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Assessing the Knowledge and Purchasing Behavior of Consumers towards Olive Oil in Lebanon

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HIGHLIGHTS

- Majority of the participants' study had minimal knowledge towards olive oil.
- Lebanese consumers preferred dark olive oil with strong flavor and packed in glass containers.
- The need to improve consumer awareness of the olive oil's benefits, which will influence their purchasing decisions.

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Acronyms and abbreviations
EVOO=Extra Virgin Olive Oil
VOO=Virgin Olive Oil

ABSTRACT

Background: The olive oil in Lebanon play an essential role in the development of rural communities, providing a source of revenue and employment for most Lebanese population. Due to its high sensory quality and health benefits, olive oil is considered the most widely consumed oil in the Mediterranean area. Considering the factors that affect individual's knowledge of olive oil and consumer purchasing behavior can be difficult due to the diverse culture in Lebanon. The purpose of the current study was to evaluate the level of knowledge and the impact of sociological-demographic factors on the knowledge and consumer purchasing behavior towards olive oil among the general population in Lebanon.

Methods: A cross-sectional study was conducted in Lebanon between January and March 2021 in which 604 responses have been collected. The questionnaire made up of four dimensions: socio-demographic characteristics, knowledge, sources and usage of olive oil; and consumer preference part. IBM SPSS V22 was applied to analyze the data for descriptive statistics and chi-square test for independence. *p*-value of less than 0.05 was employed as the level of significance

Results: The findings revealed that the majority of the participants had only one or two uses of olive oil in their daily life and had minimal knowledge towards it. The association between the knowledge of participants about nutritional properties of olive oil among different sociological-demographic factors as governorate, gender, age and marital status was statistically significant ($p<0.05$). Participants with poor knowledge about olive oil were highest in Beirut (37.0%) compared to Akkar-North (3.1%). Furthermore, the consumers preferred southern, dark, and strong tasting olive oil in terms of region, color, and flavor with a statistically significant association ($p<0.05$).

Conclusion: Our findings highlighted the need to improve consumer awareness of the olive oil's benefits, which will influence their purchasing decisions.

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Introduction

The olive tree (*Olea europaea* L.) is a well-known Mediterranean evergreen tree that produces the olive fruit. Spain is the largest producer of olives in the world and one of the world's leading manufacturers of olive oil (Vázquez-Araújo et al., 2015). The increasing consumption of olive oil worldwide, particularly in the United States and Mediterranean countries, might be associated with its health-related characteristics, as it reduces coronary heart disease risk factors, prevents several forms of cancer, and have a beneficial impact on immune and inflammatory responses (Vázquez-Araújo et al., 2015). Olive leaf extracts are used in both conventional medicine and phytotherapy for the treatment and prevention of arterial hypertension, as well as for antibacterial and diuretic effects (Gorzynik-Debicka et al., 2018). Moreover, olive leaf extracts can reduce blood pressure along with lowering heart rate, restoring regular gut muscle contractions, and increasing blood flow via the coronary arteries (Gorzynik-Debicka et al., 2018). According to a Polish study, 500 mg of olive leaf extract taken twice a day reduced blood pressure just as well as a different kind of medications (Gorzynik-Debicka et al., 2018). Olive oil is a significant agri-food item in the Mediterranean countries since it is an integral component of most local cuisines, which play a key role in economic, social, and environmental aspects. Around 3,160,000 tons of Extra Virgin Olive Oil (EVOO) and 2,900,000 tons of Virgin Olive Oil (VOO) are annually produced (Banias et al., 2017).

The European Commission states that EVOO can only be made from olives of the highest quality; it cannot be processed in any way except washing the fruits, decanting, centrifuging, and filtering the oil (EC, 1991). It excludes oils extracted from seeds by chemical or mechanical methods or the use of solvent extraction or re-esterification methods, and those mixed with oils from other sources (Issaoui et al., 2016).

The sensory characteristics of olive oil can be graded as either positive or negative one. By balancing the sensory characteristics of bitter, green, pungent and fruity, the flavor of olive oil distinguishes the authentic ones. (Genovese et al., 2021). Pungency and bitterness properties are linked to the phenolic chemicals in VOO (Delgado and Guinard, 2011). On the other hand, the five basic faults that cause the most common off-flavors are musty/humid, winey/vinegary/acid, fusty/muddy, rancid, and metallic. These defects can be caused by fatty acid oxidation, microbes, insufficient olive fruit, or incorrect oil storage (Delgado and Guinard, 2011). Olive oil flavor is influenced by variety of factors as cultivar, geographic region, Climate, fruit ripeness, fruit storage, processing system, agronomic practices, and oil storage (Delgado and Guinard, 2011). According to Lombardi et al. (2021), understanding the benefits of health claims is a crucial stage in the purchasing process. It has been proved that the more people perceive the claim's health effect, the more likely they are to purchase the product (Lombardi et al., 2021).

Foods that contain high level of bitterness may also contain valuable phytochemicals, and consumers dislike bitter foods strongly. This case creates a gap between consumer's preference and their healthy requirements (Cavallo et al., 2019). However, exposure plays a pivotal role when it comes to the consumer preferences toward bitterness in EVOO. In fact, the aversion about bitter taste seems to be strictly linked with consumers' behavior and knowledge about the product. The consumers who are very accustomed to bitter EVOO have shown exceptions to the overall dislike of bitterness; these consumers are primarily from traditional producing and consuming regions like Tunisia and Italy (Cavallo et al., 2019). Studies that examined EVOO preferences among consumers in non-traditional producing countries have validated this idea. For instance, consumers in both Japan and the United States revealed a low preference for having a sensory profile characterized by bitterness (Cavallo et al., 2019). While, the different traditions in EVOO production in Argentina were addressed as the cause of the disparities in preferences between Buenos Aires and Mendoza. Furthermore, researchers proved that in a non-traditional EVOO producing country, such as Finland, even consumers with a strong commitment to the product are reluctant to accept a sensory profile characterized by bitterness (Cavallo et al., 2019). The framework is initiated by defining perceived quality which is the most crucial factor that the consumers determine while purchasing any product. This judgment depends on both the product itself and on the characteristics of the consumer (Cavallo et al., 2019).

Olive oil is regarded as an important part of the Mediterranean cuisine, particularly in Lebanon, where it is used in salad dressings, appetizers, and stews on a regular basis. Since olive oil has antimicrobial properties, it has also been used historically to make soap (Pichierri et al., 2020). To the best of our knowledge, no assessment of olive oil knowledge and purchasing behavior of consumers toward olive oil have been conducted in Lebanon. In this context, the current study aims to investigate the level of knowledge and the impact of sociological-demographic factors on the knowledge and consumer purchasing behavior towards olive oil among the general population in Lebanon.

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Materials and methods

Study design and data collection

The current study was based on a cross-sectional survey conducted between January and March, 2021 in Lebanon. The research team created and developed a systematic questionnaire.

Several questions were on the basis of previous studies with the needed adjustment to match our objective and others were self-created by the research team (Di Vita et al., 2020; Mtimet et al., 2013). The questionnaire was shared via social media (facebook, instagram, gmail, and whatsApp) through the accounts of the research teams' members. Further, some of our colleagues shared the invitation of the current study (in the form of a google form) on their social media sites. Since the whole number of participants who received the questionnaire couldn't be gathered, this made the process of calculating the response rate of the current study relatively challenging. A pilot study involving 10 participants was carried out to assess the validity and reliability of the survey. The questionnaire has been modified in accordance with the pilot study's findings to better suit the Lebanese context. A total of 604 different responses to the questionnaire have been collected. By attaining 604 responses, the margin of error was decreased to 3.99% and the confidence interval was increased to more than 98.6% as per RAOSOFT calculator (Raosoft, 2004).

Variables

The questionnaire composed of four sections: sociological-demographics, olive oil knowledge, uses, sources, and amounts of olive oil and ultimately consumer preference part. Participants' sociological-demographic characteristics contained seven questions including gender, age, marital status, residence, education, salary income, and household members. The section associated with the assessment of olive oil knowledge consisted of five questions (rating the knowledge towards the nutritional properties of olive oil, description of tasty olive oil, etc.). The olive oil sources and amount section included five questions (the source of olive oil purchase, annual consumption of olive oil, etc.). Finally, the consumer preference section consisted of nine questions as preferable olive oil grade, taste, color, region, and packaging containers. Moreover, consumer preference section included questions assessing the factors that affect their purchasing behavior towards olive oil. For the questions related to knowledge of participants towards olive oil, participants scored zero with "one correct answer" or with "no answer at all", the participant had poor knowledge towards olive oil according to this score means. The score was 1 for 2-3 correct answers (average knowledge), and 2 for 4-5 correct answers (good knowledge). Regarding the question of olive oil usage, participants who selected one-two olive usages scored 25, three olive oil usages scored 50, four usages scored 75, and participants who responded that they have five olive oil usages scored 100 (Salazar-Ordóñez et al., 2018).

Statistical analysis

Frequency and percentage (%) was utilized to modify the data related to the sociological-demographics, assessing olive oil knowledge and usage, olive oil sources and amounts and consumer preference. Chi-square test was used to investigate the association in the two domains of knowledge and consumer preference between the participants according to their sociological-demographic characteristics (Cavallo et al., 2019). IBM SPSS V22 was used to analyze the data for descriptive statistics and chi-square test for independence. *p*-value of less than 0.05 was employed as the level of significance.

Results

Sociological-demographic characteristics of participants

Sociological-demographic characteristics of the participants are displayed in Table 1. A total of 604 participants completed the survey, the majority of participants were females (57.62%), single (58.61%), lived in Beirut (37.09%), and had master/PhD degree (33.28%). Most of the participants were between 25 and 40 years old (48.01%), their family members range between 3 and 5 (56.79%). Most of the participants were unemployed (34.60%), and 5.63% only had salary above 5, 000,000 Lebanese pounds, noting that the average dollar exchange rate in the black market during the data collection was 10,000 Lebanese pounds per 1 United States dollars.

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Table 1: Sociological-demographic characteristics of the participants (n=604)

Sociological-demographic characteristics	N (%)
Gender	
Female	348 (57.62) *
Male	256 (42.38)
Age	
18-25	210 (34.77)
25-40	290 (48.01) *
>40	104 (17.22)
Marital status	
Married	250 (41.39)
Single	354 (58.61) *
Family members	
(1-2)	79 (13.08)
(3-5)	343 (56.79) *
>5	182 (30.13)
Governorate (Regional)	
South Lebanon, Nabatieh	153 (25.33)
Mount Lebanon	172 (28.48)
Beirut	224 (37.09) *
Bekaa-Baalback	35 (5.79)
Akkar-North	20 (3.31)
Educational level	
Senior high	94 (15.56)
Bachelor	180 (29.80)
Masters/PhD	201 (33.28) *
Vocational	61 (10.10)
Others	68 (11.26)
Salary	
600,000-1,000,000 LBP	143 (23.68)
1,000,000-3,000,000 LBP	171 (28.31)
3,000,000-5,000,000 LBP	47 (7.78)
Above 5,000,0000 LBP	34 (5.63)
Unemployed	209 (34.60) *

* Correlation is significant at the 0.05 level
LBP=Lebanese Pounds

Association between sociological-demographic variables and the knowledge-purchasing behavior of consumers

Table 2 displays knowledge-purchasing behavior of Lebanese consumers towards olive oil with governorate. Data indicates significant association between governorate and the source of olive oil purchase, the consumer knowledge towards nutritional properties of olive oil, in addition to the consumer's preferable color, taste, and the region of olive oil production (p<0.05). However, the governorate is not significantly associated with the olive oil consumption, neither with price (last paid) nor with its preferable packaging and grade (p>0.05).

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Table 2: knowledge-purchasing behavior of Lebanese consumers towards olive oil base on governorate

Governorate Variables	Akkar-North N (%)	Baalback-Hermel N (%)	Beirut N (%)	Mount Lebanon N (%)	South Lebanon N (%)	*p*-value
Olive oil usage						
One or two usages	11 (55)	20 (57.1)	86 (38.4)	69 (40.1)	55 (35.9)	
Three usages	1 (5)	9 (25.7)	90 (40.2)	72 (41.9)	65 (42.5)	0.057
Four usages	3 (15)	3 (8.6)	28 (12.5)	20 (11.6)	18 (11.8)	
Five usages	5 (25)	3 (8.6)	20 (8.9)	11 (6.4)	15 (9.8)	
Source of olive oil purchase						
Market	2 (10)	1 (2.9)	25 (11.2)	8 (4.7)	5 (3.3)	
Personal cultivation	6 (30)	7 (20)	43 (19.2)	37 (21.5)	66 (43.1)	<0.001*
relatives/friends	8 (40)	17 (48.6)	119(53.1)	99 (57.6)	60 (39.2)	
Trusted producer	4 (20)	10 (28.6)	37 (16.5)	28 (16.3)	22 (14.4)	
Olive oil last paid						
100,000- 200,000 LBP	7 (35)	3 (8.6)	71 (31.7)	34 (19.8)	38 (24.8)	
200,000-300,000 LBP	6 (30)	10 (28.6)	58 (25.9)	48 (27.9)	31 (20.3)	0.071
300,000-500,000LBP	6 (30)	19 (54.3)	72 (32.1)	70 (40.7)	65 (42.5)	
More than 500,000 LBP	1 (5)	3 (8.6)	23 (10.3)	20 (11.6)	19 (12.4)	
Knowledge towards nutritional properties						
Poor knowledge	16 (3.1)	30 (5.7)	194 (37)	161 (30.7)	123 (23.5)	0.014*
Average knowledge	4 (6.7)	4 (6.7)	19 (31.7)	8 (13.3)	25 (41.7)	
Good knowledge	0 (0)	1 (5)	11 (55)	3 (15)	5 (25)	
Preferable color to purchase						
Dark	10 (50)	23 (65.7)	159 (71)	125 (72.7)	112 (73.2)	
Golden	6 (30)	1 (2.9)	15 (6.7)	10 (5.8)	4 (2.6)	0.004*
Light	4 (20)	11 (31.4)	45 (20.1)	35 (20.3)	33 (21.6)	
Yellow	0 (0)	0 (0)	5 (2.2)	2 (1.2)	4 (2.6)	
Preferable region						
South	2 (10)	18 (51.4)	178 (79.5)	130 (75.6)	144 (94.1)	
North	17 (85)	6 (17.1)	11 (4.9)	16 (9.3)	2 (1.3)	<0.001*
Bekaa	0 (0)	9 (25.7)	10 (4.5)	13 (7.6)	2 (1.3)	
Other	1 (5)	2 (5.7)	25 (11.2)	13 (7.6)	5 (3.3)	
Preferable taste						
Bland	0 (0)	1 (2.9)	15 (6.7)	2 (1.2)	7 (4.6)	<0.001*
Medium	15 (75)	16 (45.7)	106(47.3)	76 (44.2)	46 (30.1)	
Strong	5 (25)	18 (51.4)	103 (46)	94 (54.7)	100 (65.4)	
Preferable packaging						
Glass	12 (60)	20 (57.1)	139(62.1)	105 (61)	93 (60.8)	0.529
Metal	4 (20)	9 (25.7)	30 (13.4)	19 (11)	20 (13.1)	
Plastic	4 (20)	6 (17.1)	55 (24.6)	48 (27.9)	40 (26.1)	
Olive oil grade purchased						
Any grade	4 (20)	8 (22.9)	51 (22.8)	38 (22.1)	40 (26.1)	
Extra light	0 (0)	3 (8.6)	13 (5.8)	2 (1.2)	2 (1.3)	0.053
Extra Virgin	12 (60)	17 (48.6)	111(49.6)	97 (56.4)	93 (60.8)	
Virgin	4 (20)	7 (20)	49 (21.9)	35 (20.3)	18 (11.8)	

* Correlation is significant at the 0.05 level
LBP=Lebanese Pounds

When it comes to the association between the educational level of the respondents with their knowledge towards olive oil, data were presented in Table 3 demonstrates that the educational level is significantly associated with the olive oil packaging type and size in addition to the olive oil source (p<0.05) but not with the olive oil brand, neither with its color and flavor nor with consumer's knowledge towards nutritional properties of olive oil (p>0.05).

However, as illustrated in Table 4, the gender is significantly associated with the knowledge of consumers towards nutritional properties of olive oil and its grade (p<0.05). Although, no significant association is to be reported between the gender and other variables was demonstrated in our data (p>0.05).

In Table 5, the number of family members is associated significantly (p<0.05) with the purchased and amount of olive oil consumed annually. On the other hand, the age of respondents is significantly related to their preferable taste of olive oil and the region of its production as shown in Table 6.

According to Tables 7 and 8, there is a significant relationship between the consumer's salary (per month) and the olive oil price, as well as between the marital status, annual consumption, and olive oil purchased volume, and the person in charge (in the family) of the olive oil purchase. Finally, we aimed to assess the possible correlation between the knowledge of consumers towards the nutritional properties of olive oil and the sociological-demographic variables. Table 9 uncovers that the knowledge among respondents is significantly associated with their marital status, age and governorate.

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Table 3: Knowledge-purchasing behavior of Lebanese consumers towards olive oil base on education level

Education Level Variables	Senior high N (%)	Bachelor degree N (%)	Master/PhD degree N (%)	Vocational degree N (%)	Others N (%)	*p*-value
Packaging type and bottle color						
Extremely important	38 (40.4)	49 (27.2)	60 (29.9)	17 (27.9)	21(30.9)	
Very important	27 (28.7)	43 (23.9)	58 (28.9)	11 (18)	27(39.7)	**0.037***
Slightly important	22 (23.4)	54 (30)	54 (26.9)	20 (32.8)	12(17.6)	
Not important at all	7 (7.4)	34 (18.9)	29 (14.4)	13 (21.3)	8 (11.8)	
Brand						
Extremely important	34 (36.2)	52 (28.9)	58 (28.9)	20 (32.8)	24(35.3)	
Very important	36 (38.3)	55 (30.6)	53 (26.4)	16 (26.2)	23(33.8)	**0.275**
Slightly important	15 (16)	37 (20.6)	47 (23.4)	15 (24.6)	10(14.7)	
Not important at all	9 (9.6)	36 (20)	43 (21.4)	10 (16.4)	11(16.2)	
Package size						
Extremely important	27 (28.7)	30 (16.7)	33 (16.4)	12 (19.7)	15(22.1)	
Very important	30 (31.9)	63 (35)	71 (35.3)	9 (14.8)	28(41.2)	**<0.001***
Slightly important	25 (26.6)	41 (22.8)	66 (32.8)	28 (45.9)	14(20.6)	
Not important at all	12 (12.8)	46 (25.6)	31 (15.4)	12 (19.7)	11(16.2)	
Oil color						
Extremely important	54 (57.4)	108 (60)	120 (59.7)	25 (41)	35(51.5)	
Very important	31 (33)	56 (31.1)	66 (32.8)	28 (45.9)	24(35.3)	**0.092**
Slightly important	7 (7.4)	16(8.9)	14 (7)	5 (8.2)	7 (10.3)	
Not important at all	2 (2.1)	0 (0)	1 (0.5)	3 (4.9)	2 (2.9)	
Flavor						
Extremely important	66 (70.2)	138(76.7)	159 (79.1)	43 (70.5)	46(67.6)	
Very important	27 (28.7)	38 (21.1)	36 (17.9)	13 (21.3)	17 (25)	**0.058**
Slightly important	0 (0)	3 (1.7)	4 (2)	3 (4.9)	5 (7.4)	
Not important at all	1 (1.1)	1 (0.6)	2 (1)	2 (3.3)	0 (0)	
Source						
Extremely important	64 (68.1)	134(74.4)	167 (83.1)	43 (70.5)	41(60.3)	
Very important	23 (24.5)	37 (20.6)	28 (13.9)	13 (21.3)	20(29.4)	**0.019***
Slightly important	5 (5.3)	7 (3.9)	5 (2.5)	4 (6.6)	3 (4.4)	
Not important at all	2 (2.1)	2 (1.1)	1 (0.5)	1 (1.6)	4 (5.9)	
Knowledge towards the nutritional properties of olive oil						
Poor Knowledge	82 (87.2)	152(84.4)	177 (88.1)	50 (82)	63(92.6)	**0.121**
Average Knowledge	9 (9.6)	22 (12.2)	19 (9.5)	5 (8.2)	5 (7.4)	
Good Knowledge	3 (3.2)	6 (3.3)	5 (2.5)	6 (9.8)	0 (0)	

* Correlation is significant at the 0.05 level

Table 4: Knowledge-purchasing behavior of Lebanese consumers towards olive oil base on gender

Gender Variables	Male N (%)	Female N (%)	*p*-value
Knowledge towards the nutritional properties of olive oil			
Poor knowledge	239 (93.4)	285 (81.9)	<0.001*
Average knowledge	17 (6.6)	43 (12.4)	
Good knowledge	0 (0)	20 (5.7)	
Preferable color to buy			
Dark	183 (71.5)	246 (70.7)	
Golden	10 (3.9)	26 (7.5)	0.062
Light	55 (21.5)	73 (21)	
Yellow	8 (3.1)	3 (0.9)	
Preferable region			
South	189 (73.8)	283 (81.3)	
North	29 (11.3)	23 (6.6)	0.050
Bekaa	13 (5.1)	21 (6)	
Other	25 (9.8)	21 (6)	
Preferable taste			
Bland	15 (5.9)	10 (2.9)	0.080
Medium	100 (39.1)	159 (45.7)	
Strong	141 (55.1)	179 (51.4)	
Preferable packaging			0.081

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Glass	144 (56.3)	225 (64.7)	
Metal	42 (16.4)	40 (11.5)	
Plastic	70 (27.3)	83 (23.9)	
Olive oil grade purchased			
Any grade	61 (23.8)	80 (23)	
Extra light	13 (5.1)	7 (2)	0.044*
Extra virgin	127 (49.6)	203 (58.3)	
Virgin	55 (21.5)	58 (16.7)	

* Correlation is significant at the 0.05 level

Table 5: Knowledge-purchasing behavior of Lebanese consumers towards olive oil base on family members

Family members **Variables**	**1-2 members** **N (%)**	**3-5 members** **N (%)**	**More than 5 members** **N (%)**	***p*-value**
Annual consumption				
Half a tank	26 (32.9)	36 (10.5)	11 (6)	<0.001*
One tank	48 (60.8)	192 (56)	68 (37.4)	
Two tanks and more	5 (6.3)	115 (33.5)	103 (56.6)	
Purchased volumes				
Half a tank	27 (34.2)	82 (23.9)	24 (13.2)	<0.001*
One tank	50 (63.3)	196(57.1)	93 (51.1)	
Two tanks and more	2 (2.5)	65 (19)	65 (35.7)	
Olive oil grade purchased				
Any grade	22 (27.8)	72 (21)	47 (25.8)	
Extra light	5 (6.3)	6 (1.7)	9 (4.9)	0.067
Extra virgin	43 (54.4)	19 (56.9)	92 (50.5)	
Virgin	9 (11.4)	70 (20.4)	34 (18.7)	

Table 6: Knowledge-purchasing behavior of Lebanese consumers towards olive oil base on age

Age **Variables**	**18-25** **N (%)**	**25-40** **N (%)**	**40 and above** **N (%)**	***p*-value**
Knowledge towards the nutritional properties of olive oil				
Poor knowledge	185 (88.1)	254 (87.6)	85 (81.7)	0.269
Average knowledge	20 (9.5)	28 (9.7)	12 (11.5)	
Good knowledge	5 (2.4)	8 (2.8)	7 (6.7)	
Preferable color to buy				
Dark	141 (67.1)	208 (71.7)	80 (76.9)	0.380
Golden	10 (4.8)	20 (6.9)	6 (5.8)	
Light	55 (26.2)	57 (19.7)	16 (15.4)	
Yellow	4 (1.9)	5 (1.7)	2 (1.9)	
Preferable region				
South	160 (76.2)	227 (78.3)	85 (81.7)	0.006*
North	11 (5.2)	31 (10.7)	10 (9.6)	
Bekaa	14 (6.7)	19 (6.6)	1 (1)	
Other	25 (11.9)	13 (4.5)	8 (7.7)	
Preferable taste				
Bland	15 (7.1)	9 (3.1)	1 (1)	<0.001*
Medium	112 (53.3)	117 (40.3)	30 (28.8)	
Strong	83 (39.5)	164 (56.6)	73 (70.2)	
Preferable packaging				
Glass	115 (54.8)	183 (63.1)	71 (68.3)	0.075
Metal	36 (17.1)	32 (11)	14 (13.5)	
Plastic	59 (28.1)	75 (25.9)	19 (18.3)	
Olive oil grade purchased				
Any grade	59 (28.1)	64 (22.1)	18 (17.3)	0.051
Extra light	10 (4.8)	9 (3.1)	1 (1)	
Extra virgin	113 (53.8)	155 (53.4)	62 (59.6)	
Virgin	28 (13.3)	62 (21.4)	23 (22.1)	

* Correlation is significant at the 0.05 level

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Table 7: Knowledge-purchasing behavior of Lebanese consumers towards olive oil base on monthly salary

Salary Variables	Unemployed N (%)	600,000-1,000,000 LBP N (%)	1,000,000-3,000,000 LBP N (%)	3,000,000-5,000,000 LBP N (%)	Above 5,000,000 LBP N (%)	*p*-value
Purchased volumes						
Half a tank	41 (19.6)	35 (24.5)	39 (22.8)	14 (29.8)	4 (11.8)	0.540
One tank	123 (58.9)	78 (54.5)	92 (53.8)	22 (46.8)	24 (70.6)	
Two tanks and more	45 (21.5)	30 (21)	40 (23.4)	11 (23.4)	6 (17.6)	
Olive Oil price last time						
100,000- 200,000 LBP	58 (27.8)	45 (31.5)	35 (20.5)	12 (25.5)	3 (8.8)	0.047*
200,000-300,000 LBP	56 (26.8)	31 (21.7)	50 (29.2)	10 (21.3)	6 (17.6)	
300,000-500,000 LBP	71 (34)	51 (35.7)	73 (42.7)	20 (42.6)	17 (50)	
More than 500,000 LBP	24 (11.5)	16 (11.2)	13 (7.6)	5 (10.6)	8 (23.5)	

* Correlation is significant at the 0.05 level /

LBP=Lebanese Pounds

Table 8: Knowledge-purchasing behavior of Lebanese consumers towards olive oil base on marital status

Marital Status Variables	Single N (%)	Married N (%)	*p*-value
Annual Consumption			
Half a tank	27 (7.6)	46 (18.4)	<0.001*
One tank	167 (47.2)	141 (56.4)	
Two tanks and more	160 (45.2)	63 (25.2)	
Purchased volumes			
Half a tank	67 (18.9)	66 (26.4)	0.027*
One tank	199 (56.2)	140 (56)	
Two tanks and more	88 (24.9)	44 (17.6)	
Responsible of buying olive oil in the household			
Yes	268 (75.7)	100 (40)	<0.001*
No	86 (24.3)	150 (60)	

* Correlation is significant at the 0.05 level

Table 9: Mean knowledge towards the nutritional properties of olive oil base on sociological -demographics variables

	Knowledge towards the nutritional properties of olive oil	
Variables	**Mean (S.E)**	***p*-value**
Gender		
Male	2.594 (0.0463)	0.689
Female	2.569 (0.0408)	
Marital status		
Single	2.520 (0.0412)	0.020*
Married	2.664 (0.0449)	
Age		
18-20	2.481 (0.0553)	0.011*
25-40	2.590 (0.0434)	
40 and above	2.750 (0.0637)	
Governorate		
Akkar-North	3.000 (0.1277)	0.039*
Baalback-Hermel	2.343 (0.1475)	
Beirut	2.598 (0.0477)	
Mount Lebanon	2.552 (0.0590)	
South Lebanon	2.582 (0.0633)	
Education level		
Senior high	2.638 (0.0769)	0.606
Bachelor degree	2.622 (0.0529)	
Masters/PhD degree	2.542 (0.0542)	
Vocational degree	2.590 (0.0946)	
Others	2.485 (0.1016)	

* Correlation is significant at the 0.05 level
S.E=Standard Error

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Discussion

Olive oil is widely classified as a crucial element of the Mediterranean diet, particularly in Lebanon where it is frequently used in stews, salad dressings, and appetizers. The quality, nutritional, and sensorial characteristics of olive oil are correlated with the chemical composition (El Riachy et al., 2018). The sensory properties of olive oil can be classified as either positive or negative. Bitterness in food can be linked to the existence of some beneficial phytochemicals, yet consumers, like in the case of olive oil, have a strong aversion for bitter foods. To the best of our knowledge, this is the first study investigating the impact of sociological-demographic factors on the knowledge and consumer purchasing behavior towards olive oil among the general population in Lebanon.

In terms of governorate, the current study revealed that the highest percentage of participants living in Beirut preferred to purchase olive oil from market and the other participants living in the South and mount Lebanon, their source of olive oil, were either from personal cultivation, trusted producers or relatives/friends. The appropriate justification of our observation is that most individuals in the South Lebanon possess their own land, hence, they are more reliant on their own cultivation than persons living in Beirut or mount Lebanon. On the other hand, Lebanese consumers rely mostly on their friend/family net work when purchasing olive oil, and they evaluate the farmer's or producer's reputation when making their decision.

Regarding the knowledge about nutritional properties of olive oil, the obtained findings revealed that participants living in Beirut have better knowledge of nutritional properties of olive oil compared to those living in South Lebanon. These results were relatively surprising since the South and North population, where the major source of olive oil, should have better knowledge of olive oil in comparison with other governorates. These findings might be related to the fact that the respondents living in Beirut, the capital of Lebanon, have more accessibility to information than other regions in Lebanon. On the other hand, the questions related to the purchasing behavior of consumers towards olive oil as the preferable color, region, and taste indicated that the participants living in the South Lebanon preferred dark and strong taste of olive oil compared to those living in the North of Lebanon who preferred dark and medium-taste olive oil. These results are expected since southerners preferred southern olive oil, which has a strong and dark color, whereas northerners preferred northern olive oil and have become accustomed to its flavor and color. Therefore, Lebanese consumers often prefer certain type of olive oil in comparison with another, due to many differences including quality, origin, and family traditions. The results of southern participants are consistent with the findings of a Tunisian study conducted by Mtimet et al. (2013) which unveiled that participants preferred strong taste olive oil but it is in contrast with northern participants in our study that preferred medium taste olive oil. The fact that geographical differences have a significant influence on consumer attitudes toward olive oil and food consumption could clarify the differences between the findings between the two countries.

As for the questions related to the behavior of participants from various educational levels in relation to the importance of purchasing factors such as packaging type, size, and color of bottles, the study manifested that the participants with a senior high degree consider this criterion to be extremely important whereas others with bachelor, master/PhD, and vocational degree fail to consider this criterion as an important criterion when purchasing olive oil. These results with respect to master/PhD and vocational degree are the same as the study conducted by Mtimet et al. (2013) in Tunisia which stated that consumers are willing to spend less money when it comes to the sort of olive oil and its packaging. Moreover, our findings are consistent with a study conducted in Chile by Romo-Muñoz et al. (2017) who reported that participants with senior degree regarded packaging size as a significant criterion during purchasing olive oil. Regarding the source of olive oil, participants with master/PhD degrees considered that the source is an extremely important criterion during purchasing olive oil compared to participants with other degrees. According to this finding, as individual's scientific knowledge increases, their focus will shift to the source and benefits of olive oil rather than the packaging size or even bottle color. Since the source or geographical origin of olive oil is a substantial factor to consider when purchasing olive oil, particularly in Lebanon, these results were predicted. This finding was in contract with a study conducted by El Riachy et al. (2018) in Lebanon who demonstrated that the chemical composition of olive oil could have an impact on the consumer preference rather than its geographical origin. Furthermore, the identical result was observed by a study conducted by Mtimet et al. (2013) in Tunisia who found that participants' perceptions of the source of olive oil do not significantly differ when purchasing olive oil. However, our discoveries are in line with Delgado et al. (2013), who realized that the olive oil source had the greatest impact on overall quality of things such as the bottles and labels in a packaging study in California.

In terms of gender, our study proved that the females possess better knowledge towards the nutritional properties of olive oil in comparison with the male participants. This finding was predicted since females are more involved in acquiring olive oil and are more knowledgeable about its

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nutritional properties than males. However, this finding differs from that of Di Vita et al. (2020) who discovered that the males have more knowledge than females in a study published in Italy. On the other hand, this study displayed that females prefer EVOO than males who preferred the VOO. This result is consistent with the Mtimet et al.'s study (2013) in which EVOO is more preferred in Tunisia by the female participants. Further, these conclusions are correlated to the findings of similar studies of Chan-Halbrendt et al. (2010) in Albania and Salazar-Ordóñez et al. (2018) in the Netherlands preferring EVOO. The disparities in the factors that influence consumer purchasing behavior towards olive oil between countries as Tunisia (Mitmet et al., 2013), Italy (Di Vita et al., 2020), and Lebanon could be explained by the fact that the quality of olive oil in Tunisia and Italy is standardized, which is not the case in Lebanon.

In terms of annual consumption, families with one-two members apply half a tank on average, and families with more than five members rarely use half a tank (around 8.5 L). Families with more than five members consume two tanks or more (more than 34 L) annually in contrast to families with one to two members who do not consume this much. Furthermore, compared to households with more than five persons, families with one-two members purchase half a tank the most. Households with more than five persons, on the other hand, are more likely to buy two tanks or more compared to families with one-two members. Hence, families with more than five members annually purchase and consume more olive oil than families with fewer members, which is rational because the amount of olive oil required and consumed increases as the number of family members grows. According to the age variable, the present study identified that the participants older than 40 years frequently prefer southern olive oil compared to participants between the ages of 18 and 25. Participants between the ages of 25 and 40, on the other hand, prefer northern olive oil the most, while those between the ages of 18 and 25 prefer it the least. In terms of preferred flavor, participants between the ages of 18 and 25 favor medium tasting olive oil the most, compared to those over the age of 40. When compared to those aged 18 to 25, these participants prefer olive oil with a robust flavor. These detections make sense since older individuals prefer olive oil with a stronger flavor than younger ones who choose bland or medium flavored olive oil. These findings are consistent with those of Del Giudice et al. (2015) and Di Vita et al. (2020) who discovered that older participants prefer bitter tasting olive oil in Italy. Additionally, our study revealed that individuals aged 40 and up has better knowledge compared to other ages, with no significant association, which is similar with a recent study by Di Vita et al. (2020), who claimed that older people have superior knowledge than younger ones.

When it comes to the monthly salary variable, the results in the current study were predicted because individuals with a decent salary are more likely to spend more on a tank of olive oil (around 17 L), they believe that expensive olive oil is of higher quality. These conclusions are in line with a study conducted by Romo-Muñoz et al. (2017) who manifested that Chilean customers rely on the price of EVOO to determine its quality and whether it is imported or domestic. A similar cross-sectional study was conducted in four different countries (Denmark, France, Tunisia, and the US) by Chrysochou et al. (2022) where they concluded that the price of olive oil act as quality cue and is regarded as a significant factor influencing consumer choice. It is substantial to mention that the price of one tank of olive oil has been changed to become more than 2,000,000 Lebanese pounds during the economic crisis in Lebanon after the date collection, which is considered to be more expensive product nowadays; however, it is still purchased by the majority of Lebanese, in varying degrees of quantity and quality. High and medium-income Lebanese consumers, for instance, can afford to buy one to two tanks of local olive oil, with occasional purchases of other olive oils available in supermarkets; low-income consumers, on the other hand, typically buy one half to one tank of local olive oil, and in many cases, Syrian olive oil, which is cheaper.

In terms of the marital status variable, this study exhibited that single participants consume two tanks or more compared to married participants who consume one tank annually. In terms of the volume purchased, participants from both marital status (single and married) typically purchase one tank of olive oil but also the single participants purchase two tanks or more than married participants. These results were unexpected because married participants have more family members, leading in higher purchases, and consumption of olive oil. The most plausible explanation for this finding is that single participants have more family members living with him/her, which results in more purchases and consumption, but married participants are more likely to be new couples, which leads to fewer purchases and consumption. When it comes to the person in charge of purchasing olive oil in the home, single participants are more responsible than married participants. This could be explained by the fact that the single participants are more responsible for purchasing olive oil in the home, whereas married participants rely on their partners to purchase these items.

Overall, our assessments in the current study revealed that the level of knowledge towards nutritional properties of olive oil were significantly higher in married, living in Akkar-North, and old participants aged 40 and above with any education levels.

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This study has some limitations, including the short time frame for questionnaire completion and the majority of participants being between the ages of 25 and 40, who are known to have limited knowledge towards olive oil in general. Furthermore, because the study is a questionnaire-based study, it may contain some dishonesty and unconscientious responses from participants. The fact that you can only obtain a sample of the population having internet access is another drawback of using online (Elaridi et al., 2020).

Conclusions

Olive oil is a well-known and vital component of the Lebanese cuisine, with many Lebanese consumers aware of its health benefits and some families rely on olive production for livelihood, particularly during the current economic crisis occurring in Lebanon. The current study is the first attempt in Lebanon to assess the consumer behavior and knowledge towards olive oil and investigating the factors that influence the consumer purchasing behavior towards olive oil. Our findings in this study indicated that the majority of participants had one or two uses of olive oil in their daily life and had limited knowledge towards olive oil. Furthermore, one tank represents the maximum annual consumption and purchase of olive oil among participants, with the highest amount paid per tank ranging between 300,000 and 500,000 Lebanese pounds. Additionally, EVOO is the most popular and preferred olive oil, and the flavor and color are the most crucial considerations when purchasing olive oil. Participants prefer southern, dark green, and strong tasting olive oil the most in terms of region, color, and flavor. As a result, local marketers may need to determine the findings of this study in order to increase local production of olive oil when marketing it. In order to consolidate the findings of this study, it will be necessary to conduct additional experimental research on Lebanese olive oil consumption behavior using different approaches in the future.

Author contribution

A.S., A.A.K., and I.S. designed this study; A.S., S.S., A.A.K. and I.S. analyzed, interpreted the data, and drafted the manuscript with equal contributions at all levels. All authors read and approved the final version of the manuscript.

Conflicts of interest

The authors declare that there is no conflict of interest

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Ethical consideration

This study is aligned with the ethical requirements of the Helsinki Declaration. A consent form was included in the questionnaire explaining the research objectives and assuring the anonymity and confidentiality of participants. The said form states that any participation in this study is entirely voluntary and has no consequence on its participants. This study was reviewed and approved by the Lebanese International University Institutional Review Board (IRB) ethical committee (Reference LIUIRB-240207-IS-323E003).

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