20 participants showed that the MEDAS was acceptable and understandable, and its reliability was 0.76.

Statistical analysis

Data were analyzed using the SPSS (Statistical Package for Social Science) version 20 for Windows. The level of significance for the study

was set at 0.05. Descriptive statistics (i.e., frequencies, ranges, means, and standard deviations) based on level of measurement was used to summarize and describe the demographic and clinical-related variables. Inferential statistics using the chi-square test were used to assess research hypotheses.

Results

Clinical characteristics and adherence to the MED

The principal characteristics of the participants by adherence to the MED are listed in Table 1. The mean score on the screener was 7.8 points (SD 1.2), and ≥8 points (acceptable adherence criterion) in 59% (95% confidence interval, 54–64%). Adherence to the MED was positively associated with elderly patients, suburban habitation, patients from Sefrou, poor quality of life, physical activity, hypertension, oral antidiabetic drugs, diabetes complications and not using medicinal plants. Diabesity, diabetes phytotherapy, diabetes duration, controlled diabetes, and using honey are not associated with adherence to the MED.

Adherence to the MED was considered for total scores on the 14-item Mediterranean Diet Adherence Screener (MEDAS) questionnaire of ≥9 points. Hypertension: blood pressure ≥140/90 mmHg or patient under medication.

Table 1: Characteristics of the study participants by adherence to MED score groups (n=343).

	Adherence to MED		p-Value
	Low (score 0–7)	High (score 8–14)	
Age (years)			0.041
<65 years (%)	116 (82.3)	147 (72.8)	
≥65 years (%)	25 (17.7)	55 (27.2)	
Sex			0.444
Men (%)	31 (22.0)	53 (26.2)	
Women (%)	110 (78.0)	149 (73.8)	
Geographical area			<0.001
Fez	47 (33.3)	39 (19.3)	
Taza	76 (53.9)	41 (20.3)	
Sefrou	18 (12.8)	122 (60.4)	
Education			0.109
None	120 (85.1)	158 (78.2)	
Yes	21 (14.9)	44 (21.8)	
Marital status			0.977
Married	122 (86.5)	175 (86.6)	
Single or widowed	19 (13.5)	27 (13.4)	
Habitation			0.001
Rural	56 (39.7)	70 (34.7)	
Suburban	45 (31.9)	102 (50.5)	
Modern	40 (28.4)	30 (14.9)	
Perceived health			0.131
Poor / very poor	24 (17.0)	48 (23.8)	
Good / average	117 (83.0)	154 (76.2)	

(*continues*)

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Table 1: Continued

	Adherence to MED		p-Value
	Low (score 0–7)	High (score 8–14)	
Quality of life (VAS scores)			0.006
<5 (poor)	64 (45.4)	122 (60.4)	
≥5 (good)	77 (54.6)	80 (39.6)	
Physical activity			<0.001
≤2 hours per week	109 (77.3)	114 (56.4)	
>2 hours per week	32 (22.7)	88 (43.6)	
Diabesity			0.403
BMI <30 kg/m^2	24 (51.1)	83 (58.0)	
BMI ≥30 kg/m^2	23 (48.9)	60 (42.0)	
HbA_{1c} (%)			0.074
≤7	15 (23.4)	20 (13.5)	
>7	49 (76.6)	128 (86.5)	
Diabetes duration			0.917
<7 years (%)	72 (51.5)	102 (50.5)	
≥7 years (%)	69 (48.9)	100 (49.5)	
Diabetes complications			<0.001
No	110 (78.0)	104 (51.5)	
Yes	31 (22.0)	98 (48.5)	
Diabetes drugs			<0.001
OADs	95 (67.4)	117 (58.2)	
OADs and insulin	16 (11.3)	57 (28.4)	
Insulin	30 (21.3)	27 (13.4)	
Hypertension			0.029
No	59 (50.4)	60 (37.3)	
Yes	58 (49.6)	101 (62.7)	
Using medicinal plants in general			0.001
No	21 (43.8)	108 (70.1)	
Yes	27 (56.3)	46 (29.9)	
Using honey			0.448
No	126 (89.4)	175 (86.6)	
Yes	15 (10.6)	27 (13.4)	
Using medicinal plants to treat diabetes			0.126
No	95 (76.0)	161 (83.0)	
Yes	30 (24.0)	33 (17.0)	

OADs: oral antidiabetic drugs; BMI: body mass index; VAS: visual analogic scale.

Adherence to the MED and its components

Adherence to each of the 14 points of the screener is shown in Figure 1. T2D patients mainly used olive oil, less than one portion per day of butter and sugary drinks, and less than two portions of pastry per week (more than 91% of participants). More than two-thirds of participants consumed less than one portion of red meat per day; likewise, they consumed white meat more than red meat (71%). More vegetables than fruits were consumed among T2D patients. Only one patient from five consumed fish and seafood three times or more per week. It was rarely that a patient consumes three portions or more of nuts (2%). Furthermore, only one patient from ten T2D patients consumed fried onion, garlic, and tomato two times or more per week.

Discussion

To the best of our knowledge, this is the first study exploring the adherence to the Mediterranean diet and each of its components in Moroccan T2D patients. Concerning the estimated 14-item MEDAS scores, in this exploratory study among 343 T2D patients, we found a moderate MED adherence (7.8±1.2) in a Northern African Mediterranean country. Such a result is higher than MED adherence (6.2±2.0) reported in the entire investigated group of the Southern European Mediterranean region [17]. In non-Mediterranean European countries, the 14-item MEDAS scores were lower such as in the UK study with a value of 5.5±2.1 [18]. There are virtually no published data on MED adherence using MEDAS score among populations in

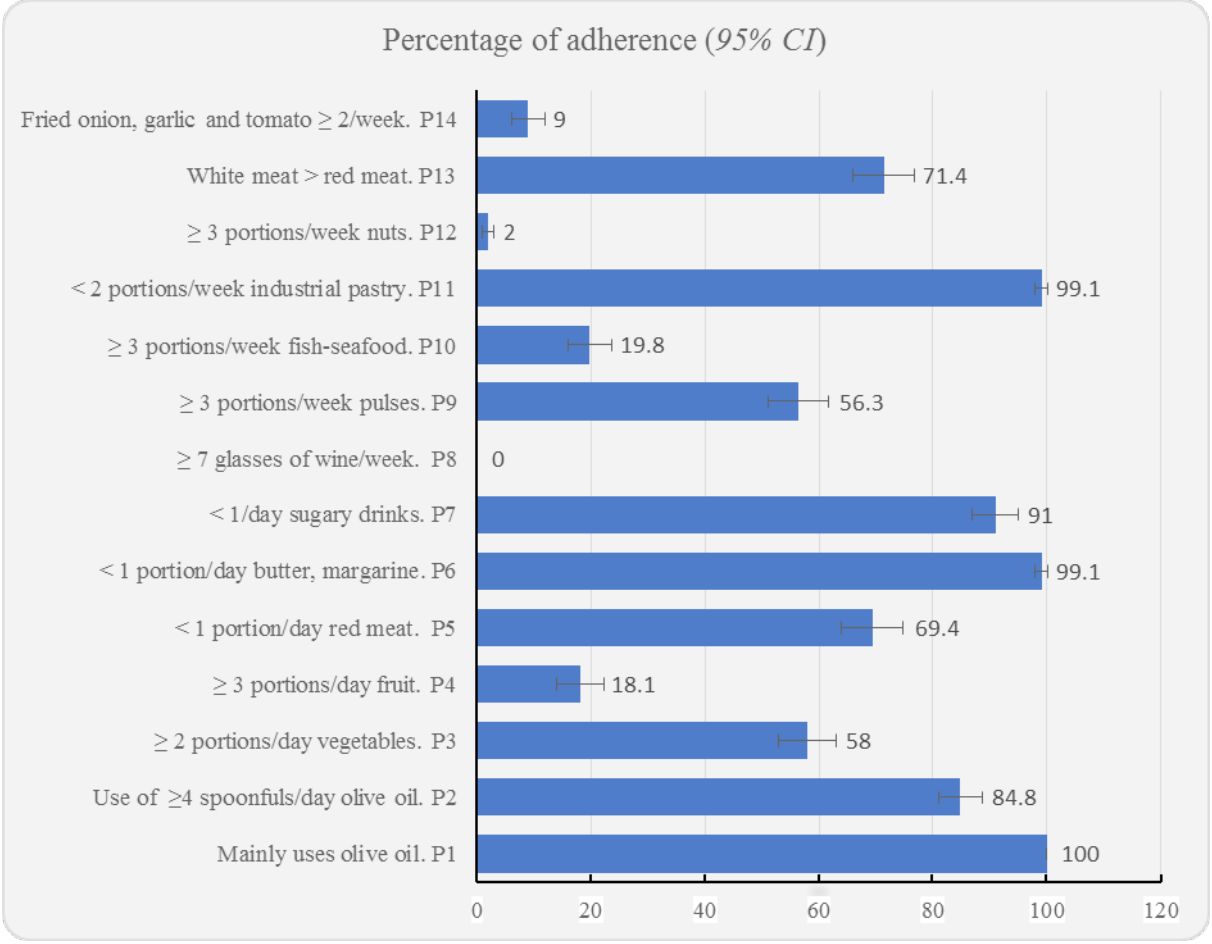

Figure 1: Adherence to each of the 14 points of the MED adherence screener (MEDAS-14) of the 343 patients with type 2 diabetes. 95% CI, 95% confidence interval.

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non-European countries of the Mediterranean basin. However, a study comparing the dietary habits of three Mediterranean populations (Spain, Morocco, and Palestine) using the Mediterranean Dietary Serving Score showed that the mean MED adherence was around 50% (12.4/24 points) and was significantly higher in Spain [19]. A recent study in Morocco aimed to evaluate the degree of adherence to the MED using simplified Mediterranean-diet score reported a moderate adherence with 4.8±1.4 (8 maximal adherence) [20]. In a previous national study, using the same tool, the adherence to the MED was reported as a mean of 5.1±1.2 [14].

The MED is characterized by a high intake of vegetables, legumes, fruits, cereals, and olive oil; a moderate to high intake of fish; moderate to low consumption of poultry, meat, and dairy; and a moderate amount of wine. There is evidence that higher MED adherence is associated with a reduced risk of diabetes [21–23]. Also, several studies have been shown that greater MED adherence is associated with a decrease in several cardiometabolic disorders, frailty, disability, improved physical function, and oxidative stress [24–29].

In the present study, higher adherence to the MED was positively associated with elderly patients and physical activity. The same results were also mentioned by other studies [29, 30]. This may be explained through individuals who have high adherence to the MED diet may also engage in more physical activity and therefore have better walking abilities. It is also possible that health promotion and therapy education for type T2D patients increase healthy diet and physical activity, and therefore the association observed is due to a causal relationship. This pleads in favor of the adhesion of more diabetic patients with diabetes complications and hypertension to the MED.

These findings have some limitations considering the cross-sectional design, therefore generalization and interpretation should be made with caution. Moreover, the validity and generalizability of findings to the entire of Morocco might be affected by the relatively small sample size from different regions. Physical activity was not measured by a validated tool. The presence of wine consumption in the MEDAS score is considered a limiting factor for adherence to the MED pattern. However, further research is required to clarify this issue and the importance of these beverages in the MED for Southern Mediterranean populations.

Conclusions

This study demonstrates a moderate adherence of T2D patients to the MED and an association between elderly patients, suburban habitation, physical activity, hypertension, diabetes complications, and higher adherence to the MED. Diabesity and diabetes phytotherapy were not related to MED adherence. Future research is needed to be conducted to precisely measure these associations.

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Conflict of interest

The authors declare no conflict of interest.

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