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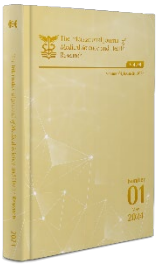

The Analysis Study of Risk Factor, Management and Outcome of Obesity in Children: A Comprehensive Systematic Review

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ABSTRACT

Background: Overweight and obesity under 18 years of age has been linked to an increased risk of premature mortality from middle adulthood onward. **The aim:** The aim of this study to show about risk factor, management and outcome of obesity in children. **Methods:** By the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020, this study was able to show that it met all of the requirements. **Result:** Eight publications were found to be directly related to our ongoing systematic examination after a rigorous three-level screening approach. Subsequently, a comprehensive analysis of the complete text was conducted, and additional scrutiny was given to these articles. **Conclusion:** the broad principle of treatment is to adjust the chronically positive energy balance. While lifestyle and behavior modifications with dietary changes and increased physical activity are the integral part of obesity management, the efficacy and sustainability are limited, especially for those with severe obesity. With emerging evidence on new pharmacological agents, it is hoped that obesity management in children could be improved in the future.

Keyword: Obesity, children, risk factor, management, outcome.

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INTRODUCTION

Obesity is an exorbitant build-up of adipose tissue that damages the well-being of an individual who suffers from that condition. It is known to be caused by excess calorie intake in diets and inadequate energy consumption from physical activity, which can lead to a positive energy balance. Various factors, such as genetic predispositions, behavior, and the environment, affect the risk of developing obesity. Globally, millions of children under five years old are struck by having overweight and obesity. The obesity prevalence among adolescents from 1975 to 2016 showed an increasing trend globally, with a 4.9% increment in girls and 6.9% in boys. According to recent data, overweight and obesity affect approximately 330 million children and adolescents aged 5 to 19 years.[1,2]

Nutrition transition theory suggests that economic development, urbanisation and globalisation result in an increase in the consumption of ultra-processed foods and a decrease in physical activity, which subsequently lead to a higher prevalence of overweight and non-communicable diseases. Context-specific policy, food systems, sociocultural norms and socioeconomics are also thought to play a role. Mitigating the obesity pandemic through appropriate programmes and policies requires a better understanding of setting-specific trends and their underlying determinants.[3,4]

Excessive energy intakes relative to requirements can lead to weight gain, usually reflecting an unhealthy diet high in fat and sugar, inadequate in fruits and vegetables, and thus low in fiber, coupled with a physically inactive lifestyle. In Indonesia, there are reports that 93.5% of children aged ten years and older consumed fruits and vegetables less frequently than recommended by the Ministry of Health. Further, 53% of these children consumed sweet food or beverages, and 41% fatty foods, more than once per day. Besides, in Indonesia, nearly a quarter of school-aged children are estimated

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to be sedentary in their behavior (i.e., being inactive for ≥6 daytime/wakeful hours/day). Thus, the exposure of Indonesian children to major causal, although alterable, practices directly increases their risk of becoming obese or incurring obesity-related health problems in their live.[5–7]

Evidence supports treating obesity and comorbidities to achieve weight loss, prevent further weight gain, and improve complications of obesity. Guidelines do not recommend "watchful waiting." Clinicians must document the presence of obesity and carefully explain to caregivers the importance of treating obesity while avoiding stigmatizing the child. Asking permission to discuss the BMI and weight is helpful. Avoiding labels such as "obese child" and using words that are perceived as neutral such as "unhealthy weight" or "gaining too much weight for age or height," are helpful. The focus should be on the child's health.[8,9]

Behavioral change forms the cornerstone in the management of pediatric obesity. Family-based interventions are aimed at decreasing BMI. These include limiting the number of sweetened beverages and fast food servings, eating more fruits and vegetables, and increasing the time spent being physically active. Clinicians should make clear recommendations about healthy foods and appropriate portions and encourage an active lifestyle with daily exercise. Merely saying "eat less and exercise more" is too simplistic. Families are encouraged to plan their meals, considering children's preferences and the nutrient value of foods to ensure a balanced diet.[8,10]

METHODS

Protocol

By following the rules provided by Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020, the author of this study made certain that it was up to par with the requirements. This is done to ensure that the conclusions drawn from the inquiry are accurate.

Criteria for Eligibility

For the purpose of this literature review, we compare and contrast risk

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factor, management and outcome of obesity in children. It is possible to accomplish this by researching of the risk factor, management and outcome of obesity in children. As the primary purpose of this piece of writing, demonstrating the relevance of the difficulties that have been identified will take place throughout its entirety.

In order for researchers to take part in the study, it was necessary for them to fulfil the following requirements: 1) The paper needs to be written in English, and it needs to determine about the risk factor, management and outcome of obesity in children. In order for the manuscript to be considered for publication, it needs to meet both of these requirements. 2) The studied papers include several that were published after 2014, but before the time period that this systematic review deems to be relevant. Examples of studies that are not permitted include editorials, submissions that do not have a DOI, review articles that have already been published, and entries that are essentially identical to journal papers that have already been published.

Search Strategy

We used "risk factor, management and outcome of obesity in children." as keywords. The search for studies to be included in the systematic review was carried out using the PubMed, SagePub, and Sciencedirect databases.

Data retrieval

After reading the abstract and the title of each study, the writers performed an examination to determine whether or not the study satisfied the inclusion criteria. The writers then decided which previous research they wanted to utilise as sources for their article and selected those studies. After looking at a number of different research, which all seemed to point to the same trend, this conclusion was drawn. All submissions need to be written in English and cannot have been seen anywhere else.

Only those papers that were able to satisfy all of the inclusion criteria were taken into consideration for the systematic review. This reduces the number of results to only those that are pertinent to the search. We do not take into consideration the

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conclusions of any study that does not satisfy our requirements. After this, the findings of the research will be analysed in great detail. The following pieces of information were uncovered as a result of the inquiry that was carried out for the purpose of this study: names, authors, publication dates, location, study activities, and parameters.

Quality Assessment and Data Synthesis

Each author did their own study on the research that was included in the publication's title and abstract before making a decision about which publications to explore further. The next step will be to evaluate all of the articles that are suitable for inclusion in the review because they match the criteria set forth for that purpose in the review. After that, we'll determine which articles to include in the review depending on the findings that we've uncovered. This criteria is utilised in the process of selecting papers for further assessment. in order to simplify the process as much as feasible when selecting papers to evaluate. Which earlier investigations were carried out, and what elements of those studies made it appropriate to include them in the review, are being discussed here.

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Table 1. Search Strategy

Database **Search Strategy**		***Hits***
Pubmed	*(("*Obesity*"[MeSH Subheading] OR "*Children*"[All Fields] OR "*Risk factor*" [All Fields]) AND ("*Etiology*"[All Fields] OR " *Management*"[All Fields]) AND ("*Therapy*"[All Fields]) OR ("*Outcome*" [All Fields]))*	4409 4
Science Direct	*(("*Obesity*"[MeSH Subheading] OR "*Children*"[All Fields] OR "*Risk factor*" [All Fields]) AND ("*Etiology*"[All Fields] OR " *Management*"[All Fields]) AND ("*Therapy*"[All Fields]) OR ("*Outcome*" [All Fields]))*	3558
Sagepub	*(("*Obesity*"[MeSH Subheading] OR "*Children*"[All Fields] OR "*Risk factor*" [All Fields]) AND ("*Etiology*"[All Fields] OR " *Management*"[All Fields]) AND ("*Therapy*"[All Fields]) OR ("*Outcome*" [All Fields]))*	14

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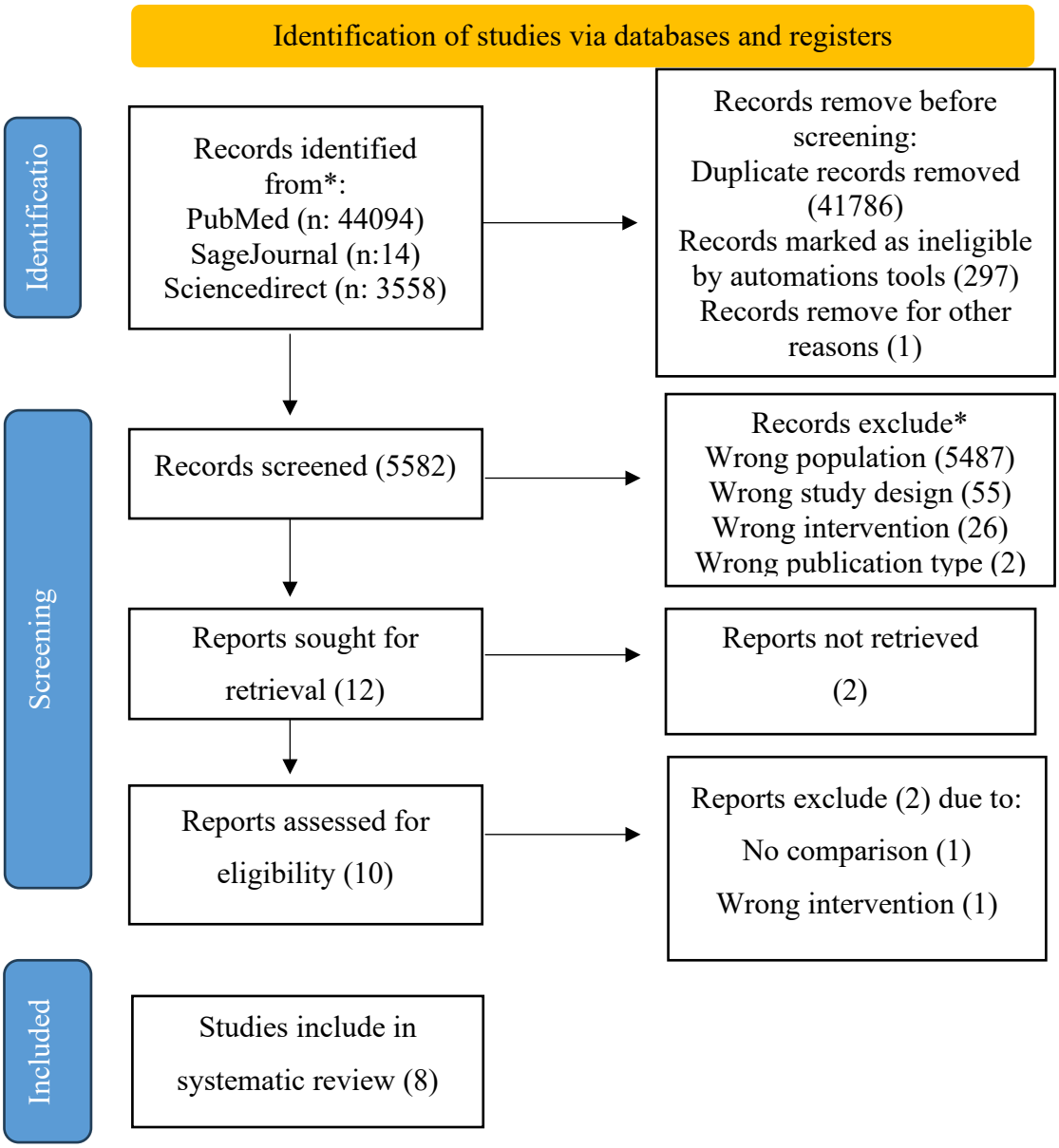

Figure 1. Article search flowchart

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Table 2. Critical appraisal of Study

Parameters	(Oktaviani, S et al., 2023)	(Lindberg, L et al., 2020)	(Abdulkarem, AR et al., 2020)	(Barati, L et al., 2022)	(Mathew, PJ et al., 2023)	(Diallo, R et al., 2023)	(Almaqhawi, A et al., 2022)	(Le, GB & Dinh, DX., 2022)
1. Bias related to temporal precedence								
Is it clear in the study what is the "cause" and what is the "effect" (ie, there is no confusion about which variable comes first)?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2. Bias related to selection and allocation								
Was there a control group?	No	No	No	No	No	No	No	No
3. Bias related to confounding factors								
Were participants included in any comparisons similar?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4. Bias related to administration of intervention/exposure								
Were the participants included in any comparisons receiving similar treatment/care, other than the exposure or intervention of interest?	No	No	No	No	No	No	No	No
5. Bias related to assessment, detection, and measurement of the outcome								
Were there multiple measurements of the outcome, both pre and post the intervention/exposure?	No	No	No	No	No	No	No	No
Were the outcomes of participants included in any comparisons measured in the same way?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Were outcomes measured in a reliable way?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6. Bias related to participant retention								
Was follow-up complete and, if not, were differences between groups in terms of their follow-up adequately described and analyzed?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
7. Statistical conclusion validity								
Was appropriate statistical analysis used?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

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RESULT

Using reputable resources like Science Direct, PubMed, and SagePub, our research team first gathered 47666 publications. A thorough three-level screening strategy was used to identify only eight papers as directly relevant to our ongoing systematic evaluation. Next, a thorough study of the entire text and further examination of these articles were selected. Table 1 compiles the literature that was analyzed for this analysis in order to make it easier to view.

Table 3. The litelature include in this study

Author	Origin	Method	Sample	Result
Oktaviani, S et al., 2023[11]	Indonesia	Study design was a secondary data analysis using the Indonesia Family Life Survey in 2014/2015, focusing on 6,090 children aged 6–12 years.	6090	The mean age of participants was 8.9 years (SD = 2.0); 51.0% were boys; 9.4% were overweight; and 8.1% were obese. Overweight and obesity were associated with age [AOR 1.09 (95% CI 1.04–1.14)], having an overweight [AOR 1.93 (95% CI 1.58–2.36)] or obese [AOR 3.36 (95% CI 2.43–4.61)] father compared with a normal father, being of Chinese [AOR 9.51 (95% CI 1.43–79.43)] or Javanese [AOR 1.60 (95% CI 1.16–2.24)] ethnicity compared with Sundanese ethnicity, and residing in an urban area [AOR 1.36 (95% CI 1.10–1.70)]. A lower risk of child overweight/obesity was associated with the father's perception [AOR 0.56 (95% CI 0.38–0.80)] and mother's perception [AOR 0.66 (95% CI 0.43–0.98)] of the child's food consumption as being less than adequate compared with adequate.
Lindberg, L et al., 2020[12]	Sweden	In this prospective cohort study, we linked nationwide registers and collected data on 41,359 individuals. Individuals enrolled at age 3–17.9 years in the Swedish Childhood Obesity	41359	Over 190,752 person-years of follow-up (median follow-up time 3.6 years), 104 deaths were recorded. Median (IQR) age at death was 22.0 (20.0–24.5) years. In the childhood obesity cohort, 0.55% (n = 39) died during the follow-up period, compared to

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		Treatment Register (BORIS) and living in Sweden on their 18th birthday (start of follow-up) were included.		0.19% (n = 65) in the comparison group (p < 0.001). More than a quarter of the deaths among individuals in the childhood obesity cohort had obesity recorded as a primary or contributing cause of death. Male sex and low parental SES were associated with premature all-cause mortality. Suicide and self-harm with undetermined intent were the main cause of death in both groups. The largest difference between the groups lay within endogenous causes of death, where children who had undergone obesity treatment had an adjusted mortality rate ratio of 4.04 (95% CI 2.00–8.17, p < 0.001) compared with the comparison group.
Abduelkarem, AR et al., 2020[13]	Saudi Arabia	The study based on a cross sectional survey including school children aged 6–11 years. Pupils were from different schools in Sharjah, UAE.	678	The number of pre-validated surveys distributed was 932 and those returned counted to 678, giving a response rate of 72.8%. More than half (379; 55.9%) of the participants were females and 191 (28.2%) of the children were obese or overweight. Almost one quarter (162; 23.9%) of the children was physically inactive. Additionally, candy and fast food consumption was significantly high (370; 54.6%) and (324; 47.8%) respectively. Participant's food, age and time spent on TV were significantly associated with body mass index (BMI).
Barati, L et al., 2022[14]	Iran	This cross-sectional study was performed on 1,091, 3-6-year-old children in Gorgan City, located in north of Iran.	1091	Given the study, respectively 3.8 and 4.5% of the boys and girls were underweight, 17.4 and 16.5% of the boys and girls were overweight, and 20.8 and 19.3% of the boys and girls were obese. In addition, 3.4, 0.7, and 0.4% of the subjects had presystolic, systolic,

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				and prediastolic HTN, respectively. There is a significant linear relationship between BMI and systolic and diastolic blood pressures. It was found that the risk of obesity in mothers with college education was estimated to be almost 5 times higher than in mothers with lower levels of education.
Mathew, PJ et al., 2023[15]	India	This observational study was conducted in a tertiary care institute in the state of Chhattisgarh from July 2020 to October 2021.	5019	Among the 5,019 children screened during the study period, 54 met the inclusion criteria (1.07%). Fifty percent of children were from the upper middle class as per the Kuppuswamy scale. Seventy percent consumed junk food more than three times a week. Twenty-three children (42.6%) engaged in physical activity of > 1 hour and 49(90.7%) had a screen time of > 2 hours. The prevalence of depression among these children stood at 5.6% with the mean age being 11.67 years. Multiple logistic regression showed an inverse association of depression with physical activity.
Diallo, R et al., 2023[16]	West African	This study was a secondary analysis of nationally representative cross-sectional data. These data were drawn from Demographic and Health Surveys (DHS) from five countries in the West African region (Benin, Guinea, Mali, Nigeria, and Togo) from 2015 to 2018.	38657	The total sample size for the analysis was 38,657 children. The pooled prevalence of overweight among children under 5 years of age in the five countries was 3%. Guinea had the highest prevalence (6%) compared to the other countries, which had a prevalence of 2%. The likelihood of being overweight was higher among children aged 0–6 months (adjusted odds ratio [AOR] = 3.09; 95% confidence interval [CI] [2.41–3.95]), who had a high birth height (AOR = 1.64; 95% CI [1.29–2.09]), whose mothers were overweight (AOR = 1.35; 95% CI [1.09–1.68]), who lived in

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				households with fewer than five members (AOR = 1.19; 95% CI [1.00–1.46]), or who lived in Guinea (AOR = 2.79; 95% CI [1.62–4.79]).
Almaqhawi, A et al., 2022[17]	Saudi Arabia	This is a cross-sectional study conducted among children aged between six and 16 years old who live in the Eastern province of Saudi Arabia.	688	Six hundred eighty-eight children agreed to participate. The prevalence of overweight and obesity was 15.3% (overweight 10.2%, obese 5.1%). Children who eat four or more meals per day were 29.5% while only 10% were regularly exercising for more than two hours a day. Independent risk factors of obesity and overweight were eating four or more meals per day. Spending more than an hour a day on physical activity was a protective factor against being overweight and obese.
Le, GB & Dinh, DX., 2022[18]	Vietnam	Cross-sectional study.	782	The prevalence of overweight/obesity among primary school children in Thanhhoa city was 35.93% (overweight 21.61% and obesity 14.32%). The proportion of overweight girls was nearly equal to that of boys (20.78% and 22.52%, respectively, p=0.6152) while the proportion of boys with obesity was four times as many as that of girls (23.86% and 5.62%, respectively, p<0.0001). Child's sex was the factor significantly associated with childhood overweight/obesity. Boys had double the risk of being overweight/obese than girls (adjusted OR: aOR=2.48, p<0.0001). Other potential factors which may be associated with childhood overweight/obesity included mode of transport to school, the people living with the child, mother's occupation, father's education, eating

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				confectionery, the total time of doing sports, and sedentary activities.

DISCUSSION

Influenced by genetics, biology, psychosocial factors, and health behaviors, overweight and obesity (OW/OB) in childhood is a complex public health problem affecting the majority of developed countries worldwide. Additionally, the key contributors to obesity—poor diet and physical inactivity—are among the leading causes of preventable youth deaths, chronic disease, and economic health burden. Despite the remarkable need to prevent childhood obesity and to intervene earlier to prevent excess weight gain in later developmental periods, few interventions have demonstrated long-lasting effects or been implemented at such a scale to have an appreciable public health impact.[19–21]

The WHO 2006 Growth Standard is recommended in many countries for children aged 0–5 years, and for children aged 0–2 years in the USA.[6] For older children and adolescents, other growth references are used, including the WHO 2007 Growth Reference, recommended for those aged 5–19 years (overweight defined as BMI ≥1SD and obesity as BMI ≥2SD of the median for age and sex), and the United States Centers for Disease Control and Prevention (CDC) Growth Reference for those aged 2 to 20 years (overweight is >85th to <95th percentile and obesity is ≥95th percentile based on CDC growth charts). The International Obesity Task Force tables for children aged 2 to 18 years are used for epidemiological studies. Abdominal or central obesity is associated with increased cardiometabolic risk in children and adolescents. For waist circumference there are regional and international growth references allowing adjustment for age and sex. A waist-to-height ratio of more than 0·5 is increasingly used as an indicator of abdominal adiposity in clinical and research studies, with no need for a comparison reference.[22–24]

The most common preventative and therapeutic interventions applied and suggested by investigations are

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nutritional, physical activity (PA), lifestyle, and educational methods. In adolescents with a high degree of obesity or advanced metabolic disease, clinical treatments including pharmacological and surgical strategies have also been suggested. Due to the potential side effects of medical interventions, a careful evaluation and comparison of risks and benefits are necessary before implementing such interventions for pediatric patients with obesity. It has been emphasized that pharmacotherapy and bariatric surgery should never be implemented in adolescents with obesity (and those with other vital untreated disorders) who have not engaged in healthy dietary and PA practices.[25,26]

CONCLUSION

In conclusion, the broad principle of treatment is to adjust the chronically positive energy balance. While lifestyle and behavior modifications with dietary changes and increased physical activity are the integral part of obesity management, the efficacy and sustainability are limited, especially for those with severe obesity. With emerging evidence on new pharmacological agents, it is hoped that obesity management in children could be improved in the future.

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