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BRIEF NOTE

Does improving hematological iron status restore the menstrual cycle in female athletes?

L'amélioration du statut hématologique en fer contribue-t-elle au rétablissement du cycle menstruel chez les athlètes de sexe féminin ?

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KEYWORDS

Anemia;
Female athletes;
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Summary

Objectives. – The aim of this study was to assess whether a 12-week nonpharmacological nutritional intervention NI aimed at improving iron status in female athletes can mitigate disorders in the menstrual cycle.

Equipment and methods. – Forty-one female athletes with menstrual disorders and iron deficiency or anemia were recruited. Energy and nutrient intake, total energy expenditure, energy availability, morphological parameters and serum iron and ferritin level, as well as serum concentrations of LH and FSH were measured at the beginning of the study and after twelve weeks of NI.

Results. – Twelve weeks of NI resulted in an increase in energy and several nutrients (energy: mean 527 kcal/d, protein: 17 g/d, carbohydrate: 98 g/d, calcium: 430 mg/d, vitamin D 2 µg/d, iron 5 mg/d, thiamin 0.5 mg/d, niacin, 3.4 mg, folate 163 µg/d, vitamin C 50 mg/d). After twelve weeks of NI, an improvement in iron status was observed in the athletes (as increases in hemoglobin: mean 0.43 g/dl, MCV: 2 fl, MCH: 1.04 fl, and serum iron level: 46 µg/l). Basis on hemoglobin, serum iron, ferritin and red cell indices (MCV, MCH, MCHC, RDW) results the number of subjects with iron deficiency, anemia declined and latent iron deficiency was observed (iron deficiency from 7 to 5, anemia from 9 to 5, latent iron deficiency from 25 to 15). Significant increases in the level of LH and the LH-to-FSH ratio were also seen (LH means 1.51 mIU/ml and LH-to-FSH ratio means 0.31).

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MOTS CLÉS

Anémie ;
Athlètes féminines ;
État nutritionnel

Conclusion. – A NI aimed at improving iron status in female athletes with simultaneous iron deficiency and anemia can also improve the level of the hormones responsible for maintaining a regular menstrual cycle.

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Résumé

Objectif. – Cette étude vise à évaluer si une intervention nutritionnelle (IN) non pharmaceutique de 12 semaines visant à améliorer le statut en fer des athlètes féminines peut atténuer les désordres de leur cycle menstruel.

Matériel et méthodes. – Quarante et une athlètes de sexe féminin possédant des troubles du cycle menstruel et une carence en fer ou une anémie, ont été recrutées. Les apports énergétiques et nutritionnels, les dépenses totales énergétiques, la disponibilité énergétique, les paramètres morphologiques, les taux de fer sérique et de ferritine sanguine, ainsi que les concentrations sériques de LH et de FSH ont été mesurés au début de l'étude et après 12 semaines d'IN.

Résultats. – Douze semaines d'IN ont entraîné une augmentation des apports énergétiques et nutritionnels (moyenne de 527 kcal/j, protéines 17 g/j, glucides 98 g/j, calcium 430 mg/j, vitamine D2 μ g/j, fer 5 mg/j, thiamine 0,5 mg/j, niacine 3,4 mg/j, folate 163 μ g/j, vitamine C 50 mg/j). Après 12 semaines d'IN, une amélioration du statut en fer a été observée chez les athlètes (augmentation de la moyenne d'hémoglobine 0,43 g/dL, du VGM 2 fl, de la CCMH 1,04 fl et du fer sérique 46 μ g/L). Une diminution du nombre de sujets avec une carence en fer (de 7 à 5), une anémie (de 9 à 5) et une carence en fer latente (de 25 à 15) a été observée, basée sur les taux d'hémoglobine, de fer sérique, de ferritine et des indices érythrocytaires (VGM, CCMH, TCMH, IDR). Des augmentations importantes du taux de LH et du rapport LH : FSH ont également été observés (moyenne LH 1,51 mLU/mL et moyenne rapport LH : FSH 0,31).

Conclusion. – Une IN visant à améliorer le taux de fer chez les athlètes de sexe féminin qui possèdent une anémie à cause d'une carence martiale, peut aussi améliorer les taux d'hormones responsables de la régulation du cycle menstruel.

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1. Introduction

As many as 66% of female athletes being reported to suffer from menstrual disorders. Besides of increased exercise and physical and mental stress, these dysfunctions can be aggravated by improper diet, which is also a major cause of iron deficiency and anemia. Even a small decrease in haemoglobin concentration from the athletes normal range result in reduced oxygen transport capacity, potentially decreasing oxygen availability during physical performance. Untreated menstrual disorders of female athletes can also involve a health consequences (hypoe-strogenism, osteoporosis) [1]. There are a few studies to have demonstrated treatment of these menstrual disorders in athletes through nutritional intervention. However, the literature does not describe any study in which the iron status of female athletes was monitored during the treatment of menstrual disorders by diet therapy. In this study we try to answer on question, does improvement iron status restore the menstrual cycle in female athletes?

2. Methods

The research experiment proceeded with the participation of 41 female athletes (rowers, synchronized swimmers, triathletes, and dancers) at age 17.8 ± 2.2 y,

BMI: 19.8 ± 1.7 kg/m² and FM $19.6 \pm 3.3\%$ from sports clubs in Poznań. The inclusion criteria were menstrual disorders within the last 12 months, at least three years of training, training more frequent than four sessions a week, a lack of serious medical conditions, nonuse of hormonal contraception or other medications that might interfere with the hypothalamic–pituitary–gonadal axis, no clinical diagnosis of eating disorders, non-smoking, and with no history of primary ovarian failure, hyperprolactinemia, thyroid dysfunction, or polycystic ovary syndrome. Written informed consent was obtained from all participants and their parents. Morphological parameters, iron and ferritin levels were measured in order to determine iron status. Menstrual disorders are diagnosed according to our previous study [2] Height, body weight (BW) and fat mass (FM) were investigated. For 3 days, each subject wore a heart-rate monitor to estimate total energy expenditure (TEE) [1]. The 24-hour energy balance (EB) and energy availability (EA) was calculated [1]. 12 weeks of the nutritional intervention (NI) were planned similar to our previous study [2]. The diets were composed so that, in addition to providing an iron intake according to Desbrow et al. [3] the bioavailability of iron in each meal would be maximized, including products containing nonheme iron. The study was approved by the Poznań Medical Ethics Committee (No. 334/09). The statistical analysis was carried out using Statistica 13.0 software (Statsoft).

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