ABSTRACT

Introduction: Synthetic anabolic-androgenic steroids (AAS) were developed with the purpose of obtaining drugs capable of increasing protein synthesis associated with a lower degree of virilization. Its use is common among bodybuilders who aim to increase physical strength and muscle mass in the short term. However, AAS cause side effects, which restrict their therapeutic use. Objective: To identify factors associated with AAS use by exercise enthusiasts at gyms in São Luís, MA. Methods: A cross-sectional study was carried out at 17 gyms. The sample totaled 723 exercise enthusiasts, who answered a structured questionnaire with multiple choice questions related to their lifestyle and the consumption of nutritional supplements and AAS use. Logistic regression analysis was used to verify the association of socioeconomic, demographic and behavioral factors with AAS use. Results: Of the 723 exercise enthusiasts, 10.65% reported having used AAS. Of these, 97.4% declared their awareness of some side effect caused by AAS use. Factors associated with AAS use were: being male, age between 20 and 29 years, consumption of food supplements and participation in exercise for over a year. Conclusion: The prevalence of AAS use by exercise enthusiasts at gyms in São Luís is high, and the risk factors identified enable us to target specific populations with preventive actions. Level of Evidence IIC; Cross-sectional study.

Keywords: Anabolic agents; Exercise; Fitness centers.

RESUMEN

Introducción: Los esteroides anabólicos androgénicos (EAA) sintéticos fueron desarrollados con el propósito de obtener fármacos capaces de producir aumento en la síntesis proteica, asociados a menor grado de virilización. Su uso es común entre practicantes de musculación que buscan aumentar la fuerza física y la masa muscular a corto plazo. Sin embargo, tienen efectos adversos que restringen el uso terapéutico. Objetivo: Identificar los factores asociados al uso de EAA por practicantes de ejercicio físico en academias de São Luís, MA. Métodos: Estudio transversal realizado en 17 academias de ginástica. A la muestra afligió 723 practicantes de ejercicio físico, quienes respondieron a cuestionario con preguntas de opción múltiple relacionadas con su estilo de vida y con el consumo de suplementos nutricionales y EAA. El análisis de regresión logística se empleó para verificar la asociación de factores socioeconómicos, demográficos y comportamentales con el uso de EAA. Resultados: De los 723 practicantes de ejercicio físico, 10,65% informaron que habían usado EAA. De estos, 97,4% afirmaron que conocían algún efecto adverso ocasionado para el uso de EAA. Se mostraron los siguientes factores asociados: ser del sexo masculino, tener entre 20 y 29 años, consumo de suplementos alimentares y participar en ejercicio por más de un año. Conclusión: El consumo de EAA por practicantes de ejercicio físico en academias de São Luís es alto y los factores de riesgo identificados permiten dirigir acciones preventivas a las poblaciones específicas. Nivel de Evidencia IIC; Estudio transversal.

Descritos: Anabolizantes; Ejercicio físico; Academias de Ginástica.
Anabolic-androgenic steroid (AAS) hormones are prescribed for medical conditions related to low testosterone production. Due to the recognized effects on the improvement of body image, their use has been widely disseminated among fitness/exercise enthusiasts at gyms around the world.1

Users follow dosage patterns that incorporate drugs capable of increasing protein synthesis (anabolic effects) associated with a lower degree of virilization (androgenic effects).2 However, they cause undesirable side effects, which restrict their therapeutic use.3 Despite these consequences, AAS use is common among bodybuilders who aim to build up their physical strength and muscle mass in the short term.4,5

AAS are illegally marketed and consumers believe that these drugs provide more intense exercise sessions, as they delay fatigue and increase motivation and stamina. However, users do not take into consideration the fact that AAS use is associated with physical and psychological problems.6 Physical problems include a greater risk for the development of coronary heart disease, arterial hypertension and liver tumors, in addition to changes in sex hormone levels (and consequent prostatic hypertrophy and testicular and breast atrophy), voice and hair growth pattern changes, and clitoral hypertrophy in women.7

According to the National Institute on Drug Abuse,8 the highest proportion of AAS misuse is among men aged between 20 and 30 years who perform resistance (weight) training. About 22% of AAS users started in their adolescence.9 Although it is increasing, steroid use among women is lower.10 The duration of regular exercise is a determining factor when making an association with AAS use. Users of these substances are assiduous frequenters of gyms and perform exercises efficiently.11

In view of the lack of data regarding the extent of AAS use in Brazil and signs that its use is increasing, which may represent a major public health problem, this study aimed to identify risk factors associated with AAS use, and to estimate the prevalence of this use by exercise enthusiasts at gyms in São Luís, Maranhão, MA.

MATERIALS AND METHODS

This is a cross-sectional study conducted between 2011 and 2012 with exercise enthusiasts at gyms in São Luís, Maranhão.

The convenience sample was based on the number of gyms registered with the Regional Council of Physical Education of Maranhão (CREF-MA), which totaled 42. These were evaluated in terms of current functioning and the types of exercise available. The selection criteria for the gyms were the number of neighborhoods in the city, their distribution by neighborhood, and the offer of resistance (weight) training by the gym. Those specific to a particular sex or age group were excluded.

Accordingly, 21 gyms met the inclusion criteria. Initially, the owners of the establishments were contacted to participate in the study. Of these, 17 agreed and four refused to take part in the study. At the gyms where consent was obtained, data were collected on the number of students enrolled, the fitness instructors available, the onsite sale of supplements, and the types of training offered.

After this phase, questionnaires were delivered directly to the gym users. They were approached randomly at the main entrances to the establishments, at different times (between 7 am and 9 am and between 4 pm and 9 pm) and on different days of the week (Monday to Saturday). Undergraduate students enrolled in a nutrition course were trained to assist the principal investigator in data collection.

These questionnaires were standardized and validated, were self-reported and contained multiple choice questions relevant to the subject. Therefore, they covered aspects related to the lifestyle of the exercise enthusiast and the consumption of nutritional supplements and AAS use. The use of thermogenic products, protein and carbohydrate supplements, multivitamins and polyminerals, isotonic drinks, meal replacement shakes, creatine and herbal products was also investigated. Participants were able to tick more than one option in the questions. As regards the indication for supplements, the response options were nutritionist, physician, fitness instructors, friends/acquaintances, and self-prescribing.

Although 738 questionnaires were delivered, 15 were answered incompletely, with the absence of important information, and ended up representing losses. Thus, the final sample of the study consisted of 723 exercise enthusiasts who frequent gyms in São Luís, Maranhão.

Data entry was performed in duplicate, with subsequent comparison between the two entries to correct errors.

The statistical analysis included a descriptive analysis, a prevalence estimation based on the Chi-square test, used to analyze the differences between the observed and expected ratios, and a logistic regression analysis to verify the association of socioeconomic, demographic and behavioral factors with AAS use. The STATA 14.0 statistical package was used.

In the logistic regression analysis, the dependent variable was AAS use, and the explanatory variables were: length of exercise participation, occupation, education, weekly frequency at the gym, training, source of AAS recommendation, sex, and age.

The descriptive analysis was followed by the univariate analysis. For this purpose we used simple logistic regression, estimating the unadjusted relative risk and 95% confidence interval. We then performed the multivariate analysis through multiple logistic regression. The independent variables with significance below 0.20 (p≤0.20) were considered candidates for the final model. However, only those with a significance level below 0.10 remained. The significance level adopted to reject the null hypothesis was 0.05.

This study is part of the research project: “Factors associated with the consumption of nutritional supplements by exercise enthusiasts at gyms in São Luís - MA”, which includes questions related to AAS use in its questionnaire. This research project fulfills the criteria of Resolution no. 196/96 of the Brazilian National Board of Health and supplementary regulations, and was approved by the Institutional Review Board of UniCEUMA under Protocol no. 316/11. All participants signed the Informed Consent Form (ICF).

RESULTS

A total of 723 exercise enthusiasts participated in the study. Male subjects (52.6%), aged between 20 and 29 years (49.4%), with a college/university degree (43.1%) and high level job occupants (51.0%) predominated, according to Table 1.
Regarding the characteristics of the exercise undertaken (Table 2), 46.1% of the study participants reported a length of participation greater than one year, 73.0% exercised between three and five times/week, 59.3% spent between one and two hours exercising, 89.8% performed anaerobic exercises and 69.6% considered their training to be moderate. Participation in exercise was linked to the consumption of nutritional supplements in 64.7% of the study sample.

With respect to AAS use (Table 3), 10.4% of the exercise enthusiasts claimed to have used the substance in the past. Of these, 29.9% used AAS for a period between one and two months, 86.7% believed they had achieved a result while using AAS, and 41.3% took AAS on their own initiative (self-prescribing). Of the total number of exercise enthusiasts studied, 10.4% were aware of the side effects caused by AAS use, which corresponds to the percentage of those who have used AAS in the past.

Based on the simple logistic regression analysis (Table 4), being male, age between 20 and 39 years, occupying a high level position or not being a member of the economically active population, consuming food supplements, exercising for more than six months, attending the gym for more than five days a week, and spending between one and two hours per day exercising, are factors that increase the individual's chance of using AAS. The education variable did not show any statistical significance and was therefore discarded in the multivariate analysis.

In the final analysis by multiple logistic regression (Table 5), being male represents a factor associated with AAS use, since men are, with a statistically significant difference, almost three times more likely to use steroids than women. People aged 20 to 29 years are 5.77 times more likely to use AAS. Likewise, the consumption of dietary supplements and exercise participation for over a year produce an approximately two-fold increase in AAS use. The variables occupation and frequency of exercises during the week did not show statistical significance in the final model.

| Table 1 | Sociodemographic profile of exercise enthusiasts in São Luís, MA, 2012 (n = 723) |
| Variables | n | % |
| --- | --- | --- |
| **Sex** | | |
| Male | 380 | 52.6 |
| Female | 343 | 47.4 |
| **Age** | | |
| <20 years | 93 | 12.9 |
| 20 to 29 years | 357 | 49.4 |
| 30 to 39 years | 181 | 25 |
| 40 to 49 years | 63 | 8.7 |
| ≥50 years | 29 | 4 |
| **Education** | | |
| Primary | 20 | 2.8 |
| Secondary | 217 | 30 |
| Higher education | 312 | 43.1 |
| Postgraduate studies | 174 | 24.1 |
| **Occupation** | | |
| Technician | 166 | 23 |
| High level position | 369 | 51 |
| Not part of the EAP* | 188 | 26 |

* economically active population.

| Table 2 | Characterization of exercise participation at gyms in São Luís, MA, 2012 (n = 723) |
| Variables | n | % |
| --- | --- | --- |
| **Length of exercise participation** | | |
| <1 month | 118 | 16.3 |
| Between 1 and 6 months | 201 | 27.8 |
| Between 7 months and 1 year | 71 | 9.8 |
| >1 year | 333 | 46.1 |
| **Frequency of exercises during the week** | | |
| <3 times/week | 76 | 10.5 |
| Between 3 and 5 times/week | 528 | 73 |
| >5 times/week | 119 | 16.5 |
| **Time spent on exercise per day** | | |
| ≤1 hour | 212 | 29.3 |
| Between 1 and 2 hours | 429 | 59.3 |
| >2 hours | 82 | 11.4 |
| **Exercises performed** | | |
| Anaerobic * | 649 | 89.8 |
| Others | 74 | 10.2 |
| **Training intensity ** ** | | |
| Light | 66 | 9.1 |
| Moderate | 503 | 69.6 |
| Intense | 154 | 21.3 |
| **Consumption of nutritional supplement** | | |
| Yes | 468 | 64.7 |
| No | 343 | 47.4 |

* Resisted exercise. ** Self-reported.

| Table 3 | Characterization of anabolic steroid use by exercise enthusiasts in São Luís, MA, 2012 (n = 723) |
| Variables | n | % |
| --- | --- | --- |
| **AAS Use** | | |
| Yes | 75 | 10.4 |
| No | 648 | 89.6 |
| **Length of AAS use** | | |
| <1 month | 21 | 27.3 |
| Between 1 and 2 months | 24 | 29.9 |
| Between 3 and 5 months | 9 | 11.7 |
| ≥6 months | 21 | 27.3 |
| **Results achieved with AAS use** | | |
| Yes | 65 | 86.7 |
| No | 10 | 13.3 |
| **Knowledge of the side effects of AAS use** | | |
| Yes | 75 | 10.4 |
| No | 648 | 89.6 |
| **Responsible for indicating AAS use** | | |
| Self-prescribing | 31 | 41.3 |
| Friend | 29 | 38.7 |
| Coach | 8 | 10.7 |
| Others | 7 | 9.3 |

| Table 4 | Univariate analysis by simple logistic regression of the factors associated with anabolic steroid use by exercise enthusiasts in São Luís, MA, 2012 (n = 723) |
| Variables | n | % |
| --- | --- | --- |
| Sex | 3.07 | 1.79 | 5.27 | 0.000 |
| Age | 20 to 29 years | 3.97 | 1.40 | 11.25 | 0.010 |
| 30 to 39 years | 2.16 | 0.70 | 6.65 | 0.181 |
| 40 to 49 years | 1.11 | 0.24 | 5.15 | 0.892 |
| Education | Higher education | 1.18 | 0.69 | 2.03 | 0.542 |
| Postgraduate studies | 0.65 | 0.32 | 1.32 | 0.231 |
| Occupation | High level | 0.61 | 0.35 | 1.05 | 0.076 |
| Not part of the economically active population | 0.52 | 0.27 | 1.02 | 0.058 |
| Consumption of supplements | Yes | 2.44 | 1.36 | 4.39 | 0.03 |
| **Length of exercise participation** | | |
| Between 1 and 6 months | 0.84 | 0.38 | 1.88 | 0.673 |
| Between 7 months and 1 year | 0.28 | 0.06 | 1.31 | 0.106 |
| >1 year | 1.63 | 0.82 | 3.27 | 0.162 |
| **Frequency of exercises during the week** | | |
| Between 3 and 5 times/week | 1.05 | 0.46 | 2.42 | 0.181 |
| >5 times/week | 1.87 | 0.75 | 4.70 | 0.181 |
| **Time spent on exercise per day** | | |
| Between 1 and 2 hours | 0.69 | 0.41 | 1.15 | 0.155 |
| >2 hours | 1.06 | 0.50 | 2.25 | 0.876 |

* The table shows only the variables with p-value p<0.20 in one of the categories.
The indiscriminate use of AAS was found to be prevalent in the sample studied and was associated with being male, age between 20 and 29 years, the consumption of nutritional supplements, and length of exercise participation over one year. These results draw our attention to the need for preventive and informative actions with the population of young adults, and for more studies that help us draw the profile of AAS users. In this way, these protective measures can be targeted and prove effective.

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All authors declare no potential conflict of interest related to this article.

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DISCUSSION

The profile of exercise enthusiasts at gyms in São Luís, Maranhão, is made up of individuals of both sexes, mostly aged between 20 and 29 years, with a high level of education and occupying high level jobs.

A considerable percentage of exercise enthusiasts reported having used AAS in the past. However, the prevalence found (10.4%) may have been underestimated, especially since it is an illegal practice. This fact tends to inhibit the responses of participants in studies of this nature, which is a limitation of this study but does not invalidate its results.

A systematic review of the literature found the prevalence of AAS use by exercise enthusiasts in Brazil ranging from 2.1% to 31.6%, depending on the sample characteristics and the region analyzed.12

In a municipality of the state of Bahia, for example, it was noted that 46% of the participants reported having made use of AAS in the past, and that the substance most frequently used was testosterone (43.5%).46% of the participants reported having made use of AAS in the past, however, the prevalence found (10.4%) may have been underestimated, especially since it is an illegal practice. This fact tends to inhibit the responses of participants in studies of this nature, which is a limitation of this study but does not invalidate its results.

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