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Effects of a Practical Nutrition Education Program on Nutritional Knowledge, Attitudes, and Practices among Male Athletes

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ABSTRACT

Introduction: Athletes often experience deficiencies in nutrients and micronutrients within their diets. This problem can be attributed to limited nutritional knowledge, which may lead to inadequate dietary practices and an overreliance on supplements or processed foods. This study aimed to evaluate the effects of a practical nutrition education program on athletes' nutritional knowledge, attitudes, and nutritional practices.

Methods: A total of 60 male athletes were enrolled in the study and randomly assigned to either the intervention group (n = 30) or the control group (n = 30). All participants completed a validated questionnaire assessing demographic characteristics, nutritional knowledge, nutritional attitudes, and nutrition practices before and after the one-month intervention. Nutritional knowledge, attitude, and performance were assessed using Wardle's validated nutrition knowledge questionnaire. Data were analyzed using the Wilcoxon Signed-Rank test and Mann–Whitney U test, and a significance level of $p < 0.05$ was considered statistically significant. After a one-month educational course, both groups completed the same questionnaire again to assess changes in the measured variables.

Results: Intergroup analysis revealed a significant increase in all four measured variables nutritional knowledge, attitude, performance, and competence in the intervention group. The nutrition education course significantly increased nutritional knowledge, attitude, performance, and overall nutritional competence in the intervention group compared with the control group ($p < 0.001$).

Conclusion: Implementing such programs can support athletes in achieving their goals more effectively. Moreover, nutrition education encourages healthy eating behaviors and informed food choices within the athletic community, ultimately promoting overall health and well-being.

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Introduction

Nutritional knowledge is one of the most critical topics in the field of dietetics. It plays a vital role in shaping individuals' dietary habits and directly influences the health and well-being of society (1). Previous studies have investigated the physiological impacts of exercise and herbal supplementation, demonstrating that aerobic training combined with Salvia can influence thyroid hormone levels in male athletes (2), that Tribulus terrestris extract and crocin modulate oxidative stress and cardiac antioxidant defenses following exhaustive exercise (3), and that varying intensities of interval training alter myostatin gene expression in the skeletal muscles with myocardial infarction (4). Studies have also reported that bodybuilding coaches and athletes generally have poor nutritional knowledge (5). Jessri et al. found that the nutritional knowledge of Iranian college basketball and football athletes was inadequate (6). Other studies similarly confirmed that athletes' understanding of nutrition remains low (7-9). Nutritionists therefore play a critical role in educating athletes, increasing awareness within the athletic community, and improving performance outcomes (10, 11). One of the major factors contributing to poor athletic performance may be athletes' insufficient knowledge,

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inappropriate attitudes, and limited nutritional practices (12).

Sports such as bodybuilding require appropriate nutrition, structured meal planning, adequate rest, and effective recovery strategies (13, 14). Nutrition thus serves as a fundamental component of athletic life. However, athletes often demonstrate unscientific attitudes toward nutrition, which influence their dietary decisions. Many athletes, particularly those in strength-based disciplines, believe that protein should represent the majority of their macronutrient intake. Consequently, they tend to consume excessive amounts of protein or rely heavily on supplements without professional guidance—practices that may lead to adverse health effects (15).

Another important aspect of athletic health is Nutrition Practices, which determines competitive ranking and influences long-term progress (16). Unfortunately, the prevalence of anabolic steroid, diuretic, and contaminated supplement use among athletes remains high, often due to inadequate nutritional knowledge and misguided attitudes (17).

Recent reviews continue to emphasize that both elite and recreational athletes face notable and ongoing gaps in their understanding of sports nutrition. These deficiencies are particularly evident in areas such as micronutrient intake, hydration strategies, and the ability to translate theoretical knowledge into everyday nutritional practices (18).

Beyond the general lack of nutrition education, there remains a scarcity of structured, evidence-based, and sport-specific educational programs that are tailored to athletes' cultural contexts and training demands (19, 20). While short-term interventions can boost knowledge, the challenge lies in sustaining long-term behavioral change. Many athletes still struggle with nutrient timing, food selection, and supplement safety even after receiving basic instruction (21-23). Given these realities, developing and implementing effective nutrition education initiatives focused on improving athletes' knowledge, attitudes, and practices has become a priority in sports science. The current study addresses this need by examining how a structured nutrition training course influences athletes' understanding, attitudes, and dietary behaviors. By identifying factors that shape their nutrition-related decisions, this work seeks to bridge the gap between what athletes know about nutrition and how they apply it offering practical evidence to inform future education programs and optimize athletic performance outcomes.

Materials and Methods

This comparative study was conducted to evaluate the effects of a practical nutrition education program on the nutritional knowledge, attitudes, and practices of male athletes. Nutritional knowledge: Understanding of food groups, nutrients, and dietary guidelines. Nutritional attitude: Beliefs and perceptions about healthy eating and dietary practices. Nutrition Practices: Self-reported dietary behavior in practice. Overall Nutrition Competency: The composite score combining the above three domains. The qualitative classification presented in Table 1 was adopted from Basami et al. (2016).

Baseline Assessments and Questionnaire

Wardell's questionnaire, comprising three sections, was used for measurement and data collection in this study (24).

First section: This section included 11 questions assessing athletes' nutritional knowledge, focusing on their understanding of food groups, nutrients, and dietary guidelines.

Second section: This part also contained 11 questions evaluating athletes' nutritional attitudes, specifically their beliefs and perceptions about healthy eating and dietary behaviors.

Third section: The final section included eight questions assessing athletes' Nutrition Practices, reflecting their self-reported dietary behaviors in practice.

Each section was scored separately, and composite values were used to calculate an overall index referred to as Overall Nutrition Competency. The validity and reliability of this questionnaire were confirmed by comparison with scientific articles in 2016 by Basami et al. This questionnaire was based on the previous articles (25).

Table 1. The score for the qualitative level of the four main indices of the research.

Variable	Weak	Moderate	Good
Nutritional knowledge	Less than 12	13-24	Higher than 25
Nutritional attitude	Less than 29	30-58	Higher than 59
Nutrition Practices	Less than 11	12-22	Higher than 23
Overall Nutrition Competency	Less than 52	53-104	Higher than 105

Table 2. Structure and content of the practical nutrition education program

Week	Main topic	Educational activities
Week 1	Basic nutrition principles and food groups	Lecture, PowerPoint presentation, group discussion
Week 2	Macronutrients and athletic performance	Case examples, interactive workshop
Week 3	Hydration strategies and supplement use	Video session, question-and-answer session
Week 4	Meal planning and healthy dietary practices	Practical meal-planning exercise, online follow-up session

Participants

The study population consisted of male athletes from Shiraz. The sample included 60 participants from three sporting disciplines—bodybuilding, ball sports, and martial arts (20 athletes from each field). Participants were considered athletes if they engaged in structured exercise at least three times per week for a minimum of six consecutive months, consistent with previous sports nutrition studies. Participants were randomly allocated to either the intervention group or the control group (n = 30 per group). Inclusion criteria were: being male, aged 18 years or older, and engaging in regular exercise at least three times per week. Data were collected using both paper-based and online versions of the questionnaire, which assessed participants' nutritional knowledge, attitudes, and performance to determine overall nutrition competency.

Course Protocol

The intervention consisted of a one-month practical nutrition education course delivered to the intervention group. Educational content was presented through video sessions, PowerPoint materials, and both in-person and online workshops designed by the researcher. The structure and weekly content of the educational program are summarized in Table 2 (25).

Statistical Analysis

Data were analyzed using SPSS software version 26. Descriptive statistics were used to summarize the demographic characteristics of the participants. Because the questionnaire scores were classified into ordinal categories, non-parametric statistical methods were applied. The Wilcoxon Signed-Rank test was used to compare pre- and post-intervention scores within each group. The Mann–Whitney U test was used to compare the intervention and control groups at baseline and after the intervention. Statistical significance was considered at $p < 0.05$.

Results

A total of 60 male athletes completed the study and were included in the final analysis (30 participants in the intervention group and 30 participants in the control group). The baseline demographic and training characteristics of participants are presented in Table 3. No significant differences were observed between the intervention and control groups regarding age, marital status, educational level, training experience, training frequency, or sport type at baseline ($p > 0.05$).

The median age was 27.5 years (IQR: 21.0–35.0) in the intervention group and 27.0 years (IQR: 21.0–36.0) in the control group ($p = 0.886$). The majority of participants in both groups were single (73.3% in the intervention group and 70.0% in the control group), and the most common educational level was a bachelor's degree (53.3% in both groups). The distribution of sport disciplines was equal between groups, with each sport category representing 33.3% of participants.

Table 3. Baseline demographic and training characteristics of the participants

Variable	Intervention Group (n=30)	Control Group (n=30)	P-value
Age (years)	27.5 (21.0-35.0)*	27.0 (21.0-36.0)*	**0.886****
Marital Status			**0.774*****
- Single	22 (73.3%)	21 (70.0%)	
- Married	8 (26.7%)	9 (30.0%)	
Education Level			**1.000*****
- Diploma	7 (23.3%)	6 (20.0%)	
- Bachelor's Degree	16 (53.3%)	16 (53.3%)	
- Postgraduate	7 (23.3%)	8 (26.7%)	
Training Experience			**0.312*****
- 1–2 years	13 (43.3%)	9 (30.0%)	
- 2–4 years	10 (33.3%)	15 (50.0%)	
- More than 4 years	7 (23.3%)	6 (20.0%)	
Training Frequency			**0.544*****
- 3–4 times/week	11 (36.7%)	14 (46.7%)	
- 5–6 times/week	19 (63.3%)	16 (53.3%)	
Sport Type			**1.000*****
- Bodybuilding	10 (33.3%)	10 (33.3%)	
- Ball Sports	10 (33.3%)	10 (33.3%)	
- Martial Arts	10 (33.3%)	10 (33.3%)	

*Data are presented as Median (IQR) or Frequency (%).
**P-value based on Mann-Whitney U test.
***P-value based on Chi-square test.

Table 4. Comparison of pre- and post-intervention scores within and between study groups

Variable	Group	Pre-test Median (IQR)	Post-test Median (IQR)	P-value* (Within-group)	P-value** (Between-group)
Nutritional Knowledge	Intervention	9.00 (6.00-12.00)	22.00 (18.00-26.00)	< 0.001	< 0.001
	Control	10.00 (7.00-14.00)	10.00 (7.00-15.00)	0.967	
Nutritional Attitude	Intervention	50.00 (42.00-62.00)	72.00 (67.00-78.00)	< 0.001	< 0.001
	Control	52.00 (41.00-64.00)	54.00 (42.00-68.00)	0.040	
Nutrition Practices	Intervention	18.00 (14.00-23.00)	27.00 (23.00-29.00)	< 0.001	< 0.001
	Control	17.00 (14.00-19.00)	17.00 (15.00-20.00)	0.059	
Overall Nutrition Competency	Intervention	79.00 (64.00-100.00)	121.00 (112.00-128.00)	< 0.001	< 0.001
	Control	78.00 (63.00-96.00)	82.00 (63.00-102.00)	0.026	

*P-value for within-group comparisons using the **Wilcoxon Signed-Rank test**.
P-value for between-group comparisons at post-intervention using the **Mann–Whitney U test.

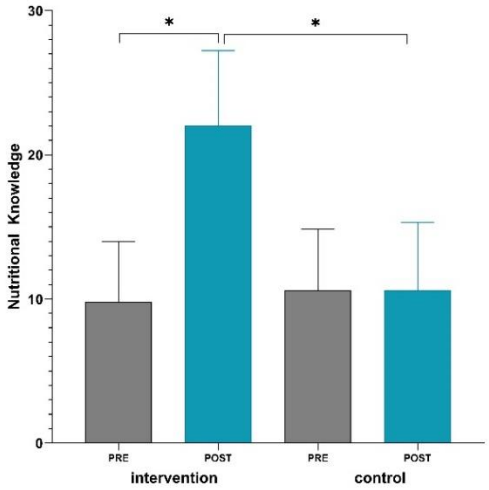

Figure 1. Comparison of nutritional knowledge scores between intervention and control groups before and after the intervention. Data are presented as mean ± SD for visual comparison only. Statistical analyses were performed using the Wilcoxon Signed-Rank test and Mann–Whitney U test.

The results of the Wilcoxon Signed-Rank test for within-group comparisons and the Mann–Whitney U test for between-group comparisons are presented in Table 4. Following the nutrition education program, the intervention group demonstrated significant improvements in nutritional knowledge, nutritional attitude, Nutrition Practices, and Overall Nutrition Competency compared with baseline values ($p < 0.001$ for all variables).

Nutritional knowledge scores increased significantly in the intervention group from a median of 9.00 (IQR: 6.00–12.00) before the intervention to 22.00 (IQR: 18.00–26.00) after the intervention ($p < 0.001$). No significant change was observed in the control group ($p = 0.967$). The post-intervention comparison between groups showed significantly higher nutritional knowledge scores in the intervention group compared with the control group ($p < 0.001$) (Figure 1).

Nutritional attitude scores also significantly increased in the intervention group from 50.00 (IQR: 42.00–62.00) at baseline to 72.00 (IQR: 67.00–78.00) after the intervention ($p < 0.001$). Although a statistically significant change was observed in the control group ($p = 0.040$), the post-intervention scores remained significantly lower than those of the intervention group ($p < 0.001$) (Figure 2).

Nutrition Practices scores significantly improved in the intervention group, increasing from 18.00 (IQR: 14.00–23.00) before the intervention to 27.00 (IQR: 23.00–29.00) after the educational program ($p < 0.001$). No significant change was observed in the control group ($p = 0.059$). Between-group analysis demonstrated a significant difference in post-intervention Nutrition Practices scores in favor of the intervention group ($p < 0.001$) (Figure 3).

Similarly, Overall Nutrition Competency significantly increased in the intervention group from 79.00 (IQR: 64.00–100.00) to 121.00 (IQR: 112.00–128.00) following the intervention ($p < 0.001$). The control group showed only a small change in Overall Nutrition Competency scores ($p = 0.026$). The post-intervention comparison revealed significantly higher Overall Nutrition Competency scores in the intervention group compared with the control group ($p < 0.001$) (Figure 4).

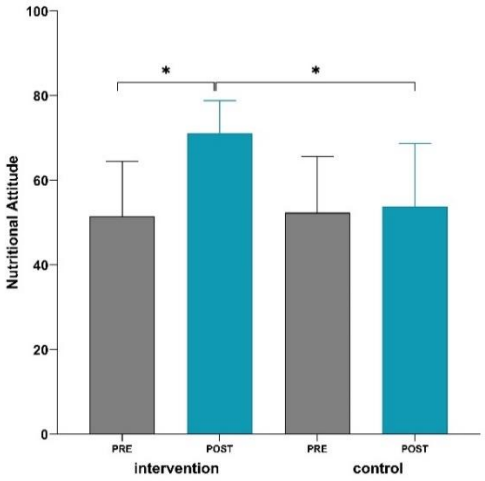

Figure 2. Comparison of nutritional attitude scores between intervention and control groups before and after the intervention. Data are presented as mean ± SD for visual comparison only. Statistical analyses were performed using the Wilcoxon Signed-Rank test and Mann–Whitney U test.

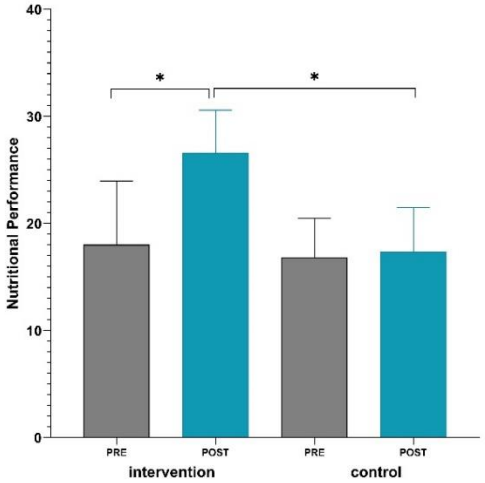

Figure 3. Comparison of Nutrition Practices scores between intervention and control groups before and after the intervention. Data are presented as mean ± SD for visual comparison only. Statistical analyses were performed using the Wilcoxon Signed-Rank test and Mann–Whitney U test.

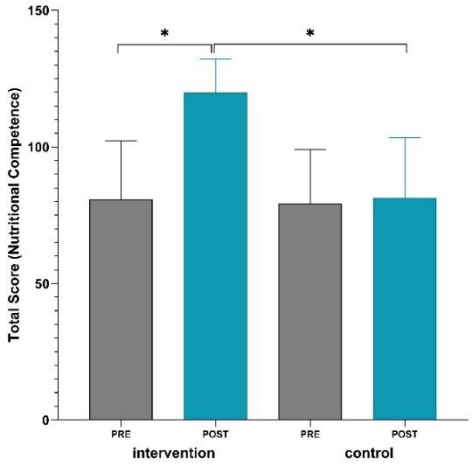

Figure 4. Comparison of Overall Nutrition Competency scores between intervention and control groups before and after the intervention. Data are presented as mean ± SD for visual comparison only. Statistical analyses were performed using the Wilcoxon Signed-Rank test and Mann–Whitney U test.

Overall, the practical nutrition education program was associated with significant improvements in nutritional knowledge, attitudes, Nutrition Practices, and Overall Nutrition Competency among male athletes compared with the control group.

Data are presented as mean values for visual presentation. Statistical analyses were performed using the Mann–Whitney U test for between-group comparisons and Wilcoxon Signed-Rank test for within-group comparisons. Significant differences were observed between groups after intervention and between pre- and post-intervention values in the intervention group ($p < 0.001$).

Data are presented as mean values for visual presentation. Statistical analyses were performed using the Mann–Whitney U test and Wilcoxon Signed-Rank test. Significant differences were observed after intervention ($p < 0.001$).

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Discussion

This study aimed to evaluate the effect of an applied nutrition education course on the nutritional knowledge, attitudes, and practices of male athletes. Adequate nutrition is a key factor influencing athletes' motivation and pursuit of improved performance (26). The findings of this study, consistent with previous research, indicate that the level of nutritional knowledge among athletes—both novices and those with prior training experience—remains suboptimal.

Investigating the Level of Nutritional Knowledge

The present study indicated a significant improvement in nutritional knowledge scores in the intervention group following the educational program ($p < 0.001$). This finding confirms that structured education plays a crucial role in enhancing individuals' nutritional knowledge. It is consistent with findings from several similar educational intervention studies. For instance, Azizi et al. (2010) found a substantial improvement in knowledge scores among Iranian physical education students after a targeted nutrition education program, emphasizing the impact of structured, evidence-based instruction on cognitive nutrition outcomes (27). This study aligns with the current research, confirming that applied and practical nutrition education sessions are more effective in promoting knowledge retention and behavior change than theoretical instruction alone.

Nutritional knowledge directly affects nutritional attitude, practices, and overall competency (28-30). According to the findings of this study and comparisons with similar research, one of the most effective ways for athletes to meet their performance goals is through adopting appropriate nutritional practices—provided that they possess adequate nutritional knowledge. Enhancing athletes' achievements and performance can be further supported by teaching them the fundamentals of nutritional science (31). Nutritional knowledge plays a key role in shaping healthy dietary habits and directly influences public health and well-being (32).

A persistent issue identified in this and previous research is the widespread belief among athletes that sports supplements particularly protein-based products are essential for all sports, regardless of age or health status. This misconception persists despite the fact that such supplements are contraindicated for certain individuals, such as those with diabetes or kidney disorders. In reality, not all athletes require supplementation; these products are recommended mainly for those engaged in high-intensity training, struggling to maintain a balanced diet, or pursuing specific performance goals (33). Consistent with earlier studies, many athletes, especially those at amateur and semi-professional levels, rely heavily on informal sources of nutritional advice such as coaches or peers rather than receiving guidance from qualified nutritionists (5, 6). This pattern was also observed in the present study, where athletes frequently sought dietary recommendations from coaches instead of certified professionals. Unfortunately, as reported in previous Iranian studies, many coaches lack adequate scientific knowledge of nutrition, perpetuating misinformation and poor dietary habits among athletes. The resulting knowledge gap contributes directly to unhealthy nutritional behaviors and ineffective dietary management.

This practical nutrition education program helped reduce additional costs among athletes in

the intervention group and improved their awareness of safe supplement purchasing practices, emphasizing the importance of obtaining products from authorized vendors such as pharmacies. During post-intervention discussions with participants, it became apparent that many had previously engaged in restrictive, protein-heavy, and potentially harmful diets aimed at rapid fat loss. These practices not only imposed financial burdens but also led to negative health consequences and unsatisfactory athletic outcomes.

Investigating the Level of Nutritional Attitude

The present study indicated a significant improvement in nutritional attitude scores in the intervention group ($p < 0.001$). Although the control group also showed a statistically significant change ($p = 0.040$), the magnitude of this change was minimal compared to the intervention group. This suggests that while some natural improvement may occur over time, structured education is far more effective in modifying attitudes.

The finding that athletes held incorrect attitudes toward dietary fats but favorable views of protein is congruent with the work of Spendlove et al. (2012), who documented pervasive "protein bias" among elite athletes in multiple disciplines, linked to misconceptions that high protein intake directly enhances muscle strength and recovery (34). The practical nature of the intervention contributed significantly to improving the nutritional attitudes of participants in the intervention group. In this study, the type of sport did not significantly influence athletes' nutritional attitudes; however, bodybuilding athletes were generally more inclined toward high-protein diets. Most participants demonstrated a poor attitude toward dietary fats, primarily due to insufficient nutritional knowledge. They lacked awareness about healthy fats and tended to associate positive nutritional value exclusively with proteins, leading to excessive protein consumption.

Without appropriate awareness, such misconceptions can affect the broader athletic community. During the survey conducted by the researcher, many athletes expressed the belief that most of their energy should come from proteins while minimizing fat intake as much as possible (35). This finding highlights the prevalence of negative attitudes toward fats, which often results in dietary imbalances. In terms of nutritional practices, many athletes struggled to identify sources of healthy fats, perceiving only fried and greasy foods as "fat sources." Consequently, they were unaware that foods such as nuts, seeds, and olives are valuable sources of beneficial fats.

Investigating the level of Nutrition Practices

The present study indicated a significant improvement in nutritional practices scores in the intervention group ($p < 0.001$), confirming the effectiveness of the course in improving dietary behaviors. No significant change was observed in the control group ($p = 0.059$). The findings also revealed that marital status was significantly associated with better nutritional practices. Married participants in both the control and intervention groups achieved notably higher scores, suggesting greater dietary discipline and responsibility in food choices.

Education likewise played an essential role in promoting conscious nutritional decision-making. Participants with postgraduate education achieved higher scores in nutritional practices and, consequently, exhibited greater overall competency. However, consistent with previous research, both novice and experienced athletes showed inadequate food selection behaviors and limited understanding of proper dietary practices (36). Training history and frequency of exercise sessions did not automatically lead to correct dietary behavior. Even athletes with extensive training experience often made poor nutritional choices. Participation in structured nutrition education programs during training could therefore enhance both dietary decision-making and overall performance outcomes.

Ultimately, athletes' nutritional practices directly influence their competitive success and long-term athletic progression. Unfortunately, the misuse of anabolic steroids, diuretics, and contaminated supplements among athletes remains a serious concern. Many individuals resort to such substances due to insufficient nutrition knowledge and misguided attitudes toward performance enhancement. Based on the results of this study, lower levels of nutritional knowledge were strongly correlated with poorer dietary practices and, ultimately, suboptimal physical condition. This lack of awareness also increases vulnerability to injuries related to inadequate nutrition and recovery (37).

Investigating the level of Overall Nutrition Competency

The present study indicated a significant improvement in overall nutrition competency scores in the intervention group ($p < 0.001$). Although the control group also showed a small change ($p = 0.026$), the improvement in the

intervention group was substantially greater, confirming the effectiveness of the educational program. This finding aligns with the intervention outcomes observed in Heaney et al. (2011), where exposure to educational workshops enhanced dietary decision-making and reduced supplement misuse among adolescent athletes (38). Likewise, Arazi and Hosseini (2020) reported that Iranian junior bodybuilders who received structured nutrition training demonstrated improved meal timing, hydration practices, and reduced use of unsafe "fat-burning" products (39).

According to the findings of this study, participation in nutrition education programs and marital status were influential factors in athletes' total overall nutrition competency scores, whereas sport type, training history, and age had no significant effect. The results also revealed that many athletes have experienced health complications or diseases as a result of consulting unqualified individuals for nutritional advice. Furthermore, the study showed that athletes lacked sufficient knowledge regarding simple sugars and their adverse effects. Many participants incorrectly perceived dietary fat as the primary cause of overweight and obesity, while in reality, one of the main contributors to obesity, weight gain, and metabolic disorders is the excessive intake of simple sugars such as refined cereals, sweets, and added sugars.

Coaches were identified as the athletes' primary source of nutritional information, serving as key figures in shaping their nutrition-related knowledge, attitudes, and behaviors. Unfortunately, many coaches lacked adequate scientific understanding of nutrition, often leading to misinformation and inappropriate dietary recommendations for athletes.

Limitations

While the study design appropriately tests short-term educational impacts, its validity and external applicability are limited by sample size, measurement method, and lack of long-term and objective validation. These limitations are consistent with common constraints reported in similar sports nutrition intervention literature (40-42).

Conclusion

According to the findings of this study, athletes indicated inadequate nutritional knowledge, which ultimately contributed to poor nutritional practices. Many athletes lacked understanding of the functions and benefits of macronutrients, as well as the appropriate timing and methods of their consumption. Similarly, they showed limited awareness regarding the correct use and necessity of sports supplements.

However, improvements in nutritional attitudes among participants led to a reduction in excessive protein intake and encouraged consultation with qualified nutrition and sports experts to achieve athletic goals. The significant enhancement in nutritional practices observed following the intervention enabled athletes to make healthier food choices, avoid unhealthy dietary habits, and improve their overall athletic performance.

Future programs should integrate certified nutritionists into athletic training environments and standardize coach education modules to ensure the dissemination of accurate, science-based nutritional guidance.

Declarations

Acknowledgments

We appreciate all the athletes who participated in this study.

Data Availability Statement

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

Conflict of Interest

The authors declare no conflict of interest.

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Consent for Publication

Written and verbal informed consent was obtained from all participants prior to their inclusion in the study.

Ethical Considerations

The current study was reviewed and approved by the Human Research Ethics Committee of Shiraz University (ethics approval code: SEP.14023/48/3869) and carried out according to the Declaration of Helsinki. All the subjects who participated in this research gave their consent verbally and in writing and participated satisfactorily. All participant information was treated confidentially and securely throughout the study.

Authors' Contributions

M.A.I.: Methodology, Software, Visualization. **F.D.:** Conceptualization, Data curation, Validation, Writing – Original Draft Preparation. **A.H.Z.:** Supervision, Writing – Review & Editing.

All authors read and approved the final manuscript.

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