

*Narrative Review*

## Understanding the Underlying Factors of Childhood Obesity in the Caribbean: A Blueprint for Preventive Measures

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The obesity epidemic is an increasing public health issue worldwide. In the Caribbean region, childhood obesity levels are higher than in the rest of the world and can be linked to developing many comorbidities. This narrative review aims to determine the factors contributing to the rise in childhood obesity in the Caribbean. A literature search included articles published between 2010 and 2023, written in English and allowed free access to the abstracts. Results show childhood obesity is a multifactorial disease that can be linked to many factors, such as physical inactivity, poor dietary habits, shortened sleep duration, family determinants, and nonmodifiable factors. A call for action is needed in the Caribbean to help curb the rise in childhood obesity.

**Keywords**

childhood obesity, risk factors, complications, the Caribbean region, statistics, and public health

**1. Introduction**

Childhood obesity is a growing public health concern, and its incidence has tripled worldwide since 1975<sup>1,2</sup>. Age forms the basis for this classification. A child under the age of five years is considered obese when the weight- for height- is three standard deviations above the World Health Organization's (WHO's) Child Growth Standards median. For children five to nineteen years old, this occurs when they are two standard deviations above the WHO Growth reference median<sup>2</sup>.

Childhood obesity is linked to many complications, not just physically but emotionally and mentally. Some health conditions that can be associated with obesity are hypertension, cholesterol, type two diabetes, breathing problems, arthropathies, gallstones, and gallbladder diseases<sup>3,4,12,13</sup>. Studies show that compared to healthy-weight children, children and adolescents who are overweight or obese have an increased risk of depression, compromised quality of life, anxiety, low self-esteem, and behavioural disorders<sup>5,6</sup>. Many studies state childhood obesity is multifactorial and can be due to genetic, behavioural, and environmental factors<sup>8,9</sup>.

In the Caribbean, the prevalence of obesity in children is currently two to three times higher than in the rest of the world<sup>7,11</sup>. It affects 140 million people, which is approximately one-quarter of the Caribbean population<sup>33</sup>. Of the top 24 countries with the highest prevalence of childhood obesity worldwide, half are small island developing states<sup>32</sup>. Obese or overweight children are likely to become overweight or obese adults, which can lead to them developing many non-communicable diseases and premature death<sup>2,3</sup>. In the region, the primary cause of death has transitioned from infectious and communicable diseases to non-communicable nutrition-related chronic diseases, which can be linked to a sedentary lifestyle and changes in diet<sup>35</sup>. If the cycle of obese children leading to obese adults continues at this rate, it will put a strain on the already deprived healthcare systems in the Caribbean.

In the region, the increase in the prevalence of obesity can be linked to the Caribbean becoming more "Westernized"<sup>11</sup>. This narrative review aims to determine the factors contributing to the rise in childhood obesity and recommend lifestyle changes to reduce the incidence and prevalence. Doing this

will lead to an overall improvement in health in the Caribbean and reduce the burden on the healthcare systems.

## 2. Methods

Currently, in the Caribbean, the increasing prevalence of childhood obesity is a matter of public health urgency and is an under-researched area. The leading search engine for this narrative review was Google Scholar, and the primary database was PubMed. Additionally, leading organizations such as the World Health Organization (WHO) and the Center for Disease Control and Prevention (CDC) were used for general information. The literature search focused on the main risk factors for childhood obesity. The keywords for retrieving articles were *childhood obesity*, *risk factors*, *complications*, *consequences*, *the Caribbean region*, *statistics*, *obesity*, and *public health*. The inclusion criteria for the review included articles published between 2010 and 2023 that were written in English and allowed free access to the abstracts. Articles that were published prior to 2010, not written in English and did not allow full free access to abstracts were excluded.

## 3. Results

After reviewing articles, the main factors contributing to the rise in childhood obesity were classified into two main categories: modifiable and nonmodifiable. The main nonmodifiable risk factors leading to the development of childhood obesity found in articles were genetics, ethnicity, and intrauterine factors. Sleep, diet, physical activity, and parental determinants were modifiable factors.

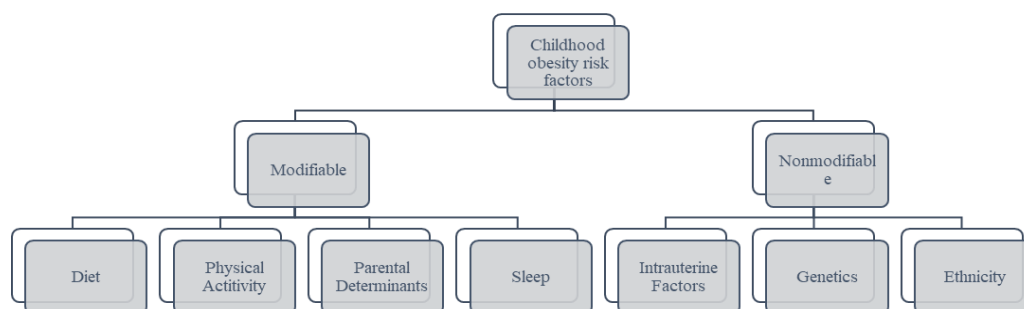


Figure 1. Childhood Obesity Risk Factors

Eight articles were selected which spoke about the nonmodifiable risk factors for childhood obesity. Three articles supported the idea that increased gestational weight gain can lead to an increase in childhood obesity. Three articles supported the theory that genetics play a role in developing childhood obesity, and two articles discussed the role of ethnicity about childhood obesity. Thirteen articles discussed the modifiable risk factors for childhood obesity. Of the thirteen, one article discussed all four modifiable risk factors. Four articles stated that shortened sleep duration can lead to childhood obesity, whereas one showed there is no association between shortened sleep duration and childhood obesity. Two articles discussed the role of poor dietary habits and the development of childhood obesity. Five articles supported the idea that physical inactivity leads to childhood obesity, and three articles showed that parents' lifestyles can impact children.

The table below (Table 1) summarises the risk factors and critical findings from articles discussed in the paper.

Table 1. Risk Factors for Childhood Obesity

Article Reference	Theme		Study Design	Main finding
Woo Baidal et al., 2016 (14)	Nonmodifiable factor- Intrauterine factor	risk	Literature review	Increased gestational weight gain can lead to childhood obesity
Sridhar et al., 2014 (15)	Nonmodifiable factor- intrauterine factor	risk	Prospective cohort study	Increased gestational weight gain can lead to childhood obesity
Josey et al., 2019	Nonmodifiable factor- intrauterine factor	risk	Prospective cohort study	Increased gestational weight gain can lead to childhood obesity
Garver et al., 2013 (16)	Nonmodifiable factor- genetics	risk	Literature review	Obese parents can lead to obese children
Taveras et al., 2013 (17)	Nonmodifiable factor- ethnicity	risk	Prospective cohort study	African Americans and Hispanics have a higher prevalence of obesity compared to their white counterparts.
Dixon et al., 2012 (39)	Nonmodifiable factor- ethnicity	risk	Literature review	Ethnicity has an impact on childhood obesity
Bhadoria et al., 2015 (9)	Nonmodifiable factor- genetics	risk	Literature review	BMI 25-40% heritable
Simmonds M et al., 2015 (34)	Nonmodifiable factor- genetics	risk	Literature review	Obese children develop obesity in adulthood
Henry FJ 2016 (19)	Modifiable- physical activity, parental determinants, sleep	diet, activity,	Literature review	Globalization leads to an increase in childhood obesity
Ang et al., 2012 (22)	Modifiable- Sleep		Literature review	Pathways that sleep deprivation leads to obesity
Halal et al., 2016 (24)	Modifiable- Sleep		Cross-sectional study	There is no natural association between sleep and obesity in children in developing countries.
Taveras et al., 2014 (18)	Modifiable- Sleep		Prospective cohort study	Chronic sleep curtailment leads to higher central and overall adiposity mid-childhood
Danial et al., 2022 (23)	Modifiable- Sleep		Prospective cohort study	BMI z-score in children increased with every hour of shorter sleep duration
Carrillo-Larco et al., 2014 (25)	Modifiable- Sleep		Prospective cohort study	32% increased risk of obesity in children 1-4 years old with < 10 hours of sleep at night
Kim et al., 2014 (26)	Modifiable- Diet		Literature review	Certain foods are associated with childhood obesity
Henry FJ 2016 (35)	Modifiable- Diet		Literature review	Increased fat and sugar requirements in the region
Paduano et al., 2021 (28)	Modifiable- activity	Physical	Cross-sectional	Physical inactivity favours obesity
Rambaran et al., 2020 (29)	Modifiable- inactivity	Physical	Cross-sectional and narrative review	Physical inactivity favours obesity
Bhadoria et al., 2015 (9)	Modifiable-	Physical	Literature	Physical inactivity favours obesity

	inactivity		review	
Ang et al., 2012 (22)	Modifiable-inactivity	Physical	Literature review	A sedentary lifestyle increases the risk of childhood obesity
Thomas-Venugopal R et al., 2023 (36)	Modifiable-inactivity	Physical	Systematic review	Physical inactivity is decreased among children in the Caribbean
Ang et al., 2012 (22)	Modifiable-determinants	Parental	Literature review	Parents' lifestyle choices impact children's
Tzou et al., 2012 (37)	Modifiable-determinants	Parental	Literature review	Parents' lifestyle choices impact children's
Aparicio et al., 2016 (38)	Modifiable-determinants	Parental	Literature review	Parents' lifestyle choices impact children's

#### 4. Discussion

Childhood obesity is a multifactorial complex disease that can be attributed to both modifiable and nonmodifiable factors. This paper focuses on the modifiable factors in more detail, but the nonmodifiable factors will also be briefly discussed.

##### 4.1 Nonmodifiable Factors

Genetics, intrauterine factors, and ethnicity were researched in detail by many studies and proved to be the main nonmodifiable factors that contribute to childhood obesity.

Studies were done that show that excessive weight gain in both early and late periods of pregnancy was linked to childhood obesity<sup>14,15,41</sup>. A recent study by Wang et al. stated that the Caribbean region has one of the highest gestational weight gain<sup>21</sup>. Therefore, it can be assumed that the high gestational weight gain in the Caribbean can be linked to the increasing prevalence of childhood obesity in the region.

Several studies also show that genetics has a role in developing childhood obesity. One study stated that BMI is 25-40% heritable<sup>9</sup>. Another study stated that if one parent is obese, there is a fourfold increase in childhood obesity. In contrast, if both parents are obese, there is a tenfold increase in childhood obesity<sup>16</sup>. Additionally, obese children eventually develop obesity as adults. One study showed that obese children are five times more likely to become obese adults, creating a never-ending cycle of obesity<sup>34</sup>.

Additionally, research has shown that ethnicity can be considered a risk factor for developing childhood obesity. While no studies were found based on ethnic backgrounds in the Caribbean and obesity development, studies were done in the United States, which showed that African Americans and Hispanics had higher rates of childhood obesity<sup>17</sup>.

Since creating prevention strategies for nonmodifiable factors will be challenging, they will only be discussed briefly.

##### 4.2 Modifiable Risk Factors

Several modifiable risk factors contribute to childhood obesity. They can be classified into four categories: diet, physical activity, parental determinants, and sleep.

###### 4.2.1 Sleep

Many studies concluded that shorter sleep duration leads to an increase in adiposity in children<sup>18,22,23,24</sup>. Sleep deprivation affects obesity through many pathways, such as increased sympathetic activity, decreased leptin and growth hormone, elevated cortisol and ghrelin levels, and impaired glucose tolerance<sup>22</sup>. One study stated that in children one to four years of age, less than ten hours of sleep at night leads to a 32 % increase in childhood obesity<sup>24</sup>. Another study stated an increase in a BMI z-score of 0.09 units with each hour of shortened sleep duration<sup>23</sup>. However, while many studies show

that shorter sleep duration may be a risk factor for developing childhood obesity, one study in developing countries showed no natural association between curtailed sleep duration and childhood obesity<sup>25</sup>. While this study contradicts the findings of other studies, it must be noted that it was a cross-sectional study that was carried out. In contrast, the others were prospective cohorts that followed children's sleep duration over time rather than at a "snapshot". Therefore, it can be concluded that curtailed sleep can be a risk factor for childhood obesity.

#### 4.2.2 Diet

Dietary habits play a role in childhood obesity. In the Caribbean, the pattern of food consumption is a significant contributing factor to the increasing obesity rates, with the region having more than 160% average requirement for fats and 250% excess requirements for sugars<sup>35</sup>. The Caribbean region has suffered from a shift from an indigenous diet to a more Westernized one. This shift can be attributed to trade liberalization, linked to increased food imports and consumption of high-fat and high-sugar food and drinks<sup>30</sup>. Increased consumption of fast food, sugar-sweetened beverages and snacks and behaviours such as watching television while having a meal, snacking often, and skipping breakfast have been associated with increased childhood obesity<sup>9,26</sup>. Besides this, the prevalence of families where both parents work outside the home results in fewer meals prepared at home and increased fast food consumption<sup>9</sup>. Statistics from the United States Bureau of Labor Statistics reveal that mothers and fathers had an increased participation rate in the labour force, regardless of marital status<sup>27</sup>. While no statistics have been found for the Caribbean region, this can be generalized to the Caribbean, seeing that the region is becoming more "Westernized" and both parents are usually working, rather than the father figure alone.

#### 4.2.3 Physical Inactivity

Physical inactivity is a risk factor for developing childhood obesity, as stated by many studies<sup>9,19,28</sup>. However, many other parameters must be addressed when examining physical inactivity. Due to the rapid increase in the use of technology and the amount of screen time among children and adolescents, there is an increase in sedentary behaviour worldwide and less time dedicated to physical activity<sup>9, 22, 28</sup>. One study showed that three out of four children spent less than seven hours in physical activities weekly, and at least 64 per cent dedicated more than two hours to sedentary activities<sup>28</sup>. A recent study done in Latin America and the Caribbean found 84.3 per cent of adolescents aged 11-17 partake in insufficient physical activity and a recent review of physical activity amongst adolescents in four Caribbean countries showed children and adolescents need to be more engaged in adequate physical activity<sup>29,36</sup>. This lack of physical activity and increase in sedentary behaviour is contributing to the rise in childhood obesity in the Caribbean.

#### 4.2.4 Parental Determinants

The concept: "Charity begins at home" is a familiar one. Parental factors play a role in developing childhood obesity. Studies show that parental habits influence children's lifestyle<sup>22,37</sup>. Thus, if parents practice more sedentary lifestyles at home or are physically inactive, it will be passed down to future generations, leading to the never-ending obesity epidemic. Additionally, research has shown that parents influence children's food choices and feeding practices from age<sup>38</sup>. The practice of using sweets to change children's temperament or as a form of reward can result in unhealthy eating behaviours, leading to childhood obesity<sup>38</sup>.

### 5. Recommendations

Due to the complexity of childhood obesity, there is no simple prevention method. It requires a multifaceted public health approach to prevent its development. It cannot be carried out solely at an individual level but also requires societal and institutional interventions.

Firstly, parents should be informed of the importance of healthy sleep habits and the duration of sleep for children and can thus set scheduled bedtimes to which children should adhere.

Children should also have access to three meals per day. Studies have shown that having three meals per day is protective against developing childhood obesity, and children who consume all three were reported to have a 63% lower risk of developing childhood obesity as compared to those who did not<sup>31</sup>.

Additionally, seeing the impact parents' lifestyle choices have on their children, they should educate and inform their children on the importance of a healthy lifestyle and should start by setting examples of this for their children.

Information about the importance of less sedentary lifestyle behaviours and focus on the importance of physical activity should be provided to children. Given that children spend most of their time at school, this can be done through the school system and incorporated into the education curriculum. While many Caribbean schools have physical education as part of their curriculum, more focus should be placed on it. Additionally, in the school setting, the food offered in cafeterias should be evaluated to ensure that the food being offered meets the national dietary guidelines. A recent review of the school nutrition policies in four Caribbean islands showed that programs for better and healthier nutrition options are currently being implemented<sup>36</sup>.

Institutions in Caribbean communities, such as churches, community centres, and youth clubs, should incorporate more physical recreational activities, providing safe places for children to exercise.

While these are just a few recommendations that can be made, the impact of all of them working together may help curb the ongoing rise of childhood obesity in the Caribbean.

## 6. Limitations

Due to the paucity of information on childhood obesity in the Caribbean region, the articles used were not limited to the Caribbean region only. Instead, they included articles worldwide and made assumptions for the region.

## 7. Conclusion

In the Caribbean region, childhood obesity rates are higher than the global average and are continuing to rise<sup>11</sup>. The main risk factors contributing to the rise are poor dietary habits, physical inactivity, parental determinants, curtailed sleep duration and nonmodifiable risk factors. Due to the globalization and "westernization" of the Caribbean region, people are now more likely to adapt to an obesogenic environment due to easy access to resources.

If nothing is done to curb the rise in childhood obesity in the Caribbean, the resultant burden of chronic diseases that arise from it will continue to overwhelm the healthcare systems of the region. Prevention is better than cure and easier; therefore, recommendations to curb the rise should be considered.

As compared to the rest of the world, the Caribbean region already has healthcare systems which are understaffed and under-resourced. Additionally, non-communicable diseases are higher globally than Organization for Economic Co-operation and Development (OECD) countries by at least 61%<sup>40</sup>. Suppose the prevalence of childhood obesity keeps increasing at the current rate. In that case, the healthcare systems in the Caribbean will be further strained with the burden of additional non-communicable diseases that occur in adulthood.

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