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FOOD CONSUMPTION AND NUTRITIONAL STATUS: CHARACTERIZATION OF PHYSICALLY ACTIVE WOMEN

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ABSTRACT

Few studies have characterized the food consumption and nutritional status of physically active women. The aim of this study was evaluating the food consumption and nutritional status of physically active women. Thirty women aged between 18 and 59 years, who trained at least three times a week, were evaluated. Weight, height, waist circumference (WC), and Body Mass Index (BMI) were checked. The percentage of body fat (%BF) was determined by the seven-skinfold protocol. Food consumption was assessed from the 72 food records collected on non-consecutive days. The records were analyzed using the DietPro 5i Program. The evaluated population had the following anthropometric characteristics: (Weight = 64.13 ± 10.16 kg, Height = 1.64 ± 0.06 m, BMI = 23.91 ± 3.04 kg/m^2, WC = 77.48 ± 9.36 cm, %BF = 25.35 ± 4.65); 33% were overweight and 30% had elevated WC. BMI showed a strong and positive correlation with% WC (r=0.70, p<0.001) and with WC (r = 0.84, p<0.001). The average daily consumption of energy and nutrients were: (Energy = 24.5 ± 7.0 Kcal/kg/day, Carbohydrates = 3.1 ± 1.1 g/kg/day, Proteins = 1.1 ± 0.3 g/kg/day, Lipids = 0.9 ± 0.4 g/kg/day, Fiber = 16.7 ± 6.2 g/day, Calcium = 556.2 ± 165.3 mg/day and Iron = 9.8 ± 2.1 mg/day). Most women consumed inadequate energy, carbohydrates, proteins, fiber, and iron. No woman achieved the recommended minimum calcium intake. It is concluded that an expressive portion has BMI, WC and% BF above the desirable values that are associated with healthy nutritional status. In addition, the significant percentage of inadequate consumption of energy, carbohydrates, proteins, fiber, calcium, and iron reveals the need for professional guidance.

Key words: Body Composition. Food Intake. Nutrition. Exercise.

RESUMO

Consumo alimentar e estado nutricional: caracterização de mulheres fisicamente ativas

Poucos estudos têm caracterizado o consumo alimentar e estado nutricional de mulheres fisicamente ativas. Mediante o exposto, o presente estudo teve como objetivo avaliar o consumo alimentar e estado nutricional de mulheres fisicamente ativas. Foram avaliadas 30 mulheres com idade entre 18 e 59 anos, que treinavam pelo menos três vezes por semana. Foram verificados o peso, altura, circunferência da cintura (CC) e o Índice de Massa Corporal (IMC). O percentual de gordura corporal (%GC) foi determinado pelo protocolo de sete dobras cutâneas. O consumo alimentar foi avaliado a partir do registro alimentar de 72 horas coletado em dias não consecutivos. Os registros foram analisados utilizando o Programa DietPro 5i. A população avaliada apresentou as seguintes características antropométricas: (Peso = 64,13 ± 10,16 kg, Altura = 1,64 ± 0,06 m, IMC = 23,91 ± 3,04 kg/m^2, CC = 77,48 ± 9,36 cm, %GC = 25,35 ± 4,65); 33% estavam com sobrepeso e 30% tinham a CC elevada. O IMC apresentou correlação forte e positiva com o %GC (r = 0,70, p<0,001) e com a CC (r = 0,84, p<0,001). O consumo diário médio de energia e nutrientes foram: (Energia = 24,5 ± 7,0 Kcal/kg/dia, Carboidratos = 3,1 ± 1,1 g/kg/dia, Proteínas = 1,1 ± 0,3 g/kg/dia, Lipídios = 0,9 ± 0,4 g/kg/dia, Fibras = 16,7 ± 6,2 g/dia, Cálcio = 556,2 ± 165,3 mg/dia e Ferro = 9,8 ± 2,1 mg/dia). A maioria das mulheres faziam consumo inadequado de energia, carboidratos, proteínas, fibras alimentares e ferro. Nenhuma mulher alcançou a ingestão mínima recomendada de cálcio. Conclui-se que parcela expressiva possui IMC, CC e %GC acima dos valores desejáveis que são associados ao estado nutricional saudável. Além disso, os expressivos percentuais de inadequação de consumo de energia, carboidratos, proteínas, fibras alimentares, cálcio e ferro revelam a necessidade de orientação profissional.

Palavras-chave: Composição Corporal. Ingestão Alimentar. Nutrição. Exercício.

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INTRODUCTION

The consumption of a healthy diet with physical exercise helps to decrease adiposity and body mass index (BMI), improve biochemical parameters like blood glucose and lipid profile, and reduce the risk of several nontransmissible chronic diseases (Mok and collaborators, 2019).

Thus, physical activity is essential for body composition modification, as a physical activity provides lean mass gain and fat mass reduction (Mialich and collaborators, 2018).

Food consumption standards in Brazil follow the global trend and have undergone intense and rapid changes in the last four decades.

During this period, there was not only a decrease in the participation of traditional foods in the diet, such as cereals, legumes, and vegetables but also a significant increase in the consumption of preparations with high concentrations of sugar, sodium, and saturated fat (Monteiro and collaborators, 2011).

In general, the quality of women's diets tends to be better than that of men. The better quality of women's diets is associated with several factors, including higher consumption of fruits, vegetables, and milk and dairy products.

Women are also more concerned about their health and nutritional status. In addition, women invest more in health services and exchange health-related experiences with other women, and have good knowledge about nutrition (Assumpção and collaborators, 2017; Almeida, Siqueira, Piatino, 2019).

Despite this, the prevalence of obesity in Brazil is higher among women (20.7%) compared to men (18.7%). On the other hand, the prevalence of overweight is lower among women (53.9%) compared to men (57.8%) (Ministério da Saúde, 2019).

In the context of physical activity, it is important to evaluate food intake and when errors are detected, it is necessary to implement nutritional intervention strategies, such as: increasing the number of daily meals, improving adherence to the consumption of good quality carbohydrates, because the low intake of this nutrient favors the decrease in physical performance, encourage the consumption of protein sources with lower saturated fat content and increase water intake. Measures such as these provide better adaptation to the nutritional needs of an individual who practices physical exercises (Nascimento and collaborators, 2016).

For individuals who practice physical exercises without major concerns about performance, a balanced diet that meets the recommendations given to the population, in general, is sufficient to maintain health and enable good physical performance (SBME, 2009).

However, nutritional guidelines and the prescription of a diet plan by a nutritionist favor obtaining the desired results safely and in the shortest time possible, preserving the subject's health (Morais and collaborators, 2018).

In the social dimension, the nutritional status is the product or biological manifestation of the set of processes that operate on the social body, it is the organic synthesis of the relations between men-nature-food, which are established within a given society. From the biological point of view, the nutritional status is the product of the relationship between consumption and nutritional needs (Vasconcelos, 2007).

The adequate nutritional status of athletes and practitioners of physical activity is essential for good performance and the achievement of satisfactory results.

Studies on the nutritional profile of women who practice physical activity are still scarce in the area of Sports Nutrition. Therefore, this study aimed to evaluate the food intake and nutritional status of physically active women from a city in southern Minas Gerais.

MATERIALS AND METHODS

A descriptive cross-sectional study was carried out, in which the food intake and nutritional status of physically active women were evaluated.

The sample selection was non-probabilistic, by convenience. We evaluated 30 women, aged between 18 and 59 years, who performed three weight-training sessions per week. Some of them also did two Pilates training sessions.

This research was approved by the Research Ethics Committee of the Universidade Federal de Lavras (protocol 34334714.2.0000.5148). Participation in the research was conditional on the signature of the Informed Consent Form (ICF).

To determine body mass, the volunteers were weighed without shoes, wearing light clothes and barefoot, using a

Tanita BC-553/Ironman portable, digital, electronic scale with 0.1kg accuracy. Height was determined using a portable Alturexata® stadiometer, accurate to 0.1 mm. The individual stood barefoot with heels together, feet at a 45° angle, back straight so that the occiput, back, buttocks, and heels touched the anthropometer, arms extended at the side of the body, and head facing forward in the Frankfurt plane.

The classification of nutritional status was performed by adopting the cut-off points proposed by the World Health Organization (2000): BMI < 18.5 Kg/m^2 (Low weight); BMI between 18.5 and 24.9 Kg/m^2 (Eutrophic); BMI between 25 and 29.9 Kg/m^2 (Overweight); and BMI ≥ 30.0 Kg/m^2 (Obese).

To determine waist circumference (WC) an inelastic tape measure was used, positioning it at the midpoint between the last rib and the top of the iliac crest. The hip circumference was measured at the site of greatest prominence of the gluteal region. WC was classified according to the cutoff points proposed by WHO (2000): <80 cm (appropriate), ≥80 cm (increased risk for metabolic complications), and ≥88 cm (very increased risk for metabolic complications).

To determine body composition, skinfolds were measured (triceps, subscapular, mid-axillary, pectoral, abdominal, iliac crest, and mid-thigh) with a Cescorf® scientific adipometer with a constant pressure of 10g/mm and precision of 0.2mm. All measurements were performed on the right side of the body 3 times in a circuit. Body density (BD) was calculated using the Jackson, Pollock and Ward (1980) formula for adult women, and the body fat percentage (%BF) was estimated using the equation proposed by Siri (1961).

Body fat percentage classification was based on the cut-off points proposed by Lohman (1992): below average (≤22%), average (23%), above average (24 to 31%), and high (≥32%).

The food consumption was determined from the collection of three 24-hour food records on non-consecutive days. The participants were instructed to write down, right after the meal, all food and beverages consumed, describing the preparation method, product brand, and amount consumed in-home measures. The food records were analyzed using the DietPro 5i® program. In this program, the foods described in the records were converted into energy and nutrients. From the three food records, the average energy and nutrient intakes of each individual were determined.

The adequacy of macronutrient intake was calculated based on the recommendations of the International Society for Sports Nutrition (Kerksick and collaborators, 2018) which advocate the following recommendations for subjects engaged in fitness programs (30-40 min) of exercise three times per week): energy (25-35 Kcal/day), carbohydrates (3-5g/day), protein (1.2-2.0 g/kg/day), fats (0.5-1.5 g/kg/day). The adequacy of intake of iron, calcium, and dietary fiber was calculated considering the recommendations of the Institute of Medicine (2002, 2005, 2011). Intake between the Recommended Dietary Allowance (RDA) or Adequate Intake (AI) values and Tolerable Upper Intake Level (UL) as proposed by the American College of Sports Medicine (Thomas, Erdman, Burke, 2016) was considered adequate.

The data were analyzed by the software Statistical Package for the Social Sciences®, version 20.0. Descriptive statistics were performed for all study variables, which were presented as an arithmetic mean and standard deviation or percentage frequency. The correlation between anthropometric variables was determined by Pearson's correlation test at a 5% significance level. It was considered strong positive correlation value between 0.7 to 1, moderate 0.3 to 0.7 and weak 0 to 0.3, and negative correlation strong values between - 0.7 to - 1, moderate - 0.3 to - 0.7 and weak 0 to - 0.3 (Feijoo, 2010).

RESULTS

Thirty women participated in the study with a mean age of 31.5 ± 11.64 years (min=18 years and max=59 years).

Table 1 shows the anthropometric characteristics of the evaluated population.

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Table 1 - Anthropometric characteristics of physically active women.

Anthropometric variables	Mean	Standard deviation
Weight (Kg)	64.13	10.16
Height (m)	1.64	0.06
BMI (Kg/m^2)	23.91	3.04
WC (cm)	77.48	9.36
%BF	25.35	4.65

Although the average BMI of the evaluated population was within the appropriate range, it was observed that 33.4% had BMI between 25 and 30 is classified as overweight (Figure 1). The BMI showed a strong positive correlation with the %BF (r=0.70, p<0.001) and with the WC (r=0.84, p<0.001).

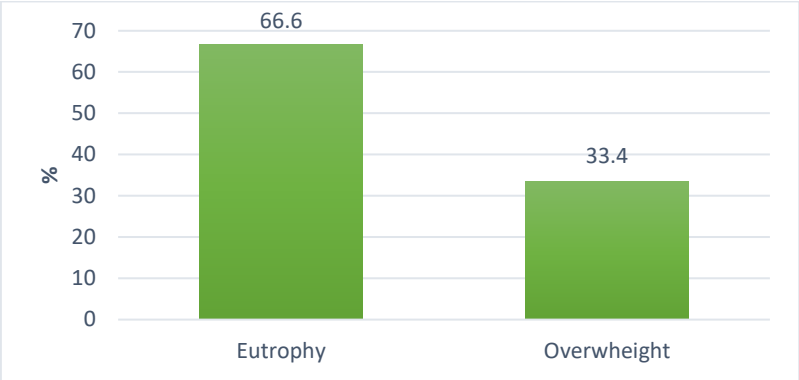

Figure 1 - Nutritional status of physically active women.

Although the mean WC value was within the appropriate range, 30% of the participants were at high risk for complications associated with obesity. WC was positively correlated with %BF (r=0.87, p<0.001). Most participants (56.7%) had their body fat percentage classified as above average (≥24%). of these, 10% had a high %BF (≥32%).

The average daily energy and nutrient intake are presented in Table 2.

The average daily energy and protein intake per kilogram of body weight were below the minimum recommended by the International Society for Sports Nutrition (ISSN) (Kerksick and collaborators, 2018).

However, carbohydrate and lipid intake per kilogram of body weight was within the range recommended by ISSN (Kerksick and collaborators, 2018). The average daily intake of dietary fiber, iron, and calcium was below the Institute of Medicine recommended values.

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Table 2 - Average daily energy and nutrient intakes of physically active women.

Energy and Nutrients	Mean	Standard deviation
Energy (Kcal)	1518.1	295.3
Energy (kcal/kg)	24.5	7.0
Carbohydrate (%)	50.3	8.3
Carbohydrate (g)	190.1	44.7
Carbohydrate (g/kg)	3.1	1.7
Lipid (%)	32.1	7.7
Lipid (g)	54.9	21.0
Lipid (g/Kg)	0.9	0.4
Protein (g)	65.9	15.0
Protein (%)	17.6	3.7
Protein (g/Kg)	1.1	0.3
Fiber (g)	16.7	6.2
Calcium (mg)	556.2	165.3
Iron (mg)	9.8	2.2

Figure 2 shows the assessment of the adequacy of energy and nutrient intake according to the recommendations of ISSN (Kerksick and collaborators, 2018) and the Institute of Medicine (2002, 2005, 2011).

Only 6.7% of women had inadequate lipid intake. However, most were doing inadequate intake of energy, carbohydrates, and protein. Of these, only 3.3%, 6.7%, and 0% had consumption above the maximum recommended consumption of energy, carbohydrates, and proteins, respectively.

A high percentage of women had inadequate intakes of dietary fiber and iron. No women reached the minimum recommended intake of calcium.

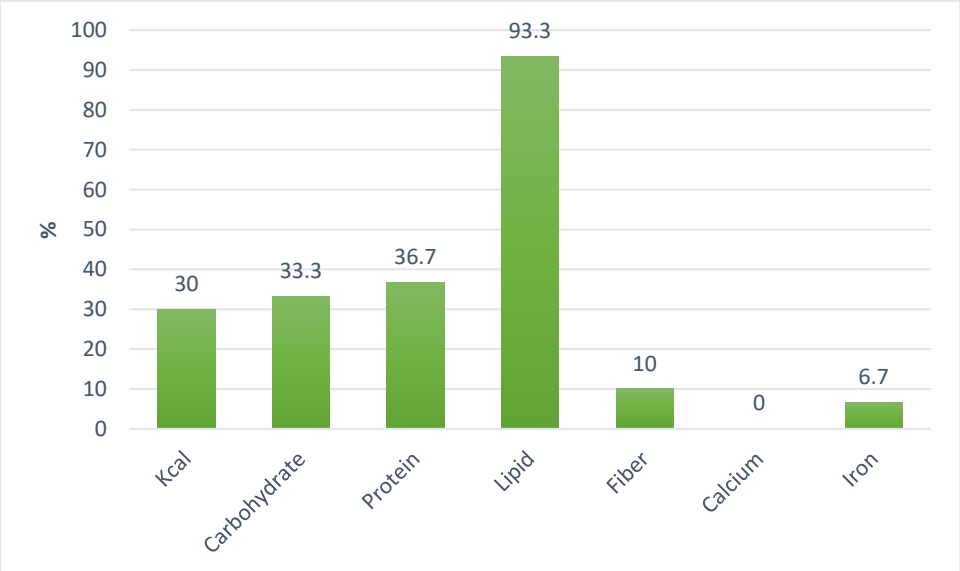

Figure 2 - Percent frequency of adequate energy and nutrient intake of physically active women.

DISCUSSION

The present study characterized the food intake and nutritional status of physically active women.

The most relevant results show that most of them have %BF above average and about one-third were overweight and had high WC. In addition, most of the evaluated women consume low energy, carbohydrate, protein, dietary fiber, iron, and calcium.

In the present study, although the BMI is within the eutrophic range, 33.4% of women were overweight.

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This percentage is lower than the Brazilian female population (53.9%) (Ministério da Saúde, 2019).

However, it is important to note that the use of BMI as a way to assess nutritional status is limiting due to the failure to distinguish between fat mass, fat-free mass, and bone mass. This omission of distinction between body tissues impairs the diagnosis of nutritional status, mainly by suppressing overweight in certain situations (Mialich and collaborators, 2018).

Similar results were observed by Gasparotto and collaborators (2009) who found in physically active women with a mean age of 32.4 years and a mean BMI of 24 kg/m^2. As well as in another study conducted with 77 women with a mean age of 29.83 ± 9.75 years, weight training practitioners, in which was found a mean BMI equal to 21.32 kg/m^2. However, 33% of the evaluated population presented BMI above 25 kg/m^2 (Sousa, 2012). Lima and collaborators (2019) observed a mean BMI in active adult women (31.77 ± 6.62 years) equal to 23.18 ± 2.69 Kg/m^2.

Mean WC was also within the appropriate range, however, 30% of the women were at increased risk for metabolic complications. Other studies also found mean WC within the appropriate range (Silva and collaborators, 2017, Silva and collaborators, 2018). In the present study, a strong positive correlation was observed between WC and %BF ($r=0.87$, $p<0.001$).

Regarding body composition, it was observed in the present study an average percentage of 25.35%, a result similar to that found by Costa, Guiselini, Fisberg (2007), who evaluated 436 women, aged 20 to 49.9 years, gym-goers, and found an average %BF of 26.44%.

Although BMI is not able to distinguish fat mass from lean mass, this index has been recommended by the World Health Organization for the diagnosis of overweight and obesity. In the present study, even in a group of physically active women, a strong positive correlation was observed between BMI and %BF ($r=0.70$, $p<0.001$). BMI also correlated positively with WC ($r=0.84$, $p<0.001$).

Women, in general, are oppressed by society and the media to have a beautiful body that has been stigmatized as a thin body with developed muscles (Silva and collaborators, 2018).

In this context, bodybuilding has been a type of physical activity quite sought after to adjust body shape, because its practice favors the increase of lean mass and reduction of body fat (Vieira, Biesek, 2015).

In the present study, most women showed energy intake (66.7%), carbohydrate (60%), and protein (63.3%) below the minimum recommended by the ISSN (Kerksick and collaborators, 2018).

Low energy intake entails a reduction in the volume of food ingested which contributes to reducing the amount of all nutrients. In the present study, only lipids had adequate consumption by most women.

However, to determine whether the individual energy intake is adequate, it is necessary to quantify the daily energy expenditure and the subject's goal, since the energy intake range recommended by the ISSN (Kerksick and collaborators, 2018) is sufficient to meet the subject's daily needs. Such information was not collected in the present study.

Thus, if the subject is engaged in a training program and diet planning to lose weight, then his or her appropriate diet will be hypoenergetic. If the subject is aiming to gain muscle mass, he or she should be on a hyperenergetic diet (Iraki and collaborators, 2019).

It should be noted that the food intake assessment tool used may underestimate the values of energy and nutrient intake (Lima, Lima, Braggion, 2015). Another point to be considered is the choice of recommendations that will be used to determine the percentage of adequacy.

Since there is no consensus on the values of recommendations proposed by various entities, part of the differences observed between studies may be attributed to the choice of different recommendation ranges.

For example, in the study conducted by Nascimento and collaborators (2016), it was shown that women athletes presented a percentage of the inadequacy of 66.7%, 45.5%, 12.0%, and 21.2%, for energy, carbohydrate, protein, and lipids, respectively.

However, the authors evaluated women athletes from several sports modalities, used a single 24h recall to quantify food intake, and chose some recommendations different from those used in the present study, except for proteins and micronutrients.

When not planned, low energy intake may be accompanied by insufficient intake of carbohydrates and proteins, which together may lead to decreased muscle mass, cause menstrual dysfunction, loss or damage to the maintenance of bone density, increase the risk of fatigue, injuries, pathological processes, providing long periods of recovery and suspension of physical activity (Tarnopolsky, 2004; SBME, 2009, ADA, 2009).

In the present study, only 10% of the women had an average consumption of dietary fiber above the Institute of Medicine (25g/day). This fact has been observed in other studies and may be related to the low consumption of vegetables, and fruits (Sehnem, Soares, 2015; Silva-Júnior and collaborators, 2017). foods rich in this nutrient such as whole grains,

In addition, low consumption of dietary fiber favors the occurrence of intestinal dysbiosis with impaired immune function and increased risk of infections that compromise training capacity (Moraes and collaborators, 2014).

The consumption of the minerals iron and calcium was low. Women, due to menstrual loss, are exposed to the highest risk of iron deficiency (Thomas, Erdman, Burke, 2016). In the present study, only two women (6.7%) who were older than 50 years reached the minimum recommended iron intake.

In the case of women over 50 years of age, the recommendation is lower (8 mg/day) and therefore easier to achieve. Insufficient iron intake can lead to anemia, and impair energy transport and production, which compromises the ability to perform work (Kerksick and collaborators, 2018). Other studies have shown greater difficulty for women in achieving adequate iron intake (Damiliano, 2006; Sehnem, Soares, 2015).

Regarding calcium intake, none reached the recommended minimum. Adequate calcium intake is important for muscle contraction and bone mineralization and its deficiency increases the risk of fractures (Bueno, Czepielewski, 2008).

The high frequency of inadequate calcium intake among athletes, especially females, has been reported in other studies (Bernardes, Della Lucia, Faria, 2016; Silva-Júnior and collaborators, 2017).

It is noteworthy that the application of instruments that assess the nutritional knowledge of physically active women is essential to obtain positive results when practicing physical activity, however, there are still few studies that use validated questionnaires for this purpose, which reinforces the development of studies that assess nutritional knowledge through validated questionnaires and that these can be compared with the socio-demographic variables and nutritional status for the expansion of knowledge in this population (Almeida, Siqueira, Piantino, 2017).

Importantly, this study has a limitation regarding the method of food intake assessment used, because, although the food record is a widely used method in several national and international studies, it still does not reflect the usual diet of the individual.

CONCLUSION

It is concluded that the mean BMI and WC values of the volunteers in this study are within the recommendations, but a significant portion has BMI, WC, and %BF above the desirable values that are associated with a healthy nutritional status.

Moreover, the evaluation of food intake revealed significant percentages of inadequate intake of energy, carbohydrates, protein, dietary fiber, calcium, and iron.

Thus, the need for nutritional support in gyms is emphasized, considering that important nutritional inadequacies occurred, which can negatively impact health and physical performance.

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