



The Journal of Nutrition and Food Sciences

Journal Home Page: <https://nutritionsof Sri Lanka.org/the-journal-of-nutrition-and-food-sciences-2/>

Development and Validation of Evidence-based, Culturally-specific Nutrition Guidelines for Sri Lankan Track and Field Athletes

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ARTICLE INFO

Article history:

Received:

10.10.2024

Revised version received:

06.03.2025

Accepted:

20.03.2025

Available online:

01.11.2025

Keywords:

Athlete

Guidelines

Sports nutrition

Track and field

Validation

Citation:

Jayawardena, R., Thevapalan, A., Nanayakkara, I., Madhujith, T., Hills, A.P., Kalupahana, N.S. (2025). Development and validation of evidence-based, culturally-specific nutrition guidelines for Sri Lankan track and field athletes. *The Journal of Nutrition and Food Sciences*, 4(1), 1-11.

ABSTRACT

Background: Up-to-date, culturally-specific sports nutrition advice is important to improve the sports performance and overall well-being of athletes. Although various sports nutrition guidelines exist, there is a lack of culturally specific guidelines for Sri Lankan athletes.

Objectives: This study aimed to develop and validate evidence-based sports nutrition guidelines for Sri Lankan athletes to enhance nutritional status and performance.

Materials & Methods: The guidelines were developed using a systematic four-phase approach involving a team of nutrition experts. The validation process employed a two-phased Delphi method, wherein a separate panel of nutrition specialists experienced in working with athletes, assessed the guidelines based on its accuracy, relevance, appropriateness, and clarity. The Content Validity Index (CVI) was calculated, with a threshold of ≥ 3.2 out of 4.0 required for each chapter to meet the validation criteria and revisions were done when the chapters did not meet the threshold.

Results: The finalized guidelines comprised ten chapters addressing both general nutrition (five chapters) and sports nutrition (five chapters). In the initial validation phase, Chapter 2 (clarity and appropriateness), Chapter 5 (clarity), and Chapter 9 (clarity) did not meet the threshold, with CVI scores falling below 3.2. Following revisions, the content validity of the chapters improved, achieving CVI scores of 3.4, 3.3, 3.4, and 3.4, respectively, meeting the required standards for validation.

Conclusion: The study successfully developed and validated evidence-based sports nutrition guidelines tailored for Sri Lankan track and field athletes. Future research should focus on long-term adherence and the broader applicability of these guidelines across different sports disciplines.

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INTRODUCTION

The performance and well-being of sports personnel are shaped by a combination of factors, including genetic advantages, sport-specific training, adequate sleep, psychological well-being, and optimal dietary practices (Martín-Rodríguez et al., 2024). With recent advances in the science and practice of sports nutrition, dietary strategies have also emerged as significant, influential factors for achieving optimal sporting performance (Beck et al., 2015; Burke et al., 2013). Training is integral to an athletic lifestyle and requires frequent high-energy output episodes. These episodes significantly affect the energy balance and raise the need for additional energy substrates and hydration strategies (Nor Azizam et al., 2022). Conventional diets often fall short of the nutritional demands imposed by intense training, and poor food choices can significantly hinder an athlete's potential (Mujika & Burke, 2010).

Enhancing the nutritional status of athletes necessitates a comprehensive understanding of sports nutrition principles. A survey among Australian elite athletes showed a positive association between higher nutrition knowledge and better dietary practices (Spronk et al., 2015). Nepalese national players exhibited suboptimal nutritional practices, particularly among those with poor nutrition education, those not reading food labels, and those not adhering to different diet plans during off-season and in-season periods (Thapa et al., 2023). Athletic coaches play a vital role in providing dietary advice to athletes (Klein et al., 2021). However, it is apparent that the vast majority of athletic trainers are deficient in their knowledge of sports nutrition (Klein et al., 2021; Webb & Beckford, 2014). Despite gaps in knowledge, athletes and coaches commonly maintain positive attitudes toward healthy nutrition choices, indicating a receptiveness to considering nutrition education initiatives (Webb & Beckford, 2014).

Current evidence also highlights a significant deficiency in nutrition knowledge among athletes and the general population in Sri Lanka. For example, a cross-sectional study

among undergraduate students engaged in sports at Sabaragamuwa University in Sri Lanka found that those athletes had insufficient protein intake and consumed excessive amounts of fats (Rupasinghe et al., 2023). The study also found that students did not consume enough energy, protein, calcium, magnesium, potassium, or daily vitamin B and C allowances. Furthermore, a qualitative study found that stakeholders in Sri Lankan track and field recognize the importance of sports nutrition knowledge for enhancing athletic performance, and they also noted that athletes face significant barriers to effectively implementing this knowledge (Jayawardena, Weerasinghe, Madhujith, et al., 2024).

The International Olympic Committee (IOC) emphasizes the importance of sports nutrition guidelines, which include the type, quality, and quantity of nutrients required by athletes for effective training and injury prevention (Potgieter, 2013). Multiple reviews and consensus statements have facilitated sports nutrient insights (Maughan et al., 2018; Peeling et al., 2019). Recognizing the need for improved sports nutrition knowledge and considering the influence of socio-demographic factors, the current study aimed to develop and validate evidence-based, culturally-specific nutrition recommendations for Sri Lankan track and field athletes. This approach is anticipated to be the optimal solution for enhancing the nutritional status and performance of athletes in the country. The findings could inform policy by integrating evidence-based recommendations into athlete training programs.

MATERIALS & METHODS

This study comprised two stages, namely the development and validation of evidence-based, culturally specific sports nutrition guidelines for Sri Lankan track and field athletes. In the development stage, the guidelines were designed to provide comprehensive knowledge in both general and sports nutrition. The guideline development process was conducted in four phases: first, identifying the core elements of general and sports nutrition;

second, performing a comprehensive literature review on common nutritional practices; third, identifying evidence-based strategies to improve these practices; and finally, formulating culturally-specific sports nutrition guidelines. Following the development, the validation stage ensured the accuracy and applicability of the guidelines. This process utilized the Delphi method, which was conducted in two phases: initial validation by experts, followed by the incorporation of expert feedback and subsequent revisions.

The development of the guidelines

Phase 1: Identifying fundamentals of general and sports nutrition sections

Key topics in general nutrition were identified by the principal investigator (RJ), who is a nutritionist with expertise in local food practices. The primary investigator and a team of nutrition professionals were involved in developing the guidelines. The general nutrition section was built based on previous research, a sports nutrition knowledge questionnaire that was culturally specific for Sri Lankan athletes (Jayawardena, Weerasinghe, Trakman, et al., 2024). Important topics were identified for the sports nutrition section according to previous qualitative studies and personal experience (Jayawardena, Weerasinghe, Madhujith, et al., 2024). Additionally, key concepts from the previously developed sports nutrition questionnaire were further expanded to enhance the guidelines' content.

Phase 2: Performing a literature review on common nutrition practices

An extensive literature review was conducted in Google Scholar using keywords such as "sports," "nutrition," and "Sri Lanka" to investigate athletes' dietary habits and understand how their nutrition knowledge and environmental factors influenced their practices.

Phase 3: Evidence-based methods for improving nutritional practices

A comprehensive review of multiple scholarly articles and guidelines was conducted to identify evidence-based strategies aimed at improving athletes' dietary habits, performance, body composition, and nutritional status. For the general nutrition section, data were sourced from local resources, including the Sri Lankan food-based dietary guidelines (Nutrition Division, 2021), the Sri Lankan food atlas (Jayawardena et al., 2023), and the Sri Lankan food composition database (Jayatissa et al., 2021). In the sports nutrition section, international resources such as the International Olympic Committee (IOC) guidelines (International Olympics Committee, 2012) and position stands from the International Society of Sports Nutrition (Maughan et al., 2018) were reviewed.

Phase 4: Formulating culturally-specific sports nutrition guidelines

Comprehensive data gathered from local and international resources were utilized to formulate recommendations tailored to the needs of Sri Lankan athletes. The guidelines address cultural differences, food availability, and local dietary patterns (Jayawardena, Weerasinghe, Madhujith, et al., 2024). The guidelines also incorporate multiple local food composition tables, traditional recipes, food exchange lists, and visual aids such as food photographs and food labels to ensure practical applicability.

The validation of the guidelines

Phase 1: Initial validation by experts

In the first phase, a validation form containing detailed instructions and the newly developed Sports Nutrition Recommendations was distributed to nine experts in the field of nutrition. The experts assessed each chapter based on accuracy, relevance, appropriateness, and clarity. Evaluations were provided using a Likert scale, where 4 indicated "very accurate, highly relevant, very appropriate, very clear"

and 1 indicated "not accurate, not relevant, not appropriate, not clear." Suggestions for improvement were also provided alongside the ratings.

To establish consensus, each chapter's content validity index (CVI) was calculated by dividing the total score assigned by all evaluators by the number of evaluators. Chapters receiving scores of $\geq 3.2/4.0$ were considered as having satisfactory validity in terms of accuracy, relevance, appropriateness, and clarity based on the literature-supported cutoff of 0.8 for validation (Polit et al., 2007).

Phase 2: Incorporation of feedback and repeat validation by the experts

In the second phase, chapters that received scores below 3.2 underwent a thorough review,

integrating expert feedback to improve their quality. Experts who had initially assigned lower ratings (1 or 2 out of 4) were invited to re-evaluate the revised chapters. This iterative Delphi process continued until a mean score of ≥ 3.2 was achieved for each chapter across all criteria. The validation scores from this phase reaffirmed the guidelines' quality, with only minor recommendations for further refinement, which were meticulously integrated.

RESULTS

Findings related to development

During the development stage, five key topics in general nutrition and five in sports nutrition were identified. Table 1 presents the specific details of these topics.

Table 1. List of topics in the nutrition guidelines

Subsections	Chapters	Topics
General nutrition	Chapter 1	Fundamentals of macronutrients
	Chapter 2	Fundamentals of micronutrients
	Chapter 3	Energy balance
	Chapter 4	Hydration
	Chapter 5	Weight management
Sports nutrition	Chapter 6	Training meals
	Chapter 7	Sports supplements
	Chapter 8	Doping
	Chapter 9	Supplement label reading
	Chapter 10	Food habits while traveling

Findings of the two-phase Delphi method for validation

The validation process was conducted in two phases, with the results summarized as follows.

In Phase 1, seven of the nine nutrition experts invited to participate (four males and three females) responded, a response rate of 77.8%. These experts, possessing 3 to 20 years of experience, evaluated the guidelines for accuracy, relevance, appropriateness, and clarity. All chapters, except for Chapter 2

(regarding clarity and appropriateness), Chapter 5 (clarity), and Chapter 9 (clarity), achieved CVI scores exceeding the threshold (≥ 3.2).

In Phase 2, the revised guidelines submitted to the panel of experts who provided lower ratings received a 100% response rate. The CVI scores for the chapters that did not meet the desired criteria in Phase 1 showed improvement in Phase 2, with clarity in Chapter 2 rising from 3.14 to 3.4, appropriateness in Chapter 2 rising from 3.14 to 3.3, clarity in Chapter 5 from 3.14

Table 2. Content validity index scores of the two phases of validation

Chapters	Assessment categories	Phase 1	Phase 2
Chapter 1	Accuracy	3.4	3.6
	Relevance	3.6	3.7
	Clarity	3.2	3.5
	Appropriateness	3.3	3.6
Chapter 2	Accuracy	3.4	3.6
	Relevance	3.6	3.6
	Clarity	3.1	3.4
	Appropriateness	3.1	3.3
Chapter 3	Accuracy	3.6	3.7
	Relevance	3.7	3.7
	Clarity	3.6	3.6
	Appropriateness	3.6	3.6
Chapter 4	Accuracy	3.3	3.6
	Relevance	3.4	3.6
	Clarity	3.3	3.6
	Appropriateness	3.4	3.6
Chapter 5	Accuracy	3.3	3.6
	Relevance	3.4	3.7
	Clarity	3.1	3.4
	Appropriateness	3.3	3.6
Chapter 6	Accuracy	3.4	3.7
	Relevance	3.4	3.7
	Clarity	3.2	3.5
	Appropriateness	3.4	3.7
Chapter 7	Accuracy	3.6	3.7
	Relevance	3.4	3.6
	Clarity	3.4	3.6
	Appropriateness	3.6	3.7
Chapter 8	Accuracy	3.6	3.6
	Relevance	3.4	3.7
	Clarity	3.3	3.6
	Appropriateness	3.4	3.7
Chapter 9	Accuracy	3.4	3.4
	Relevance	3.4	3.6
	Clarity	3.1	3.3
	Appropriateness	3.3	3.4

to 3.4, and clarity in Chapter 9 from 3.14 to 3.4. In Phase 2, all chapters achieved CVI values of ≥ 3.2 across the dimensions of relevance, appropriateness, clarity, and accuracy, thereby affirming the validity of the guidelines. Thus, the guidelines were comprehensively validated through these two phases of the Delphi validation process of the Delphi validation process.

DISCUSSION

Studies focusing on developing sports nutrition guidelines and their validation are currently limited, and this is the first study to provide culturally specific nutrition guidelines for athletes in Sri Lanka. These comprehensive, culturally appropriate guidelines were achieved through a two-phase approach encompassing development and validation, incorporating cultural differences and up-to-date research findings. Hence, these guidelines address a notable gap in the existing literature, serving as a valuable tool to enhance sports nutrition knowledge among athletes, athletic coaches, and sports nutrition practitioners.

With inadequate dietary practices negatively impacting nutritional status, many athletes appear to have turned to supplementation to bridge the gap between their dietary shortcomings and performance demands. A study involving national-level athletes in Sri Lanka revealed a high prevalence of self-supplementation without medical advice, where most athletes (94%) consumed dietary supplements, with advice primarily sought from sports doctors (45%), team coaches (40%) or friends (15%), rather than registered nutritionists (de Silva et al., 2010). This trend underscores the widespread practice of self-supplementation without professional guidance (de Silva et al., 2010). Furthermore, only a small percentage of athletes were aware of the potential risks associated with supplement use and only two athletes recognized that supplements could pose health risks, highlighting a significant gap in knowledge (de Silva et al., 2010). A parallel study showed widespread dietary supplement consumption among Sri Lankan national-level athletes

without proper nutritional assessment before use and athletes who attended anti-doping workshops or participated in international competitions were more cautious about supplement content ($p < 0.05$) (Rashani et al., 2021).

As self-supplementation with poor nutrition knowledge becomes more prevalent among Sri Lankan athletes, the risk of inadvertent doping increases, with increased health risks (Nilaweera et al., 2021). The prevalence of doping among national-level athletes in Sri Lanka has been reported to be 8.4%, with a significant proportion of these athletes using performance-enhancing drugs (Nilaweera et al., 2021). One major reason for doping among athletes is a lack of knowledge: 66.6% of athletes could not define the term World Anti-Doping Agency (WADA), and less than 38% were aware of specific doping drugs (Nilaweera et al., 2021). This finding highlights the crucial need to fill knowledge gaps regarding doping and other sports nutrition concepts addressed in the newly developed guidelines.

Guidelines to provide sports nutrition knowledge are internationally oriented, including those from the IOC (Maughan et al., 2018), the American College of Sports Nutrition (Jäger et al., 2017), and the International Society of Sports Nutrition. International sports nutrition guidelines are typically available only in English, creating a significant language barrier for many Sri Lankan athletes who may not be proficient in English. These athletes often come from lower socio-economic backgrounds, where limited resources and access to education further hinder their understanding of such guidelines. Moreover, these international recommendations often overlook the local dietary realities of Sri Lankan athletes, who must rely on locally available, affordable foods to meet their nutritional needs. Given this context, the development of culturally tailored nutrition guidelines is essential for addressing the unique nutritional challenges faced by Sri Lankan athletes.

Poor dietary practices and widespread reliance on self-supplementation, often harmful when done without proper guidance, underscore the need for accessible nutritional support. However, the scarcity of sports nutrition experts in Sri Lanka and the high costs associated with consultations make it difficult for athletes to access professional advice. In this light, providing athletes with culturally specific, easy-to-understand guidelines represents a practical solution. While it may not offer the same personalized benefits as consulting with a nutrition specialist, such guidelines can serve as an essential tool in bridging the knowledge gap and empowering athletes to make informed dietary choices that enhance performance and well-being. Thus, the newly developed guidelines utilized data from international sports nutrition guidelines, adapting it to address the Sri Lankan athletic population based on previous studies (Jayawardena, Weerasinghe, Madhujith, et al., 2024).

The guidelines developed in this study include five chapters on both general and sports nutrition, emphasizing each area. This approach addresses the significant gaps in basic nutrition knowledge and the barriers Sri Lankan athletes face in accessing proper nutrition (Jayawardena, Weerasinghe, Madhujith, et al., 2024). In comparison, the nutrition and hydration guidelines for excellence in sports performance (International Life Sciences Institute- India, 2007) developed in India, consists of eight chapters, with two on general nutrition and six on sports nutrition. While the Indian guidelines include a more comprehensive chapter on body composition and its impact on athletic performance, the current guidelines focus on energy balance and weight management. The guidelines also include meal suggestions based on locally available foods easily accessible to Sri Lankan athletes, making it more practical for the target population.

A study conducted by Iwasa-Madge et al. proposed a conceptual sports nutrition framework aimed at enhancing athlete health

and performance through a more individualized approach (Iwasa-Madge & Sesbreno, 2022). However, the current guidelines are designed to equip athletes with general knowledge, enabling them to make informed nutrition choices independently. The conceptual framework uses a three-tiered approach, where each tier involves assessment and intervention tools. The first tier addresses the upstream determinants of eating behaviors, relying on expert assessments and questionnaires, which partially align with our guidelines. Our approach, however, is based on qualitative research conducted within the Sri Lankan athletic population, exploring perceptions of sports nutrition and barriers to its implementation. Additionally, our guidelines expand on the sports nutrition knowledge questionnaire developed and validated for Sri Lankan athletes, providing a foundation that was essential in its development (Jayawardena, Weerasinghe, Trakman, et al., 2024). Tier 2 of the proposed framework focuses on individualized nutrition plans, aligning with the developmental aspects of our guidelines. Tier 3 assesses the health and performance outcomes of dietary interventions, an area not covered in our current guidelines but identified as a future direction for evaluating its effectiveness in enhancing athlete performance.

A notable strength of this study is the comprehensive and systematic validation process, utilizing the modified Delphi technique. This two-phased validation took place among an expert panel comprising specialists in human nutrition, dietetics, and sports nutrition. In several studies validating sports nutrition knowledge questionnaires to assess athletes' nutrition knowledge, recruiting sports nutrition experts is identified as crucial for obtaining essential feedback on content validity (MacKenzie et al., 2011). In Sri Lanka, sports nutrition is a newly emerging field, and the panel is best suited to offer insights on the guideline's content within the cultural context. The bias between the experts in reaching a consensus was excluded by allowing them to provide individual comments through the email platform. Furthermore, since the panel of

experts closely interacts with the target population daily, the resulting guideline demonstrates high readability and comprehension. The guidelines are available as both a printed version and an online resource to increase receptiveness among the target population. It applies to athletes, coaches, and sports nutrition professionals; implementing evidence-based strategies from national recommendations can enhance athletes' nutritional knowledge and behaviors, improving performance and success in sports.

Despite its strengths, this research has a few shortcomings. Current guidelines provide more generalized content compared to international sports nutrition guidelines and reviews, which offer more comprehensive and sophisticated data. It can also be argued that such general emphasis, compared to in-depth analysis, better suits the target population with limited nutrition knowledge. Certain constraints were also noted during the validation phase, during which only three of the seven nutrition experts provided sufficient comments when feedback on the relevance, accuracy, appropriateness, and clarity of content was requested. This lack of contribution may be due to insufficient knowledge or a general cultural tendency to provide minimal feedback. Future studies should engage more proactive professionals.

The development and validation of these sports nutrition guidelines mark a significant step towards improving the sports nutrition knowledge of athletes and their supporting staff. Widespread adoption of the guidelines is anticipated to enhance the nutritional status and sporting performance of track and field athletes. Future interventional studies are crucial to assess the impact of these guidelines on athletes' sports nutrition knowledge, nutritional status, performance, and overall health. Furthermore, national organizations, including the Ministry of Sports, the National Olympic Committee (NOC), and the Sri Lanka Athletic Association, should incorporate this document into their frameworks to support the development of both school and professional athletes.

ACKNOWLEDGMENT

We extend our gratitude to the team of nutrition professionals involved in developing the guideline and the panel of experts who participated in the validation of the newly developed guidelines, as well as to all individuals who contributed to this study.

FUNDING

The study was self-funded by the primary investigator.

CONFLICT OF INTEREST

The authors declare no competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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