

Consumption and physicochemical evaluation of dietary supplements used by handball players in Yaounde (Cameroon)

Soppo Lobe Charlotte Vanessa ^{1,*}, Emanda Ekoudi Martin ¹, Benga Mekoulou Felecité Chimène ¹, Teufa Tchoupeua Sybeine ¹, Minyem Ngombi Aude Perinne ^{1,2} and Nnanga Nga ¹

¹ Department of Galenic Pharmacy and Pharmaceutical Legislation, University of Yaounde I, Cameroon.

² Department of Pharmacy, Medicines and Laboratories, Ministry of Public Health, Cameroon.

World Journal of Biology Pharmacy and Health Sciences, 2026, 25(03), 117-121

Publication history: Received on 04 February 2026; revised on 10 March 2026; accepted on 13 March 2026

Article DOI: <https://doi.org/10.30574/wjbphs.2026.25.3.0147>

Abstract

Introduction: The consumption of dietary supplements with ergogenic purposes is widespread among athletes, despite uncertainties regarding their quality, safety, and regulatory compliance. This study aimed to evaluate the physicochemical quality of the most commonly consumed dietary supplements among handball players in Yaounde.

Methodology: A descriptive study was conducted over an eight-month period. A cross-sectional survey was carried out among first-division handball players using a semi-structured digital questionnaire. The most frequently consumed dietary supplements were subsequently subjected to physicochemical evaluation, including label examination and quantification of selected active substances using reference analytical methods.

Results: A total of 106 handball players participated in the survey, with a predominance of female athletes (57.45%). The 26–30-year age group was the most represented. Dietary supplement consumption increased with weekly training duration and competitive level, with international-level athletes being the highest consumers. Vitamin C and energy drinks were the most commonly used supplements. Physicochemical analysis of the most consumed energy drink revealed sugar contents ranging from 350% to 506% of the declared values, while actual caffeine content ranged from 0.93% to 31.25% of the labeled amounts.

Conclusion: These findings highlight insufficient physicochemical quality and limited labeling reliability for certain dietary supplements. The use of these products may expose athletes to nutritional and health risks, underscoring the need for professional supervision and strengthened regulatory control.

Keywords: Dietary Supplements; Handball Players; Quality; Sports Performance

1. Introduction

Dietary supplements are defined as foodstuffs intended to supplement the normal diet and constitute a concentrated source of nutrients or other substances with nutritional or physiological effects, alone or in combination [1,2]. They include vitamins, minerals, amino acids, enzymes, herbal preparations, and certain additives authorized for human consumption [3–5].

The consumption of these products has expanded worldwide, driven by the prevention of real or perceived nutritional deficiencies and the pursuit of improved physical and athletic performance. Initially limited to strength sports, this practice has progressively extended to numerous sporting disciplines and has become widespread among the general

* Corresponding author: Soppo Lobe Charlotte Vanessa.

population, including young athletes [6–8]. From an economic perspective, the global dietary supplement market has experienced rapid growth, dominated by the United States and Europe [9,10].

Among athletes, dietary supplements are often presented as essential for optimizing performance, recovery, and body composition. However, their use is not without risk. Adverse effects related to overdosing, interactions, or contamination with prohibited substances have been reported, potentially leading to unintentional doping practices [8,11]. The physicochemical quality and labeling compliance of these products therefore represent major public health concerns.

In France, the regulation and monitoring of dietary supplements rely on the recommendations of ANSES, while in Cameroon, their regulation is governed by Decree No. 2001/MINSANTE of November 22, 2007. A study conducted in Cameroon showed that more than two-thirds of consumers use dietary supplements [12], highlighting the importance of rigorous control. To our knowledge, few studies in Cameroon have focused on the pharmaco-technical quality of dietary supplements used by athletes, particularly in team sports such as handball.

In this context, it is essential to assess the consumption and quality of dietary supplements used by athletes. The objective of this study was to evaluate the physicochemical quality and labeling compliance of the most commonly consumed dietary supplements among handball players in the city of Yaoundé, in order to estimate their safety of use and potential impact on sports performance.

2. Materials and Methods

2.1. Survey

A cross-sectional survey was conducted among handball clubs in the city of Yaoundé. The target population consisted of first-division male and female handball players. Inclusion criteria included active athletes practicing more than two hours of physical activity per week.

Data were collected using a semi-structured digital questionnaire comprising 27 items, distributed via Google Forms®. The questionnaire included three sections: sociodemographic data, sports characteristics, and dietary supplement consumption (types, motivations, duration of use, sources of supply, and perceived effects on performance).

2.2. Physicochemical Evaluation

The most frequently consumed dietary supplements were selected for physicochemical evaluation.

2.2.1. Label Examination

Visual inspection was performed to verify labeling compliance, including product name, composition, batch numbers, manufacturing and expiration dates, declared concentrations, and manufacturer contact information.

2.2.2. Substance Quantification

Caffeine: quantified by UV-Visible spectrophotometry (200–350 nm for caffeine) [13].

Sugars: quantified using a GDH-FAD glucometer [14].

2.3. Statistical Analysis

Data were entered and analyzed using Microsoft Excel 2016® and Epi Info software version 3.4.5. Results were expressed as frequencies, percentages, tables, and figures.

3. Results

3.1. Survey Results

A total of 106 handball players participated in the study. Women accounted for 57.45% of respondents, while men represented 42.55%. The most represented age group was 26–30 years (37.23%), followed by 31–40 years (27.66%). Figure 1 shows dietary supplement consumption by gender and age.

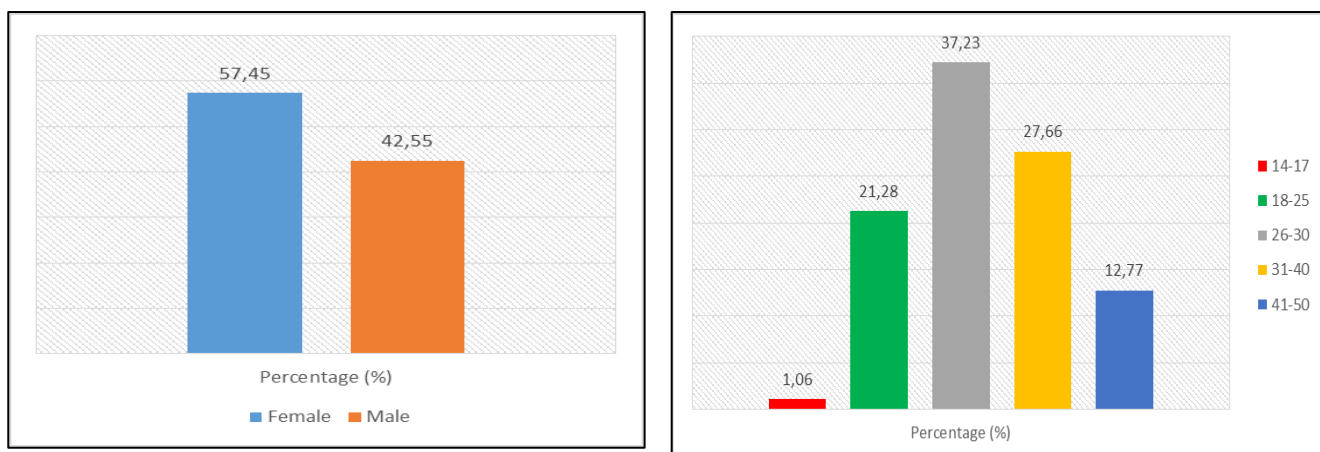


Figure 1 Distribution of consumption by gender (left) and age group (right)

Dietary supplement consumption was higher among international-level athletes (40.43%) compared with national and amateur levels. A progressive increase in consumption was observed with weekly training duration, particularly beyond six hours per week. These data are presented in Figure 2.

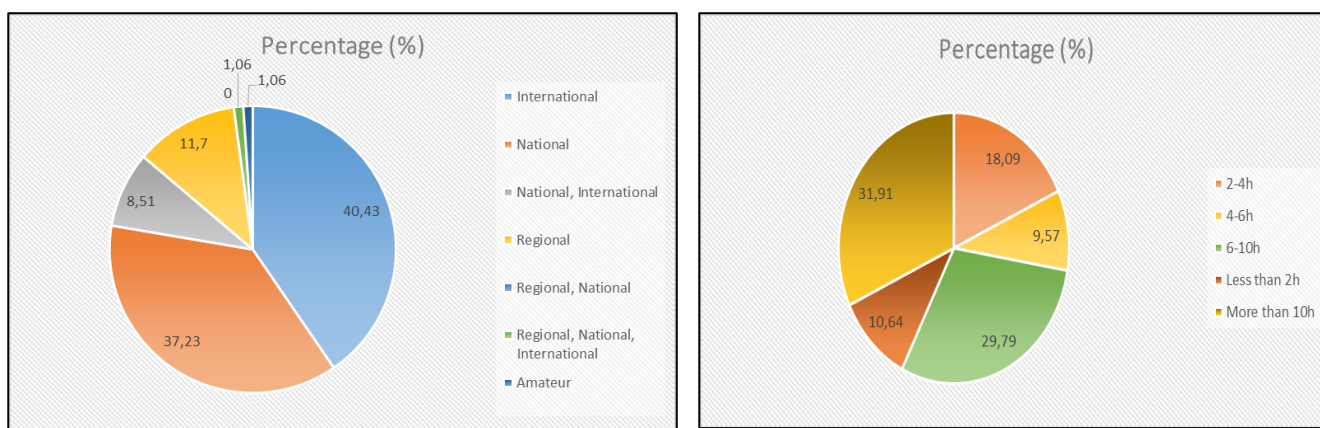


Figure 2 Distribution of consumption according to level of sport practice (left) and weekly training duration (right)

Figure 3 shows that the most frequently consumed supplements were vitamin C, used alone (25.00%) or in combination (22.62%), followed by energy drinks (17.86%).

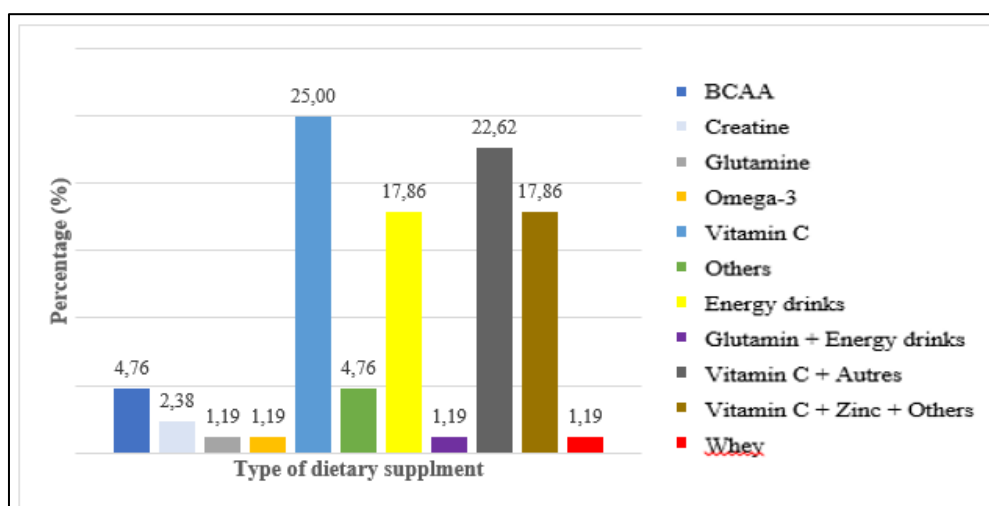


Figure 3 Distribution of consumption by type of dietary supplement

3.2. Physicochemical Evaluation Results

Analysis of the most consumed energy drink revealed significant discrepancies between declared and measured values. Actual sugar contents ranged from 350% to 506% of the manufacturer-declared values. Conversely, caffeine contents ranged from 0.93% to 31.25% of the declared amounts.

4. Discussion

This study evaluated dietary supplement consumption and physicochemical quality among handball players in Yaoundé, highlighting several important findings.

The results demonstrate high dietary supplement consumption among handball players in Yaoundé, particularly among high-level athletes and those with a high training load. This trend is consistent with literature data indicating increased supplement use among athletes seeking to optimize performance [6,10].

The predominance of vitamin C consumption can be explained by its accessibility and its perceived effects on immunity and recovery, although its direct ergogenic effect remains limited. In contrast, energy drinks raise major concerns.

The substantial discrepancies between declared and measured sugar and caffeine contents reflect poor labeling reliability, exposing athletes to excessive sugar intake and uncertain stimulant efficacy, a phenomenon already reported in several studies involving athletes who consume energy drinks [15]. Excessive intake of simple sugars is associated with an increased risk of metabolic imbalance, fat mass gain, and decreased performance in the medium to long term among athletes [16].

These findings reinforce the need for rigorous regulatory control and enhanced quality monitoring of dietary supplements, as recommended by several international health authorities [17]. Although this study did not directly assess the clinical impact of excessive intake, the observed discrepancies suggest a potential risk in cases of chronic consumption.

The absence of formal sample size calculation and the limitation of analyses to selected constituents represent limitations of this study.

5. Conclusion

This study shows high dietary supplement consumption among handball players in Yaounde, particularly among high-level athletes and those undergoing intensive training. Vitamin C and energy drinks were the most commonly used products. Physicochemical analysis of energy drinks revealed significant discrepancies between declared and actual contents, with excessive sugar concentrations and caffeine levels lower than those advertised. These non-compliances reflect insufficient quality and unreliable labeling, exposing athletes to nutritional risks. Strengthened health supervision and regulatory control are therefore necessary.

Compliance with ethical standards

Acknowledgments

The authors thank the handball players who participated in this study and the Multidisciplinary Laboratory of Galenic Pharmacy and Pharmaceutical Legislation where the analyses were conducted.

Disclosure of conflict of interest

The authors declare no conflicts of interest.

References

- [1] European Parliament, Council of the European Union. Directive 2002/46/EC of the European Parliament and of the Council of 10 June 2002 on the approximation of the laws of the Member States relating to food supplements. J Off Union Eur. 2002;L183:51–7. Food and Drug Administration (FDA). Dietary Supplement Health and Education Act of 1994. Public Law 103-417. Washington DC; 1994.

- [2] Jacques-Louis B, Bresson JL, Chanson P, et al. Dietary supplements: benefits, risks and regulations. *Presse Med.* 2004;33(6):389–95.
- [3] French Agency for Food Safety (AFSSA). Risk assessment related to the consumption of dietary supplements. Paris: AFSSA; 2009.
- [4] Dubecq C, Lecerf JM, Bougnères P. Dietary supplements: between nutrition and medicine. *Nutr Clin Metab.* 2014;28(2):73–80.
- [5] Coste O. Dietary supplements and sport: uses, risks and regulations. *Sci Sports.* 2006;21(2):69–76.
- [6] French Agency for Food, Environmental and Occupational Health & Safety (ANSES). Opinion on the risks related to the consumption of dietary supplements intended for athletes. Paris: ANSES; 2016.
- [7] Deloy L. Consumption of dietary supplements among athletes: practices and perceptions. Doctoral thesis. University of Lille; 2017. British Nutrition Journal (BNJ). Global dietary supplements market overview. *Br Nutr J.* 2001;85(3):S1–S8.
- [8] Maughan RJ, Burke LM, Dvorak J, et al. IOC consensus statement: dietary supplements and the high-performance athlete. *Br J Sports Med.* 2018;52(7):439–55.
- [9] Geyer H, Parr MK, Koehler K, Mareck U, Schänzer W, Thevis M. Nutritional supplements cross-contaminated and faked with doping substances. *J Mass Spectrom.* 2008;43(7):892–902.
- [10] Pokam Mouafo FJ. Consommation et réglementation des compléments alimentaires au Cameroun. Thèse de doctorat en pharmacie. Université de Yaoundé I; 2012.
- [11] European Pharmacopoeia Commission. Caffeine. In: *European Pharmacopoeia*. 10th ed. Strasbourg: Council of Europe; 2020.
- [12] Koch CD, Brunner J. Evaluation of glucose meters for food and beverage analysis. *J Food Compos Anal.* 2014;36(1–2):1–7.
- [13] Higgins JP, Tuttle TD, Higgins CL. Energy beverages: content and safety. *Mayo Clin Proc.* 2010;85(11):1033–41.
- [14] Burke LM, Hawley JA, Wong SH, Jeukendrup AE. Carbohydrates for training and competition. *J Sports Sci.* 2011;29 Suppl 1:S17–27.
- [15] European Food Safety Authority (EFSA). Scientific opinion on the safety of caffeine. *EFSA J.* 2015;13(5):4102.