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Original Research Article

Nutritional habits among high-performance endurance athletes

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ABSTRACT

Background and objective: For athletes, the main purpose of nutrition is to ensure the compensation of increased energy consumption and the need for nutrients in the athlete's body, thereby enabling maximum adaptation to physical loads. The aim of this study was to determine the habits of highly trained endurance athletes depending on sports type, sex and age in order to improve the planning and management of the training of athletes using targeted measures.

Materials and methods: In 2009–2012, the dietary habits of 146 endurance athletes were analyzed. The actual diet of Lithuania endurance athletes was investigated using a 24-h dietary survey method. Data on the athletes' actual diet were collected for the previous day.

Results: It was found that 80.8% of endurance athletes used lower-than-recommended amounts of carbohydrates in their diet, and more than 70% of athletes used higher-than-recommended levels of fat, saturated fatty acids, and cholesterol. The diet of female athletes was low in carbohydrates, dietary fiber, protein, omega-3 fatty acids, B vitamins, potassium, calcium, phosphorus, iron, manganese, and zinc. Athletes aged 14–18 years tended to consume quantities of protein that were either lower than recommended or excessive.

Conclusions: The diet of highly trained endurance athletes does not fully meet their requirements and in this situation cannot ensure maximum adaptation to very intense and/or long-duration physical loads. The diet of highly trained endurance athletes must be

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optimized, adjusted and individualized. Particular attention should be focused on female athletes.

1. Introduction

Athletes and their training specialists should pay special attention to the supervision of nutrition because proper diet is an integral part of the optimal physical development of athletes and achievement of optimal results [1]. To improve the planning and management of highly trained athletes using targeted measures, it is no doubt very important to clarify the nutritional hazards of different groups of athletes. The diet of athletes training for major competitions must meet certain requirements. Only with adequate nutrition can an athlete's body compensate for increased energy loss and nutritional needs and thereby facilitate the maximum adaptation to physical loads.

Endurance athletes raise their aerobic capacity to overcome daily intensive and/or long-lasting, onerous physical loads. Physical performance and the fatigue incurred by athletes during aerobic training are partly dependent on endogenous carbohydrate reserves accumulated in the body and/or exogenous carbohydrate availability during physical loads [2]. Therefore, when enduring intense 2–3 h of physical loads on a daily basis, athletes must consume the recommended amount of carbohydrates (7–12 g/kg of body weight) [2]. Meanwhile, the recommended protein intake is 1.2–1.6 g/kg of body weight, and the energy value supplied by fat should not be higher than 35% [1]. In addition, athletes must consume the recommended amounts of vitamins and minerals [1].

Over the past decade, it has been demonstrated that the nutritional habits of athletes depend on sex and age. Due to incomplete growth and maturation, a special focus is required for the diet of young athletes. In 1980–2000, female athletes were placed in the risk group of inadequate nutrition for the lack of carbohydrate intake and insufficient energy value of food rations [3]. Insufficient carbohydrate consumption is associated with low fat mass of athletes and poorer physical performance [3]. In addition, it has been found that the quantities of some vitamins and minerals consumed by female athletes in various countries are below recommended doses [4,5]. Therefore, to prevent anemia and osteoporosis, female endurance athletes are recommended to take iron supplements, and their intake of calcium should be 1.5–2 times higher than the recommended daily intake (RDI) [1,6,7].

Unlike in other countries, the diets of Lithuania high-performance endurance athletes have not yet been fully explored and evaluated. There is no summary data about the eating habits of elite Lithuanian endurance athletes. For these reasons, until now is has not been possible to highlight the characteristics of different groups of athletes. The aim of this study was to determine the actual nutrition habits of high-performance endurance athletes depending on sport, sex and age.

2. Material and methods

2.1. Study population

During general training in 2009–2012, 95% of the endurance sports athletes who were included on the list of athletes approved by orders of the Department of Physical Education and Sports were studied. The highest-performance endurance athletes (n = 146) in Lithuania, engaged in Olympic disciplines such as rowing, cycling, swimming, skiing, biathlon, and long-distance running, were investigated. The highly skilled endurance athletes were tested during the preparatory period before a competition. The scope of the athletes' workout load fully complied with approved training plans. The assessment of the athletes' training plans was based on the plans that are used by highly skilled endurance athletes training for the Olympics and officially approved by the Department of Physical Education and Sports and the National Olympic Committee of Lithuania, plans specified in the London 2012 and Sochi 2014 programs (Table 1).

All the organizational issues regarding the survey were discussed prior to the research with the Lithuanian Olympic Sports Center and with the Bioethics Committee. Permission to carry out the biomedical study was issued by the Bioethics Committee (No. 158200-11-113-25, November 3, 2009).

2.2. Anthropometric measures

The height of the athletes was measured using a stadiometer (±1 cm) at the Lithuanian Sports Medicine Centre. Measurement of the body weight and individual weight components (body mass, lean body mass [LBM] in kg and %, muscle mass [MM] in kg and %, and body fat [BF] in kg and %) were performed at the Lithuanian Olympic Sport Centre using the BIA (bioelectrical impedance analysis) method. Athletes' height and body weight ratios were assessed by calculating the body mass index (BMI). Each athlete's BMI was determined by calculating it as body weight in kilograms (kg) and dividing by height in meters squared (m^2). It was assessed according to the standards that describe insufficient body weight (when BMI is <19 kg/m^2), normal body weight (when BMI is 19–24 kg/m^2), excess weight (when BMI of 24–30 kg/m^2), and obesity (when BMI $\geq$30 kg/m^2) [8]. BF and the muscle and fat mass index (MFMI) of athletes was assessed according to the standards [8] presented in Table 2.

2.3. Dietary intake

The actual diet of Lithuania endurance training athletes was investigated using a 24-h dietary survey method. Data on the athletes' actual diet was collected for the previous day. The