Chapter 39

Supplement use and protein intake by bodybuilders

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ABSTRACT
Introduction: The demand for the practice of bodybuilding in gyms is related to the aesthetic look, with the increase of muscle mass and search for health and quality of life. It is widespread among supporters that additional protein intake and use of supplements increase strength, hypertrophy and improve performance. AIM: To evaluate the consumption of dietary supplements and protein intake in bodybuilders in two gyms. Materials and methods: The sample consisted of 44 bodybuilding practitioners: 20 male and 24 female. As inclusion criteria, be a bodybuilder and perform training for hypertrophy. For data collection, a self-filling form with information regarding training and feeding was adopted, with a food record of three alternate days throughout the week. The protein intake recommended by the Brazilian Society of Exercise and Sports Medicine guidelines was adopted: 1.6 to 1.7 grams of protein per kilogram of weight. Results: Regarding the use of supplements and their frequency, it was observed that the majority of participants (80% of men and 62% of women) use supplements, with the association of up to 3 or more supplements simultaneously. As for protein intake, 56.8% showed consumption below ideal, while the rest 38.7% above recommended and 4.5% with ideal consumption. Conclusion: It was found a high consumption of food supplements and an association between them and that most participants have inadequate consumption of proteins according to the reference used.

Keywords: bodybuilding, hypertrophy, food supplements, protein intake

1 INTRODUCTION

The search for an aesthetically perfect body associated with improved physical performance has led many people to go to gyms, modify their dietary intake, and consume dietary supplements. The percentage of people who practice physical activities during their free time has increased from 33.8% to 38.1% in the last five years, the percentage of inactive men has reduced by more than 20% (Vigitel 2018).

The practice of physical activity is directly related to physical and mental health, and when associated with a proper diet, the benefits are even greater. According to Benetti and Chagas (2017), besides the concern with health, most gym users seek exercise for aesthetic purposes and in this context there is a strong contribution of the media for the dissemination of a model of "perfect body" to be adopted (Ferraz and collaborators, 2015).

Body aesthetics has received increased attention with the proliferation of body care techniques such as bodybuilding, dieting, use of dietary supplements, anabolic steroids, and cosmetic surgery (Vieira et al., 2018).

The search for a quick and effective solution to have the desired body can lead people to adopt erroneous patterns of eating behavior and other practices, motivated by results and unaware or unaware of the long-term harm, as well as the ineffectiveness of some eating strategies used (Soares et al., 2019).

The demand for hyperprotein diets has undergone a significant increase, especially among strength exercisers who desire lean mass gain and/or hypertrophy, as has the increased use of dietary supplements (Borba et al. 2011; Maioli 2012).

The main food supplements consumed by bodybuilding practitioners are proteins, amino acids, fast-absorbing carbohydrates (maltodextrin), thermogenics (caffeine), and vitamins. There is also an increase in the use of anabolic steroids, which can aggravate negative health effects and continuous and indefinite use (Frade et al. 2016; Fernandes, 2017).

The present study is justified due to the need for guidance and awareness about the various supplementation products used by bodybuilding practitioners and other activities without proper health safety. Thus, the present study aimed to evaluate the consumption of food supplements and protein intake in bodybuilding practitioners in two gyms in the interior of Minas Gerais.

2 MATERIALS AND METHODS

This was a cross-sectional and descriptive study, with a non-probabilistic sampling design by convenience. The research was conducted in two gyms in the city of Passos-MG.

Participants in the study were: weightlifters between 18 and 45 years old of both sexes, who practiced weightlifting at least twice a week, after two months of enrollment and attendance. The exclusion criterion was age under 18 and over 45 years old, and those who did not practice weight training.

To evaluate the protein intake, a food diary was adopted for 3 alternate days, with previous guidance to the participants about filling out a description of all foods and beverages consumed each day. The use of supplements was evaluated by a questionnaire indicating the types of supplements in use, quantity, frequency, and indication. For the quantification of protein intake with was adopted NUT WIN (2010) and average of the three days evaluated.

For the statistical analysis, a quantitative approach and descriptive analysis of the variables was adopted by means of measures of central tendency, absolute and relative frequencies, with the help of the Excel®, 2016 program.

This was a course completion work of the State University of Minas Gerais (Unit - Passos), carried out in 2019, where all ethical criteria for research were followed according to Resolution 466/12.

3 RESULTS

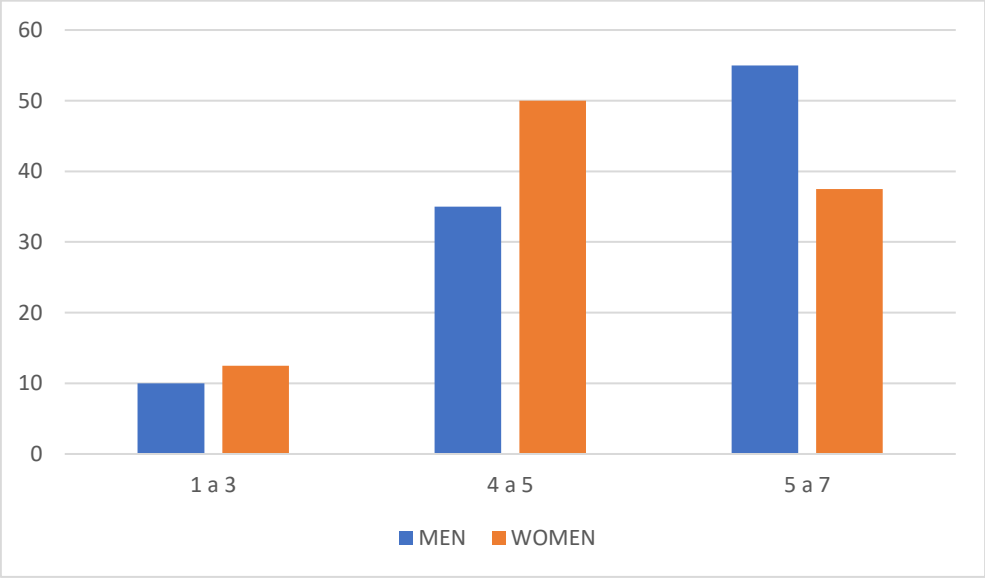
Table 1 presents the characterization of the sample studied, composed of 44 participants. Regarding age, it ranged from 18 to over 40 years old.

Table 1 - Characterization of the sample (n=44).

	Men	**Women**
	45,5%	54,55%
Age group (years)		
18-25	20%	20,8%
25-30	30%	41,6%
30-35	15%	25%
35-40	15%	8,3%
> 40	20%	4,3%

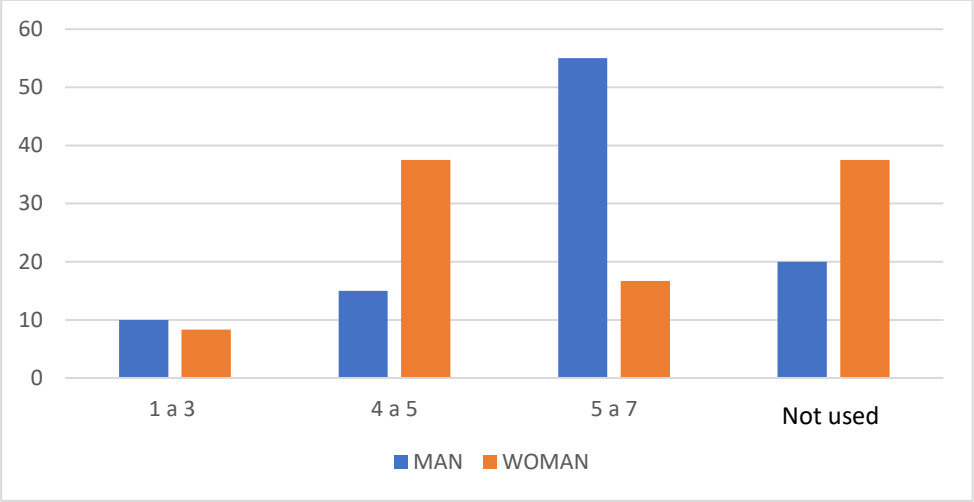
Regarding frequency, it was observed that a larger portion of the males used the gym from 5 to 7 times a week, while females used it from 4 to 5 times a week, as seen in figure 1.

Figure 1 - Frequency of physical activity



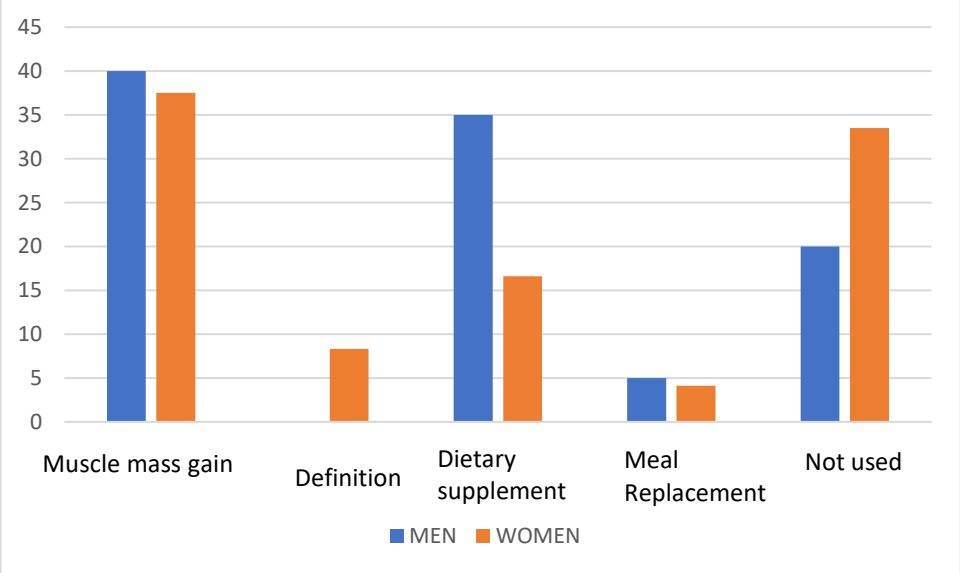
Regarding the use of supplements and their frequency, it was observed that most participants, 80% of men and 62% of women, use supplements. A higher frequency of use was observed in 54% of men who use them 5 to 7 times a week. However, it is relevant to note that a considerable frequency of women, more specifically 38%, do not use supplements even if the goal is to gain lean mass, as shown in figure 2.

Figure 2 - Consumption of supplements according to gender.



As for the purposes for which the supplement is used, we can see in figure 3 that the majority of men and women 40% and 37.5% respectively, consume supplements to gain muscle mass, other answers reported were for muscle definition, as a food supplement, and as a meal replacement.

Figure 3 - Reasons for using dietary supplements according to gender.



Regarding the use of supplementation according to the recommendation of a nutritionist, it was observed that 50% of the men and 42% of the women sought the professional, and 20% of the men and 12% of the women use it on their own.

Among the most used types of supplements are the use of isolated milk protein, casein, hypercaloric, maltodextrin, thermogenics, isolated amino acids or in association, such as arginine, glutamine, and BCAA among the most used, followed by association with vitamins and minerals, it is common to associate up to three supplements simultaneously or more.

Regarding the quantification of protein that each participating individual consumes daily compared to the ideal value to be consumed, among men it stands out that 55% consume less protein than recommended by the adopted reference. Only one male participant presents an ideal consumption, 44% with a consumption value above the followed recommendation.

For women, 54% had protein intakes below the recommended level, while 20.8% had intakes above the recommended level, and 26% had intakes within the recommended range.

As for the origin of the proteins used in the diet, the use of protein of animal origin, associated with vegetable origin and followed by supplementation in the group that reported performing.

4 DISCUSSION

Nutritional supplements, currently popularized by a strong marketing appeal and growth of the supplementation industry, are used both in the competitive sports environment and among the non-athlete public, with indication for use by different professionals or on their own. A healthy and appropriate diet for training should be considered as a starting point for maximum performance, being sufficient for individuals practicing physical exercises without competitive purposes (Vieira et al., 2018).

Definitions of dietary supplements vary from country to country, and regulation is generally permissible and appears to be geared more toward promoting trade than protecting public health. Supplements can cause toxic reactions directly or can interact with other supplements or pharmaceuticals (Binns, Lee, 2011).

The easy access to supplements in gyms, pharmacies, specialized stores, and the internet has enabled the indication by individuals who do not have technical knowledge and encourage self-prescription, which increases the risks to the consumer's health (Santos; Sampaio, 2014).

In the present research the use of supplements was mentioned by 70% of the respondents (80% of men and 62% of women) and still those who use without indication from a nutritionist In a similar study to this one the source of supplement indication most cited were physical education instructors and teachers, followed by salespeople, friends and self indication (Vieira and collaborators, 2018).

In addition, the main consumption targets were whey protein "Whey Protein" (73%) and branched chain amino acids "BCAA" (79%), occasionally in simultaneous use. A study of elite athletes showed widespread use of dietary supplements and drugs. The consumption of supplements without evident performance or health benefits demonstrated the need for specific educational programs aimed at use. Quality, quantity, and combination of products reported raised concern about the risk of potential side effects (Suzic; Lazic. et al, 2011) and corroborates with Fayh and colleagues' (2013) data about health education for this purpose.

Some form of dietary supplement is consumed by over 70% of Americans every day and the supplement industry is currently a big business, with gross revenues of over $28 billion (Ronis, 2018). The

high consumption of supplements associated with a lack of knowledge about metabolism and the health problems they can cause, further worsens the scenario of improper use in the bodybuilding population. If necessary, the association of a nutritional supplement should be based on the individual characteristics of each person (Macedo; De Souza; Fernandez 2017; Soares et al., 2019).

Some supplements have been found to be contaminated with heavy metals and others do not contain the expected amounts of active ingredients. In general, supplements are not necessary except in cases of established deficiencies, and excess of some nutrients may increase cancer rates (Bins, 2011).

Analysis of US FDA warnings from 2007 to 2016 showed that unapproved pharmaceutical ingredients were identified in 776 dietary supplements. The most common adulterants for nutritional supplements was sibutramine for weight loss and synthetic steroids or steroid-like ingredients for muscle building supplements, with 157 products (20.2%) containing more than 1 unapproved ingredient (Tucker J, Fischer T, Upjohn L, Mazzera D, Kumar M, 2018).

New data shows that 90% of sports supplements contain trace amounts of estrogenic endocrine regulators, with 25% of them having higher than acceptable estrogenic activity. About 50% of supplements are contaminated with melanin, a non-protein nitrogen source. Additional data is accumulating for the safety of nitrate intake (Deldick, 2016).

Regarding the form of use, many use beyond the indication of use and daily consumption amounts according to recommendation. Sá (2011) states that the indication of use according to the manufacturer is often disregarded by consumers themselves.

According to Biesek, Alves and Guerra (2010), the excessive intake of protein can be harmful because it can affect the hepatic and renal metabolism, since the byproducts of protein metabolism have their synthesis and excretion in these organs. According to the authors, the recommendation of protein is 1.4 g/kg a day for bodybuilding practitioners and, in the study they did, they observed an average intake of 10.75 g/day in beginners and 23.16 g/day in trained practitioners only considering the use of supplements. If associated with the daily diet, the authors stated a high probability that the value would exceed the recommended amount.

It is possible to find recommendation values in the literature ranging from 1.2 to more than 2.2 grams of protein per kilogram of body weight per day. The Guidelines of the Brazilian Society of Exercise Medicine and Sports recommends as adequate protein intake for strength athletes would be 1.6 to 1.7 grams. In this study we observed both below and above the adopted reference.

A high-protein diet is known to cause metabolic acidosis, which is manifested by increased urinary excretion of nitrogen and calcium. Bodybuilders often consume dietary protein in excess of recommended amounts to promote increased muscle mass. However, this study implies that resistance exercise with adequate mineral supplementation, such as potassium and calcium, may reduce or offset the negative effects

of protein-generated metabolic changes (Kim, 2011). There is no evidence to suggest that consuming a high protein diet for a period of 2 years may cause any detrimental side effects (Ellerbroek 2018).

In healthy individuals there is little evidence that high protein intake is dangerous (Tipton 2011). The results are conflicting and do not allow for any conclusions about the harmful effects on the kidneys of long-term high-protein intake and until additional data are available, the current knowledge seems to support a concern. Screening for kidney disease should be considered before and during long-term high-protein intake (Kamper; Strandgaard, 2017).

5 CONCLUSION

The high consumption of supplements was found among bodybuilding practitioners, either of proteins, amino acids, vitamins and minerals or used in various associations. Given the health risks they can offer, it deserves attention from the professionals involved, where education about the use and proper indication by a professional of the area is necessary, in order to demystify the beliefs of performance gain or rapid muscle building regarding the use of these products by strength training practitioners. More studies are needed to characterize in larger populations the details of the use and indication of these products with potential risks to public health in Brazilian gyms.

As for protein intake, it varied below, adequate, and above the adopted reference. It is noteworthy that there is no consensus on the harm of high protein diets in healthy individuals, as well as no evidence of additional benefit from increasing the intake above 1.5g per kg of weight, which is already considered high in protein content. You should still consider screening for chronic kidney disease before and during long-term use. We emphasize the importance of nutritional monitoring and proper guidance in bodybuilders, as well as in other groups of athletes.

REFERENCES

Abrahin, O.C.; Sousa, E.C. Esteroides anabolizantes androgênicos e seus efeitos colaterais: uma revisão crítico-científica. Revista da Educação Física/UEM. Vol 24. Num 4. 2013. p. 669-679.

Anção, M.S.; Cuppari, L., Draibe, A.S.; Sigulem, D. Programa de apoio à nutrição–NutWin. 2010.

Antonio J.; Ellerbroek A. Case Reports on Well-Trained Bodybuilders: Two Years on a High Protein Diet. JEP online 2018;21(1):14-24.

Basaria, S.; Wahlstrom, J.T.; Dobs, A.S. Anabolic-androgenic steroid therapy in the treatment of chronic diseases. The Journal of Clinical Endocrinology & Metabolism. Vol. 86. Num. 11. 2001.p. 5108-5117.

Benetti, F.; Das Chagas, B.C. Avaliação do consumo de suplementos alimentares por praticantes de musculação das academias do município de Tenente Portela-RS. RBNE-Revista Brasileira de Nutrição Esportiva. Vol. 11. Num. 63. 2017. p. 363-374.

Bhasin, S.; Storer, T.; Asbel-Sethi, N.; Kilbourne, A.; Hays, R.; Sinha-Hikim, I.; Shen, R.; Arver, S.; Beall, G. Effects of testosterone replacement with a nongenital, transdermal system, Androderm, in human immunodeficiency virus-infected men with low testosterone levels. The Journal of Clinical Endocrinology & Metabolism. Vol. 83. Num. 9. 1998. p. 3155-3162.

Biesek, S.; Alves, L. A.; Guerra, I. Estratégias de nutrição e suplementação no esporte. 2ª edição. Brasileira: Manole, 2010. p. 87.

Binns, C.W.; Lee M.K.; Lee, A.H. Problems and Prospects: Public Health Regulation of Dietary Supplements. Annu Rev Public Health. 2018; 39:403-420.

Borba, A.J.; Rocha, M.; Silva, M.; Tibùrcio, D.; Pereira, S.; Reis, L.; Junior, G.. Dieta hiperlipídico-proteica utilizada para emagrecimento induz obesidade em ratos. Revista de Nutrição. Vol 24. Num 4. 2011. p. 519-528.

BRASIL. Lei nº 8.234, de 17 de setembro de 1991. Regulamenta a profissão de Nutricionista e determina outras providências. Diário Oficial da União, 1991.

Brasil. Ministério da Saúde. Secretaria de vigilância em Saúde. Departamento de Vigilância de doenças e agravos nao transmissíveis e Promoção da saúde Vigitel Brasil 2018 vigilância de fatores de risco e proteção para doenças crônicas por inquérito telefônico. Brasília: Ministério de Saúde, 2019.

Conselho Federal deNutricionistas,. Resolução CFN Nº 390, de 27 de outubro de 2006. Regulamenta a prescrição dietética de suplementos nutricionais pelo nutricionista e dá outras providências. Diário Oficial da União, Num. 223. 2006. p. 104.

Da Silva, C.S.M.; Kirten, V.R. Avaliação da adequação de dietas publicadas por revistas não científicas. Disciplinarum Scientia| Saúde. Vol 15. Num 1. 2014. p. 101-112.

Dal, P. T.S.;Brancoii, M.M.N.; De Carvalho, R.M.A.; Pasqualotti, A.; Maciel, E.N.; Migott, A.B.Uso não-médico de medicamentos psicoativos entre escolares do ensino fundamental e médio no Sul do Brasil. Cadernos de Saúde Pública. Vol 22. Num 1. 2006. p. 109-115.

Dartora, W.J.; Wartchow, K.M.; Rodríguez A.A.L. O uso abusivo de esteroides anabolizantes como um problema de saúde pública. Revista Cuidarte. Vol 5. Num. 1. 2014. p. 689-693.

De Santana, M.H.M.; Del Mayer, B.M.; Gavranich, K.C. Avaliação da adequação nutricional das dietas para emagrecimento veiculadas pela internet. Cons CIentI Ae saúde. Num 2. 2003. p. 99-104.

De Souza, F.B.; Ramalho, A.A.; Imada, K.S.; Martins, F.A.Consumo de suplementos alimentares por praticantes de atividade física em academias de ginástica: um artigo de revisão. Journal of Amazon Health Science. Vol 1. Num 2. 2015. p. 24-43.

De Vasconcelos, G.R.; Moraes, M.I.; Finelli, S.B. Avaliação do perfil e do conhecimento básico de educadores físicos em relação à suplementação alimentar em academias de Belo Horizonte-MG. RBNE-Revista Brasileira de Nutrição Esportiva. Vol 5. Num 29, v. 5, n. 29, 2011. p. 455-460.

Deldicque, Louise & Francaux, Marc. (2016). Potential harmful effects of dietary supplements in sports medicine. Current opinion in clinical nutrition and metabolic care. 19. 10.1097/MCO.0000000000000321.

Fayh, A.P.T.; Da Silva, C.V.; De Jesus, F.R.D.; Costa, G.K.. Consumo de suplementos nutricionais por frequentadores de academias da cidade de Porto Alegre. Rev Bras Ciênc Esporte. Vol 35.Num 1. 2013. p. 27-37.

Fernandes, P.H.P.D.. Biomarcadores de lesão renal em praticantes de musculação em uso de anabolizantes. Dissertação de Mestrado. UFC – CE. Fortaleza. 2017.

Ferreira, U.M.G.; Ferreira, A.C.D.; Azevedo, A.M.P.; De Medeiros, R.L.; Da Silva, C.A.B.. Anabolic-Androgenic Steroids. Revista Brasileira em Promoção da Saúde. Vol 20. Num 4. 2007. p. 267, 2007.

Frade, R.E.; Viebig, R.F.; Moreira, I.C.L.S.; Fonseca, D.C. Avaliação do consumo de suplementos nutricionais por frequentadores de uma academia da cidade de São Paulo-SP. Revista Brasileira de Nutrição Esportiva. Vol 10. Num 55. 2016. p. 50-58.

Hartgens, F.; Rietjens, G.J.W.M.; Keizer, H.A., Wolffenbuttel, B.H. Effects of androgenic-anabolic steroids on apolipoproteins and lipoprotein (a). British journal of sports medicine. Vol 38. Num 3. 2004. p. 253-259.

Hernandez, A.J.; Nahas, R.M.. Diretriz da Sociedade Brasileira de Medicina do Esporte: Modificações dietéticas, reposição hídrica, suplementos alimentares e drogas: comprovação de ação ergogênica e potenciais riscos para a saúde. Revista Brasileira Medicina do Esporte. Vol 15. Num 2. 2009. p. 03-12.

Iriart, J.A.B.; Andrade, T.M. Musculação uso de esteróides anabolizantes e percepção de risco entre jovens fisiculturistas de um bairro popular de Salvador, Bahia, Brasil. Cadernos de saúde pública. Vol 18. 2002. p. 1379-1387.

Iriart, J.A.B.; Chaves, J.C.; Orleans, R.G. Culto ao corpo e uso de anabolizantes entre praticantes de musculação. Cadernos de Saúde Pública. Vol 25. 2009. p. 773-782.
Kamper A.L, Strandgaard, S. Long-Term Effects of High-Protein Diets on Renal Function. Annual Review of Nutrition. 2017; 37:1, 347-369.

Kim, H., Lee, S.; Choue, R. Metabolic responses to high protein diet in Korean elite bodybuilders with high-intensity resistance exercise. *J Int Soc Sports Nutr* 8, 10 (2011).
Lang, T; Streeper, T; Cawthon, P; Baldwin, K; Taaffe, D. R.; Harris, T. B. Sarcopenia: etiology, clinical consequences, intervention, and assessment. Osteoporosis international. Vol 21. Num. 4. 2010. p. 543-559.

Macedo, T.S.; De Sousa, A.L.; Fernandez, N.C. Suplementação e consumo alimentar em praticantes de musculação. Revista Brasileira de Nutrição Esportiva. Vol 11. Num 68. 2017. p. 974-985.

Maioli, H. N. Avaliação do consumo de suplementos por mulheres praticantes de atividade física em uma academia nas cidade de Taguatinga-DF. RBNE-Revista Brasileira de Nutrição Esportiva. Vol 6. Num 32. 2012. p. 118-125.

Ronis, M.J.J.; Pedersen, K.B.; Watt J. Adverse Effects of Nutraceuticals and Dietary Supplements. *Annu Rev Pharmacol Toxicol*. 2018;58:583-601. doi:10.1146/annurev-pharmtox-010617-052844.

Santos, J. A.; Sampaio, K. P. B. Os riscos do consumo de suplemento alimentar sem orientação do profissional nutricionista. Revista ENAF Science. Vol 9. Num. 1. 2014. p. 102-106.

Scoppel, P.; Kumpel, D.. Percepção nutricional de praticantes de musculação em uma academia. Revista Brasileira de Nutrição Esportiva. Vol 8. Num. 48. 2014. p. 385-391.

Soares, J.P.; Da Costa, A.C.P.; Costa,G.A.; De Carvalho, L.M.F.; Landim, L.A.S.R. Conhecimento nutricional e uso de suplementos alimentares por frequentadores de academias de uma capital do nordeste. Nutrição Brasil. Vol 18. Num 2. 2019. p. 95-101.

Suzic Lazic, J.; Dikic, N.; Radivojevic, N.; Mazic, S.; Radovanovic, D.; Mitrovic, N.; Lazic, M.; Zivanic, S; Suzic, S. Dietary suplementos e medicamentos no esporte de elite - polifarmácia ou necessidade real ?. Scandinavian Journal of Medicine & Science in Sports. 2011; 21: 260-267.

Tipton KD. Efficacy and consequences of very-high-protein diets for athletes and exercisers. *Proc Nutr Soc*. 2011; 70(2):205-214.

Tucker J, Fischer T, Upjohn L, Mazzera D, Kumar M. Unapproved Pharmaceutical Ingredients Included in Dietary Supplements Associated With US Food and Drug Administration Warnings. *JAMA Netw Open.* 2018; 1(6):e183337.

Vieira, D.M., Martins, N.G.P.; Tupinambá, Í.M.; Couceiro, K.N.; Silva, M.S., Horstmann, H., Maduro, I.P.N.N.Avaliação do consumo de suplementos alimentares ergorgênicos por praticantes de atividade física em academias de ginástica em Manaus, Amazonas. Amazonia Health Science Journal. Num 01. 2018. p. 29-38.