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ASSESSMENT OF DIETARY INTAKE AND SUPPLEMENT USE IN FEMALE WEIGHT TRAINING PRACTITIONERS: EVIDENCE OF INSUFFICIENT ENERGY AND FIBER INTAKE

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ABSTRACT

Strength training has become increasingly popular among women due to its beneficial effects on muscle development, esthetics, and overall health. However, limited information is available on dietary intake and supplement use among female weight training practitioners. This study aimed to evaluate the nutritional intake, supplement use, and body composition of female weight training practitioners. This cross-sectional study included 58 female weight training practitioners aged 18-60 years. Dietary intake was assessed using three-day food records, including two training days and one non-training day. Nutritional analysis was conducted using Web Diet software version 3.0, and energy, macronutrient, and fiber intake were recorded. Supplement use was also documented. The average intake of proteins, carbohydrates, and lipids met the recommended guidelines; however, energy and fiber intake were below the recommended levels. Protein consumption was significantly higher among post-workout meals ($p<0.001$). A significant proportion of the participants (66.6%) used supplements, with whey protein (65.8%) and creatine (50%) being the most common. The results indicated that although the intake of proteins, carbohydrates, and lipids met the recommended guidelines, energy and fiber intake was insufficient. High protein consumption during post-workout meals highlights the importance of protein intake for female weight training practitioners.

Key words: Dietary intake. Body composition. Women. Whey protein. Creatine.

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RESUMO

Avaliação da ingestão alimentar e do uso de suplementos em praticantes de musculação do sexo feminino: evidências de ingestão insuficiente de energia e fibras

O treinamento de força tem se tornado cada vez mais popular entre as mulheres devido aos seus benefícios para o desenvolvimento muscular, estética e saúde geral. No entanto, há pesquisas limitadas sobre a ingestão alimentar e o uso de suplementos entre praticantes de musculação do sexo feminino. Este estudo teve como objetivo avaliar a ingestão nutricional, o uso de suplementos e a composição corporal de praticantes de musculação do sexo feminino. Este estudo transversal incluiu 58 praticantes de musculação do sexo feminino com idades entre 18 e 60 anos. A ingestão alimentar foi avaliada por meio de registros alimentares de três dias, incluindo dois dias de treino e um dia sem treino. A análise nutricional foi realizada utilizando o software Web Diet versão 3.0, e a ingestão de energia, macronutrientes e fibras foi registrada. O uso de suplementos também foi documentado. A ingestão média de proteínas, carboidratos e lipídios atendeu às diretrizes recomendadas; no entanto, a ingestão de energia e fibras estava abaixo dos níveis recomendados. O consumo de proteínas foi significativamente maior nas refeições pós-treino ($p<0,001$). Uma parte significativa das participantes (66,6%) usou suplementos, sendo a proteína do soro de leite (65,8%) e a creatina (50%) os mais comuns. Os resultados indicam que, embora a ingestão de proteínas, carboidratos e lipídios tenha atendido às diretrizes recomendadas, a ingestão de energia e fibras foi insuficiente. O alto consumo de proteínas na refeição pós-treino ressalta a importância dada a este nutriente pelas mulheres praticantes de musculação.

Palavras-chave: Consumo alimentar. Composição corporal. Mulheres. Whey protein. Creatina.

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INTRODUCTION

Strength training has gained increasing popularity in recent years, driven by the dissemination of its associated benefits, esthetic appeal, and the pursuit of bodily satisfaction (Almeida et al., 2020).

Historically, weightlifting was socially contraindicated for women because of its association with "androgenization", but this perspective has been changing (Leśniewicz et al., 2021).

Several studies have demonstrated the positive impacts of regular physical activity among women (Obi et al., 2022).

The synergy of a proper diet and resistance training offers various benefits, including improved body composition and biochemical parameters such as lipid and glycemic profiles, as well as prevention and assistance in the treatment of non-communicable chronic conditions (Schoenfeld et al., 2014; Westcott, 2012; Garber et al., 2011).

Additionally, resistance exercises increase bone mineralization, mitigating fracture and osteoporosis risks, which is particularly relevant for menopausal women, as well as increasing caloric expenditure and promoting muscle toning (Daly et al., 2019; Farr, Khosla, 2019; Watson et al., 2018).

Strength training induces stimuli necessitating an adequate supply of energy and nutrients (Iraki et al., 2019).

Carbohydrate intake should be adjusted according to the type of training and session duration and protein consumption should consider the quantity, quality, and distribution of proteins throughout the day (Thomas et al., 2016).

However, the level of nutritional knowledge among weightlifting practitioners is often low, resulting in inadequate eating habits. These inadequacies frequently manifest as insufficient carbohydrate intake and high consumption of atherogenic nutrients, such as saturated fatty acids, cholesterol, and animal protein (Bronkowska, 2007).

The prevalence of dietary supplement use among weightlifting practitioners is notable, often driven by the belief that supplements facilitate the achievement of na ideal physique.

Aggressive marketing by the supplement industry contributes to this increase, with many consumers using supplements without proper professional guidance (Sganzerla, Reis, 2021).

Among the most popular supplements is whey protein, due to the belief that excess protein promotes muscle mass gain (Sperandio et al., 2017).

Therefore, nutritional guidance is essential for this group. Accurate nutritional recommendations should consider eating habits, lifestyle, culture, and the increased energy needs due to exercise, helping to achieve the desired goals (Kreider et al., 2017).

Despite the growing body of research on strength training, there is a notable shortage of studies that exclusively assess women, particularly in the context of dietary and supplement consumption. This gap in the literature underscores the need for focused investigations.

Therefore, this study aimed to evaluate the dietary intake of macronutrients in daily meals, especially in pre- and post-workout meals, as well as the use of sports supplements and the body composition of women who practice weightlifting.

MATERIALS AND METHODS

This cross-sectional study aimed to assess the dietary intake and body composition of female weight training practitioners.

The sample comprised women aged between 18 and 60 years who were regular weight training practitioners. Recruitment was conducted via social media announcements and direct invitations from the research team.

The inclusion criteria were: age between 18 and 60 years and a minimum of three months of weight training experience. Participants who did not complete the three required dietary records were excluded from the study.

After agreeing to participate, the volunteers signed the Informed Consent Form (ICF), which ensured their informed consent. They were informed of their right to withdraw from the study at any time without penalty. The study received approval from the Human Research Ethics Committee of the Federal University of Lavras (code number: 20221419.7.0000.5148).

Data collection began with the anthropometric assessment of the participants, using a digital scale, stadiometer (Sanny), clinical skinfold caliper (Avanutri, sensitivity: 1 mm; measurement range: 80 mm; spring

pressure: 10 g/mm^2), and a non-extensible measuring tape. The collected data included weight, height, triceps skinfold (TSF), abdominal skinfold (ASF), suprailiac skinfold (SISF), and thigh skinfold (TSF). The body fat percentage was calculated using the Jackson, Pollock (1978) four-site skinfold protocol, supplemented by Siri's (1961) equation.

During the assessment, personal data such as name, age, duration of weight training practice, and use of sports supplements were also collected. Then, the participants were given three dietary record sheets, after a detailed explanation on how to fill them out. Dietary records were completed on two training days and one weekend day when the participant did not train. After completion, the sheets were returned to the researchers for nutritional analysis.

For the analysis of the dietary data, the foods were entered into Web Diet software version 3.0. The average daily caloric value, macronutrient level, and fiber content were subsequently recorded in an Excel spreadsheet. It was possible to identify the calories, macronutrients, and fiber present in each meal, with special attention given to pre- and post-workout meals.

Energy intake adequacy was calculated using the values recommended by the Brazilian Society of Sports Medicine (SBME, 2009), which advocates an energy intake of 30-50 kcal/kg/day. Carbohydrate intake adequacy was assessed based on the recommendations of Iraki et al. (2019), which recommended an intake of 3-5 g/kg body weight per day. For lipids and proteins, the guidelines of the American College of Sports Medicine (ACSM) were used (Thomas et al., 2016), which recommend a lipid intake of 20%-35% of the total energy intake and protein intake between 1.2 and 2.0 g/kg body weight per day. Fiber intake was considered adequate if it was greater than or equal to 25 g/day Institute of Medicine (IOM, 2005). Energy and nutrient intake falling below or exceeding recommended ranges were deemed inadequate.

The results of the anthropometric characterization and the average energy and macronutrient intake were presented as mean and standard deviation.

Data on supplement use and the objectives of weight training practice were presented as percentages. To compare pre- and post-workout energy and macronutrient intake, the Shapiro-Wilk test was conducted to verify normality, and the Mann-Whitney test was used to compare the means. The results were expressed as median and interquartile ranges of 25% and 75%.

RESULTS

The present study evaluated the dietary intake and anthropometric variables of 58 female weight training practitioners aged 18 to 60 years.

The anthropometric characteristics are presented in Table 1.

Table 1 - Anthropometric characterization of the population.

Anthropometric variables	Mean	Standard deviation	Minimum	Maximum
Weight (Kg)	61.2	9.4	44.8	90.8
Height (m)	1.60	0.1	1.50	1.78
Body Mass Index (kg/m^2)	23.4	3.6	18.2	33.7
Body Fat (%)	23.7	4.5	13.9	34.5

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Table 2 - Average energy and macronutrient intake of female weight training practitioners.

Nutrients and energy	Mean	SD	Minimum	Maximum	Recommendations
Energy (kcal)	1664.9	391.5	863.7	2388.7	-
Energy (kcal/kg)	28.1	7.6	10.9	45.4	30-50 kcal/kg/day*
Carbohydrate (g/kg)	3.3	1	1.6	5.4	3-5 g/kg/day**
Carbohydrate (%)	47.2	6.1	27.8	58.7	-
Protein (g/kg)	1.6	0.5	0.8	2.6	1,2-2,0 g/kg/day***
Protein (%)	23.5	5.5	14.64	36.30	-
Lipids (g/kg)	1.0	0.4	0.31	1.85	-
Lipids (%)	30.6	6.4	17.08	46.29	20-35% TCV***
Dietary fiber	17.6	8.2	3.37	51.23	25 g****

Note: SD = Standard deviation; TCV = Total Caloric Value; *Sociedade Brasileira de Medicina no Esporte, 2009; **Iraki et al., 2019; *** American College of Sports Medicine, 2016; **** Institute of Medicine, 2005.

The energy and macronutrient intake are shown in Table 2. Although the average intake of proteins, carbohydrates, and lipids adhered to the recommendations proposed by the American College of Sports Medicine (Thomas et al., 2016) and by Iraki et al.. (2019), it was observed that the energy intake was below the recommendation of the Brazilian Society of Sports Medicine (SBME, 2009). Additionally, fiber intake Didi not meet the recommendation of the IOM (2005).

When comparing pre- and post-workout meals, it was observed that energy intake ($p=0.060$), carbohydrates ($p=0.426$), and lipids ($p=0.062$) did not show significant differences. However, protein consumption was significantly higher in the post-workout meal ($p<0.001$), as illustrated in Figure 1.

Tables 3 and 4 present the supplement intake and the specific supplements reported by female weight training practitioners in this study. It is noted that more than half of the sample (66.6%) consumed supplements, with the most commonly used being whey protein (65.8%) and creatine (50%).

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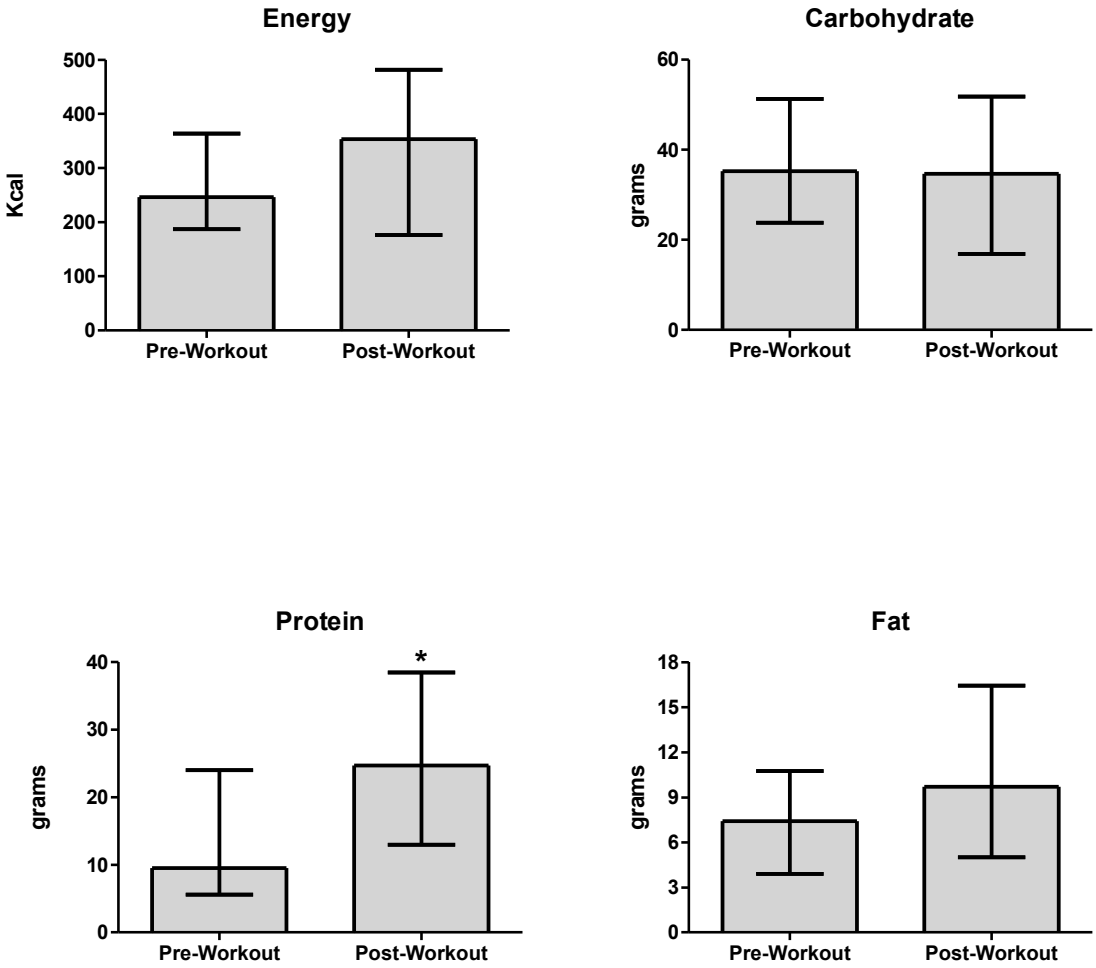

Figure 1 - Energy and Macronutrient Intake in Pre and Post-Workout Meals
Note: Results expressed as median with interquartile ranges from 25% to 75%. * p<0.001.

Table 3 - Supplement Intake in the sample

Supplement consumption	Percentage (%)
Yes	66.6
No	33.3

Table 4 - Consumption of each supplement in percentage.

Supplement	Consumption in the sample (%)
BCAA	5.3
Creatine	50
Whey protein	65.8
Multivitamins	2.6
Pre-workout	7.8
Glutamine	5.3
Maltodextrin	2.6
Albumin	2.6
Weight gainer	2.6

Note: BCAA = Branched-Chain Amino Acids.

DISCUSSION

This study evaluated the anthropometric characteristics, body composition, and dietary and supplement intake of female weight training practitioners. The findings provide valuable insights into the nutritional habits and body composition of this population.

Anthropometric data indicated that the women were considered eutrophic according to the Body Mass Index (BMI) classification by the World Health Organization (2000). However, BMI alone is insufficient to differentiate between fat mass and lean body mass, necessitating complementary anthropometric assessments (Mialich et al., 2018).

The body fat percentage of the participants was within the population average, as adapted from Lohman (1992) and Heyward, Stolarczyk (1996).

According to Jackson et al. (2002), the average body fat percentage was within the normal range for sex and age. Comparatively, Grifante, Werner (2022) reported an average body fat percentage of 32.92% among 19 female weight training practitioners, which is considered above average according to Lohman (1992).

However, their study utilized a different assessment method, employing bioelectrical impedance via a whole-body digital body composition monitor (HBF-514 OMRON).

Da Silva et al., (2019) found an average body fat percentage of 26.64 ± 3.96% in a study of 99 female weight-training practitioners, using the Petroski protocol (2009).

Notably, 92.1% of these women expressed dissatisfaction with their body image, highlighting the impact of aesthetic pressures on female bodies (Grabe et al., 2008).

The average energy intake of participants was below the minimum recommended by the Brazilian Society of Sports Medicine (SBME, 2009).

Adequate caloric intake is crucial for promoting muscle mass gain, preventing muscle mass loss, and enhancing training performance (Thomas et al., 2016).

Inadequate energy intake, combined with high exercise demand, can lead to the female athlete triad syndrome, characterized by decreased bone mineral density, eating disorders, menstrual cycle disturbances, and increased fatigue (Mountjoy et al., 2014).

This syndrome is a subset of Relative Energy Deficiency in Sport (RED-S), which encompasses broader physiological impairments due to energy deficiency, including effects on basal metabolic rate, menstrual function, bone health, protein synthesis, immunity, and cardiovascular health (Mountjoy et al., 2023).

Silva-Júnior et al., (2018) reported similar findings with an average energy intake of 27.2 ± 5.8 kcal/kg, also below the recommendations of SBME (2009).

Conversely, Souza et al. (2021) found adequate average energy intake (32.1 ± 11.3 kcal/day) among 13 female weight training practitioners.

To assess individual energy intake adequacy, it is essential to quantify daily energy expenditure and consider people's body composition goals, information that was not collected in this study.

For example, if a volunteer in this study aimed to lose fat, a hypocaloric diet would be recommended. On the other hand, if the goal was to gain muscle mass, a hypercaloric diet should be followed. Among women, the desire for fat reduction is more common and is associated with a hypocaloric diet. This likely influenced the energy consumption observed in the population investigated in this study.

Caparros et al., (2015) highlighted that inadequate carbohydrate intake is common

among weight training practitioners, which is problematic as muscle glycogen stores significantly influence exercise performance.

Bernardes et al., (2016) similarly reported insufficient carbohydrate intake among male and female weight training practitioners, impacting athletic performance. However, protein and lipid intake were adequate, as in the current study.

Rocha et al., (2022) found similar carbohydrate intake levels (3.1 ± 1.7 g/kg) to those in the present study.

The average fiber intake was below the IOM (2005) recommendation of 25 g/day. This inadequacy is consistent with findings from other studies, such as Silva-Júnior et al., (2018), Souza et al., (2021), and Rocha et al., (2022), which also reported insufficient fiber consumption among weight training practitioners.

The low fiber intake may be attributed to insufficient consumption of fruits, vegetables, and whole grains. According to the Brazilian Surveillance System of Risk and Protective Factors for Chronic Diseases by Telephone Survey (VIGITEL), only 41% of Brazilian women reported regularly consuming fruits and vegetables (Brasil, 2022).

Adequate protein intake is crucial for women engaged in resistance training, who require a high-protein diet (Thomas et al., 2016; Sims et al., 2023).

Morton et al. (2018) determined that 1.6 g/kg/day maximizes protein synthesis, a value achieved by the participants in this study. However, intake varied widely, with some women consuming as little as 0.8 g/kg/day and others up to 2.6 g/kg/day, indicating a lack of awareness about appropriate protein intake.

The high consumption (>2,0g/kg/day) may be associated with preserving muscle mass while reducing body fat (Kerksick et al., 2018). In this study, the dietary intake of female weight training practitioners was assessed with a specific focus on pre- and post-workout meals.

The findings indicate no significant differences in energy intake ($p=0.060$), carbohydrate intake ($p=0.426$), and lipid intake ($p=0.062$) between pre- and post-workout meals. However, protein consumption was significantly higher in post-workout meals ($p<0.001$), as illustrated in Figure 1. Protein intake immediately after exercise promotes muscle protein synthesis and aids in muscle repair (Schoenfeld et al., 2013).

The significantly higher protein consumption in post-workout meals observed in this study reflects the common practice among weight training practitioners of emphasizing the importance of protein for recovery and muscle hypertrophy, as supported by the literature.

Although few studies focus on sports supplementation in women, existing research indicates higher supplement use among women (Herbold et al., 2004; Garthe, Maughan, 2018).

Supplement prescriptions should ideally be made by a nutritionist, yet many individuals use supplements without professional guidance, influenced by advertisements or trainers (Oliveira, Pereira, 2023).

Self-prescription of supplements can be harmful to health, as highlighted by Velasco et al., (2022), who noted frequent abusive consumption of sports supplements in Brazil.

In this study, a significant portion of the sample used supplements, with the most common being whey protein (65.8%) and creatine (50%). Whey protein is favoured for its convenience and high biological value, providing essential amino acids necessary for muscle protein synthesis (Haraguchi et al., 2006).

However, whey protein has modest effects on lean mass, but does not significantly affect fat mass or total body mass in adult women (Bergia et al., 2018).

Creatine supplementation is supported by substantial scientific evidence for its efficacy and safety, improving workout performance, recovery, muscle strength, and reducing fatigue (Kreider et al., 2017; Ronald et al., 2018).

Creatine supplementation can be particularly beneficial for women, enhancing muscular and cerebral phosphocreatine levels and improving strength and exercise capacity (Smith-Ryan et al., 2021).

The common pattern of supplement use among strength training practitioners observed in this study aligns with findings from other research, suggesting a prevalent trend in this population (Mazzilli et al., 2021; Velasco et al., 2022; Martínez et al., 2024).

This study has several limitations. First, the relatively small sample size and potential lack of diversity among the participants may limit the generalizability of the findings. Second, reliance on self-reported dietary records is associated with potential biases and inaccuracies.

Third, a short duration of dietary assessment may not fully capture habitual dietary patterns.

Fourth, the absence of quantified daily energy expenditure data hinders the assessment of energy intake adequacy relative to individual needs.

Fifth, as a cross-sectional study, it only provides a snapshot in time, thus limiting causal inferences.

Sixth, while focusing on female weight training practitioners is a strength, it restricts its applicability to males. Seventh, the study did not account for confounding factors, such as menstrual cycle phases, hormonal contraceptive use, and lifestyle factors. Lastly, the differentiation between supplement use with and without professional guidance was not considered, which could impact the interpretation of the findings.

CONCLUSION

The findings indicated that the average intake of proteins, carbohydrates, and lipids generally met the recommended guidelines and that the overall energy and fiber intake was insufficient.

The significantly higher protein consumption during post-workout meals underscores the importance of protein intake for muscle recovery and hypertrophy by this population.

Additionally, the high prevalence of supplement use, particularly whey protein and creatine, highlights the reliance on these products for training.

To improve these findings, it is recommended to implement dietary and nutritional education actions, as well as nutritional monitoring by professional nutritionists.

This support is essential for providing adequate and personalized dietary guidance and promoting more balanced and effective dietary intake to improve health and sports performance.

Further studies with larger, more diverse samples and longitudinal designs are needed to better understand the long-term effects of dietary patterns and supplementation on body composition and performance.

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