Effectiveness of nursing intervention in prevention of childhood obesity: a systematic review

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Abstract

Increases in population weight and obesity have been attributed to an obesogenic environment, one which promotes sedentary behaviour coupled with easy access to high-energy-dense foods. Countless childhood obesity interventions have been trialled with some determining effectiveness. This study aimed to examine the effectiveness of nurse-led interventions to prevent childhood and adolescent overweight and obesity. The study involved a systematic review from internet databases such as Pubmed, Medline, WoS, Scopus in order to determine the feasibility and efficacy of nurse-led interventions in childhood obesity. Following that, databases were accessed to conduct a more detailed search of the literature using key phrases and Boolean operators to create articles pertinent to the issue. 1121 records identified. The duplicates and those not matching with the criteria were excluded. 8 articles were filtered using an inclusion/exclusion criterion. The results emerged that lifestyle is the main challenge. Nursing interventions seem moderately feasible. The results concluded that Interventions were diverse and included counselling and MI, the development of nutritional and PA guidelines and the establishment of workshops, all with the aim of promoting lifestyle and behaviour change in children and their parents. Nurse-led interventions to prevent Childhood obesity are feasible but have not yet determined effectiveness. With adequate training, nurses could make better use of existing clinical and situational opportunities to assist in the effort to prevent childhood obesity.

Key words: Childhood obesity, Nursing, Intervention,

Introduction

Although definition of obesity and overweight has changed over time, it can be defined as an excess of body fat (BF). There is no consensus on a cut-off point for excess fatness of overweight or obesity in children and adolescents. The Center for Disease Control and Prevention defined overweight as at or above the 95th percentile of body mass index (BMI)
Overweight and obese children are likely to stay obese into adulthood and more likely to develop non-communicable diseases like diabetes and cardiovascular diseases at a younger age. The mechanism of obesity development is not fully understood and it is believed to be a disorder with multiple causes.

The highest prevalence rates of childhood obesity have been observed in developed countries; however, its prevalence is increasing in developing countries as well.(2) It is widely accepted that increase in obesity results from an imbalance between energy intake and expenditure, with an increase in positive energy balance being closely associated with the lifestyle adopted and the dietary intake preferences. However, there is increasing evidence indicating that an individual's genetic background is important in determining obesity risk. Research has made important contributions to our understanding of the factors associated with obesity. The ecological model, as described by Davison et al., suggests that child risk factors for obesity include dietary intake, physical activity, and sedentary behaviour (3)The impact of such risk factors is moderated by factors such as age, gender, Family characteristics parenting style, parents’ lifestyles also play a role. Environmental factors such as school policies, demographics, and parents’ work-related demands further influence eating and activity behaviors.

Justification

Childhood obesity is one of the most serious public health challenges of the 21st century. The problem is global and is steadily affecting many low and middle income countries, particularly in urban settings. The prevalence has increased at an alarming rate. Globally in 2010, the number of overweight children under the age of five is estimated to be over 42 million. Close to 35 million of these are living in developing countries. Environmental factors, lifestyle preferences, and cultural environment play pivotal roles in the rising prevalence of obesity worldwide. In general, overweight and obesity are assumed to be the results of an increase in caloric and fat intake. On the other hand, there are supporting evidence that excessive sugar intake by soft drink, increased portion size, and steady decline in physical activity have been playing major roles in the rising rates of obesity all around the world. (4)Childhood obesity can profoundly affect children's physical health, social, and emotional well-being, and self esteem. It is also associated with poor academic performance and a lower quality of life experienced by the child. Many co-morbid conditions like
metabolic, cardiovascular, orthopedic, neurological, hepatic, pulmonary, and renal disorders are also seen in association with childhood obesity. (5)

The growing issue of childhood obesity can be slowed, if society focuses on the causes. There are many components that play into childhood obesity, some being more crucial than others. A combined diet and physical activity intervention conducted in the community with a school component is more effective at preventing obesity or overweight. (6) Moreover, if parents enforce a healthier lifestyle at home, many obesity problems could be avoided. What children learn at home about eating healthy, exercising and making the right nutritional choices will eventually spill over into other aspects of their life. This will have the biggest influence on the choices kids make when selecting foods to consume at school and fast-food restaurants and choosing to be active. Focusing on these causes may, over time, decrease childhood obesity and lead to a healthier society as a whole.

Aim

This dissertation aims to critically review the best available evidence on nurses interventions on preventing childhood obesity

Objectives

1. To critically analyse current literature on childhood obesity
2. To extract the data from the eligible studies and produce a final list of studies to be included.
3. To draw conclusions from the findings of the eligible studies to enable meta-analysis;
4. To interpret the findings and conclude the suitable recommendations

Research Question

The main aim of this review is to investigate effectiveness of various nursing led interventions in prevention of childhood obesity.

Literature Review

The review of literature is a summary of current knowledge about a particular practice, problem and includes what is known and what is unknown about the problem. Literature is
reviewed to summarize knowledge for use in practice or to provide a basis for conducting a study.

The term overweight refers to excess body weight for a particular height whereas the term obesity is used to define excess body fat. Overweight and obesity primarily happen either due to excess calorie intake or insufficient physical activity or both. Furthermore, various genetic, behavioural, and environmental factors play a role in its pathogenesis. Childhood obesity is a forerunner of metabolic syndrome, poor physical health, mental disorders, respiratory problems and glucose intolerance, all of which can track into adulthood.

Developing countries like India have a unique problem of ‘double burden’ wherein at one end of the spectrum we have obesity in children and adolescents while at the other end we have malnutrition and underweight.

Causes of obesity in children

Children become overweight and obese for a variety of reasons. The most common causes are genetic factors, lack of physical activity, unhealthy eating patterns, or a combination of these factors. Only in rare cases is being overweight caused by a medical condition such as a hormonal problem. A physical exam and some blood tests can rule out the possibility of a medical condition as the cause for obesity. Although weight problems run in families, not all children with a family history of obesity will be overweight. Children whose parents or brothers or sisters are overweight may be at an increased risk of becoming overweight themselves, but this can be linked to shared family behaviors such as eating and activity habits.

Behaviors that influence excess weight gain include eating high-calorie, low-nutrient foods and beverages, medication use and sleep routines. Not getting enough physical activity and spending too much time on sedentary activities such as watching television or other screen devices can lead to weight gain. In contrast, consuming healthy foods and being physically active can help children grow and maintain a healthy weight. Balancing energy or calories consumed from foods and beverages with the calories burned through activity plays a role in preventing excess weight gain. In addition, eating healthy foods and being physically active helps to prevent chronic diseases such as type 2 diabetes, some cancers, and heart disease.

Family history, psychological factors, and lifestyle all play a role in childhood obesity. Children whose parents or other family members are overweight or obese are more likely to follow suit. But the main cause of childhood obesity is a combination of eating too much and
exercising too little. A poor diet containing high levels of fat or sugar and few nutrients can cause kids to gain weight quickly. Fast food, candy, and soft drinks are common culprits. The U.S. Department of Health & Human Services (HHS) reports that 32 percent of adolescent girls and 52 percent of adolescent boys in the United States drink 24 ounces of soda or more per day.(10)

Convenience foods, such as frozen dinners, salty snacks, and canned pastas, can also contribute to unhealthy weight gain. Some children become obese because their parents don’t know how to choose or prepare healthy foods. Other families may not be able to easily afford fresh fruits, vegetables, and meats. Not enough physical activity can be another cause of childhood obesity. People of all ages tend to gain weight when they’re less active. Exercise burns calories and helps you maintain a healthy weight. Children who aren’t encouraged to be active may be less likely to burn extra calories through sports, time on the playground, or other forms of physical activity.(11)

**Health risk associated with childhood obesity**

Childhood overweight and obesity has both immediate and long-term health outcomes. Increasingly, obese children are being diagnosed with a range of health conditions previously seen almost exclusively among adults. Childhood unhealthy weights may result in serious medical problems in childhood such as: type 2 diabetes, high blood pressure and elevated blood cholesterol, liver disease, bone and joint problems, respiratory problems such as asthma, sleep disorders such as difficulty breathing while asleep (sleep apnea), earlier than normal puberty or menstruation, eating disorders such as anorexia or bulimia, skin infections due to moisture from sweat being trapped in skin folds and fatigue.

Obesity, family history, and diet can lead to high cholesterol in children. Too much cholesterol causes a substance called plaque to build up inside blood vessels. It hardens, the vessels narrow, and blood cannot flow like it should. That can raise the risk of heart attack and stroke as the obese child grows older. A healthy diet and exercise are the best ways to treat this problem in children. Parents should make diet changes for any child who is obese, starting at age 2. (12)
Family history and obesity can put kids at risk of high blood pressure. How do you treat this in a child? Make sure your child eats a heart-healthy diet and encourage physical activity. Both of these measures will help with weight loss, which should help ease blood pressure problems. This is the best way for kids to fight both obesity and high blood pressure. It's important to start young with these lifestyle changes. Kids with high blood pressure may develop thickening of their arteries by age 30. (13)

Typically a disease of older adults, type 2 diabetes is now one of the most common diseases in children. Over the past 20 years, obesity has led to a huge increase in type 2 diabetes in little kids and teens. The connection is that obesity causes insulin resistance. That means the child's body can't properly use the insulin it makes. This causes diabetes. It’s dangerous to get diabetes at a young age. It can lead to heart disease, stroke, blindness, and more by early adulthood. (14)

Up to 60% of obese children have sleep apnea—a dangerous breathing condition. It causes loud snoring stopped by brief periods of not breathing. This pattern repeats itself over and over while the child is trying to sleep. Sleep apnea causes oxygen levels in the blood to drop. The condition can increase the child’s risk of heart disease and high blood pressure. It also causes poor sleep and daytime sleepiness. It is important to diagnose and treat this problem early to prevent these complications. (15)

Obese kids often have body image issues, low self-esteem, and poor social skills. They may have trouble feeling accepted or popular. Obese children also are frequent targets of bullies who make fun of them. All of this can make kids anxious, causing some kids to act out and others to withdraw. It also can lead to depression. In fact, many studies have found a link between depression and obesity, in adults and children alike. Obese kids are more likely than other kids to be depressed. And kids who are depressed are more likely to be obese. No one is sure which comes first. But experts also say it doesn't really matter. What does matter for obese kids is that their mental well-being is at risk.(16)

*Preventive Measures*

Nutrition experts, consumer advocacy groups, and food industry leaders are encouraging the development of simplified front-of-package nutritional labeling schemes that complement
nutrition panels, but also allow consumers to quickly compare the content of nutrients of greatest public health significance (e.g., energy, total/saturated fat, sugar, sodium, and fiber). Food labeling and nutrition “signposts” such as logos that indicate that a food meets certain nutrition standards might help consumers make choices of healthy foods. An example is the symbol program run by the National Heart Foundations in Australia and New Zealand (17) The “Pick the Tick” symbols made it easier for consumers to identify healthier food choices. Furthermore, in addition to the nutrition criteria, the products serve as “de-facto” standards of product formulation for the manufacturers.

United Kingdom has initiated a comprehensive strategy on obesity prevention called as “Healthy Weight, Healthy Lives: A cross-government strategy for England.” Based on the available evidence, the strategy highlights five key themes for tackling excess weight:

1. Children: Healthy growth and healthy weight – early prevention of weight problems to avoid the “conveyor-belt” effect into adulthood
2. Promoting healthier food choices – reducing the consumption of foods that are high in fat, sugar and salt and increasing the consumption of fruit and vegetables
3. Building physical activity into our lives – getting people moving as a normal part of their day
4. Creating incentives for better health – increasing the understanding and value people place on the long-term impact of decisions
5. Personalized support for overweight and obese individuals: complementing preventive care with treatment for those who already have weight problems.

Though this intervention program; an “eat well plate” concept is promoted where all healthy individuals over the age of 5 years are encouraged to eat a healthy, balanced diet that is rich in fruits, vegetables, and starchy foods.(18)

The childhood obesity epidemic in America is a national health crisis one in every three children (31.7%) ages 2–19 is overweight or obese. This report presents a series of 70 specific recommendations, summarizing them broadly, they include:

- Getting children a healthy start on life, with good prenatal care for their parents; support for breastfeeding; adherence to limits on “screen time;” and quality child care
settings with nutritious food and ample opportunity for young children to be physically active

- Empowering parents and caregivers with simpler, more actionable messages about nutritional choices based on the latest Dietary Guidelines for Americans; improved labels on food and menus that provide clear information to help make healthy choices for children; reduced marketing of unhealthy products to children; and improved health care services, including BMI measurement for all children

- Providing healthy food in schools, through improvements in federally-supported school lunches and breakfasts; upgrading the nutritional quality of other foods sold in schools; and improving nutrition education and the overall school environment

- Improving access to healthy, affordable food, by eliminating “food deserts” in urban and rural America; lowering the relative prices of healthier foods; developing or reformulating food products to be healthier; and reducing the incidence of hunger, which has been linked to obesity

- Getting children more physically active, through quality physical education, recess, and other opportunities in and after school; addressing aspects of the “built environment” that make it difficult for children to walk or bike safely in their communities; and improving access to safe parks, playgrounds, and indoor and outdoor recreational facilities.(19)

**Indian Scenario**

There is considerable knowledge about the risk factors associated with childhood obesity research and scientific information on the causes and consequences of childhood obesity from developed nations as mentioned in this narrative review. India should also formulate a national policy and partner with the private sector to end the childhood obesity epidemic.

**Surveillance**

- Periodic monitoring of nutritional and obesity status of children including adults:
  - To create a database for childhood obesity at various regions to start with and then may be at state level
- Initiate community-based research to document burden of obesity and associated risk factor and monitor these trends over time.

- Maintain a nationwide database on secular trends in obesity and associated comorbidities.

**Health education**

- For all children and their families, routine health care should include obesity-focused education

- Nutrition and physical advice through audio-visual media and culturally conducive methods

- Endorsement of healthy lifestyle by prominent people and local champions

- For children who are overweight or obese, a series of clinical counseling interventions in the primary care setting is suggested

- Educational materials are available from a variety of sources to facilitate the counseling. These materials have much in common and have not been directly compared; it is reasonable for providers to select materials with messaging that is best suited to their community.

**Community mobilization**

- Organization and participation in health walks and healthy food festivals

- Information about nutrition to parents (particularly mothers)

- Children-specific nutrition information and workshops for newly married women

- Safe walk/bicycle routes to school

- To establish a therapeutic relationship and enhance effectiveness, the communication and interventions should be supportive rather than blaming, and family-centered, rather than focused on the child alone

- Long-term changes in behaviors that are related to obesity risk should be emphasized, rather than diets and exercise prescriptions, which tend to set short-term goals.

**Early infancy and perinatal period**

[www.turkjphysiotherrehabil.org](http://www.turkjphysiotherrehabil.org)
- Balanced nutrition to pregnant mothers
- Encourage exclusive breastfeeding
- Avoidance of catch-up obesity in children
- Maintenance of correct growth velocity under guidance of physicians
- Avoid excess nutrition to stunted children.

**School-based interventions**

- High importance on physical activity
- Making healthier choice available and banning un-healthy food in cafeteria, (sweetened beverages and energy-dense junk food). Teachers can play a vital role in this initiative
- Training of teachers regarding nutrition education
- Incorporation of more knowledge about nutrition and physical activity and nutrition related diseases in school curriculum.

**Home-based interventions**

- Key goals to address are the common diet-related problems encountered in children, set firm limits on television and other media early in the child's life, and establish habits of frequent physical activity
- TV/computer time to be restricted to maximum 2 h/day
- Mandatory 60 min of physical activity daily to be supervised by parents
- Restriction on eating out at weekends and restricting availability of junk foods at home.

**Policy formulation**

- Creation of national task force for obesity
- Decrease in taxes and prices of fruits and vegetables
- Proper Food labeling practices and quality monitoring
More playgrounds, parks and walking and bicycle tracks

Restriction on advertisement of commercial foods on television at prime time and during children's programs and ban on unfair nutrition claims for commercial products

Encourage trans-national food companies to manufacture healthy snacks

Prohibition of promotional gifts with junk foods

Ban on monetary sponsorship of youth festivals by cola companies.

Childhood obesity is a complex health issue. It occurs when a child is well above the normal or healthy weight for his or her age and height. The causes of excess weight gain in young people are similar to those in adults, including behavior and genetics. Obesity is also influenced by a person’s community as it can affect the ability to make healthy choices.

Methodology

To investigate details, this chapter will expand on the literature review and emphasise the dissertation's research topic. It will shed light on the significance of a systematic review by outlining the advantages over a literature review. Literature review qualitatively summarizes evidence on a topic using informal or subjective methods to collect and interpret studies whereas Systematic review is a High-level overview of primary research on a focused question that identifies, selects, synthesizes, and appraises all high quality research evidence relevant to that question. The goal of literature review is to provide a summary about the topic whereas systematic review Clearly defines and answerable clinical question. Its purpose is to investigate and define the systematic review process through the use of the P.I.C.O. (population, intervention, comparison, and outcome) approach (Booth et al., 2019).

<table>
<thead>
<tr>
<th>Participants</th>
<th>Children and adolescents less than 18 years, both male and females</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intervention</td>
<td>Nurses led interventions where nurses plays an important role.</td>
</tr>
<tr>
<td>Comparison/Control</td>
<td>Other interventions</td>
</tr>
<tr>
<td>Outcome</td>
<td>Any quantitative or qualitative measure showing improvement or leading to preventive measures in the childhood obesity</td>
</tr>
</tbody>
</table>
The data gathered for a SR should employ specific relevant search terms along with the use of a methodical, reliable and precise search process to unite existing information and research literature. This SR analyses eight studies which used a variety of research designs, and which were searched for using particular keywords from specific databases. These selected studies should then be assessed for quality. From this, the findings should be synthesised making sure that there is no bias. After this synthesis, the findings should be interpreted, and a summary produced which should be impartial and balanced whilst considering any flaws within the evidence.

**Data Collection Strategies**

Relevant literature reporting the interventions for controlling excess weight in children and adolescents was identified through electronic search in MEDLINE, PubMed, Web of Science, and Scopus. Each concept of the search strategy was mapped to a MeSH term appropriate to each database. The concepts broadly represented: children and adolescents, nurse-led interventions, weight-related outcomes and randomised (controlled) trials. Search strings included a mix of MeSH headings and key words. The searches yielded 1121 articles. (Pati & Lorusso, 2018) suggest that intentional or accidental bias can be apparent depending on how a search is conducted. This is why it is important to be able to demonstrate that a complete, thorough and broad search was conducted.

**Inclusion/exclusion criteria**

For this review, a clear strategy was produced in order to identify the relevant inclusion and exclusion criteria (see table below). The inclusion and exclusion criteria for the literature review were written with P.I.C.O. in mind. This ensured that the research question was followed and that appropriately designed research articles were found as suggested by (23)

<table>
<thead>
<tr>
<th>Inclusion Criteria</th>
<th>Exclusion Criteria</th>
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<tbody>
<tr>
<td>Children and adolescents less than 18 years</td>
<td>Systematic Reviews and Mata analysis</td>
</tr>
<tr>
<td>both male and females</td>
<td>Intervention on children and adolescents (less than 18 years of age)</td>
</tr>
<tr>
<td>Articles written in English</td>
<td>Editorials</td>
</tr>
</tbody>
</table>
Based on Prisma data extraction and abstraction 1121 records identified (382 from PubMed, 290 from Medline and 320 Web of science and 129 SCOPUS). 778 records excluded with justification. 309 records excluded based on title and duplicates. This SR analyses eight papers of that employed a range of research designs and were identified through the use of certain keywords in various databases accessed and finalized. The quality of these selected studies should next be determined. The findings should then be synthesized to ensure there is no bias. Following this synthesis, the findings should be evaluated and a summary created that is objective and balanced while taking into account any weaknesses in the evidence.

**PRISMA FLOWCHART**

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1121 Records identified through data base search

778 Irrelevant Records excluded

309 Records excluded based on title and Duplicate papers

34 full text articles assessed for eligibility

8 full text articles studied
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22 full text articles excluded with reasons
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Results

All of the above studies are relevant as they fulfil all the guidelines prescribed in the inclusion criteria. Each study is recent, being published 2011 onwards which means that the information is up to date. The final articles were critiqued and analysed against the CASP checklist. The table below is used to display an overview of each article.

<table>
<thead>
<tr>
<th>Author and country</th>
<th>Design</th>
<th>Participants</th>
<th>Type of intervention and duration</th>
<th>Key findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lakshman et al 2018</td>
<td>Parallel-group RCT</td>
<td>infants</td>
<td>30–45 min in-person consultations delivered at baseline and at age 4 and 6 months, and two, 15- to 20-min phone consultations delivered at age 3 and 6 month by nurse</td>
<td>A specialised intervention which reduced formula milk intake did not result in significant differences in mean BMISDS between groups at either 6 or 12 months old</td>
</tr>
<tr>
<td>Paul et al 2011</td>
<td>Pilot randomised trial using a $2 \times 2$ factorial design</td>
<td>infants</td>
<td>delivered 2- to 3-week post-birth by a research nurse where parents learned alternate soothing techniques to improve infant's duration of sleep and reduce total sleep duration at age 3 weeks, number of daily feeds at age 16 weeks and maternal pre-pregnancy BMI, there was a significant difference</td>
<td></td>
</tr>
<tr>
<td>Study</td>
<td>Design Description</td>
<td>Population</td>
<td>Description</td>
<td>Findings</td>
</tr>
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<td>---------------------</td>
<td>-------------------------------------------------------------------------------------</td>
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<tr>
<td>Taylor et al 2018</td>
<td>RCT with 4 arms delivered in the home and clinic setting</td>
<td>Infants</td>
<td>Feeding and delivered 2-to 3-week post-birth by a research nurse where parents were educated on infants hunger and satiety cues and the appropriate timing for the introduction of solid food</td>
<td>Between groups in terms of mean WFL percentile at 12-month follow-up, with the group receiving both the feeding and sleeping interventions recording the lowest mean WFL percentile.</td>
</tr>
<tr>
<td>Chahal et al 2017</td>
<td>Randomised clinical trial</td>
<td>Children and adolescents</td>
<td>The addition of a food, activity and breastfeeding intervention or a sleep intervention or both interventions to usual care did not result in significant differences.</td>
<td>At 6-month follow-up, there was no significant difference in the reduction of</td>
</tr>
<tr>
<td><strong>Christie et al. 2017</strong></td>
<td>Randomised (efficacy) trial</td>
<td>Adolescents</td>
<td>Twelve session, weight-management programme delivered by graduate mental health workers to families over a 6-month period. 4- and 5- to 10-min follow-up phone calls, 2 weeks after each session to reinforce progress and answer questions. Mean BMI between the adolescent group who received MI with their parents and the adolescent group who received MI alone.</td>
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<tr>
<td><strong>Kong et al. 2014</strong></td>
<td>RCT</td>
<td>Adolescents</td>
<td>1-h counselling session at week 0, followed by six, 20-min, counselling sessions at week 2, 4, 6, 8, 16 and 24. Furthermore, there was no significant difference in the reduction of mean BMI between the dietitian-led experimental group and the nurse-led comparator group at 6- or 12-month follow-up.</td>
<td></td>
</tr>
<tr>
<td>Study</td>
<td>Design</td>
<td>Age</td>
<td>Intervention</td>
<td>Follow-up</td>
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<tr>
<td>Pbert et al 2013</td>
<td>Pair-matched cluster-RCT</td>
<td>Adolescents</td>
<td>Six, 1-on-1 school nurse-led counselling sessions lasting 18–29 min, conducted over 2 months</td>
<td>there was no significant difference in mean BMI between the intervention and comparator group, suggesting that short term behavioural changes brought on by the intervention did not translate to meaningful reductions in BMI</td>
</tr>
<tr>
<td>Alkon et al 2014</td>
<td>Cluster RCT</td>
<td>Children</td>
<td>Nurse conducted health and safety assessments, provided educational workshops and updated nutrition</td>
<td>After excluding extreme outliers and adjusting for cluster location, parental education and family income,</td>
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</table>

five, 10- to 15-min, phone calls were delivered over the 6-month intervention period to monitor progress group and the nurse-led comparator group at 6-month follow-up
and physical activity policies in the childcare centres

The first study was done by Lakshman et al. (24) assessed the efficacy of a theory-based behavioural intervention to prevent rapid weight gain in formula milk-fed infants. The intervention aimed to reduce formula milk intakes, and promote responsive feeding and growth monitoring to prevent rapid weight gain (≥+0.67 SD scores (SDS)). It was delivered to mothers by trained facilitators up to infant age 6 months through three face-to-face contacts, two telephone contacts and written materials. The intervention strengthened maternal attitudes to following infant feeding recommendations, reduced reported milk intakes at ages 3, 4 months slowed initial infant weight gain from baseline to 6 months. By 12 months, 40.3% of infants in the intervention group and 45.9% in the control group showed rapid weight gain.

In second study by Paul et al (25) tested the independent and combined effects of two behavioral interventions delivered to parents, designed to promote healthy infant growth in the first year. The first intervention ("Soothe/Sleep") instructed parents on discriminating between hunger and other sources of infant distress. Soothing strategies were taught to minimize feeding for non-hunger-related fussiness and to prolong sleep duration, particularly at night. The second intervention ("Introduction of Solids") taught parents about hunger and satiety cues, the timing for the introduction of solid foods, and how to overcome infants' initial rejection of healthy foods through repeated exposure. A total of 110 mother-infant dyads completed the year-long study. At 1 year, infants who received both interventions had lower weight-for-length percentiles (P = 0.009). Participants receiving both interventions had a mean weight-for-length in the 33rd percentile; in contrast, those in other study groups were
higher first intervention only--50th percentile; second intervention only--56th percentile; control group--50th percentile

The third study by Taylor et al (26) determined how various interventions influenced growth at ages 3.5 and 5 y compared with usual care (Control). All groups received standard Well-Child care with additional support for 3 intervention groups: FAB (promotion of breastfeeding, healthy eating, physical activity: 8 contacts, antenatal, 18 mo); Sleep (prevention of sleep problems: antenatal, 3 wk); Combination (both interventions). Retention was 77% at age 3.5 y and 69% at age 5 y. Children in the FAB group had significantly higher BMI z scores than did Controls at age 5 y but not at age 3.5 y. Children who received the Sleep intervention (Sleep and Combination groups) had significantly lower BMI z scores at age 3.5 y and at age 5 y than children who did not (Control and FAB groups). A conventional intervention had unexpected adverse long-term weight outcomes, whereas positive outcomes from a less conventional sleep intervention remained promising at age 5 y.

The fourth study by Chahal et al (27) effectiveness of motivational interviewing for lifestyle behavior change for dyslipidemic adolescents in a dyad with a parent versus alone. A total number of 32 adolescents were randomized 1:1 to receive a series of motivational interviewing sessions either together with a parent or alone for a 6-month intervention, with both quantitative and qualitative assessment of outcomes. Both groups were similar at baseline. Following the intervention, there were no significant differences between groups in physical, laboratory, lifestyle or psychosocial measures, except for a reduction in dietary fats/sugars and in screen time in alone group. When both groups were combined, significant reductions at 6 months were noted for body mass index. Waist circumference, total cholesterol, low-density lipoprotein cholesterol, triglycerides, non-high-density lipoprotein cholesterol, fasting insulin, and homeostatic model. Reduced screen time and increased fruit and vegetable intake were also noted for both groups combined. These changes were also reflected in self-efficacy, self-esteem, and improvement in quality of life measures.

The fifth study by Christie et al (28) mentioned that the Healthy Eating and Lifestyle Programme (HELP) was a specific adolescent-focused intervention, designed for obese 12 to 18-year-olds seeking help to manage their weight. Participants were randomised to the 12-session HELP intervention or standard care. At week 26 there were no significant effects of the intervention on BMI (mean change in BMI 0.18 kg/m² for the intervention arm, 0.25 kg/m² for the control arm; adjusted difference between groups: -0.11 kg/m². At weeks 26 and
52 there were no significant differences between groups in any secondary outcomes. The HELP intervention was no more effective than a single educational session for reducing BMI in a community sample of obese adolescents.

The sixth study by Kong et al (29) evaluated the impact of low GI diet versus a conventional Chinese diet on the body mass index (BMI) and other obesity indices of obese adolescents. Eligible subjects were randomized to either an intervention with low GI diet (consisting of 45-50% carbohydrate, 30-35% fat and 15-20% protein) or conventional Chinese diet as control (consisting of 55-60% carbohydrate, 25-30% fat and 10-15% protein). 04 obese adolescents were recruited (52 in low GI group and 52 in control group; 43.3% boys). 58.7% subjects completed the study at 6 months. After adjustment for age and sex, subjects in the low GI group had a significantly greater reduction in obesity indices including BMI, body weight and waist circumference (WC) compared to subjects in the control group. After further adjustment for physical activity levels, WC was found to be significantly lower in the low GI group compared to the conventional group.

The seventh study by Pbert et al (30) evaluated the feasibility and efficacy of a school nurse-delivered intervention in improving diet and activity and reducing body mass index (BMI) among overweight and obese adolescents. Six high schools were randomized to either a 6-session school nurse-delivered counseling intervention utilizing cognitive-behavioral techniques or nurse contact with provision of information. At 2 months, intervention participants ate breakfast on more days/week, and had a lower intake of total sugar and added sugar compared to control participants. At 6 months, they were more likely to drink soda ≤ one time/day and eat at fast food restaurants ≤ one time/week compared to control participants. There were no significant differences in BMI, activity, or caloric intake.

The eighth study by Alkon et al (31) tried Nutrition And Physical Activity Self Assessment for Child Care (NAP SACC) intervention was delivered by nurse child care health consultants with the objective of improving child care provider and parent nutrition and physical activity knowledge, center-level nutrition and physical activity policies and practices, and children’s body mass index. The NAP SACC intervention included educational workshops for child care providers and parents on nutrition and physical activity and consultation visits provided by trained nurse child care health consultants. Hierarchical linear models and multiple regression models assessed individual- and center-level changes in knowledge, policies, practices and age- and sex-specific standardized body mass index.
Results showed significant increases in providers’ and parents’ knowledge of nutrition and physical activity, center-level improvements in policies, and child-level changes in children’s zBMI based on 209 children in the intervention and control centers at both pre- and post-intervention time points.

Discussion

The majority of nurse-led primary prevention studies focused on infants and adolescents. Interventions to prevent childhood overweight and obesity have the potential to mitigate the trajectory of obesity into adulthood, thereby improving long-term quality of life, reducing risk for chronic disease and lowering future healthcare costs. Nurses have the potential to facilitate the delivery of interventions across community, health and education settings, by virtue of the size, scale and adaptability of the workforce. In this review, nurse-led interventions were conducted in the home, childcare, primary care and school settings. Nurses delivered complex multicomponent interventions and were often the leading or most utilised member of a multidisciplinary team. Interventions were diverse and included counselling and MI, the development of nutritional and PA guidelines and the establishment of workshops, all with the aim of promoting lifestyle and behaviour change in children and their parents. Despite nurses’ leading roles in the delivery of childhood obesity interventions, they were heavily underrepresented in their conceptualisation. For example, nurses were only included in a consultative capacity. In Pbert et al. their school-based interventions were conceptualised following focus-group consultation with school nurses. Paradoxically, in nearly all cases, interventions were designed by the research team (doctors, nutritionists, epidemiologists, public health experts) but carried out by nurses, typically following a brief training period with the intervention. The failure to leverage nurse knowledge, training, practice and experience in the design of these interventions may have been a contributing factor to the lack of observed effect. Therefore, future studies should look to integrate nurses into the design of these interventions to improve intervention fidelity. Overall, prevention studies for childhood overweight and obesity reported small to moderate decreases in weight-related outcomes. However, significant differences between groups were not consistently established.

Limitations

There are several limitations to this review due to the developing status of this field of research. A publication bias may exist and studies showing no or negative effects may have
important data on acceptability and feasibility. While RCTs are the gold-standard in study design, their application in pragmatic settings often leads to a difficulty in the interpretation of intervention effects. This is particularly true where comparator groups are effectively ethically required to receive some form of intervention, beyond what is expected in usual care. Operating under these constraints, it can be difficult to demonstrate a clear effect of nurse-led interventions on weight-related outcomes using an RCT framework.

Conclusion

This review has identified that relatively few interventions have harnessed the potential of nurses to lead interventions to reduce the burden of overweight and obesity among children and young people. However, the ability of nurses to lead programmes across a range of settings was evident. There are numerous methodological issues that need to be addressed in order to determine the effectiveness of primary and secondary prevention programmes to reduce the burden of overweight and obesity. The research to date has illustrated a number of potential directions that should be further explored, in particular the opportunity afforded to early childcare nurses and the general need to involve nurses as stakeholders in the design of interventions. Childhood obesity is a serious issue that warrants the resources necessary to find effective prevention strategies.

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