

REVIEW



Knowledge, practices, and health perceptions related to kefir consumption

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ABSTRACT

Kefir, a probiotic-rich fermented milk with documented health benefits, remains largely underexplored in North African populations, including Tunisia. This study assessed public knowledge, attitudes, and consumption patterns of kefir in Tunisia, and explored perceived health benefits. A cross-sectional survey was conducted from August to December 2024 among 279 adults (18–87years) using a structured questionnaire in Arabic and French. Data collected included demographics, medical history, kefir awareness, consumption habits, and perceived health effects. Descriptive statistics and the Kruskal–Wallis test were applied ($p < 0.05$). Awareness of kefir was limited: 40.9% of participants had prior knowledge, and only 16.8% consumed it occasionally or regularly. Among consumers, reported benefits included improved intestinal transit (19.7%), immune stimulation (18.3%), obesity management (15.1%), blood sugar regulation (11.1%), and male fertility support (7.9%). Kefir was mainly obtained from supermarkets (44.6%) or home preparation (33.7%). Despite low consumption, 93% expressed interest in learning more about kefir, and 88.4% would consider purchasing it if available. This study highlights a striking gap between kefir's recognized health benefits and its actual consumption in Tunisia. The findings underscore opportunities for educational initiatives, improved accessibility, and further research into kefir's bioactive properties, supporting its potential as a functional food with therapeutic value.

KEY WORDS

Kefir; Fermented milk;
Probiotics;
Tunisia; Functional food

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Introduction

Kefir is a fermented dairy product that has gained significant attention in recent years due to its health-promoting properties. It is produced by fermenting milk with kefir grains, which consist of a symbiotic culture of bacteria and yeasts. This fermentation process contributes to its unique health benefits, making it a highly valued functional food. Research has consistently demonstrated that kefir supports gut health, enhances digestion, and bolsters the immune system [1]. Moreover, recent studies have expanded its known benefits to include effects on metabolic health, liver function, lipid profiles, and even fertility [2]. The probiotic bacteria in kefir help modulate the intestinal microbiome, influencing various aspects of health, from immune response to metabolism [3]. Given the increasing global awareness of the importance of gut health and its impact on overall well-being, kefir is emerging as a key functional food for addressing a variety of health concerns, including obesity, metabolic syndrome, stress oxidant, and gastrointestinal disorders [4,5].

Despite its well-documented health benefits, kefir remains under-consumed in many regions, including Tunisia. While fermented dairy products like yogurt and laban are staples in

the Tunisian diet, kefir has not yet gained similar popularity. This discrepancy is likely due to limited awareness, cultural factors, and a lack of sufficient availability in the market. Kefir's global popularity, particularly in Eastern Europe and Asia, contrasts with its limited presence in Tunisia, where traditional fermented products dominate. This gap in consumption necessitates research on Tunisian attitudes and perceptions regarding kefir, as well as an exploration of the factors influencing its adoption in the local diet. Studies show that kefir's acceptance in new markets often depends on consumer awareness and understanding of its health benefits. Therefore, addressing knowledge gaps and increasing awareness about kefir could pave the way for its wider acceptance in Tunisia.

The primary aim of this research is to evaluate the level of awareness, attitudes, and consumption patterns of kefir among the Tunisian population. The study aims to assess factors such as demographic characteristics, health status, and knowledge of kefir's potential health benefits. Understanding barriers to kefir consumption, such as limited knowledge or accessibility, is crucial for promoting its wider adoption in

Tunisia. Additionally, the research will examine how kefir is perceived in terms of its health benefits, including its potential role in digestive health, weight management, and the prevention of chronic diseases like diabetes and hypertension. Kefir's probiotic-rich composition is believed to help with gut microbiota modulation, which can improve digestion and enhance the body's immune response [6]. By identifying the factors influencing kefir consumption in Tunisia, this study aims to provide valuable insights into how kefir could be integrated into the Tunisian diet, ultimately improving public health.

The data for this study was collected using a structured questionnaire, divided into three main sections. The first section gathered demographic information, including age, gender, education, and health-related factors. The second section focused on participants' medical history, including weight, height, chronic conditions, and dietary restrictions. The third section assessed participants' knowledge of kefir, including how they learned about it, their familiarity with its health benefits, and their consumption patterns. The questionnaire also addressed whether participants use kefir for medical purposes and their satisfaction with the results. Importantly, the survey sought to determine whether it sparked greater interest in kefir and what additional information participants would need to encourage its consumption. Recent studies have shown that awareness campaigns can play a significant role in increasing consumer knowledge and promoting the acceptance of kefir as a beneficial food [7].

Given the increasing global interest in functional foods, this research is timely and contributes to the broader understanding of kefir's potential to improve public health. The findings will provide evidence on the role of kefir in digestive health and metabolic regulation and could pave the way for public health campaigns aimed at promoting its consumption in Tunisia. By evaluating Tunisian attitudes and behaviors towards kefir, this study will offer a comprehensive analysis of the factors influencing kefir consumption and identify ways to overcome barriers to its adoption in Tunisia. The growing body of literature supporting kefir's health benefits underscores the importance of educating populations about its potential, especially in regions where it is not yet widely consumed.

Material and Methods

Study design

This study was designed as a cross-sectional survey aimed at assessing the knowledge, attitudes, and consumption behaviors of kefir among the Tunisian population. The methodology was based on established survey techniques widely used in dietary behavior research. Data collection was conducted over a five-month period, from August to December 2024, with continuous data gathering throughout this time to capture a broad spectrum of responses. This approach allows for a more comprehensive understanding of consumption patterns and attitudes over time. This cross-sectional design has been previously employed in studies assessing consumer behaviors related to probiotic foods.

Study population

The study aimed to recruit a total of 279 adult participants (aged 18 and above) residing in Tunisia. A convenience sampling method was used to gather data from a diverse group of participants in terms of age, gender, education level,

and geographical location. This method is commonly employed in dietary behavior studies when access to a large and varied sample is required. Participants were approached via two main methods: online distribution of the questionnaire through platforms such as Google Forms, Facebook, and WhatsApp, and in-person interviews in public spaces such as markets, cafes, and local centers. The combination of online and face-to-face surveys ensures a wide geographical reach and increases sample diversity.

Data collection

Data were gathered using a structured questionnaire designed in both Arabic and French to ensure accessibility for all participants. The survey was divided into three main sections:

Section A: Personal Information – Participants were asked to provide demographic data, including age, gender, nationality, place of residence, education level, marital status, and employment status. This section is similar to the demographic data collection in studies assessing consumer preferences in health-related behaviors [8].

Section B: Medical Data: This section inquired about participants' health status, including their weight, height, chronic conditions, and adherence to specific dietary regimens. Medical data collection about dietary habits is a well-established practice in consumer health studies [8].

Section C: Attitudes and Consumption of Kefir: This section explored participants' knowledge about kefir, its perceived health benefits, and consumption patterns. Key questions included:

"Do you know what kefir is?"

"On a scale of 0 (I know nothing) to 5 (I know everything), how would you rate your knowledge of kefir?"

"Where did you first hear about kefir?"

"What health benefits of kefir are you familiar with?"

"Do you consume kefir regularly?"

"How much kefir do you consume per day (in milliliters)?"

"If you use kefir for health treatment, are you satisfied with the results?"

"Has this survey prompted you to seek more information about kefir? What would you like to know more about?"

This type of survey structure is aligned with best practices in consumer research on functional foods, particularly those that involve knowledge, attitudes, and consumption behaviors [9].

The questionnaire was distributed both online via social media and messaging apps and in person. For online distribution, the survey link was shared through multiple platforms to ensure wide access. For face-to-face collection, participants completed the survey using a tablet or mobile device, allowing for immediate data entry. This combined approach increases the representativeness of the sample and captures both tech-savvy and non-tech-savvy populations.

Data analysis

The collected data were entered into statistical software (BIOSTAT) for analysis. Descriptive statistics, including frequencies, means, and standard deviations, were used to summarize the demographic characteristics of the participants and their responses. The difference between all parameters was estimated by the Kruskal-Wallis test. The difference between treatment groups was considered as significant when $p < 0.05$.

Limitations

The study employed a convenience sampling method, which, while practical, may have introduced selection bias, as the sample may not be fully representative of the broader Tunisian population. Similar limitations were observed in other dietary behavior studies that used convenience sampling for data collection [8]. Furthermore, self-reported data are susceptible to recall bias, where participants may either overestimate or underestimate their kefir consumption. The use of both online and face-to-face data collection methods may also have introduced some differences in responses based on the mode of participation, as noted in previous studies [9].

Results

Demographic and social characteristics of the respondents

Study participants in Tunisia

According to the Tunisian population, the majority of those responders belonged to the Northeast region (66%), followed by the North west region (16.2%) ($p < 0.05$). The Southeast and Central east region was less represented compared to the North (6.8% and 4.4%, respectively), while a minority of individuals surveyed were situated in the Central west and South west (2.2 % and 0.8 %, respectively) as shown in Figure 1.

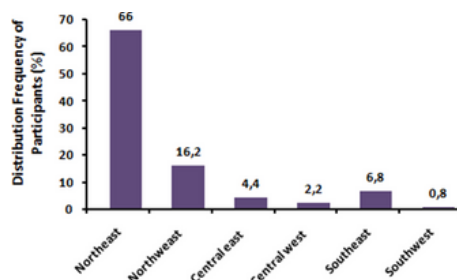


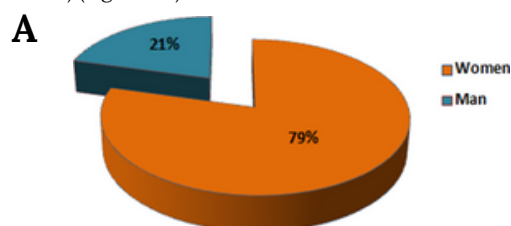
Figure 1. Distribution of participants in Tunisia.

Distribution of respondents by gender, and age group

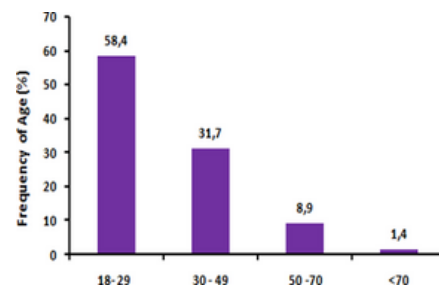
The figure 2 showed the distribution of respondents by gender, and age group. The surveyed population showed a female predominance, with a sex ratio (M/F) of approximately 3.8 (Figure 2A). Participants ranged in age from 18 to 87 years, with the largest proportion (58.47%) belonging to the 18 to 29 years age group, 31.17 % were between the ages of 30 and 49, 8.96 % were between 50 and 70 years old and, 1.4 % were more than 70 years old ($p < 0.05$) (Figure 2B).

Education level and professional status

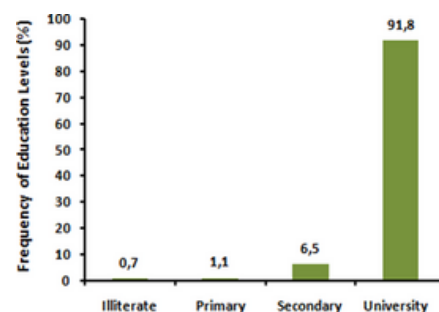
Regarding education levels, 91.9 % of respondents were university graduates, while 1.1 % and 6.5% had completed primary and secondary education, respectively. Furthermore, 0.7% of the participants were illiterate (Figure 2C). The findings of our study showed that the majority of the professional population were students (49.1%), followed by senior executive (30.5%) and intermediate employee (9.3%) ($p < 0.05$) (Figure 2D).



B



C



D

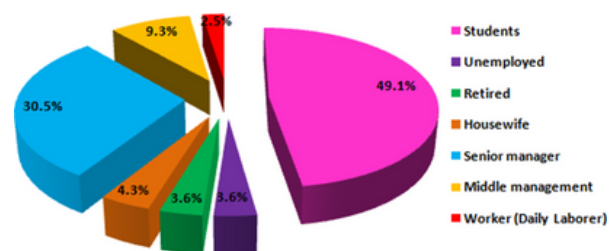


Figure 2. Demographic profile of respondents by gender (A), age group (B), education level (C), and professional profile (D) in Tunisia

Identification and application of kefir milk

Knowledge of kefir milk respondents

A significant portion of respondents reported being unfamiliar with kefir milk, its beneficial effects, and its use for perceived health benefits, with percentages of 59.1%, 70.3%, and 88.9%, respectively. However, nearly half of the participants (40.9%) indicated awareness of kefir milk (Figure 3A). Conversely, a smaller proportion of respondents were unaware of its beneficial effects (29.7%) (Figure 3B) and did not use kefir milk (11.1%) (Figure 3C).

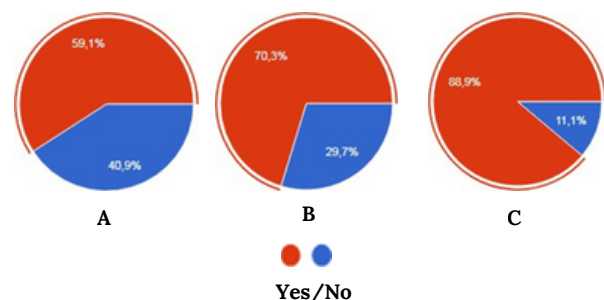


Figure 3. Knowledge about Kefir Milk (A), perceived beneficial effects (B), and frequency of Kefir Milk consumption (C).

Knowledge level of kefir

The most commonly reported knowledge level about kefir was "No Knowledge" (0), accounting for 33% of respondents. This was followed by "Low Knowledge" (Level 1) at 29.4% and "Moderate Knowledge" (Level 2) at 16.5%. Higher levels of knowledge were less frequent, with "Level 3" at 10.8%, "Level 4" at 5.4%, and "Complete Knowledge" (Level 5) at 5% (Figure 4A).

Sources of awareness and discovered of kefir milk

Most respondents (57.8%) discovered kefir milk through our survey, followed by family and friends (23.7%), healthcare professionals (9.7%), websites and social media (8.6%), and newspapers/scientific magazines (4.3%) (Figure 4B).

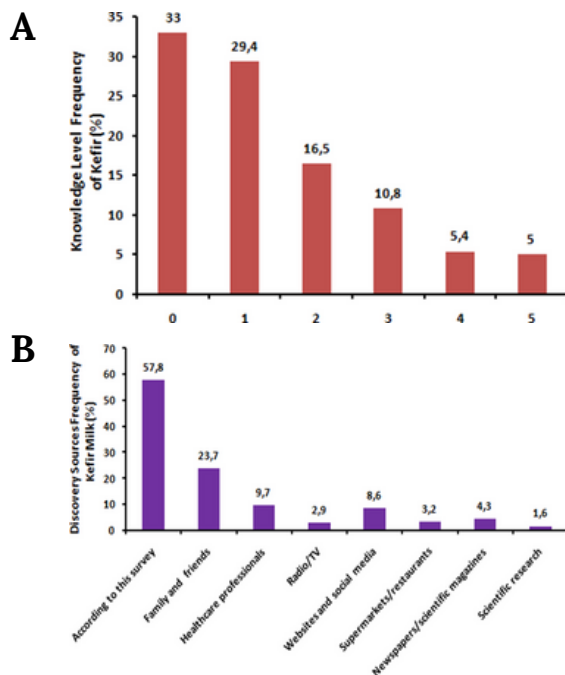


Figure 4. Knowledge levels about Kefir Milk (A) and sources of discovery (B).

Therapeutic use of kefir milk

Reasons for consuming kefir milk

The findings show that several factors influence the choice to use kefir milk. The majority of respondents (62.1%) reported using it for health benefits, including therapeutic purposes, cosmetic applications, and nutritional supplementation. This was followed by 24.1% who cited its pleasant taste and 19% who used it based on recommendations from family and friends for a health condition (Figure 5A).

Beneficial effects of kefir milk

The survey results highlight the various health benefits that respondents associate with kefir milk consumption. The most commonly reported benefit is the improvement of intestinal transit, with 19.7% of participants recognizing its positive impact. Additionally, 18.3% believe that kefir stimulates the immune system, and 15.1% use it to help prevent obesity. Other perceived benefits include its ability to regulate blood sugar levels (11.1%), reduce cholesterol levels (11.8%), and regulate blood pressure (10.1%). Kefir is also seen as having anti-carcinogenic effects (7.1%) and stimulating male fertility (7.9%). Our results suggest that respondents view kefir as a versatile product with multiple health-promoting properties. (Figure 5B).

Source of my kefir milk

Our Findings indicate that kefir is primarily obtained through commercial and personal sources. A significant proportion of respondents (44.6%) purchase their kefir from supermarkets, while 33.7% prepare it at home. Additionally, 28.9% receive their kefir from acquaintances, highlighting the diverse ways in which people access this popular probiotic drink (Figure 5C).

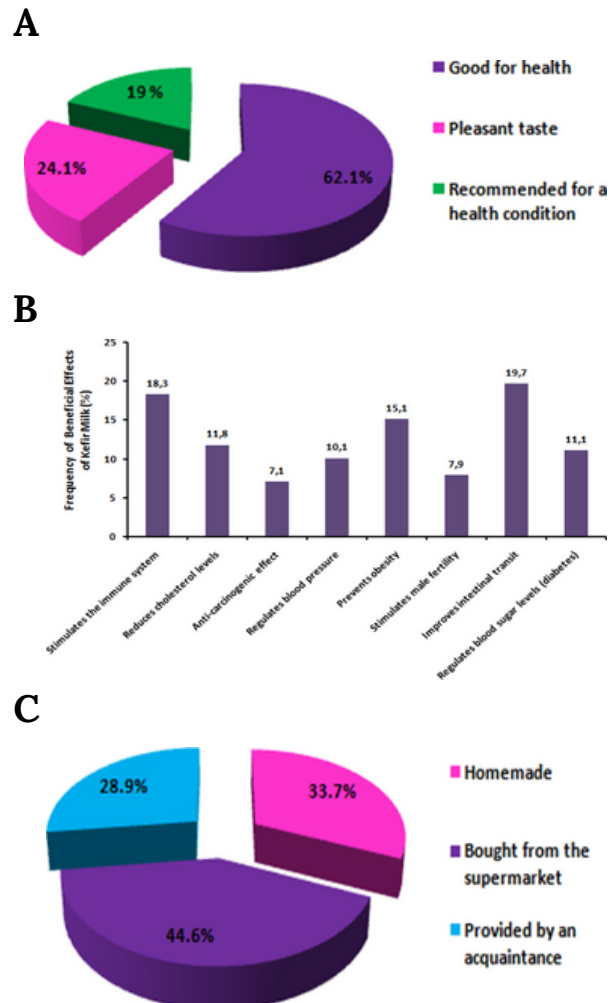


Figure 5. Reasons for Kefir milk consumption (A), perceived beneficial effects of Kefir milk (B), and sources of Kefir milk (C).

Kefir consumption frequency

The results reveal that a large majority of respondents (83.2%) never consume kefir. A smaller proportion of individuals consume it occasionally (8.6%), while even fewer drink it once or twice a month (5.7%), once or twice a week (1.1%), or once or twice a day (1.4%) (Figure 6A).

Daily Kefir consumption (mL/day)

Our study showed that the majority of respondents (85.7%) do not consume kefir on a daily basis. A smaller proportion of participants reported drinking 125 mL (1 glass) of kefir daily (11.1%), while only a few consume 250 mL (2 glasses) daily (1.8%) or more than 250 mL (1.4%). These findings suggest that kefir consumption is limited to a small portion of the population, with most individuals either not consuming it at all or having minimal daily intake (Figure 6B).

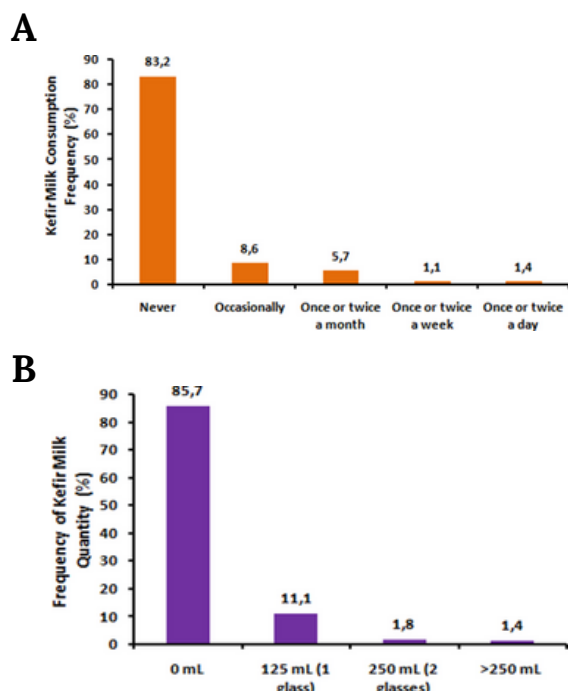


Figure 6. Frequency of Kefir milk consumption (A) and daily Kefir milk consumption (mL/day) (B).

Frequency of satisfaction rate and motivation to learn more about kefir milk

The survey results reveal that 57.9% of respondents are satisfied with their current knowledge and experience with kefir milk, while 42% expressed dissatisfaction (Figure 7A). Additionally, a significant majority, 93% of participants, expressed a desire to learn more about kefir (Figure 7B), indicating a strong interest in gaining further knowledge about its benefits and uses. Our results showed that while many individuals are satisfied with what they know about kefir, there is a considerable interest in expanding their understanding of the product.

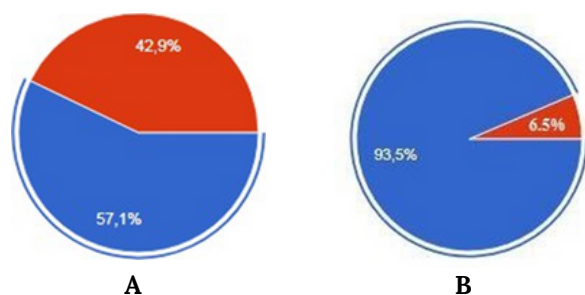


Figure 7. Satisfaction rate frequency (A) and frequency of motivation to learn more about Kefir milk (B).

Discussion

Our ethno-pharmacological survey in Tunisia has provided valuable insights into the knowledge, usage, and perceptions of kefir milk among a diverse group of respondents. While kefir is known for its potential health benefits, the findings reveal a mixed level of awareness and consumption patterns within the surveyed population.

Data collected through questionnaire forms showed that women, accounting for 79% of respondents, were the most knowledgeable and experienced regarding kefir milk. Participants' ages ranged from 19 to 78 years, with the majority between 20 and 29 years old, and most having a high level of education. Similar observations were reported in studies conducted in Ethiopia [10]. Kefir milk serves various purposes, including being consumed as a probiotic-rich drink, used as a base for smoothies, incorporated into salad dressings, or substituted for buttermilk in baking [11–14]. It is also widely used in marinades, soups, and desserts, offering a tangy flavor while boosting the nutritional value of dishes.

One of the most striking results is that a significant proportion of respondents (88.9%) reported never consuming kefir milk, and 59.1% indicated being unfamiliar with it. However, 40.9% of participants were aware of kefir milk, though this does not necessarily reflect a high level of knowledge about its benefits or uses. Only a small minority incorporated kefir into their daily routine. This suggests that kefir is not yet a mainstream product for most people, despite its known health benefits. The relatively low frequency of consumption, as evidenced by the high number of respondents who consume kefir occasionally or not at all, may reflect several factors, including limited availability in Tunisia, lack of in-depth knowledge, or a preference for other beverages. A consumer's reaction is pivotal in shaping their affinity for a product and influencing their intention to purchase it when the product is available [15]. These feelings towards a product may stem from information or experiences related to the product, whether actual or perceived. This highlights the importance of assessing consumers' feelings towards products they have never used [16].

Interestingly, when asked where they first learned about kefir, a large portion of respondents (57.8%) discovered it through the survey itself, indicating that many people may have had little prior exposure to kefir. Others cited family and friends (23.7%) and healthcare professionals (9.7%) as sources of information, pointing to the role of informal networks in spreading knowledge about health-related products. However, a small proportion of respondents learned about kefir through media sources such as websites, social media, and scientific magazines, underscoring the importance of accessible information channels for raising public awareness.

However, the 62.1% of participants who use kefir for health-related reasons, such as its potential to improve digestive health, boost immunity, and manage weight, highlights the product's recognition as a beneficial food [17]. Kefir is a fermented dairy product made from a single culture that includes a combination of lactic and acetic acid bacteria, as well as yeast [18]. It is a cost-effective food option, easily accessible to the general population, and simple to prepare. Additionally, kefir boasts substantial functional potential owing to its rich bioactive components, including exopolysaccharides, conjugated fatty acids, and peptidases [17–19]. This shows that those who do consume kefir are likely aware of its therapeutic advantages. The therapeutic benefits that respondents associate with kefir are diverse, with the most commonly mentioned benefits being its ability to improve intestinal transit, stimulate the immune system, and prevent obesity. These findings are consistent with the known health benefits of kefir, which is rich in probiotics that support gut health and enhance immune function [20]. Other benefits, such as regulating blood sugar levels, lowering cholesterol, and

stimulating male fertility, were mentioned by smaller proportions of the participants. Hammami et al. found that kefir milk had a protective effect on sperm quality in obese adult rats, with chronic consumption of 1 mL/100 g of kefir milk over 60 days preventing a decline in sperm quality [21]. This highlights the potential of kefir as a multifunctional food that can play a role in managing various health conditions. However, it also indicates that further research and education are needed to fully communicate the breadth of kefir's health benefits to the public.

The results highlight a significant gap between the recognized health benefits of kefir and its actual consumption patterns, with 83.2% of respondents never consuming it and 85.7% not drinking it daily. This limited consumption may stem from factors such as a lack of awareness about kefir's health benefits, restricted availability, cultural dietary preferences, and the tangy taste that may not appeal to everyone. Among those who do consume kefir, intake is generally low, with only 1.8% drinking 250 mL or more daily, which may limit the realization of its probiotic benefits. To address this, efforts should focus on increasing awareness through education campaigns, enhancing accessibility and affordability, and aligning kefir with local dietary practices. Promoting kefir as a versatile and beneficial food product could help bridge the gap between its potential health advantages and its current low adoption rates. Various studies have explored different intake amounts, such as 180 mL per day, which was administered to patients with metabolic syndrome over 12 weeks, showing positive effect on metabolic parameters [22]. In another clinical study, kefir was provided in increasing doses, starting at 60 mL and reaching 240 mL daily, to assess its impact on gut health in ICU patients. These studies highlight the potential benefits of kefir consumption, though specific dosage recommendations may vary [23].

Despite the relatively low daily consumption rates, there is considerable interest in learning more about kefir, with 93% of respondents expressing a desire to gain more knowledge. This finding is particularly encouraging, as it suggests a latent demand for more information and resources on kefir. Respondents who expressed dissatisfaction with their current knowledge (42%) could benefit from educational efforts to address their concerns and expand their understanding of the product. The significant interest in learning more about kefir points to an opportunity for further research and dissemination of knowledge, especially through platforms like social media, health blogs, and workshops that could engage the public more effectively. Similar results were demonstrated when respondents were asked about their purchase intention for kefir using a 5-point scale from very interested to very uninterested, with 88.4% expressed interest in buying kefir if available, with 6.6% neutral and 5% uninterested or very uninterested [10].

Finally, while kefir is recognized by some respondents for its health benefits, there is a clear need for greater education and awareness to expand its reach. The survey highlights the gap in knowledge and consumption habits and suggests that increasing access to kefir and providing more information could encourage greater uptake of this probiotic-rich beverage. There is also a strong interest in learning more about kefir, which presents an opportunity for targeted educational initiatives aimed at promoting its consumption and exploring its full range of health benefits.

Conclusions

This ethno-pharmacological survey highlights the limited knowledge and low consumption of kefir milk despite its recognized health benefits. While many respondents were unfamiliar with kefir, a significant number expressed interest in learning more. The survey revealed that kefir milk is widely utilized in traditional medicine among respondents in Tunisia, demonstrating its potential role in improving intestinal transit, boosting immunity, and managing obesity, cholesterol, and diabetes, thereby positioning it as a functional food. The findings provide a valuable dataset for future research in pharmacology, phytochemistry, and biochemistry, potentially aiding in the discovery of new remedies and the development of pharmaceuticals derived from kefir milk.

Disclosure Statement

No potential conflict of interest was reported by the authors.

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