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Food literacy among athletes: a cross-sectional study

Alfabetización alimentaria en deportistas: estudio transversal

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ABSTRACT

Introduction: Adopting good nutritional practices and strategies can be attributed to a better understanding of dietary knowledge and habits, thus promoting good sports performance. This study aimed to assess athletes' nutritional knowledge, eating habits, and adherence to the Mediterranean diet.

Methodology: Cross-sectional survey of 70 adult athletes. Data were collected using a questionnaire assessing their eating habits, nutritional knowledge (Abridged Nutrition for Sport Knowledge Questionnaire, A-NSKQ), and adherence to the Mediterranean diet (Medi-Lite score). Statistical analyses were performed using R software (version 3.0.3), with a significance level set at $p < 0.05$.

Results: Athletes were young adults (18.9–27.8 years) with an average of 7.5 ± 2.8 years of sports practice. Most participants (77.1%) reported consuming four or more meals per day. No sex differences were observed in the consumption of milk and derivatives, cereals, legumes, or starchy foods. In contrast, men generally consumed other food groups more frequently, except for sweet products, which were consumed more often by women ($p < 0.001$). Overall nutritional knowledge was low (46.5%), with significantly higher scores for general nutrition compared with sports nutrition (67.3% vs. 36.9%; $p < 0.001$). Adherence to the Mediterranean diet was moderate (mean score: 7.95), with higher scores in men than women and a large effect size. No significant correlations were observed between length of time in sport and either general nutrition knowledge ($r = 0.04$) or sports nutrition knowledge ($r = 0.03$). Likewise, adherence to the Mediterranean diet was not significantly correlated with general nutrition knowledge ($r = 0.0001$), sports nutrition knowledge ($r = 0.0013$), or total nutrition knowledge ($r = 0.0011$).

Conclusion: The present study found no significant correlation between nutritional knowledge and adherence to the Mediterranean diet, with athletes demonstrating low levels of both. These findings underscore the necessity for targeted nutrition education interventions to enhance dietary knowledge and practices.

Keywords: Athletes; Food literacy; Sports nutrition knowledge; Mediterranean diet; Eating habits.

RESUMEN

Introducción: La adopción de buenas prácticas y estrategias nutricionales puede atribuirse a una mejor comprensión de los conocimientos y hábitos alimenticios, lo que favorece un buen rendimiento deportivo. El objetivo de este estudio fue evaluar los conocimientos nutricionales, los hábitos alimenticios y el cumplimiento de la dieta mediterránea entre los deportistas.

Metodología: Encuesta transversal a 70 deportistas adultos. Los datos se recopilaron mediante un cuestionario que evaluaba sus hábitos alimenticios, sus conocimientos nutricionales (Cuestionario abreviado de conocimientos sobre nutrición deportiva, A-NSKQ) y su adherencia a la dieta mediterránea (puntuación Medi-Lite). Los análisis estadísticos se realizaron con el software R (versión 3.0.3), con un nivel de significación establecido en $p < 0,05$.

Resultados: Los deportistas eran adultos jóvenes (18,9-27,8 años) con una media de 7,5 ± 2,8 años de práctica deportiva. La mayoría de los participantes (77,1 %) declararon consumir cuatro o más comidas al día. No se observaron diferencias entre sexos en el consumo de leche y derivados, cereales, legumbres o alimentos ricos en almidón, mientras que los hombres consumían en general otros grupos de alimentos con mayor frecuencia, excepto los productos dulces, que eran consumidos con mayor frecuencia por las mujeres ($p < 0,001$). El conocimiento nutricional general era bajo (46,5 %), con puntuaciones significativamente más altas en nutrición general que en nutrición deportiva (67,3 % frente a 36,9 %; $p < 0,001$). La adherencia a la dieta mediterránea fue moderada (puntuación media: 7,95), con puntuaciones más altas en los hombres que en las mujeres y un gran tamaño del efecto. No se observaron correlaciones significativas entre el tiempo dedicado al deporte y los conocimientos generales sobre nutrición ($r = 0,04$) o los conocimientos sobre nutrición deportiva ($r = 0,03$). Del mismo modo, la adherencia a la dieta mediterránea no se correlacionó significativamente con los conocimientos generales sobre nutrición ($r = 0,0001$), los conocimientos sobre nutrición deportiva ($r = 0,0013$) o los conocimientos totales sobre nutrición ($r = 0,0011$).

Conclusión: El presente estudio no encontró una correlación significativa entre los conocimientos nutricionales y la adherencia a la dieta mediterránea, ya que los atletas mostraron niveles bajos en ambos aspectos. Estos hallazgos subrayan la necesidad de intervenciones específicas de educación nutricional para mejorar los conocimientos y las prácticas alimentarias.

Palabras clave: Atletas; Alfabetización alimentaria; Conocimientos sobre nutrición deportiva; Dieta mediterránea; Hábitos alimenticios.

KEY MESSAGES

- The athletes selected for this study demonstrated a deficiency in nutritional knowledge and a low level of adherence to the Mediterranean diet.
- The present study found no correlation between adherence to the Mediterranean diet and the level of nutritional knowledge. This highlights the complexity of the factors that determine food choices.
- The results of this study underscore the necessity to enhance food literacy and nutritional education among athletes.

1. Introduction

Food literacy refers to the knowledge and skills that enable individuals to understand nutritional information and adopt daily eating habits that are in line with nutritional recommendations (1). In the field of sports nutrition, food literacy is particularly important, as athletes are required to make informed dietary decisions, which requires a thorough understanding of nutrition. Indeed, a lack of knowledge can compromise or reduce their athletic performance. However, due to the complex nature of the concept, this study focused on certain cognitive and behavioral dimensions of food literacy, including general and sports nutrition knowledge, eating habits, and adherence to the Mediterranean diet.

Although food literacy and its components have been the subject of numerous studies in scientific literature, this topic remains largely unexplored in Algeria, particularly among athletes. A series of studies has revealed worrying findings regarding athletes' nutritional knowledge. For example, Arnaoutis et al. (2) reported a significant deficit in nutritional knowledge among 39 high-level handball players, with an average score of 38.50 ± 10.70%. In contrast, Modena et al. (3) found a high level of adherence to the Mediterranean diet, with an average score of 10.10 ± 1.80, indicating favorable eating habits among 23 semi-professional female soccer players. However, few studies have simultaneously analyzed nutritional knowledge and eating behaviors, particularly adherence to a healthy dietary pattern such as the Mediterranean diet. This gap highlights the importance of jointly analyzing these variables as operational components of food literacy to better understand their role in optimizing health and athletic performance.

The objectives of this study were to assess general and sports nutrition knowledge, eating habits, and adherence to the Mediterranean diet among Algerian athletes, to examine sex differences in these variables, and to analyze the correlations between nutritional knowledge, adherence to the Mediterranean diet, and length of time participating in sports.

Therefore, this study aimed to address the following research questions:

- What are the levels of general nutrition knowledge, sports nutrition knowledge, and adherence to the Mediterranean diet among Algerian athletes?
- Are there sex-related differences in nutritional knowledge and adherence to the Mediterranean diet?
- Are general and sports nutrition knowledge associated with adherence to the Mediterranean diet and with the length of time spent practicing sports?

2. Methodology

2.1. Study design and population

The present study was a cross-sectional descriptive study of a sample of 70 high-level athletes affiliated with a recognized sports federation, actively competing at regional, national, or international levels, and engaged in structured training programs with a minimum training volume of ≥3–5 sessions per week,no prior estimate of sample size was made. Sample size was determined based on feasibility and availability of eligible athletes during the data collection period.

Participants were recruited via convenience sampling from sports clubs. Athletes were invited to participate during training sessions and informed about the objectives of the study. Athletes who were available during training sessions and met the inclusion criteria were invited to participate. A total of 70 athletes agreed to participate and completed the questionnaire. No information was collected from non-respondents. They were recruited from three sports clubs located in two Algerian cities: Algiers (the capital, in central Algeria) and Constantine (in the east of the country) from February 2025 to May 2025. These two cities were chosen mainly for their accessibility, geographical proximity, and organized sports facilities. These are densely populated and influential areas. As the capital of eastern Algeria, Constantine provides an alternative viewpoint to Algiers, showcasing the socio-economic dynamics of an inland region.

The study covered three sporting disciplines: soccer, volleyball, and 800-meter Athletics. The limited selection of sports was based on athlete availability, enabling us to have strong representation and a more targeted analysis to ensure consistent data about these three types of sport.

- **Inclusion criteria**

Participants were included if they were 18 years or older, of either sex, and regularly engaged in competitive sports through a club or academic institution, following structured training programs. Participants were also required to be in good health.

- **Exclusion criteria**

Participants were excluded if they did not meet the inclusion criteria, including minors (<18 years) or individuals with food allergies or dietary restrictions that could introduce bias in reporting eating habits.

2.2. Ethics Committee Approval

The study protocol was approved by the LNTA research laboratory ethics committee in accordance with the principles set out in the Declaration of Helsinki. It was not registered or publicly available before data collection. All participants were informed of the research objectives and provided informed consent before being included in the study.

2.3. Data collection

The data for this research were collected using a questionnaire format paper, which was administered in French, completed independently, with explanations provided beforehand (translation, clarification) to ensure understanding and the validity of responses. The average time required to complete the questionnaire was approximately 45 minutes. The questionnaire contained initial information such as sex, to classify the population, and date of birth to calculate age. Other information included smoking habits, professional activity, usual sleep duration, type of sporting activity practiced, and sporting experience.

The second part of the questionnaire focused on athletes' dietary practices. It also inquired about the sources athletes consult for nutritional advice, as well as how their clubs manage their diet through specific pre- and post-competition diets. To assess their usual consumption over three months, subjects were also asked to complete a food frequency questionnaire covering various food groups. Each response category was assigned a numerical value corresponding to its midpoint (e.g., "once per week" = (1*4,3)/7 times per day; once per month = 1/30 times per day; "once per day" = 1 time per day).

The questionnaire assessed nutrition knowledge using the 35-item Abridged Nutrition for Sport Knowledge Questionnaire (A-NSKQ), validated by Trakman et al. (4). It included 9 questions on general nutrition knowledge (GNK) and 26 on sports nutrition knowledge (SNK), allowing the calculation of a total nutrition knowledge score (TNK). Each correct response was scored as 1, incorrect/uncertain as 0, with totals converted into percentages. Scores were classified as: poor (0–49%), average (50–65%), good (66–75%), and excellent (76–100%) (4).

The second phase of the questionnaire used the Medi-Lite score to assess adherence to the Mediterranean diet. This tool categorizes foods into nine groups. For typical Mediterranean foods, higher scores indicate greater consumption (2= high, 0= low). For non-Mediterranean foods, higher scores reflect lower consumption. Olive oil was scored separately (2= daily, 1= frequent, 0= occasional). A score above 8.5 points indicates adherence to the Mediterranean diet (5).

Although validated questionnaires were employed, they were administered in French without undergoing formal translation or validation procedures specific to the Algerian population. This aspect should be acknowledged as a methodological consideration of the study. However, a faithful translation was ensured, and the items did not involve technical terminology likely to alter participants' responses.

2.3. Statistical analysis of data

The data were entered into Epi-Info 3.5.3 and subsequently analyzed using R 3.0.3. Descriptive statistics were calculated for quantitative variables, including the mean (m), standard deviation (SD), minimum (min), and maximum (max). Numbers (N) and percentages were determined for qualitative variables. The statistical analyses involved chi-square to compare two percentages and ANOVA between several means. Pearson's correlation coefficient (r) was used to assess the relationship between two variables, with a significance level of 0.05.

3. Results

3.1. General information on athletes

The study included 70 athletes, 38 (54.29%) of whom were women and 32 (45.71%) men (p=0.484). Their ages ranged from 18.92 to 27.81 years, with an average of 23.70±1.95 years. The subjects' sporting activities included soccer (74.29%), volleyball (17.14%), and 800-meter athletics (8.57%).

The average duration of their involvement in sports was 7.54±2.84 years, ranging from two years to 15 years. In terms of their professional status, 22.85% were employed, with a male predominance (43.75%). The remaining athletes were students (77.15%). Regarding sleep, the athletes reported an average of 7.61 ± 0.64 hours per night, with a variation ranging from 6 to 8 hours. Additionally, 5.71% of the athletes reported identifying as male smokers.

3.2. Athletes' eating habits

Most athletes reported eating ≥4 meals per day, with a male predominance (77.14%). The main source of dietary guidance was dieticians (61.43%), followed by the internet (15.71%) and other athletes (12.86%). All male athletes followed a specialized diet before and after competition, and 74.28% benefited from club-managed diets. Female athletes showed greater awareness of the importance of food quality for performance (86.84%, $p<0.001$, Cohen's h=0.95).

3.3. Usual food consumption frequencies

Table 1 presents data on the habitual consumption of different food groups by athletes. According to these results, no significant differences were observed between the sexes in terms of consumption of dairy products or cereals, legumes, and starchy foods ($p > 0.05$). However, notable sex disparities were observed for meat products, seafood, eggs, cold cuts, fruits and vegetables, fats, and sugary products ($p < 0.001$). A detailed analysis of the data revealed that males had a higher consumption of meat, fish, eggs, cold cuts, fruits and vegetables, and fats. In contrast, females reported a higher consumption of sugary foods, which resulted in a significant effect (Cohen's d = 1.15).

Table 1. Frequency of athletes' usual food consumption by sex

Food group consumption (times/day)	Total (N=70)	Women (N=38)	Men (N=32)	*p1*
	m±SD [min-max]			
Dairy products	2.51±0.64 [0.34-3.98]	2.77±0.75 [0.34-3.98]	2.59±0.48 [1.91-3.56]	0.246
Cereals. pulses and starches	2.94±0.54 [1.97-4.56]	3.00±0.66 [1.97-4.56]	2.88±0.33 [2.39-4.25]	0.353
Meat. Fish. eggs and cold cuts	2.18±0.71 [0.96-3.22]	1.72±0.53 [0.96-3.22]	2.73±0.46 [1.4-3.11]	0.000
Fruit and vegetables	4.49±1.53 [1.99-6.85]	3.46±1.01 [1.99-6.28]	5.71±1.08 [3.10-6.85]	0.000
Fats	1.17±0.4 [0.44-2.48]	1.02±0.49 [0.44-2.48]	1.35±0.12 [0.99-1.41]	0.000
Sugary products	1.65±0.98 [0.62-5.48]	2.10±1.11 [0.62-5.48]	1.12±0.35 [0.86-2.11]	0.000
p2	0.000	0.000	0.000	/

N: number; m: mean; SD: standard deviation; min: minimum; max: maximum; *p1*: significance level of the difference between women and men; *p2*: significance level of the difference between all food groups

3.4. Athletes' general nutrition knowledge

Table 2 shows that the majority of the athletes' answers were correct. Regardless of the question asked, no significant difference was found between the two sexes (p>0.05).

Table 2. General knowledge of sports nutrition by sex

General nutrition knowledge	Total (N=70)	Women (N=38)	Men (N=32)
	N(%)		
Consuming more energy from protein than you need can make you fatter			
Agreed	51(72.86)	26(68.42)	25(78.13)
Disagree	14(20.00)	10(26.32)	4(12.50)
Not sure of the answer	5(7.14)	2(5.26)	3(9.37)
p1	0.000	0.000	0.000
The body needs fat to fight disease			
Agreed	20(28.57)	11(28.95)	9(28.13)
Disagree	21(30.00)	11(28.95)	10(31.25)
Not sure of the answer	29(41.43)	16(42.10)	13(40.62)
p1	0.209	0.373	0.544
Do you think cheddar cheese is high or low in fat?			
High	61(87.14)	33(86.84)	28(87.50)
Low	4(5.71)	2(5.26)	2(6.25)
Not sure of the answer	5(7.14)	3(7.89)	2(6.25)
p1	0.000	0.000	0.000
Do you think margarine is high or low in fat?			
High	65(92.86)	35(92.10)	30(93.75)
Low	3(4.29)	2(5.26%	1(3.13)
Not sure of the answer	2(2.86)	1(2.63)	1(3.13)
p1	0.000	0.000	0.000
Do you think honey is high or low in fat?			
High	4(5.71)	2(5.26)	2(6.25)
Low	54(77.14)	29(76.31)	25(78.13)
Not sure of the answer	12(17.14)	7(18.42)	5(15.63)
p1	0.000	0.000	0.000
The body has a limited capacity to use proteins for muscle protein synthesis			
Agreed	45(64.29)	25(65.79)	20(62.50)
Disagree	14(20.00)	8(21.05)	6(18.75)
Not sure of the answer	11(15.71)	5(13.16)	6(18.75)
p1	0.000	0.000	0.000
Eggs contain all the essential amino acids needed by the body			
Agreed	53(75.71)	29(76.32)	24(75.00)
Disagree	7(10.00)	3(7.89)	4(12.50)
Not sure of the answer	10(14.29)	6(15.79)	4(12.50)
p1	0.000	0.000	0.000
Thiamine (vitamin B1) is needed to supply oxygen to the muscles			
Agreed	27(38.57)	14(36.84)	13(40.63)
Disagree	13(18.57)	7(18.42)	6(18.75)
Not sure of the answer	30(42.86)	17(44.74)	13(40.63)
p1	0.005	0.044	0.101
Vitamins contain energy (kilojoules/calories)			
Agreed	10(14.29)	6(15.79)	4(12.50)
Disagree	56(80.00)	30(78.95)	26(81.25)
Not sure of the answer	4(5.71)	2(5.26)	2(6.25)
p1	0.000	0.000	0.000

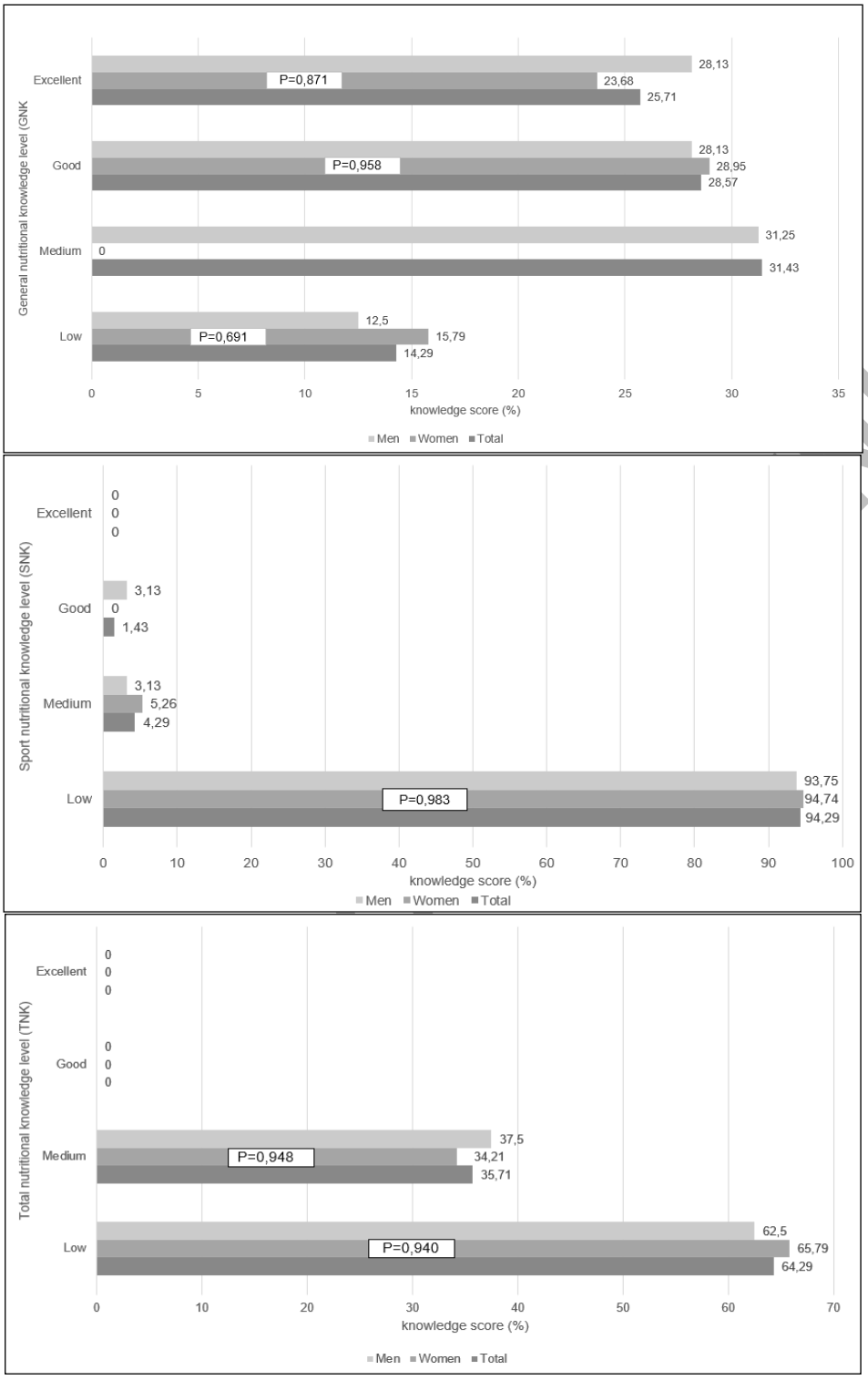
N: number; *p1*: significance level for the difference between answers to the same question.

3.5. Nutritional knowledge score among athletes

The overall TNK score was 46.45±6.84% and was considered low. Female athletes had a score of 46.45±6.84%, which was significantly similar in nutritional knowledge to male athletes at 46.67±6.67% (p=0.893), with a negligible effect size (d = -0.03).

The GNK score was 67.27±11.90%, classified as good with a difference between women and men (p<0.001). In contrast, the SNK score was classified as poor 36.90±6.90% with no difference between the two sexes with a small effect size (p=0.239; d=-0.29). This showed that athletes had poor overall knowledge, but better knowledge of general nutrition than sports nutrition.

In the (GNK), (SNK) subsection, the athletes' nutritional knowledge percentages were illustrated in Figure 01 as follows:



TNK: total nutrition knowledge. SNK: sport nutrition knowledge. GNK: general nutrition knowledge)

Figure 1. Classification of nutrition knowledge by respondent group

3.6. Mediterranean diet

The mean total score for adherence to the Mediterranean diet was 7.95±1.22. when analyzing the results by sex, males had a mean score of 8,89±0,20, while females had a mean score of 7.96±1,22 with a large effect size (*d*=-1.02). A total of 47.15% of the athletes were found to be low adherents to this dietary model, of whom 3.13% were males. The average for adherents was 8.88±0.20 *vs* 8.00±0.00 for non-adherents. 84.21% of women were non-adherents to the Mediterranean diet, with an average score of 7.95±1.22. Differences were observed between the two sexes ($p<0.05$).

3.7. Association between nutrition knowledge and adherence to the mediterranean diet

Figure 2 illustrates the relationship between the participants' nutrition knowledge scores and their adherence to the Mediterranean diet. No significant correlations were observed between adherence to the Mediterranean diet and general nutrition knowledge (r = 0.0001), sports nutrition knowledge (r = 0.0013), and total nutrition knowledge (r = 0.0011), indicating no substantial linear relationships between these variables ($p > 0.05$). These results suggest that increased nutritional knowledge is not necessarily associated with greater adherence to the Mediterranean diet.

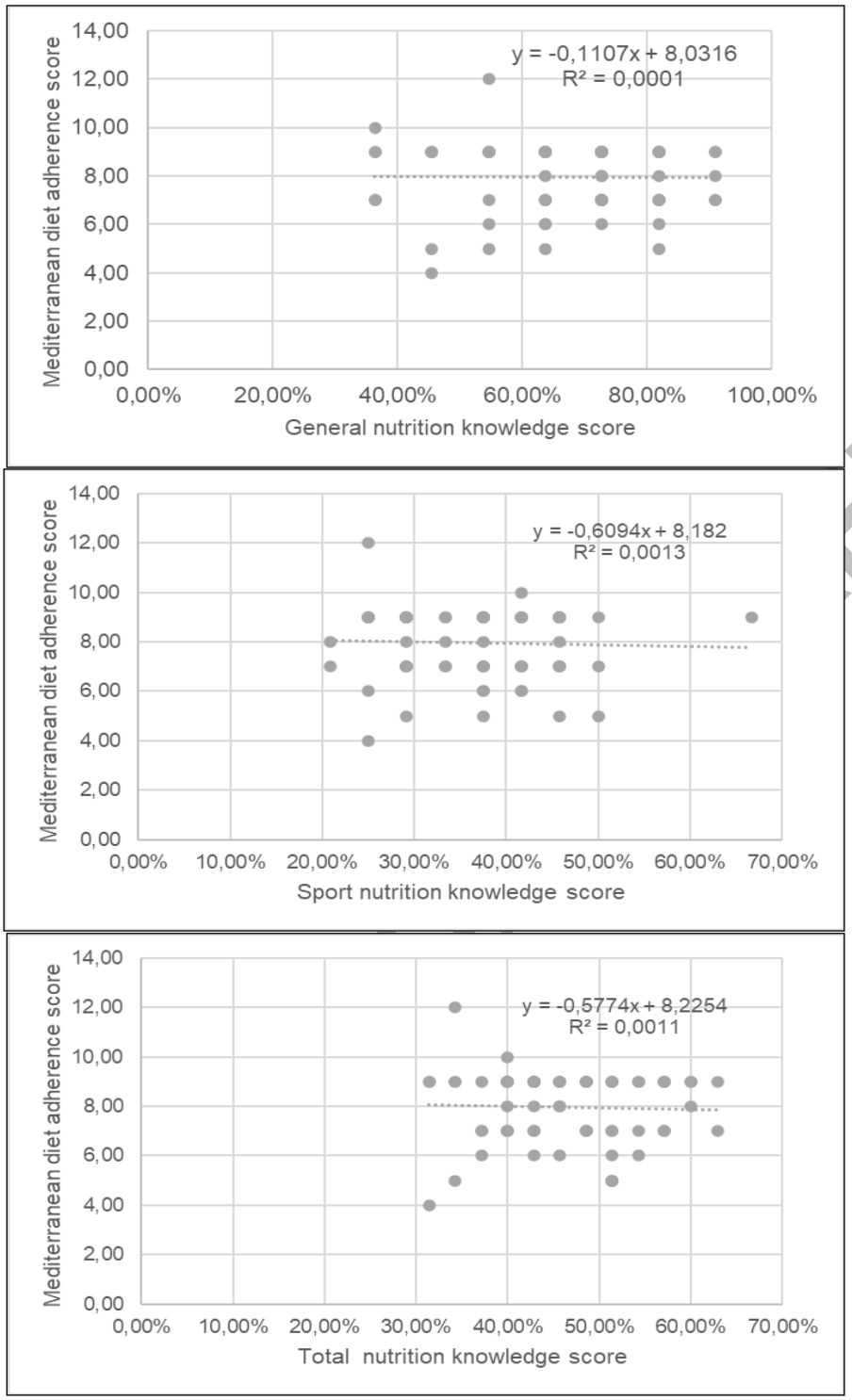


Figure 2. Pearson correlation between nutrition knowledge and adherence to the mediterranean diet

3.8. Relationship between sports seniority and nutritional score

A study of the correlation between the length of sports experience and nutritional scores (Figure 3) revealed a weak correlation between these two variables. The correlation coefficient was very close to zero for general and sports knowledge (r=0.04) and (r=0.03), respectively, suggesting that there is almost no linear relationship between the length of sports practice and the level of nutritional knowledge.

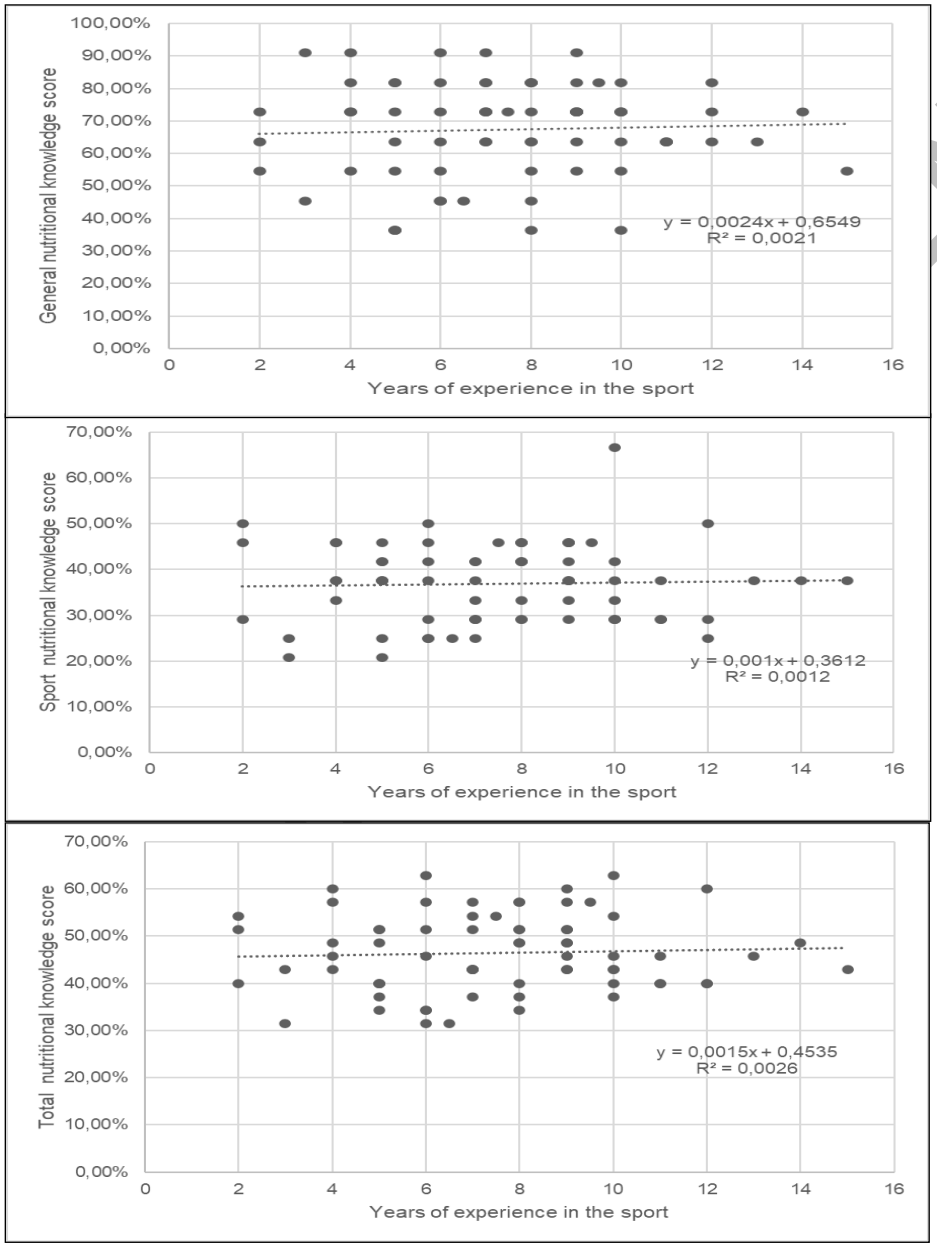


Figure 03. Relationship between nutritional knowledge scores and years of experience in sport

4. Discussion

The aim of this study was to explore two complementary dimensions of food literacy in a group of athletes: their level of nutritional knowledge and their adherence to the Mediterranean diet.

A large proportion of the athletes were students. Young adults in Algeria are often more responsive to this type of appeal, especially if they are aware of the scientific approach.

The results indicate that athletes have limited knowledge of sports nutrition and low adherence to the Mediterranean diet, despite evidence suggesting potential benefits for athletic performance.

In the present study, most athletes demonstrated awareness of the negative effects of smoking on performance. The prevalence of smoking observed in the current sample was comparable to that reported among Serbian elite athletes (6).

The average sleep duration was at the lower limit of the National Sleep Foundation recommendations for adults, which suggest a sleep duration of 7 to 9 hours (7). Previous studies have shown that sleep quantity and quality are closely associated with athletic performance. In particular, longer sleep duration has been associated with greater muscle strength (8), possibly through mechanisms related to cortisol regulation and improved psychological resilience (9).

Meal frequency was relatively high, with all male athletes and more than half of female athletes reporting consumption of more than four meals per day. This practice is generally adjusted according to athletes' goals and may help maintain optimal glycogen levels and promote faster recovery after exercise (10). In addition, the majority of athletes reported following a specific diet before and after competitions, highlighting the importance of nutrition in both preparation and post-exercise recovery.When compared with the recommendations of the Mediterranean Diet Foundation (11), dairy product consumption appeared adequate, as these foods should be consumed in moderate amounts, preferably in low-fat forms. The frequency of consumption of cereals and pulses was also sufficient, as these foods are recommended to be included in all main daily meals (11).

In contrast, the frequency of consumption of foods from the meat, fish, and eggs group exceeded the recommendations of the Mediterranean Diet Foundation, which suggests limiting animal product intake and emphasizing plant-based sources (11). This higher intake may reflect adaptations to the specific protein needs of athletes, as inadequate protein intake

may impair muscle protein synthesis and recovery.Daily fruit and vegetable consumption did not fully meet the recommendations for a balanced diet, which advise two or more portions of vegetables per meal, at least one serving of raw vegetables per day, and one to two servings of fruit per meal to ensure adequate vitamin and mineral intake (11).Foods located at the top of the Mediterranean diet pyramid, rich in sugars and unhealthy fats, should be consumed in small quantities, and their intake in the present study appeared to be moderate (11).Finally, water consumption frequency depends on several factors, including the type of exercise, individual characteristics, and environmental conditions (12). Adequate hydration is essential, as dehydration can negatively affect cardiopulmonary exercise capacity and impair athletic performance (13).

4.1. Athletes' nutritional knowledge score

The extent of nutritional knowledge was found to be limited, with percentages ranging from 46.45% to 47.00% (p=0.718), as reported in the study that validated the A-NSKQ (4). In a separate study involving 264 elite team athletes, it was evident that there is a pressing need for athletes to enhance their nutritional knowledge (14). In contrast, the study by Citarella et al. (15) revealed that elite ultramarathon runners attained significantly higher scores, with a mean nutritional knowledge score of 77.50±16.90%. Conversely, a study involving 39 Greek professional handball players, aged 23.20±2.70 years, revealed that although their overall nutritional knowledge was low, their nutritional knowledge surpassed their sporting knowledge (2). The relatively low nutritional knowledge scores of the participants may be attributed to their preferred sources of information. 61.43% of subjects indicated that they primarily relied on the guidance of a dietician. A subsequent analysis of Australian professional soccer players (14) revealed that these athletes exhibited suboptimal nutritional knowledge scores and identified club dieticians and coaches, as well as the Internet, as their predominant sources of nutritional information. This phenomenon may be related to the limited nutritional literacy among athletes. which hinders their comprehension and implementation of recommendations provided by nutritionists and sports coaches, and the quality of the information and education that athletes. Consequently, there is a compelling need to extend nutrition education programs to coaches and other individuals systematically working with athletes (16).

The impact of age on nutritional knowledge has been demonstrated in several studies, which have indicated that older athletes exhibit superior nutritional knowledge (17). An additional perspective is provided by a study conducted among Jordanian adult coaches and athletes with at least four years of sports experience, which reported higher nutritional knowledge scores (18). While these findings suggest a potential association between longer sports involvement and greater nutritional knowledge, such an association was not observed in the present study. This discrepancy may be related to differences in study populations, contexts, or methodological approaches.

In the context of sleep, athletes with extensive sporting experience appear to demonstrate superior sleep quality and effective sleep management, attributable to the development of well-established habits and the implementation of specialized strategies to enhance rest (19).

4.2. Athletes' adherence to the Mediterranean diet

The Mediterranean diet has garnered interest in the field of sports nutrition, with the potential to offer benefits such as enhanced muscle strength in athletes (20). This hypothesis was substantiated by Ficarra et al. (21), who implemented an eight-week Mediterranean diet intervention program with CrossFit athletes. The findings revealed substantial enhancements in squat jump performance, power, muscular endurance, and anaerobic power. Additionally, the Mediterranean diet has been shown to enhance calcium bioavailability, a factor that could contribute to the observed increase in lean body mass and skeletal muscle mass (22).

In the present study, the mean score for adherence to the Mediterranean diet was close to optimal. However, a cross-sectional survey by Muros & Zabala (23) revealed low adherence to the Mediterranean diet among 4.037 Spanish cyclists and triathletes aged 34.14±9.28. A similar observation in a study of elite female futsal athletes in Spain, where the mean age was 20.31±2.65 (24). These findings suggest that enhancing understanding and education of nutrition, along with acquiring more in-depth nutritional knowledge, could be pivotal in enhancing sporting performance. This notion is further substantiated by a study by Spronk et al. (25), which demonstrated that increased nutritional knowledge was positively associated with better diet quality.

4.3. Nutritional knowledge and Mediterranean diet

Several studies have investigated the relationship between knowledge levels and adherence to the Mediterranean diet. An Italian study of adults demonstrated a positive correlation (26). A Moroccan survey of a sample of students found that adherence to the Mediterranean diet was positively correlated with nutritional knowledge scores (27). This outcome stands in stark contrast to the negligible results observed in our study. The dietary choices of athletes are influenced by a multitude of sociocultural, sensory, nutritional, and economic factors (28). The findings of the present study demonstrated that an improvement in nutritional knowledge did not necessarily result in enhanced adherence to the Mediterranean diet. This phenomenon is indicative of the divergent dietary choices influenced by the sport, which is predominantly characterized by high-protein diets. Food literacy may serve as a mediator between nutritional knowledge and adherence to the Mediterranean diet, the intention-behavior gap phenomenon may offer a potential explanation for this observed negative correlation. Indeed, the intention to adopt a Mediterranean diet does not guarantee its effective implementation, as explained by Conner and Norman (29), who argue that intentions explain only a limited part of actual behavior.

4.4. Study limitations

It should be noted that this study has certain limitations. Furthermore, it does not allow for the establishment of cause-and-effect relationships. Convenience sampling and the limited sample size may restrict the representativeness of the participants. Furthermore, the use of self-reported data and the lack of control for confounding factors limit the generalizability of the results. The study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement recommendations; however, the table identifying the criteria was not included. This omission represents a methodological limitation, as it reduces transparency for external evaluation. Nevertheless, the main requirements of scientific rigor were fulfilled. In addition, the use of translated questionnaires that were not fully validated in the Algerian context may have affected the accuracy of the results. Despite these constraints, the study provides valuable insights into athletes' nutritional knowledge, eating habits, and adherence to the Mediterranean diet, and highlights areas for methodological improvement in future research.

5. Conclusion

The study revealed that the athletes exhibited suboptimal levels of nutritional knowledge and only moderate adherence to the Mediterranean diet. No significant correlation was observed between nutritional knowledge and diet adherence. Given the study's design and sample size, the conclusions should be regarded as exploratory, offering a solid starting point for future investigations. The findings underscore the necessity for targeted nutrition education interventions to enhance athletes' knowledge and dietary habits.

AUTHORS' CONTRIBUTIONS

The authorship of the study design and layout was shared by IF-K, IS, and MB, who were also responsible for developing the statistical plan and interpreting the data. IF-K was responsible for conducting the literature review and analyses, and for drafting the first version of the text, with assistance from IS and MB. HM contributed to the data collection. A critical review of this version and previous versions of the article was conducted by NA, AI-B, and all the other authors.

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CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest in connection with the writing of this manuscript.

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