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COMPLIENCE OF SCHOOLCHIDREN'S DIET WITH THE PRINCIPLES OF HEALTHY NUTRITION. THE ROLE OF EDUCATIONAL PROGRAMS

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ABSTRACT. Preserving and strengthening the health of children and adolescents turn out to be urgent problems in the modern world and a necessary condition for the existence and prosperity of the country. Non-communicable diseases (NCDs) are the main causes of the deterioration in the health status of the population. One of the predictors of NCDs is the increase in the number of overweight and obese children. Primary prevention is the most popular and effective measure to avoid the development of diseases. The issues of healthy nutrition such as the prevention of non-communicable diseases are in the focus of close attention not only of the medical community, but also of the state organs. National projects have been developed and are being successfully implemented in Russia. Teaching of the principles of a healthy lifestyle must be carried out from a child's very early age and the role of the family remains paramount, but it should not be neglected that most of the time the child spends within the walls of educational institutions. The purpose of our work was to survey adolescents to assess the level of knowledge about healthy nutrition and its application in everyday life alongside further training of the principles of healthy nutrition. Schoolchildren aged 10 to 17 years old living in various regions of the Russian Federation took part in the study on the basis of the FGBOU VDC "Orlyonok". A program developed presents 12 topics, combined into three content modules, and after the cause of training is completed, the children were asked to fill out a questionnaire. All children participating in the survey were trained and were engaged in the program "Fundamentals of Healthy Nutrition", the purpose of which is to develop adolescents' knowledge, skills and abilities in the field of healthy nutrition as a component of a healthy lifestyle. The program is authorized by the staff of the FGBOU VDC "Eaglet". The medical substantiation and scientific support of the program was provided by the staff of the Department of Pediatrics named after Academician A.F. Tur, St. Petersburg State Pediatric Medical University of the Ministry of Health of Russia. The program is implemented in the format of an optional practice-oriented course for children by Orlyonok teachers with the provision of advisory and methodological assistance by Rospotrebnadzor. Statistical processing of the obtained results was carried out using the Microsoft Excel software package. Thus, educational projects for schoolchildren, when teachers and pediatricians work together, represent a useful format for teaching children and adolescents a healthy lifestyle.

KEY WORDS: schoolchildren; rational nutrition; healthy lifestyle rules; NCDs.

СООТВЕТСТВИЕ РАЦИОНА ШКОЛЬНИКОВ ПРИНЦИПАМ ЗДОРОВОГО ПИТАНИЯ. РОЛЬ ОБРАЗОВАТЕЛЬНЫХ ПРОГРАММ

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РЕЗЮМЕ. Сохранение и укрепление здоровья детей и подростков являются актуальными проблемами в современном мире и необходимым условием для существования и процветания страны. Основными причинами ухудшения состояния здоровья населения являются неинфекционные заболевания (НИЗ). Один из предикторов НИЗ — рост числа детей с избыточным весом и ожирением. Первичная профилактика является наиболее востребованной и эффективной мерой предотвращения развития заболеваний. Вопросы здорового питания как профилактика неинфекционных заболеваний находятся в центре внимания не только медицинской общественности, но и государства. В России разработаны и успешно реализуются национальные проекты. Воспитание по принципам здорового образа жизни необходимо осуществлять с самого раннего возраста, и роль семьи остается первостепенной, но большую часть времени ребенок проводит в стенах образовательных учреждений. Целью нашей работы было анкетирование подростков для оценки уровня знаний о здоровом питании и применения их в повседневной жизни с дальнейшим обучением принципам здорового питания. В исследовании на базе ФГБОУ ВДЦ «Орлёнок» приняли участие школьники в возрасте от 10 до 17 лет, проживающие в различных регионах Российской Федерации. Была разработана программа, которая представляет 12 тем, объединенных в три содержательных модуля, и после обучения детям было предложено заполнить анкету. Все дети-участники анкетирования прошли обучение, занимались по программе «Основы здорового питания», целью которой является формирование у подростков знаний, умений и навыков в сфере здорового питания как составляющей здорового образа жизни. Автор программы — коллектив ФГБОУ ВДЦ «Орлёнок». Медицинское обоснование и научную поддержку программы оказал коллектив кафедры педиатрии им. акад. А.Ф. Тура СПбГПМУ Минздрава России. Программа реализуется в формате факультативного практико-ориентированного курса для детей педагогами «Орлёнка» при оказании консультативно-методической помощи Роспотребнадзором. Статистическую обработку полученных результатов проводили с использованием пакета программ Microsoft Excel. Таким образом, образовательные проекты для школьников при совместной работе педагогов и врачей-педиатров представляют полезный формат для обучения детей и подростков здоровому образу жизни.

КЛЮЧЕВЫЕ СЛОВА: школьники; рациональное питание; правила ЗОЖ; НИЗ.

INTRODUCTION

The most urgent task of modern medicine is to preserve and strengthen the health of pediatric population and improve the quality of life.

Nowadays, noncommunicable diseases (NCDs), which have a long course and are generally characterized by slow progression, are the leading causes of health deterioration and one of the main causes of death in economically developed countries. The international medical community focuses on 4 groups of NCDs including cardiovascular diseases (46% of NCD deaths), oncology (22%), chronic respiratory diseases (10%) and diabetes mellitus (4%) [17, 31]. World Health Organization (WHO) statistics report that NCDs were responsible for 40.5 million, or 71%, of global deaths in 2016. [17, 18]. These diseases were responsible for 75% of all deaths in the Russian Federation [20]. Although NCDs mainly affect adults, most of them have their origins in behaviors inculcated during childhood and adolescence.

A pressing global problem, in particular, remains the growing number of overweight and obese children, which in turn are predictors of the growth of NCDs. Over the past four decades, the number of obese children and adolescents has increased 10-fold globally. From 2014 to 2018, the incidence of obesity among children in the Russian Federation aged 0–17 years increased by 21.4%, with primary morbidity increasing by 8.7% [6]. Overweight and obesity persist in 50–60% of children in later life [29].

It is well known that human health depends on lifestyle by 50%; therefore, primary prevention aimed at avoiding diseases by eliminating or neutralizing causative and predisposing factors is the most popular and effective measure to prevent the development of NCDs [31].

Healthy nutrition is undoubtedly the most important factor in preventing NCDs, promoting health and increasing life expectancy. The issues of healthy nutrition are in the center of attention both in the medical community and in the state since it forms a healthy lifestyle and prevents non-communicable diseases [12]. The Russian Ministry of Health defines a healthy lifestyle as a way of life aimed at preventing the occurrence and development of non-communicable diseases and characterized by the exclusion or reduction of behavioral risk factors, which include tobacco use, harmful alcohol consumption, irrational nutrition, physical inactivity, and maladaptive coping with stress [17].

Much attention is paid to the promotion of healthy lifestyles and nutrition, particularly among children and adolescents all over the world. Developed and developing countries have established extensive state programs and activities at the school level. It is emphasized that successful work with children and adolescents in this direction is especially relevant and effective through the joint collaboration of pediatricians and teachers [25–28].

Russia actively cooperates with many countries of the world in the field of NCDs prevention and promotion of healthy lifestyles among children and adolescents. In particular, within the framework of BRICS, a council on physical culture and sport (BRICSCESS) has been established. The functions of BRICSCESS are aimed at performing various tasks such as establishing links between institutions and organizations; promoting cooperation in research, teaching and mentoring between scientists; developing, organizing and promoting conferences, seminars, workshops, symposia, round tables; publishing new scientific information related to physical activity, sports science, lifestyle management and nutrition [22].

Russian health care has a great experience in promoting and shaping a healthy lifestyle for children both at the state level and at the level of schools and holiday camps. The USSR schools carried out large-scale work on the formation of a proper lifestyle and commitment to healthy nutrition. Professor I.I. Milman, the founder of the system of hygienic education, started to develop health lessons as early as in the 1920s. In his opinion, it is the school teacher who is the main figure in the process of teaching all schoolchildren ‘the technique of performing hygienic skills’ [5]. The issues of proper nutrition were discussed at home economics and biology lessons, class hours and school events were held.

At present, the state policy in the sphere of protection and strengthening of children’s and adolescents’ health, as well as formation of a healthy lifestyle is implemented in accordance with the Decree N 240 29.05.2017 of the President of the Russian Federation V.V. Putin. Correspondingly, 2018–2027 was declared as the Decade of Childhood [14]. By the Order of the Government of the Russian Federation N 122-r dated 23 January 2021, there was ap-

proved the plan of main activities carried out within the framework of the Decade of Childhood for the period up to 2027. [10]. In accordance with this Plan, one of the main tasks was 'the formation of healthy lifestyle skills and family health culture as a basic value' [10].

A range of Russian national projects have been successfully developed and implemented, among them — "Demography", "Promoting a Healthy Lifestyle" and "Healthy Nutrition" programs. The "Strategy for the formation of a healthy lifestyle, prevention and control of non-infectious diseases for the period up to 2025" has been approved [6].

Upbringing according to the principles of healthy lifestyle is necessary for a child from a very early age, from these positions the role of the family remains paramount [29]. However, starting from preschool age, children spend most of their time in educational institutions. School is the most important institution of socialization for children and adolescents today; the foundations of individual health are formed during the period of school education, which constitute the health of society as a whole [16]. School age is an extremely important period when a child develops and the lifestyle is formed, so that many eating and physical activity habits are reinforced or established. School-age children have more freedom in their food choices; many eat at least once a day out-of-home [23]. Allowing them to participate in food choices at home and providing them with positive encouragement can help them make 'healthy' choices outside the home. School-aged children's attitudes towards food and food choices may be influenced (positively or negatively) by family members, friends and/or the media [27]. Appearance issues and societal attitudes towards obese people can influence the eating behavior and nutritional status of older children [24].

Parental influence still remains strong, but children communicate more with their peers and begin to make their own decisions about food choices, studies, and extra activities without direct parental supervision. At the same time, the time of food intake and its quality may not correspond to the physiological needs of a child. In adolescence, children may no longer find their favorite sports and hobbies interesting and replace them with sedentary activities or social networks.

Schools may offer effective opportunities to work on the development of healthy eating habits in children. That is why school and other educational institutions should become the most important link in the process of preserving and improving the health of students and promoting healthy lifestyles in general and healthy eating in particular.

However, despite the urgency of this task, and official recognition of its importance, issues of nutrition education still remain underdeveloped [2, 4]. Low awareness of teachers in educational institutions in relation to healthy lifestyle is one of main problems [19]. In addition, the material is presented in a boring or inaccessible form, and there is no personal example [21, 28], which also undermines confidence in the information. At the same time, pediatricians who have the necessary medical knowledge may not have the experience and ability to present this information to a large pediatric and/or adolescent audience. Thus, in modern conditions, the search for effective methods of forming healthy lifestyle attitudes in children and adolescents is relevant.

AIM

To assess the level of adolescents' knowledge about healthy eating and its use in everyday life by means of questionnaires. To teach schoolchildren the principles of healthy eating in a playful way.

MATERIALS AND METHODS

The study was conducted on the basis of the Federal State Budgetary Educational Institution All-Russian Children's Center "Orlyonok", director A.V. Dzheus, from October to December 2021 and involved 4267 children aged 10 to 17 years residing in different regions of the Russian Federation.

The staff of the Department of Paediatrics named after Academician A.F. Tur of the Federal State Budgetary Educational Institution of Higher Education "St. Petersburg State Pediatric Medical University" gave distance lectures for the teachers of RCC "Orlyonok". These lectures focused on rational nutrition, physical development and medical aspects of schoolchildren's movement regime as part of the joint project "Fundamentals of Healthy Nutrition" in March–May 2021.

The "Orlyonok" team developed a program under the general editorship of L.V. Spirina,

Deputy Director for Educational Activities, Personnel Management and Public Relations, and L.R. Sayfutdinova, Head of the Department of Educational Programs of RCC "Orlyonok", which presents 12 topics united in three content modules: 'Talking about health and proper nutrition', "Formula of proper nutrition", "Movement is life".

Children were asked to fill out a questionnaire after the sessions, which was compiled at the Department of Paediatrics named after Acad. A.F. Tur. The answers were anonymized and ethical committee permission to conduct the study was obtained.

Statistical processing of the obtained results was performed using Microsoft Excel software package.

RESULTS

A total of 4267 children (boys — 1845 (43%), girls — 2422 (57%)) responded to the questionnaire. The ages of the children ranged from 10 to 17 years, with the majority being 13 to 15 years old (Fig. 1).

Respondents lived in different regions of Russia, the largest number of children came to "Orlyonok" from the Central Federal District — 41.2%, 16% — from the Southern Federal District, from the Urals — 11.1%, from the North-West — 8.86%, from Siberia — 8.86%, from the Far East — 6.8%, from the Volga Region — 3.42%, from the Republic of Crimea — 0.3% and from other regions of Russia — 4.01% (Fig. 2). There was no significant difference in dietary intake depending on the region of residence and age of respondents.

Schoolchildren's breakfast should contain a sufficient amount of nutrients and calories to cover the upcoming energy expenditures. Breakfast should be dense and necessarily include a hot dish — cereal, cottage cheese, egg or meat [30]. The majority of schoolchildren preferred sandwiches (38%) and porridge (27%) for breakfast, more rarely children used eggs (11%), muesli (8%) and cottage cheese (8%) (Fig. 3).

The questionnaire survey revealed that 76% of children consumed meat daily or 3–4 times a week. Children who get meat 1–2 times a week accounted for 22%, and 2% of children do not eat meat (Fig. 4). The diet of school-aged children should include daily meat consumption, preferably of different varieties [6]. Consumption of meat 1–2 times a week or a complete refusal indicates a deficiency of animal protein and haem iron in almost a quarter of the children examined.

It is recommended that children should consume fish 2–3 times a week [6]. In our study 57% of children responded that they get fish in

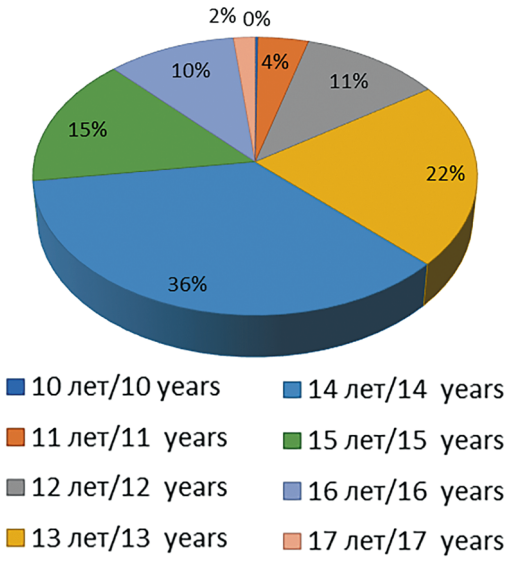

Fig. 1. Distribution of children by age

Рис. 1. Распределение детей по возрасту

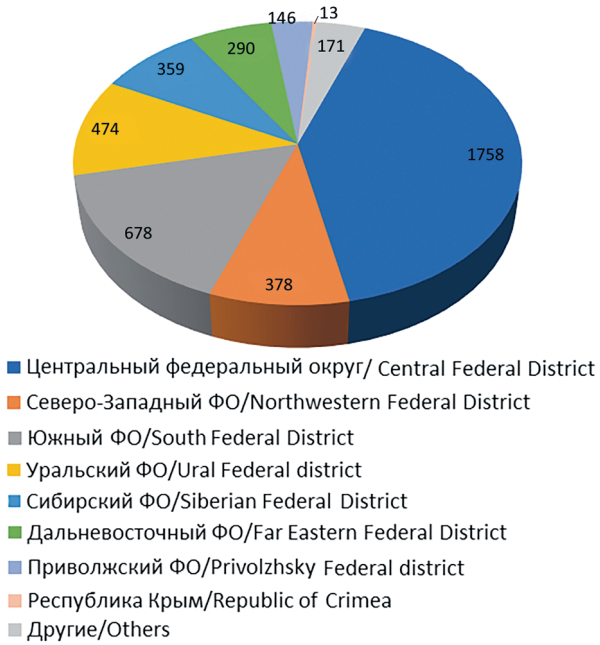

Fig. 2. Distribution of children by residential region: FD — Federal District

Рис. 2. Распределение детей по регионам проживания: ФО — федеральный округ

their diet 1–2 times a week, in 13% — 3–4 times a week, 26% do not eat fish (Fig. 5).

Overall, the percentage of fish consumption is quite high. However, a quarter of children do not eat fish, which is a source of easily digestible protein, polyunsaturated fatty acids, a number of vitamins and minerals.

Analyzing the questionnaires, it was established that 38% of children receive milk daily, 27% — 3–4 times a week, and 12% of children do not drink milk (Fig. 6). Milk protein and other components of milk meet the needs of children's organism to the maximum extent, and therefore it must be included in the diet and should not be substituted (in the absence of allergic reactions to cow's milk protein). The daily allowance of milk for school-age children is 500 ml [9].

Only 27% of children consume dairy products daily, 24% consume them 3–4 times a week, 40% consume them 1–2 times a week, and 9% do not consume dairy products (Fig. 7).

Consumption of fermented milk products in children is recommended in the amount of 200 ml of fermented milk drink, 60–70 g of cottage cheese, 10–20 g of sour cream and 10–15 g of cheese daily [3, 11]. Sour-milk products are sources of animal protein and also improve the intestinal microbiota.

Milk and dairy products are an indispensable source of calcium, it is difficult to meet the daily requirement for this important nutrient without sufficient intake.

Pasta and potatoes are consumed as a side dish to meat by 71% of children, and vegetables in stewed or raw form — by 15% (Fig. 8). The daily amount of carbohydrates in a child's diet should amount to 300–400 g, with no more than 100 g of simple carbohydrates, the bulk of which should be complex carbohydrates contained in cereals, legumes, and coarse bread [12].

Sufficient amounts of complex carbohydrates, which are the main sources of energy like simple carbohydrates, allow to avoid glucose spikes and utilize the energy gained rationally, since complex carbohydrates are digested slower. Potatoes are included in the list of complex carbohydrates, but their glycemic index is high and they are rapidly digested.

Schoolchildren in the study group have a significantly low consumption of vegetables, which should be present in daily diet as a source of vitamins and fibre [1]. Regular consumption of foods which are rich in soluble dietary

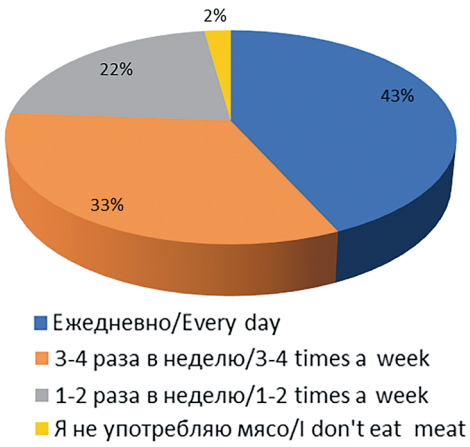

Fig. 4. Frequency of meat consumption per week

Рис. 4. Кратность употребления мяса в неделю

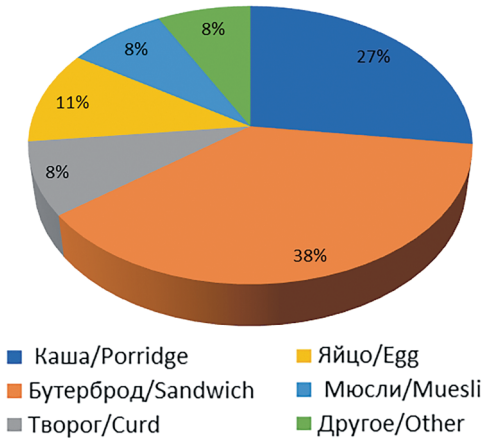

Fig. 3. Breakfast food preference

Рис. 3. Предпочтение продуктов на завтрак

Fig. 5. Frequency rate of fish consumption per week

Рис. 5. Кратность употребления рыбы в неделю

fiber reduces cholesterol levels, stabilises blood sugar and reduces fat absorption, which may reduce the risk of cardiovascular disease and circulatory disorders later in life. Soluble fiber is a prebiotic and is a substrate for the growth of beneficial microorganisms living in the colon [13].

According to the questionnaire survey data (Fig. 9), children consumed the following foods more than 3 times a week: potatoes, pasta and dumplings — 20%, fruits — 20%, bananas — 11%, candies — 16%, pastries and cakes — 17%, chips — 6%, nuts — 5%. Thus, only 31% of children regularly consume fruits. The rest of children consume high-carbohydrate foods frequently and in large quantities.

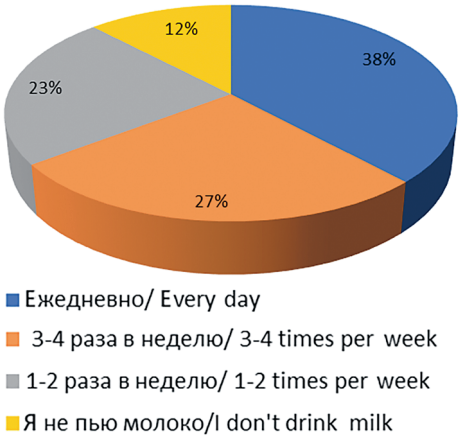

Fig. 6. Multiplicity of milk consumption

Рис. 6. Кратность употребления молока

Fig. 7. The frequency of consumption of fermented milk products

Рис. 7. Кратность употребления кисломолочных продуктов

Children prefer tea or coffee with sugar — 40% or without sugar — 26%, juices — 13%, other drinks were used much less frequently (Fig. 10). The beverages recommended in children include: tea (preferably herbal or fruit), cocoa drink, and chicory-containing drinks [11]. Coffee consumption is undesirable on a daily basis.

Children more often consume fruit (30%), pastries (22%) or chocolate bars such as Snickers, Twix (18%) as a snack (Fig. 11). The use of products with a high level of added sugar (more than 38 g — not more than 10% of the daily requirement in carbohydrates), as

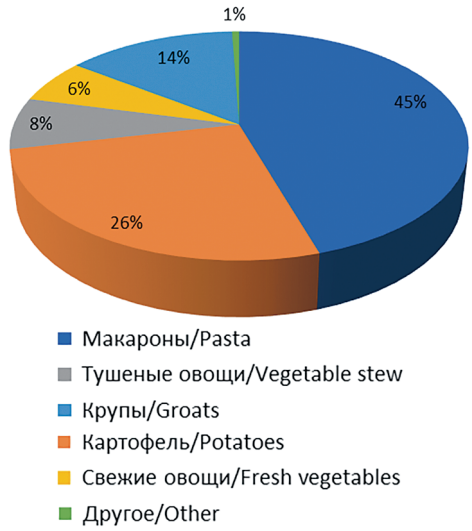

Fig. 8. Garnish for meat

Рис. 8. Гарнир к мясу

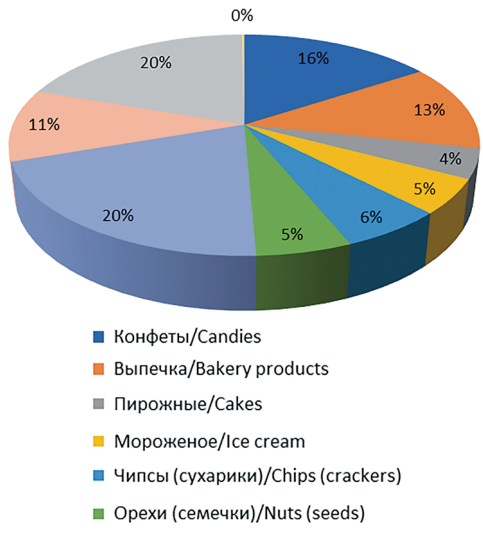

Fig. 9. Foods consumed more than 3 times a week

Рис. 9. Продукты, употребляемые более 3 раз в неделю

well as those containing cooking or confectionery fat, is not recommended in children's nutrition [15, 16].

According to the conducted questionnaire survey, 53% of children visit fast food restaurants not more than once a month, in 20% of cases — once a week, 16% of schoolchildren answered that they have never tried such food (Fig. 12).

All children who participated in the survey were trained in the "Basics of Healthy Eating" program. This program is based on the concept of creating educational programs on healthy nutrition in order to implement the National Project "Demography", part of the federal project "Forming a system of motivation for healthy lifestyles, including healthy eating and avoidance of bad habits (Strengthening Public Health)".

The goal of the "Basics of Healthy Eating" program was to provide adolescents with knowledge, skills and abilities in the area of healthy and safe eating as a component of a healthy lifestyle.

The implementation of the program makes it possible to achieve the following results:

1) the acquired knowledge allows adolescents to navigate in the assortment of the most typical food products, consciously choose the most useful ones;
2) adolescents are able to evaluate and control their diet and eating habits from the point of view of compliance with the requirements of a healthy lifestyle;
3) adolescents independently evaluate their diet from the point of view of its adequacy and conformity to their lifestyle;

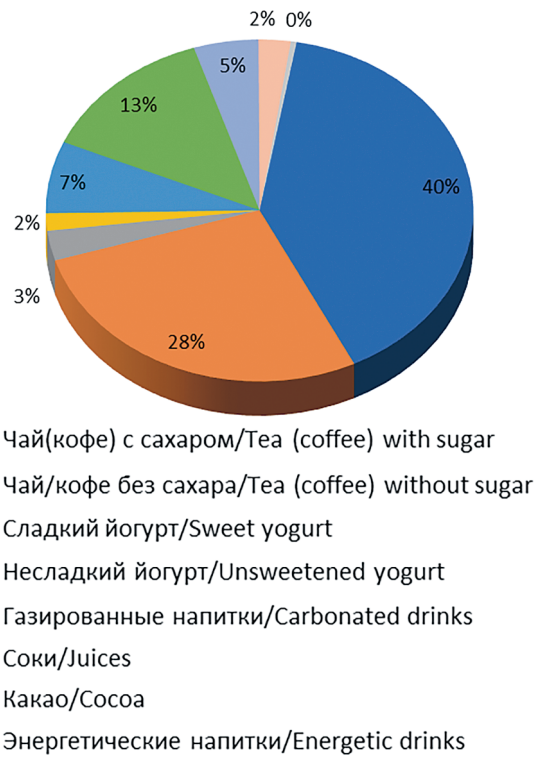

Fig. 10. Drinks consumed more than 3 times a week

Рис. 10. Напитки, употребляемые более 3 раз в неделю

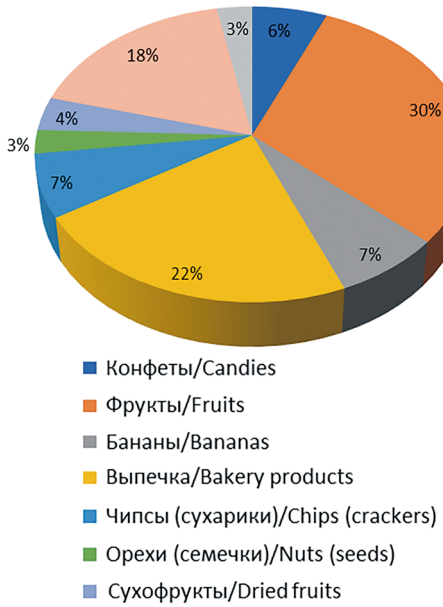

Fig. 11. Foods used as a snack

Рис. 11. Продукты, используемые в качестве перекуса

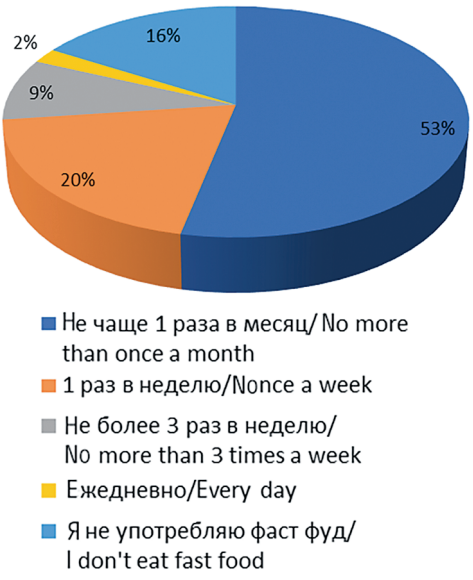

Fig. 12. Frequency of consumption fast food

Рис. 12. Частота употребления фастфуда

4) adolescents master various forms of motor activity in accordance with the loads they can bear.

The program is implemented as an optional practice-oriented course of additional development program for children's camps by educators, secondary school teachers, instructors in physical education, sports and tourism, methodologists, staff of the nutrition department and health protection department with the support and advisory and methodological assistance of Rospotrebnadzor.

The forms and methods used were interactive: heuristic classes, intellectual and creative games, culinary master classes, contests, presentations, discussions, motor activity classes, theatrical performances, etc. The program involves collective and independent work of adolescents, demonstration of the results of participation in practical activities.

The Program consisted of three modules. The first module "Talking about Health and Good Nutrition" was a series of games and interactive sessions, activities aimed at mastering different ways of motor activity. The second module was an educational internship on the basis of "Orlyonok" canteens. It included familiarization with the stages of cooking, studying the menu of the day and presenting it through various creative forms, tasting of Krasnodar tea with a story about its properties, preparation, growing area, master class on table setting. The third module — "Festival-Competition 'National Cuisine of Russia'" — consisted of educational platforms in the areas of "Culture and traditions of food of the peoples of Russia", "Technology and food", competition of culinary teams. The competition was implemented by specialists of the catering department, school, workshop of applied and artistic creativity, children's innovation center of aviation and astronautics, instructors for physical culture, sports and tourism.

The program's advantages are coverage of a large number of teenagers from different regions during the health recreation period, and work in teams.

According to the results of the questionnaire survey, the majority of children agreed (74%) that they learned a lot of new and beneficial things that will be useful in their future life, and 26% said that the classes did not add any new knowledge (Fig. 13).

After taking the classes, 39% of children said that they always knew and followed the rules of healthy lifestyle, but the majority of children (61%) promised to reconsider their diet and physical activity (Fig. 14).

CONCLUSION

Educational projects during recreation in children's health centers, joint work of teachers and pediatricians is a useful tool for the formation of a healthy lifestyle among adolescents.

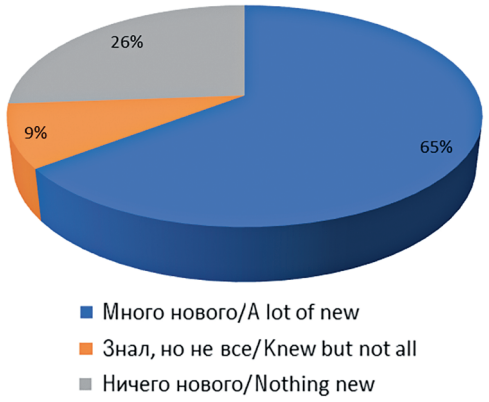

Fig. 13. Have you learnt anything new from the educational program?

Рис. 13. Узнал ли ты что-то новое из образовательной программы?

Fig. 14. Will you change anything in your diet and lifestyle when you leave the camp?

Рис. 14. Изменишь ли ты что-то в своем питании и образе жизни, когда вернешься из лагеря?

ADDITIONAL INFORMATION

Author contribution. Thereby, all authors made a substantial contribution to the conception of the study, acquisition, analysis, interpretation of data for the work, drafting and revising the article, final approval of the version to be published and agree to be accountable for all aspects of the study.

Competing interests. The authors declare that they have no competing interests.

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Consent for publication. Written consent was obtained from the patient for publication of relevant medical information within the manuscript.

ДОПОЛНИТЕЛЬНАЯ ИНФОРМАЦИЯ

Вклад авторов. Все авторы внесли существенный вклад в разработку концепции, проведение исследования и подготовку статьи, прочли и одобрили финальную версию перед публикацией.

Конфликт интересов. Авторы декларируют отсутствие явных и потенциальных конфликтов интересов, связанных с публикацией настоящей статьи.

Источник финансирования. Авторы заявляют об отсутствии внешнего финансирования при проведении исследования.

Информированное согласие на публикацию. Авторы получили письменное согласие пациентов на публикацию медицинских данных.

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