

# Visual Analysis of Research Hotspots on Adolescent Obesity in China Based on Citespace

Yunxi Pu, Beibei Chen, Yinan Tang, Jie Ding, Yan Lu\*

The First Affiliated Hospital of Shihezi University, Shihezi 832000, Xinjiang Uygur Autonomous Region, China

*\*Authors to whom correspondence should be addressed.*

**Copyright:** © 2025 Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), permitting distribution and reproduction in any medium, provided the original work is cited.

**Abstract:** *Objective:* To conduct a visual analysis of the current status and hotspots of adolescent obesity research based on CiteSpace, to provide evidence-based basis for research directions and ideas in this field. *Methods:* This study used subject words and free words to retrieve literature from China National Knowledge Infrastructure, Wanfang Database, and VIP Core database. The retrieval time was from January 1, 2010 to December 31, 2024. CiteSpace6.3.R2 software was used to perform cluster sub-visualization analysis of the number of articles, authors, and keywords of literature on adolescent obesity. *Results:* A total of 523 Chinese articles were included. Since 2010, the number of articles on adolescent obesity in China showed an increasing trend, with an average annual growth rate of 12.3%. From the perspective of spatial distribution, more regions, institutions, and researchers have begun to pay attention to the research in this field, exploring the impact of dietary imbalance and insufficient exercise on adolescent obesity in different regions and the management methods. From the perspective of cooperation, the cooperation of various regions and institutions showed the characteristics of regional concentration or professional concentration, mainly distributed in medicine and physical education. High-frequency keywords included “living standard”, “exercise intervention”, “physical activity”, “mental health”, “body fat rate”, and “body fat rate”. After 2020, “intelligent weight management platform” and “remote follow-up” emerged to reflect the deep integration of technology and health management. Keyword cluster analysis showed that research hotspots focused on the etiological mechanism of obesity, intervention models, regional characteristics in different regions, and the risk of obesity-related metabolic diseases. With the launch of the national “Weight Management Year” initiative, research has been tilted to community health promotion and multi-sectoral collaboration, focusing on obesity prevention of preschool children and AI-driven personalized intervention programs <sup>[1]</sup>. However, there is a bottleneck of lack of tracking mechanisms for long-term effects such as adolescent development and metabolic adaptability. *Conclusions:* The research status and hotspots of adolescent obesity have gradually shifted from early etiological exploration to precise intervention models driven by technology empowerment. In the future, researchers can build an obesity prevention and control network covering the whole life cycle and the whole region through the three-dimensional drive of “technological innovation × policy empowerment × disciplinary integration”, and eventually achieve the goal of reducing the obesity rate in adolescents.

**Keywords:** Adolescents; Obesity; Management; Intervention; Visual analysis

**Online publication:** August 4, 2025

# 1. Introduction

With the changes of lifestyle in modern society, the incidence of obesity in adolescents has increased rapidly, which has become a major challenge in the field of global public health. The prevalence of overweight and obesity among Chinese adolescents had reached 19.4% in 2014, and the gap between urban and rural areas was gradually narrowing, with the obesity rate among urban adolescents even exceeding 10%. Obesity in adolescents is not only closely related to the risk of chronic diseases such as diabetes and cardiovascular disease, but also causes psychological disorders, social distress, and decreased academic ability, which has a profound impact on individuals and society <sup>[2, 3]</sup>. Dietary structure with high sugar and fat, as well as behavioral patterns such as sedentary and lack of exercise, lead to an imbalance between energy intake and expenditure <sup>[4]</sup>. Adolescent obesity is not only a medical problem, but also a social system engineering. At present, the management model of adolescent obesity is still single, and there is a lack of personalized intervention programs to achieve the purpose of “health promotion” <sup>[5]</sup>. By integrating CiteSpace visualization technology and bibliometric methods, this study systematically analyzed the research trends, cooperation networks, and hotspot evolution in the field of adolescent obesity management in the past 15 years, aiming to provide a scientific basis for optimizing management strategies, promoting technological innovation, and resource integration.

## 2. Materials and methods

### 2.1. Data sources

Subject headings and free words are used to search literature from CNKI, Wanfang database, and VIP database, and the retrieval time limit was from January 1, 2010 to December 31, 2024. The subject terms of the Chinese database search are “adolescents”, “obesity”, “management”, “intervention”, and “treatment”.

### 2.2. Literature inclusion and exclusion criteria

The inclusion criteria are as follows: first, the literature type was clearly defined as a literature, conference paper or review related to adolescent obesity. Among them, the first document contains original research data, the conference papers can reflect the frontier academic trends, and the review can systematically sort out the research context, all of which have high academic value. Secondly, the language of the literature is required to be Chinese, which is convenient for accurate interpretation and analysis.

The exclusion criteria are as follows: repeated reports were excluded due to lack of innovation; Articles without full text were difficult to conduct in-depth analysis, so they were not included in the scope of the study. The literature unrelated to the topic of this research is easy to interfere with the research direction, so it is excluded. News and science literature were not included in the study due to their weak academic rigor, so as to ensure the quality of research.

### 2.3. Data analysis

CiteSpace6.3R2 software is used for visual analysis. The main analysis content included authors, institutions, countries, keyword clustering, and visual analysis, and further summarized the analysis rules. The time slice of literature analysis is 1 year, and the algorithm is set to extract the top 50 cited literatures in each time slice for analysis. The rest are the default parameters. The authors' cooperation network, institution distribution, and keyword cluster map are drawn, and the module value (Q value) and average contour value (S value) are used to

evaluate the rationality of clustering ( $Q > 0.3$ ,  $S > 0.5$  are considered effective).

### 3. Results

#### 3.1. Number of publications

Based on strict literature screening criteria, a total of 523 Chinese literatures were included for systematic analysis. The data show that from 2021 to 2024, domestic academic research on adolescent obesity will show a significant development trend. According to the statistics of the annual number of publications, the number of research results in this field showed a continuous increasing trend, with an average annual growth rate of 12.3%. It is particularly noteworthy that the number of published papers reached 43 in 2024, becoming the peak in the past four years. This data change directly reflects that with the increasing social attention to adolescent health issues, academic research investment in adolescent obesity continues to increase, and the research popularity continues to rise, which also means that this field is gradually becoming a key direction of public health and adolescent health research.

#### 3.2. Institution of publication

From the perspective of spatial distribution, the publishing institutions of the Chinese data platform showed that the research on adolescent obesity depended on the advantages of regional resources, forming three core clusters centered on Beijing, Shanghai, and Guangzhou, and the problem of uneven resource distribution was prominent. At the same time more and more areas, institutions and researchers begin to pay close attention to this field of research, to explore different areas lack of imbalance in the structure of diet and exercise of adolescent obesity, and the influence of management style <sup>[6]</sup>. From the perspective of cooperation, the cooperation of various regions and institutions was characterized by regional concentration or professional concentration, mainly distributed in medicine and physical education <sup>[7]</sup>. Medical institutions (68%) mainly focused on the pathological mechanism and clinical intervention of obesity, while sports institutions (29%) focused on the innovation of sports intervention models <sup>[8, 9]</sup>. It is worth noting that the cross cooperation between medicine and sports disciplines accounted for only 3%, which was lack of interdisciplinary collaboration platform, lack of organic connection between basic research and clinical/practical application, and there were still disciplinary barriers <sup>[10]</sup>.

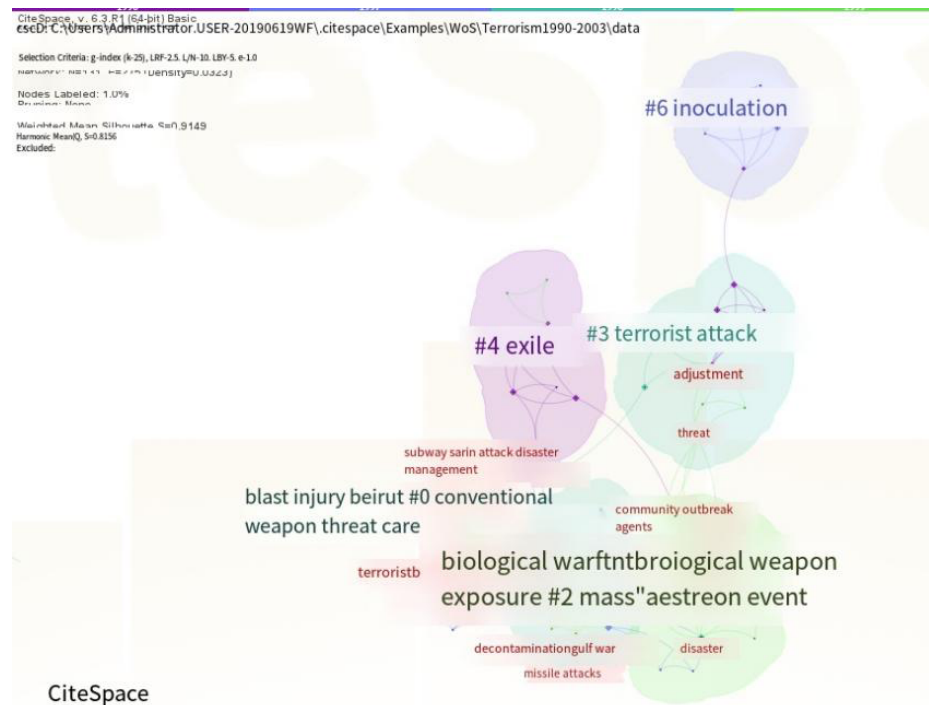
#### 3.3. Author of the paper

Utilizing data from Chinese national platforms, a research team, led by Peking University and comprising multiple institutions, has conducted comprehensive studies on the epidemiological characteristics, metabolic mechanisms, and policy interventions related to obesity. Their findings reveal the multi-level contributing factors to adolescent obesity in China <sup>[11]</sup>. The team from Capital Medical University, focusing on clinical nutrition and exercise prescription, led the development of the “medical and physical integration of pediatric weight loss outpatient service standards” to promote the standardization of obesity intervention <sup>[12]</sup>. Fudan University team, focused on the relationship of the eating behavior and mental health, emphasizes the importance of refinement and family to participate in health education <sup>[13]</sup>.

#### 3.4. Co-occurrence of keywords

**Keyword co-occurrence analysis** was conducted to identify research focus areas within the field of adolescent obesity, resulting in the formation of nine distinct clusters. Using CNKI's CiteSpace software, clustering was

performed based on the network structure of keyword co-occurrences. The software provides two key indicators to assess clustering quality: **modularity (Q)** and **silhouette score (S)**. A Q value greater than 0.300 indicates a reasonably well-divided network structure, while an S value exceeding 0.500 signifies meaningful and consistent clustering. These values serve as critical criteria for evaluating the effectiveness and interpretability of the resulting knowledge map. Analysis, according to the results of this study in CNKI nine clustering Q = 0.721, S = 0.894, prompt meaningful clustering results, as shown in **Figure 1**. Specific content according to the clustering results, and combining with literature to extract keywords, keyword highlight strength, as shown in **Figure 1**.



**Figure 1.** Cluster map of keywords in adolescent obesity research

Cluster analysis further revealed five hot topics:

- (1) Etiology and intervention: Including dietary imbalance, lack of exercise, genetic susceptibility, etc. <sup>[14]</sup>.
- (2) Intelligent and precise intervention: After 2020, with the popularization of digital technology, research hotspots have turned to technology-driven intervention, with emergent words such as “intelligent weight management platform”, “remote follow-up through APP”, and “AI physical training system to improve the efficiency of exercise intervention” becoming high-frequency keywords. Through real-time data collection and algorithm optimization, the implementation of personalized intervention programs is promoted <sup>[15]</sup>.
- (3) Multi-agent collaborative prevention and control: Key words such as “year of weight management”, “family-school-doctor collaboration”, and “food advertising regulation” marked the transition from individual intervention to systematic prevention and control.
- (4) The dual track of medicine and sports: The feature of interdisciplinary is significant, and the high-frequency words include “metabolic syndrome” “intestinal flora” “exercise prescription” “micronutrient deficiency” “environmental toxins”, etc., but the cross-disciplinary cooperation only accounts for 3%, and the disciplinary barriers still need to be broken through.



- (5) Urban-rural differences and full-cycle management: In recent years, studies have emphasized regional specificity and long-term effects. Key words such as “urban-rural differences”, “metabolic intergenerational transmission”, and “full-life cycle management” have become the focus, and solving urban-rural resource allocation has become one of the future research directions.

## 4. Conclusion

In summary, the research on obesity in adolescents presents a multi-dimensional and cross-evolving trend. Studies on the etiology of obesity have expanded from traditional genetic, diet, and exercise factors to the relationship between gut microbiota and metabolomics. The intervention model has changed from simple behavioral intervention to precise management enabled by technology, and the intelligent weight management platform has realized dynamic risk warning and remote follow-up. In economically disadvantaged areas, the imbalance of diet structure and the lack of health resources have become difficulties for prevention and control. There is a “double nutritional burden” behind the difference between urban and rural areas, that is, the coexistence of wasting and obesity, which requires differentiated policy intervention. In terms of policy drivers, the “Weight Management Year” initiative promoted multi-sectoral collaboration. In the future, it is urgent to build a full-cycle management framework of “genetic-environment-technology-policy” from the research of long-term tracking mechanism (the association between adolescent metabolic adaptation and adult health), integrated application of technology (integration of wearable devices and metabolomics data), and social equity (urban-rural resource allocation and policy implementation efficiency), to realize the transition from “disease management” to “holistic health”.

## Disclosure statement

The authors declare no conflict of interest.

## References

- [1] Notice on the Issuance of the Implementation Plan for the “Year of Weight Management”, 2024, Bulletin of National Health Commission of the People’s Republic of China, 2024(06): 6–9.
- [2] Qi JY, 2020, Research Progress on Risk Factors and Prevention and Control Measures of Obesity in Children and Adolescents. China Urban and Rural Enterprise Health, 35(12): 39–41.
- [3] Chen X, Yang S, 2012, Understanding Adolescent Obesity. Adolescent Health, 22(12): 28–29.
- [4] Guo Z, 2024, Study on the Correlation Between Traditional Chinese Medicine Syndrome Types and Dietary Factors in 146 Children With Simple Obesity, thesis, Chengdu University of Traditional Chinese Medicine.
- [5] Zhang R, Hai X, 2021, Research Progress on Obesity in Children and Adolescents. Data, 2021(05): 73–75.
- [6] 52 Areas Were Identified as the Pilot Areas of Traditional Chinese Medicine Intervention for Children and Adolescents With Obesity or Scoliosis, 2024, Chinese Medicine Health Preservation, 10(08): 2.
- [7] Yao Y, Xu S, Fang X, et al., 2024, Quantitative Evaluation of Policy Text on Obesity Prevention and Control for Children and Adolescents in China From the Perspective of Policy Tools. Chinese Journal of Maternal and Child Health, 15(06): 1–12.
- [8] Pan F, 2024, Combination of Prevention and Treatment Is the Key to Solve the Problem of Obesity in Children and Adolescents. Guide to Maternal and Child Health, 3(23): 4–7.

- [9] Zhou C, Yao B, Liu Y, et al., 2024, The Significance and Value of Baduanjin “Body and Mind Harmony” Concept in Improving Simple Obesity in Adolescents From the Perspective of Wu Medical Practitioners. Proceedings of the Second Committee Congress of the First Wu Medical Health Professional Committee of Chinese Medical Qigong Society and the Second Wu Medical Health Academic Paper Report in 2024, College of AcupunctureMoxibustion and Tuina, Beijing University of Chinese Medicine, 100–106.
- [10] Guo K, Cao J, Cao H, et al., 2019, Obesity Status and Intervention of Children and Adolescents in China. Exercise, 2019(04): 155–156+101.
- [11] Fu L, Wang H, Yang Y, et al., 2015, Status of Awareness of Risk Factors for Obesity in Children and Adolescents. Peking University Journal of Medicine, 47(03): 410–413.
- [12] Wang HH, Yan J, Xia LL, et al., 2024, Effect of Summer Camp on Weight Loss and FollowUp of Overweight and Obese Children. Chinese Journal of Practical Pediatrics, 39(07): 539–543.
- [13] Liu SJ, Jia YN, Dong RH, et al., 2022, Evaluation of Diet Quality and Its Influencing Factors of College Students in Shanghai Using Chinese Healthy Eating Index. Proceedings of the 15th National Nutrition Science Congress of Chinese Nutrition Society, 67.
- [14] Liu L, 2022, Gene–Physical Activity Interaction on Obesity and Related Metabolic Indicators in Children and Adolescents, thesis, China Medical University.
- [15] Zhao W, Yu Z, Lu B, 2023, Research and Design of Data Acquisition and Monitoring System of Physical Fitness Indicators in Sports Training. Journal of Ezhou University, 30(05): 102–104+108.

**Publisher’s note**

Bio-Byword Scientific Publishing remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.