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Energy Value and Diet Structure in the Management of Childhood Obesity: A Comparative Analysis of National Models (Systematic Review)

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Abstract

Introduction. Childhood obesity remains one of the most pressing medical and social challenges, associated with a high risk of metabolic and cardiovascular complications. Despite the common basic principles of diet therapy, approaches to regulating energy intake and dietary structure vary significantly between countries.

Objective is to conduct a comparative analysis of current approaches to dietary therapy for childhood obesity in Russia and China, to identify conceptual differences, evaluate their effectiveness, and determine prospects for unification.

Materials and methods. A targeted literature review was performed using the databases PubMed, Scopus, Cochrane Library, eLibrary.ru, and CNKI for the period 2017–2025, following the PRISMA 2020 methodology. A total of 46 publications were included in the analysis, comprising national clinical guidelines, expert consensus statements, systematic reviews, and original studies.

Results. According to Russian clinical guidelines, diet therapy is based on a normocaloric diet aimed at physiological normalization of nutrition and maintenance of growth rates. The Chinese model emphasizes controlled reduction of dietary energy density with active participation of families and schools. Both models acknowledge the importance of a multicomponent and behavioral approach, but differ in organizational structure and level of energy intake restriction.

Conclusion. The optimal degree of energy restriction in childhood obesity remains insufficiently studied. To improve the effectiveness and safety of dietary interventions, multicenter studies and standardization of evaluation criteria are required.

Keywords: childhood obesity, diet therapy, energy intake, diet composition, Russia, China, Russian Federation, People's Republic of China

Conflict of interest. Olga P. Kovtun is the editor-in-chief of *Ural Medical Journal*; she did not participate in reviewing and reviewing the material, as well as in making a decision on its publication. The other authors declare the absence of obvious or potential conflicts of interest.

Conformity with the principles of ethics. This review is based solely on the analysis of published sources and does not include any research involving human participants or animals; therefore, informed consent was not required. The study was conducted in accordance with the Declaration of Helsinki (2013) and international standards for systematic and narrative reviews (PRISMA 2020).

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Энергетическая ценность и диетическая структура рациона в терапии детского ожирения: сравнительный анализ национальных моделей (систематический обзор)

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Аннотация

Введение. Детское ожирение остается одной из наиболее актуальных медико-социальных проблем, сопряженных с риском метаболических и сердечно-сосудистых осложнений. Несмотря на общность базовых принципов диетотерапии, подходы к регулированию энергетической ценности и структуры рациона существенно различаются между странами.

Цель — провести сравнительный анализ современных подходов к диетотерапии детского ожирения в России и Китае, определить их концептуальные различия, эффективность и перспективы унификации.

Материалы и методы. Выполнен целевой обзор литературы в базах данных PubMed, Scopus, Cochrane Library, eLibrary.ru и CNKI за 2017–2025 гг. с использованием методологии PRISMA 2020. В анализ включено 46 публикаций, включая национальные клинические рекомендации, экспертные консенсусы, систематические обзоры и оригинальные исследования.

Результаты. В России диетотерапия рассматривается как основной немедикаментозный метод лечения и основана на нормокалорийном рационе, направленном на физиологическую нормализацию питания и сохранение темпов роста без ограничения калорийности. Вмешательство реализуется преимущественно в рамках семейной модели, предусматривающей совместное участие врача и родителей в изменении питания, физической активности и поведенческих привычек ребенка. В Китае, согласно экспертному консенсусу, диетотерапия строится на контролируемом постепенном снижении энергетической плотности рациона до достижения рекомендованного уровня и включает интеграцию медицинского, семейного и школьного уровней: участие родителей и педагогов рассматривается как обязательный компонент коррекции пищевого и двигательного поведения. Основные различия касаются степени энергокоррекции и механизмов реализации — от индивидуально-семейного подхода в России до социально интегрированного, школьно-ориентированного в Китае.

Заключение. Оптимальная степень ограничения энергетической ценности при детском ожирении остается недостаточно изученной. Для повышения эффективности и безопасности диетических вмешательств необходимы многоцентровые исследования и унификация критериев оценки результатов.

Ключевые слова: детское ожирение, диетотерапия, энергетическая ценность, рацион, Россия, Китай, Российская Федерация, Китайская Народная Республика

Конфликт интересов. О.П. Ковтун — главный редактор «Уральского медицинского журнала»; не принимала участия в рассмотрении и рецензировании материала, а также принятии решения о его публикации. Остальные авторы заявляют об отсутствии явных и потенциальных конфликтов интересов.

Соответствие принципам этики. Обзор основан исключительно на анализе опубликованных источников и не включает в себя какие-либо исследования с участием людей или животных. Работа проводилась в соответствии с Хельсинкской декларацией (2013) и международными стандартами систематических и описательных обзоров (PRISMA 2020).

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Relevance

Childhood obesity remains one of the most pressing public health challenges worldwide, including in countries with rapidly changing social and economic conditions such as the People's Republic of China (PRC) and Russia.

In the PRC, the prevalence of childhood obesity has increased dramatically over the past decades, particularly in metropolitan and economically developed regions — from 0.1 % in 1985 to 8.1 % in 2019 [1]. Although growth rates have stabilized in recent years, the frequency of obesity-related complications continues to rise [2].

In Russia, according to representative national data from the Federal State Statistics Service and the Federal Research Centre of Nutrition, overweight is observed in 18.0 % of children and obesity in 9.1 % [3]. Thus, in both the PRC and Russia, childhood obesity represents a serious challenge for healthcare systems, carrying not only social but also biological consequences.

Overweight and obesity in childhood remain significant medical and social problems, associated with a high risk of developing metabolic disorders [4], cardiovascular diseases [5], and lower quality of life in adulthood [6].

Modern national and international clinical guidelines consider dietary therapy and regulation of energy balance as central components of the prevention and treatment of childhood obesity [7, 8]. Dietary interventions are recommended in combination with physical activity and behavioral support [9, 10]. Most guidelines allow for a controlled energy deficit, while the macronutrient composition of the diet is viewed as a secondary factor compared with overall energy balance [11].

The need for personalized nutrition, taking into account cultural, social, and age-specific factors, as well as family involvement in forming sustainable eating behaviors, is increasingly emphasized [12, 13]. Despite these universal principles, the optimal degree of energy restriction ensuring a balance between growth safety and therapeutic efficacy remains unclear, which determines the relevance of the present review.

The objective is to analyze modern approaches to regulating the energy value and dietary structure in the diet therapy of childhood obesity based on current clinical guidelines and scientific publications, to compare national models, and to identify optimal directions for improving the efficacy and safety of dietary interventions in children.

Materials and methods

A targeted literature search was conducted in the databases PubMed, Scopus, Cochrane Library, eLibrary.ru, and CNKI¹, covering the period from January 2017 to January 2025. The aim of the search was to identify publications addressing dietary therapy and regulation of energy balance in childhood obesity.

The search included combinations of keywords and MeSH² terms: childhood obesity, pediatric obesity, diet therapy, energy restriction, caloric intake, diet composition, nutrition guidelines, Russia, PRC, children, adolescents, as well as their Russian and Chinese equivalents (Russian: детское ожирение, диетотерапия, энергетическая ценность, рацион питания, Россия; Chinese: 中华人民共和国). The search strategy was adapted for each database according to indexing features.

A total of 312 publications were identified, and after removing 115 duplicates, 197 records were included in the initial screening. Following the review of titles and abstracts, 114 publications were excluded as irrelevant (e.g., not related to dietary therapy or pediatric populations). During the full-text assessment, 83 articles were evaluated, of which 37 were excluded for the following reasons:

¹ CNKI — China National Knowledge Infrastructure.

² MeSH — Medical Subject Headings.

- 1) absence of data on dietary therapy or energy balance regulation ($n = 14$);
- 2) focus on pharmacological or surgical treatment ($n = 5$);
- 3) inclusion of adult or mixed-age populations without a separate pediatric subgroup ($n = 10$);
- 4) insufficient methodological detail or missing outcome data ($n = 5$);
- 5) duplicate or secondary publications ($n = 3$).

Finally, 46 publications meeting the inclusion criteria were included in the final analysis. These comprised national clinical guidelines, expert consensus statements, systematic and umbrella reviews, and original studies describing dietary therapy strategies for childhood obesity in Russia and the PRC. The study selection process followed the PRISMA¹ 2020 guidelines [14] and is illustrated in figure.

Inclusion criteria:

- 1) national and international clinical guidelines, expert consensus statements, and systematic reviews on nutrition and energy balance regulation in childhood obesity;
- 2) original studies describing dietary structure, degree of energy restriction, and clinical outcomes in children and adolescents;
- 3) publications in Russian, English, or Chinese.

Exclusion criteria:

- 1) studies focused exclusively on pharmacological or surgical treatment of obesity;
- 2) publications without full-text access or insufficient description of dietary components and outcomes;
- 3) studies not involving pediatric populations.

The selection of publications was performed by two independent reviewers, with discrepancies resolved by discussion until consensus was reached. Data extraction was carried out using a standardized form specifying the publication type, year, country, dietary approach characteristics, and outcome measures (BMI-SDS², body composition, metabolic markers, behavioral parameters).

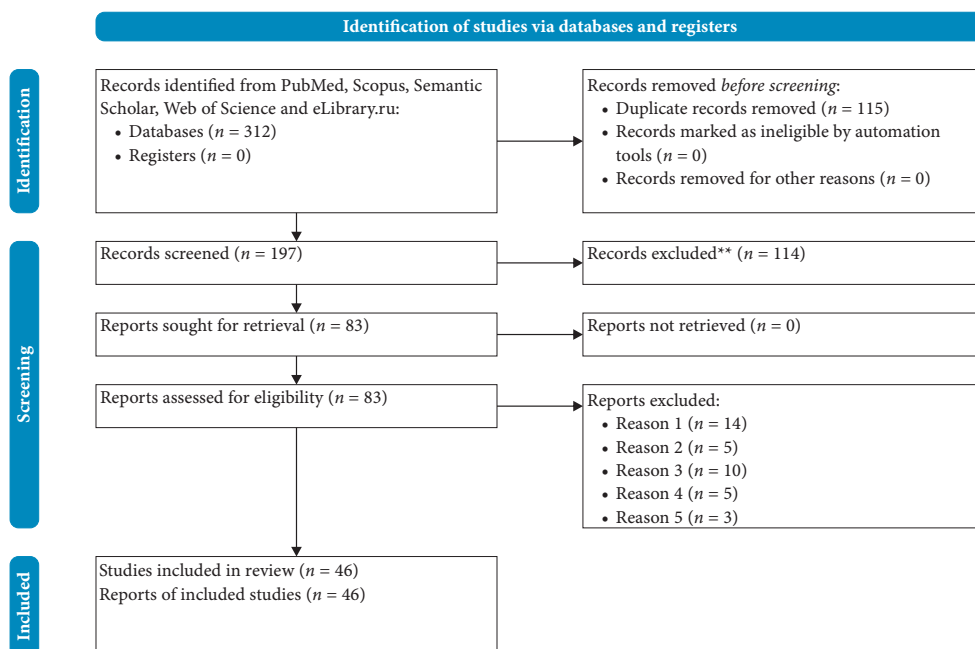


Fig. PRISMA 2020 Flow Diagram for Study Selection

¹ PRISMA — Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

² BMI-SDS — body mass index standard deviation score.

Results

Core Principles of Dietary Therapy for Childhood Obesity

Modern international and national clinical guidelines consider dietary therapy as a central component of comprehensive treatment for childhood obesity [7, 9]. The multicomponent approach is recognized as optimal, combining balanced nutrition, behavioral modification, increased physical activity, and sleep normalization, with the active involvement of families and multidisciplinary specialists [15–17].

The primary goals of dietary therapy are to stabilize or gradually reduce body weight while maintaining growth velocity, to prevent nutritional deficiencies, and to promote the development of sustainable healthy eating behaviors [9, 17]. Personalization of dietary plans is recommended, taking into account the child's age, cultural background, and family food preferences [12].

Universal components of a balanced diet include reducing dietary energy density by eliminating sugar-sweetened beverages, limiting added sugars, refined grains, and ultra-processed foods, and simultaneously increasing the consumption of vegetables, fruits, whole grains, and protein sources [18, 19].

All major guidelines emphasize the importance of regular physical activity — at least 60 minutes per day of moderate-to-vigorous intensity — in combination with dietary interventions, as this significantly enhances treatment effectiveness [9, 17, 19]. At the same time, adequate sleep and reduction of screen time are highlighted as important behavioral factors influencing appetite regulation and overall energy balance [16, 19].

A family-centered and multidisciplinary approach is considered essential for successful intervention. Parents play a key role in shaping the home food environment, modeling eating behaviors, and providing emotional support. Family-based programs that include parental education and joint lifestyle modification demonstrate greater and more sustainable results compared to individual interventions [20, 21].

Behavioral techniques such as goal setting, self-monitoring, positive reinforcement, and problem-solving strategies are integral to improving adherence and outcomes [22, 23]. The effectiveness of interventions increases when programs last for at least six months and are implemented by trained professionals following a structured protocol [23].

Thus, the key principles of dietary therapy for childhood obesity are consistent across existing recommendations. Diet is not viewed in isolation but as part of a multicomponent strategy, though differences persist in approaches to energy regulation and dietary composition, determining the degree of permissible calorie restriction and methods of nutritional correction. The analysis of these models, their effectiveness, and safety is presented in the following section.

Approaches to Regulating Energy Value and Dietary Structure

Russian Model

According to the Russian clinical guidelines “Childhood Obesity” (Ministry of Health of the Russian Federation, 2024) [24], dietary therapy is considered the foundation of non-pharmacological treatment, along with increased physical activity and correction of eating behavior.

The main therapeutic goal is to maintain the BMI-SDS in the short term and to achieve its gradual reduction in the long term while ensuring normal physical and somatic development of the child.

The core principle is the use of a normocaloric diet that meets the child's age and physiological needs, providing adequate amounts of proteins, carbohydrates, vitamins, and minerals, with only the minimally necessary amount of fats [25].

Such a diet is not aimed at creating an artificial energy deficit but rather at returning to a physiological norm of nutrition, which promotes weight reduction without impairing growth or puber-

tal development. Given the initially elevated energy intake in children with obesity, the transition to a normocaloric diet naturally forms a spontaneous energy deficit relative to the habitual diet. This makes the approach a gentle and physiologically safe form of energy adjustment, not requiring conscious caloric restriction and preventing nutritional deficiencies [10, 26].

Practical implementation of the normocaloric approach includes eliminating sugar-sweetened beverages, limiting sweet fruits to one serving per day (≈ 100 g), ensuring a mandatory breakfast and four meals per day, controlling portion sizes using the “balanced plate” model, and increasing consumption of vegetables (300–400 g per day depending on age), whole grains, and dietary fiber.

Children are encouraged to eat slowly and without distractions, which helps establish sustainable eating habits [24, 25].

The advantages of the normocaloric approach include physiological safety, preservation of growth rates, high adherence among children and families, and the potential for long-term compliance without significant hunger [27].

Its main limitation is the slow rate of weight loss, which complicates short-term evaluation of effectiveness and may reduce motivation to continue therapy.

Chinese Model

In the Chinese Expert Consensus on Diagnosis, Assessment, and Management of Obesity in Children [28], dietary therapy is also recognized as the core of non-pharmacological treatment, implemented in combination with behavioral modification, increased physical activity, and sleep regulation [10, 29].

The objective is to achieve energy balance, normalize growth rates, and prevent metabolic disorders.

The primary principle of the Chinese model is the control of food volume and energy density while maintaining nutritional adequacy and meeting the age-related needs for macro- and micro-nutrients [10, 28].

This approach aims to achieve a gradual and safe reduction in energy intake without strict caloric restriction and without the risk of nutritional deficiencies.

For practical implementation, the “traffic light” food system is recommended, dividing foods into three categories:

- 1) Green group — preferred foods forming the diet base (vegetables, fruits, low-fat dairy products, water, whole grains);
- 2) Yellow group — moderate consumption;
- 3) Red group — limited foods (sugar-sweetened beverages, fried, fatty, or fast foods) [30].

If no significant improvement in weight dynamics is observed after initial dietary restructuring, a further moderate reduction of energy intake may be considered through control of portion size and energy density, under medical supervision and with regular assessment of growth and nutritional status [10].

The guidelines emphasize that dietary interventions must be combined with regular physical activity — at least 60 minutes per day of moderate-to-vigorous exercise, including aerobic or resistance training at least three times per week — and with screen time limited to no more than two hours per day [31, 32].

Sleep hygiene is regarded as an essential component of both treatment and prevention: if sleep disturbances are identified, targeted interventions and family education on “healthy sleep” practices are recommended [33, 34].

The advantages of the controlled approach include physiological safety, long-term sustainability, and integration into both school and family environments. Limitations include dependence on family and school discipline, the need for continuous supervision, and moderate weight loss rates compared to programs with direct energy restriction.

Comparative Analysis of Approaches

The Russian and Chinese models of dietary therapy for childhood obesity share common principles of safety, comprehensiveness, and behavioral orientation, yet differ in the degree of energy balance regulation and in the role of the social environment in implementing recommendations.

In the Russian clinical guidelines, dietary therapy focuses on restoring the physiological norm of nutrition. A normocaloric diet ensures adequate intake of essential nutrients, and weight reduction occurs naturally through decreased excessive energy consumption. This approach emphasizes physiological safety, preservation of normal growth and pubertal development, and the formation of sustainable family eating habits under medical supervision.

The Chinese model pursues the same goals but emphasizes active control of food volume and energy density, development of mindful eating behavior, and long-term supervision. Dietary therapy is integrated with physical activity, sleep correction, and psychological support. Unlike the Russian model, the Chinese recommendations explicitly involve the school environment: management of diet, physical activity, and daily routine is carried out with the participation of parents, teachers, and healthcare professionals, with a recommended duration of at least one year.

Thus, the Russian approach is characterized by physiological normalization of nutrition within a family-medical framework, while the Chinese strategy focuses on socially integrated lifestyle management, in which school and family act as key partners in the prevention and treatment of childhood obesity.

Challenges and Unresolved Issues

Despite the expanding body of evidence, dietary therapy for childhood obesity remains an area with several methodological and practical uncertainties [9]. One of the key challenges is determining the optimal degree of energy restriction that enables weight reduction while maintaining safety for growth and development [10].

Current clinical guidelines allow for moderate energy reduction, emphasizing the need for individualized dietary planning, but they do not define uniform thresholds or algorithms for caloric deficit assignment, taking into account the child's age, degree of obesity, and level of physical activity [17]. Comparative studies indicate that continuous and intermittent energy restriction regimens produce comparable short-term reductions in BMI-SDS and do not negatively affect linear growth or nutritional status during 6–12 months of follow-up [35–37].

However, the long-term consequences of moderate energy restriction, including potential effects on pubertal development and nutritional adequacy, remain unclear due to the lack of multicenter studies lasting longer than one year [35, 37]. Another critical issue is the limited evidence on long-term outcomes: most studies have a follow-up period of less than one year, making it difficult to assess the sustainability of weight reduction and the impact of dietary energy adjustment on growth, puberty, and nutritional status [19, 38, 39]. The effectiveness of interventions tends to decline after the program ends, especially in the absence of structured post-intervention support and family or school engagement, underscoring the need for multilevel and long-term prevention models [17, 40].

Cultural and Contextual Adaptation

Cultural and contextual adaptation remains a major challenge when transferring successful intervention models between countries. Despite the increasing number of adapted programs, reporting on their development and implementation quality remains incomplete.

In Russian and Chinese practice, the effectiveness of dietary therapy is ensured through different organizational models. In the PRC, schools and families play a key role in implementing nutrition, physical activity, and daily routine management programs [41], which helps to foster sustainable behavioral changes within the child's natural social environment [42]. In Russia, the leading role belongs to pediatricians and parents, who ensure rationalization of nutrition and correction of eating behavior in the home setting [24].

Another unresolved issue is the lack of unified criteria for evaluating the effectiveness of dietary interventions. Studies use heterogeneous endpoints — BMI, BMI-SDS, body composition, biochemical markers, and indicators of physical activity and behavior — which makes meta-analytical integration of the data impossible [43–45]. Methods for assessing adherence and intervention “dose” are not standardized [46], further reducing the quality of evidence [11].

Thus, the further development of dietary therapy for childhood obesity requires multicenter studies with long-term follow-up, age and sex stratification, detailed description of the degree (“dose”) of energy adjustment, cultural adaptation, and use of a standardized outcome set — BMI-SDS, body composition, metabolic markers, and adherence. Addressing these challenges will enhance data comparability and help identify optimal directions for improving the efficacy and safety of dietary interventions in children [8, 9].

Conclusion

The conducted analysis demonstrated that both the Russian and Chinese models of dietary therapy for childhood obesity are based on shared principles — ensuring physiological safety, nutritional adequacy, and the formation of sustainable eating behaviors — but differ in their approaches to energy balance regulation and organizational mechanisms of implementation.

In Russian practice, the key element remains the normocaloric diet, aimed at restoring physiological nutrition without deliberate caloric restriction. In the PRC, the predominant approach is controlled energy management, focusing on regulating portion size and energy density of food, with integrated family-school participation and behavioral supervision.

Despite the common objectives of dietary therapy, the evidence base regarding long-term sustainability and the optimal degree of energy restriction remains limited, emphasizing the need for further research and standardization of evaluation criteria for efficacy and safety.

A promising direction for future work is the implementation of cross-national comparative studies to determine safe ranges of energy adjustment, to unify outcome criteria (BMI-SDS, body composition, metabolic parameters), and to develop culturally and behaviorally tailored programs that integrate both family and educational environments.

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