The Specific Characteristics of Childhood Obesity and the Effective Strategies to Combat Childhood Obesity in Hong Kong: A Short Review

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Abstract—Childhood obesity is a serious health problem around the world. The problem also currently exists in Hong Kong. Unhealthy lifestyle behaviour is a key factor contributing to childhood obesity. Many preceding programs of childhood obesity were conducted but the findings were controversial.

The review revealed the specific characteristics of childhood obesity and the effective strategies in Hong Kong context. Parents have significant influence in shaping lifestyle behaviour of children. While Chinese culture, informal childcare and more energy-dense food consumptions are the specific factors affecting children in lifestyle behaviour as shown in the previous studies, parents directly or indirectly regulated children’ behaviour. On the other hand, many preceding programs of childhood obesity were also reviewed. It was found that many programs provided intervention and invited parents for assistance. However, parental education was not the focus on childhood obesity programs and parent-oriented approach on childhood obesity program was not commonly found. While limited childhood obesity programs had been found, it is recommended to conduct an appropriate program for children in Hong Kong context.

After reviewing the specific characteristics of childhood obesity in Hong Kong context and various childhood obesity programs, the finding of the review paper are expected to realize root causes of the prevalence of childhood obesity and conduct an adequate program for childhood obesity in Hong Kong context. The design of preventive strategies tends to take into consideration of these characteristics against the increased prevalence of childhood obesity.

Keywords-component: childhood obesity, lifestyle behaviour, Hong Kong, Parental education

Introduction

Childhood obesity is a serious health problem adversely affecting health of children [1]. The increasing prevalence of childhood obesity has marked. Apart from genetic causes, energy imbalance is marked as the main cause contributing to childhood obesity. The health problem affect various medical, social and psychological aspects of children. However, it could be preventable if preventive measures are adopted early. Body Mass Index (BMI) is the common tool to define obesity but it cannot apply on children. Under continuous physiological development of children, there are three common tools to define childhood obesity- skinfolds thickness, BMI and growth reference for 5-19 years. To define childhood obesity, skinfold thickness of boys and girls are more than 25% and 30% respectively [2], BMI of children is more than 95th percentiles [3,4] or growth reference for 5-19 years indicated children more than 2 standard deviation [3, 5].

Epidemiology of Childhood Obesity

According to World Obesity Federation, childhood obesity is common in westernized countries. Africa, Asia, Europe, the Americas and the Middle East are also found to have rising prevalence of childhood obesity [6]. Childhood obesity also is a significant health problem in Hong Kong. According to the report from Department of Health, Education Bureau and Leisure and Cultural Service Department, primary school students with obesity has increased from 16.4% to 21.3% in 1997/98 to 2007/08 [7].
Comorbidity of Childhood Obesity

Obesity not only affects individuals, but also influences health care system in one’s country. For individuals, it threatens children in current and future health. Obese children are less physically active and spend much more time in sedentary activities. As a result, their physical fitness is negatively affected. Physical fitness is significantly associated with physical activity level. It includes cardiorespiratory fitness, muscular endurance, muscular strength, flexibility, coordination and speed [8]. Moreover, children’s physical fitness may be affected by maturation status. Sexual maturation in obese girls were found to be earlier when compared with non-obese girl [9]. Obese children are likely to become obese adolescent or adult. They also suffer from various health consequences in physiological and psychological aspects. Many complications may not appear till years later. When children become obese, metabolic disorder may become in progress and increase physical stress for the body. The onset of some metabolic complications such as insulin resistance and glucose intolerance, hypertension, dyslipidemia, non-alcoholic fatty liver disease, menstrual abnormalities and sleep apnoea are earlier. It significantly influences mortality and mobility in their later life [10, 17].

Obese children also confront difficulties in social interaction. Laziness and lack of individual self-control are prevalent perception of obese people, including obese children. The negative attitude of public has made obese children under the stress of stigmatization. Under the negative experience, they are subjected to bullying and harassment [11]. From a study determining any associations between BMI and body esteem of overweight and obese children, it was found that BMI was inversely associated with body esteem [12]. In addition, they also experience social difficulties with peers and teachers. A study assessed the peer relation of obese children in classroom environment shown that obese children were significantly less nominated as best friends. Significantly less leadership behaviour and more aggressive-disruptive behaviour were perceived. Teachers also described obese children as more prosocial, compared with peers. Peers perceived obese children as less attractive and less authentically skilled. They were ill more often and get fatigue easily [13]. Obese children were promoted an increased risk of having depression, anxiety and suicide [11, 12, 13].

Academic performance of obese children was poor performed, compared with non-obese children. A study reviewed numerous papers and found that obese children had poor academic performance in the United States [14]. Another similar study investigated the effectiveness of the school-based program on BMI percentile and academic performance in the United States. Children in the intervention group, had more BMI percentile reduction and better academic performance, compared with children in the control group [15].

Obesity becomes economic burden on the health care system in many countries. The direct cost in treating obesity included preventive strategies, investigation, treatment and relevant problems. Another indirect cost such as economic losses and its related conditions cannot be calculated [18]. In the United States, the direct medical costs of childhood obesity are 14.1 billion and $237.6 million for outpatient and inpatient care respectively [19]. The indirect cost is not estimated. Little evidence was published to estimate the medical costs of childhood obesity in Hong Kong.

Risk Factor of Childhood Obesity

Apart from genetic factor, child weight status is directly associated with lifestyle behaviour such as dietary intake, physical activity and sedentary behaviour [16]. Healthy lifestyle promotes health and increase energy expenditure of children. These lifestyle behaviour interfere energy balance of children and contributing to childhood obesity.

Physical activity

Physical activity can significantly increase energy expense of children. It is suggested to engage in physical activity for at least 60 minutes daily but few individuals can fulfil this recommendation [17].

Parents play an important role in taking care of children. Their lifestyle and activity pattern are directly associated with behavioural change of children. Many parents need to engage in working. Their work schedule is associated with physical activity pattern of children. A study investigated the association between parental work schedule and overweight/obesity of children in Australia. The finding demonstrated parental nonstandard work schedule was significantly associated with childhood obesity. Father who worked in nonstandard schedule was significantly associated with childhood obesity. It seemed that father spent time to engage in recreational activity with children whereas mother was responsible for child care tasks [21]. However, fewer studies investigated such causal relationship in Hong Kong.

Parental support and encouragement in physical activity also influence physical activity engagement of children. A study reviewed numerous studies and found that it had a significant association between parental support and physical activity level of children [22]. Parental activity is closely related to physical activity level of children. Hong Kong parents are physically inactive. Although parents valued health benefit of physical activity, they seldom encouraged children engaging in physical activity [23].

Children’s safety also is an issue to inhibit children engaging in physical activity. Neighbourhood unsafety concern is the main issue for patients limiting physical activity of children [24]. A study investigated the association between neighbourhood safety and physical activity among youth in Australia. A finding revealed that parental perception of personal safety significantly inhibited boys to have moderate-
vigorous physical activity after school [25]. In the United States, patients who were living in inner city, had higher level of anxiety about neighbourhood safety, compared with parents who were living in suburb [24]. It indicated that a safe environment would increase children’s engagement in physical activity. As cultural difference, a study was also conducted to find out parental practices encouraging and discouraging in physical activity of pre-schoolers in Hong Kong. A finding claimed that safety issue is the main concern for parents to discourage physical activity of children [26].

Environmental setting affects physical activity engagement of children. Environmental development such as fewer sidewalks, long distances to schools, and the need to cross busy streets, restriction on walking and biking to school, also inhibit physical activity of children [27]. People were more active when they live near parks and pre-schoolers became more active when they accessed more places for vigorous play [27]. A longitudinal study assessed how proximity of recreational resources and parks was affecting development of childhood obesity in the United States. Children were less likely to become obese if parks and recreation programs were within a 500 m and a 10 km buffer of children’s home [28]. This circumference also happened in Hong Kong. A study examined the effect of socio-economic status and physical activity participation of children. Children who were living in low socio-economic status area were found to have relatively less physical activity because of lack of sport facilities and the presence of steep streets nearby. Physical environment and facilities indirectly affect physical activity participation of children [29].

Physical education is the only subject for children engaging in physical activity. It could help children develop physical fitness, motor skills and knowledge to participate in various activities including games and sports [30]. It seemed to be not important and fewer lessons were found, compared with another subjects. A study examined the effectiveness of intervention for weight loss of published studies in children. It indicated that children spent less time on physical education lessons and did not require physical education classes daily in the United States [31]. Most primary schools offer two physical activity lessons per week to meet the guideline of 5–8% of the total curriculum time allocation for physical education [30]. A study assessed physical activity level of children during physical education in Hong Kong primary schools. It found that children relatively more engaged in standing and walking during physical education lesson and spent less time on moderate to vigorous physical activity. Besides, the time of physical education lesson is not enough to achieve health-related purposes [32].

Sedentary behaviour

It is the behaviour to reduce energy expenditure and contribute to obesity of children. TV viewing, playing digital games and computer games are counted to be sedentary behaviour [33]. A study reviewed the published studies on the relationship between sedentary behaviour and childhood obesity in Spain. TV viewing was found to be the main behaviour contributing to childhood obesity. Playing computer games and digital games are relatively less significantly associated with obesity of children but these activities cannot replace physical activity in increasing energy expense of children [33]. Several studies also indicated the positive association between TV viewing and childhood obesity. Children were found to consume more unhealthy foods when they were watching TV [33, 34, 35]. A study investigated an association between lifestyle factors and childhood obesity. The result showed a positive association between TV viewing and childhood obesity. When children spent less than 3 hours on TV viewing, they were relatively less obese. Interestingly, while the positive association between TV viewing and energy-dense snacks was found, healthy snacks was negatively associated with TV viewing [36]. In Hong Kong, TV viewing is the major activity for children. While TV viewing cannot increase energy output of children, it has synergetic effect when children eat more energy-dense foods at the same time [23].

Parental influence also affects lifestyle behaviour of children. Parents are the role model for children to follow their behaviour. Children become physically active when they have energetic parents [23]. Parents shape eating and physical activity pattern of children in daily living. Moreover, they are responsible to build up a healthy environment for children. Parents also determine physical activity level of children. They considered many factors before allowing children to have outdoor activity. Parents preferred children engaging in indoor activity because they felt anxious about safety of children [26]. Parent’s instruction and parenting style also affect activity pattern of children. Some children were found to watch TV for a long period of time and TV was set in the bedroom. Both arrangement also promote sedentary lifestyle behaviour of children and contribute to childhood obesity [37]. A study investigated the value of physical activity in the lives of parents and children in Hong Kong. Parents usually have habitual lifestyle behaviour such as slopping, yamcha, watching movie and they seldom engaged in physical activity. Children were also encouraged having such habitual behaviours as mentioned rather than engaged in physical activity [38].

Dietary intake

Dietary behaviour determines the amount of food intake and eating pattern that affect energy intake of children. Parents play a significant role in building a healthy eating environment and shaping eating behaviour of children.

Large food Portion

Food portion determine the amount of food intake. Parents determine food amount for children when they were small. A study reviewed findings of published studies on the relationship between portion size and energy intake. The larger food portion, the more energy intake was noted. Children did not request foods based on satiety signal, they were fed by parents and parents determine food portion for them. It became a usual eating habit when they grew up contributing to obesity [39]. An ethnographic study was conducted to confirm risk factors and reveal how these factors interacted and contributed to obesity. The main finding demonstrated that primary carers such as parents or grandparents feed children food with large portion size was one of the risk factors producing obesity of children [40].
Eating Out

Eating out is a common habit of children which tends to increase energy intake. Eating prepacked foods, read-to-eat meals and eating foods in restaurants are also included the habit of eating out [41]. Food with eating out contains higher energy, fat intake and lower micronutrient intake. Children tend to become obese when they have this dietary practice [42, 43]. To alter the unhealthy eating habit, parents are the key persons to promote behavioural change of them. As parents need to work, fewer family meals are made and practice of eating out is common [44]. Many available literatures showed a significant association between eating out and obesity. A review study described how food environments and condition were influencing food choices with an emphasis on the knowledge in various settings in the United States. It emphasized that eating out resulted in the more calorie intake from foods and poor nutrition, when compared with food prepared at home [44]. A cross-sectional study was conducted to assess the prevalence of overweight of Chinese pre-schoolers and explore risk factors of childhood obesity, especially on parental characteristics, feeding practice and lifestyle in China. Apart from TV viewing and insufficient physical activity, eating out of home is one of the risk factors for Chinese pre-schoolers to obesity [45]. In Hong Kong, children had practice of eating out of home more than 3 meals per week. They commonly consume foods in western and eastern restaurant. Moreover, full-day school arrangement is commonly facilitated in primary schools in Hong Kong and students must have lunch in schools. Majority of children consume school lunch so that eating out of home becomes usual eating habit of children. Therefore, primary school students are more likely to become obese in Hong Kong [46].

Breakfast Skipping

Breakfast skipping is an unhealthy eating habit to produce more energy intake of children. When children skipped breakfast, they consume more snacks. They usually consume higher fat and energy-dense snacks [44]. A study reviewed the findings of published studies on the association between breakfast consumption and nutritional adequacy with body weight and academic performance of children and adolescents. The negative association between breakfast consumption and childhood obesity was found [47]. However, it is the common habit of Hong Kong children and adolescents. A study investigated the association between breakfast skipping and BMI of Chinese children in Hong Kong. A standardized questionnaire was used to assess their breakfast habit and lifestyle for 2 years. A negative association between breakfast skipping and BMI was found. The association were also applied on lunch skippers and eaters. Interestingly, children with breakfast skipping also associated with another unhealthy lifestyle behaviours such as low level of physical activity [48]. As parents and children believed that breakfast skipping is a strategy for weight control, it is considered to enhance health education strategies among parents and children on childhood obesity [48].

Snacking

Snacking is a usual eating habit of children but the health benefit is questionable. Snacking is defined as the habit to eat little and often [46]. A study proposed snacking as having health benefit in controlling appetite, better maintaining blood glucose level and body management [49]. If snacking becomes habitual, it is predicted to have positive energy balance [49]. An interventional study investigated an association between snacking and weight status and abnormal obesity of adolescents in the United States. The inverse association between snacking and weight status was found in adolescents. It emphasised that snacking improved diet quality and increased fruit, whole grains and fibre consumption to maintain satiety and reduce risk of obesity [50]. The main cause of snacking contributes to obesity because of positive energy balance. A cross-sectional study investigated an association between snacking and energy intake and food choice in Sweden. Frequent snacking was associated with obesity. Sweet, fatty snacks such as cakes/cookies, candies/chocolate and desserts were common choices for snacking and contributed to positive energy intake. Seventy-nine percent of children reported to have habitual snacking in school breaks [46]. They usually consumed potatoes chips as their major snacks and another energy-dense food [23]. To promote health benefit and prevent childhood obesity, parents should supervise and participate in promoting healthy eating habit and adequate food choice for children [23].

Specific Characteristics of Childhood Obesity in Hong Kong

Hong Kong is a specific place which mixed with eastern and western culture. Apart from unhealthy lifestyle behaviour as mentioned above, parenting style and informal childcare are specific factors influencing energy consumption of children in Hong Kong.

Under Confucianism, quality parenting is reflected on the academic achievement of children. Parents concern academic performance rather than other developments. It is the most important indicator of success of children [38]. Too much physical activity is discouraged because of affecting academic concentration [31]. Children have major encouragement to engage in physical activity when their parents participated in physical activity together. However, parents focus on work and caring of children resulting in no time engaging in physical activity with children [38]. On the other hand, parents control child’s development and achievement with high level engagement. An explorative study investigated the reasons of parental practice encouraging or discouraging physical activity of pre-schoolers in Hong Kong. Although parents provide instrumental, motivation and conditional support on physical activity of children, they discouraged children’s physical activity due to lack of time, safety issues and focus on academic achievement. The parental practice totally affects physical activity engagement of children [26].

Informal childcare is another common situation contributing childhood obesity. Informal childcare is defined as caring children by grandparents, other families, friends or others [52]. A study explored the association between childcare and childhood obesity in the United Kingdom. It was evidenced that informal childcare was associated with childhood obesity [53]. It may due to informal carers such as friends, grandparents and others, are less likely to regulate food intake and activity pattern. Moreover, mother is less likely to give snack children at irregular times, compared with caring by fathers or grandparents.
Another cross-sectional study investigated the relationship between preschool childcare arrangements and childhood obesity in Canada. Children, who were cared by relatives or others and attended to centre-based care, were found to have higher chance of becoming obesity [54]. Many parents work with long schedule in Hong Kong. Grandparents and domestic helpers become main carers of children. They experienced poverty and they were less likely bother children eating. Under Chinese culture, fat represent a symbol of wealthy and healthy so that grandparents encouraged children to eat more [52].

**Ecological Model of Predictors of Childhood Overweight**

Ecological model of predictor of childhood overweight (Figure 1) was conducted by Davison & Birch in 2001. It is a theoretical model to further explain the causes contributing to childhood obesity and how it impact child weight status.

![Ecological Model of Predictors of Childhood Overweight](image)

The model is composed by several circles. All circles are interrelated. Child weight status is located in the inner circle. It is the centre of this model. Several outer circles surround the centre. The circle next to the centre is called “Child characteristics and child risk factors”. Apart from age and gender, it included “dietary intake, physical activity and sedentary behaviour”. All these lifestyle behaviour directly affect child weight status as mentioned before. The circle of “parenting styles and family characteristics” is surrounding “child characteristics and child risk factors”. It represented all factors which involving parenting styles and family usual practices, influencing dietary intake, physical activity and sedentary behaviour. The outer circle is called “Community, Demographic and societal characteristics” such as school lunch program, accessibility of recreational facilities, crime rates, neighbourhood safety and school physical education programs. These community characteristics influence child characteristics and child risk factors indirectly but influence parenting style and family characteristics directly. The model indicated that parental and familial influence significantly affects behaviour and weight status of children [16].

**Previous Programs for Childhood Obesity**

Many programs were conducted to explore the effective strategies on combating childhood obesity. Majority of them focus on altering lifestyle behaviours but the outcomes were controversial. These programs were preceded in school, community and family that children are likely to have activity in these contexts.

**School-based Program**

School is a desirable place for children’ learning. Children meet teachers and students in school. They learn knowledge and social interaction through participating in various learning activities and communicate with teachers and students. Moreover, children spend much time in school daily. Their behaviours are influenced by teachers and peers. An interventional study conducted a multicomponent intervention to promote healthy lifestyle and controlling childhood obesity in Italy. The treatment period is 5 months with 8 months follow up. Children were received health knowledge about nutrition and physical activity. Family were invited to assist children to adopt healthy lifestyle behaviour and phone follow up was provided to monitor the progress of behavioural change of children. The finding showed that children had significantly improvement to exhibit healthy lifestyle behaviour. It also found that children had slightly reduction in BMI after treatment [55]. A longitudinal study investigated the effectiveness of a childhood obesity prevention program. The program had implemented for 4 years and it promoted healthy dietary intake, increase physical activities and reduce sedentary activities during school time and after school. All interventions were facilitated by teachers and parents. After completion of treatment, children in the experimental group, had significant reduction in BMI. They also found to exhibit more healthy lifestyle behaviour [56]. Another program also delivered knowledge regarding to healthy eating and physical activity in Argentina. Parents also involved in the program and partially behavioural change of children was found [57]. A different study was conducted to investigate the effectiveness of counselling and the family-based behavioural program for treating childhood obesity. Children who are under treatment of family-based behavioural program had significant reduction in weight gain but no long-term effect was found in BMI and BMI SDS reduction [58]. In all the above programs, Parents or family participation were invited to enhance the effectiveness of their programs.

**Community-based Program**

Community is a place for people having leisure activity and seeking for support when they encounter personal and family problems. Community development determines activity pattern among children and their families. Many childhood obesity programs were conducted in community. These programs make use of community facilities to enhance programs’ effectiveness. A program assessed the effectiveness of family-based intervention and recreation centre-based intervention for childhood obesity prevention in the United States. Families assisted children to adopt healthy lifestyle behaviours and report the progress by phone. Girls in the intervention group were found to have significant reduction in BMI [59]. Two studies were conducted to investigate the effectiveness of a community-based behavioural treatment on weight loss and promote quality
of life for overweight/obese youth in the United States. Families and youths also received education on weight control and healthy lifestyle behaviour (physical activity and dietary intake) respectively. Both studies were found to have significant improvement on BMI z-score and health quality of life of children. Parents also experienced significant reduction of body weight from 0-6 months and from 0-18 months respectively [60, 61]. An interventional study investigated the effectiveness of a new childhood obesity program. The program provided education about parenting skills, healthy lifestyles and emotional well-being for parents or carers and overweight children in England. Parents were also received health education on altering behaviours of children. After intervention, children exhibited more healthy behaviour and their BMI z-score had significantly reduced. Hence, the quality of life of children was improved [62]. To promote physical activity, another childhood obesity program fully utilised community facilities. This study assessed the effectiveness of their childhood obesity program in providing knowledge in behavioural changes, nutrition education, and physical activity to families in controlling childhood obesity in the United Kingdom. Free family swimming pass was provided to enhance physical activity engagement of families. Parents also involved in certain teaching sessions. Waist circumference, BMI z scores and BMI had significantly reduced among these children. Physical fitness of children was improved as well [63]. A 2-year program was conducted to focus on increasing healthy eating and physical activity engagement of children in New Zealand. The aim was to prevent weight gain of children with 5-12 years old. The program used positive reinforcement to motivate children implementing intervention. BMI, BMI z scores and healthy behaviour of children had significantly improved [64]. However, majority of the program design was either single arm study or lack of blinding measurement or intervention.

Family-based Program

Family is a group with closed relationship. Parents play a major role on affecting various behaviour of family's members. They are responsible for arranging adequate environment, various activities and dietary intake for children. A family project was conducted to assess the effectiveness in treating childhood obesity in the United Kingdom. Family-based interventions included providing nutritional advice, physical activity and behaviour modification. To assess the long-term effect of the project, the control group and the intervention group took turn after received the intervention 1 year. The reduction of BMI SDS and increase physical activity was found in both groups. However, no significant long-term effect was found [65]. Another family-based behaviour treatment was assessed in terms of the effectiveness in treating childhood obesity in Iceland. This study compared the effectiveness of a family-based behaviour treatment and standard care in weight control of children. The treatment provided information about healthy diet and regular exercise, lifestyle, behavioural modification techniques through individual sessions and group sessions. Families also participated in the treatment program. BMS SD and parents’ weight were found to have significantly reduction and children more exhibited healthy behaviour [66]. A study assessed the effectiveness of delivering skill building technique and nutrition knowledge to parents in controlling food portion of children in the United States. The intervention should strengthen feeding skills for preschool children through parent-focused, educational intervention. Significant reduction in the served calories and fewer calories consumption were found after delivering feeding skill. Fat and carbohydrates consumption of children was significantly decreased [67]. Two studies were employed role modelling approach to affect behavioural change among children and mothers. The first study assessed the influence of father in behavioural change of children. Another study examined the influence of father in altering parenting practice of mothers. Fathers had significantly reduction in weight and waist circumference and children exhibited more healthy behaviour in the first study. While children and fathers also had weight loss in the second study, no significant change of parent involving practice of mothers was identified [68, 69].

Strengths and Weaknesses of Previous Childhood Obesity Programs

After reviewed previous childhood obesity programs, researchers use different approaches and intervention to enhance the effectiveness of their programs in controlling childhood obesity. The strengths and weaknesses of these programs are summarized as follow:

Strengths of School-based Programs and Community-based Programs

School-based programs and community-based programs invite more experts to provide professional input for their programs. School-based programs invited teachers and some health care professionals to participate in teaching activity and implement those interventions [55, 56, 57]. Community-based programs also invited health care professionals and staff of recreation centre to implement interventions. Community-based programs also utilize community facilities to enhance the effectiveness of programs [59, 60, 61, 62, 63, 64]. These arrangement could concern various needs of children in controlling childhood obesity.

Weaknesses of School-based Programs and Community-based Programs

School-based programs and community-based programs provide various interventions in controlling childhood obesity. Majority of programs also invite parents assisting children in adopting healthy lifestyle behaviour or implement certain interventions. It reflected that parents play the important role in control of childhood obesity. However, fewer programs were found to concern parents’ difficulties in assisting children to adopt healthy lifestyle behaviour and combat childhood obesity [55, 56, 58, 59, 60, 61, 62, 63, 64].

These programs involved many professionals in teaching or facilitating those interventions. Many extra resources were used to help children to adopt healthy lifestyle behaviour and to prevent weight gain. However, the outcomes were not desirable. The cost for these programs is relatively high so that it is difficult to apply into real setting [55, 56, 58, 59, 60, 61, 62, 63, 64].

Positive reinforcement is a strategy to motivate children achieving their goals. After reviewing these programs, fewer programs apply this strategy to enhance effectiveness [55, 56,
57, 58, 62, 63, 64]. The strategy could inhibit negative behaviour and exhibit positive behaviour of children. Children identify and validate these behaviour so that behavioural change of children is found [70].

Strengths of Family-based Programs

Family-based programs involved higher level of parental participation. Children implement intervention in home setting. Family likely adopt healthy eating and activity pattern with children. They did not feel fear to implement intervention and encounter relatively less resistance at home [70]. On the other hand, parents play significant role to prepare food for their meals and arrange activity. Their involvement could increase power of these programs [65, 66, 67, 68, 69].

Weaknesses of Family-based Programs

Major parental involvement has been found in family-based programs. Parents should provide various levels assistance for children. However, less parental education was found to concern their parenting skill and strategies to tackle problem behaviour of children [65, 66, 67, 68, 69]. The content is most useful for parents to help children adopting healthy lifestyle behaviour.

Research Gaps

After reviewed previous studies, some research gaps are found. Majority of childhood obesity programs focus on parental involvement and provide health education in their programs. However, Programs focusing on parental education were seldom found. Apart from health education, parental education should involve parenting skills and practices, strategies to tackle problem behaviour of children. These components should help parents taking care of children efficacy. Parental influence is effective to alter behaviour of children in different programs [55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69]. It is valuable to enhance the quality of parental education to reinforce parental influence in control of childhood obesity.

Majority of childhood obesity programs involved children participating in teaching or implement interventions in treatment period. No review programs were found in parent-oriented approach [55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69]. The effectiveness of childhood obesity programs involving children is questionable. A study stated that an emphasis of dietary intake and calorie calculation may probably lead to development of altered eating attitude and behaviour of children. In addition, an emphasis weight loss may lead children to develop food or appearance preoccupation, disturbed body image and eating disorder. Parent-oriented approach on childhood obesity programs should promote lifestyle change of the whole family. It may provide environment to conduct healthy behaviour of children [71].

Hong Kong situation

Hong Kong is a metropolitan city. The high prevalence of childhood obesity is found and many relevant studies were conducted. These studies were commonly conducted to explore risk factors, consequences and phenomena of childhood obesity in Hong Kong [23, 46, 72, 73, 74, 76, 77]. Some interventional studies were conducted to explore the effective interventions in control of childhood obesity on physical activity or other alternatives [38, 75, 79, 80]. It is rare to find a study in promoting healthy lifestyle behaviour involving physical activity and eating pattern focusing on parent involvement. To combat childhood obesity in Hong Kong, it is necessary to help children adopting healthy lifestyle behaviour in Hong Kong.

Conclusion

Unhealthy lifestyle behaviour has been proved directly or indirectly associating with childhood obesity. Parents play a significant role to shape or facilitate these behaviour so that parental education and parent-oriented approach on compacting childhood obesity is important.

As Hong Kong is a metropolitan city with a unique mixture of east and west cultures, parents arrange more sedentary activity and increase energy intake of children under the influence of Chinese culture. The prevalence of informal childcare, breakfast skipping and snacking of children become specific characteristics contributing to childhood obesity in Hong Kong. Parents should be reinforced to minimize such arrangement or behaviour of children. However, parental education and parent-oriented approach was rarely found in reviewing previous programs and studies. As childhood obesity in Hong Kong prevails, it is necessary to conduct an effective program with parental education or parent-oriented approach to promote healthy lifestyle behaviour for children. It could enhance health and quality of life of children.

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Reference


