



Nutritional intake, body composition, and bone mineral density in menarcheal and non-menarcheal gymnasts

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ABSTRACT

Introduction: The clinical study of high-performance athletes is fundamental to their health and athletic performance.

Objective: To evaluate the nutritional status of female gymnasts, including bone mineral density, according to menarche.

Methodology: 59 gymnasts (12.0±2.7 years old) were evaluated during the competitive period, and the following data were collected: sociodemographic, training, clinical (including menstrual function), food intake, and body composition (including bone mineral density by ultrasound). All participants provided informed consent. The study was approved by the Ethics Committee of the Fernando Pessoa University. Statistical analysis was performed using SPSS, version 25.0. Variable normality was assessed using the Kolmogorov-Smirnov test for sample sizes greater than 30, and the Shapiro-Wilk test for sample sizes of 30 or fewer. For group comparisons, the student's t-test was applied to normally distributed variables, while the Mann-Whitney U test was used when at least one variable deviated from a normal distribution. Comparisons against reference values were performed using the one-sample t-test, and categorical variables were analyzed using the Chi-square test. To evaluate correlations between continuous or ordinal variables with non-normal distributions, Spearman's rank correlation coefficient (ρ) was utilized. Statistical significance was defined as $p < 0.05$.

Results: Non-menarche athletes ($n=46$) trained less (10.8±1.7 years; 13.4±5.1 hours/week) than menarche gymnasts ($n=13$; 15.9±2.1 years; 14.3±6.8 hours/week; $p<0.05$), and had lower body

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weight (32.5 ± 5.4 kg), lower fat mass ($9.2 \pm 1.7\%$) and higher fat-free mass ($96.9 \pm 0.8\%$) than menarche gymnasts (52.7 ± 3.8 kg; $11.8 \pm 1.8\%$; $93.3 \pm 1.1\%$, respectively; $p < 0.05$). Both groups presented low energy availability (35.8 ± 15.9 kcal/kg fat-free mass/day), and intakes of micronutrients relevant to bone health were lower than the recommendations: calcium (591.0 ± 259.2 mg/day vs. 1300 mg/day, $p < 0.05$), magnesium (165.2 ± 51.0 mg/day vs. 240.0 mg/day, $p < 0.05$) and vitamin D (1.8 ± 1.3 µg/day vs. 5 µg/day, $p < 0.05$). There were no differences in bone mineral density between groups (0.62 ± 0.11 vs. 0.59 ± 0.07 g/cm²; $p = 0.848$), although the menarche group had higher mean values.

Conclusions: These results reinforce the importance of monitoring nutritional status and the menstrual cycle in preventing bone abnormalities in young gymnasts.
