

FOOD PURCHASING HABITS AT TRADITIONAL AND MODERN MARKETS AND CONSUMPTION OF NATURAL AND PROCESSED FOODS IN MOROCCAN HOUSEHOLDS

Imane Barakat^{1,2}, Sanaa El-Jamal¹, Houda Elfane¹, Mohammed Elayachi¹, Rekia Belahsen¹

¹Laboratory of Biotechnology, Biochemistry and Nutrition, Faculty of Sciences, Chouaib Doukkali University, El Jadida, Morocco

²Higher Institute of Professions Nurses and Health Techniques of Marrakesh, Morocco

ABSTRACT

Background. The locations of food purchase have an impact on the quality of food consumed.

Objective. To examine food purchasing habits at traditional and modern markets, their associated factors, and their effects on consuming natural and processed foods.

Material and methods. This work used a validated conceptual and methodological framework of a study conducted among 507 households in the Rabat-Salé-Kenitra region in Morocco. Data on sociodemographic and economic characteristics and the frequency of food purchasing were collected from household representatives through a population survey. The food frequency questionnaire was used to collect frequency of consumption of 20 foods, including 10 natural and 10 processed. The associations between the variables were studied by the *Chi-square* test with a level of significance of $p < 0.05$.

Results. Among the households 70% were urban, 62% have nuclear families, 51.5% a size of 5 to 12 members, 41% middle standard of living, 87% frequented markets and souks (MS), and 19% frequented large and medium-sized stores (LMS) at least once a week. The households have in majority a frequency of natural foods consumption ≥ 3 times/week, including fresh vegetables (91%), olive oil (85%), and fresh fruit (84%); and processed foods, such as refined flours (68%), industrial cheese (65%) and industrial yoghurt (52%). MS and LMS frequentation were associated with environment ($p < 0.001$), family type ($p = 0.01$ and $p = 0.002$, respectively), household size ($p = 0.04$ and $p = 0.002$ respectively) and standard of living ($p < 0.001$). Foods whose consumption was associated with both MS and LMS frequentation included fresh vegetables ($p < 0.001$) as natural foods and baked goods as processed foods (respectively, $p = 0.01$ and $p = 0.04$).

Conclusion. The results of this study argue for implementing a nutrition education strategy based on the choice of food purchase locations as well as the consumption of natural or processed foods as part of a sustainable Mediterranean diet.

Key words: food stores, markets, souks, large and medium-sized supermarkets, natural foods, processed foods, Morocco

INTRODUCTION

Food distribution systems in the emerging countries include traditional markets and modern stores such as supermarkets, hypermarkets, and minimarkets [1]. New modes of consumption and acquisition of foods [2] linked to the modern types of markets also emerged and are likely to convey new cultural values affecting tastes and eating habits [1], and favor the consumption of modern and industrial food products whose nutritional quality could be harmful to health [3]. This tends to abandon Mediterranean food model, which favors a healthy diet that is rich in biodiversity, respects the environment, and plays a beneficial role in the development of sustainable agriculture [4].

Although structured hypermarkets have acquired a good clientele, interest in local and farmers' markets is noted in both developed countries [5] and in developing countries in the southern Mediterranean area, where urban markets and daily or weekly rural souks persist in offering fresh and natural food products [6]. Indeed, food purchasing continues to be carried out from traditional markets [7] that represent spaces of exchange and communication that play a fundamental role both in sociability and in offering of various food choices. The traditional market favors the maintenance of personalized relations with the clientele [8] and preserves its social and cultural norms while granting payment facilities, unlike modern forms of markets [9, 10].

Corresponding author: Rekia Belahsen, Laboratory of Biotechnology, Biochemistry and Nutrition, Faculty of Sciences, Chouaib Doukkali University, El Jadida – 4000, Morocco, e-mail: b.rekia@gmail.com

This article is available in Open Access model and licensed under a Creative Commons Attribution-Non Commercial 3.0 Poland License (CC BY-NC) (<http://creativecommons.org/licenses/by-nc/3.0/pl/deed.en>)

Publisher: National Institute of Public Health NIH - National Research Institute

The factors that determine food purchase practices are related to the socioeconomic and demographic characteristics of households, the geographic and cultural origin of the population, and the characteristics of the market, specifically the availability of food products, and the guaranteed quality of both natural and processed products [8, 11]. In addition, food cost and socioeconomic levels are determining factors of food choice. However, increasing the amount of income available for food choices does not necessarily mean that individuals will have more balanced and healthy diets choices. Likewise, education and knowledge in terms of foods and nutrition are determinants of food choices. Thus, individuals who are educated and informed about healthy diets are more likely to make healthy food choices [12].

The purpose of the current work was to examine food purchasing habits in traditional and modern markets, their associated factors, and their effects on consuming natural and processed foods.

MATERIAL AND METHODS

This work is a part of a study based on a validated conceptual and methodological framework that was conducted on 507 households in the region of Rabat-Salé-Kenitra in Morocco [13].

Data collection

Data were collected from household representatives (HRs) who have a major role in food purchases through a survey on sociodemographic, socioeconomic, sociocultural, and dietary characteristics, as well as food shopping locations. The frequency of food consumption within households was collected by a food frequency questionnaire [14–16]. The latter was designed taking into account the methods of development of this type of instrument [17] and consisted of a closed list of 20 natural and processed foods. The natural foods studied were: whole wheat, fresh vegetables, pulses, fresh fruit, fish, olive oil, free-range chicken, free-range egg, fresh cheese and free-range butter. The processed foods studied were: refined flour, baked goods, corn flakes, potato chips, packaged milk, industrial cheese, industrial yogurt, industrial chicken, industrial eggs, and industrial butter.

Variables under study

1. Household characteristics: area of residence, family type, household size, and standard of living.
2. HRs characteristics: age, education, work status, marital status, ethnicity, and sources of food information.

3. Frequentation of markets and souks¹ (MS) and large and medium-sized stores (LMS) categorized into, 1) < once a week; 2) ≥ once a week.
4. Frequency of consumption of natural or processed foods, categorized as 1) < 3 times per week; 2) ≥ 3 times per week.

Statistical analysis

Statistical analysis was performed by SPSS for Windows (Statistical Package for the Social Sciences) version 21 and Microsoft Office Excel 2007. The *Chi-square* test was used to study associations between variables with a statistical significance level of $p < 0.05$.

RESULTS

Characteristics of households and their representatives

The study results showed that 70% of the households are urban, 62% are nuclear families, 51.5% are composed of 5 to 12 members, 41% have an average standard of living, 87% go to the MS, and 19% go to the LMS, at least once a week. Moreover, 76% of the HRs are aged 35 to 65 years, 40% are illiterate, 13% have a higher education, 76% are inactive, 80% are married, 80% are of Arab ethnic origin, and all of them have as source of dietary information their parents and grandparents, 80% from the media, 59% from their entourage, 35% from health professionals, 26% from Internet websites, and 12% from scientific journals (Table 1).

Frequency of consumption of natural and processed foods within households

The majority of the surveyed households have a consumption frequency of ≥ 3 times per week of some natural foods, including fresh vegetables (91%), olive oil (85%), fresh fruits (84%), whole wheat (64%), and free-range butter (52%); and of some processed foods, namely, the packaged milk (90%), industrial butter (81%), refined flours (68%), industrial cheese (65%), and industrial yogurt (52%) (Figure 1).

Associations of household characteristics and their representatives with MS and LMS frequentation

Data analysis revealed that household characteristics that have a significant association with the frequentation of both MS and LMS are household size ($p = 0.04$, $p = 0.002$; respectively), environment ($p < 0.001$, $p < 0.001$; respectively), family type ($p = 0.01$, $p = 0.002$; respectively), and living standard ($p < 0.001$, $p < 0.001$; respectively). On the other hand, HRs char-

¹ In the Arab world, souks are ephemeral fairs, usually held weekly. They are also places for commercial transactions. They're almost always outdoors. There are rural souks and urban souks. It contains everything that people in a traditional society need in terms of food.

Table1. Characteristics of households and their representatives (n=507)

Characteristics *		Values (%)	CI 95%	
Household characteristics				
Area of residence	Urban	355 (70)	[67-73]	
	Rural	152 (30)	[27-33]	
Family type	Nuclear	316 (62)	[58-67]	
	Composed	191 (38)	[33-42]	
Household size	2-4 members	246 (48.5)	[43.8-53.1]	
	5-12 members	261 (51.5)	[46.9-56.2]	
Standard of living	Low	156 (31)	[27-35]	
	Average	208 (41)	[37-45]	
	High	143 (28)	[25-32]	
Food purchase locations	MS	< Once a week	65 (13)	[10.1-16]
		≥ Once a week	442 (87)	[84-89.9]
	LMS	< Once a week	409 (81)	[76.9-84.2]
		≥ Once a week	98 (19)	[15.8-23.1]
Household representatives characteristics				
Age groups (years)	20-34	122 (24)	[20.1-27.8]	
	35-65	385 (76)	[72.2-79.9]	
Education level	Without	209 (40)	[37.3-45.4]	
	Preschool and primary	100 (20)	[16.2-23.3]	
	Secondary school	78 (16)	[12.2-18.5]	
	Qualifying secondary	53 (11)	[7.7-13.2]	
	Higher education	67 (13)	[10-16.4]	
Professional occupation	Active	122 (24)	[20.3-27.6]	
	Inactive	385 (76)	[72.4-79.7]	
Marital status	Single	41 (8)	[5.9-10.3]	
	Married	405 (80)	[76.5-83.4]	
	Divorced	42 (8)	[5.9-10.7]	
	Widower	19 (4)	[2.2-5.5]	
Ethnic origin	Arabs	403 (80)	[76-83]	
	Berber	104 (20)	[17-24]	
Food information sources	Parents and grand parents	507 (100)	[100-100]	
	Family and entourage	297 (59)	[54.2-62.7]	
	Health Professionals	175 (35)	[30.4-38.9]	
	Scientific journals	62 (12)	[9.7-15]	
	Internet Websites	132 (26)	[22.1-29.8]	
	Media	404 (80)	[76.1-83.2]	

* = Expressed in size (%); CI = Confidence interval; MS = markets and souks; LMS = large and medium-sized stores.

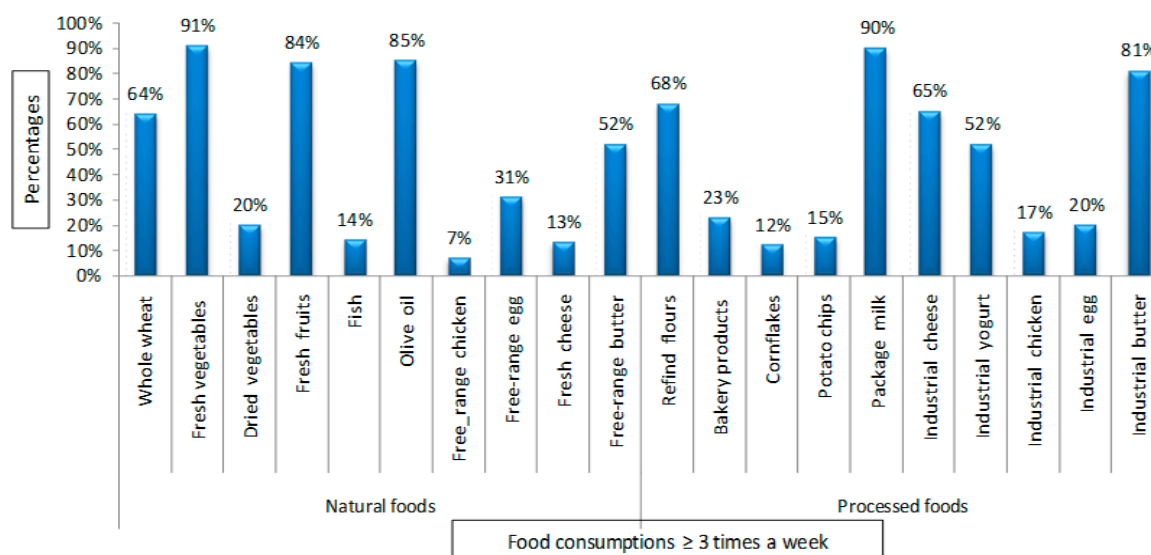


Figure 1. Distribution of households according to the frequency of consumption of natural and processed foods (n=507)

Table 2. Characteristics of households and their representatives associated with frequentation of MS and LMS (n=507)

Characteristics *	MS			LMS			
	<1/S (%)	≥1/S (%)	P**	<1/S (%)	≥1/S (%)	P**	
Age groups (years)							
20-34	17 (14)	105 (86)	0.3	103 (84)	19 (16)	0.1	
35-65	48 (12.5)	337 (87.5)	NS	306 (79.5)	79 (20.5)	NS	
Area of residence							
Urban	62 (17.5)	293 (82.5)	<0.001	262 (74)	93 (26)	<0.001	
Rural	3 (2)	149 (98)	***	147 (97)	5 (3)	***	
Education level							
Without,	14 (6.7)	195 (93)	<0.001 ***	192 (92)	17 (8)	<0.001 ***	
Preschool and primary	11 (11)	89 (89)		81 (81)	19 (19)		
Secondary school	6 (8)	72 (92)		58 (74)	20 (26)		
Qualifying secondary	17 (32)	36 (68)		37 (70)	16 (30)		
Higher education	17 (25)	50 (75)		41 (61)	26 (39)		
Professional occupation							
Active	23 (19)	99 (81)	0.02	90 (74)	32 (26)	0.02	
Inactive	42 (11)	343 (89)	***	319 (83)	66 (17)	***	
Marital status							
Single	9 (22)	32 (78)	0.3 NS	24 (58.5)	17 (40.5)	0.001 ***	
Married	49 (12)	356 (88)		330 (81.5)	75 (18.5)		
Divorced	5 (12)	37 (88)		39 (93)	3 (7)		
Widower	2 (10.5)	17 (89.5)		16 (84)	3 (16)		
Ethnic origin							
Arabic	57 (14)	346 (86)	0.04	320 (79)	83 (21)	0.09	
Berber	8 (8)	96 (92)	***	89 (86)	15 (14)	NS	
Food information sources							
Family and entourage	Yes	33 (11)	264 (89)	0.2	241 (81)	56 (19)	0.7
	No	32 (15)	178 (85)	NS	168 (80)	42 (20)	NS
Health Professionals	Yes	32 (18)	143 (82)	0.01	125 (71)	50 (29)	<0.001
	No	33 (10)	299 (90)	***	284 (85.5)	48 (14.5)	***
Scientific journals	Yes	14 (23)	48 (77)	0.02	38 (61)	24 (39)	<0.001
	No	51 (11.5)	394 (88.5)	***	371 (83)	74 (17)	***
Internet Websites	Yes	32 (24)	100 (76)	<0.001	88 (67)	44 (33)	<0.001
	No	33 (9)	342 (91)	***	321 (86)	54 (14)	***
Media	Yes	54 (13)	350 (87)	0.3	320 (79)	84 (21)	0.09
	No	11 (11)	92 (89)	NS	89 (86)	14 (14)	NS
Family type							
Nuclear	49 (15.5)	267 (84.5)	0.01	242 (77)	74 (23)	0.002	
Composed	16 (8)	175 (92)	***	167 (87)	24 (13)	***	
Household size							
2-4 members	42 (17)	204 (83)	0.04	185 (75)	61 (25)	0.002	
5-12 members	23 (9)	238 (91)	***	224 (86)	37 (14)	***	
Standard of living							
Low	7 (4.5)	149 (95.5)	<0.001 ***	142 (91)	14 (9)	<0.001 ***	
Average	29 (14)	179 (86)		169 (81)	39 (19)		
High	29 (20)	114 (80)		98 (68.5)	45 (31.5)		

* = Expressed in Size (%); ** = *Chi*-square test with a significance level of $p < 0.05$; *** = Significant; NS = Not significant; MS: Markets and Souks; LMS: Large and Medium-sized Stores.

acteristics that had a significant association with MS frequentation were, ethnicity ($p=0.04$), education level ($p<0.001$), work status ($p=0.02$), consulting of health professionals ($p=0.01$), use of scientific journals ($p=0.02$), and internet websites ($p<0.001$). In addition, HRs characteristics that had a significant association with LMS frequentation, are age ($p=0.003$), education level ($p<0.001$), work status ($p=0.02$), marital status ($p=0.001$), consulting of health professionals ($p<0.001$), use of scientific journals ($p<0.001$) and internet websites ($p<0.001$) (Table 2).

Associations between frequentation of MS and LMS, and consumption frequency of natural and processed foods

The natural foods whose consumption was significantly associated with frequenting MS are whole wheat ($p<0.001$), fresh vegetables ($p<0.001$), fresh fruit ($p<0.001$), fish ($p<0.001$), and free-range chicken ($p<0.001$); and those whose consumption is significantly associated with the frequentation of LMS are whole wheat ($p<0.001$), fresh vegetables ($p<0.001$), dried vegetables ($p<0.001$), fish ($p<0.001$), and fresh cheese ($p=0.02$) (Table 3).

The processed foods whose consumption was significantly associated with MS frequentation were, cornflakes ($p=0.01$), potato chips ($p=0.003$), and industrial chicken ($p=0.03$); and those whose consumption is significantly associated with the frequentation of LMS are, bakery products ($p=0.04$), cornflakes ($p=0.03$), potato chips ($p<0.001$) and industrial yogurt ($p=0.01$) (Table 4).

DISCUSSION

The nutritional quality of foods introduced in recent decades has been reported to be incriminated in the etiology of many chronic diseases which are on the rise in both developed and developing countries, including Morocco. These diseases have been linked to the negative effects of the complex interplay of multiple nutritional factors directly linked to the excessive consumption of new foods and industrialized foods high in fats, refined sugars and salt. In addition, consumers' food choices are influenced by the global emerging trends. On the other hand, food preparation procedures even simple affect their initial nutritional quality. Around the world, the processed food sector is increasingly contributing to both the economy and people's eating habits [18]. Also, as in western countries worldwide, supermarkets and hypermarkets are expanding in developing countries including, in Morocco [19].

However, the present study shows that, markets and souks are more frequently visited by the studied population than large or medium-sized stores. This

result proves that traditional trade is still resisting, despite the development of modern distribution networks. This can be explained by the fact that this type of trade fulfills, beyond its economic function, a mission of social link, personalized relationships, and payment facilities [1, 9, 20, 21]. All these advantages that are difficult to find in modern stores encourage the consumer to adopt a selective behavior towards traditional food shopping markets [22, 23].

The present study revealed also several statistically significant associations of household characteristics and their representatives with MS and LMS frequentation. Indeed, there are significant associations of sociodemographic, sociocultural, and socioeconomic characteristics with food practices as a whole and more specifically with food shopping [24–26]. It should be noted that purchasing power and area of residence are among the determining factors in the choice of places to buy food. Thus, frequenting supermarkets generally characterizes the wealthy socio-professional category living in urban areas and not those with low incomes, living in rural areas [27]. On the other hand, the size of the household would be proportional to the food expenses within the household and would direct the food purchase choices toward the most economically accessible sale points. Consistent with these data, it has been reported that the structure and quantity of foods and dishes consumed as well as in food preparation and consumption practices differ according to household size [11]. Monthly income and standard of living would also be proportional to food expenditure. In addition, income has been reported as a moderating factor of the relationships between involvement and intention to buy with food purchasing behavior [28]. Furthermore, low family income has been consistently associated with poorer food quality [11]. Another factor involved is ethnicity which is also associated with food purchasing practices. The cultural heritage specific to each ethnic group is indeed among others factors which can influence the choice of food purchases [29]. Also, the influence of the ethnic origin of the family in determining the eating behavior of individuals has been confirmed [30].

Educational level is also recognized as a determinant of food preferences. Indeed, food-buying behavior has been reported to be influenced by the education level [28]. Work status can also lead individuals to resort to local food stores due to lack of time and availability [29, 31].

Furthermore, the type of family influences the selection of food markets. Indeed, family members, depending on their nuclear or extended type, are involved in guiding food choices within the household. The extended family, which generally includes grandparents, aunts, uncles, etc., tries to ensure that good eating habits are adopted by family members and thus

Table 3. Associations between natural food consumption and frequentation of MS and LMS (n=507)

Food purchase locations	Foods*		Whole wheat	Fresh vegetables		Dried vegetables	Fresh fruits		Fish		Olive oil		Free-range chicken		Free-range eggs		Fresh cheese		Free-range butter	
	<1/w	≥1/w		<3/w	≥3/w		<3/w	≥3/w	<3/w	≥3/w	<3/w	≥3/w	<3/w	≥3/w	<3/w	≥3/w	<3/w	≥3/w	<3/w	≥3/w
MS	<1/w		65 (36%)	19 (4%)	54 (13%)	11 (11%)	39 (49%)	26 (6%)	46 (11%)	19 (28%)	12 (16%)	53 (12%)	45 (10%)	20 (53%)	48 (14%)	17 (11%)	54 (12%)	11 (16%)	32 (13%)	33 (12%)
	≥1/w		115 (64%)	442 (96%)	353 (87%)	289 (89%)	40 (51%)	402 (94%)	392 (89%)	50 (12%)	64 (84%)	378 (88%)	424 (90%)	18 (47%)	300 (88%)	142 (89%)	386 (88%)	56 (84%)	209 (87%)	233 (88%)
	P		<0.001***	<0.001***	0.5 NS	<0.001***	<0.001***	<0.001***	<0.001***	<0.001***	0.4 NS	0.4 NS	<0.001***	0.3 NS	0.3 NS	0.3 NS	0.3 NS	0.3 NS	0.7 NS	0.7 NS
LMS	<1/w		128 (71%)	23 (50%)	344 (84%)	65 (65%)	59 (74%)	350 (82%)	394 (90%)	15 (22%)	65 (85%)	344 (80%)	378 (81%)	31 (82%)	284 (82%)	125 (79%)	348 (79%)	61 (91%)	201 (83%)	208 (78%)
	≥1/w		52 (29%)	75 (16%)	63 (16%)	35 (35%)	20 (25%)	78 (18%)	44 (10%)	54 (78%)	11 (15%)	87 (20%)	91 (19%)	7 (18%)	64 (18%)	34 (21%)	92 (21%)	6 (9%)	40 (17%)	58 (22%)
	P		<0.001***	<0.001***	<0.001***	0.1 NS	<0.001***	0.1 NS	<0.001***	<0.001***	0.2 NS	0.2 NS	0.8 NS	0.4 NS	0.4 NS	0.4 NS	0.02***	0.02***	0.1 NS	0.1 NS

* = Expressed in size (%); ** = *Chi*-square test with significance level $p < 0.05$; *** = Significant; NS = Not Significant; MS = Markets and souks; LMS = Large and medium-sized stores; w = week.

Table 4. Associations between processed food consumption and frequentation of MS and LMS (n=507)

Food purchase locations	Foods*		Refined flour	Bakery products		Cornflakes	Potato chips		Package milk		Industrial cheese		Industrial yogurt		Industrial chicken		Industrial egg		Industrial butter	
	<1/S	≥1/S		<3/S	≥3/S		<3/S	≥3/S	<3/S	≥3/S	<3/S	≥3/S	<3/S	≥3/S	<3/S	≥3/S	<3/S	≥3/S	<3/S	≥3/S
MS	<1/S		18 (11%)	42 (11%)	56 (13%)	9 (15%)	47 (11%)	18 (23%)	5 (10%)	60 (13%)	22 (12%)	43 (13%)	37 (15%)	28 (11%)	60 (14%)	5 (6%)	51 (13%)	14 (14%)	15 (16%)	50 (12%)
	≥1/S		142 (89%)	346 (89%)	391 (87%)	51 (85%)	383 (89%)	59 (77%)	47 (90%)	395 (87%)	155 (88%)	287 (87%)	205 (85%)	237 (89%)	361 (86%)	81 (94%)	355 (87%)	87 (86%)	81 (84%)	361 (87%)
	P**		0.5 NS	0.01***	0.6 NS	0.003***	0.003***	0.5 NS	0.5 NS	0.5 NS	0.8 NS	0.8 NS	0.1 NS	0.1 NS	0.03***	0.03***	0.7 NS	0.7 NS	0.4 NS	0.4 NS
LMS	<1/S		125 (78%)	306 (79%)	355 (79%)	54 (90%)	387 (90%)	22 (29%)	39 (75%)	370 (81%)	145 (82%)	264 (80%)	206 (85%)	203 (77%)	334 (79%)	75 (87%)	322 (79%)	87 (86%)	83 (87%)	326 (79%)
	≥1/S		35 (22%)	82 (21%)	92 (21%)	6 (10%)	43 (10%)	55 (71%)	13 (25%)	85 (19%)	32 (18%)	66 (20%)	36 (15%)	62 (23%)	87 (21%)	11 (13%)	84 (21%)	14 (14%)	13 (13%)	85 (21%)
	P**		0.3 NS	0.04***	0.03***	<0.001***	<0.001***	0.3 NS	0.3 NS	0.3 NS	0.6 NS	0.6 NS	0.01***	0.01***	0.09 NS	0.09 NS	0.1 NS	0.1 NS	NS	NS

* = Expressed as size (%); ** = *Chi*-square test with significance level $p < 0.05$; *** = Significant; NS = Not significant; MS = Markets and souks; LMS = Large and medium-sized stores.

gives their opinion on the food shopping for the household [32]. Also, the family represents the decision-making unit that is made by the couple [33]. In the same context, marital status is a factor associated with the choice of food shopping locations, as the opinions of both spouses are taken into consideration in any type of food purchase for the benefit of the family [11].

Finally, sources of food information are associated with choices for food purchase locations. However, vigilance and the ability to distinguish between good and bad information are required in this respect, to avoid places that offer foods that are potentially harmful to health and/or that are advised by people and/or authorities who are not qualified in the matter [34, 35, 36].

This study also showed that the majority of the surveyed households consume certain natural foods quite frequently (at least three times a week), including fresh vegetables and fruits, olive oil, whole wheat, and free-range butter. The positive effect of all these natural foods is reported in the literature. Indeed, the benefits of fresh vegetables and fruits are well known and include a diverse group of plant materials that vary considerably in energy and nutrient content. In addition, fruits and vegetables provide dietary fibers that are associated with a lower incidence of cardiovascular diseases and obesity, provide vitamins and minerals, and are sources of phytochemicals with antioxidants activities, phytoestrogens, and as anti-inflammatory agents [37, 38, 39]. Olive oil is also a foodstuff that has proven its virtues for good health, and well-being as well as its beneficial impact on lipid metabolism [40]. A study covering 28 years of follow-up showed indeed that higher consumption of olive oil was associated with a 19% lower risk of mortality from cardiovascular diseases, a 17% lower risk of mortality from cancer, a 29% lower risk of mortality from neurodegenerative diseases, and an 18% lower risk of mortality from respiratory diseases [41]. Regarding whole wheat consumption, whole grain intake has been shown to reduce the risk of several non-communicable diseases, including cardiovascular diseases, type 2 diabetes, and some types of cancer [42–44]. Unfortunately, despite its recognized nutritional and health benefits, whole grain consumption is below recommendations in almost all countries of the world [45]. Regarding the consumption of free-range butter, few studies have investigated its effect on health and particularly on the lipid profile compared with industrially produced butter. Nevertheless, there is generally considerable interest in free-range products, given their higher content of bioactive compounds [46].

On the other hand, the present study also showed that certain processed foods were quite frequently consumed (at least three times a week) by the majority of the investigated population. It is about, packaged

milk, industrial butter, industrial cheese, industrial yogurt, and refined flour. Regarding the consumption of milk and other dairy products, recent evidence has shown controversial results regarding their role in deleterious processes such as inflammation [47]. The effect of dairy consumption on health has received considerable attention over the past decade. However, there is uncertainty about their health effects, as several prospective cohort studies have shown conflicting results. On the other hand, no association between the consumption of dairy products and the risk of all-cause mortality has been demonstrated in all the systematic reviews and meta-analyses on the risk of mortality linked to the consumption of dairy products [48]. Concerning refined flour, it has been reported that its consumption has adverse health effects, including an increased risk of cardiovascular diseases, type 2 diabetes, and obesity [49], which could be linked to a loss of both dietary fibers and mineral content by the refining of cereals as well as an increase in carbohydrate content [50].

The present study revealed that among the natural foods, the consumption of whole wheat, fresh vegetables, fresh fruits, fish, and free-range chicken is significantly associated with the frequentation of MS. Indeed, markets and souks represent a shopping area where various food products used daily in Moroccan cuisine are available. Moreover, MS offer healthy foods with nutritional virtues for health, given their richness in dietary fibers, minerals and vitamins, and proteins of high biological value. This study showed also that the natural foods whose consumption is associated with the frequentation of LMS are whole wheat, fresh vegetables, dried vegetables, fish, and fresh cheese. This justifies the diversity of foods offered by the LMS, which do not only offer processed foods as is generally assumed.

The data reported here also revealed that the processed foods whose consumption is significantly associated with the frequentation of MS are bakery products and industrial chicken. This diversity of available foods (natural and processed) is explained by the fact that MS provide everything that the populations require in terms of foodstuffs while also providing modern sales points such as bakeries and pastry shops, grocery stores, butcher shops, etc. Admittedly, LMS usually offer sophisticated or refined products while MS continue to be the priority recourse for the purchase of natural or traditional products [51, 52].

The present study did not, however, find an exclusive statistically significant association between the consumption of natural foods and the frequentation of traditional markets, or between the consumption of modern foods and the frequentation of LMS.

CONCLUSION

This work investigated factors associated with food purchasing habits at traditional and modern markets, as well as its implication on the consumption of natural and processed foods. These results will serve as the basis for the establishment of a nutrition education strategy on the choice of places for food shopping and on the consumption of natural and processed foods in the context of a sustainable Mediterranean diet.

Acknowledgements

The authors present their heartfelt thanks to the Wilaya and the Regional Directorate of Health in the Rabat-Salé-Kenitra region for having authorized the carrying out of this study.

Funding sources

This study did not receive any funding.

Conflicts of interest

The authors declare that they have no conflicts of interest.

REFERENCES

1. Amine A., Lazzaoui N.: Rôle de la distribution moderne dans l'évolution des pratiques de consommation dans les pays émergents: Cas de la distribution alimentaire au Maroc. *Revue Marocaine de Recherche en Management et Marketing* 2009; (1).
2. Amine A.: La grande distribution dans les pays émergents: caractéristiques, enjeux et perspectives. *Marché et organisations* 2012;15(1):117-41.
3. Van Diepen S., Scholten AM., Korobili C., Kyrli D., Tsigga M., Van Diejen T., et al.: Greater Mediterranean diet adherence is observed in Dutch compared with Greek university students. *Nutr Metab Cardiovasc Dis* 2011;21(7):534-40.
4. Belahsen R.: Nutrition transition and food sustainability. *Proc Nutr Soc* 2014;73(3):385-8.
5. Laisney C.: L'évolution de l'alimentation en France: tendances émergentes et ruptures possible. *Futuribles* 2011;5-23.
6. Mermier F., Peraldi M.: Mondes et places du marché en Méditerranée; formes sociales et spatiales de l'échange. Paris 2011.
7. Hannah C., Davies J., Green R., Zimmer A., Anderson P., Battersby J., et al.: Persistence of open-air markets in the food systems of Africa's secondary cities. *Cities* 2022;124:103608.
8. Belloute R., Diour M.: Comportement et critères d'achat des produits alimentaires au Maroc et les facteurs qui les influencent. *Mersenne* 2014;6 (141116 ISSN 2111-4706):1-14.
9. Gahinet MC.: The dimensions of proximity applied to food purchases. *Revue d'économie régionale urbaine* 2018;(5):1367-90.
10. Goldman A., Ramaswami S., Krider RE.: Barriers to the advancement of modern food retail formats: theory and measurement. *Journal of Retailing* 2002;78 (4):281-95.
11. French SA., Tangney CC., Crane MM., Wang Y., Appelhans BM.: Nutrition quality of food purchases varies by household income: the Shopper study. *BMC Public Health* 2019;19(1):231.
12. Langley-Evans S.: M. J. Gibney, B. M. Margetts, J. M. Kearney and L. Arab (editors). *Public Health Nutrition*. Oxford: Blackwell Science 2004. pp. 378. ISBN 0632056274». *British Journal of Nutrition*. Cambridge University Press 2006;95(1):214.
13. Barakat I., Elayachi M., Belahsen R.: Validation of conceptual and methodological framework for the study of dietary practices and nutritional status of an adult population. *Rocz Panstw Zakl Hig* 2022;73(2):199-207.
14. Monteiro CA., Levy RB., Claro RM., Castro IRR de., Cannon G.: A new classification of foods based on the extent and purpose of their processing. *Cad Saude Publica* 2010;26(11):2039-49.
15. Moubarac JC., Martins APB., Claro RM., Levy RB., Cannon G., Monteiro CA.: Consumption of ultra-processed foods and likely impact on human health. Evidence from Canada. *Public Health Nutr* 2013;16(12):2240-8.
16. Moubarac JC., Batal M., Martins APB., Claro R., Levy RB., Cannon G., et al.: Processed and ultra-processed food products: consumption trends in Canada from 1938 to 2011. *Can J Diet Pract Res* 2014;75(1):15-21.
17. Rutishauser IH.: Dietary intake measurements. *Public Health Nutrition* 2005; 8(7a):1100-7.
18. Cordain L., Eaton SB., Sebastian A., Mann N., Lindeberg S., Watkins BA., O'Keefe JH., Brand-Miller J.: Origins and evolution of the Western diet: health implications for the 21st century. *Am J Clin Nutr* 2005;81(2):341-54. doi: 10.1093/ajcn.81.2.341. PMID: 15699220.
19. Reardon T., Timmer CP.: The Economics of the Food System Revolution. *Annual Review of Resource Economics* 2012;4(1):225-64.
20. Aladwani AM.: A quality-facilitated socialization model of social commerce decisions. *Int. J. Info Management* 2018;40:1-7.
21. Busalim AH., Hussin ARC.: Understanding social commerce: A systematic literature review and directions for further research. *Int J. Information Management* 2016;36(6, Part A):1075-88.
22. Skallerud K., Wien AH.: Preference for local food as a matter of helping behaviour: Insights from Norway. *Journal of Rural Studies* 2019;67:79-88.
23. Veeck A., Leingpibul T., Xie H., Veeck G.: The role of personal factors in attitudes toward the adoption of new consumption behaviors in developing food systems. *Appetite* 2020; 149:104614.
24. Aydin G.: Do Personality Traits and Shopping Motivations Affect Social Commerce Adoption Intentions? Evidence from an Emerging Market. *Journal of Internet Commerce* 2019;18(4):428-67.
25. Idoko EC., Ukenna SI., Obeta CE.: Determinants of shopping mall patronage frequency in a developing economy: Evidence from Nigerian mall shoppers.

- Journal of Retailing and Consumer Services 2019;48:186-201.
26. *Kusumawaty Y.*: Determinants of cross-shopping behaviour among modern and traditional food retail stores in Indonesia: An empirical analysis of Riau Province [Thesis]. Curtin University; 2016.
 27. *El Mimouni D.*: Enquête grande distribution: où les Marocains font-ils leurs courses? Sunergia 2020.
 28. *Gnoufougou D.*: Effet modérateur du niveau d'éducation et du niveau de revenu dans les relations entre implication du consommateur et intention d'achat et comportement d'achat biologique. *Recherches et Pratiques Marketing* 2021;(5).
 29. *Reddy G., van Dam RM.*: Food, culture, and identity in multicultural societies: Insights from Singapore. *Appetite* 2020;149:104633.
 30. *Labossiere W., Bouheni FB., Bellelah M.*: Effect of Ethnic Socialization Factors on Determination of Ethnicity and Consumption Behavior. *La Revue des Sciences de Gestion* 2018;293(5):61-70.
 31. *Çalışkan C., Sabbağ Ç., Dedeoğlu B.*: The Importance of the Occupational Factors in Local Food Consumption Behavior. *Anais Brasileiros de Estudos Turísticos - ABET.* 2019; 9.
 32. *Lindsay AC., Wallington SF., Lees FD., Greaney ML.*: Exploring How the Home Environment Influences Eating and Physical Activity Habits of Low-Income, Latino Children of Predominantly Immigrant Families: A Qualitative Study. *International Journal of Environmental Research and Public Health* 2018;15(5):978.
 33. *Sdiri I., Bendhia B.*: Les déterminants de la décision d'achat du couple : Contexte Tunisien. *Revue Internationale des Sciences de Gestion* 2019;2(3).
 34. *Clavier V.*: La place de l'information dans les pratiques professionnelles des diététiciennes : au croisement des missions d'éducation, de prévention et de soin. *I2D - Information, données documents* 2019;1(1):114-33.
 35. Haut Commissariat au Plan (Maroc): Indicateurs Sociaux. HCP 2016. <https://www.hcp.ma/region-drda/attachment/834622/>.
 36. *Quaidoo EY., Ohemeng A., Amankwah-Poku M.*: Sources of nutrition information and level of nutrition knowledge among young adults in the Accra metropolis. *BMC Public Health* 2018;18:1323.
 37. *Morris AL., Mohiuddin SS.*: Biochemistry, Nutrients. In: *StatPearls*. Treasure Island (FL): Stat Pearls Publishing 2022.
 38. Organisation Mondiale de la Santé (OMS): Alimentation Saine. 2018. <https://www.who.int/fr/news-room/fact-sheets/detail/healthy-diet>.
 39. *Slavin JL., Lloyd B.*: Health benefits of fruits and vegetables. *Adv Nutr* 2012;3(4):506-16.
 40. *Tomé-Carneiro J., Crespo MC., López de Las Hazas MC., Visioli F., Dávalos A.*: Olive oil consumption and its repercussions on lipid metabolism. *Nutr Rev* 2020;78(11):952-68.
 41. *Guasch-Ferré M., Li Y., Willett WC., Sun Q., Sampson L., Salas-Salvadó J., et al.*: Consumption of Olive Oil and Risk of Total and Cause-Specific Mortality Among U.S. Adults. *Journal of the American College of Cardiology* 2022;79(2):101-12.
 42. *Aune D., Keum N., Giovannucci E., Fadnes LT., Boffetta P., Greenwood DC., et al.*: Whole grain consumption and risk of cardiovascular disease, cancer, and all cause and cause specific mortality: systematic review and dose-response meta-analysis of prospective studies. *BMJ* 2016;353:i2716.
 43. *Chanson-Rolle A., Meynier A., Aubin F., Lappi J., Poutanen K., Vinoy S., et al.*: Systematic Review and Meta-Analysis of Human Studies to Support a Quantitative Recommendation for Whole Grain Intake in Relation to Type 2 Diabetes. *PLoS One* 2015;10(6):e0131377.
 44. *Johnson J., Wallace TC.*: Introduction to Whole Grains and Human Health. In: *Whole Grains and their Bioactives*. John Wiley & Sons, Ltd 2019. p. 1-17.
 45. *Meynier A., Chanson-Rollé A., Riou E.*: Main Factors Influencing Whole Grain Consumption in Children and Adults-A Narrative Review. *Nutrients.* 2020;12(8):2217. doi:10.3390/nu12082217.
 46. *Werner LB., Hellgren LI., Raff M., Jensen SK., Petersen RA., Drachmann T., et al.*: Effects of butter from mountain-pasture grazing cows on risk markers of the metabolic syndrome compared with conventional Danish butter: a randomized controlled study. *Lipids Health Dis* 2013;12:99.
 47. *Ulven SM., Holven KB., Gil A., Rangel-Huerta OD.*: Milk and Dairy Product Consumption and Inflammatory Biomarkers: An Updated Systematic Review of Randomized Clinical Trials. *Adv Nutr* 2019;10(suppl_2):S239-50.
 48. *Cavero-Redondo I., Alvarez-Bueno C., Sotos-Prieto M., Gil A., Martinez-Vizcaino V., Ruiz JR.*: Milk and Dairy Product Consumption and Risk of Mortality: An Overview of Systematic Reviews and Meta-Analyses. *Adv Nutr* 2019;10(suppl_2):S97-104.
 49. *Gaesser GA.*: Perspective: Refined Grains and Health: Genuine Risk or Guilt by Association? *Adv Nutr* 2019;10(3):361-71.
 50. *Jeanette R., Croguennec T., Schuck P., Brule G.*: *Handbook of Food Science and Technology 2: Food Process Engineering and Packaging*. John Wiley & Sons 2016. 346 p.
 51. *Potvin L.*: Les aliments ultra-transformés, un concept utile pour la santé publique. *Can J Public Health* 2019;110(1):1-3.
 52. *Sproesser G., Ruby MB., Arbit N., Akotia CS., Alvarenga M dos S., Bhangaokar R., et al.*: Understanding traditional and modern eating: the TEP10 framework. *BMC Public Health* 2019;19(1):1606.

Received: 06.02.2023

Accepted: 07.04.2023

