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THE NUTRITIONAL STATUS OF A CATEGORY I JUNIOR HANDBALL TEAM IN TRAINING

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ABSTRACT. *Introduction.* Youth is the optimal period for healthy physical exercise, as well as performance sports. One achieves harmonious physical and mental development through these means. Nevertheless, the conditions of modern life, with its numerous temptations and food industry novelties, as well as the change in traditional eating frequency and habits are responsible for nutritional deficiencies or excess of potentially anti-nutritional substances. Since the speciality literature on this topic has only been studied to a small extent, we have considered evaluating the nutritional status of professional athletes. *Objectives.* The main objective of this research has been to investigate the nutritional status and its consequences, in the case of professional handball players (junior I team – males). *Methods.* While investigating the nutritional status, we have used standard protocol, involving several components: eating intervals (generating data that pertain to food behaviour and preferences), analysis of food intake (this uses data provided by the food inquiry and the structure of the food rations), anthropometry and biochemical analyses. *Results.* Based on anthropometrical measurements, we have found that the lot is homogenous, with excess adipose tissue comparable to the upper limit of normality. Within the handball team, following detailed research, we have discovered that there are eight harmoniously developed players, and seven disharmonious ones, a diagnostic set by using BMI, excess adipose tissue and active muscle mass. With regard to biochemical analyses, the lot is considered to be within normal parameters, given the tests performed. *Conclusions*. Within the handball team, eight players are harmoniously developed, while seven are disharmonious. The average value of biochemical parameters is normal. The average value of the total caloric intake of handball players during training period is 4330.14 ± 340.69 kcal/day. The synthesis of the food rations structure of the handball team is: protein participation 13.46%, fat 34.30% and carbohydrates 52.24%. Fats of vegetable origin account for 50.11%, while animal ones stand at 49.89, i.e. below recommended levels.

Keywords: *sports diet, professional sports, sports nutrition, food regime, dietetics, handball*

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REZUMAT. ***Evaluarea stării de nutriție la lotul de handbal categoria juniori I în perioada de antrenament.*** *Introducere.* Tinerețea este perioada optimă pentru mișcare fizică sănătoasă, chiar sport de performanţă. Este o modalitate prin care se obține o dezvoltare armonioasă, fizică și psihică. Dar condițiile vieții moderne, cu multiplele ei tentații și noutăți comerciale alimentare, precum și modificarea frecvenței și obiceiurilor alimentare tradiționale sunt responsabile de carențe nutriționale sau exces de substanţe cu potențial antinutritiv. Pentru că în literatura de specialitate a fost lacunar studiată, ne-am gândit să evaluăm starea de nutriție a sportivilor de performanță. *Obiective.* Scopul principal al acestei cercetări, a fost de a se investiga starea de nutriție și consecințele ei pentru sportivii care practică handbal de performanţă (categoria junior I masculin) *Metode.* În investigarea stării de nutriție s-a utilizat un protocol standard, care presupune mai multe componente: interviul nutrițional (aduce informații referitoare la comportamentul alimentar, preferințele alimentare), analiza aportului alimentar (utilizează datele oferite de ancheta alimentară și structura rației alimentare), antropometria și analize biochimice. *Rezultate.* Pe baza măsurătorilor antropometrice s-a constatat faptul ca avem un lot omogen, cu țesut adipos excedentar față de limita superioară a normalului. În cadrul lotului de handbal, după cercetări amănunțite s-a descoperit că există 8 sportivi dezvoltați armonic, iar 7 dizarmonic, diagnostic stabilit prin utilizarea IMC, surplus de țesut adipos și masă musculară activă. Referitor la analizele biochimice putem spune că avem un lot care se află între parametrii normali după testările efectuate. *Concluzii.* În cadrul lotului de handbal 8 sportivi sunt dezvoltați armonic, iar 7 disarmonic. Valoarea medie parametrilor biochimici este normală. Valoarea medie a aportului caloric total al handbaliștilor din perioada de antrenament este de 4330,14 ± 340,69 kcal/zi. Sinteza structurii rației alimentare a lotului de handbal din perioada de antrenament este: participare proteică 13,46%, lipidică 34,30% și glucidică 52,24%. Lipidele de origine vegetale reprezintă 50,11%, iar cele de origine animală 49,89% fiind sub recomandări.

Cuvinte-cheie: *diete sportive, sporturi profesioniste, nutriție sportivă, regim alimentar, dietă, handbal.*

Introduction

Experts' recommendations pertaining to nutritional intake provide standards for energy and nutritional consumption of various categories of people. Nutritional recommendations are chiefly aimed at ensuring nutritional needs, as well as protein, vitamin and mineral intake, thus setting general principles for energy intake, without appropriately covering the 'moderation area' and protecting the population from excess of fat, sugar, salt and other food components which are believed to be connected to cardiovascular disease (Simu, Roman, Szilagy, 2000).

Healthy eating principles may be encountered in nutritional recommendations for professional athletes. However, in their case there are specific caloric and nutritional adaptations that are needed, depending on several criteria germane to the type of

sport, age, stage, duration and type of physical effort. The diet of athletes must meet the following conditions: to cover the energy consumed by basic metabolism, the additional energy needs of growth and everyday life, the energy required by training and competitions, as well as that prompted by effort recovery processes, and unforeseen energy expenditure (special conditions, based on environment, illness or stress), while also protecting athletes from potentially avoidable illnesses (Zamora, Crăciun, 1999).

With regard to the necessary nutritional intake for supporting oneself, it is preferred to opt for a formula that takes into account the quantity and quality of the effort spent during training (duration, intensity and complexity), presumptive energy consumption (evaluated as kcal/hour of effort), added to the previously mentioned activities. It is apparent that all decisions leading to nutritional recommendations should take into consideration weather conditions (temperature, humidity, wind and altitude). Another way of calculating the necessary nutritional intake, starting from theoretical data, refers to 60-70 kcal/kg of body mass, depending on sport, sex, physical effort, duration and environmental factors (Dragan, 1989).

Objectives (operational hypothesis)

Starting from the major impact of eating on the development, health and performance of athletes, chiefly at this delicate age, we have aimed to investigate their nutritional status in the pre-competition preparatory stage (training), as well as to potentially correlate our results with the anthropometric indicators of their physical development and biochemical confirmations of their state of health. We have carried out a transversal descriptive study.

Material and method

We have included in our study a number 15 junior athletes (aged 16-18), who practice professional handball. Their sporting effort is divided into training stages, competition and training camp, albeit this study solely focuses on the training stage.

The data gathered have been processed using the MS EXCEL application. The calculation formulas have been generated by the same program.

In order to analyse the nutritional value and understand the structure of the food rations, we have used a relevant computer application.

Results

Table 1. Anthropometric measurements. Statistical indicators

Indicator	Age	Height (cm)	Weight (kg)	B.M.I.	Body surface area (m^2)
Average value	16.92	179.75	73.45	23.82	1.97
Standard deviation	0.93	5.37	9.63	3.73	0.12
"P" value	5.50	2.98	13.11	15.66	5.85

Table 2. Statistical indicators (continues)

Indicator	Torso (cm)	Abdominal perimeter	Length of lower limbs (cm)	Biacromial width (cm)	Bitrochanteric width (cm)	Arm span (cm)
Average value	93.56	81.07	89.63	41.67	31.87	185.20
Standard deviation	2.79	7.78	6.83	1.63	1.68	5.36
"P" value	2.98	9.59	7.62	3.92	5.29	2.89

Tabel 3. Adiposity measurement. Statistical indicators

Indicator	Triceps (cm)	Scapula (cm)	Flank (cm)	Abdomen (cm)	Thighs (cm)	Fat tissue %
Arithmetic mean	9.53	9.73	10.67	15.33	14.33	16.41
Standard deviation	4.00	4.03	6.21	8.48	7.08	4.07
Coefficient of variation %	41.93	41.36	58.19	55.32	49.38	24.83

In the case of the players in the handball team, excess adipose tissue amounts to 16. 41%, compared to the normal upper limit of 13%.

Table 4. Integrated physical development

No.	Status	Excess adipose tissue (kg)	Active mass	Harmonious/ Disharmonious
1	normal weight	4	g	H
2	underweight	normal	minus 6 kg	D
3	overweight	20	vg	D
4	normal weight	14	minus 4 kg	D
5	normal weight	normal	vg	H
6	normal weight	5	vg	H
7	normal weight	8	minus 9 kg	D
8	normal weight	normal	vg	H
9	underweight	5,5	minus 14 kg	D
10	underweight	9	minus 15 kg	D
11	underweight	normal	minus 8 kg	H
12	normal weight	normal	vg	H
13	normal weight	normal	vg	H
14	normal weight	14	minus 10 kg	D
15	normal weight	normal	g	H

In the handball team, eight players are harmoniously developed, and seven are disharmoniously developed, a diagnostic established using BMI, excess adipose tissue and active muscle mass.

Table 5. Laboratory analyses. Statistical indicators

Indicator	Glycaemia (mg/dL)	Cholesterol (mg/dL)	Creatinine (mg/dL)	Serum iron (µg/dL)	TG (mg/dL)	Hb mg/Dl	VSH (mm/hour)
Arithmetic mean	89.19	146.13	1.05	89.21	79.53	14.94	5.47
Standard deviation	7.87	25.22	0.23	16.50	32.82	0.56	4.98
Coefficient of variation %	8.82	17.26	21.44	18.50	41.26	3.76	91.17

Table 6. Statistical indicators (continues)

Indicator	Nitrogen (mg/dL)	Calcium (mg/dL)	Magnesium (mg/dL)	Tgo (UI/ litre)	Tgp (UI/ litre)	L (x10³ elements/ µL)	HT (%)	TR (x10³ elements/ µL)
Arithmetic mean	27.27	8.23	1.93	22.53	20.00	6.81	44.96	254.13
Standard deviation	7.31	2.93	0.59	6.62	6.90	1.11	2.32	73.50
Coefficient of variation %	26.82	35.58	30.70	29.38	34.49	16.30	5.16	28.92

The average value of biochemical parameters is normal.

The total average caloric intake of handball players during training period is 4330.14 ± 340.69 kcal/day. The spread of consumption is fairly uniform, with one athlete reaching the intake recommended by some authors. (Fig. 1)

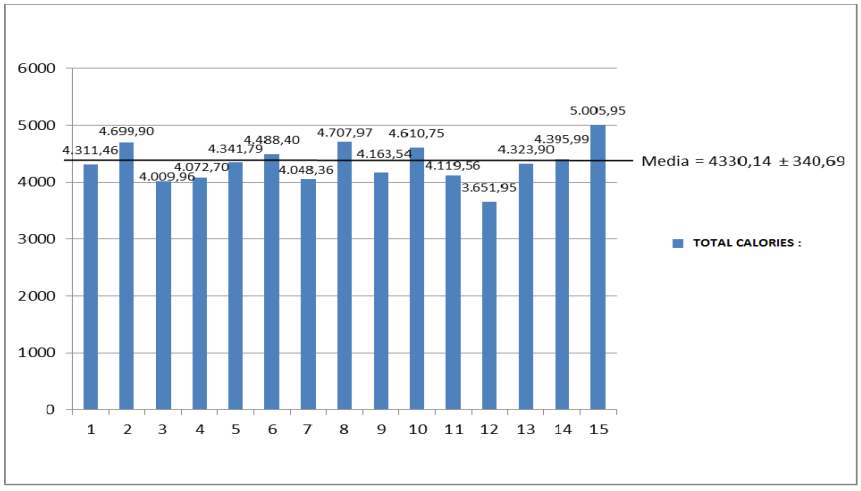

Fig. 1. Total average caloric intake of handball players. (training period)

The synthesis of the structure of the handball team's food rations during training period is: proteins 13,46%, fats 34,30% and carbohydrates 52,24%. (Fig. 2)

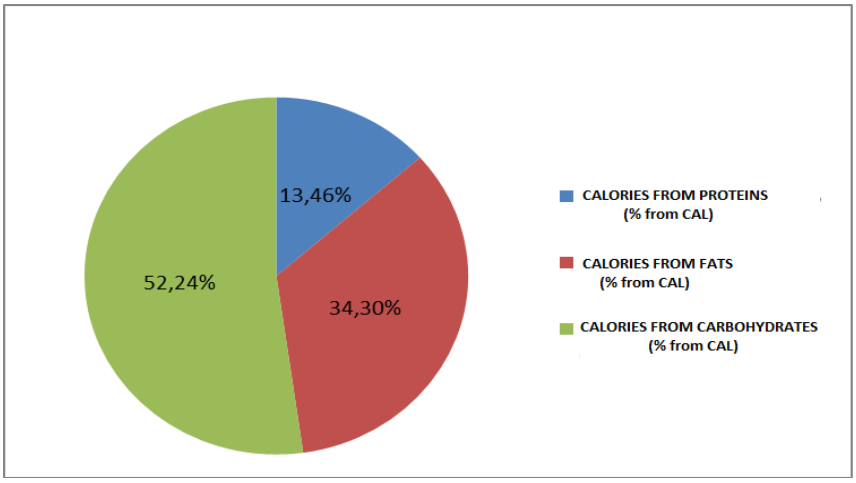

Fig. 2. Structure of the team's rations, as microelements, in percentages.

Fats of vegetable origin account for 50.11% (greatly exceeding recommended levels), while those of animal origin stand at 49.89%, i.e. below recommended levels. (Fig. 3)

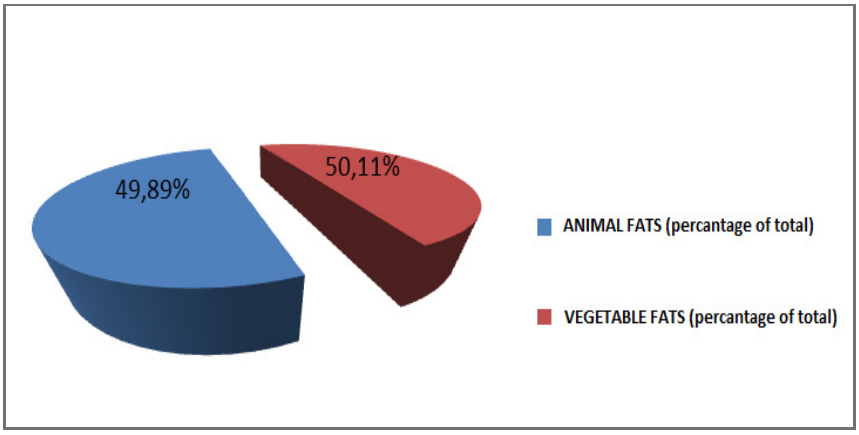

Fig. 3. Fat type share in food rations during training period

The (average) ratio of proteins of animal origin in the daily diet is 69,71% (above recommended levels), while vegetable ones account for 30,29%. (Fig. 4)

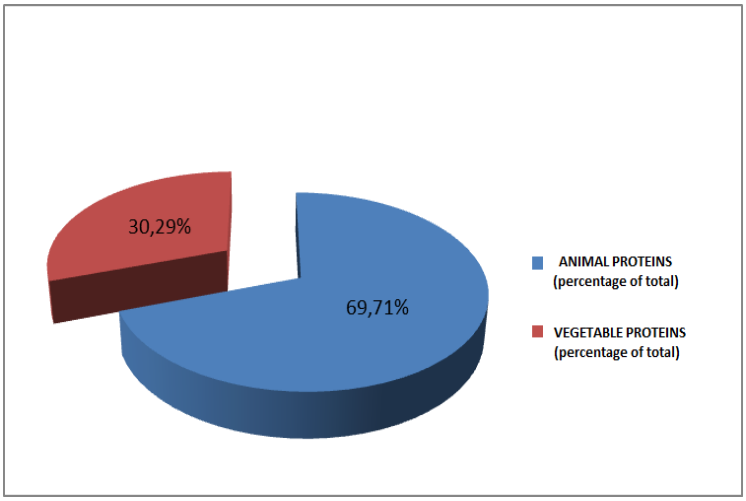

Fig. 4. Intake of proteins of animal and vegetable origin (%).

Table 7. Consumption of minerals in members of the handball team.

No.	Calcium (mg)	Magnesium (mg)	Iron (mg)	Potassium (mg)	Sodium (mg)	Phosphorus (mg)
1	1224.4	479.6	34.1	4543.8	15764	2230.6
2	1301.6	577.4	28.3	6007.8	1735.7	2092.7
3	1261	664.3	24.1	6131.6	1518.9	2325.2
4	1344	430.5	23.8	5649.5	1659.4	2208.4
5	1187.2	465.6	19.6	5641.6	1433.5	1807.4
6	829	396.3	18.7	4097.1	1696.2	1642.9
7	1114.8	615.6	30.4	5275.2	1460.6	2511.3
8	974.2	482.9	241	5095	1503.5	2300.9
9	1213.7	431.6	21.5	4760.3	1794	2203.9
10	1166.2	503.9	19.2	4727.7	1848.2	2124.3
11	1226.5	438.3	21.6	4608.3	1491	2110.4
12	1235.2	325.3	22.1	4832.9	1465.1	2001.4
13	1152.3	563.4	24.3	5173.3	1553.3	2235.9
14	982.5	423.8	24.8	5495.3	1325.8	2520.5
15	872.1	563.2	23.5	5559.2	1256.2	2158.3
MEAN	924.8	529.8	24.8	5576.2	1320.8	2195.9
SD	204.23129	81.819789	4.3779989	680.86942	194.46148	288.66619

Table 8. Consumption of vitamins in junior handball players.

Name	Vit. A (UI)	Carotene (microg)	Vit. B1 (microg)	Vit. B2 (microg)	Vit. B6 (mg)	Vit. C (mg)	Vit. D (UI)
1	1802.5	2805	2849.5	1912.9	4.4	74.5	124.8
2	11142.6	5787.8	2406.7	3738.3	4.4	211.2	190.6
3	2076.3	9137.8	3105.6	2580	4.8	175	139.6
4	2108.6	2512	2106.1	1910	3.3	173	166.9
5	1724.3	4131.2	1809.5	2353.5	5.9	231.3	144.8
6	1284.3	6439.5	1776	1675.4	3.5	125.6	154.7
7	14563.8	7436.6	3050.1	4263.5	4.9	190	136.7
8	25313	5411.1	2600.5	2272	4.5	236.9	221.3
9	1997.1	3176.9	2490.8	2619.3	4.1	73.8	146.4
10	1995.5	3425.3	2062.1	2188	4.3	109.5	153.7
11	2594.1	4293.1	1811.5	2145.4	4.3	154.6	127.4
12	2465.3	4324.6	2651.3	2176.9	4.8	145.3	103.2
13	1985.2	3245.1	2789.2	3287.2	3.5	165.3	145.3
14	2109.5	5456.8	2698.5	2489.3	3.9	187.3	198.8
15	1890.4	3547.6	5498.1	1983.3	4.2	198.2	120.1
MEAN	2215	4737	3075.2	2512	5.2	102.9	122.8
SD	1536.9	1890.2	2680.1	2175.9	5	119.8	147.8

Discussion

The training period may be regarded as a maintenance and/or support period. At its turn, it is of two types: one that aims to increase energy reserves and another seeking the growth of muscle mass. The rations meant for the increase in the body's energy reserves encompass the growth of muscle and hepatic glycogen reserves. This is particularly useful to athletes practising high-endurance activities. In the week prior to competing, on days 7, 6, 5 and 4 before the contest, high intensity and volume training is to be pursued.

During this interval, the intake of carbohydrates decreases to 45%-50%, leading to a shortage of carbohydrates inside the body. On days 3, 2 and 1, trainings are to have a high intensity, but a low volume. This is the stage marked by "oversaturation with carbohydrates", with the latter accounting for ~70% of the rations. Muscle and hepatic glycogen increases 2,3-2,6 times/100g of active tissue, compared to initial values.

The increased protein intake (high-protein diet) is justified when growing muscle mass and strength. It is useful in strength sports. Proteins are supplemented, reaching a level of 4 g/kg of body mass/day, or up to 18-20% of the total number of calories/day, preferably through food, albeit there are authors who consider that one

can administer protein concentrates with added minerals and vitamins. Diets during competitions are not an exceptional source of energy for the body; their role is chiefly psychological. They have to be pleasant in terms of aspect and taste, prevent unwanted hunger and leave the stomach within two and a half – three hours of consumption.

The post-effort recovery rations have several distinctive characteristics: they have to be hypocaloric, hyperhydric, hyperglucidic, rich in alkaline radicals (to fight the acidosis triggered by effort) and rich in minerals and vitamins (to compensate for losses and the consumption prompted by effort). The intake of liquids should take into account the high loss occurring during training or competitions, and the fact that liquids (water) are needed for metabolic processes and the composition of skeletal muscles. Each litre of water lost through perspiration dissipates 600 kcal of warmth. Athletes may lose over 1,5 litres of water for every hour of endurance workout. Optimal hydration is done before, during and after exercising. Depending on the time of workout, the following are recommended: plain cold water (apart from workouts), sweetened beverages (during workouts) and sodium-rich beverages (during long-lasting workouts).

Talent is the most important trait of a professional athlete, but there are also other notable factors, including efficient and constant preparation through training, a series of psychological and cognitive features, resistance to injury and adequate nutritional support (Damian. 2006; Talbott, 2003; Muraru, 2005). Professional sports are becoming ever more competitive and athletes aiming for lasting top-level performance need to explore every possibility to reach and maintain this privileged position.

Nutrition is an area that can undoubtedly make a difference – the food the athlete chooses may contribute to failure or success (Damian, 2006). Nevertheless, just as a well-suited diet cannot make a champion out of an athlete that lacks the talent and/or motivation for winning, so too must we be aware that inadequate diets can prevent a talented athlete from reaching the top.

Our results draw attention to the fact that, probably without admitting it, the athletes from handball team consume dietary supplements, since the average values obtained for all three stages, in the case of both minerals and vitamins, are above those currently recommended. No shortage of microelements is detected, which is highly improbable in uncontrolled diets of professional athletes, which engender significant dietary imbalances, with respect to calories and macronutrients.

Conclusions

1. Within the handball team, 8 players are harmoniously developed, while 7 are disharmonious.
2. The average value of biochemical parameters is normal.
3. The average value of the handball players' total caloric intake during training period is 4330.14 ± 340.69 kcal/day. (fig.1)

4. The synthesis of the handball team's food rations during training period is: proteins 13,46%, fats 34,30% and carbohydrates 52,24%. (fig.2)

5. Vegetable fats account for 50,11% (greatly exceeding recommended values), while animal ones stand at 49,89%, below recommended values. (fig. 3)

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