Prevalence and Management of Childhood Obesity in Saudi Arabia: A Systematic Review from Family and Internal Medicine Perspectives

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ABSTRACT

Background: Childhood obesity is a critical public health challenge in Saudi Arabia.

Objective: This review synthesizes evidence on its prevalence, risk factors, and management from family medicine perspectives.

Methods: Following the PRISMA 2020 guidelines, a comprehensive search was conducted across PubMed/MEDLINE, Embase, Scopus, Web of Science, and Cochrane Library for studies published up to 2025. Observational studies and trials reporting prevalence, risk factors, or management of childhood obesity in Saudi Arabia were included. Two reviewers independently performed study selection, data extraction, and quality assessment using the Newcastle-Ottawa Scale.

Results: Ten studies (published 2021–2025) varied by region, sample size, and growth standards were included. Prevalence estimates varied widely due to methodological differences, though a nationwide study using Saudi growth charts reported obesity at 9.4% and overweight at 11.2%. Key modifiable risk factors included high consumption of fast food, sweets, and sugar-sweetened beverages; low physical activity; and excessive screen time. A critical and consistent finding was widespread parental misperception of children's weight status, with significant underestimation linked to familial normalization of obesity. Parental knowledge was often high, but practices did not align with awareness. Studies highlighted the influence of paternal self-efficacy and feeding practices, as well as socio-demographic factors such as parental education and family history of obesity. **Conclusion:** Childhood obesity in Saudi Arabia is a multifactorial issue sustained by unhealthy dietary patterns, sedentary behaviors, and deeply embedded familial perceptions.

Keywords: Childhood obesity, Saudi Arabia, prevalence, parental perception, family-centered intervention, systematic review.

INTRODUCTION

Childhood obesity has emerged as one of the most formidable global public health challenges of the 21st century, representing a critical threat to the immediate and long-term health of populations worldwide [1]. It is defined as an abnormal or excessive fat accumulation that presents a risk to health, and in pediatric populations, it is typically diagnosed using body mass index (BMI)-for-age percentile thresholds [2]. The ramifications of this condition extend far beyond physical appearance, establishing a direct pathogenic pathway to a constellation of non-communicable diseases (NCDs) previously considered exclusive to adulthood. These include, but are not limited to, insulin resistance and type 2 diabetes,

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hypertension, dyslipidemia, fatty liver disease, and early-onset cardiovascular complications [3, 4]. Furthermore, the psychosocial burden is profound, with affected children and adolescents experiencing a higher prevalence of depression, anxiety, low self-esteem, social stigmatization, and reduced quality of life, creating a cycle that can hinder academic and social development [5].

The Kingdom of Saudi Arabia is no exception to this global pandemic and is, in fact, considered one of the nations most severely affected by the rapid rise in childhood obesity [6]. This alarming trend is deeply rooted in the profound and rapid socioeconomic and lifestyle transformations the country has undergone over the past four decades—a phenomenon often termed the "nutrition transition" [7].

Traditional, active lifestyles and diets have been swiftly replaced by patterns characterized by high consumption of energy-dense, processed foods and sugar-sweetened beverages, coupled with markedly reduced levels of physical activity due to increased urbanization, vehicular dependence, climate constraints on outdoor play, and the pervasive influence of screen-based entertaiNRent [8]. This shift has created a powerfully obesogenic enviroNRent, placing Saudi children and adolescents at exceptional risk.

Despite widespread recognition of the problem, efforts to quantify its true scale and to implement effective, nationwide management strategies in Saudi Arabia have been met with significant challenges. The existing body of literature is marked by considerable heterogeneity. Studies vary widely in their geographic focus—from single-city surveys to regional assessments—their methodological rigor, the age groups targeted, and, most critically, the anthropometric criteria used to define overweight and obesity. While some studies employ international standards from the World Health Organization (WHO) or the International Obesity Task Force (IOTF), others utilize the Saudi national growth charts, a practice recommended for local accuracy but one that complicates direct comparisons and syntheses of data [9]. This inconsistency has resulted in a fragmented evidence base, with prevalence estimates ranging dramatically and a lack of clarity on the most potent and pervasive risk factors specific to the Saudi context.

Similarly, the landscape of management and prevention is complex and inadequately mapped. While risk factors such as poor diet and inactivity are universally acknowledged, deeper systemic and cultural determinants, such as parental perceptions, feeding practices, the role of school health services, and the influence of broader family dynamics, are less comprehensively understood. A cohesive national strategy requires a precise and unified understanding of both the epidemiological burden and the multifaceted barriers to effective intervention [2]. This systematic review aims to assess the prevalence rates of obesity among Saudi children and adolescents and summarize the evidence on management in family medicine and internal medicine settings.

METHODOLOGY

Study Design

This systematic review was conducted and reported in strict accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 statement [10]. The protocol for this review has been designed to ensure a transparent, reproducible, and comprehensive synthesis of the existing evidence on the prevalence and management of childhood obesity in Saudi Arabia.

Eligibility Criteria

The review include**d** studies based on the following predefined criteria, structured using the PECO (Population, Exposure, Comparator, Outcome) framework:

- **Population:** Children and adolescents (aged 0–18 years) residing in the Kingdom of Saudi Arabia. Studies that include both Saudi nationals and non-nationals were included if the study was conducted within Saudi Arabia.
- **Exposure / Condition:** The condition of interest is childhood overweight or obesity, as defined by the individual study's criteria. This includes the use of various diagnostic standards such as body mass index (BMI) percentiles based on:
  - Saudi national growth references.
  - World Health Organization (WHO) growth standards.
  - Centers for Disease Control and Prevention (CDC) growth charts.
  - International Obesity Task Force (IOTF) cut-offs.
- **Comparator:** For prevalence studies, the comparator is the general pediatric population without the condition for establishing rates. For studies on risk factors, management, or perceptions, comparators may include children with normal weight, different intervention groups, or parents/guardians with varying levels of knowledge or practice.
- **Outcomes:** The primary outcomes are:

1. **Prevalence:** Proportion of overweight and obesity among the study population.
2. **Management & Associated Factors:** Identification of risk factors (e.g., dietary habits, physical inactivity, screen time, parental factors, socioeconomic status) and evidence of management strategies, interventions, or healthcare practices (e.g., parental perceptions,

knowledge, attitudes, and practices (KAP), school-based programs, clinical management approaches).

- **Study Types:** Observational studies were included, specifically:
  - Cross-sectional studies.
  - Case-control studies.
  - Cohort studies (prospective or retrospective).
  - Descriptive studies reporting prevalence.

  Randomized Controlled Trials (RCTs) evaluating management or prevention interventions were also eligible. Reviews, editorials, commentaries, case reports, case series, qualitative-only studies (without quantitative prevalence or risk factor data), and non-human studies were excluded. Studies published in languages other than English or Arabic were excluded due to resource constraints.

Search Strategy

A systematic and exhaustive search was performed to identify all relevant published literature. The search encompassed the following electronic bibliographic databases from their inception to the present date: PubMed/MEDLINE, Embase, Scopus, Web of Science, and Cochrane Library. The search strategy was developed and refined in consultation with a professional medical librarian. It utilized a combination of controlled vocabulary (e.g., MeSH terms in PubMed, Emtree in Embase) and free-text keywords related to three core concepts: **"child," "obesity," and "Saudi Arabia."** Boolean operators (AND, OR) were used to combine these concepts. The search strategy for PubMed is provided below as an example and was adapted for syntax and subject headings in other databases.

Sample PubMed Search Strategy:

1. (child* OR adolescent* OR pediatric* OR teen* OR youth* OR "school aged")
2. (obes* OR overweight OR "body mass index" OR BMI OR adiposity)
3. ("Saudi Arabia" OR Saudi)
4. 1 AND 2 AND 3

Filters: Humans

Study Selection Process

All records retrieved from the database searches were imported into **Rayyan** systematic review software for efficient management. Duplicate records were removed automatically and manually. The study selection followed a two-stage, independent screening process conducted by two reviewers (Reviewer 1 and Reviewer 2). In the first stage, both reviewers independently screened the titles and abstracts of all records against the eligibility criteria. In the second stage**,** the full-text articles of all records deemed potentially relevant were retrieved and assessed independently by both reviewers for final inclusion. At both stages, any disagreements between the reviewers was resolved through discussion. If consensus cannot be reached, a third senior reviewer (Reviewer 3) was consulted for adjudication. The entire selection process was documented and presented in a **PRISMA 2020 flow diagram** [10], illustrating the number of records identified, screened, assessed for eligibility, and finally included, with reasons for exclusion at the full-text stage.

Data Extraction

Data from the included studies were extracted independently by two reviewers using a pre-designed, standardized, and piloted data extraction form in **Microsoft Excel**. The form captured the following information:

- **Study Identification:** First author, publication year, journal, study title.
- **Study Characteristics:** Study design, setting (city/region), data collection period, study objectives.
- **Participant Characteristics:** Sample size, age range (mean/median), sex distribution, inclusion/exclusion criteria, sampling method.
- **Exposure/Outcome Assessment:** Definition and diagnostic criteria for overweight/obesity (e.g., growth reference used, cut-off points), methods for measuring height and weight (objective vs. self-reported).

RESULTS

  - **Prevalence:** Numbers and proportions for underweight, normal weight, overweight, and obesity.
  - **Risk Factors/Management:** Key findings related to associated factors (e.g., dietary habits, physical activity, screen time, family history) and management (e.g., parental KAP scores, intervention outcomes, healthcare provider roles). Quantitative data (e.g., odds ratios, prevalence ratios, mean differences) with 95% confidence intervals and p-values was extracted where reported.
- **Other:** Funding sources, author declarations of interest, and key limitations noted by the study authors.

Risk of Bias (Quality) Assessment

The methodological quality and risk of bias of the included observational studies were critically appraised by two independent reviewers using the Newcastle-Ottawa Scale (NOS) [11, 12]. The NOS is a validated tool for assessing non-randomized studies. For cross-sectional studies, the adapted version assessed three domains: Selection (representativeness of the sample, sample size, non-respondents, ascertaiNRent of exposure), Comparability (control for confounding factors), and Outcome (assessment of outcome, statistical test). For the single included case-control study, the standard NOS for case-control designs was applied. Each study was judged and awarded stars within each domain, leading to a total score. An overall judgment of risk of

bias was made based on the total score: Low risk (≥7 stars), Moderate risk (5-6 stars), High risk (≤4 stars). Any discrepancies in scoring between reviewers were resolved through discussion or by consultation with a third reviewer. The results of this assessment was summarized narratively and presented in a tabular format within the review.

RESULTS

A total of 782 records were identified through systematic searches of relevant databases. Following the automated removal of 398 duplicate records, 384 unique studies underwent initial title and abstract screening, from which 251 records were excluded. Full-text retrieval was attempted for the remaining 133 reports; 94 of these could not be retrieved for further assessment due to inaccessability and missing of full-text. Consequently, 39 full-text reports were evaluated for eligibility against the inclusion criteria. Of these, 29 were excluded for reasons including wrong outcome (n=13), wrong population (n=5), and being only an abstract (n=11). Ultimately, a total of 10 studies met all eligibility criteria and were included in the final systematic review.

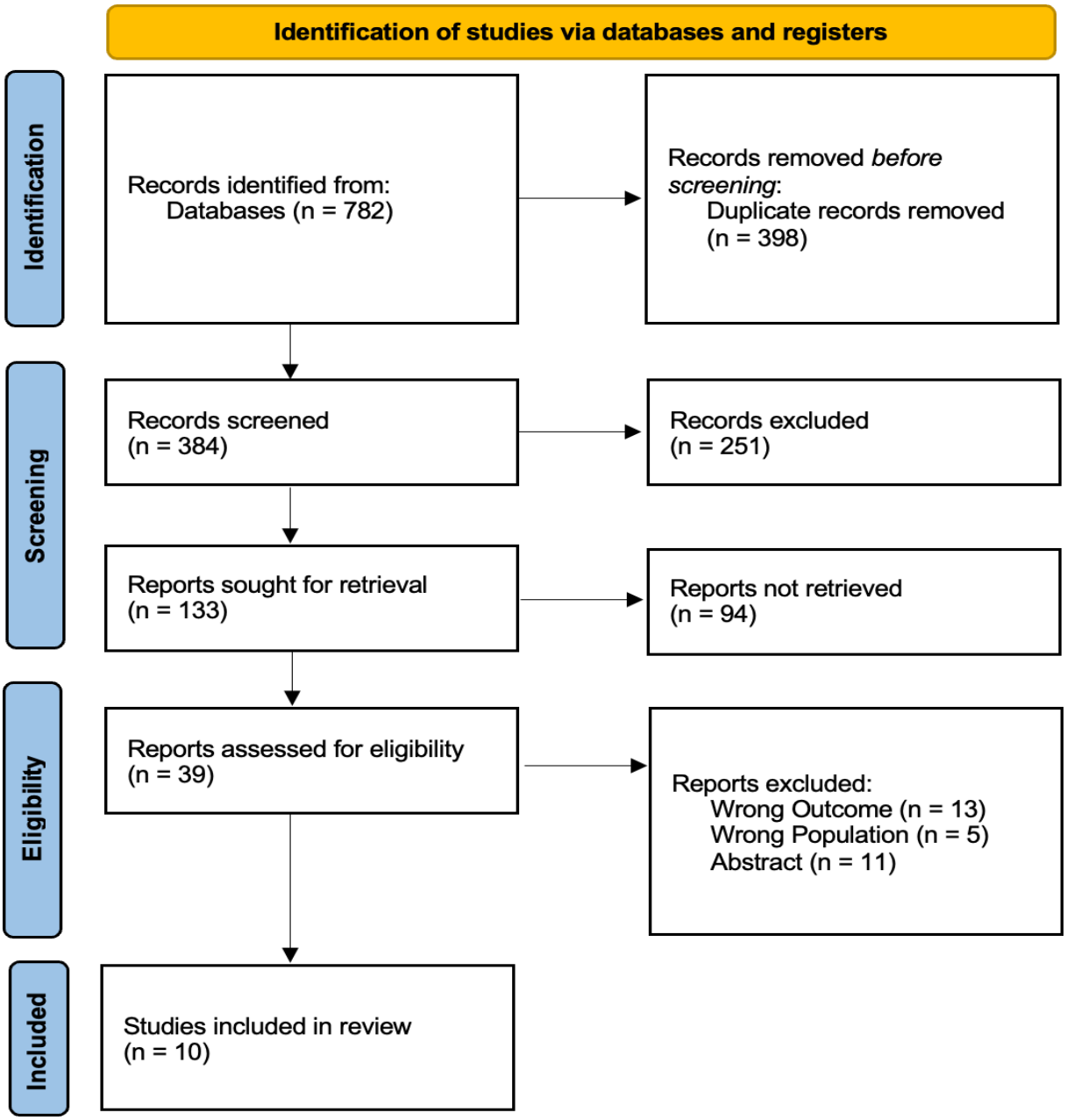

Figure (1): PRISMA 2020 Flow Diagram for Study Selection. Add Prisma citation.

The ten studies included in this systematic review, published between 2021 and 2025, provide a multi-faceted perspective on childhood obesity in Saudi Arabia, encompassing various regions, designs, and sample types.

The largest and most nationally representative study [13] was a retrospective, population-based analysis of 351,195 children and adolescents (aged 2-19 years) utilizing records from the National Guard Health System between 2016 and 2021, providing a crucial benchmark using Saudi-specific growth charts. Other studies employed cross-sectional designs with varying scopes: two investigations offered comparative insights using school-based samples from major cities (Riyadh and Jeddah, n=2,169) [15] and from the Aseer region (n=300) [16], while others focused on specific settings like outpatient clinics in Riyadh (n=576) [20] or primary healthcare centers in Yanbu (n=80) [21].

Notably, several studies shifted the focus from child anthropometrics to parental influence, surveying fathers (n=179) [17] and parents (n=907 [18] and n=324 [19]) to assess perceptions, knowledge, and feeding practices. The samples primarily consisted of school-aged children, with one study focusing exclusively on female students in Ha'il (n=549) [22], and one utilizing a case-control design (n=492) to identify risk factors [14]. This heterogeneity in geographic coverage, sample size, and design underscores the diverse evidence base on this public health issue within the Kingdom.

The reported prevalence of childhood obesity and overweight varied significantly across studies, influenced by sample characteristics, geographic location, and the growth references used. The nationwide study [13] established a baseline prevalence of 9.4% for obesity and 11.2% for overweight, identifying higher rates in boys, young children (2-6 years), and the Central and Eastern regions. Other studies reported higher figures in specific cohorts, such as 27% obesity among schoolgirls in Ha'il [22] and a combined overweight/obesity rate of approximately 50% in a sample from Aseer [16]. A critical methodological study [15] demonstrated how the choice of growth standard (Saudi, IOTF, or WHO) substantially alters prevalence estimates, with the WHO criteria yielding the highest obesity rate (18.9%). Beyond prevalence, the studies consistently identified a constellation of modifiable risk factors. These included behavioural elements such as frequent consumption of sweets, fast food, and sugar-sweetened beverages [16, 20, 22], low physical activity [14, 22], and excessive screen time [14, 18]. Parental and familial factors were strongly emphasized, including parental obesity [14], low parental education [21], cesarean delivery [14], and a family history of obesity which was linked to the normalization of excess weight [19]. A significant and convergent finding across multiple studies was the critical role of parental perception and knowledge, often highlighting a substantial gap between awareness and practice or accurate recognition. Studies consistently found a high degree of parental misperception regarding their child's weight status, with a strong tendency to underestimate it. For instance, while 17% of children were objectively measured as obese in one study, only 4% of parents perceived them as such [19]; another found that 56.3% of parents misperceived their child's weight [21]. This misperception was identified as an independent risk factor for obesity [14] and was more likely in families with a history of obesity [19].

While parental knowledge and attitudes about obesity risks were generally high [18], reported practices often contradicted this awareness, with prevalent issues like uncontrolled snacking, eating while using screens, and insufficient monitoring of diet [17, 18]. The study focusing on Saudi fathers [17] provided a novel perspective, revealing that lower paternal self-efficacy was associated with more controlling and potentially counterproductive feeding practices, such as pressuring children to eat. This collective evidence underscores that effective management strategies must move beyond generic awareness campaigns to address deep-seated perceptual biases and empower parents with practical skills.

The methodological quality of the included studies, assessed using the Newcastle-Ottawa Scale adapted for observational research, ranged from high to low risk of bias, which is essential for interpreting the strength of the evidence. The study by **AlEnazi *et al.*** [13] was judged to have a low risk of bias due to its exceptionally large, nationwide, health-system-based sample and the use of objectively measured growth data classified with national standards.

Similarly, the comparative study by **Al-Hazzaa *et al.*** [15] and the two-stage study by Gohal [19] were rated as low risk, owing to their robust sampling methods, objective measurements, and appropriate control for confounders. In contrast, several studies were rated as having a moderate [16, 17, 20] or high [21] risk of bias, primarily due to limitations in participant selection. These limitations included the use of convenience sampling from restricted geographical areas [16, 21], online recruitment which may not be representative [17, 18], and clinic-based sampling which introduces selection bias [20]. Furthermore, some studies did not adequately account for key confounding variables like age and sex in their analyses of risk factors [16, 21].

This spectrum of quality highlights that while the review identifies consistent themes—particularly regarding risk factors and parental perceptions—the precision of pooled prevalence estimates is constrained by the variability in study design and sampling rigor.

Table 1: Methodological and Demographic Characteristics of Selected Studies

Study (Author, Year, Reference)	Study Location	Study Design	Sample Size	Sample Type	Age Range (Years)	Sex	Study Year/ Period	Sampling Method
AlEnazi *et al.*, 2023 [13]	Nationwide (5 hospitals & 24 PHC centers)	Retrospective, population-based	351,195	Children & adolescents visiting NGHS facilities	2-19	Both	2016-2021	Census of health system records
Aljassim & Jradi, 2021 [14]	Not specified (school children)	Case-control	492 (246 cases, 246 controls)	School children	5-9	Both	Sept-Dec 2017	Purposive/Case-control
Al-Hazzaa *et al.*, 2022 [15]	Riyadh & Jeddah	Cross-sectional	2,169	School children	6-13	Both	2017 & 2019	Multistage random cluster (schools)
Mustafa *et al.*, 2021 [16]	Abha & Khamis Mushayt (Aseer)	Cross-sectional	300	School children	1-17 (Mean: 8.6)	Both	2019	Convenience (schools)
Aldolaim *et al.*, 2025 [17]	Saudi Arabia (online)	Cross-sectional	179	Fathers of school-age children	Children: 6-12	Fathers only	Jun-Dec 2023	Online survey (convenience)
Alqahtani YA, 2025 [18]	Aseer Region (online)	Cross-sectional	907	Parents of children ≤18 years	Children: ≤18	Parents (both)	3 months	Online survey (convenience)
Gohal G, 2025 [19]	Jazan Region	Cross-sectional	324	School students & their parents	12-16	Both	2022-2023	Two-stage (parent survey & school measurements)
Alrashed *et al.*, 2023 [20]	Riyadh (outpatient clinics)	Cross-sectional	576	Pediatric patients at a public hospital	6-15	Both	Jan-Oct 2022	On-site survey at clinics
Alodainy, 2022 [21]	Yanbu Al Bahr (PHCCs)	Cross-sectional	80	School children attending PHCCs	6-12	Both	2021	Convenience (PHCC attendees)
Hussein *et al.*, 2021 [22]	Ha'il Region	Cross-sectional	549	Female school students	7-12 (Mean: 8.9)	Female only	NR	Multistage (from different schools)

PHC: Primary Healthcare, **PHCC:** Primary Healthcare Center, **NGHS:** National Guard Health System, **NR:** Not Reported.

Table 2: Key Findings and Specific Outcomes According to Study Objectives

Study (Author, Year, Reference)	Prevalence (Obesity / Overweight)	Key Risk / Associated Factors	Feeding Practices / Dietary Habits	Parental Perceptions / KAP	Other Outcomes / Notes
AlEnazi *et al.*, 2023 [13]	**Obesity:** 9.4% **Overweight:** 11.2%	Higher in boys (10.4%) vs girls (8.3%). Highest in ages 2-6 yrs (12.3%) & in Central/Eastern regions (9.9%).	NR	NR	**Main Outcome:** Provides a national prevalence benchmark using Saudi growth charts.
Aljassim & Jradi, 2021 [14]	**Cases:** Overweight /Obese (246).	Unemployed father, paternal overweight/obesity, cesarean delivery, low active play (<30 min/day), frequent snacking, screen time >2 hrs/day, incorrect parental weight perception.	Frequent snacking.	Incorrect child weight perception is a significant risk factor.	NR
Al-Hazzaa *et al.*, 2022 [15]	**Varies by ref:** KSA: Ob:9.3%, OW:22.4% IOTF: Ob:12.7%, OW:18.4% WHO: Ob:18.9%, OW:19.1%	Boys > Girls (OW/Ob). Family income (IOTF), small family size associated with obesity across all criteria.	NR	NR	**Main Outcome:** Highlights significant variation in prevalence estimates based on classification criteria.
Mustafa *et al.*, 2021 [16]	**Overweight/Obese:** ~50% (Exact: >50% had high BMI). **Obesity:** 31 % (estimated from text).	Significant association with sweets, chocolate, and fast-food consumption. More prevalent in older children.	Unhealthy dietary habits (sweets, chocolate, fast food).	NR	NR
Aldolaim *et al.*, 2025 [17]	NR	Lower paternal self-efficacy correlated with greater control (pressure to eat, monitoring). Higher self-efficacy linked to accurate perception of child/parent weight.	Pressure to eat, monitoring, feeding responsibility.	Paternal self-efficacy and perceptions are central findings.	Focus on the need for **father-centered**interventions.
Alqahtani YA, 2025 [18]	NR	Maternal education & employment associated with higher knowledge.	Prevalent unhealthy practices: snacking (85.1%), eating with screens (73.8%), high	**High knowledge & attitude, but poor practice translation.** Knowledge correlates with attitude & practice.	NR

Study (Author, Year, Reference)	Prevalence (Obesity / Overweight)	Key Risk / Associated Factors	Feeding Practices / Dietary Habits	Parental Perceptions / KAP	Other Outcomes / Notes
			screen time (48.7% >3 hrs).		
Gohal G, 2025 [19]	**Observed:** OW:19.45%, Ob:17% **Parent-Perceived:** OW:13 .65%, Ob:4%	Family history of obesity increases odds of parental misperception (OR: 1.6)	NR	**Significant underestimation** of child's weight status, especially with family obesity history.	Highlights **normaliza tion** of obesity within families as a key barrier.
Alrashed *et al.*, 2023 [20]	**Obese:** 13.5% **Overweight:** 16.7 % **Underweight:** 15. 6%	Age (11-12 yrs), eating lunch from school cafeteria, consuming soft drinks ≥4 times/week.	Lunch from school cafeteria, high soft drink intake.	NR	Conducted in **outpatient clinic** setting; also notes a high underweight prevalence.
Alodainy, 2022 [21]	**Obese:** 13.8% **Overweight:** 5%	Parental education level (higher obesity with less educated parents). No significant link to child demographics/diet in this sample.	Fast food, sweets, soft drinks common. Low sports practice (36.3%).	**High misperception (56.3%).** Only 1.3% perceived child as obese.	NR
Hussein *et al.*, 2021 [22]	**Obese:** 27% (by BMI)	Chocolate/sweets consumption (significant). High fast food & soft drink intake (high OR). Watching TV while eating correlated with waist girth.	High fast food, soft drinks, sweets/choco late. Low activity linked to abdominal fat.	NR	Focus on **female students only**. Uses additional anthropometric measures (skinfold, waist girth).

KAP: Knowledge, Attitudes, Practices. **OW:** Overweight. **Ob:** Obese. **IOTF:** International Obesity Task Force. **OR:** Odds Ratio. **NR:** Not Reported.

Table 3: Risk of Bias Assessment using the Newcastle-Ottawa Scale

Study (Author, Year)	Selection (Max 5)	Comparability (Max 2)	Outcome (Max 3)	Total Stars (/10)	Overall Risk of Bias
AlEnazi *et al.*, 2023 [13]	★★★★★ (5)	★★ (2)	★★★ (3)	**10**	**Low**
Aljassim & Jradi, 2021 [14]	★★★☆☆ (3)	★☆ (1)	★★★ (3)	**7**	**Low**
Al-Hazzaa *et al.*, 2022 [15]	★★★★☆ (4)	★★ (2)	★★★ (3)	**9**	**Low**
Mustafa *et al.*, 2021 [16]	★★☆☆☆ (2)	☆☆ (0)	★★☆ (3)	**5**	**Moderate**
Aldolaim *et al.*, 2025 [17]	★★☆☆☆ (2)	★☆ (1)	★★☆ (3)	**6**	**Moderate**
Alqahtani YA, 2025 [18]	★★★☆☆ (3)	★☆ (1)	★★☆ (3)	**7**	**Low**
Gohal G, 2025 [19]	★★★☆☆ (3)	★★ (2)	★★★ (3)	**8**	**Low**
Alrashed *et al.*, 2023 [20]	★★☆☆☆ (2)	★☆ (1)	★★☆ (3)	**6**	**Moderate**
Alodainy, 2022 [21]	★☆☆☆☆ (1)	☆☆ (0)	★★☆ (3)	**4**	**High**
Hussein *et al.*, 2021 [22]	★★★☆☆ (3)	★☆ (1)	★★★ (3)	**7**	**Low**

DISCUSSION

This review confirms childhood obesity as a serious and widespread concern in Saudi Arabia. The most robust contemporary estimate, from a nationwide sample using Saudi growth charts, places obesity at 9.4% and overweight at 11.2% [13]. However, significant heterogeneity persists, with regional studies reporting rates as high as 27% for obesity [22] or 50% for combined overweight/obesity [16]. This geographical disparity, historically linked to urbanized areas like the Central and Eastern provinces [13, 23], is compounded by methodological challenges. The choice of diagnostic criteria remains a critical confounder, as demonstrated by Al-Hazzaa et al. [15], where using WHO standards doubled the estimated obesity prevalence compared to Saudi charts for the same cohort. This convergence of recent and past data indicates the fundamental drivers of the epidemic have not been decisively arrested.

The identified behavioral risk factors center on a persistent obesogenic lifestyle: high consumption of fast food, sweets, and sugar-sweetened beverages [16, 20, 22], coupled with physical inactivity and excessive screen time [14]. This pattern aligns with earlier seminal research [24, 25]. Recent studies add specificity, linking obesity to eating lunches from school cafeterias [20] and to the behavior of watching television while eating [22], highlighting evolving enviroNRental vectors beyond basic dietary categories.

A critical and consistent finding is the profound role of familial perception as a barrier. A majority of parents of overweight or obese children fail to recognize the problem [14, 19, 21]. This misperception is strongly linked to the normalization of obesity within families, particularly those with a history of weight issues [19]. This explains the observed "knowledge-practice gap," where high parental awareness of obesity risks coexists with practices that promote it, such as permitting frequent snacking and excessive screen time [18]. Earlier qualitative work noted cultural preferences contributing to this lack of urgency [26]. The focus on paternal factors further enriches understanding, showing that lower paternal self-efficacy is associated with more controlling feeding practices [27], underscoring the need to engage all caregivers.

Despite recognition of the problem, significant gaps exist in intervention strategies and management pathways. Current efforts often remain fragmented, oscillating between generalized national awareness campaigns and isolated school-based programs, with limited evidence of sustained, integrated approaches. A critical gap is the lack of a standardized, national clinical management protocol for childhood obesity within primary care, which is often the first point of contact. While school nurse programs exist, they face systemic hurdles like ambiguous roles and competing priorities, as highlighted by Alharbi [28]. Furthermore, there is a stark shortage of tailored, family-centered behavioral intervention programs that specifically address the

identified perceptual gaps and build practical parenting skills. Community-based resources for nutrition education and physical activity are often underutilized or inaccessible [29, 31]. Policy-level actions, such as stricter regulations on food marketing to children and mandatory nutritional standards for school meals, though discussed within Vision 2030 [32], require more robust implementation and enforcement to alter the obesogenic enviroNRent effectively.

Systemic barriers extend beyond the household. Challenges faced by frontline health workers, such as school nurses, include a lack of institutional support and competing priorities [28, 29]. Childhood obesity remains associated with broader socio-economic determinants like parental education and employment [14, 21], emphasizing its multidimensional nature within the socio-ecological model [30]. Rapid socioeconomic transformation and cultural norms around food further complicate individual-level change [31]. Therefore, effective management necessitates moving beyond clinical counseling to include integrated policies targeting the food industry, urban planning, and media regulation, as envisioned in Saudi Vision 2030 [32].

LIMITATIONS

The interpretation of this review's findings must be tempered by an acknowledgment of its limitations. The most significant constraint is the substantial heterogeneity among the included studies, particularly in their methodological approaches to defining and measuring obesity, their sampling strategies, and their geographic focus. This variability, while reflective of the real-world research landscape, precludes a statistically robust meta-analysis to derive a single pooled prevalence estimate and complicates direct comparisons across studies. The predominance of cross-sectional study designs limits our ability to infer causality from the identified associations between risk factors and obesity.

Furthermore, a non-trivial number of studies were assessed as having a moderate to high risk of bias, often due to the use of convenience, online, or clinic-based sampling, which may limit the generalizability of their findings to the broader Saudi pediatric population. Several studies also relied on self-reported data for dietary and behavioral practices, which is susceptible to recall and social desirability biases. Publication bias was not assessed due to small number of studies.

Finally, while this review captures studies published through early 2025, the dynamic policy enviroNRent under Saudi Vision 2030 means that the full impact of recent large-scale national health promotion initiatives may not yet be evident in the peer-reviewed literature, representing a potential lag in the evidence base.

CONCLUSION

In conclusion, this systematic review affirms that childhood obesity remains a deeply entrenched and multifactorial public health priority in Saudi Arabia. The condition is sustained by a well-characterized yet persistently unaddressed triad of unhealthy diets, physical inactivity, and excessive sedentary behavior. The review's most critical insight, however, moves beyond these conventional risk factors to highlight the paramount importance of the familial context—specifically, the pervasive parental misperception of child weight and the consequential gap between health knowledge and daily practice. These findings demand a strategic evolution in the national response. Future efforts must pivot decisively from generic awareness campaigns to implement evidence-based, family-centered interventions. Such programs should be designed to systematically correct weight misperceptions, build parental (including paternal) self-efficacy and skills, and provide tangible strategies for creating a healthier home food and activity enviroNRent. Concurrently, this familial focus must be supported and reinforced by strong macro-level policies. These include strengthening nutritional standards in schools, regulating the marketing of unhealthy foods and beverages to children, creating safe and accessible spaces for physical activity, and formally integrating obesity prevention into the mandates and training of community health workers. Addressing the complex etiology of childhood obesity in Saudi Arabia necessitates a sustained, integrated, and culturally intelligent approach that simultaneously empowers families and transforms the enviroNRents in which they live.

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Ethics Approval and Consent to Participate

Not Applicable.

Consent for Publication

Not Applicable.

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Competing Interests

None.

Authors' Contributions

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