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Systematic review on the prevalence and factors associated with childhood overweight and obesity in Malaysia

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> **Abstract**---Background: Obesity in children is the world's most serious health problem, and it has been connected to death. Children who are obese are more prone to experience major health issues. Therefore, the purpose of this study is to systematically review the prevalence of childhood overweight and obesity in Malaysia and its associated factors. Materials and Methods: Three main databases were adopted in this review and study was done according to the PRISMA flow diagram. After being reviewed for stringent inclusion and exclusion criteria, the data were retrieved and compiled in Microsoft Excel. For quality evaluation, the articles included were appraised by using Newcastle-Ottawa scale. Result: The first search yielded 4121 articles for review and left with 21 articles after eliminating duplicates and applying inclusion criteria. All of data from the review were divided into five primary domains. Based on our data, we concluded that the prevalence of overweight and obesity in Malaysian children

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ranged from 23.8% to 58.0%. The ultimate risk for childhood overweight and obesity was due to genetics, followed by low education level of parents, physically inactive and others. Conclusion: Genes contribute to the occurrence of obesity in many ways, including metabolism, food craving, body-fat distribution, and others. However, parents can set a good example by promoting healthy eating and encourage physical activity that could prevent the risk of children from becoming overweight or obese adults.

Keywords---Childhood, Adolescent, Overweight, Obesity, Prevalence, Associated factors, Malaysia.

Introduction

The World Health Organization (WHO) described overweight and obesity as abnormal buildup of fat that can affect a person's health. In defining overweight and obesity for a child, it requires consideration of age. For children aged 5-19 years old, consider overweight when BMI-for-age >1 standard deviation (SD) above the WHO Growth Reference median (equivalent to BMI 25 kg/m2 at 19 years old) and obese when BMI-for-age >2 SD above the WHO Growth Reference median (equivalent to BMI 30 kg/m2 at 19 years old). Childhood obesity is the leading worldwide health crisis because of its relation to death (1). Obesity in children and teenagers have risen in most regions and nations over the last 40 years. In addition, the epidemic of overweight children globally is spreading and poses a major risk to public health especially in developing Asian countries, such as Thailand and India which recorded a marked increase in the prevalence of overweight children at 15% and 30%, respectively (2). With this continuing to increase at an alarming pace, it soon progresses to adulthood and the disease will likely to be more severe.

Overweight children are often more likely to become overweight or obese in their adulthood. Thus, they are at a higher risk to develop diabetes, heart diseases and other chronic illnesses. Obesity in children can arise from medical or hereditary diseases such as endocrine disorders. Children with obese parents are more expected to be obese adults, as stated by Paediatric Endocrinology Senior Consultant of UM Specialist Centre (UMSC) (1). A prior study showed the overall prevalence of overweight children between 7 and 12 years old in Malaysia was 19.9%, thus concluded that one out of five children were overweight (3). Another study conducted among male teenagers in the same four schools between 1990 and 1997 revealed an increase in obesity prevalence from 1% to 6%. (4).

The comorbidities of obesity cause a huge burden to our health economy in terms of financial costs and are liable to interrupt priorities in health setting sectors or other sectors. As Malaysia progresses forward to developed economic status, there is an urgency to formulate national strategies to intervene the contributors of overweight and obesity for a better diagnosis and management intervention (4). Therefore, the goal of this systematic review is to identify the prevalence and factors associated with childhood overweight and obesity in Malaysia.

Materials and Method

1.1 Material and Methods

This systematic review utilized three databases from January 2010 to December 2021, namely PubMed, Google Scholar, and BMJ, concentrating on the prevalence and factors associated with childhood overweight and obesity in Malaysia. These three databases were chosen in considering the ease of access and vast coverage of credible journals. Preferred Reporting Items for a Systematic Review and Meta-analysis (PRISMA) checklist was used as a guidance for the search strategy. An initial search was conducted to find pertinent terms and assess the viability of this review. Both manual and advanced searching the following keywords namely 'child', 'childhood', 'adolescent', 'overweight', 'obesity', 'obese', 'prevalence', 'associated risk factors', 'Malaysia'. Boolean operators such as (and, or, not), truncation (*) and quotation marks were utilized to aid in getting more focused search results.

According to Centers for Disease Control and Prevention (CDC), BMI-age- and sex-specific is defined as BMI-for-age in children and most common used indicator to measure their growth patterns and size. It is expressed in percentile after BMI is calculated as their weight and height change during growth and development, as does their relation to body fat. Therefore, the child's BMI must be shown in comparison to other kids his or her age and sex. The children categorized as overweight when the percentile range is at 85th - <95th percentile and obese when the range is at \geq 95th percentile (28).

1.2 Selection Criteria

The phases in the systematic review were given in Figure 1. Initially, the search engines produced a total of 4121 articles. Duplicate articles were eliminated, and the relevance of 66 articles was determined by judging their titles and abstracts. 50 articles underwent secondary evaluation for eligibility after screening. Articles that were accessible in full text and published in English between 2010 and 2021 met the inclusion criteria and were included in this study. Types of study included in this review were cohort and cross-sectional study which reported the prevalence of childhood overweight and obesity, and its associated factors. Articles with methodological problems and irrelevant were excluded. Eventually, 21 articles were included as final literature search. Every author went over their list of pertinent articles and argued them until they came to an end decision.



Fig 1: PRISMA flow diagram showing selection of articles selected in our study

1.3 Data Extraction Tool

Each researcher entered the data into an Excel spreadsheet independently for each article. The details were tailored according to the (a) title, (b) objective, (c) date of publication, (d) study design, (e) place of study, (f) age group, (g) prevalence of childhood overweight and obesity, (h) factors associated with overweight and obesity, and (i) conclusion. A second reviewer checked the articles given to them and provided comments to the table.

1.4 Quality Assessment Tool

The Newcastle-Ottawa quality assessment tool was used to appraise the quality of the articles by the first reviewer and revised by the second reviewer. Any disagreements were referred to the third reviewer. Articles were classified based on the study group selections (four criteria), which include study group

high quality were included in the review (5). Checklists were followed according to the PRISMA guideline.

Result

The first search yielded 4121 studies for review; however, after eliminating duplicates and applying the criteria given above, we were left with 21 articles, all of which were quantitative in nature. The studies included 19 cross-sectional studies and two cohort studies.

comparability (one criteria) and outcome analysis (three criteria). The articles were then given scores from 0 to 9 stars. Articles were categorized into high, medium, and low categories, according to the rank given. Only articles with moderate or

The age group of each sample varied between each study widely between the age of five till 19 years old. Cut-off point for overweight and obesity were varied and we concluded that most of the studies followed the guideline given by WHO where more than 1 standard deviation (SD) is considered overweight (equivalent to BMI 25 kg/m2 at 19 years old) and more than 2 standard deviations is considered obese (equivalent to BMI 30 kg/m2 at 19 years old). (1) Based on our data, we concluded that the prevalence of childhood overweight and obesity in Malaysia ranged from 23.8% to 58%.

All data regarding factors associated with childhood overweight and obesity in Malaysia were divided into five primary domains, as shown in Figure 2.



Fig 2: Conceptual framework on Factors associated with Childhood Overweight and Obesity

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1.5 Education Level

In our study, 6 out of 21 articles agreed that guardian's education is an important tool in determining childhood overweight and obesity.

1.6 Genetic

A significant number of studies in which 7 out of 21 articles agreed that the risk factor of childhood overweight and obesity was due to overweight or obese parents. Besides, 3 from 21 articles suggested that male children were more likely to be overweight and obesity.

1.7 Lifestyle

Other factors associated such as lifestyle have been determined to have influence on childhood BMI. 5 from 21 articles agreed that physical activity lowered the risk of childhood overweight and obesity.

1.8 Family

Family domain was categorized into household income and maternal factors. For household income, 2 out of 21 articles shows that middle and high household income were most likely to be obese because of higher buying power, affordability of buying food and fast-food stores accessibility which usually located in affluent areas. However, 1 out of 21 articles suggested that lower household income tend to have obese children because healthier food is expensive and less available in poorer community while unhealthy with high calorie food are cheap and affordable.

On the other hand, maternal factors which include employment status, beliefs and feeding practices revealed that 1 out of 21 articles found that the risk of childhood obesity is associated with it. This is because employed mothers have less time to prepare healthy food leading them to choose fast food for their children.

1.9 Food

Though very few are mentioned, a cross-sectional study conducted by (7), it was discovered that more than one-fourth (27.6%, 288/1045) of people who lived within a 1000-meter radius of at least one fast-food restaurant were overweight and shows that it's a high risk of being overweight [4.5(1), p = 0.034].

Furthermore, 4 out of 21 articles shows that dietary intake that includes sweet drinks and desserts is associated with childhood overweight and obesity whereas 2 out of 21 articles shows that irregular meals intake is a significant risk factor of abdominal obesity in childhood. Another study also shows that junk food self-medication habits have a positive association with obesity in children between 5-12 years old. Besides, 1 out of 21 articles also reveals that feeding practice is an important tool that leads to childhood overweight and obesity

Discussion

The main goal of this systematic review was to identify factors associated with childhood overweight and obesity in Malaysia. The findings in our review revealed that genetic, education and lifestyle factors were the most highlighted.

In addition, one study out of twenty-one, the foods consumed most frequently by overweight Malay adolescents were, in descending order, seafood, vegetables, fruits, rice, Malaysian cakes or "kuih," chicken, and noodles and frequencies of

drinks consumed were double compared to plain water.

Our study revealed that genetics was another associated factor that involved parents' BMI status of obesity which contributed to a major predictor of obesity in children, indicating both environmental and genetic factors. Numerous studies have shown that maternal and paternal obesity have a beneficial impact on the likelihood of obesity in the offspring. Early-onset obesity in children less than 10 years old has been linked to an elevated relative risk of obesity in first-degree relatives of 2.14, implying higher genetic loading and family aggregation (11). The prevalence of overweight children increased proportionately with the BMI status of their guardians. This result was similar to those reported by Lazzeri et al. (12). According to a systematic review, children have a 70% probability of being obesity if both parents were obese, a 50% chance if one parent was obese, and a 10% chance if neither parent were obese. The lack of data on the relationship between the guardian and the children with their biological parents in the study could explain why they were unable to demonstrate the potential link (13).

A study suggested that male gender was strongly linked to being overweight or obese among children (OR 2.52, 95% CI 2.00 - 3.19). (14). Results from another study also showed that the prevalence of obesity among Malay adolescents affected boys more (14.5%) rather than girls (9%). In many Asian countries, parents urge their boys to consume more energy-dense foods than their daughters, believed that the boys needed more energy than the daughters. Furthermore, their sedentary lifestyle choices resulted in a favorable energy balance, favoring weight gain in boys (15). According to our research, Male, Malay, older, and coming from middle-class families were all risk factors for overweight children. Since older boys are more outgoing, they tend to eat out more frequently and visit fast food restaurants as compared to young girls (7).

According to a study, children whose parents with low educational level were 80% more likely to be overweight or obese (OR:1.8); 95%, 1.37 - 2.37). Our findings imply that, its possibly due to lifestyle variables and parental traits that play a significant effect in influencing children's overweight or obesity status (8). Lack of education on the importance of good lifestyle such as exercising, eating nutritious and balanced diet may lead to the excess of accumulated fat (9). Nevertheless, this is contradicted from prior study (10), found that in both Colombia and Kenya, mother education was positively correlated with childhood obesity. Children from Colombia and Kenya had 1.9 and 4.8 times higher risks of being overweight if their mothers had a college education or higher, respectively. This potentially could be due to highly educated parents being more likely to spend time on

working which consequently lead to a less active lifestyle which gave a poor example to their children (10).

Within the lifestyle domain such as physical activity, 5 out of 21 articles were found to reduce the risk of overweight and obesity. This is supported by a research by Hills et al. (26) who found that the majority of studies on children's habitual physical activity revealed that overweight and obese children were less active than children with normal BMI. In another study, children categorized as obese were reported doing less exercise. (17). Being physically active reduces the risk of obesity in children as what had been mentioned by Hong, et al. (27), where children who followed the 60 minutes per day physical activity guideline were negatively associated with overweight and obesity.

Association within the family domain such as household income is also a predictor of childhood overweight and obesity. A study in England suggested that children from lower family income has 1.88 times to be obese compared to those from higher family income because of less likely to consume healthy diet or to participate in sports (19). According to a study, having working mothers has a positive impact on their children's BMI. Children with working mothers also appear to have poor eating habits and more sedentary behavior.

In addition, it is widely acknowledged that household food insecurity is significantly associated with poor health. Food insecurity could be linked to obesity in an indirect way through dietary patterns and low socioeconomic and demographic variables. This is because, for example, a low-income individual may not have the money to obtain a wider variety of nutritious foods, so they must rely solely on carbs, which are readily available, especially in rural areas. Hence food insecurity results in a poor balanced diet which predisposes children to obesity. Malaysian families are increasingly opting for eating out and take-away meals as a result of their increasingly hectic lifestyles, with fast-food restaurants located near residential areas providing the most convenient options. Furthermore, the majority of fast-food restaurants are open 24 hours a day and provide drive-through and home delivery services. According to another study, fast food is particularly popular among Malaysian children aged 10 to 18, with around 8 out of 10 Malaysian children aged 10 to 18 eating it at least once a week (7).

As for junk food self-medication habits related to obesity, it happens when a person is stressed, insecure, and succumbing to emotional turmoil. Naturally, an individual seeks relief from these discomforts through the brain-reward system. Hedonic effects of junk food, which are induced by an elevated energy density, are an easily available method of self-medication through binge eating, which results in habit formation through alterations in the hippocampus and amygdala. Children with poor eating habits, such as skipping breakfast, would become hungrier and consume more food during the following meal of the day. This is reinforced by research that demonstrate that skipping breakfast is connected to becoming overweight or obese (23,24). People who skip breakfast are more likely to engage in habits such as indulging snacks, skipping lunch, and leading a sedentary lifestyle (25).

Conclusion

Several factors associated with childhood overweight and obesity have been identified in this study. In a nutshell, there's little to none can be changed in terms of genetic factor, however the other factors are still modifiable to some extent. Even though that a child might be obese due to genetics, but it could be reduced by tackling the other associated factors. The epigenome, or DNA, is very dynamic and seems to alter with ageing and environmental exposures including nutrition and exercise. (Institute of Medicine, 2015). Hence, this paves a possibility albeit indirectly that a genetically obese or overweight child still could make a change. We suggest parents should take the initiative to act effectively in combating childhood overweight and obesity. This could be done by encouraging healthy eating and regular exercise that have been recommended by the WHO, as healthy habits formed in childhood could be carried over into adulthood. Moreover, it is also the role of the government or local contributors in providing healthier alternatives of fast food chains such as promoting healthier fresh ingredients in cooking that are still attractive to a child's palate via encouraging healthier menu options. These could prevent the risk of children from becoming overweight or obese adults. It is vital to take action in the prevention of childhood obesity as not only it affects their physical health, it also has a negative impact on their emotional well-being. Other realistic interventions and holistic approaches should involve all groups including peers, society, related government and nongovernment agencies to prevent and lessen this public health burden. We hope this study can give enlightenment on some risk factors that lead to childhood overweight and obesity. We hope other studies can address the best and relevant strategies to overcome this health issue effectively.

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