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Knowledge, Attitude, and Behavior of Olive Oil Consumers Regarding Quality, Usage, and Storage Practices Among Adult Population of Arabian Countries

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Abstract

Background

Olive oil is widely used in the Arab world for both culinary and medicinal purposes. Despite the well-documented health benefits of olive oil, particularly extra virgin olive oil (EVOO), there is limited knowledge about consumer knowledge, attitudes, and practices (KAP) regarding its proper use and storage across different countries. This study aims to assess purchasing habits, usage patterns, and storage practices, as well as the knowledge, attitudes, and practices related to olive oil among Arab consumers in such region

Methodology: A cross-sectional-self administered questionnaire-based study was conducted among 511 participants from Jordan, Morocco, and Egypt. Data were analyzed using simple and multiple linear regression models to identify demographic and lifestyle factors influencing KAP scores.

Results

The study showed low knowledge levels across all countries, with median scores of 6 $\pm$ 4.25 out of 15. All three countries ' attitudes towards olive oil were neutral, with median attitude scores ranging from 23 $\pm$ 4.25 out of 35. Practice scores indicated moderate behavior, with median scores between 7 $\pm$ 2 out of 10. Regression analysis revealed that the age of the participants significantly affected knowledge (B = 0.138, $p < 0.001$); while involvement in olive oil production was associated with lower knowledge and less favorable attitudes (B=-0.133, p = 0.001 and B=-0.103, p = 0.020, respectively). A significant gap was found in consumer awareness about proper storage methods and certain types of olive oil, including olive pomace oil.

Conclusion

Olive oil consumption is prevalent in Jordan, Morocco, and Egypt; however, knowledge regarding its proper use and storage is inadequate. Public health interventions focusing on education, particularly emphasizing the benefits of high-quality oils and correct storage practices, are necessary to improve consumer behavior and maintain the health benefits of olive oil. Future research should investigate the long-term effects of these educational interventions.

Introduction

Olive oil industry has undergone significant advancements over the past three decades(Bonazzi, 1999). These advancements encompass the use of modern techniques for nursery olive tree production, the adoption of intensive cultivation practices, and the implementation of specialized training, pruning, and sophisticated methods used in extracting and purifying olive oil (Fernández-Escobar et al., 2013, Lambardi et al., 2023). Olive oil has been a key mark of the Mediterranean diet for many years (Shannon et al., 2021, Caradonna et al., 2020). Global olive oil consumption has progressively increased because of the growing awareness of its health benefits (Mili and Bouhaddane, 2021), as research has shown and

proven protective benefits against cardiovascular diseases and other chronic degenerative health aspects (Mili and Bouhaddane, 2021, Shannon et al., 2021, Fernandes et al., 2020, Ilak Peršurić and Težak Damijanić, 2021). The health-promoting properties of olive oil are attributed mainly to its high fatty acid content. particularly its predominant oleic acid, as well as its bioactive phytochemicals, including tocopherols and phenolic compounds such as oleuropein, hydroxytyrosol, oleocanthal, and oleasin (Cecchi et al., 2021, Crizel et al., 2020). Such health-related attributes of olive oil are affected by production method, processing, packaging, usage pattern, and storage, where usage pattern and storage are strictly consumer-dependent (Marakis et al., 2021, Mousavi et al., 2021). Hence, it is important to provide means to understand consumer behavior regarding the use pattern and storage handling at home.

The International Olive Council (IOC) estimated that 139 olive varieties (cultivars) are grown in 23 countries, accounting for ~ 85% of the world's olive production. These olive varieties include Manzanilla, Kalamata (Greece), Souri (Jordan and Palestine), Chemlali (Tunisia), Barnea, Rumi and Nabali (Jordan), K-18 (Palestine), with most common olive varieties are found in Morocco such as Picholine marocaine, Menara, Haouzia, Meslala, Dahbia, and Bouchouika. Each olive cultivar has its unique chemical, physical, and taste characteristics. On the other hand, oils made from the same cultivar usually differ depending on the cultivation conditions, harvesting, and processing variations. Globally, the olive oil market has evolved from a traditional bulk to a more customized market where olive oil is perceived as a food specialty with high nutritional value and a high-quality product to consumers(Carzedda et al., 2021, Marakis et al., 2021). Greece is among the three largest producers in the European Union (EU), along with Spain and Italy (Chousou et al., 2020), and then comes the Arabian countries like Jordan, Palestine, Tunisia, Morrocco, Lebanon, and Algeria (El Hanandeh and Gharaibeh, 2016, Qrunfleh, 2010, Anania and Pupo D'Andrea, 2008). Consumer preferences for use, handling, and choice of olive oil have been studied and there was no main attribute regarding consumer preference for olive oil (Bernabéu et al., 2020). A study from Greece reported that the most valued characteristics of olive oil among Greek consumers were geographical origin and organic production, with price being among the least valued (Krystallis and Ness, 2005). Moreover, Greek consumers prefer unbranded products from friends and family over branded olive oils (Kountouri and Prodromidis, 2017). Consumers ' knowledge of attributes in differentiating types of olive oil and adultery acts is critical, particularly those easily detectable through taste and flavor (Krystallis and Ness, 2005). In a recent Italian study, although 73% of the participants stated that they knew the characteristics of extra virgin olive oil, only ~ 50% could correctly recognize those characteristics that distinguish between products (Carzedda et al., 2021). Another study pointed out that even though California consumers perceive olive oil as "healthy" food, most were unaware of the bioactive components of olive oil and the link between some of these components with the sensory properties of bitterness, astringency, and pungency (Santosa et al., 2013). Moreover, many studies indicated that improperly storing olive oil containers in consumer's households under air exposure increased the levels of negative sensory components like pentenol and hexanal, stating that this effect would be expected to reduce quality (Stefanoudaki et al., 2010). In addition, virgin olive oil stored at low temperatures (20–25 ℃) had characteristics closest to fresh oil, while oil stored in the light was seen to

have the largest departure from freshness (Kalua et al., 2006). Similarly, the oxidation of olive oil samples proceeded slowly in darkness, and faster in diffused light, and even faster in direct sunlight (Kiritsakis and Dugan, 1984). Although many ways were used to preserve the olive oil by using different types of plastics, clay bottles, and amber glass containers, dark glass packaging materials gave better protection against oxidation than plastic bottles or clay (Kiritsakis and Dugan, 1984, Kontominas, 2017).

Understanding the quality perceptions, attitudes, and behaviors of olive oil consumers, particularly in relation to its usage and domestic storage, is crucial for evaluation and research, especially within major olive oil markets like those in Arab countries. This study aims to assess purchasing habits, usage patterns, and storage practices, as well as the knowledge, attitudes, and practices related to olive oil among Arab consumers in these regions. Furthermore, this study aims to examine the factors associated between the knowledge, attitude, and practice scores and some consumer characteristics.

Methodology

Study design and participants

A self-administered questionnaire was developed using Google® Forms after reviewing similar concepts in the literature (Marakis et al., 2021). The questionnaire was first designed in English, then translated to Arabic before and back-translated to English by two academicians fluent in both languages to perform statistical analysis. Responses were collected in Arabic, the official language of Middle Eastern countries. The questionnaire was distributed using different social media platforms such as Facebook, Instagram, X, WhatsApp, and LinkedIn to collect individual responses from the target group from March to August 2024. As explicitly outlined at the beginning of the questionnaire before seeking informed consent, the inclusion criteria clearly stated that participants must be of Arab origin in Arabian countries and be 18 years old and above.

Sample size

The sample size was determined using Open-Source Epidemiologic Statistics for Public Health (OpenEpi) Version 3.01 with a 95% confidence level and a 5% margin of error. The minimal sample size required for this study is 385 people.

Questionnaire development, validation, and reliability

The questionnaire for this study was constructed based on recognized principles of sound questionnaire development (Boynton, 2004). Questions were carefully compiled from a variety of relevant sources (Marakis et al., 2021, Krystallis and Ness, 2005, Chrysochou et al., 2022) to ensure they directly supported the research aims. The final tool was divided into four sections, each containing multiple-choice items, and focused on: socio-demographic profile, knowledge, attitudes, and household practices concerning the purchase, use, and storage of olive oil among Arabian citizens.

Content and face validity of the English draft were confirmed through evaluation by five university academics. The instrument was then forward-translated into Arabic and back-translated into English by two separate qualified academic translators to guarantee linguistic accuracy. Before full deployment, the Arabic version underwent a pilot trial with 30 individuals representing varied educational and occupational backgrounds; this step helped verify that the questions were clear and easily understood by the intended audience. Necessary wording improvements were made in response to pilot participants' comments, and pilot data were not included in the main study results.

Internal consistency and reliability were assessed using Cronbach's alpha, which returned a value of 0.8 for the Likert-type items in the practices section, well above the commonly accepted threshold of 0.7, thereby confirming the adequacy of the measurement scales.

The questionnaire was structured around four core sections. The first gathered basic socio-demographic details: participants' age, gender, marital status, highest level of education, monthly household income, area of residence, and whether they lived with any chronic health condition. The second section explored actual behaviors, inquiring about preferred brands or types when buying olive oil, criteria considered before purchase, usual sources of supply, typical household uses, preferred storage containers and places, health conditions for which respondents rely on olive oil therapeutically, and steps taken if adulteration is suspected. The third section tested factual knowledge, covering topics such as olive oil acidity grades, which category represents the best quality, most appropriate culinary applications, and factors responsible for differences in flavor and appearance. The fourth section captured opinions and beliefs through a five-point Likert response format (strongly agree to strongly disagree), inviting participants to indicate their level of agreement with statements about the comparative health advantages of olive oil over other fats, the acceptability of blending different olive oil grades, and the reliability of brand names offered by local commercial companies.

Score calculation

Scores for the knowledge, attitude, and practice domains were computed and reported as mean values at the conclusion of each respective section in the results. Each correct response in the knowledge section received one point. In the attitude section, responses were scored such that the most favorable (positive) attitude earned the maximum of five points per item. Similarly, in the practice section, the most desirable (positive) practice behavior was awarded up to five points per item. Interpretation of these percentage-based scores followed Bloom's cutoff criteria, as referenced by Alzahrani et al. (2022) (Alzahrani et al., 2022): scores ranging from 80% to 100% were classified as indicating a high level of knowledge, a positive attitude, or good practice; scores between 60% and 79% denoted a moderate level of knowledge, a neutral attitude, or moderate practice; and scores below 60% were regarded as reflecting a low level of knowledge, a negative attitude, or poor practice.

Ethical approval

The study received ethical approval from the Institutional Research Ethics Committee in Amman, Jordan (Approval No. 2024-PHA-3). Participation was entirely voluntary, and all respondents provided informed consent by selecting the “I agree” option on the electronic consent form prior to accessing and completing the questionnaire. The research was conducted in full compliance with the ethical principles outlined in the Declaration of Helsinki and other applicable national and international guidelines. As this was not a clinical trial, no clinical trial registration number is applicable.

Statistical analysis

Data was collected via Google Forms and imported into an Excel spreadsheet for initial organization. The dataset was subsequently exported and subjected to statistical analysis using IBM SPSS Statistics version 24.0 (SPSS Inc., Chicago, IL, USA). Descriptive statistics were applied to summarize the data: for continuous variables, medians and interquartile ranges were calculated, as normality was assessed with the Shapiro-Wilk test. This test yielded p-values < 0.05 in most instances, indicating non-normal distribution; however, age data from Morocco exhibited normal distribution, allowing the use of means and standard deviations for that subgroup. Categorical variables were summarized using frequencies and percentages.

To examine associations between knowledge, attitude, and practice scores and dichotomous independent variables, simple linear regression was performed, reporting standardized Beta coefficients along with corresponding p-values. Variables demonstrating a p-value < 0.250 in simple regression were considered eligible for entry into multiple linear regression models. In the multiple linear regression analysis, statistical significance was defined as $p < 0.05$. All graphical illustrations were created using Microsoft Excel (version 16.81).

Results

Demographics

This study included *n*=511 responses from all participating countries. The study's demographic analysis reveals distinct differences among Jordan, Morocco, and Egypt participants. The majority of respondents were female, particularly in Jordan (71.7%, *n*=226) and Morocco (73%, *n*=92), while Egypt had a relatively more balanced gender distribution (60%, *n*=42 female). Urban residents were predominant across all regions, with over 90% in Jordan and Morocco. The educational level varied, with a significant portion of Jordanian participants (60%, *n*=189) holding a bachelor's degree, while Morocco had a higher percentage (71.4%, *n*=90) of participants with higher education. In contrast, Egyptian respondents mostly had bachelor's degrees or lower. Income levels also varied, with most Jordanians earning more than $1,000 per month, while a significant percentage of Egyptians earned less than $300. Despite these differences, olive oil usage was widespread, with nearly all participants in Jordan and Morocco using it, compared to 87.1% in Egypt as shown in Table 1.

Knowledge, attitude, and practice scores

The knowledge, attitude, and practice scores related to olive oil among consumers from Jordan, Morocco, and Egypt revealed varying levels of awareness and behavior. Jordanian respondents demonstrated a median knowledge score of 8 5 out of 15, reflecting low knowledge, a neutral attitude with a median score of 24 out of 35, and moderate practice with a median score of 7 out of 10. Moroccan participants showed a slightly lower median knowledge score of 7 , also indicating low knowledge, and a similar neutral attitude score of 24 , with a slightly lower median practice score of 6 . Egyptian respondents recorded the lowest median knowledge score of 6 , maintaining a neutral attitude with a median score of 23 , and moderate practice with a median score of 7 as shown in Table 2.

Factors affecting knowledge, attitude, and practice scores

The linear regression analysis (**Table S1**) reveals that age positively predicts knowledge ($\beta = 0.201$, $p < 0.001$) and attitude ($\beta = 0.090$, $p = 0.042$) scores about olive oil, suggesting greater knowledge and favorable attitudes in older individuals. The type of olive oil used significantly affects all outcome measures, with extra virgin/virgin oil users showing lower knowledge, attitude, and practice scores. Additionally, individuals or families producing olive oil tend to have lower knowledge ($\beta = -0.207$, $p < 0.001$) and attitude ($\beta = -0.137$, $p = 0.002$) scores, highlighting possible knowledge gaps within this group.

The multiple linear regression analysis results in **Table 3** highlight key determinants of practice, knowledge, and attitude scores regarding olive oil usage across different demographic factors. Age shows a significant positive association with knowledge scores ($\beta = 0.138$, $p < 0.001$), suggesting that as participants age, their knowledge increases. Surprisingly, educational level is positively associated with lower knowledge scores ($\beta = 0.071$, $p = 0.090$). Those who have studied or are studying health-related fields display better knowledge and attitudes, although these associations are not statistically significant. Regarding lifestyle factors, the type of olive oil used (EVOO and VOO) is a significant predictor of both practice ($\beta = 0.141$, $p = 0.002$) and knowledge scores ($\beta = 0.239$, $p < 0.001$). Participants who or whose families produce olive oil show a significant negative association with practice ($\beta = -0.133$, $p = 0.001$) and attitude ($\beta = -0.103$, $p = 0.020$) scores. Awareness of olive pomace oil is also inversely correlated with practice ($\beta = -0.231$, $p < 0.001$) and attitude ($\beta = -0.167$, $p < 0.001$) scores, indicating that those unfamiliar with this type of oil may lack essential knowledge and hold less favorable attitudes.

Figure 1 presents the usage patterns and consumer behaviors related to olive oil among participants from all countries. Panel A illustrates the percentage of participants who use olive oil for different medical purposes. The most common uses include hair loss (82%), constipation (77%), and gastrointestinal (GI) disorders (71%), followed by muscle pain and nerve relief (73%), skin stretch marks (63%), and cough relief (70%). Panel B shows the percentage of participants using olive oil for various

culinary purposes, with salads (82%) and preparing savory dishes (73%) being the most frequent uses while frying (24%) and preparing desserts (24%) are less common. Additionally, pastries (56%) also constitute a notable application. Panel C demonstrates the annual consumption of olive oil, where nearly half of the participants (49%) reported using more than 16 liters per year, followed by 35% who use 8-16 liters, and 17% who consume less than 8 liters annually. Lastly, Panel D reveals participants' responses in cases of suspected olive oil adulteration; 72% would return the olive oil to its source, 24% would report the issue to the General Organization for Food and Drug, while only 2% would involve the police or relevant agricultural authorities. These findings highlight diverse uses of olive oil and varying levels of awareness and consumer action in response to potential product adulteration.

Discussion

This study aimed to assess olive oil consumers' knowledge, attitudes, and behavior regarding quality, usage, and storage practices among the adult population of Arabian countries. The study included 511 participants, with the majority from Jordan (n=315, 61.6%), followed by Morocco (n=126, 24.6%), and Egypt (n=70, 13.7%). Most participants across the countries were female (n=360, 70.5%), and a significant portion of the respondents were urban residents and free of chronic diseases. In terms of educational level, a considerable percentage of participants held a bachelor's degree (46.6%), with Morocco showing the highest proportion of individuals with higher education (71.4%). Additionally, 57.1% of the respondents had university degrees related to health specialties. Regarding income, a larger percentage of participants from Jordan and Morocco reported earning more than $1,000 per month (41.6% and 46%, respectively) compared to only 15.7% of Egyptian participants.

Olive oil usage was nearly universal among respondents (n = 499, 97.7%), with universal usage in Morocco (100%) and Jordan (99%) compared to a slightly lower rate in Egypt (87.1%). Approximately half of the participants (50.3%) in all participating countries used extra virgin olive oil, although a significant proportion of respondents in Egypt (30%) were uncertain about the type of olive oil consumed. In addition, approximately two-thirds of the participants (66.7%) were unaware of olive pomace oil. Furthermore, more than half of the respondents (61.4%) did not obtain olive oil from their families or relatives. The findings from this study demonstrate that consumer knowledge regarding olive oil in the participating countries was relatively low (6±4.25 out of 15). Despite this, a neutral attitude (23±4.25 out of 35) was consistently observed across all three countries, with scores ranging from (24±4) in Jordan and Morocco to (23±4.25) in Egypt, the latter being the lowest among the samples. Furthermore, participants exhibited moderate practice (7±2 out of 10) across all countries.

The results of our study revealed a positive correlation between age and knowledge scores, indicating that as participants aged, their knowledge about olive oil increased. This suggests that age-related experiences and exposure to health information over time could contribute to this accumulated knowledge. This finding is consistent with previous research, which demonstrated that older adults possess greater nutritional knowledge, thereby enhancing their ability to make informed food choices (Miller and Cassady, 2015). Moreover, consumers of non-extra-virgin olive oil and non-virgin olive oil

exhibited better knowledge, suggesting that their preference for non-virgin olive oils in particular culinary applications may be due to the distinct sensory qualities that make these oils a better fit for certain foods. Thus, well-informed customers may prefer them (Romero et al., 2016). Additionally, one study (Martínez-González et al., 2012) pointed out that individuals with a higher nutrition awareness might choose non-virgin olive oil because of factors such as affordability or specific health outcomes. Although extra-virgin olive oil (EVOO) has a well-documented positive impact on various health aspects, it is especially recognized for its cardiovascular benefits. A previous study showed that the risk of major cardiovascular events was significantly lower among those adhering to a Mediterranean diet enriched with EVOO. This protective effect is largely attributed to the high concentrations of monounsaturated fats and bioactive compounds, such as phenolic compounds, found in EVOO (Milena and Maurizio, 2025).

The distinction between extra-virgin olive oil (EVOO) and virgin olive oil (VOO) is based on sensory characteristics, chemical composition, and phenolic profiles. EVOO is characterized by a fruity aroma, absence of sensory defects, and a free acidity level of ≤ 0.8%, typically obtained from olives harvested early in the winter (Boskou et al., 2005). EVOO also contains higher concentrations of phenolic compounds, such as hydroxytyrosol, tyrosol, and oleuropein derivatives, contributing to its superior antioxidant properties and more pronounced bitter and pungent notes (Bendini et al., 2007). In contrast, VOO may exhibit minor sensory defects, have a free acidity level between 0.8% and 2.0%, and contain lower levels of phenolics, resulting in reduced antioxidant capacity and a milder taste profile (García-González et al., 2008). Extra-virgin olive oil possesses a unique profile of phenolic compounds, making it superior to other types of olive oils (Fito et al., 2007). These phenolic compounds significantly reduce oxidative stress, modulate inflammation, and provide anti-carcinogenic effects, thereby offering considerable health benefits (Servili et al., 2013). This highlights the importance of enhancing consumer understanding of the health benefits of EVOO and encouraging its use as a primary dietary fat. Strategies such as utilizing interactive platforms, including apps or websites, to provide accessible information to consumers, conducting community workshops, and collaborating with dietitians to effectively promote the use of EVOO as a primary dietary component. In addition, region-specific marketing campaigns, educational initiatives in schools, and culinary workshops have been suggested by various studies as effective methods for increasing the knowledge and consumption of EVOO (García-González et al., 2008, Fito et al., 2007, Arjona-Fuentes and Amador-Hidalgo, 2017).

Participants whose families or relatives did not produce olive oil showed greater knowledge. This could be attributed to the increased reliance of individuals not directly involved in olive oil production on external sources of knowledge, such as educational programs and public health campaign knowledge, rather than inherited traditional knowledge (Martínez-González et al., 2012). Similarly, another study concluded that individuals from non-olive-oil-producing families were more likely to rely on formal education and market-driven knowledge, leading to a better understanding of health benefits and proper usage of olive oil (Saba and Di Natale, 1998). Moreover, participants who were unaware of olive pomace oil exhibited higher knowledge and better practice, suggesting that individuals with better knowledge

prefer higher-quality oils, such as extra virgin olive oil, and are less likely to be aware of or choose lower-quality oils, such as olive pomace oil (Dekhili and d'Hauteville, 2009).

Although low levels of knowledge were observed, neutral attitudes were generally observed among respondents across all countries, suggesting a potential disconnect between their knowledge and actual behavior or perceptions. Although the advantages of olive oil are well known, some factors, such as cultural influences, limited understanding of olive oil's health benefits, and concerns about product authenticity, may have contributed to this neutral stance (Riolo et al., 2022, Verbeke, 2008, Latino et al., 2022). To shift neutral attitudes toward positive attitudes, targeted educational campaigns should focus on the specific health benefits of olive oil, particularly extra virgin olive oil. Regarding public health campaigns targeting dietary fats, one study highlighted that well-structured educational interventions significantly increased consumer awareness and consumption of olive oil (Vilarnau et al., 2019). Additionally, a dietary education program that emphasized the health benefits of olive oil targeted middle-aged adults, and the intervention was successful in raising participants' awareness and use of olive oil (Esposito et al., 2004).

Although proper storage of olive oil is critical for maintaining its quality, nutritional value, and sensory qualities, our study revealed that consumers in all three countries displayed moderate to poor practices regarding olive oil storage. Numerous studies have emphasized the significant impact of storage conditions on olive oil quality. It is well known that improper storage conditions, such as exposure to light, heat, and air, accelerate the degradation of olive oil and diminish its nutritional value and sensory quality. Velasco and Dobarganes (2002) emphasized that maintaining the oxidative stability and overall quality of virgin olive oil critically depends on appropriate storage. They mentioned that improper storage conditions, such as exposure to light, air, and high temperatures, greatly accelerate the oxidation process, leading to the breakdown of beneficial compounds in olive oil, including phenolic compounds. This, in turn, lowers the nutritional value of the oil and degrades its sensory qualities such as taste and aroma (Velasco and Dobarganes, 2002). Another study further explored how inappropriate storage conditions cause phenolic compounds, which are crucial for the antioxidant capabilities and health benefits of olive oil, to degrade over time, as exposure to light, oxygen, and high temperatures accelerates this degradation, thereby reducing the overall quality and health advantages of the oil (Bendini et al., 2007).

Participants in our study reported using olive oil for medicinal purposes, with the most common applications being hair loss (82%), constipation (77%), skin allergies/eczema (72%), and gastrointestinal disorders (71%). Likewise in other studies (Faghihi et al., 2021, Morvaridi et al., 2020, Bhatia and Genekam Biotechnology) . Additionally, findings revealed that olive oil is primarily used in salads (82%) and savory dishes (73%), as well as in pastry preparation (56%), while it is less frequently used for frying (24%) and desserts (24%). Surprisingly, participants across all countries indicated that they would return the product in cases of suspected adulteration (72%), while only (24%) would report it to the general organization for food and drugs, and just 2% would involve law enforcement.

Regional and cultural practices significantly shape olive oil consumption, particularly in Jordan and Morocco, where home production and a preference for unbranded locally produced olive oil are prevalent. While these practices help preserve cultural heritage, they also pose challenges to consumer protection and market regulation. A study conducted in Morocco explored how cultural practices shape consumer preferences for locally produced olive oil, highlighting Morocco's strong preference for home-produced and unbranded olive oil and the regulatory challenges this presents, particularly in ensuring consistent product quality and safety (RAIF and AITHEDA, 2021). Similarly, another study found that Moroccan consumers' preference for home-produced olive oil reflects a deep cultural attachment to traditional production methods. The implications for market regulation include the need for policies that ensure the safety and authenticity of olive oil while accommodating local traditions (Buckland and González, 2010)

Furthermore, a study revealed that Jordanian consumers frequently rely on locally produced and unbranded olive oil due to cultural preferences and a lack of standardized commercial labeling (El Hanandeh and Gharaibeh, 2016). Bendini et al. (2007) examined the influence of traditional processing and storage methods on the phenolic content and overall quality of virgin olive oil. Their study found that these practices, common in home-produced and unbranded olive oils, can significantly affect the antioxidant profile of the oil, leading to variability in its quality (Bendini et al., 2007). These findings underscore the need for enhanced quality assurance mechanisms and consumer protection policies to address the challenges posed by reliance on traditional unregulated production methods. Such methods can lead to inconsistent quality, emphasizing the importance of regulatory frameworks that balance cultural preservation and consumer safety.

Our study provides valuable insights into olive oil consumers' knowledge, attitudes, and behaviors concerning quality, usage, and storage practices among the adult population in Arabian countries. However, certain limitations and obstacles were encountered throughout the study, highlighting the need for further research to explore and clarify additional factors that may influence the Arabian population's knowledge, attitudes, and practices.

Limitations

This study had several limitations. First, reliance on self-reported data introduces the possibility of bias, including over- or under-reporting olive oil consumption, storage practices, and related knowledge. Future studies could incorporate objective measures, such as dietary records or biomarkers, to mitigate this to validate the self-reported data. Second, geographic representation is constrained, with the sample disproportionately reflecting urban populations, potentially neglecting the behaviors and perspectives of rural consumers. Expanding sampling efforts to include more diverse geographic and demographic representations would address this issue. Third, the cross-sectional design limits the ability to assess causal relationships or observe temporal changes in knowledge and practice. Longitudinal studies should be conducted to track changes over time and provide a deeper understanding of causality.

Additionally, the study did not account for participants' broader dietary patterns or health status, which may have influenced olive oil consumption and related health outcomes. Including detailed dietary and health information in future studies would offer a more comprehensive analysis. Finally, the use of social media for data collection may introduce sampling bias, underrepresenting individuals with limited Internet access or those who are not active on these platforms. To minimize this, future research could incorporate alternative data collection methods such as in-person questionnaire s or telephone interviews to reach a broader segment of the population.

Clinical implication

The clinical implications of this study highlight significant knowledge gaps in olive oil usage and storage practices among consumers in Arabian countries, which have direct implications for public health and dietary behaviours. Poor storage practices, such as exposure to light and improper temperature control, degrade the quality of olive oil, resulting in the loss of health-promoting phenolic compounds. Given olive oil's known benefits, particularly extra virgin olive oil (EVOO), in reducing oxidative stress and cardiovascular risks due to its high concentration of monounsaturated fats and phenolic compounds, it is crucial that consumers adopt proper storage methods to maintain these benefits. Educational interventions targeting proper olive oil storage and consumption could significantly improve public health outcomes. This is especially important as the study revealed that older individuals and those not involved in olive oil production exhibited greater knowledge, suggesting that consumer education, rather than traditional knowledge, plays a crucial role in promoting healthier behaviours. Programs to raise awareness about the health benefits of high-quality olive oils, including their anti-inflammatory and antioxidant properties, could enhance the population's diet quality and overall health. Lastly, addressing adulteration and ensuring quality control in the olive oil supply chain is vital for protecting consumers. Strengthening public health campaigns and regulatory measures to ensure the authenticity and purity of olive oil products can mitigate the risks posed by adulterated or low-quality oils, which fail to provide the expected health benefits.

Future research should address these knowledge gaps by conducting longitudinal studies to track changes in knowledge, attitudes, and practices over time, particularly after public health interventions. Intervention-based research should evaluate the effectiveness of educational tools, and further studies are needed to explore the relationship between olive oil consumption, particularly EVOO, and health outcomes across various populations.

Conclusion

This study provides valuable insights into the knowledge, attitudes, and practices related to olive oil among consumers in Jordan, Morocco, and Egypt. Findings revealed that overall consumer knowledge was relatively low, particularly among younger individuals, with neutral attitudes and moderate practices observed. Interestingly, those not involved in olive oil production demonstrated better knowledge,

underscoring the importance of formal education over traditional knowledge. The study highlights a need for targeted educational programs to enhance consumer understanding of the health benefits of high-quality olive oils, particularly extra virgin olive oil, and the importance of proper storage practices to preserve its nutritional value.

Declarations

Ethics approval and consent to participate

This study was approved by the Institutional Research Ethics Committee at Applied Science Private University, Amman, Jordan (Approval number: 2024-PHA-3). All participants provided informed consent electronically prior to participation. The study was conducted in accordance with the ethical standards outlined in the Declaration of Helsinki.

Consent for publication

Not applicable. This study did not involve any individual-level data requiring specific consent for publication.

Availability of data and materials

The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

S.B. Abdulrazzaq and M. Barakat conceived and designed the study. A. Omar, M.A.A. Al-Najjar, and S. Altai contributed to data collection and prepared the initial draft of the manuscript. A. Kamal, D. Raad, and E.O. Alhassan supported data interpretation and conducted the literature review. S.B. Abdulrazzaq and M. Barakat performed the statistical analyses and contributed to critical revision of the manuscript. M. Barakat supervised the project and finalized the manuscript. S. Atawneh, N. Benajiba, D. Chellappan, D. Abdelaziz and S. Atawneh reviewed and approved the final version of the manuscript.

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Figures

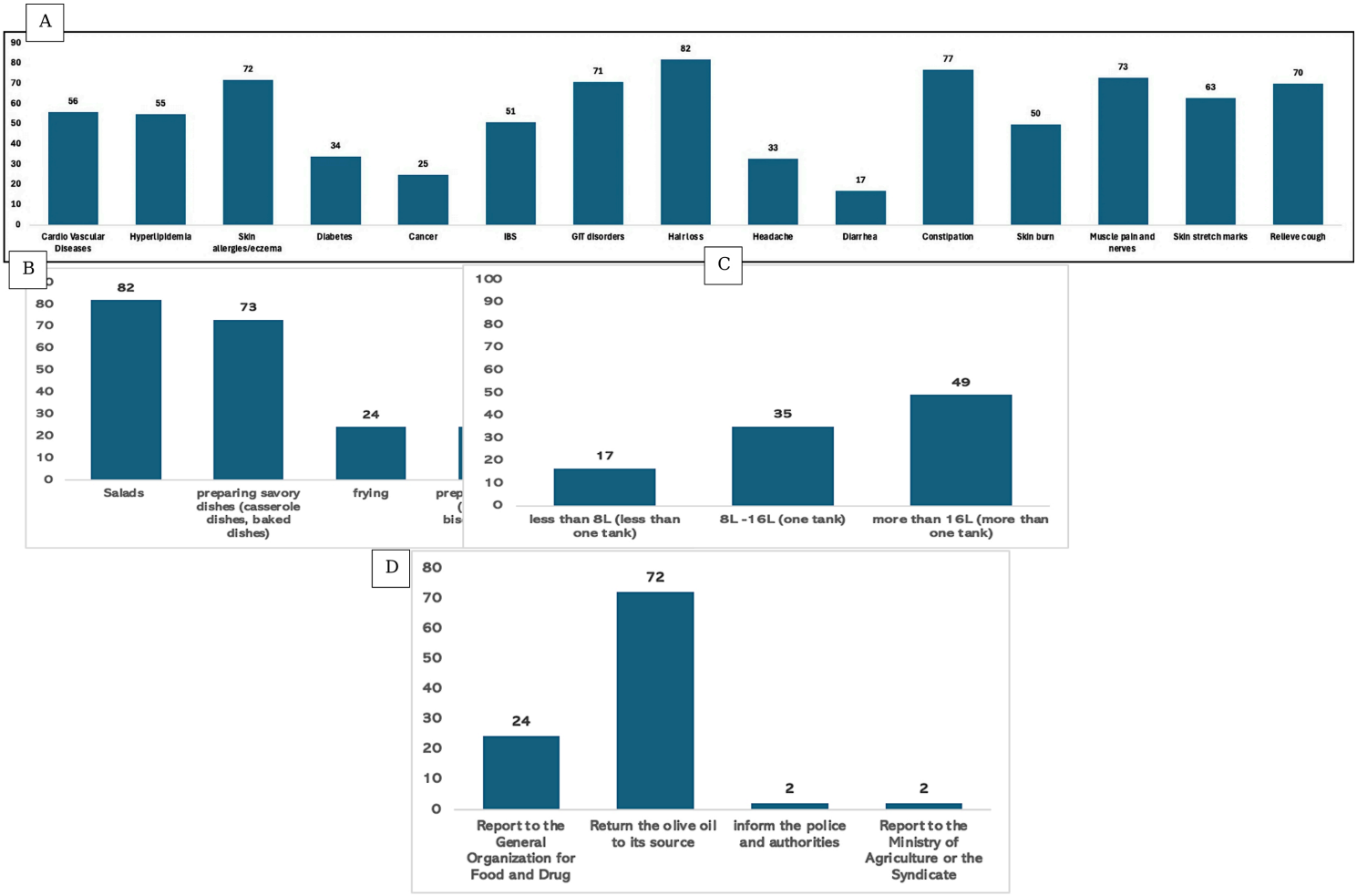


Figure 1. Shows the percentage of participants from all countries where A) shows the percentage of participants that use olive oil in different medical purposes. B) shows the percentage of participants that use olive oil for various purposes in cooking, C) shows the percentage of participants who use of olive oil amounts per year, and D) shows what the participants would do in case of suspected adultery actions reported as a percentage of participants.

Figure 1

See image above for figure legend

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