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How Has the Approach to Treating Childhood Obesity Changed in Recent Years: Literature Review

Katarzyna Prośniak

Medical University of Lublin, Aleje Racławickie 1, 20-059 Lublin, Poland

katarzynka11011@wp.pl

<https://orcid.org/0009-0000-2591-558X>

Jakub Prośniak

Medical University of Lublin, Aleje Racławickie 1, 20-059 Lublin, Poland

zippocanyon@gmail.com

<https://orcid.org/0009-0009-8067-9503>

Zuzanna Skiba

Medical University of Lublin, Aleje Racławickie 1, 20-059 Lublin, Poland

zuzannaskiba01@o2.pl

<https://orcid.org/0009-0002-8252-7385>

Aleksander Siwek

Medical University of Lublin, Aleje Racławickie 1, 20-059 Lublin, Poland

AlekSiwek12@gmail.com

<https://orcid.org/0009-0006-1855-3916>

Karolina Przeniosło

Medical University of Lublin, Aleje Racławickie 1, 20-059 Lublin, Poland

karolinaprzenioslo2@gmail.com

<https://orcid.org/0009-0006-6153-8359>

Magdalena Popławska

Medical University of Lublin, Aleje Racławickie 1, 20-059 Lublin, Poland

magda.poplawska@yahoo.com

<https://orcid.org/0009-0007-0043-780X>

Maria Wojnowska

Medical University of Lublin, Aleje Racławickie 1, 20-059 Lublin, Poland

wojnowska.00.maria@gmail.com

<https://orcid.org/0009-0006-5581-4863>

Milosz Rudziński

Medical University of Lublin, Aleje Racławickie 1, 20-059 Lublin, Poland

milosz.rudzinski@gmail.com

<https://orcid.org/0009-0008-2474-5775>

Jakub Pobidel

Medical University of Lublin, Aleje Racławickie 1, 20-059 Lublin, Poland

jakubpob@gmail.com

<https://orcid.org/0009-0009-8493-1040>

Zuzanna Skowronek

Medical University of Warsaw, 61 Zwirki i Wigury Street, 02-091 Warsaw, Poland

zuzannasko@gmail.com

<https://orcid.org/0009-0005-2433-1677>

Abstract

Background: Overweight and obesity in children represent a serious global problem, with prevalence rates rising steadily in both developed and developing countries. Effective strategies for the prevention and treatment of childhood obesity require a comprehensive approach that takes into account individual, family, social and educational aspects. This forms the basis for the treatment of childhood obesity. Guidelines recommend such an intensive approach as first-line treatment, but in practice this is limited due to the time required, specialist resources and family involvement. Although lifestyle interventions are a key strategy for treating obesity, metabolic and bariatric surgery has become a treatment option for severe obesity. Furthermore, obesity has come to be regarded as a chronic condition requiring long-term management. The importance of psychological factors and quality of life has increased, and new therapeutic options have emerged – pharmacotherapies that enable tangible improvements in patients' health.

Aim of the study: This study presents the current state of knowledge about childhood obesity and describes changes in its treatment, with particular emphasis on pharmacotherapy.

Methodology: The review was conducted using PubMed and supplementary Google Scholar. Studies from 2021 to 2026 were analyzed.

Results: Solving the problem of childhood obesity requires a comprehensive approach that takes into account not only biological and environmental factors, but also behavioral factors influencing children's eating behavior, physical activity levels, as well as early initiation of pharmacotherapy. A good response to childhood obesity treatment was associated with reduced long-term morbidity.

Conclusion: Nowadays, more attention is paid to the early implementation of treatment for obesity in children. Pharmacotherapy is a diverse and promising group of compounds with significant preventive and therapeutic potential in childhood obesity. However, further, well-designed, large-scale clinical trials are necessary to confirm their effectiveness and safety. Obesity treatment requires multidisciplinary care, including a pediatrician, dietitian, psychologist, and physiotherapist.

Keywords: obesity, childhood, pediatric obesity, lifestyle modification, liraglutide

1. Introduction

Childhood obesity has reached epidemic proportions. It affects 1 in 5 children and adolescents under the age of 18 [1, 2]. Obesity is characterised by excessive accumulation of adipose tissue and is associated with organ dysfunction and metabolic complications [3]. The traditional classification of obesity based on body mass index (BMI) does not take into account the distribution of body fat or clinical dysfunction, and may therefore fail to identify those at highest cardiometabolic risk [4]. BMI has high specificity in detecting obesity but low sensitivity [5]. A growing body of evidence suggests that abdominal obesity, assessed on the basis of waist circumference and the waist-to-height ratio, is a better predictor of cardiometabolic risk, even in children with a normal BMI [6]. Obesity occurs when energy intake exceeds energy expenditure. In children, however, obesity can be defined as a situation where the body mass index (BMI) on a centile chart is at or above the 95th percentile for children of the same age, sex and ethnic background. Dietary, environmental, behavioural, genetic, psychological and metabolic factors contribute to obesity [7]. Obesity in children is associated with numerous comorbidities, such as diabetes, hypertension, dyslipidaemia, non-alcoholic fatty liver disease, obstructive sleep apnoea syndrome and mental health conditions [3, 6]. Childhood obesity also poses a challenge for the bones, which are affected by a combination of endocrine, metabolic and mechanical factors. Excess body fat correlates with an increase in bone mineral density, but paradoxically increases the risk of fractures due to a deterioration in bone quality and increased mechanical stress in unusual locations [8]. Treatment should be multidisciplinary, encompassing lifestyle changes, bariatric surgery and, above all, pharmacotherapy [3].

2. Methodology

The literature search covered the years **2021–2026** and included PubMed and supplementary Google Scholar queries using combinations of terms such as *obesity*, *childhood*, *pediatric obesity*, *lifestyle modification*, *liraglutide*. Studies on obesity and related metabolic diseases were included in the analysis if they were peer-reviewed original articles, clinical trials, meta-analyses, or reviews. Titles, abstracts, and full texts were screened for relevance and methodological quality. Extracted results were synthesized into narrative form to highlight mechanisms of action and clinical implications.

3. A change of approach

In the past, obesity was primarily seen as a cosmetic issue. The stigma surrounding weight from a very young age led children who were overweight or obese to attempt to achieve the ideal of a slim figure through unhealthy weight-control behaviours [9].

Dietary patterns, levels of physical activity, sleep habits and the use of digital technologies are undergoing rapid and interrelated changes, which have significant negative implications for the health of children and young people. Scientific evidence regarding nutrition and lifestyle behaviours in children and young people highlights the reality of a problem occurring globally [10]. Childhood obesity has now been recognised by the World Health Organisation (WHO) as one of the major challenges of the 21st century [11]. Cardiometabolic diseases associated with obesity in children and adolescents are becoming increasingly common, requiring targeted interventions for both obesity and its comorbidities [12]. One way to counteract the spread of obesity among children is its early recognition by parents [13].

The COVID-19 pandemic has been linked to a rise in obesity rates [14]. Prior to the 2019 coronavirus pandemic, it was estimated that 23,000 young people aged under 18 had type 2 diabetes. The prevalence of type 2 diabetes in adolescents increased significantly, by 77.2%, during the pandemic, coinciding with higher rates of BMI increase among young people during the pandemic. The vast majority of young people diagnosed with T2D have a BMI screening result in the obese range (BMI $\geq$ 95th percentile for age and sex) [15]. The current approach assumes the possibility of long-term treatment and the cessation of stigmatisation of people with obesity. Diagnosis is recommended based on anthropometry, personal and family history, and clinical data indicating complications of metabolic syndrome. Given that obesity is a chronic condition, access to treatment must be guaranteed and patient care promoted through the intervention of an interdisciplinary team [16, 17]. Therapies based on lifestyle changes, with an emphasis solely on physical activity and diet, have little impact on the course of the disease. The treatment of obesity requires additional and more effective therapeutic options, which should be tailored to the patient's age, the severity of the condition and any comorbidities. Pharmacotherapy for obesity should be used in patients in whom attempts to lose weight following lifestyle changes have proved ineffective [18].

4. Methods of treating obesity: a multidisciplinary approach

It is widely recognised that dietary habits and other lifestyle patterns are established in early life and maintained into adulthood. Research has shown that diet from birth plays a significant role in disease prevention. Micronutrients in the diet alter gene expression, which in turn affects health and treatment outcomes later in life. Longer duration of breastfeeding, considered the most appropriate way to feed newborns, is associated with beneficial changes in leptin gene expression [19]. Many adolescents seeking treatment for obesity have tried diets, with or without the help of a dietitian or specialist care. Many adolescents also experience comorbid conditions, including insulin resistance, metabolic steatohepatitis and dyslipidaemia, which require treatment. First-line treatment involves intensive behavioural interventions, delivered by a multidisciplinary team [20]. However, it has been found that dietary substances such as fibre and prebiotics have a positive effect on children's gut microbiota. Consequently, they hold potential for the treatment of obesity [21]. The Planetary Health Diet (PHD), recognised as a healthy and environmentally sustainable way of eating, is promoted worldwide. It involves reducing the consumption of both red meat and sugar by half compared to current levels. Furthermore, the consumption of vegetables, fruit, pulses and nuts should increase by half compared to current levels. However, its role in supporting weight change in children within structured weight management interventions remains unclear [20]. Home-based interventions and those involving parents/families have effectively prevented childhood obesity [22]. Family-based treatment for overweight and obesity in children has been successfully implemented in paediatric primary care settings and has led to improved weight outcomes in both children and parents. This therapy may represent an innovative approach for large families [23]. Although bariatric surgery is becoming an increasingly accepted approach, it is not widely available nor is it desired by many patients and their families [24]. Bariatric surgery, particularly laparoscopic sleeve gastrectomy, is the most commonly performed procedure in the paediatric population. It is characterised by a low complication rate. In this case, the expected rapid weight loss alleviates comorbid conditions [25]. Vitamin D deficiency was observed two years after surgery in adolescents and is more commonly seen in the paediatric population than in adults [15]. Evidence suggests that achieving significant weight loss before reaching adulthood substantially reduces the risk of long-term complications associated with obesity. Currently, the American Society for Metabolic and Bariatric Surgery (ASMBS) recommends surgical intervention in children at Tanner stages 3–4 and beyond who are obese and have cardiometabolic comorbidities [26]. In adolescents with type 2 diabetes (T2D), a

significant reduction in body weight was observed following bariatric surgery, with significant rates of diabetes remission at 3 and 10 years [15]. Although researchers argue that surgical interventions in adolescents can be an effective method of achieving sustainable weight loss and reversing many comorbidities associated with severe obesity, their effectiveness has yet to be fully explained [27]. It is believed that the effectiveness of bariatric surgery is influenced by many mechanisms, including reduced calorie intake, impaired calorie absorption, changes in intestinal morphology, alterations in hormones regulating appetite and satiety, changes in dietary preferences, the intestinal microenvironment, and bile acid metabolism. Further studies involving paediatric patients with type 2 diabetes and obesity are needed to determine the long-term impact of obesity therapy and bariatric surgery on the progression and outcomes of type 2 diabetes in adolescents [15]. Fecal microbiota transplantation (FMT) has been investigated as a potential treatment for obesity, but its long-term impact on metabolic health remains unclear [28]. Obesity reduces healthy life years and increases disability-adjusted life years lost [19]. Dietary interventions, pharmacotherapy and bariatric surgery may be used in adolescents with moderate to severe obesity and associated metabolic complications [20, 29].

5. Advances in pharmacotherapy

Projections indicate a further rise in the number of people with obesity. Despite this need, treatment has been limited to metformin and insulin for over three decades [1]. However, research findings have shown that diabetes medicines used in adults, such as metformin or dipeptidyl peptidase-4 inhibitors (DPP-4 inhibitors), are less effective in treating metabolic disorders in adolescents [15]. Given the specific differences between overweight/obese children and those of normal weight, drug dosing for obesity cannot be determined solely on the basis of body weight per kilogram. When considering body weight, several parameters are taken into account, including: total body weight (TBW), which represents actual body weight, and ideal body weight (IBW), calculated on the basis of age, body weight and height. In obese children, administering medication based on TBW may lead to overdose, whereas, conversely, using IBW may lead to underdosing. Obese children may require higher doses to achieve plasma concentrations comparable to those in non-obese children [30]. We distinguish between anti-obesity drugs such as phentermine/topiramate [PHEN/TPM], orlistat, semaglutide and liraglutide. These are indicated as an adjunct to lifestyle changes in individuals who have failed to achieve a $\geq 5\%$ reduction in body weight from baseline after 6 months of lifestyle changes and who meet the following BMI criteria: a BMI of 27–29 with at least one weight-related comorbidity, or a BMI ≥ 30 . Although PHEN/TPM has been approved by the

FDA for children aged ≥ 12 years, phentermine monotherapy is the only FDA-approved drug for individuals aged ≥ 17 years, and research on paediatric patients treated exclusively with phentermine is very limited and results in insufficient evidence [31]. Treatment options for obesity in adolescents are limited, and the effects of lifestyle modification alone are unsatisfactory. The FDA (in 2020) and the EMA (in 2021) approved the use of liraglutide. Glucagon-like peptide-1 (GLP-1) receptors are found in the pancreas and intestines. Their activation stimulates glucose-dependent insulin secretion, inhibits glucagon production, induces a feeling of satiety via gastroparesis, and reduces appetite and food intake through the activation and inhibition of neural pathways in the hypothalamus. This latter mechanism is the most important for weight loss. Currently, liraglutide is indicated for the treatment of obesity in patients aged 12 years and older with a BMI at or above the 95th percentile and weighing over 60 kg. The drug is administered subcutaneously every day and is not reimbursed in most countries [32]. Glucagon-like peptide-1 receptor agonists (GLP-1 RAs) have emerged as promising pharmacological options. Semaglutide is also currently approved by the US Food and Drug Administration (FDA) for adolescents aged ≥ 12 years. Among the adolescents studied, 73.9% of participants achieved a BMI reduction of $\geq 5\%$, and 43.5% achieved $\geq 10\%$ [33]. Recent studies have highlighted the efficacy of GLP-1RAs, such as exenatide, liraglutide and semaglutide, in promoting weight loss and improving metabolic parameters in children and adolescents. Clinical trials have demonstrated their efficacy and safety in reducing BMI and improving cardiometabolic risk factors without significant neuropsychiatric or cardiovascular risks. Semaglutide, the latest GLP-1RA, has the potential to achieve significant weight loss in adolescents and demonstrates similar safety and efficacy to that seen in adults [34]. Obesity increases the risk of type 2 diabetes (T2D). Glucagon-like peptide-1 receptor agonists (GLP-1 RAs) are among the few pharmacological treatment options available for this patient group [1]. In 2019, the European Medicines Agency (EMA) issued a positive opinion on the use of liraglutide in children over 10 years of age with type 2 diabetes that is inadequately controlled with metformin [30]. Liraglutide, semaglutide, dulaglutide and extended-release exenatide have been approved for the treatment of obesity in children and adolescents with type 2 diabetes. In contrast, tirzepatide, a dual GLP-1 receptor agonist/glucose-dependent insulinotropic polypeptide (GIP) agonist, is being investigated for type 2 diabetes and obesity in this population. Paediatric guidelines on obesity and type 2 diabetes have also been expanded to include GLP-1 agonists as a pharmacotherapy option. A gap in treatment options and the availability of GLP-1 RA drugs has led to an exponential increase in the use of GLP-1 RA drugs between 2020 and 2023 in this young population [1]. Effective treatment of obesity can

lead to remission of type 2 diabetes, significantly improve dysglycaemia and insulin sensitivity. Obesity medications are effective and well tolerated by adolescents with obesity and represent an important therapeutic tool for adolescents with T2D and obesity [15]. The primary efficacy outcomes were: change in haemoglobin A1c (HbA1c) levels, fasting glucose levels, body weight, body mass index (BMI), lipid profile results and blood pressure[1]. A meta-analysis was conducted, with weight loss and improvements in LDL cholesterol and glycaemia due to anti-obesity drugs, as well as associated adverse events, serving as outcome measures. Orlistat, GLP-1RAs (liraglutide and semaglutide), demonstrate favourable efficacy and safety profiles in the treatment of obesity in children [35]. Despite these encouraging results, the need for daily subcutaneous injections of the aforementioned drugs and their adverse effects must be taken into account. The most common were gastrointestinal complaints, particularly abdominal pain, vomiting and diarrhoea, which led five patients to discontinue treatment [32]. We now have highly effective anti-obesity drugs that can reduce body weight by as much as 17–22% within a year; consequently, efforts are underway to replace bariatric surgery, given the substantial weight loss that is typically achieved only through bariatric procedures. These drugs also significantly reduce fatty liver disease. In particular, for paediatric MASLD, further biopsy-based clinical trials are needed to determine the efficacy of these drugs in this population [31].

6. The importance of mental health and quality of life

There is a reciprocal relationship between obesity and mental health disorders from childhood through to adolescence. Overweight and obese children have a higher prevalence of psychological diagnoses than their normal-weight peers (48% compared with 2%). Furthermore, this increases the risk of overeating and subsequent weight gain [36]. One of the most important relationships influencing children's behaviour is between parents and child. Parents are children's first guides, helping them to develop healthy behaviours. The influence of parents on a child's behaviour is extremely important, as it can either promote or prevent childhood obesity. There is now greater awareness of the condition among parents, which translates into greater support for children [7]. As a result, health-related quality of life is significantly reduced in children living with obesity. There is a well-established positive correlation between childhood and adolescent obesity persisting into adulthood. Children and adolescents who are obese are five times more likely to remain obese as adults compared to their peers who are not obese. Around 55% of children with obesity remain obese during adolescence, and nearly 80% of adolescents living with obesity remain obese in adulthood.

This highlights the urgent need for early intervention and preventive strategies to reduce obesity and its long-term health consequences [37,38]. According to research, a lack of public funding limits access to these medicines, which exacerbates social inequalities in obesity, with a higher prevalence in low-income families. Research indicates that patients found it difficult to consistently adhere to medical advice due to a lack of pharmacies or the financial cost to the family. Another factor limiting the use of these medicines is the belief that children with obesity can achieve a healthy weight simply by avoiding unhealthy foods and engaging in physical activity. This belief leads to the assumption that medication is unnecessary and even dangerous – a view shared not only by parents but also by some doctors [32, 39].

7. Conclusion

A cohort study showed that a good response to obesity treatment in children was associated with a reduction in long-term morbidity, such as type 2 diabetes, dyslipidaemia and hypertension. Furthermore, a link was observed between the effectiveness of obesity treatment in children and lower mortality in young adulthood.

Weight-loss drugs used in children, as in adults, are characterised by variable efficacy and a similar profile of adverse effects. Thorough research and better education of doctors on weight-loss drugs may address the significant gap in the treatment of severe childhood obesity.

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Conceptualization: Katarzyna Prośniak, Jakub Prośniak, Zuzanna Skiba, Aleksander Siwek, Magdalena Popławska, Karolina Przeniosło

Methodology: Katarzyna Prośniak, Jakub Prośniak, Zuzanna Skiba

Formal analysis: Magdalena Popławska, Karolina Przeniosło

Investigation: Katarzyna Prośniak, Jakub Prośniak, Zuzanna Skiba, Aleksander Siwek, Magdalena Popławska, Karolina Przeniosło

Resources: Katarzyna Prośniak

Data curation: Katarzyna Prośniak, Jakub Prośniak, Aleksander Siwek

Writing - rough preparation: Katarzyna Prośniak, Jakub Prośniak, Zuzanna Skiba, Aleksander Siwek, Magdalena Popławska, Karolina Przeniosło

Writing–review and editing: Katarzyna Prośniak, Magdalena Popławska, Karolina Przeniosło

Visualization: Zuzanna Skiba, Aleksander Siwek

Supervision: Katarzyna Prośniak

Project administration: Katarzyna Prośniak

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