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ORIGINAL

Modification of Mediterranean Diet Pyramid from an Island's perspective

Alteração da Pirâmide Alimentar Mediterrânea na perspectiva de uma Ilha

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ABSTRACT

Objective

The present study aimed to determine traditional and local food consumption and adherence to the Mediterranean diet in Cyprus. And also, aimed to improve their adherence to the Mediterranean diet and traditional and local food consumption. From this point, this current study aimed to revise the Cyprus Mediterranean Diet Pyramid, based on the Current Mediterranean Diet Pyramid.

Methods

The sample size was calculated as a minimum of 386 according to a 95.0% confidence interval, and a 5.0% error. This study was conducted online between November 2020-April 2021 in Cyprus. All volunteers were invited to this study on the national public internet platforms. Participant´s adherence to the Mediterranean diet was determined by the Mediterranean Diet Adherence Screener. Traditional and local food consumption frequencies were determined

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by a Food Frequency Questionnaire. A novel Cyprus Mediterranean Diet Pyramid was developed with traditional and local food items for Cyprus. The modification was also aimed to safeguard planet health, to increase traditional food consumption and adherence to the Mediterranean diet.

Results

1,007 adults (78.0% native islanders/Cypriots) participated voluntarily in the current study. The mean Mediterranean Diet Adherence Screener score was 7.55±2.30 points and only 34.4% had high adherence to the Mediterranean diet. According to their responses, there was a need to increase use of olive oil, vegetables, fruits, fish, and red wine consumption and to decrease red meat and dessert consumption. According to responses to the Mediterranean Diet Adherence Screener and their traditional/local food consumption frequencies an up-to-date Cyprus Mediterranean Diet Pyramid was done hence a national food pyramid for Cyprus. Commonly consumed traditional and local foods were added to the pyramid to facilitate increased adaptation of the Mediterranean diet in the general population. Adequately consumed foods were added to make it more region-specific and rarely consumed foods were added to help to increase consumption.

Conclusion

This modification is believed to be instrumental to increase Mediterranean diet adaptation, traditional/local food consumption and decrease the impact of nutrition on the planet´s health. And also, this modification can shed light on the development of the other traditional food pyramids.

Keywords: Cyprus, traditional foods. Food pyramid. Mediterranean diet.

RESUMO

Objetivo

Este estudo teve como objetivo determinar o consumo alimentar tradicional e local, bem como a adesão à dieta mediterrânea no Chipre. Também teve como objetivo melhorar a adesão à dieta mediterrânea e ao consumo de alimentos tradicionais e locais. A partir desse ponto, este trabalho atual teve como objetivo revisar a Pirâmide da Dieta Mediterrânea do Chipre, que é baseada na Pirâmide da Dieta Mediterrânea Atual.

Métodos

O tamanho da amostra foi calculado com um mínimo de 386 de acordo com intervalo de confiança de 95,0% e erro de 5,0%. Este estudo foi realizado online entre novembro de 2020 e abril de 2021 em Chipre. Todos os voluntários foram convidados para esta análise nas plataformas públicas nacionais de internet. A adesão dos participantes à dieta mediterrânea foi avaliada pelo Medidor de Adesão à Dieta Mediterrânea. As frequências de consumo alimentar tradicional e local foram determinadas pelo Questionário de Frequência Alimentar. Foi desenvolvida uma nova Pirâmide da Dieta Mediterrânica de e para o Chipre, com alimentos tradicionais e locais. A modificação teve também como objetivo salvaguardar a saúde do planeta, aumentar o consumo de alimentos tradicionais e a adesão à dieta mediterrânea.

Resultados

No total de 1.007 adultos (78,0% naturais da ilha/cipriotas) participaram voluntariamente no estudo. A pontuação média obtida no Medidor de Adesão à Dieta Mediterrânea foi de 7,55±2,30 pontos, com apenas 34,4% aderindo fortemente à dieta mediterrânea. De acordo com as suas respostas, houve necessidade de aumentar a utilização de azeite, vegetais, frutas, peixe e vinho tinto, bem como de diminuir o consumo de carnes vermelhas e sobremesas. Com base nas suas respostas ao Medidor de Adesão à Dieta Mediterrânea e as suas frequências de consumo alimentar tradicional/local, foi feita uma pirâmide da Dieta Mediterrânea do Chipre atualizada, ou seja, uma pirâmide alimentar nacional para o Chipre. Alimentos locais e regionais comumente consumidos foram adicionados à pirâmide para aumentar a adesão à dieta mediterrânea. Alimentos consumidos de acordo com as recomendações foram adicionados para torná-los específico da região, e alimentos pouco consumidos foram adicionados para ajudar a aumentar o consumo.

Conclusão

Acredita-se que esta modificação seja determinante para aumentar a adaptação da dieta mediterrânea e o consumo de alimentos tradicionais e locais, além de diminuir o impacto da nutrição na saúde do planeta. Ainda, essa modificação pode lançar luz sobre o desenvolvimento das outras pirâmides alimentares tradicionais.

Palavras-chave: *Chipre, alimentos tradicionais. Pirâmide alimentar. Dieta mediterrânea.*

INTRODUCTION

The Mediterranean Diet (MD) is a nutrition model derived from the Greek word '*díaita*', which indeed means lifestyle. The MD has been historically adopted by people who live in the Mediterranean region [1]. The MD is plant-based and it is possible to divide foods into three groups according to their suggested consumption frequencies in this nutrition model. Olive oil, vegetables, fruits, nuts, legumes, and unprocessed cereals are suggested to consume 'often', fish, red wine, dairy products 'moderately', and poultry, red meat, and processed red meat products 'rarely' [2,3]. The MD is a good source of some beneficial nutrients and nutritional substances such as vitamins, minerals, dietary fiber, fatty acids (omega 3 and 9) and bioactive components (*e.g.*, polyphenols, *etc.*) [4]. Due to its components, MD can potentially decrease chronic disorder risk [5]. On the other hand, this diet is largely based on traditional nutrition habits [6]. Current Mediterranean Diet Pyramid (CMDP) was developed by Bach-Faig *et al.* [7] according to the MD principles. With recent advancements in the field, there are some revisional suggestions for regarding this classical pyramid. However, most of these recommendations remain general and not specific to traditional foods of individual Mediterranean countries. Seasonal and traditional food consumption is the actual basis of the CMDP [7]. Hence incorporating local production and traditional foods in a certain Mediterranean country, would have a positive impact on the adherence to the MD [8]. Traditional nutrition behaviors mean indigenous/region-specific food consumption. Healthy traditional foods include less sugar, fat, trans-fatty acids, salt, *etc.*, so their consumption is healthier than the westernized diet model [9]. In addition, traditional food consumption is important for the sustainability of life, food security, maintenance of public culture, and the economy [10,11]. The MD heavily relies on local and traditional food consumption. Thus, it has low carbon, water, nitrogen and energy footprint so it is important for planet health and MD is a proper example of sustainable diets [12,13]. To note a shortcoming, CMDP only includes general suggestions about local and traditional food consumption [7].

In light of the issues mentioned above, Cyprus being an island in the center of the Mediterranean Sea could become an ideal geographical model for studying food pyramids. It is suitable for producing various vegetables and fruits, the natural growth of edible herbs, and wild fruits due to its soil composition and native vegetation. While agriculture is carried out in various parts of the island, olive oil production is also abundant on the island [14,15]. As a trademark, Halloumi is the traditional cheese, and *Commandaria* is a traditional red wine of the island [16,17]. On the other hand, jams, produced from natural fruits, are important segments of the islanders' culture [18]. These traditional foods are mostly sold in the local markets of the island. Thus, people from different cultures can easily have access and adopt them [19].

From this point, this present study aimed to evaluate locals' and non-locals' adherence to the MD via adaptation to the basic principles of this nutrition model. And also, the current study was intended to determine traditional and local food consumption frequencies. According to these data, this study aimed to rearrange the MD pyramid and endorse adherence to the MD as well as promote the consumption of the local and traditional foods on the island of Cyprus.

METHODS

The present study was conducted on the island of Cyprus between November 2020-April 2021. The sample size has been calculated by a statistician. According to the general population of the island (nearly 1.3 million) sample size was determined as a minimum of 386 adults (95.0% confidence interval, 5.0% error). The link of the invitation letter was shared on five different national internet platforms via the government and invited adults (≥19 years old) to this study. Data was collected online (via Google Forms)

because of the Covid-19-related restrictions and lockdown on the island of Cyprus. At the end of five months, total 1,007 adults participated voluntarily in this study which decreased the margin of error to 3.09%. Data were collected from 24 zones (11 provinces, 13 districts). Locals (native islanders/Cypriots) and non-locals -who have come to the island later from other cultures but had lived on the island for more than one year- all participated on a voluntary basis. This study was approved by the local Ethics Committee and registered (NEU/2020/85-1198).

The broad sense of cultural background, length of stay on the island, food production status, health status (diagnosed chronic diseases by a physician), *etc.* were determined in the first section. The second section evaluated the adaptation status of the MD with Mediterranean Diet Adherence Screener (MEDAS). Section three is related to local and traditional foods. The researchers have prepared a novel Food Frequency Questionnaire (FFQ) to determine participants' local and traditional food consumption frequency. The questionnaire was designed with five different language alternatives by specialized translators and MEDAS validated forms specific for each language were used.

Mediterranean Diet Adherence Screener

Mediterranean Diet Adherence Screener (MEDAS) was developed by Martínez-González *et al.* and includes 14 items. A positive response -compatible with the MD- provides a +1 point [20]. According to MEDAS a score of ≤6 points mean 'low', 7-8 points 'moderate' and ≥9 points 'high' adherence to the MD [21]. Since its first publication, it has been validated in different societies and languages [22-25].

The local and traditional food consumption frequencies

The current study has organized the FFQ for local and traditional foods of Cyprus. 11 subgroups contained a total of 90 food items and two alcoholic beverages. A national book containing local and traditional foods was used to determine these food items [26]. A pilot study was conducted to evaluate this FFQ in the elderly age group who can have more knowledge about local and traditional foods. And, the latest form of the FFQ was organized according to that. The groups were composed as 'dairy products', 'vegetables', 'fruits', 'natural herbs', 'natural fruits', 'grains', 'meat/chicken/fish and shellfish', 'game animals', 'fats and seeds', 'sugary foods', 'salted foods' and 'alcoholic' beverages. In addition, researchers have designed the 'Local and Traditional Foods Photo Catalog' for easier determination of participants' consumption frequencies. The CMDP includes some nutrition suggestions for 'each meal', 'every day', 'every week', and 'rare' frequency [7]. Researchers used these frequency elements for the determination of the food frequency data. And also 'once or twice a month', 'every few months' and 'once a year' items were used for determination of rare consumption. And also, for the evaluation of consumption frequencies, 'each meal', 'daily' and 'weekly' consumption is accepted as often consumption. In addition, seasonal foods data was determined as seasonal consumption frequency. This study did not determine the amount of consumption for local and traditional foods.

Statistical analysis of data

Data was evaluated with Statistical Package for Social Science (SPSS 24.0). Descriptive statistics were used to find minimum, maximum, mean and standard deviation values of quantitative data and frequencies (n) and percentages (%) of qualitative data.

Current pyramid modification and update for sustainable diet

The Mediterranean diet has 'often', 'moderate' and 'rare' recommendation sections [7]. From this point, 'often consumption frequency' refers to weekly and more frequent consumption to support diet diversity while 'rare consumption frequency' refers to two times in a month or less frequent consumption. After the consumption frequencies of local and traditional foods were evaluated, the CMDP was rearranged with some foods that are grown and produced on the island of Cyprus. The backbone structure of the pyramid -which was developed by Bach-Faig *et al.* [7] was not altered. However, an update was made with traditional foods. The modification also aimed to safeguard planet health, increase traditional food consumption and adherence to the MD. Some traditional and local foods -which the study participants commonly consumed- were added to the pyramid to facilitate increased adaptation of the Mediterranean diet in the general population.

Certain food items – which participants consume adequately – added to make it more region-specific and some of them – which participants consume rarely – added to help to increase consumption as well as to support sustainability and public economy. Researchers and graphic design experts made the figural food symbol changes and redesign of the pyramid.

RESULTS

There were a total of 1007 participants in the current study, this has fulfilled the sample size criteria three-fold. Most of the participants (78.0%) were locals. In addition, among other participants, 59.5% have lived in Cyprus for more than ten years. 83.5% of participants was from Mediterranean origin and 33.8% of them produced their own foods such as dairies, vegetables, fruits *etc.* The mean MEDAS score was found to be 7.55±2.30 points and only 34.4% had high adherence to the MD. Healthy participants (n=707) had higher MEDAS scores than others who had at least one disease (7.61±2.28 vs 7.42±2.33) (p>0.05). The most common three chronic diseases were cardiovascular disease (19.7%), hypertension (17.0%) and diabetes mellitus (16.7%). According to their responses to the MEDAS items, there was an obvious need to increase consumption of olive oil [49.3% (n=496) consumed non-adequate amounts], vegetables [32.0% (n=322)], fruits [58.8% (n=592)], red wine [88.1% (n=887)] and fish [76.5% (n=770)]. On the other hand, there was a need to decrease consumption of red meat [38.0% (n=383) has consumed more than the MD recommendations], butter, margarine and creme [45.1% (n=454)], sugary and carbonated beverages [52.9% (n=533)] and ready-made desserts and pastries [43.7% (n=440)] (Table 1).

Table 1 – General background information and the Mediterranean diet adaptations of participants who were living in Cyprus between November 2020 to April 2021.

1 of 2

General backgrounds of participants	n	%
Cultural properties of participants		
Locals	785	78.0
Non-locals	222	22.0
Total	1007	100.0
Non-locals' duration of stay in Cyprus		
1-5 years	52	23.4
5-10 years	38	17.1
>10 years	132	59.5
Total	222	100.0

Table 1 – General background information and the Mediterranean diet adaptations of participants who were living in Cyprus between November 2020 to April 2021.

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General backgrounds of participants	n	%
Region of origin		
Mediterranean	841	83.5
Non-Mediterranean	166	16.5
Total	1007	100.0
Own food production status		
Yes	340	33.8
No	667	66.2
Total	1007	100.0
The Mediterranean diet adaptation level		
Low and moderate	661	65.6
High	346	34.4
Total	1007	100.0

Mediterranean Diet Adherence Screener scores (n=1007)	Min	Max	M	SD
	0.0	14.0	7.55	2.30

Note: M: Mean, SD: Standard Deviation.

Table 2 shows some local and traditional food consumption frequencies. Researchers have evaluated these consumption frequencies according to recommendations of the CMDP and designed the updated MD pyramid for Cyprus. 33.8% of participants produced their foods (gardening, halloumi production *etc.*) (Table 1). Thus, based on the pyramid there are some social activities such as gardening, food production and plant hunting to support and increase the rate and life quality of participants (Figure 1). Participants' often consumption frequency rates were found to be between 10.2-67.3% for traditional/local vegetables and fruits. However, they consumed natural indigenous herbs rarely (2.7-13.7%). In addition, the local olive oil consumption frequency was insufficient for recommended levels (30.4%). Local and traditional grain products were consumed rarely (3.2-31.2% had recommended consumption frequency rate) in the present study except for Cyprus pita (Table 2). Based on these results, researchers designed 'every main meal section' with traditional and local vegetables, fruits, natural herbs, Cyprus olive oil and grain products to increase consumption rates of these foods (Figure 1).

Table 2 – Consumption frequencies of some traditional foods of participants who were living in Cyprus between November 2020 to April 2021.

1 of 2

Foods	CF				Foods	CF			
	Often		Rare			Often		Rare	
	n	%	n	%		n	%	n	%
[1] Halloumi	826	82.1	181	18.1	[14] Gavulla [R]	36	3.6	971	96.4
Village yoghurt	715	71.0	292	29.0	[15] Tagarninas [C]	22	2.2	985	97.8
Curd	279	27.7	728	72.3	[16] Cyprus mountain thyme	385	38.2	622	61.8
Coriander [R]	648	64.4	359	35.9	Cyprus olive oil	306◇	30.4◇	50	5.0
Kohlrabi [R]	284	28.2	723	71.8	[17] ***Çakısdez***	730	72.5	277	27.5
[2] Molehiya [C]	210	20.9	797	79.1	[18] Pasedembo	190	18.9	817	81.1
Artichoke [C,R] stalk/trunk/leaves)	529	52.5	478	45.5	Cyprus pork/boar	80	7.9	927	92.1
Celery stalk [R]	462	45.9	545	54.1	[19] Seftali kebab ◦	112	11.1	895	88.9
[3] Zucchini blossom [C]	133	13.2	874	86.8	Dusky spine foot	76	7.5	931	92.5
Purslane [C,R]	201	20.0	806	80.0	[20] Garavolli (Snail)	11	1.1	996	98.9
[4] Louvana [C]	102	10.1	905	89.9	[21] Cyprus Ashura/Golifa ▼	16	1.6	991	98.4

Table 2 – Consumption frequencies of some traditional foods of participants who were living in Cyprus between November 2020 to April 2021. 2 of 2

Foods	CF				Foods	CF			
	Often		Rare			Often		Rare	
	n	%	n	%		n	%	n	%
Strawberry	288	28.6	719	71.4	[22] Limassol dessert(curd dessert)	5	0.5	1002	99.5
Orange	646	64.2	361	35.8	[23] Gullirikya ▲	15	1.5	992	98.5
Tangerine	678	67.3	329	32.7	[24] Crop/tavern dessert ☼	36	3.6	971	96.4
Pomelo	152	15.1	855	84.9	[25] Şammalli*	13	1.3	994	98.7
Grapes	351	34.9	656	65.1	[26] Samsı*	8	0.8	999	99.2
[5] Babutsa/Indian fig	142	14.1	865	85.9	[27] Walnut jam	46	4.6	961	95.4
[6] Common mallow[C]	124	12.3	883	87.7	[28] Pupmkin jam	8	0.8	999	99.2
[7] Hostes [C]	82	8.1	925	91.9	[29] Cyprus pastrami	147	14.6	860	85.4
[8] Bladder campion [C]	48	4.8	959	95.2	[30] Tsamerella •	35	3.5	972	96.5
[9] Yellow star-thistle [C]	27	2.7	980	97.3	Taro	90	8.9	917	91.1
[10] Wild artichoke (trunk/leaves) [C,R]	62	6.2	945	93.8	[31] Cyprus tarhana □	262	26.0	745	74.0
[11] Gavcar mushroom [C]	123	12.2	884	87.8	[32] Pirohu/Cyprus ravioli	50	4.7	957	95.3
[12] Wild asparagus [C]	138	13.7	869	86.3	Cyprus sesame bread	314	31.2	693	68.8
[13] Lapsana [R]	61	6.1	946	93.9	Hackberry rusks	32	3.2	975	96.8
Cyprus pita	858	85.2	149	14.8	Olive bread	184	18.3	823	81.7
Chickpea bread	12	1.2	995	98.8	[33] Commandaria/Paphos red wine	22	2.2	985	97.8

Note: *Often refers to weekly and more frequent consumption & *Rare refers to two times in a month and less frequent consumption. [Type of consumption]: C: Cooked, R: Raw, CF: Consumption frequencies, ⌂ Consumption rate of every meal, ○ Grilled spicy meatballs wrapped in lamb/sheep abdominal fat, ▼A dessert which is mixture of wheat, anise, pomegranate, raisin, almond, sesame and made for the New Year celebration, ▲ Dough boiled in molasses, ☼ A dessert made with curd and cream, served with honey, molasses, walnuts and pomegranates, * Desserts with sugar syrup, ● Sun-dried spicy meat, □ A soup made with bulgur, yoghurt and halloumi.

72.5% of participants met the often consumption frequency for traditional green olive. And also, only 18.9% met this frequency for nuts/seeds with pumpkin seeds. In dairy products, Halloumi received 82.1%, village yogurt 71.0% and curd 27.7% which is compatible with often consumption frequencies. On the other hand, they consumed Cyprus mountain thyme rarely in their meals (38.2%) (Table 2). From these results, traditional olive, Halloumi and village yogurt were placed in the 'every day' section to support local food consumption. And also, this section includes curd and Cyprus mountain thyme to increase consumption rates (Figure 1).

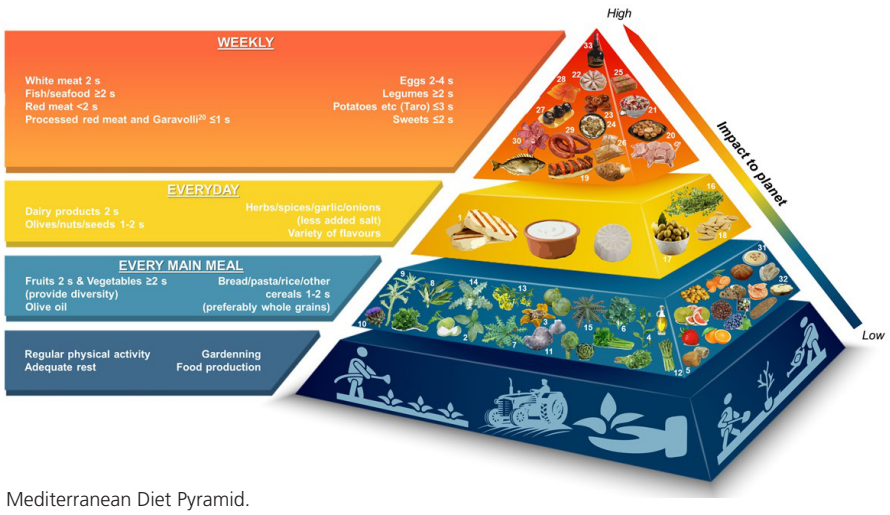

Figure 1 – Cyprus Mediterranean Diet Pyramid.
Note: s: means serving; Numbers: shows name of some traditional foods on the Table 2.

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Participants met the consumption frequency recommendations for Taro (91.1% rare consumption), red meat (92.5-88.9% rare consumption), traditional snail (98.9% rare consumption) and processed red meat products (96.5-85.4% rare consumption) according to CMDP. However, they did not meet recommended levels for fish consumption and consumed Dusky spine foot which lives in the Mediterranean Sea rarely (7.5% met consumption recommendation). In addition, consumption frequencies of salted foods and desserts were compatible with recommendations (99.5-79.1% rare consumption) (Table 2). Thus, 'weekly' section of the present pyramid includes recommendations about Taro, red meat, traditional snail, red meat products, salted foods and desserts consumption and also recommendations about Dusky spine foot was given to increase its consumption in the island (Figure 1).

Lastly, the study population did not heavily consume traditional red wine (*Commandaria*). The *Commandaria* was placed on the top of the pyramid, to address the high environmental impact while respecting social and cultural *(i.e.* religious, *etc.*) (Figure 1).

DISCUSSION

The present study showed that adherence to MD was low to moderate (n=661, 65.6%, mean score 7.55±2.30 points) in our model island in the middle of the Mediterranean Sea. Some studies with similar results report that adherence to the MD was not so high in Mediterranean countries [27-29]. However, the MD is known as the most common traditional nutrition model in the Mediterranean region with important positive effects on human and planet health, economy and culture [1,6,30]. Thus, adherence to the MD is very important at least from the sustainability point of view [31].

Scott *et al.* [32] studied the Australian population and reported that gardening had beneficial effects on physical and psychological well-being. On the other hand, food production showed positive effects on human and planet health, economy and social relations in a meta-analysis [33]. Nature activities such as gardening and plant hunting have an important role in reducing stress levels and increasing physical activity levels. Thus, it may inherently decrease the risk of some chronic diseases [34].

In this study, 33.8% of participants produced their foods such as dairies, seasonal fruits and vegetables *etc.* There is an obvious benefit to uplifting this range because of the gardening and food production benefits being provided. Thus, we have included gardening, food production and plant hunting at the base of the present pyramid.

The CMDP recommends 1-2 of servings fruits and ≥2 servings of vegetables with variety of colours/textures in every meal [7]. In the present study, 68.8% of participants consumed adequate servings of vegetables, 41.2% consumed adequate servings of fruits. Thus, Cyprus Mediterranean Diet Pyramid (CYMDP) now includes traditional/local vegetables and fruits to provide diet diversity, endorses vegetable/fruit consumption and supports local production (Figure 1).

The natural edible herbs contain some nutritional substances and potentially effect on health [35]. Some edible herbs in the Mediterranean region such as *Corchorus olitorius*, Common mallow (*Malva sylvestris*), *Cynara cornigera, Silene vulgaris, Centaurea hyalolepis, Cynara cardunculus*, wild asparagus (*Asparagus acutifolius*), *Notobasis syriaca, Sinapis alba* and wild fruits which grow in the nature include some nutrients and phytochemicals. Thus, they have potentially important health benefits [36-47]. In the current study, consumption frequencies of edible herbs and wild fruits were rare. The natural edible herbs and fruits are placed in the 'every meal' section to increase their consumption rates on the island.

Olive oil is the main feature of the MD. ≥4 spoons of olive oil consumption in a day is recommended in this diet. Accordingly, CMDP supports olive oil consumption in every meal [7]. Hence, olive oil production and marketing are common in the Cyprus [48]. According to the results, 30.4% of participants consumed

olive oil every meal and only 50.7% of them consumed adequate amount of it according to MEDAS (Table 2). There is olive oil in the 'every meal' section to increase consumption amount and support local economy (Figure 1).

The grains are an important part of 'every meal' section of the CMDP [7]. Cyprus pita is a traditional grain product that has important role in the economy of the island [49]. Consumption of Cyprus pita was found to be common in this study. Similarly, Cyprus tarhana is special for the island. It is composed of bulgur, yogurt and halloumi with probiotic effects, providing benefits on human health [50]. However, consumption frequency of Tarhana was rare, similar to other grains in the current study. Cyprus pita, Cyprus tarhana and other traditional grains were placed in CYMDP to provide diet diversity, support consumption and economy (Figure 1).

Recommendations for dairy products, olives/nuts/seeds and herbs/spices/garlic/onions are in the 'everyday' section of the CMDP [7]. Halloumi is a pickled cheese made from the milk of sheep, goat or both. It is a traditional dairy product of Cyprus [51]. Yogurt production is very easily made at home and majority of people who live in rural areas make their yogurt [52]. 82.1% participants consumed Halloumi and 71.0% consumed village yogurt often (Table 2).

The Mediterranean herbal spices have potentially positive effects on health such as Cyprus thyme (*Thymus capitatus*). It grows on the Cyprus mountains naturally [53]. On a similar ground, dried pumpkin seeds include dietary fiber, poly unsaturated fatty acids, some minerals and vitamins. It shows potential benefits on the health but high consumption of roasted type may cause to adiposity [54]. Adults who participated in this study rarely consumed these traditional foods (Table 2). There are Halloumi, village yogurt and other dairy products, Cyprus thyme, pumpkin seeds and green olive in the 'everyday' section of the present pyramid. Adequate and balanced consumption of these foods are very important for human health (Figure 1).

'Weekly' section of the CYMDP includes Taro (*Colocasia esculanta*), red meat and red meat products, traditional desserts and salted foods such as Cyprus pastrami according to their compatible consumption frequencies. On the other hand, there is Dusky spine foot (*Siganus luridus*) in this section to increase fish consumption in the island. Cyprus is the third largest producer of Taro a tuber like potato- production is common [55]. Thus, adequate and balanced consumption is very important to the local economy. 76.5% of participants preferred red meat instead of fish according to MEDAS. Similar to our study, literature supported that Cypriots prefer red meat more than others [56].

Traditional desserts are very important part of the Cypriots´culture being server home to guests. In addition, there are many traditional desserts on the menu in restaurants [18]. 43.7% of the participants had high dessert consumption than current diet recommendations in this study (Table 2).

On the other hand, pickling is common on the island. Cypriots use traditional and local natural herbs to make pickles in the home [18]. Consumption frequencies of these foods are very important. Frequent consumption of these increases the risk of some chronic disorders which have high mortality risk [57]. To address rare consumption, researchers placed these foods on the top of the CYMDP similar to Bach-Faig *et al.* [7] (Figure 1).

The MD is characterized by moderate red wine consumption (respecting social beliefs) [7]. Red wine includes resveratrol, a phenolic substance that has potential effects on health [58]. *Commandaria* is a traditional red wine of Cyprus [17].

However, participants rarely consumed it (Table 1-2). Types of dry alcohol consumption are common on island such as Zivania, Raki, *etc.* [59]. To support moderate consumption of Paphos red wine while respecting social beliefs and the local economy, *Commandaria* is placed on the top of the present pyramid (Figure 1).

CONCLUSION

This study presents a novel "Cyprus Mediterranean Diet Pyramid" developed according to current outcomes. Being a national food pyramid for an island it addresses a scope that may benefit a wide range of "global diet-life style-health" models. The study marks a first with the evaluation of traditional and local food knowledge and consumption frequencies for Cyprus while acknowledging the multicultural background (five different languages and 24 different zones).

In the current global climate and food-security crises scene, this modification is necessary to endorse the Mediterranean diet compliance, traditional and local food consumption and decrease the impact of a nutritional footprint on the planet health. Traditional food items have been added to the pyramid to pave the way for modifying consumption and adherence, while minimizing the food-insecurity dimension and as maximizing adherence.

In the future, this multidimensional approach could be adopted into further local and specific nutrition models with enhanced impact on human health with a timely focus on planet health. On the other hand, physical activity behaviors are one of the Mediterranean diet components. In addition, technological devices and vehicle use are other important things that can affect planet health negatively. These data were not determined in this study. Researchers should focus on these topics and on nutrition behaviors for future studies.

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CONTRIBUTORS

T DAYI and A ONIZ contributed to the study conception and design, data analysis and interpretation. M OZTURK and M OZGOREN contributed to the article review and approval of the final version.

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