Nutritional profile and dietary intake of antioxidants of street runners

Perfil nutricional e consumo alimentar de antioxidantes de praticantes de corrida de rua

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Abstract

The regular practice of physical activity, associated with adequate nutrition, rich in antioxidant nutrients, provides protection to the body and reduces the risk of cell damage caused by excessive production of free radicals. The aim of this study was to evaluate the nutritional profile and dietary intake of antioxidants of street runners, members of a sports advisory group from the Federal District of Brasilia, Brazil. This is an analytical and descriptive cross-sectional study, carried out through a structured questionnaire and two adapted, contemplating the sociodemographic aspects, the knowledge about the importance and role of antioxidants in physical activity, and the frequency of dietary intake of antioxidants, along with anthropometric data extracted from the records of the participants from the company. The anthropometric profile showed that 80% of runners presented a Body Mass Index (BMI) above the normal range and 60% were outside the ideal body fat percentage. It was observed that 50% of the runners did not have enough information about the mechanisms of action of free radicals and antioxidants, and 95% presented a satisfactory level of knowledge concerning the importance of a healthy diet in the prevention of chronic diseases and premature aging. Among the antioxidants analyzed, a high intake of zinc and vitamin A and inadequate intake of selenium and flavonoids were observed. The results indicate an inadequate food intake of micronutrient antioxidants, and suggest the need for food education and individualized nutritional guidance aimed at the adoption of specific eating habits for the population studied.

Keywords: Running. Exercise. Free Radicals. Oxidative Stress. Antioxidants.

Resumo

A prática regular de atividade física, associada a uma nutrição adequada, rica em nutrientes antioxidantes, garante proteção ao organismo e reduz os riscos de danos celulares ocasionados pela produção excessiva de radicais livres. O objetivo deste estudo foi avaliar o perfil nutricional e o consumo alimentar de antioxidantes de praticantes de corrida de rua, integrantes de uma assessoria esportiva de Brasília, Distrito Federal. Trata-se de um estudo transversal analítico e descritivo, realizado por meio de um questionário estruturado e dois adaptados, contemplando os aspectos sociodemográficos, o conhecimento sobre a importância e o papel dos antioxidantes na atividade física, e a frequência do consumo alimentar de antioxidantes, além de dados antropométricos extraídos dos cadastros dos participantes junto à empresa. O perfil antropométrico demonstrou que 80% dos corredores apresentavam Índice de Massa Corporal (IMC) dentro da faixa de normalidade e 60% encontravam-se acima do percentual de gordura corporal ideal. Observou-se que 50% dos corredores não possuem informações suficientes sobre os mecanismos de ação dos radicais livres e dos antioxidantes na prática esportiva e 95% apresentam nível de conhecimento satisfatório quanto à importância de uma alimentação saudável na prevenção de doenças crônicas e do envelhecimento precoce. Dentre os antioxidantes analisados, destacaram-se o alto consumo de zinco e vitamina A e a ingestão inadequada de selênio e flavonoides. Os resultados indicam um consumo alimentar inadequado de micronutrientes antioxidantes e sugerem a necessidade de ações de educação alimentar e orientação nutricional individualizada, visando à adoção de práticas alimentares específicas para a população estudada.

Palavras-chave: Corrida. Exercício. Radicais Livres. Estresse Oxidativo. Antioxidantes.

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INTRODUCTION

Physical exercise is usually associated with the well-being of its practitioners[1]. However, in addition to increasing the production of free radicals, it contributes to the increase of the use of antioxidants which originate from the organism or directly supplied by their diet, in which deficiencies can cause oxidative stress[2].

Among the various sporting events, running is one of the modalities with the greatest number of fans, due to the ease in its practice, the beneficial effects to health, and the low cost[1]. The International Association of Athletics Federations (IAAF) defines street running as played on street circuits, avenues, and roads with official distances ranging from 5 to 100 km[3].

Practiced on public roads, long-distance races include 10 km, a half marathon (21.095 km) and a marathon (42.195 km). The trainings take place daily under the supervision of a qualified professional, and competitions are based on overcoming limits on achievement records and improving quality of life[4].

Although amateur athletes in general are not subject to a physiological stress as marked as professional athletes, they certainly require special attention to their diet, as there is also a concern with sports performance[5].

Nutritional behaviors are crucial in maintaining health, in increasing physical performance, and in controlling the body composition of athletes, regardless of the sport practiced6. Furthermore, a systematic assessment of dietary intake can help the orientation of the athletes on the most appropriate nutritional management[3].

Knowing the importance of healthy eating, Pessi & Fayh[7] claim that physical exercise requires nutritional monitoring and, thus, nutritional education becomes essential as it helps and creates sedentary for conditions and physically active choose healthy foods.

The purpose of this study was to evaluate the nutritional profile and food intake of antioxidant nutrients of street racers from a sports consultancy in Brasilia, Federal District of Brazil.

METHODS

This is an analytical and descriptive cross-sectional study carried out with a team of street runners from a sports consultancy in Brasilia-DF, in November 2014.

This study was approved by the Human Research Ethics Committee of the Paulista University - UNIP, Indianópolis Campus, according to Resolution 196/1996 of the National Health Council, CAAE: 05398612.4.0000.5423.

The team consisted of 40 runners effectively registered as members of the official sports calendar, of which 26 were randomly selected. However, the final sample consisted of 20 volunteers of both sexes, aged between 24 and 45 years (34.2 ± 6.21 years), considering 6 losses related to the exclusion criterion.

All the participants were accompanied by a physical educator, and presented themselves healthy and maintained in regular trainings (4 times/week, 2 hours/day). Athletes using drugs and/or nutritional supplements were excluded along with those in recovery regimes of physical conditioning due to injuries associated with sports practice.

The runners that met the inclusion criterion and agreed to participate in the study signed an Written Informed Consent Form (WICF) and were informed about the purpose of the research, as well as the form and conditions for their participation.

The data collection was done by interview by one of the previously trained researchers, using three questionnaires; one prepared by the authors of the study and two validated and adapted Fanhani & Ferreira (2006) questionnaires[8].

The questionnaires were applied at the location of and at the end of each training in order to investigate the following variables: sociodemographic and lifestyle aspects, sportsman's knowledge about the importance and role of antioxidant agents in an athlete's

nutrition and health, and consumption of foods rich in antioxidant nutrients.

For the anthropometric evaluation, the information of weight, height, and skinfolds were obtained from the records of the athletes filed in the sports advisory office. These measures, updated in October 2013, were measured by the physical educator on all street runners in the last week of the month.

The Body Mass Index (BMI) was calculated and ranked following the cutoff points established for adults by the World Health Organization (WHO, 2002)[9]. The body density was estimated by the predictive equation of the sum of three skinfolds (DC) proposed by Jackson and Pollock for men (1978)[10] and women (1980)[11]; the result of which was converted to percentage of body fat (%BF) according to the equation proposed by Siri (1961)[12].

Data were analyzed using *the software Statistical Package for Social Sciences* (SPSS) version 20.0. Anthropometric variables and body composition were represented by the central tendency measure (mean ± standard deviation). To compare the means of these variables, the Student t test was used and for interpreting the results, the error threshold adopted was 5%.

RESULTS

Of the 20 street runners, 13 (65%) were male and 7 (35%) were female, with a mean age of 36.0 ± 4.91 years and 30.8 ± 7.33 years, respectively.

Concerning the sociodemographic situation and lifestyle, 10 (50%) reported being single, 7 (35%) married, 2 (10%) divorced and 1 (5%) widowed. It was verified that all the runners had a college education, and that 2 (10%) were lawyers, 2 (10%) were journalists, 5 (25%) were government employees, 4 (20%) acted as Health professionals, and 7 (35%) performed administrative, accounting and secretarial functions in private companies. Regarding alcohol consumption and tobacco use, 11 (55%) declared themselves to be alcoholics and 4 (20%) were smokers.

When assessing the anthropometric characteristics, the mean height obtained was 1.77 ± 0.05m (men) and 1.69 ± 0.09m (women), values that make evident the statistically significant difference (p = 0.006) of the variable (75.4 ± 5.59 kg) and female (60.7 ± 8.65 kg). Both sexes had a mean BMI lower than 25 kg/m², and the mean values of %BF were 17.81 ± 5.12% and 22.71 ± 4.85% between men and women, respectively. However, in the individual assessments, 16 (80%) participants showed a BMI within the normal range (18.5 to 24.9 kg/m² - WHO, 2002)9 and 12 (60%) were above the ideal %BF, according to sex and age, as shown in table 1.

Regarding the level of information the runners had about the action of free radicals in disease promotion and early aging, figure 1 shows that 10 (50%) reported having little or no knowledge and 10 (50%) demonstrated satisfactory knowledge on the subject.

According to figure 2, when questioned about the importance of a healthy diet, including antioxidant foods, in the prevention of chronic diseases and of the early aging, as well as in the improvement of the quality of life and the sporting performance, only 1 (5%) of the participants declared "insufficient" knowledge, and "sufficient" knowledge prevailed among some of the other respondents (40%).

When it comes to the level of knowledge regarding the mechanisms of action of antioxidant foods in the prevention of chronic diseases and early aging in sports, figure 3 shows that half the population studied revealed satisfactory knowledge about the subject.

The analysis of the frequency of antioxidant-rich food consumption is presented in table two using five classifications. First, there was a high occurrence of the consumption of zinc (100%) and vitamin A (90%), and a low consumption of flavonoids, since 14 (70%) of those evaluated reported "rarely" consuming foods of this group. Magnesium and vitamin C were considered the most regularly consumed (40%) in relation to the other antioxidant agents. Beta-carotene and vitamin E were the most cited as being consumed "almost always", corresponding to 8 (40%) participants. On the

other hand, selenium, after flavonoids, was the most "rarely" consumed by the respondents (45%).

As for coenzyme Q-10, there was a predominance of regular consumption among the runners (35%).

Table 1 – Distribution of body fat percentage as proposed by Siri (1961). Brasilia, 2013.

Variable	Ideal %BF*		Total (n = 20)	
Age Group	Men (n=13)	Women (n=7)	<%BF	>%BF
24-30 years	14	19	1	5
31-40 years	16	20	5	6
>40 years	18	22	2	1

*Percentages expressed by sex and age. Jackson & Pollock protocol for men (1978) and women (1980).

Figure 1 – Knowledge about the effects of free radicals in the body. Brasilia, 2013.

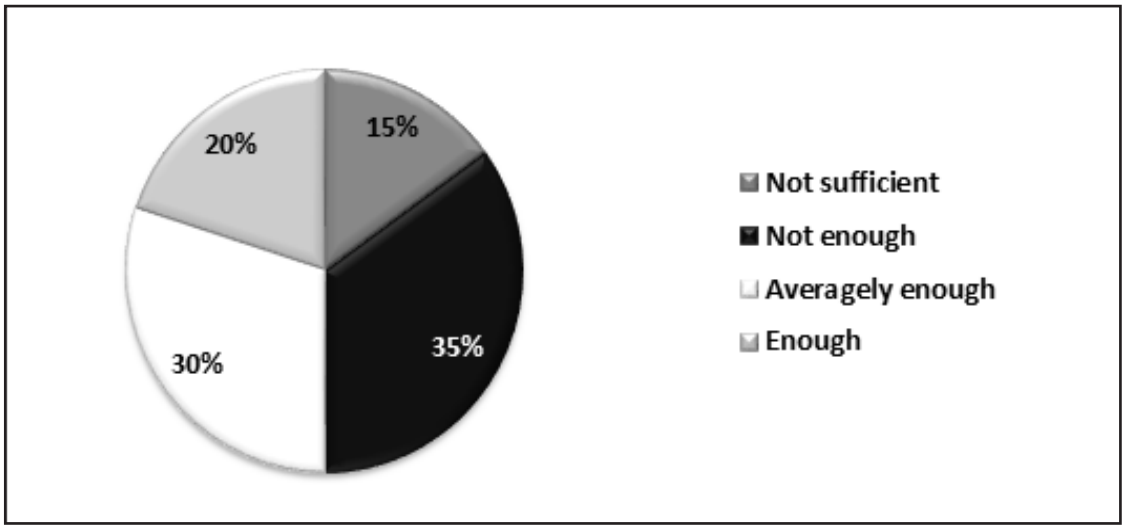

Figure 2 – Knowledge about healthy eating in disease prevention and early aging. Brasilia, 2013.

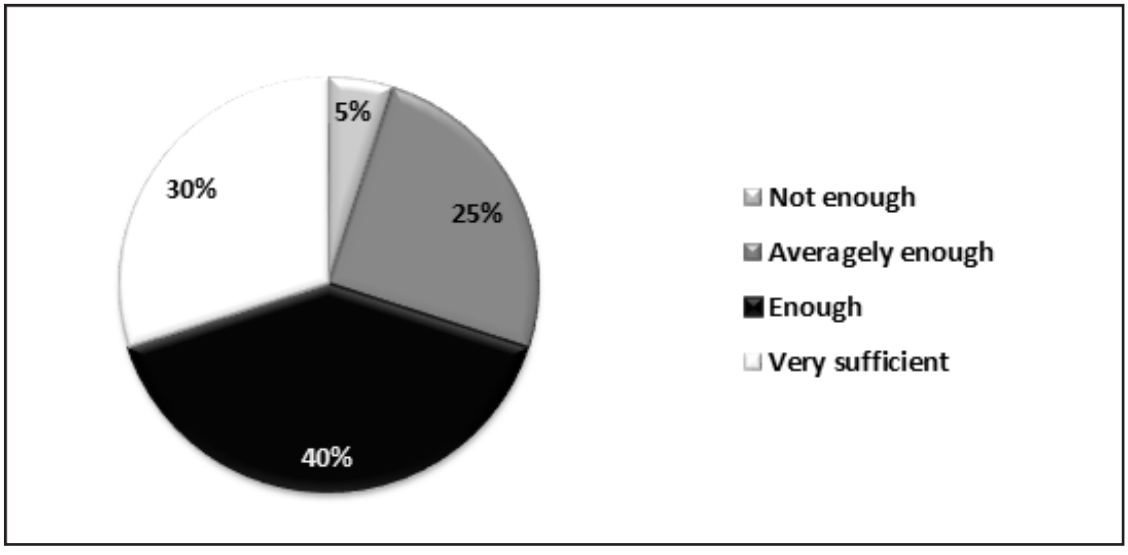

Figure 3 – Knowledge about the mechanisms of action of antioxidant foods. Brasilia, 2013.

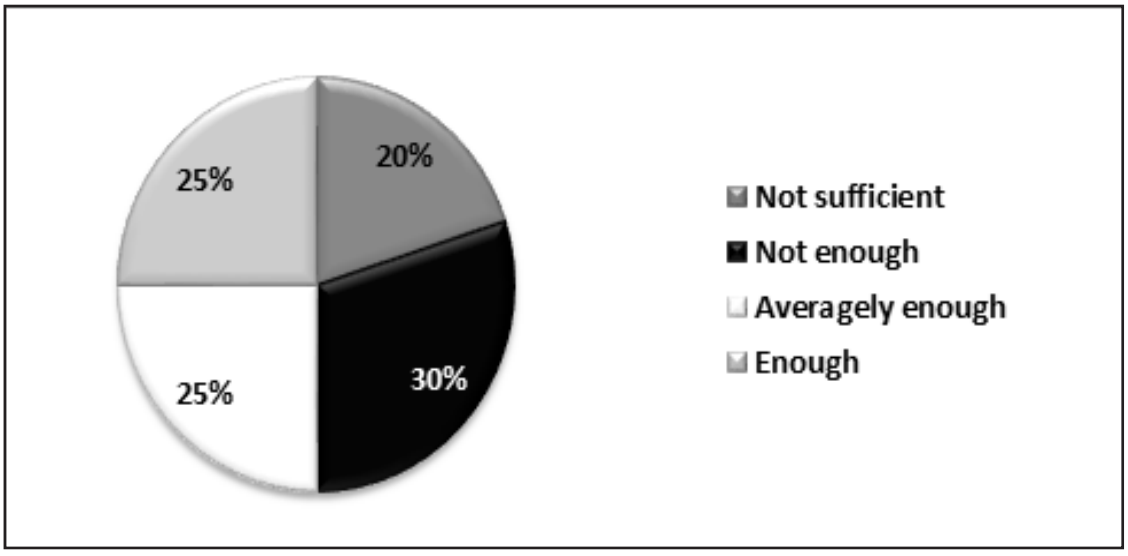

Table 2 – Consumption frequency of antioxidant micronutrients. Brasilia, 2013.

Antioxidants	Frequency of Consumption (n = 20)				
	Never	Rarely	Regularly	Often	Ever
Vitamin A	—	—	5	5	**90**
Vitamin C	—	5	**40**	20	35
Vitamin E	—	20	30	**40**	10
Betacarotene	—	5	30	**40**	25
Coenzyme Q-10	5	20	**35**	25	15
Flavonoids	10	**70**	15	—	5
Magnesium	5	35	**40**	15	5
Selenium	10	**45**	25	10	10
Zinc	—	—	—	—	**100**

Notes: Results expressed in percentage frequency. Prevalence of consumption represented by highlighted values.

DISCUSSION

In Brazil, popular participation in street races has increased significantly in the last years, but the street runners have not been the object of many studies. Scientific interest in the international literature has been limited to elite runners, but also to people with moderate training activity, called amateur runners[13].

Mendonça & Brito[14] analyzed the sociodemographic characteristics of Sergipe street runners and identified the prevalence of married (60.8%) males (72.2%) with a high school education (37.2%). Despite the similarity with the predominance of males, their marital status contrasts this study, in which the majority of the sample declared themselves single. The discrepancy in schooling is also noteworthy, considering that the findings of this study and Truccolo et al.[15] were categorical in pointing out the completion of higher education as more prevalent.

According to the World Health Organization (WHO, 2002)[9], the use of anthropometric variables to determine the nutritional profile provides important information and is a good predictor of health status. Body dimensions and composition are closely related to sports performance. Thus, the amounts of fat and muscle mass can impact more or less in different sports, especially in those that require body displacement, such as a race[16].

In a cross-sectional study conducted by Goston & Mendes3, which evaluated 19 recreational street racers, of both sexes, aged between 28 and 53 years, the average weight, height and BMI of men was higher than women, with a mean BMI of less than 25 kg/m², being classified as eutrophic, a finding corroborating this study, which also resulted in male means higher than female for the aforementioned parameters (mean BMI of 24.0 ± 1.20 kg/m² for men and 21.2 ± 2.52 kg/m² for women), although BMI is not the most adequate indicator for the evaluation of physically active individuals, since it does not consider body mass components.

The main model used in research to establish the relationship between body composition and athletic performance consists of two components, in which the body is divided into fat mass and fat-free mass[17]. The percentage of body fat (%BF) of male runners (17.81 ± 5.12%) was classified as above average in comparison with professional marathoners (12.0 ± 1.7%)[18].

Regarding %BF of runners in our study, the mean value of 22.71 ± 4.85% also ranks above average when compared to women who participate in a street racing group in the municipality of Campo Grande-MS (17.7 ± 5.1%)[19]. The practice of anaerobic exercise in the academy to which the studied population belongs and the friendly participation in competitions of the official sports calendar justify the average values of BMI and %BF being above the averages presented by previous studies, except for the study by Goston & Mendes[3], where in the average %BF were higher (18.95 ± 6.9% males, 23.8 ± 4.8% women) than those of our study.

Although the focus of the present study was not to evaluate the physical performance of the participants, it is important to emphasize the inversely proportional relationship between the time of practice for the race and the percentage of body fat, by the influence of the first greatness in the oxidation of the fat stores, observing and lower %BF means in elite runners.

The diversified and consistent food consumption increases protection against excessive free radical generation, because each food has different bioactive compounds with antioxidant properties. These compounds act on different metabolic pathways to prevent oxidative damage in various parts of its formation[20].

Pessi & Fayh[7], when assessing professional athletes athletics and triathlon through a nutritional knowledge scale, concluded that the level of information of the participants was satisfactory because nutritional knowledge is a topic of great interest to the population of the sports field, since such knowledge can enhance the athlete's performance.

Fanhani & Ferreira8 worked with 21 practitioners of different sports and of both sexes, to assess consumption levels of antioxidant foods and knowledge of their benefits in athletes. They observed that 55% of men and 61.5% of women did not have enough information on the mechanism of action of antioxidants in the body, as well as its effects on disease prevention and early aging.

In regard to the importance of adequate nutrition, both in the prevention of chronic diseases and in the early aging, as well as in the improvement of sports performance, 95% of the runners in this study had sufficient information. Regarding the mechanisms of action of free radicals and antioxidants, 50% demonstrated an insufficient level of knowledge about the subject.

Although this study did not establish a relationship between the participant's level of schooling and the knowledge about healthy eating, prevention of chronic diseases, and early aging in sports practice, high levels of knowledge about the subject can be justified by the predominance of upper level runners; especially those with training and performance in the health area.

Regarding the frequency of consumption of antioxidant foods, Fanhani & Ferreira[8] found that 70% of male athletes of indoor soccer and volleyball rarely ate selenium and flavonoids.

Among the handball athletes, 73% and 55% seldom consumed selenium and flavonoids, respectively. Similar results were observed in our study, in which most runners reported a low consumption of selenium and flavonoid foods (55% and 80%, respectively, considering the concepts "never" and "rarely" were available in the evaluation). This is like due to the fact that they are nutrients present predominantly in foods such as soybean and its byproducts, oilseeds, whole grains, and seafood, which are expensive and are not typical in the Federal District.

The scientific literature has shown that selenium may have effects on reducing chronic disease by minimizing pro-inflammatory activity and promote the antioxidant defense system[21]. Flavonoids facilitate the kidnapping of oxyradicals, being identified as important antioxidants to combat oxidative stress in individual athletes and even pathological states[22].

According to the Brazilian Society of Sports Medicine (SBME, 2009)[5], the intake of foods rich in vitamin C, assists in antioxidant capacity and improving the immune response due to the participation of this vitamin in catecholamine biosynthesis and cellular redox processes, as well as the body's defense against infections. In our study, the athletes reported regular intake of foods rich in vitamin C and "almost always" consumed sources of beta-carotene (vitamin A precursor), which differs from the results obtained by Fanhani & Ferreira8, which indicated an insufficient intake of vitamin C (45%) and beta-carotene (32%) in the evaluated population.

The use of vitamin E in intensive training also enhances cellular antioxidant activity by reacting with free radicals soluble in lipid membranes, inhibiting lipid peroxidation induced by physical exercise and reducing muscle damage[23].

Yi et al.[24] showed, in a study of Chinese cyclists, that the consumption of a food source a- tocopherol, the most common form of vitamin E present in nature, increased performance, time, distance, and endurance of these athletes.

Fanhani & Ferreira[8] observed in their study that 70% of indoor soccer and volleyball practitioners rarely consumed vitamin E food sources, which differs from the result of our study, in which only 20% of respondents reported rarely consume food sources of this nutrient. However, their results are similar to the research conducted by Molina-Lópes et al.[25], in which poor food intake of this vitamin was identified among Spanish handball athletes.

The food frequency questionnaire of this study revealed a high intake of zinc (100%) and vitamin A (90%), possibly because they are nutrients present in dairy products, are easily purchased, and are widely consumed by the local population.

There were also the regular consumption of sources of magnesium (65%) and satisfying amounts of Coenzyme Q-10 (75%), which diverge from the findings of Fanhani & Ferreira8 in which vitamin A and Coenzyme Q-10 were insufficiently consumed by their subjects (45% and 35%, respectively).

Here we emphasize the role of the nutritionist in the propagation of information and in the constant clarification about these foods. Their purpose is to ensure the synergistic benefits between physical activity and antioxidant food intake, especially for the improvement of performance, quality of life, and for the prevention of muscle injuries resulting from the excessive production of free radicals.

There were some limitations of this research. First, we highlight the use of anthropometric variables obtained from athletes' previous stored records, because of the inexperience of the researcher recruited to perform the physical evaluation in the studied population; the absence of complementary tools such as a 24-hour recall (R24h); and the absence of dietary records for detailed knowledge of the amounts of micronutrients ingested by the runners. This limited our ability to establish a relationship of these parameters with the antioxidant food frequency questionnaire to improve the characterization of the participants' consumption. Also, unfavorable climatic conditions at the training site, reduced the sample size of our study.

Considering the prevalence of injuries in physical exercise, especially among street runners, and the divergences on the determinants for their occurrence, we suggest that a national studies should be conducted to investigate the influence of the antioxidant

diet in the prevention or development of these diseases. This information could be useful in developing more effective strategies and nutritional interventions for the benefit of physical activity practitioners, especially those who participate in aerobic activities.

CONCLUSION

The results showed an adequate nutritional status, according to anthropometric indicators, for the group of evaluated runners, and a satisfactory amount of nutritional knowledge regarding the importance of a healthy diet in the prevention of chronic diseases and of the early aging in sports practice. On the other hand, regarding the deleterious effects of free radicals and mechanisms of action of antioxidants, it was observed that the athletes do not have enough information.

Participants also demonstrated an inadequate dietary pattern in relation to antioxidant nutrients, especially with regard to food sources of selenium and flavonoids. Therefore, there is an indisputable need to invest in food education and individualized nutritional orientation, aiming at changing the behavior of athletes to guarantee the introduction and maintenance antioxidant-rich food consumption, following the specific dietary recommendations for this population.

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