

# A Complex Interrelationship of Childhood Obesity, Dental Caries and Malocclusion Amidst the COVID-19 Pandemic and Social Media Amplification: A Narrative Review

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## ABSTRACT

Recent research has highlighted the link between childhood obesity, dental caries, and malocclusion, and how the Coronavirus Disease - 2019 (COVID-19) pandemic and social media have worsened these health issues. Increased screentime and decreased physical activity during the pandemic have significantly contributed to these conditions among children. Studies emphasise the need to address common risk factors such as unhealthy diets, limited healthcare access, and poor public health policies to reduce their negative effects. This review explores the complex relationship between childhood obesity, dental caries, and malocclusion, with a focus on their global importance. It examines the connections and shared risk factors between these conditions, particularly in the context of the pandemic and the growing influence of social media on children. The goal is to provide insights for developing effective interventions and management strategies to improve children's health worldwide. The present review stresses the urgent need for comprehensive strategies that target both individual and collective risk factors, while also considering broader socio-economic and digital influences on children's health behaviours. Promoting healthy lifestyles, access to nutritious foods, physical activity, and better dental care can help to alleviate these conditions. Understanding the interplay between these health issues and the digital environment is crucial to creating effective and adaptable public health interventions.

**Keywords:** Coronavirus disease-2019, Health issues, Paediatric dentistry, Public health

## INTRODUCTION

Childhood obesity, dental caries, and malocclusion represent significant public health challenges affecting children globally, necessitating comprehensive understanding and targeted interventions to mitigate their adverse effects. According to recent estimates, childhood obesity, characterised by excessive body fat accumulation, affects approximately 19.7% of children and adolescents worldwide, with steadily rising prevalence rates in both developed and developing countries [1]. This epidemic not only predisposes children to immediate health risks, such as cardiovascular diseases, Type 2 diabetes, and musculoskeletal disorders, but also increases the risk of developing chronic conditions in adulthood, imposing a substantial burden on healthcare systems and society as a whole [2].

Dental caries, often referred to as tooth decay, remains one of the most prevalent chronic diseases in childhood, affecting nearly half of the world's paediatric population, with the highest burden observed in low- and middle-income countries [3]. Despite advancements in preventive measures and oral health education programs, dental caries continues to be a significant public health concern, leading to pain, discomfort, functional impairment, and impaired quality of life among affected children [4]. Furthermore, untreated dental caries can progress to more severe conditions, including abscess formation, tooth loss, and systemic infections, highlighting the need for early detection and intervention strategies [5,6].

Malocclusion, characterised by misalignment or incorrect positioning of the teeth when the jaws are closed, is another common dental condition affecting children worldwide [7]. Globally, malocclusion affects approximately 56% of the population with no significant differences between sexes. The highest prevalence was observed in Africa (81%) and Europe (72%), followed by America (53%) and Asia (48%). Interestingly, the prevalence of malocclusion remains consistent from primary to permanent dentition, with an average of 54% [8].

While malocclusion may manifest as a purely aesthetic concern in some cases, it can also lead to functional issues, such as difficulty chewing, speaking, and maintaining proper oral hygiene [9]. Moreover, untreated malocclusion has been associated with temporomandibular joint disorders, occlusal trauma, and psychological impacts such as low self-esteem and social stigma, underscoring the importance of early diagnosis and orthodontic intervention [10].

The emergence of the COVID-19 pandemic, alongside the proliferation of social media, has significantly impacted children's lives, introducing new complexities and exacerbating existing health challenges. School closures, limited outdoor activities, disrupted routines, and increased social media use collectively influence children's health behaviours and well-being [11]. In the present review, the authors explore the multifaceted interplay between childhood obesity, dental caries, and malocclusion within the context of these broader societal shifts. By synthesising the current evidence, they aimed to shed light on the interconnected health issues facing children and advocate comprehensive strategies to address their holistic well-being.

## Interplay between Childhood Obesity and Dental Caries

The complex relationship between childhood obesity and dental caries is well-documented in the literature, emphasising its significant correlation [12,13]. Studies have shown that dietary habits, particularly the consumption of sugary foods and beverages, play a pivotal role in childhood obesity [14] and dental caries [15]. High sugar intake not only contributes to weight gain [16] but also provides a substrate for cariogenic bacteria in the oral cavity, leading to the development of dental caries [17]. This shared risk factor underscores the importance of dietary interventions to address both conditions.

Moreover, sedentary lifestyle behaviours characterised by insufficient physical activity and increased screentime have been implicated in

the development of childhood obesity [18] and dental caries [19]. Sedentary behaviour often correlates with unhealthy eating habits, such as frequent consumption of sugary snacks and beverages [20], exacerbating the risk of both obesity and dental caries.

Childhood obesity and dental caries are multifactorial conditions with potential interconnections; however, the nature of their relationship remains complex. Some studies have reported a positive association between childhood obesity and dental caries, suggesting that obese children are more likely to experience dental caries [21-24]. On the other hand, some studies have observed a reverse correlation, indicating that higher Body Mass Index (BMI) z-scores are linked to lower Decayed, Missing and Filled Teeth (DMFT) scores [25-29]. Nevertheless, some studies have failed to identify a significant association between these two conditions [30-32]. Moreover, systematic reviews and meta-analyses have reported conflicting results [24,33]. Two primary factors may have contributed to the variation in results. Firstly, the multifaceted nature of obesity development encompasses various factors such as age, sex, socio-economic status, physical activity, diet, and psychological well-being, alongside variations across racial and ethnic groups [34]. Secondly, the limited representativeness of small sample sizes in most studies introduces potential selection biases [35]. Although many countries conduct large-scale surveys to collect data on children under five years of age, research on older children and adolescents is sparse and often characterised by smaller sample sizes [36].

In summary, although evidence suggests an association between childhood obesity and dental caries, this relationship is not straightforward and is influenced by demographic and lifestyle factors. Further research is needed to clarify these associations and to understand the underlying mechanisms. Interventions aimed at reducing obesity and dental caries in children should consider these multifactorial influences and possibly target common risk factors such as diet and physical activity.

### **Interplay between Childhood Obesity and Malocclusion**

Studies examining childhood obesity and malocclusion have revealed a complex relationship, demonstrating a significant association between them and their shared risk factors [35,37-39]. Dietary habits, particularly the consumption of calorie-dense foods, play pivotal roles in both childhood obesity [40] and malocclusion [41].

Excessive adiposity in the facial region due to obesity can lead to alterations in craniofacial morphology, potentially affecting dental alignment and occlusion [42]. Moreover, obesity-related habits, such as mouth breathing and altered tongue posture [43], can influence the growth and positioning of teeth and jaws, thereby contributing to malocclusion [44]. Childhood obesity has been associated with the development of malocclusion, as evidenced by studies examining the relationship between Body Mass Index (BMI) and dental health [45,46]. Overweight or obese children exhibited a higher frequency of dental crowding and a reduced overjet than their normal-weight peers, although the differences in dental parameters were not statistically significant [38]. Additionally, maternal obesity is a strong risk factor for childhood obesity that can indirectly affect the development of malocclusion [47]. Moreover, obese children face an increased risk of obesity-associated comorbidities, including obstructive sleep apnea, a condition linked to orthodontic malocclusion [48].

Furthermore, malocclusion may affect childhood obesity by affecting dietary habits and oral health behaviours. Individuals with malocclusion may experience difficulties in chewing and biting, leading to altered food choice and consumption patterns. This can predispose them to prefer soft, calorie-dense foods, which are often associated with obesity [49]. In addition, malocclusion may hinder proper oral hygiene practices, increasing the risk of dental caries

and subsequent weight gain owing to dietary changes caused by dental pain or discomfort [50].

In contrast, while obesity has been linked to malocclusion, the psychosocial impact of malocclusion does not seem to be significantly influenced by social class or sex [51]. This suggests that the psychological impact of malocclusion is a concern across demographics [52]. Moreover, the perception of dental aesthetics and the impact of malocclusion on self-esteem can vary widely among individuals, indicating that the relationship between obesity, malocclusion, and psychosocial factors is complex [53].

In summary, there is evidence to suggest a relationship between childhood obesity and malocclusion, with obese children showing a tendency towards certain malocclusions. However, the psychosocial impact of malocclusion appears to be more universally experienced across different social classes and genders, and individual perception plays a significant role in the impact of malocclusion on the quality of life. Further research is needed to fully understand the mechanisms linking obesity and malocclusion as well as their broader implications for psychosocial health.

### **Interplay between Malocclusion and Dental Caries**

The literature on the association between malocclusion and dental caries reveals a complex relationship between these two oral health concerns. Research has consistently demonstrated a significant correlation between malocclusion and dental caries, highlighting the shared risk factors and pathways contributing to their interconnectedness [54]. Studies have shown that malocclusion can predispose individuals to dental caries by creating areas of plaque accumulation and food impaction, particularly in crowded or misaligned teeth [55,56]. These conditions create challenges in maintaining proper oral hygiene, leading to the retention of food particles and bacteria that contribute to the development of dental caries [57]. Moreover, malocclusion-related habits such as mouth breathing and altered tongue posture may further exacerbate the risk of dental caries by promoting a dry oral environment conducive to bacterial proliferation [58].

Conversely, dental caries can exacerbate malocclusion by causing tooth loss or structural damage, which affects dental occlusion and alignment [59]. Premature loss of primary or permanent teeth due to dental caries can disrupt the natural sequence of tooth eruption and lead to malocclusion-related complications such as dental crowding or spacing [60].

However, numerous uncertainties underscore the need for further investigation into the relationship between malocclusion and dental caries. Although some studies have demonstrated a significant link between malocclusion and heightened dental caries [54,61], others have either suggested insignificant correlations or inadequately explored this relationship [62-66]. Discrepancies in findings and methodologies, including variations in participant demographics, geographical locations, and assessment tools for malocclusion and caries, have contributed to these gaps. Interestingly, some studies have reported a positive correlation between severe malocclusion and elevated DMFT scores [61,67], whereas others have found no association between crowding and increased caries [68]. Moreover, although the impact of malocclusion on Oral Health-related Quality of Life (OHRQoL) is acknowledged [62], the direct link between malocclusion and caries within this context remains unclear. Furthermore, the potential influence of confounding factors such as socio-economic status, oral hygiene practices and dietary habits has not been consistently addressed across studies.

While evidence suggests an association between malocclusion and dental caries, inconsistencies and methodological limitations underscore the need for more robust longitudinal studies employing standardised methodologies. Future research should strive to

elucidate the causal relationships and explore the role of confounding variables in greater detail. Such efforts are essential for establishing definitive conclusions and informing clinical strategies for the prevention and management of malocclusion and dental caries.

### COVID-19, Social Media, and Oral Health: Interplay between Childhood Obesity, Dental Caries, and Malocclusion

The COVID-19 pandemic has introduced novel dimensions to the complex interplay among childhood obesity [69], dental caries [70], and malocclusion [71], with lifestyle changes and the pervasive influence of social media amplifying the risks associated with these conditions. Lockdowns and restrictions have led to increased sedentary behaviour and altered dietary patterns among children, exacerbating predisposing factors for both obesity and dental caries [72].

Furthermore, the COVID-19 pandemic has witnessed a surge in social media usage among children, with platforms serving as primary sources of information, social interaction, and entertainment during the lockdown and isolation. Although social media can provide valuable educational resources and support networks, excessive screentime and exposure to unhealthy content have been associated with adverse health outcomes. These include poor dietary habits, sedentary lifestyles, and body image concerns, thereby exacerbating the challenges posed by childhood obesity, dental caries, and malocclusion. Simultaneously, the proliferation of social media platforms has amplified children's exposure to unhealthy food marketing and diminished the emphasis on maintaining optimal oral hygiene practices [73]. As screentime surged during remote learning periods, physical activity levels plummeted, and snacking behaviours surged, further contributing to weight gain and dental caries development [74]. Moreover, pandemic-induced disruptions in routine dental care have compounded these challenges, resulting in delayed or neglected orthodontic treatments that potentially worsen malocclusion outcomes [75]. Additionally, the impact of social media influencers promoting unrealistic beauty standards, including dental aesthetics, may exacerbate body image issues and drive inappropriate orthodontic treatment-seeking behaviours among children and adolescents [76].

### Recommendations

Childhood obesity, dental caries, and malocclusion are interconnected health issues that are influenced by a myriad of contributing factors [77-79]. Addressing these intertwined issues necessitates the implementation of comprehensive public health interventions that not only target shared risk factors but also account for the distinct challenges brought about by the COVID-19 pandemic [71,80,81] and the pervasive influence of social media [82-84]. Tailored educational campaigns that promote healthy dietary habits [85,86], regular physical activity [87], and optimal oral hygiene practices [88] are fundamental components of preventive strategies aimed at mitigating the prevalence of these conditions. Furthermore, underscoring the importance of routine dental check-ups and fostering healthy behaviours can play pivotal roles in alleviating the burden associated with childhood obesity, dental caries, and malocclusion, ultimately leading to improved child health outcomes on a global scale [89]. Collaboration across various disciplines is imperative for the successful implementation of these interventions and cultivation of healthier futures for children worldwide [90]. Moving forward, prioritising personalised interventions [91], innovative dental health strategies [92], non invasive approaches to malocclusion for better acceptance [93], digital interventions to leverage positive social media impact [94], and gaining insights into the long-term health implications of the pandemic [95] should be key areas of focus in future research.

## CONCLUSION(S)

The convergence of the COVID-19 pandemic and the widespread use of social media has presented unprecedented challenges to children's health, amplifying existing concerns such as childhood obesity, dental caries, and malocclusion. Disruptions caused by the pandemic, including school closures and limited access to healthcare services, have exacerbated these health issues. The pervasive influence of social media has introduced new factors affecting children's behaviours and perceptions. Moving forward, policymakers, healthcare professionals, and educators must address these interconnected health challenges comprehensively. By implementing evidence-based interventions and fostering collaboration across sectors, we can strive to promote the holistic well-being of children and mitigate the long-term impacts of these complex health issues.

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