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Strategies and Challenges in Controlling Childhood Obesity: A systematic Review

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Abstract
Childhood obesity worldwide affects 5.6% or 38.3 million children under five years of age. The longer children are overweight or obese, the more likely they are to become obese adults with all the contingent morbidity involved. Childhood obesity is an important predictor of adult obesity . Metabolic and cardiovascular risk profiles tend to track from childhood into adult life, resulting in an elevated risk of ill health and premature mortality. The study involved a systematic review from internet databases such as Pubmed and CINHAL in order to determine effects of various challenges and interventions targeting the control of childhood obesity and make a suggestion for future interventions. 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. 1732 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 life style is the main challenge. School and Family based interventions seems successful in dietary management The resultsconcluded that among different types of interventional programs, a multidisciplinary approach in schools in which children's family are involved, can be the best and most sustainable approach for management of childhood obesity.
Key words:Child, Childhood, Obesity, Control, Prevention

Introduction

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 (Sahoo et al., 2015) A study by conducted by Williams *et al*. (1992), on 3,320 children in the age-group of 5–18 years classified children as fat if their percentage of body fat was at least 25% for males and 30% for females, respectively(DP et al., 1992). It has been classified as overweight as at or above 85th percentile and obesity as at or above 95th percentile of BMI.(G. A, 2014). There has been a phenomenal rise in proportions of children having obesity in the last 4 decades, especially in the developed world. Studies emerging from different parts of India within last decade are also indicative of similar trend.(ST & K, 2009)(L. A et al., 2007) The World Health Organization (WHO) experts have estimated that there are 43 million overweight children under the age of 5 and by 2020 more than 60% of global disease burden will be the result of obesity related disorders(B. A & Z, 2012)Two main underlying causes of excess weight are genes and environment.(Karnik& Kanekar, 2012) Although both genes and environment have a role in an obesity epidemic, gene defects needs to time to show their phenotype; so obesogenic environment is responsible for obesity.(Procter, 2007)

Primordial/primary prevention of paediatrics obesity and establishment of a healthy lifestyle behaviours from early life are the favoured against the epidemic of obesity at the global level.

Justification

Obesity is a chronic disease affecting increasing numbers of children, teens and adults. Obesity rates among children have doubled since 1980 and have tripled for teens. About 17% of children aged 2 to 19 are considered obese, compared to over 35% of adults who are considered obese. A primary reason that prevention of obesity is so vital in children is because the likelihood of childhood obesity persisting into adulthood increases as the child ages. This puts the person at high risk of diabetes, high blood pressure, and heart disease.(Johns Hopkins, 2020)
Early childhood is recognised as a key developmental period in which to address the obesity epidemic (SL et al., 2010) and UK health policy endorses this . There is convincing evidence that most excess weight before puberty is gained before 5 years of age (DS et al., 2009). Estimates vary but it is thought that 25% -33% of infants gain weight more rapidly than desirable during the first six months of life.(E. U et al., 2006)Systematic reviews have concluded that rapid weight gain during infancy is associated with obesity in later life (O. KK & RJ, 2006)(J et al., 2005). In addition, two well conducted prospective longitudinal cohort studies show that rapid weight gain, between 0-3 months in a Hong Kong Chinese population (Hui et al., 2008) and between 0-4 months in a US population (N et al., 2002)is associated with a greater risk of obesity at age 7 years. However, most childhood obesity prevention efforts focus on periods of the life span that follow these early periods, after children's initial growth trajectories and eating habits have already been established . The risk factors for childhood obesity are

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identifiable and an infant's weight trajectory may be modified by intervention directed at early feeding practices (SL et al., 2010).

There remain a number of challenges to enable a shift from a curative to a preventative focus for childhood obesity in primary care. However, the association strongly believes that additional actions are needed to reduce the unacceptably high prevalence of childhood obesity in the UK. It is widely accepted that no one solution can reverse childhood obesity, and that a combination of measures is required.(*UK Government's Childhood Obesity Strategy | British Dietetic Association (BDA)*, n.d.)

Whilst the prevention of childhood obesity is the only viable, enduring, cost-effective solution to the obesity epidemic, effective methods for it remain elusive. Furthermore, strategies to influence obesogenic environments remain relatively unexplored. In order to be able to develop powerful population-level interventions and public health policies to prevent childhood obesity, it is important to understand the challenges to plan the strategies(Procter, 2007)

Aim

This dissertation aims to critically review the best available evidence the effects of various strategies and interventions targeting the control of childhood obesity and make a suggestion for future interventions

Objectives

1. To critically analyse current literature on strategies to prevent child hood 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 metaanalysis;
4. To interpret the findings and conclude thesuitable recommendations

Research Question

The main aim of this review is to investigate the how various strategies can serve as a highly effective way to contribute to reduce the challenges and prevent the 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.

Causes of Childhood Obesity

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.(D. KK & LL, 2001)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 behaviours.Genetics are one of the biggest factors examined as a cause of obesity. Some studies have found that BMI is 25–40% heritable(PM & KE, 2006)Dietary factors have been studied extensively for its possible contributions to the rising rates of obesity. The dietary factors that have been examined include fast food consumption, sugary beverages, snack foods, and portion sizes.Fast food Consumption: Increased fast food consumption has been linked with obesity in the recent years. Many families, especially those with two parents working outside the home, opt for these places as they are often favoured by their children and are both convenient and inexpensive(Niehoff, 2009)

Activity level and childhood obesity

One of the factors that is most significantly linked to obesity is a sedentary lifestyle. Each additional hour of television per day increased the prevalence of obesity by 2%.(PM & KE, 2006) Television viewing among young children and adolescents has increased dramatically in recent years.(K. U & AS, 2014)The increased amount of time spent in sedentary behaviors has decreased the amount of time spent in physical activity. Research which indicates the number of hours children spend watching TV correlates with their consumption of the most advertised goods, including sweetened cereals, sweets, sweetened beverages, and salty snacks (S. M et al., 2002).Despite difficulties in empirically assessing the media impact, other research discussed emphasizes that advertising effects should not be underestimated. Media effects have been found for adolescent aggression and smoking and formation of unrealistic body ideals. Regulation of marketing for unhealthy foods is recommended, as is media advocacy to promote healthy eating.

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Environmental Factors

While extensive television viewing and the use of other electronic media has contributed to the sedentary lifestyles, other environmental factors have reduced the opportunities for physical activity. Opportunities to be physically active and safe environments to be active in have decreased in the recent years. The majority of children in the past walked or rode their bike to school. A study conducted in 2002 found that 53% of parents drove their children to school. Of these parents, 66% said they drove their children to school since their homes were too far away from the school. Other reasons parents gave for driving their children to school included no safe walking route, fear of child predators, and out of convenience for the child.(PM & KE, 2006) Children who live in unsafe areas or who do not have access to safe, well-lit walking routes have fewer opportunities to be physically active

Socio cultural and family Factors

Socio-cultural factors have also been found to influence the development of obesity. Our society tends to use food as a reward, as a means to control others, and as part of socializing.(GM & LL, 2008) These uses of food can encourage the development of unhealthy relationships with food, thereby increasing the risk of developing obesity.Family factors have also been associated with the increase of cases of obesity. The types of food available in the house and the food preferences of family members can influence the foods that children eat. In addition, family mealtimes can influence the type of food consumed and the amount thereof. Lastly, family habits, whether they are sedentary or physically active, influence the child.Studies have shown that having an overweight mother and living in a single parent household are associated with overweight and childhood obesity.(M. E et al., 2009)

Psychological factors

A recent review concluded that the majority of studies find a prospective relationship between eating disturbances and depression.(JS et al., 2010) However, this relationship is not unidirectional; depression may be both a cause and a consequence of obesity.Additionally, in a clinical sample of obese adolescents, a higher life-time prevalence of anxiety disorders was reported compared to non-obese controls(GS et al., 2010). Although some studies demonstrate no significant relationship between increased BMI and increased anxiety symptoms. Thus, the relationship between obesity and anxiety may not be unidirectional and is certainly not conclusive.(T.-K. M et al., 2004)

Research findings comparing overweight/obese children with normal-weight children in regards to self-esteem have been mixed(AJ et al., 2004).Some studies have found that obese children have lower self-esteem while others do not.(DM et al., 2003) There is some consensus in the literature that the global approach to self-esteem measurement with children who are overweight/obese is misleading as the physical and social domains of self-esteem seem to be where these children are most vulnerable.(JB et al., 2003)

Research has consistently found that body satisfaction is higher in males than females at all ages. Gender differences may reflect the westernized cultural ideals of beauty in that thinness is the only culturally defined ideal for females, while males are encouraged to be both lean and muscular. Thus, there is a linear relationship between body dissatisfaction and increasing BMI for girls; while for boys a U-shaped relationship suggests that boys with BMIs at the low and high extremes experience high levels of body dissatisfaction.(SB et al., 2009)

Consequences of Child Obesity

Although for most children, complications of childhood obesity do not become apparent for decades, the metabolic consequences of obesity may be already evident in young children. Even a young child, if severely obese, can suffer serious morbidity. Prior to adulthood, the obese child may develop gallstones, hepatitis, sleep apnoea and increased intracranial pressure. In fact, there are few organ systems that obesity does not affect in childhood. Of equal concern are the teasing, discrimination and victimization of obese children(Must & Strauss, n.d.)

Medical Problems

The presence of unfused growth plates and softer, cartilagenous bones of children, contributes to the occurrence of orthopedic abnormalities in obese children. Permanent damage to the femoral head may occur when dislocation occurs at the femoral growth plate. The incidence of slipped capital epiphyses is approximately 3.4 per 100 000 children.Between 50% and 70% of patients with slipped capital epiphyses are obese,5,6 and

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approximately two-thirds of patients with bilateral slipped capital epiphyses are obese.7 Furthermore, slipped capital ephiphyses occur at significantly younger ages among obese children than among non-obese children.(Must & Strauss, n.d.)

Childhood obesity has been linked to numerous medical conditions. These conditions include, but are not limited to, fatty liver disease, sleep apnea, Type 2 diabetes, asthma, hepatic steatosis (fatty liver disease), cardiovascular disease, high cholesterol, cholelithiasis (gallstones), glucose intolerance and insulin resistance, skin conditions, menstrual abnormalities, impaired balance, and orthopedic problems. Until recently, many of the above health conditions had only been found in adults; now they are extremely prevalent in obese children. Although most of the physical health conditions associated with childhood obesity are preventable and can disappear when a child or adolescent reaches a healthy weight, some continue to have negative consequences throughout adulthood. (*IHCW*, n.d.)In the worst cases, some of these health conditions can even result in death. Below, three of the more common health problems associated with childhood obesity are discussed, diabetes, sleep apnea, and cardiovascular disease.

Social Problems

The social consequences of obesity may contribute to continuing difficulty in weight management. Overweight children tend to protect themselves from negative comments and attitudes by retreating to safe places, such as their homes, where they may seek food as a comfort. In addition, children who are overweight tend to have fewer friends than normal weight children, which results in less social interaction and play, and more time spent in sedentary activities. (Niehoff, 2009)As aforementioned, physical activity is often more difficult for overweight and obese children as they tend to get shortness of breath and often have a hard time keeping up with their peers. This in turn inevitably results in weight gain, as the amount of calories consumed exceeds the amount of energy burnedIn addition to being implicated in numerous medical concerns, childhood obesity affects children's and adolescent's social and emotional health. Obesity has been described as being “one of the most stigmatizing and least socially acceptable conditions in childhood(JB et al., 2003)

Prevention

All health care personnel unanimously agree that prevention is the key strategy for controlling the current epidemic of obesity.(MJ et al., 2001). Prevention may include primary prevention of overweight or obesity itself, secondary prevention or avoidance of weight regains following weight loss, and prevention of further weight increases in obese individuals unable to lose weight. Till recently, most exclusively focused approaches were based on behavioral changes of individuals, dietary modifications, and exercise; it is seen that these strategies have had little impact on the growing increase of the obesity epidemic. Therefore, the prevention efforts are now best focused on key behaviors associated with the development of obesity, although other factors including genetics undoubtedly also contribute to the risk for obesity.(BA et al., 2007)

There is modest evidence to suggest that modification of the following factors may help to prevent the development of obesity.

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. (Phillips, n.d.)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).**P**articipants are 2-18 Years of age , both male and females, **I**ntervention is Family, Community, School and clinical interventions, **C**omparison/**C**ontrol is Other interventions and **O**utcome was Controlling Obesity

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.

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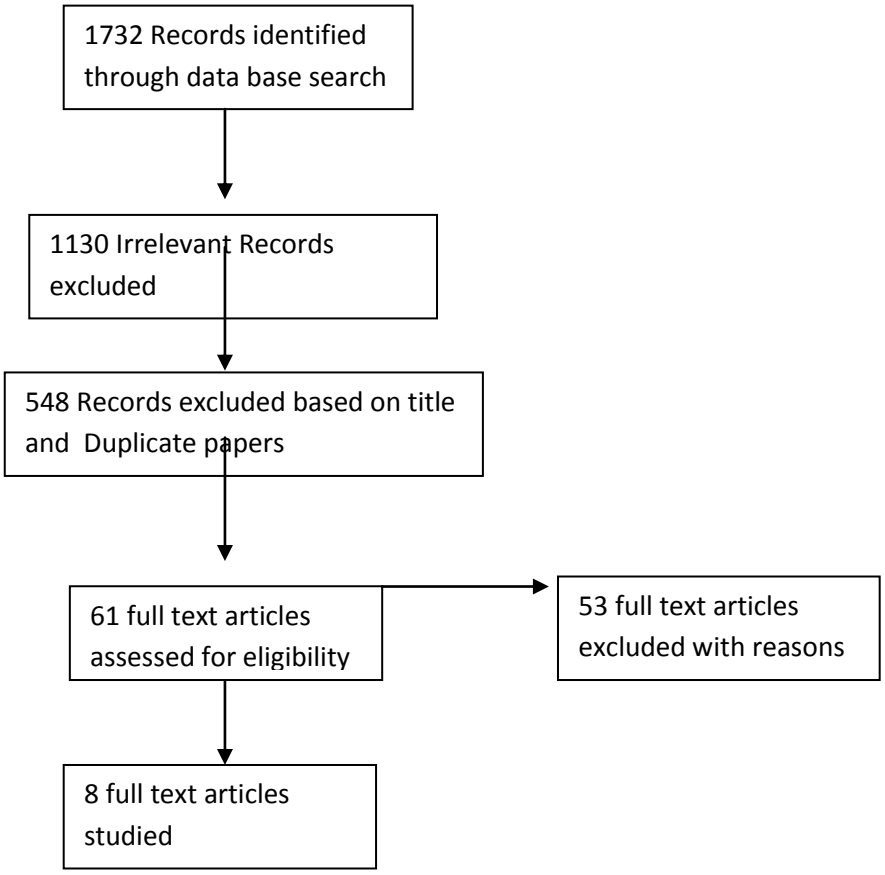
Data Collection Strategies

(L. T et al., 2015) highlight that data collection is a key step in systematic reviews as this data then forms the basis of conclusions which are to be made. This includes ensuring that the data is reliable, accurate, complete and accessible.

Relevant literature reporting the interventions for controlling excess weight in children and adolescents was identified through electronic search of papers published from 2011 to 2021 in MEDLINE, PubMed, Web of Science, and Scopus. Keywords such as "childhood obesity", "overweight," "weight disorder," "intervention," "treatment," "management," "control," were used. The searches yielded 1732 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.

PRISMA FLOWCHART



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 (Torgerson & Torgerson, 2003)

(Pati & Lorusso, 2018)highlight that the inclusion and exclusion criteria within a literature search is a source of potential bias therefore higher trust and credibility can be gained by the clear documentation of such exclusion and inclusion criteria.

Table 1exclusion and inclusion criteria

Inclusion Criteria	Exclusion Criteria
Participants of 2-18 Years of age	Systematic Reviews and Mata analysis
both male and females	Articles published more than 10 years ago
Articles written in English	Editorials
Articles Free to access	Non Peer reviewed articles
Peer reviewed articles	Published in other languages

Based on Prisma data extraction and abstraction 1732 records identified (482 from PubMed, 444 from Medline and 492 Web of science and 314 SCOPUS) .1130 records excluded with justification. 548 records excluded based on title. This SR analyses eight papers of that employed a range of research designs and were identified

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through the use of certain keywords in various databases accessed and finalized in the month September 2021. 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.

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. (Annexure 1) The table below is used to display an overview of each article.

Author and date	**Design**	**Participants**	**Type of intervention and duration**	**Key findings**
Fungetal 2012(F. C et al., 2012)	**One group Pre-tests Post test**	Grade 5 students	Healthy eating and active living strategies 3 Years	Fruit and vegetable intake and PA enhanced, calorie intake declined, children were less obese
Sigmund 2012(S. E et al., 2012)	Non-randomized longitudinal intervention	6-9 years old children	PA programs 2 Years	1 year later, the odds of being overweight or obese in children was three times lower and these odds declined with the duration of the intervention
Bacardi Gascon et al (2012)(B.-G. M et al., 2012)	Quasi-experimental randomized cluster controlled trial.	2nd and 3rd grade elementary school children	Decrease in sedentary behavior, nutrition education 6 months	At 6 months differences were observed in BMI and after 24 months, BMI z-score and WC enhanced and abdominal obesity declined
Danielsen et al 2013(YS et al., 2013)	Consecutive randomization procedure	7-13 years old children	Cognitive behavioral weight management program 12 weeks	Mean BMI SDS reduced 0.18 units that was sustained after 12 months follow-up
Vos et al., 2012(RC et al., 2012)	Randomized clinical trial	11-15 years old teenagers	Nutritional and psychological counseling through CBT 3 months	Significant fall in BMI-SDS after the study and 1 year later
Teder et al. 2012(T. M et al., 2012)	Single-group preand post-intervention feasibility study	8.3-12-years old children	Education about healthy eating, PA and problem solving 2 Years	Standardized BMI declined with no change in W/H ratio
Bloom et al., 2013,(B. T et al., 2013)	Pilot randomized controlled trial	6-12 years old children	6-12 years old children 6 weeks	Treatment had a significant, short term impact on the BMI and 6 months later, children's BMI did not go up significantly but the difference between

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				basement and followup BMI
Kirk et al., 2012,(S et al., 2012)	Randomized controlled trial	7-12 years old children	3 groups: LC, RGL, or standard PC diet plus weekly dietary counseling and biweekly group exercise) 3 months	Lower BMI z-score in all diet groups which was sustained at 6 months with interchangeable results for BF percentage and WC

The first study was done by Fung et al (F. C et al., 2012)examined the effectiveness of a CSH program adopted from a "best practice" example in another setting by evaluating temporal changes in diets, activity levels and body weight.Students completed the Harvard Youth/Adolescent Food Frequency Questionnaire, questions on physical activity, and had their height and weight measured. Study showed students those who are attending APPLE Schools were eating more fruits and vegetables, consuming fewer calories, were more physically active and were less likely obese. These changes contrasted changes observed among students elsewhere in the province.Risk of bias includes random sequence generation and allocation Notspecified

In second study by Sigmundetal(S. E et al., 2012)assessed the physical activity (PA) within the school setting resulted in increased daily PA and decreased overweight/obesity levels. There was a significant increase of school-based PA during schooldays in intervention children in comparison with the control children.One year after the start of the PA intervention, the odds of being overweight or obese in the intervention children was almost three times lower than that of controlchildren and these odds steadily decreased with the duration of the intervention.

The third study by Bacardietal(B.-G. M et al., 2012)randomized cluster controlled trial.Study focused on challange of the parents and children to reduce sedentary behavior, consumption of soft drinks and high-fat and salt containing snacks, and increase the consumption of fruits and vegetables. Six month school base intervention and an 18 month follow-up intervention on the body mass index, food consumption and physical activity of 2nd and 3rd grade elementary school children was conducted. The results of this study indicated that with a comprehensive intervention there is a positive response to lifestyle changes and a reduction of abdominal obesity.

The fourth study by Danielsen et al(YS et al., 2013)examined the effect of a 12-week family-based cognitive behavioural weight management programme developed for use in primary care settings. Assessments were conducted at baseline, post-treatment, post-waiting list and 12 months after treatment termination.The treatment showed significant and favourable effects on BMI SDS, self-esteem and symptoms of depression compared with a waiting list condition.

The fifth study by Vos et al (RC et al., 2012)evaluate the effect of multidisciplinary family based treatment on obesity and health-related quality of life (HRQOL). Obese children were randomized to a multidisciplinary lifestyle treatment, including medical, nutritional, physical, and psychological counseling during 3 months. At baseline, after 3 months of treatment and at 12 months follow-up, data were collected for BMI-SDS and a European validated questionnaire for assessing HRQOL. HRQOL in the intervention group was significantly improved at 12 months follow-up and unchanged in the obese control group. Multidisciplinary treatment is effective in reducing BMI-SDS and improving HRQOL after 12 months follow-up.

The sixth study by Teder et al(T. M et al., 2012)assessed a 2-year family-based behavioural intervention programme against child obesity. 25 paediatric outpatient group sessions over a 2-year period with parallel groups for children and parents was conducted. The primary outcome measure was change in standardised body mass index between baseline and after 36 months. The secondary outcome measures were change in the waist:height ratio, metabolic parameters and programme adherence. This feasibility study of a 2-year family-based behavioural intervention programme in paediatric outpatient care showed promising results with regard to further weight gain and programme adherence.

The seventh study by Bloom et al (B. T et al., 2013)conducted a preliminary evaluation of Children's Appetite Awareness Training (CAAT), a treatment for childhood obesity which encourages overweight children to eat in response to internal appetite cues. Overweight children were randomized to either the CAAT treatment group , to receive 1-h treatment sessions over 6 weeks, or a wait-list group. Follow up taken after 6 months. The intervention had a significant, short-term effect on the BMI of children who participated. Although at 6-month follow-up, children's BMI has not increased significantly, the difference between pretreatment and follow-up BMI was no longer significant.

The eighth study by Kirk et al (S et al., 2012)compared the effectiveness and safety of carbohydrate (CHO)-modified diets with a standard portion-controlled (PC) diet in obese children. Anthropometry, dietary adherence, and clinical measures were evaluated at baseline and 3, 6, and 12 months.Diets with modified CHO intake were

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as effective as a PC diet for weight management in obese children. However, the lower adherence to the LC diet suggests that this regimen is more difficult for children to follow, particularly in the long term

Discussion

This review evaluated three different approaches in childhood obesity management. There is positive effect of school-based intervention on dietary habits or anthropometric measures. Teachers can train students how to choose nutritious and low-calorie foods. In addition, exercise training can be reinforced in the school curriculum(SE, 2007). Most students with excess weight prefer to eat fatty, sweetened, and salty snacks; they also choose fast foods as their first meal preference. If attendants get involved in obesity prevention programs, they can provide an environment for children to purchase healthy snacks and foods Families based intervention studies showed that through family meals, children can eat more whole grains, fruits, vegetables, low fat milk, and consume less sweets and unhealthy fats. Parents should involve kids in preparing food to make a positive effect on their attitudes toward obesity prevention. It seems that the family has a key role in long-term weight control(E. C et al., 2006). Principally clinic-setting programs have brought nutrition, PA, and education or counseling together to achieve their goals and they have demonstrated long lasting results. Most experts advise a low calorie low fat diet for obesity management; but they may have side-effects such as binge eating. Actually weight loss is allowed in severe obesity and in other cases weight maintenance is an appropriate policy(D et al., 2005)

Limitations

The purpose of this dissertation was to determine the interventional strategies in controlling the child hood obesity. The search process used involved searching the databases for relevant literature. This was carried out by using keywords with Boolean operators. It was aimed that unpublished data would also be included however due to time constraints this was not carried out therefore evidence selection bias could be prevalent. (AM et al., 2016)state this is where some studies can be missed and all available data is not identified. Researchers tend to choose a small sample arbitrarily based on convenience, available resources and time limitations; however, the results will not be sufficiently generalisable as to be of any practical use. RCTs would always be the choice for systematitic reviews but due unavailability of the suitable data as per inclusion criteria mixed designs were adopted so it was a limitation. Although it would have been ideal if the results could have been weighted based on the population profile as is the practice in a typical public opinion program, this was not done in this study because the population profile of were not available

Conclusion and Recommendations

The findings suggest that among different types of interventional programs for management of childhood obesity, a multidisciplinary approach in schools in which children's family are involved, can be the most feasible and effective approach. As teachers and parents are the best role models, it will be easier to accustom children with healthy dietary, PA, and behavioral habits. IT is recommended that future studies are needed to determine the long-term effects and sustainability of different programs. Also schools must have obesity control interventions as a part of curriculum and teacher should act as role model in prevention and controlling obesity.

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