RESEARCH PAPER

Effectiveness of school, family and nurse led strategies for childhood obesity: A Narrative review..

Arpan Pandya[1]*, Dr. Anil Kumar Sharma[2]

*[1]*Assistant Professor, Manikaka Topawala Institute of Nursing, CHARUSAT, Changa.*
Email. arpanpandya.nur@charusat.ac.in
[2]Professor cum Principal, Manikaka Topawala Institute of Nursing, CHARUSAT, Changa
Corresponding author
Arpan Pandya

ABSTRACT

Introduction: Childhood obesity remains a Major global public health concern. With rising prevalence across Children and adolescents. Over the past decade, Multiple interventions. Particularly, nurse led, school based, family cantered and digital health approaches have emerged to address behavioral, dietary and physical activity determinants. Equality evidence from randomised control trials (RCT's), Experimental studies and systematic reviews examining the effectiveness of interventions targeting childhood obesity.

Aim: To evaluate the effectiveness of recent interventions aimed at reducing childhood obesity among individuals aged ≤ 20 years Be the focus on nurse led, school based and family cantered strategies

Material and Methods: Structured search was conducted among various databases like Permit Scoopers, EBSCO, CINHAL And few unpublished research studies from 2020 to 2025. The search strategies combined terms related to nurse lead intervention, children/adolescent and obesity restricted to relevant subject areas and keywords. Only English language randomised control trials, experimental studies (true and quasi), scoping review, systematic review, meta-analysis, qualitative, cross sectional, process evaluation, program evaluation, non RCT, mix method, studies were included. Studies were considered eligible if. They reported anthropometric outcomes such as BMI, BMI Z score, west hip circumference or body fat percentage. Studies focusing on non-nursing intervention, non-obesity treatment intervention Conducted beyond 5 years of time was excluded from review. Studies were screened as per PRISMA-Scr guidenes

Results: The literature review process identified multiple interventions focused on treatment and management of childhood obesity. Research interventions demonstrated variable effectiveness across settings. Nurse led and M Health approaches shoes promising reduction in BMI and improvised health behaviour among adolescents. School based secondary prevention programme were effective in promoting healthy lifestyle changes, While family base council and lifestyle interventions generated. Modest yet significant improvements in anthropometric measures. Digital, behavioural and multi component interventions generally outperform single component approaches

Conclusion: The outcome of literature review suggests that the nurse led, school based, family focused and digital interventions can effectively address childhood obesity, especially when multi component and behaviourally oriented Interventions r deployed. A future large scale or cities with longer follow pagers are needed to strengthen the evidence on long term sustainability

Keywords: Childhood obesity, nurse led intervention, school & family-based intervention, BMI, Z score..

How to cite this article: Pandya A, Sharma AK; Effectiveness of school, family and nurse led strategies for childhood obesity: A Narrative review... Int J Drug Deliv Technol. 2026;16(4): 249-274. DOI: 10.25258/ijddt.16.4.28

Source of support: Nil.

Conflict of interest: The author declares no conflict of interest, and this work represents independent academic research conducted in a personal capacity, not associated with any employer or commercial entity.

INTRODUCTION

Childhood obesity has emerged as one of the most. And. Psychosocial complications extending into Persistent global health challenges of 21st century. adulthood.[2,3,4] With prevalence increasing across both developed and developing countries of the world. According to The multifactorial nature of obesity driven by dietary World Health Organization, more than 39,000,000 children under the age of 5 and over 300 and 40,000,000 adolescent age 5 to 19 were classified as overweight or obese, Reflecting a study upward trajectory in most word regions.[1]

Childhood obesity is associated with higher risk of metabolic syndrome, type 2 diabetes, dyslipidaemia, patterns, physical Inactivity, Position sleep behaviour. Social. Environmental influences and digital exposure necessitates comprehensive intervention Models rather than single component approaches. [5,6]

In recent years nurse led, Family cantered and technology assisted interventions have gained. Prominence as sustainable strategies for addressing childhood and adults and obesity. Nurses play a crucial.

role in patient education, behaviour modification, counselling, follow up and monitoring, making them central figure in obesity prevention program across community, clinical and school settings.[7,8]

Evidence suggest that nurse led intervention focusing on lifestyle counselling, motivational interviewing, digital

monitoring and parental support have shown promising improvement in BMI, lifestyle behaviours and self-efficacy among children and adolescent.[9,10,11]

Schools represent an ideal setting for preventive Interventions As the influences directory behaviour, physical activity opportunities and health literacy. School based obesity prevention programme incorporating nutrition education, physical activity session and environmental modification and family involvement have demonstrated moderate bird consistent improvement in directory behaviour and

activity patterns. [12,13]

Similarly, family cantered intervention emphasises the integral role of caregivers in shaping eating environment. Portion control and daily routines

Material and Methods:

A comprehensive literature search was conducted Following databases And eventually, based on inclusion and exclusion criteria, researcher Identified. Totally 30 research papers eligible for review.

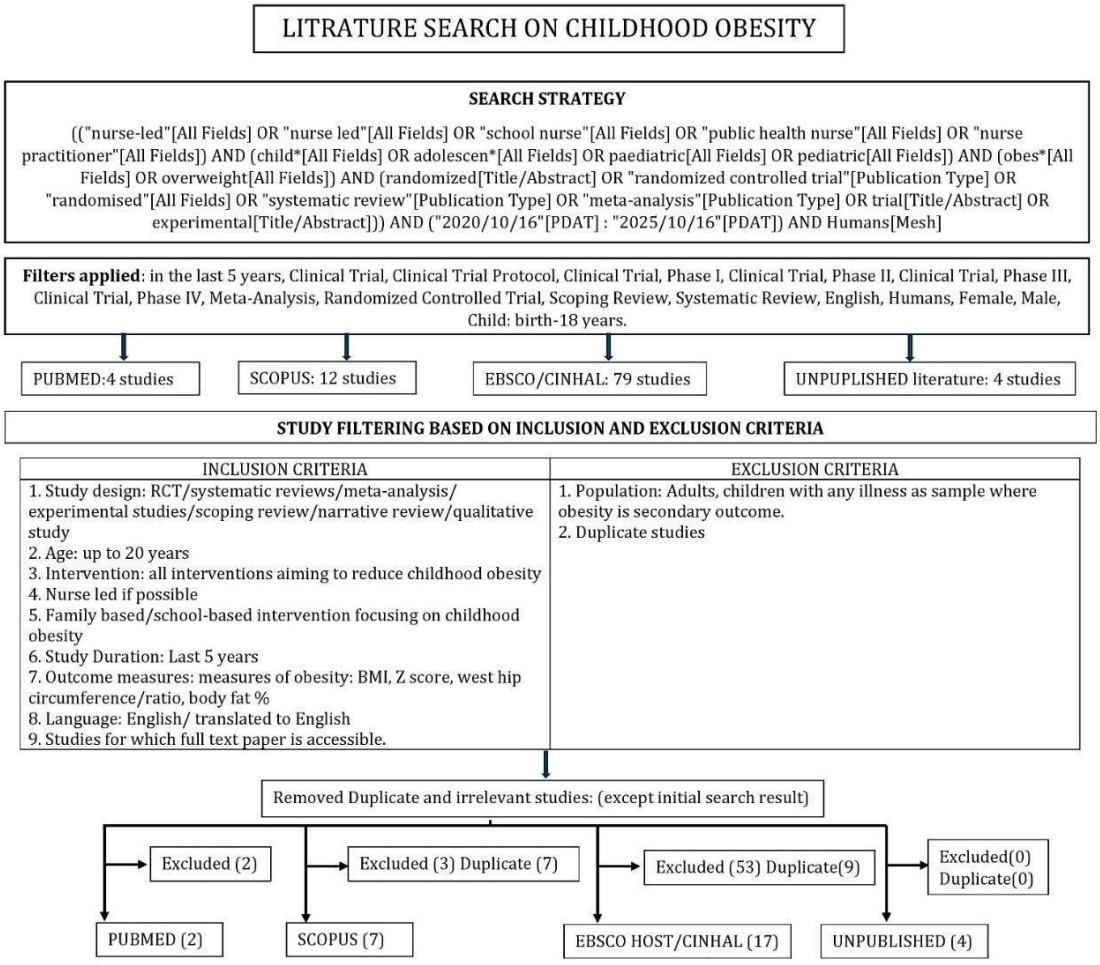
Thereby improving long term adherence and sustaining behaviour changes.[14,15]

Put an expansion of digital platforms like M Health and Tally interventions have added a new dimensions to basicity management. Mobile app variable activity trackers, text message reminders and daily nursing models promote the interactive self-monitoring, real time feedback and continuous engagement factors linked to improvised health outcomes and healthier habits among youths. [16,17,18]

This technology enabled interventions have particular advantages in increasing accessibility for population in remote and Underserved communities.

Given the rising prevalence of childhood obesity and the increasing number of the trials published in the recent years and updated, synthesis of randomised and experimental evidence is essential. This review exam means their studies published between 2020. N 2025 to identify effective intervention strategies, summarise key components contributing to positive outcomes and guide future practices in research.

Figure 1: Flow diagram for literature searching on Childhood Obesity



After a thorough literature search totally 30 studies were screened for review, and the study results were analysed based on major study components as in Table 1 representing comparative analysis of literature.

Author for Correspondence: Arpan Pandya

Summary of Literature review									
SN	**Research Aim / Objective**	**Study Type**	**Design And Methodological Approach**	**Sample And Sample Size**	**Intervention Summery**	**Key Findings**	**Auther's Interpretation & Recommendation**	**Research Gap Analysis**	**Summery**
1	Impact of nurse led SNAPSHOT programme on BMI, food habits, play time. [19]	RCT	Parallel group with intent to treat analysis General Linear Mixed model accounted for a partially clustered block design and adjusted for baseline and key covariance.	132 child parent group Children's aged between 8 to 12 years with BMI ≥75th percentile.	The school nurse implemented a behavioral program involving 4 home visits, 14 group meetings, and 32.5 hours of support from 5 parent teams and special caretakers.	High program acceptability but no reduction in BMI or improvisation in lifestyle behaviour.	Programme is feasible and acceptable. Recommend developing more accessible, possibly more intensive or differently structured interventions.	Insufficient scalable school programs for high-BMI children in diverse, low-income communities, with unclear evidence on effective intervention methods.	Upcoming plans require improved access, tailored services, enhanced collaboration between schools and health groups.
2.	Identify Cobenefits among mothers and children participating in the telephone support arm of the Healthy Beginnings intervention and factors affecting it.[20]	Multi method qualitative study with Randomised controlled trial	Sequential qualitative design. Content analysis followed by thematic analysis of focus group with intervention nurse's.	one focus group with four Child & Family Health Nurses who delivered the calls	Nurse lead telephonic talk with aligned with health beginning protocol.	Study intervention was psychological supportive to families	Telephonic assistance can be scalable and effective measure for management of childhood obesity.	Study results describe how Study intervention was supportive In Childhood obesity Management Council.	A structured nurse-led telephone intervention for early obesity prevention also functions as an important psychosocial and practical support system for new mothers.

3.	Evaluate nurse-led mHealth app for diet, physical activity and anthro - pometrics in overweight adolescents.[21]	Randomized controlled trial (parallel groups).	Quantitative; convenience sampling; Mann-Whitney U, chi-square tests; validated tools	305 adolescents (154 intervention, 151 control); overweight/ obese students.	9-month app with education/ behaviour-change; nurse facilitation; vs. usual care.	Higher knowledge (47 vs 42), PA (160 vs 120 min/week); modest KidMed gains; anthropometrics less clear.	Promising for knowledge /PA; need long-term weight follow-up.	Long-term anthropometric effects, scalability.	mHealth boosts knowledge/activity; supports digital nurse-led prevention.
4.	Examine effectiveness of nurse-led interventions for childhood/ adolescent overweight/ obesity prevention.[22]	Systematic review of RCTs.	Cochrane-informed narrative synthesis (18 studies); no meta-analysis due to hetero-genecity.	26 publications (18 studies); infants/children/adolescents.	Education, counselling, motivational interviewing multicomponent/ parental; vs. usual care.	Limited BMI effectiveness; consistent knowledge/behavior gains.	Feasible but inconclusive; improve trial quality/training/system embedding.	High-quality RCTs, consistent outcomes, contextual factors.	Nurses promising but evidence weak for weight; knowledge improves reliably.
5.	Evaluate multi-disciplinary family program on weight/ metabolic parameters in overweight/ obese children.[23]	Randomized controlled clinical trial.	Quantitative RCT; 24-month follow-up; ANOVA, ICC.	108 children (aged 6-12); overweight/obese.	12-month family-cantered: nutrition, exercise, CBT/education; vs. usual care.	BMI/skinfolds/waist reductions; metabolic improvements sustained.	Effective long-term; replicate/scale family programs.	Multi-site scalability, longer follow-up.	Family multi-disciplinary yields weight/metabolic gains.
6.	Map nurse-led interventions for paediatric overweight/ obesity prevention/ treatment.	Scoping review.	Systematic search (databases/ grey lit to 2019); descriptive synthesis; socioecological framework.	83 studies/programs (17 refs); infants/children/adolescents.	Education, counselling, advocacy, policy; multicomponent in schools/primary care.	Knowledge/ physical activity/diet gains consistent; BMI heterogeneous; broad nursing roles.	Nurses versatile; need training/sustainability for scale-up.	Rigorous effectiveness trials, implementation science.	Maps nurse roles/strategies; supports system embedding.
7.	Examine the effect of school nurse	Cluster RCT	Quantitative 16 weeks cluster	12-18 years students	Physical-activity-based structure	Decrease BMI, postprandial blood	School based actions are beneficial	Lack of long-term follow-	Health program improves weight,

	intervention on anthropometric and diabetic indicators.[24]		RCT		d program delivered during school time	glucose reduction, no change in FBS	in adolescent obesity and diabetes,	up, findings limited to one region.	BMI, glucose in adolescents.
8.	Impact of school nurse intervention and health screening on student's knowledge and behaviour.[25]	Quasi-experimental	pretest/ post-test single-group design with Quantitative evaluation	473 primary school students	10 week Omaha system problem rating scale for health screening of students.	School nurse screening plus interventions improved students' health knowledge, behaviors, and status scores.	School nurses can use screening and Omaha System documentation to detect problems and improve outcomes.	Need for controlled studies and longer-term follow-up.	The study results highlight the potential of nurse-led screening and intervention frameworks in school settings.
9.	Effect of an obesity prevention program on children's eating behaviors, physical activity, and obesity prevalence[26]	Quasi-experimental pretest-post-test design with control group.	Non-randomized controlled quasi-experimental3 observation	128 primary school students	School-based obesity prevention program	Positive behavioral and anthro-pometric effects sustained up to 15 months.	School based programme can improvise behaviour and BMI outcome.	Randomization can check casual effect.	Well organised school-based intervention can produce significant results.
10	Evaluating the use of a web-based resource targeted at increasing primary school physical activity.[27]	Observational quantitative process evaluation	web-based survey	269 school nursing staff	web-based resource features short exercises and movies designed for use during the school day to increase children's physical	There was moderate utilization of tool for physical activity which was improvised.	PRISMA principles, with data extraction for author, purpose, design, sample, methods, tools, findings, and evaluation	7,224 participants	

					activity				
11	rapidly review and synthesize evidence on the relationship between parenting practices and childhood obesity[28]	rapid review of the literature	Structured multiple database search with PRISMA guideline.	9 studies	Structured literature searching across various data base.	authoritative parenting correlates with healthier dietary habits, increased physical activity, and reduced obesity risk	Family-focused treatments emphasize parenting, feeding, routines, and education support.	Inconsistent definitions and measurements of parenting styles and practices reduce comparability across studies.	there is a robust and interrelated relationship between the factors and the likelihood of childhood obesity.
12	Evaluate effects of a two-year telephone-based intervention on BMI, eating habits, active play, and screen time behaviors[29]	Extension RCT	RCT with 1st year intervention and 2nd year follow up.	662 mother child group	Behavioral guidance on child feeding, activity promotion, reducing screen time for obesity risk reduction	Intervention results were associated with lower BMI among experimental group.	Telephonic intervention boosted BMI reduction activity	Can be tested at different setting and population	Telephone based obesity management programs aid children's weight.
13	improve the health outcomes of children through implementation of the On Track to Wellness, a nurse-led health education program[30]	Program evaluation	repeated cross-sectional design with community-based participatory approach	8 children	Nurse led health education programme including nutrition, physical activity, stress management, accident prevention	Results identified high prevalence of obesogenic behaviours and psychosocial stress among participating children	Program educates, addresses obesity challenges.	There is a need for community education programme. A gap exists in integrated programs that both educate children and provide experiential	Parents report barriers to healthy habits, highlighting needs for nutrition education and safe activity spaces, advocating for broader implementation.

								learning.	
14	Interview school faculty regarding barriers and catalyst of school obesity programme [31]	Qualitative phenomenological	Qualitative semi structured in depth interview	School faculty	Descriptive analysis of current practices	Schools prioritize academics over obesity prevention, facing resource and staff challenges.	Effective school obesity prevention needs committed leadership, resources, community involvement, teacher engagement, inclusive activities, and equity-focused support.	Studies are needed that incorporate parents, pupils, and staff views, assess implementation and funding, and test multi-level interventions addressing socioeconomic inequities in schools.	identifies barriers like curriculum pressures, limited funding, parental challenges, and underestimation of obesity in hindering school-based prevention, despite existing policies.
15	evaluate the effectiveness of a mobile health intervention in improving health parameters among children.[32]	RCT	Two-arm RCT. pre-post assessment over 12 weeks	112 children (Intervention = 56, Control = 56)	Participants used "Smart Kids Health" app with parental reminders for engagement.	App improved children's diet quality, physical activity, and obesity indicators compared to standard education.	Digital health platforms complement school programs, enabling scalable childhood health improvements.	Lack of long-term and culturally appropriate mHealth therapies evaluated in varied groups.	Application is effective. Combining multiple intervention improved adherence.
16	Compare the effect of gamified v/s traditional physical activity on physical parameters among obese children.[33]	RCT	Parallel-group RCT	60 participants, 9-12 yr. old students	60 min. session 3 times/week. Game group enjoyed team games while other group	Both intervention was effective but gamification shows more effectiveness.	interactive, game-based physical activity is more effective and engaging than conventional exercise	scarcity of direct comparisons between game-based and standard school training for	Game intervention for overweight children led to better weight loss and enjoyment.

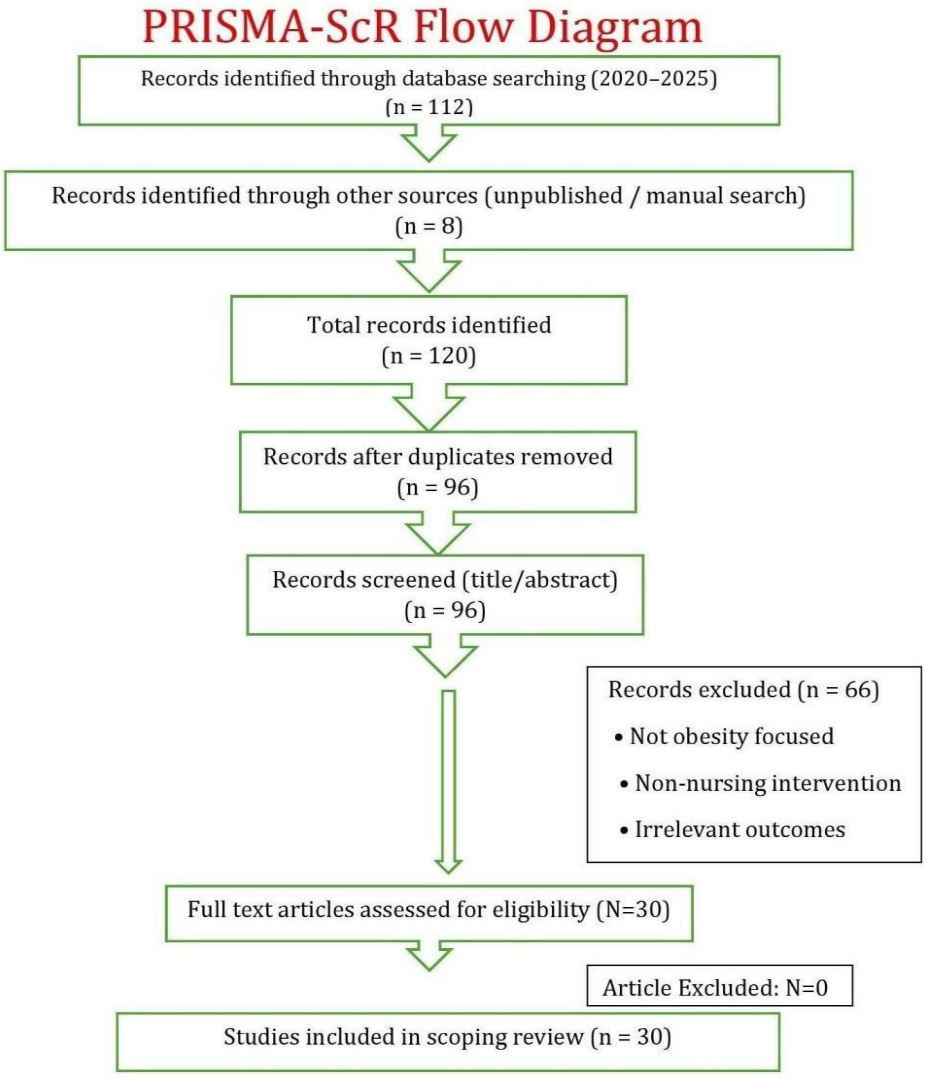
					practiced aerobic & strength training without game.			obesity management	
17	PHN's difficulty if implementation of national guidelines and follow up of obese children.[34]	Qualitative descriptive	Exploratory qualitative design using semi-structured interviews.	17 public health nurses.	Assessment, communication, coordination	PHNs face challenges balancing guidelines and family sensitivity.	National guidelines need practical tools.	Need for interventional and implementation studies evaluating structured training and team-based obesity management models.	Norwegian PHNs face barriers in implementing childhood obesity guidelines; support and training are needed.
18	Children's obesity intervention reduces BMI z-score.[35]	Study protocol for a pragmatic randomized controlled trial	Parallel-group, superiority RCT with stratified randomi-zation	108 samples	Virtual coaching sessions on parenting and health behaviours.	it details planned outcomes and analyses but does not report trial effectiveness results.	Nurse intervention aims to reduce toddler zBMI.	Need for virtual, cost-effective interventions for at-risk preschoolers	The PARENT trial tests a virtual nurse-delivered intervention for obesity risk in toddlers, evaluating effectiveness
19	Describe school nurses' experiences and challenges of working with childhood obesity in northern Sweden.[36]	Qualitative descriptive study	Inductive, emergent qualitative design using focus-group discussion	10 female school nurses	Nill	Nurses struggle with limitations.	Stigmatization and resource shortages are core obstacles. Support via guidelines, knowledge, reflection time, and peer	National guidelines needed.	School nurses face barriers addressing childhood obesity; collaboration and guidelines are

							support could empower them and improve equity of care		essential.
20	The impact of a 6-month family-based primary care intervention on dietary habits and BMI z-score reduction.[37]	Non RCT	Regression analysis is used in the lifestyle program to assess diet and BMI.	143 children aged 6–12 years with overweight or obesity and their families	Motivational interviewing, nutrition education, and activity sessions are all part of family-based counselling.	The intervention improved meals, decreased snacks, increased water intake, and decreased BMI.	Children's diet and weight status are improved by family-based interventions.	There is little data on transferability, cost-effectiveness, and sustain-ability.	Better eating practices resulted in healthier intake and a lower BMI.
21	Investigating perceptions of the disparities in childhood obesity between rural and urban areas.[38]	Qualitative	Qualitative exploratory	16 school nurses and 5 teachers.	non-interventional, descriptive study	Childhood obesity is a result of cultural norms in rural areas.	Rural lifestyles affect childhood obesity; interventions should honour local food beliefs and identities, adjusting to rural customs and behaviors.	Decision of diet plan should be based on local diet practices.	Views on preventing childhood obesity and overweight are influenced by cultural customs in rural Mid-Norway.
23	Examine public health nurses' communication with parents about obesity risk.[39]	qualitative, exploratory study	Qualitative categorical analysis was used to examine in-depth, semi-structured telephone interviews.	20 trained public health nurses with substantial experience, the majority of them are women in their	The experiences of nurses in communicating infant weight.	Barriers to obesity care include organizational challenges like limited time and workload, and internal issues such as	systems have to put into effect dependent applications, clean hints, comprehensive training, and integrate with allied health special	Generating nurse-delivered interventions, nurse's and parental perception.	Nurs's due to job constraints focuses less on BMI and need training for same.

				mid-40s.		insufficient knowledge and fear of offending parents.	ists like dietitians and social employees.		
24	assess the effectiveness of a routine primary healthcare module in preventing and managing childhood overweight and obesity.[40]	Mixed method	Qualitative Retrospective ecological	676 children aged 2–7 years	Diet, parental counselling,assesment	BMI reduction, normal and under weight gain BMI	Intervention can stabilize or improve weight trajectories.	absence of RCT, short follow-up and insufficient clarity on optimal integration with general practice and related services.	Study stabilized obesity, reduced BMI, but integration and family complexity challenged nurses.
25	Impact of high sugar sweetened beverages (SSB) on adolescent health, public health challenges and barriers.[41]	Narrative review	Descriptive synthesis of children's SSB trend.	secondary data on children and adolescents surveys	Describes population strategies for reducing sugary drink consumption in youth	SSB intake remains high, driving childhood obesity; policies yield modest, unequal reductions among high-risk groups.	Entrenched SSB intake requires multi-level policies beyond education alone	Gaps persist in evidence, populations, measurement, and policy implementation for effective, equitable youth SSB reduction.	SSBs drive youth health risks, requiring comprehensive, equity-focused prevention strategies.
26	family-based behavioral therapy program affects BMI, physical activity, and healthy eating.[42]	Quasi-experimental intervention study	Three-arm design with pretest, post-test	63 school-age obese children	Seven-week counselling: family involvement, school groups, self-efficacy, goals, problem-	Sixteen weeks after the intervention, the family-based group considerably improved diet and activity.	school collaboration aids in the control of obesity, family-based therapy encourages healthy behaviors.	Larger, longer trials are needed; implementation gaps, context, and mechanisms are still unknown	Children who receive family-based therapy eat better and exercise more, and their BMI slightly

					solving.			.	improves .
27	Assess long-term BMI changes in children via family-cantered interventions.[43]	Observational cohort	Prospective real-life cohort with retrospective registry extraction of anthropometric data	Studies including more than 1,500 children	offering multidisciplinary, guided support, family-cantered lifestyle care improves physical activity and nutrition.	Younger children improved their BMI, whereas older, very obese children exhibited little change.	BMI SDS is reduced by early family-cantered therapy, but long-term normalization is still a challenge.	Controlled trials and standardization are necessary to fill in design, data, and outcome gaps.	The national cohort demonstrates moderate decreases in BMI SDS; younger children benefit the most.
28	Examine whether family-based behavioral counselling is effective.[44]	Quasi-experimental study	Three-group pre-test post-test and follow-up design . Eating Behaviors Questionnaire, Physical Activity Questionnaire (PAQ-C), and standard BMI measurements .	School-aged children (10–12 years) with obesity (BMI ≥ 85th percentile) in municipal schools in southern Thailand .	7-week individual family-based counselling at home and school, involving parents v/s 7-week group-based counselling at school without family	Group 1 showed significantly higher healthy eating and physical activity scores than the Group-Based (GBCP) and Control groups after intervention .	Although BMI reductions may require longer treatments, FBCP successfully encourages healthy behaviors by involving the family system and self-efficacy.	Thai research lacked parental focus; study compares family versus group therapies.	Family-based counselling effectively improves healthy eating and activity in obese children .
29	impact of a Family-Based Behavioral Counselling Program (FBCP) on healthy eating behavior (HEB), physical activity (PA), and body mass	Quasi-experimental study	Three-group pre-test, post-test, and follow-up. Used validated questionnaires, BMI. Data analyzed with Repeated	63 School-aged children (10–12 years) with obesity in southern Thailand .	FBCP: family-focused; GBCP: school group; Control: usual brochures.	FBCP improved healthy eating and activity; BMI decreased, not significant.	FBCP boosts health behaviors via family involvement; longer intervention may reduce BMI.	The study highlighted family-based counselling as more effective than group-based interventions.	Family-based therapies can improve BMI and body composition, but standardized methods are needed.

	index (BMI) [45]		Measures ANOVA and ANCOVA .						
30	Study evaluated ecological nudge-based program's effects on body, habits, knowledge, support.[46]	Quasi-experimental design	Quasi-experimental, ecological nudge study; pre-post comparisons using repeated measures.	82 Grade 5 elementary school children with obesity degree ≥ 10%	Nine-week multidimensional obesity program using ecological nudge strategies at multiple levels.	Experimental group improved height, BMI, exercise, and obesity awareness; other measures unchanged .	Nudge-based program improved behaviors and obesity; longer duration needed for body fat.	Filled research gap on nudge-based, multilevel child obesity interventions in Korea.	9-week nudge program improved BMI, activity, awareness; limited effects.



QUALITY ASSESSMENT : GRADE Evidence Profile Table

Outcome	No. of Studies	Study Design	Risk of Bias	Inconsistency	Indirectness	Imprecision	Publication Bias	Overall Certainty	Summary of Findings
BMI / BMI z-score reduction	18	RCTs, cluster RCTs, quasi-experimental	Moderate	Moderate	Low	Moderate	Undetected	●●●◯ (Moderate)	Nurse-led, family-based, and digital interventions show modest but significant BMI reduction, stronger in multicomponent models.
Dietary behaviour improvement	20	RCTs, quasi-experimental, reviews	Low	Low	Low	Low	Undetected	●●●● (High)	Consistent improvements in diet quality, reduced sugary intake, improved meal patterns.
Physical activity increase	17	RCTs, quasi-experimental	Low	Moderate	Low	Low	Undetected	●●●◯ (Moderate)	School- and game-based interventions significantly increase activity levels.
Knowledge & self-efficacy	15	RCTs, quasi-experimental	Low	Low	Low	Low	Undetected	●●●● (High)	Strong evidence for improved obesity-related knowledge and motivation.
Metabolic indicators (waist, glucose)	6	RCTs	Moderate	Moderate	Low	Moderate	Undetected	●●◯◯ (Low)	Limited but promising improvements; evidence insufficient for firm conclusions.
Long-term sustainability	5	Cohort, extension RCTs	Serious	Serious	Moderate	Serious	Possible	●◯◯◯ (Very Low)	Long-term maintenance of weight outcomes remains uncertain.
Outcome	No. of Studies	Study Design	Risk of Bias	Inconsistency	Indirectness	Imprecision	Publication Bias	Overall Certainty	Summary of Findings
BMI / BMI z-score reduction	18	RCTs, cluster RCTs, quasi-experimental	Moderate	Moderate	Low	Moderate	Undetected	●●●◯ (Moderate)	Nurse-led, family-based, and digital interventions show modest but significant BMI reduction, stronger in multicomponent models.
Dietary	20	RCTs,	Low	Low	Low	Low	Undete	●●●	Consistent

behavior improvement		quasi-experimental, reviews					cted	● (High)	improvements in diet quality, reduced sugary intake, improved meal patterns.
Physical activity increase	17	RCTs, quasi-experimental	Low	Moderate	Low	Low	Undetected	●●●◯ (Moderate)	School- and game-based interventions significantly increase activity levels.
Knowledge & self-efficacy	15	RCTs, quasi-experimental	Low	Low	Low	Low	Undetected	●●●● (High)	Strong evidence for improved obesity-related knowledge and motivation.
Metabolic indicators (waist, glucose)	6	RCTs	Moderate	Moderate	Low	Moderate	Undetected	●●◯◯ (Low)	Limited but promising improvements; evidence insufficient for firm conclusions.
Long-term sustainability	5	Cohort, extension RCTs	Serious	Serious	Moderate	Serious	Possible	●◯◯◯ (Very Low)	Long-term maintenance of weight outcomes remains uncertain.

Interpretation of GRADE

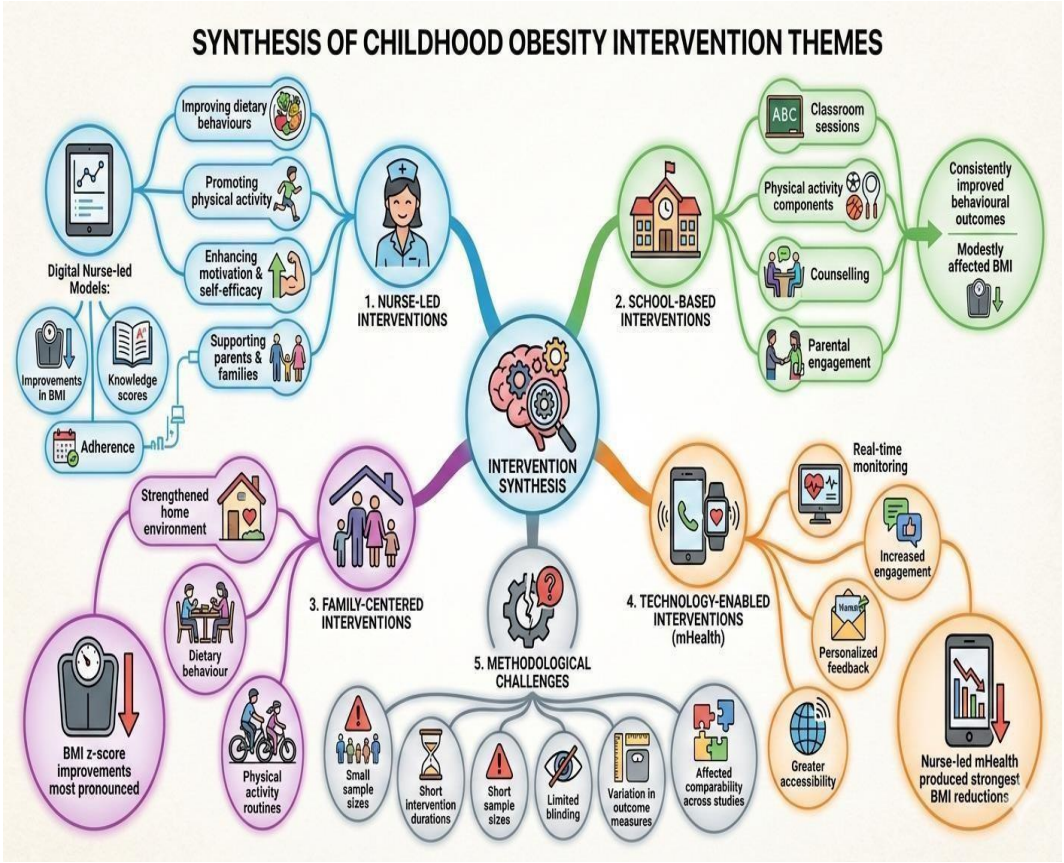
- **High**: Very confident that the true effect lies close to the estimate.
- **Moderate**: True effect is likely close, but may differ.
- **Low**: Limited confidence; true effect may differ substantially.
- **Very Low**: Very little confidence in the effect estimate.

DISCUSSION

The synthesis of the included studies highlights five major themes:

SN	Themes	Subthemes	Interpretation
1	Nurse-led interventions	Across multiple RCTs, nurse-led designs were effective in: 1.1 improving dietary behaviours 1.2 promoting physical activity 1.3 enhancing motivation and self-efficacy 1.4 supporting parents and families	Digital nurse-led models further demonstrated improvements in BMI, knowledge scores, and adherence.
2	School-based interventions	These included: 2.1 classroom sessions 2.2 physical activity components 2.3 counselling 2.4 parental engagement	School-based models consistently improved behavioural outcomes and modestly affected BMI.

3	Family-cantered interventions	Family involvement strengthened: 3.1 home environment 3.2 dietary behaviour 3.3 physical activity routines	BMI z-score improvements were most pronounced in familybased models.
4	Technology-enabled interventions (mHealth)	mHealth provided: 4.1 real-time monitoring 4.2 increased engagement 4.3 personalized feedback 4.4 greater accessibility	Nurse-led mHealth interventions produced some of the strongest BMI reductions.
5	Methodological challenges	5.1 Small sample sizes 5.2 Short intervention durations 5.3 Limited blinding 5.4 Variation in outcome measures	These limitations affected comparability across studies.



Grade Summery Table

Outcome	No. of Studies (Participants)	Study Design	Effect Direction	Certainty of Evidence (GRADE)	Reasons for Certainty Rating
BMI / BMI z-score reduction	18 studies (~4,500 children)	RCTs, cluster RCTs, quasi-experimental	⬇ Modest reduction	⬤⬤⬤◯ Moderate	Downgraded for heterogeneity and short follow-up; consistent benefit in multicomponent interventions
Dietary behavior improvement	20 studies (~5,200 children)	RCTs, quasi-experimental, reviews	⬆ Significant improvement	⬤⬤⬤⬤ High	Consistent findings, low risk of bias, direct outcomes
Physical activity level	17 studies (~3,800 children)	RCTs, quasi-experimental	⬆ Increased PA	⬤⬤⬤◯ Moderate	Some inconsistency across school vs digital models
Knowledge, motivation & self-efficacy	15 studies (~3,200 children)	RCTs, quasi-experimental	⬆ Large improvement	⬤⬤⬤⬤ High	Strong, consistent effects across nurse-led and school-based studies
Waist circumference / body fat %	7 studies (~1,400 children)	RCTs, non-RCTs	⬇ Small reduction	⬤⬤◯◯ Low	Imprecision and variation in measurement methods
Metabolic indicators (glucose, lipids)	6 studies (~1,100 children)	RCTs	⬇ Improvement	⬤⬤◯◯ Low	Limited sample size, inconsistent outcomes
Long-term sustainability (>12 months)	5 studies (~1,800 children)	Cohort, extension RCTs	? Uncertain	⬤◯◯◯ Very Low	Serious risk of bias, attrition, and limited follow-up duration
Overall effectiveness of multicomponent interventions	12 studies (~3,000 children)	RCTs, cluster RCTs	⬆⬇ Favourable	⬤⬤⬤◯ Moderate	Stronger effects when nurse-led + family + digital components used

LIMITATIONS AND RECOMMENDATIONS

Limitations

Heterogeneity in interventions and outcomes

Short follow-up periods

Variability in study quality

Self-reported measures increasing bias

Limited representation from low-income settings

Recommendations

Standardize outcome measures across studies

Conduct longer-term follow-up

Increase culturally tailored interventions

Use hybrid models combining school, family, and nurse-led components

Expand digital intervention research

CONCLUSION

This review demonstrates that nurse-led, schoolbased, family-centered, and digital interventions play significant roles in reducing childhood obesity. Multicomponent interventions integrating behaviour change, parental involvement, and technology yield the most promising outcomes. Strengthening methodological rigor and expanding implementation across diverse settings remain essential for advancing global childhood obesity prevention.

Conflict of Interest

None.

Funding

Self-funded.

Acknowledgement

The authors extend gratitude to all researchers whose work contributed to this review

PRISMA-ScR Checklist (Preferred Reporting Items for Systematic Reviews and Meta-Analyses – Scoping Reviews)

Section	**Ite m**	**Description**	**Reported (Yes/ No)**	**Page/ Section**
Title	1	Identify the report as a scoping review	Yes	Title
Abstract	2	Structured summary including background, objectives, eligibility, sources, charting, results, conclusions	Yes	Abstract
Introducti on	3	Rationale for the review in context of existing knowledge	Yes	Introducti on
Introducti on	4	Explicit statement of objectives and questions	Yes	Aim
Methods	5	Protocol and registration (if available)	No	–
Methods	6	Eligibility criteria (population, concept, context, years, language)	Yes	Methods
Methods	7	Information sources (databases, years covered)	Yes	Methods
Methods	8	Search strategy	Yes	Methods
Methods	9	Selection of sources of evidence	Yes	Methods
Methods	10	Data charting process	Yes	Methods
Methods	11	Data items extracted	Yes	Table 1
Methods	12	Critical appraisal of sources (if done)	Partial	Limitation s

Results	13	Number of sources screened, assessed, included	Yes	Results / Flow diagram
Results	14	Characteristics of included sources	Yes	Table 1
Results	15	Results of individual sources	Yes	Sum ma ry Table
Results	16	Synthesis of results	Yes	Discussion
Discussion	17	Summary of evidence	Yes	Discussion
Discussion	18	Limitations of the review	Yes	Limita ti on s
Discussion	19	Conclusions and implications	Yes	Conclusion
Funding	20	Sources of funding	No	Funding

REFERENCE

1. World Health Organization. Obesity and overweight: key facts. Geneva: WHO; 2023 [cited 2025 Nov 30]. Available from: https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight

2. Sanyaolu A, Okorie C, Qi X, Locke J, Rehman R. Childhood and adolescent obesity in the United States: a public health concern. Glob Pediatr Health. 2019;6:2333794X19891305. PMID: 31871787.

3.Kumar S, Kelly AS. Review of childhood obesity: from epidemiology, etiology, and comorbidities to clinical assessment and treatment. Mayo Clin Proc. 2017;92(2):251–265. doi:10.1016/j.mayocp.2016.09.017.

4.Reilly JJ, Kelly J. Long-term impact of overweight and obesity in childhood and adolescence on morbidity and premature mortality in adulthood: systematic review. Int J Obes. 2011;35(7):891–898. doi:10.1038/ijo.2010.222.

5. Jebeile H, Kelly AS, O'Malley G, Baur LA. Obesity in children and adolescents: epidemiology, causes, assessment and management. Lancet Diabetes Endocrinol. 2022;10(5):351–365. doi:10.1016/S2213-8587(22)00047-X.

6.World Health Organization. Taking action on childhood obesity: report of the Commission on Ending Childhood Obesity. Geneva: WHO; 2022. Available from: https://apps.who.int/iris/handle/10665/326263

7. Whitehead L, Walsh A, Carter R. The effectiveness of nurse-led interventions to prevent childhood and adolescent overweight and obesity: a systematic review of randomised trials. J Adv Nurs. 2021;77(12):4935–4951. doi:10.1111/jan.15023.

8. Cheng H, et al. Nurse-led interventions in the prevention and treatment of obesity and overweight: a scoping review. J Clin Nurs. 2021;30(1–2):e1–e16. doi:10.1111/jocn.15576.

9. Manzano-Felipe MÁ, Cruz-Cobo C, Bernal-Jiménez MÁ, et al. Effectiveness of a nurse-led mHealth approach in preventing obesity in adolescents: randomized clinical trial. J Res Nurs. 2024;29(4–5):348–363. doi:10.1177/17449871241236393.

10. Taki S, Marshall S, Smith W, et al. Cobenefits for participants of a nurse-led telephone-based early childhood

obesity prevention intervention: a multimethod qualitative study. Int J Nurs Pract. 2025;31(1):e13123. doi:10.1111/ijn.13123.
11. Whitehead L, Walsh M, Carter R. Nurse-led interventions for pediatric obesity management: a systematic review. J Clin Nurs. 2021;30(1–2):e1–e14. doi:10.1111/jocn.15489
12.Kubik MY, Lee J, Fulkerson JA, Sirard J. School-based secondary obesity prevention for eight- to twelve-year-olds: results from the SNAPSHOT randomized trial. Child Obes. 2021;17(3):185–195. doi:10.1089/chi.2020.0321.
13.Padgett LC. Childhood obesity prevention trials: systematic review and meta-analysis of design and effectiveness. Obes Rev. 2024;25(2):e13576. doi:10.1111/obr.13576.
14.Fernández-Ruiz VE, Solé-Agustí M, Sáez M, et al. Weight loss and metabolic improvement in overweight and obese children through the I²AO² family programme: a randomized controlled clinical trial. Nutrients. 2021;13(4):1098. doi:10.3390/nu13041098.
15.Ash T, Agaronov A, Young T, Aftosmes-Tobio A, Davison KK. Family-based childhood obesity prevention interventions: a systematic review and quantitative content analysis. Int J Behav Nutr Phys Act. 2017;14(1):113. doi:10.1186/s12966-017-0571-2.
16. Kracht CL, Katzmarzyk PT. E-health and m-health interventions targeting nutrition, physical activity, sedentary behaviour and/or obesity among children: a scoping review of systematic reviews. J Transl Med. 2021;19(1):128. doi:10.1186/s12967-021-02801-4.
17. O'Hara VM, Johnston SV, Browne NT. Pediatric obesity telemedicine during COVID-19 pandemic: rapid review of effectiveness. Clin Obes. 2023;13(1):e12512. doi:10.1111/cob.12512.
18. Woolford SJ, Sidell M, Li X, et al. Changes in body mass index among children and adolescents during the COVID-19 pandemic. JAMA. 2021;326(14):1434–1436. doi:10.1001/jama.2021.15036.
19. Kubik MY, Lee J, Fulkerson JA, Gurvich OV, Sirard JR. School-based secondary obesity prevention for eight-to twelve-year-olds: results from the students, nurses, and parents seeking healthy options together randomized trial. Childhood Obesity. 2021 Apr 1;17(3):185-95.
20. Taki S, Marshall S, Smith W, Phillis C, Lavery A, Cant T, Jones J, Gordon P, Llewelyn C, Baur LA, Wen LM. Cobenefits for Participants of a Nurse-Led Telephone-Based Early Childhood Obesity Prevention Intervention: A Multimethod Qualitative Study. International Journal of Nursing Practice. 2025 Aug;31(4):e70037.
21. Manzano-Felipe MÁ, Cruz-Cobo C, Bernal-Jiménez MÁ, Santi-Cano MJ. Effectiveness of a nurse-led mHealth approach in preventing obesity in adolescents: an intervention study. Journal of Research in Nursing. 2024 Aug;29(4-5):348-63.
22. Whitehead L, Kabdebo I, Dunham M, Quinn R, Hummelshoj J, George C, Denney-Wilson E. The effectiveness of nurse-led interventions to prevent childhood and adolescent Overweight and obesity: A systematic review of randomised trials. Journal of advanced nursing. 2021 Dec;77(12):4612-31.
23. Fernández-Ruiz VE, Solé-Agustí M, Armero-Barranco D, Cauli O. Weight loss and improvement of metabolic alterations in overweight and obese children through the I2AO2 family program: a randomized controlled clinical trial. Biological Research for Nursing. 2021 Jul;23(3):488-503.
24. Pappiya EM, Al Baalharith IM, Kumar MJ. A School Nurse Delivered Health Promotion Intervention on Diabetes Indices among overweight children. International Journal of Nursing Care. 2022 Jan 1;10(1).
25. Ilgaz A. Effect of health screening and School Nurse Interventions on primary school students' knowledge, behavior, and status in Turkey: A quasi-experimental Omaha System study. Journal of Pediatric Nursing. 2022 Jan 1;62:e115-24.
26. Demir D, Bektas M. The effect of an obesity prevention program on children's eating behaviors, food addiction, physical activity, and obesity status. Journal of Pediatric Nursing. 2021 Nov 1;61:355-63.
27. Welker K, Cox C. Public Health and School Health Partnership for a Web-Based Physical Activity Resource. Journal of Physical Activity and Health. 2024 Dec 12;1(aop):1-5.
28. Harrison CV, Rogge N, Roy J, Sacco K, Tartaglione B. A rapid review exploring childhood obesity and parenting practices. Journal of Pediatric Nursing. 2025 Feb 8.
29. Wen LM, Xu H, Chen Z, Hayes A, Phongsavan P, Taki S, Kerr E, Jawad D, Simone L, Rissel C, Baur LA. Effectiveness of a telephone-based randomised clinical trial targeting obesity risk of preschool-aged children: An extension study during the COVID-19 pandemic: Epidemiology and Population Health. International Journal of Obesity. 2025 Aug 14:1-8.
30. Bray LA, Brown J. On Track to Wellness: Nurse-Led Public Health Education for Children. Journal of Community Health Nursing. 2025 May 10:1-8.
31. Saleh M, Ba-Break M, Abahussin A. Barriers and facilitators of school-based obesity prevention interventions: a qualitative study from the perspectives of primary school headteachers. Journal of Health, Population and Nutrition. 2024 Dec 18;43(1):217.
32. Yang HJ, Kang J-H, Kim OH, Choi M, Oh M, Nam J, Sung E. Interventions for Preventing Childhood Obesity with Smartphones and Wearable Device: A Protocol for a Non-Randomized Controlled Trial. *Int J Environ Res Public Health.* 2017;14(2):184. doi:10.3390/ijerph14020184
33. Çevik C, Örsal Ö, Amaro S. Comparison of the Effect of School-Based Game and Training Intervention on Overweight and Obese Students on Weight Loss: A Randomized Controlled Trial. Journal of Nursology. 2024;27(1):47-57.
34. Nygaard HS, Øen KG. Public health nurses' experiences following up children with overweight and obesity according to national guidelines. A qualitative study.

International journal of qualitative studies on health and well-being. 2024 Dec 31;19(1):2306658.
35. Rae S, Maguire J, Aglipay M, Barwick M, Danavan K, Haines J, Jenkins J, Klaassen M, Moretti ME, Ong F, Persaud N. Randomized controlled trial evaluating a virtual parenting intervention for young children at risk of obesity: study protocol for Parenting Addressing Early Years Intervention with Coaching Visits in Toronto (PARENT) trial. Trials. 2023 Jan 4;24(1):8.
36. Gothilander J, Johansson H. School nurses' experiences and challenges of working with childhood obesity in Northern Sweden: A qualitative descriptive study. Nordic journal of nursing research. 2023 Jan;43(1):20571585211044698.
37. Stea TH, Vettore MV, Øvrebø B, Abildsnes E. Changes in dietary habits and BMI z-score after a 6-month non-randomized cluster-controlled trial among 6–12 years old overweight and obese Norwegian children. Food & Nutrition Research. 2023 Dec 12;67:10-29219.
38. Heggem R, Zahl-Thanem A. Overweight and obesity among children in rural areas: The importance of culture. Scandinavian Journal of Public Health. 2022 Dec;50(8):1208-13.
39. Sela Y, Grinberg K, Nemet D. Obstacles preventing public health nurses from discussing children's overweight and obesity with parents. Comprehensive Child and Adolescent Nursing. 2022 Oct 2;45(4):425-36.
40. Westergren T, Fegran L, Jørstad Antonsen A, Timenes Mikkelsen H, Hennig CB, Stamnes Köpp UM. Prevention of overweight and obesity in a Norwegian public health care context: a mixed-methods study. BMC Public Health. 2021 May 26;21(1):983.
41. Cooper CC. Pouring on the pounds: the persistent problem of sugar-sweetened beverage intake among children and adolescents. NASN School Nurse. 2021 May;36(3):137-41.
42. Rattanamanee K, Wacharasin C. Effectiveness of a Family-Based Behavioral Counseling Program among School-aged Children with Obesity: A Quasi-Experimental Study. Pacific Rim Int J Nurs Res. 2021;25(3):466-480.
43. Jørgensen RM, Støvring H, Østergaard JN, Hede S, Svendsen K, Vestergaard ET, Bruun JM. Long-term change in BMI for children with obesity treated in family-centered lifestyle interventions. Obesity Facts. 2024 Dec 20;17(6):570-81.
44. Nally S, Carlin A, Blackburn NE, Baird JS, Salmon J, Murphy MH, Gallagher AM. The effectiveness of school-based interventions on obesity-related behaviours in primary school children: a systematic review and meta-analysis of randomised controlled trials. Children. 2021 Jun 8;8(6):489.
45. Fernández-Lázaro D, Celorrio San Miguel AM, Garrosa E, Fernández-Araque AM, Mielgo-Ayuso J, Roche E, Arribalzaga S. Evaluation of family-based interventions as a therapeutic tool in the modulation of childhood obesity: A systematic review. Children. 2024 Jul 31;11(8):930.
46. Park Y, Kim J. Development, and effect of child obesity management program by applied nudge. International Journal of Environmental Research and Public Health. 2022 Oct 4;19(19):12692.

Appendix-A

PRISMA-ScR Checklist (Preferred Reporting Items for Systematic Reviews and Meta-Analyses – Scoping Reviews)

Section	Item	Description	Reported (Yes/ No)	Page/ Section
Title	1	Identify the report as a scoping review	Yes	Title
Abstract	2	Structured summary including background, objectives, eligibility, sources, charting, results, conclusions	Yes	Abstract
Introduction	3	Rationale for the review in context of existing knowledge	Yes	Introduction
Introduction	4	Explicit statement of objectives and questions	Yes	Aim
Methods	5	Protocol and registration (if available)	No	–
Methods	6	Eligibility criteria (population, concept, context, years, language)	Yes	Methods
Methods	7	Information sources (databases, years covered)	Yes	Methods
Methods	8	Search strategy	Yes	Methods
Methods	9	Selection of sources of evidence	Yes	Methods
Methods	10	Data charting process	Yes	Methods
Methods	11	Data items extracted	Yes	Table 1
Methods	12	Critical appraisal of sources (if done)	Partial	Limitations
Results	13	Number of sources screened, assessed, included	Yes	Results / Flow diagram
Results	14	Characteristics of included sources	Yes	Table 1
Results	15	Results of individual sources	Yes	Summary Table
Results	16	Synthesis of results	Yes	Discussion
Discussion	17	Summary of evidence	Yes	Discussion
Discussion	18	Limitations of the review	Yes	Limitations
Discussion	19	Conclusions and implications	Yes	Conclusion
Funding	20	Sources of funding	No	Funding

.