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Relationship Between Body Mass Index, Dental Caries and Diet Among A Group of 6-12 Years Old School Going Children in Bhopal City

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Abstract

This study aims to evaluate the relationship between Body Mass Index (BMI), dental caries, and dietary habits among children residing in Bhopal city. Both childhood obesity and dental caries are increasingly prevalent public health issues that can have long-term impacts on an individual's overall health and well-being. With changing dietary patterns, lifestyle shifts, and reduced physical activity among children, the coexistence of these two conditions has raised concerns among healthcare professionals and policy makers. Understanding whether a link exists between these conditions, and if so, how dietary habits mediate this relationship, is critical for designing holistic and effective health interventions.

A cross-sectional study design was employed, involving a representative sample of school-aged children in Bhopal. Participants were categorized based on their Body Mass Index (BMI) using standardized percentile charts according to age and sex. Dental caries status was assessed using the widely accepted DMFT (Decayed, Missing, and Filled Teeth for permanent teeth) and dmft (for primary teeth) indices. To explore dietary habits, structured questionnaires were distributed to collect information on the frequency of sugar intake, number of meals and snacks consumed per day, and general eating behavior, including preferences for processed or high-sugar foods.

The findings revealed a complex and varied association between BMI and dental caries. While some children with high BMI exhibited a greater prevalence of dental caries—primarily attributed to unhealthy dietary choices and frequent consumption of cariogenic foods—others in the same BMI category showed a lower incidence of caries, potentially due to limited sugar exposure or better oral hygiene practices. Similarly, children with normal or low BMI were not exempt from dental caries, indicating that low BMI does not necessarily equate to lower caries risk. These results suggest that while BMI may be a contributing factor in some cases, it is not a direct or consistent predictor of dental caries.

The study concludes that dietary habits play a more significant and mediating role in the occurrence of dental caries than BMI alone. Therefore, integrated health education initiatives focusing on both nutrition and oral hygiene should be emphasized in school-based and community-level programs. Promoting awareness about balanced diets and effective oral care practices could contribute significantly to improving the overall health outcomes of children.

Keywords: Body Mass Index, dental caries, dietary habits, children, oral health.

Introduction

Childhood obesity has become a growing global health concern, with its prevalence steadily increasing over the past few decades. It is now recognized as a significant risk factor for various chronic health conditions in both the short and long term. Among the most common complications associated with childhood obesity are hypertension, type 2 diabetes mellitus, dyslipidemia, respiratory issues, musculoskeletal disorders, and a range of psychosocial problems such as low self-esteem, depression, and social stigmatization. These health issues not only affect the immediate quality of life of the affected children but also increase their risk of developing more severe conditions in adulthood, including cardiovascular diseases and metabolic syndrome. The rising rates of obesity in children are largely attributed to sedentary lifestyles, decreased physical activity, and, most importantly, unhealthy dietary patterns marked by high intake of sugars, processed foods, and saturated fats.

Parallel to the increase in childhood obesity, dental caries continues to be one of the most prevalent chronic diseases affecting children globally. Dental caries, commonly known as tooth decay, occurs due to the demineralization of the tooth enamel by acids produced from bacterial fermentation of dietary carbohydrates—particularly sugars. If left untreated, dental caries can result in pain, infection, difficulty in eating or speaking, and absenteeism from school, thereby affecting a child's overall well-being and development. Despite advancements in dental care and preventive measures, the prevalence of dental caries among children remains alarmingly high, especially in developing countries where access to dental health services may be limited.

What is particularly noteworthy is that both childhood obesity and dental caries share a number of overlapping risk factors, most prominently

Aims and Objectives

- To determine the association between BMI-for-age and dental caries.
- To explore the relationship between BMI-for-age and children's dietary patterns.

Methodology

This research was designed as a descriptive, cross-sectional study conducted among school-going children in the age group of 6 to 12 years, across various schools in Bhopal, Madhya Pradesh. A total of 600 children were initially selected using stratified random sampling to

ensure adequate representation across age, gender, and socio-economic backgrounds. Following data validation and removal of incomplete or inconsistent entries, the final sample size analyzed comprised 510 participants.

Body Mass Index (BMI) was determined for each child using standardized anthropometric techniques. Height was measured using a stadiometer, and weight was recorded with a calibrated digital weighing scale. BMI was then calculated by dividing weight in kilograms by the square of height in meters (kg/m^2). Children were categorized into four groups—underweight, normal weight, overweight, and obese—according to the age- and sex-specific percentile charts provided by the Centers for Disease Control and Prevention (CDC) growth reference.

Dental caries status was assessed using the World Health Organization (WHO) Oral Health Assessment Form (1997), a standardized tool for recording dental conditions. Caries experience was quantified using the DMFT (Decayed, Missing, and Filled Teeth for permanent teeth) and dmft (for primary teeth) indices. The dental examinations were carried out under natural light using sterilized mouth mirrors and explorers by trained dental professionals adhering to infection control protocols.

To evaluate dietary habits, a three-day dietary recall was employed. This included two weekdays and one weekend day to capture variations in eating patterns. Food group-based dietary charts were distributed to each participant and were either self-completed or filled out with parental assistance for younger children. The chart focused on the frequency and types of food consumed, particularly targeting the intake of sugary snacks, beverages, refined carbohydrates, and meal timing.

The collected data were systematically tabulated and analyzed to explore associations between BMI categories, dental caries prevalence, and dietary behavior. Ethical clearance was obtained prior to the study, and informed consent was secured from the parents or guardians of all participating children.

Key Results

Body Mass Index (BMI) Distribution

Among the 510 schoolchildren included in the final analysis, BMI distribution revealed that nearly half (48.8%) of the participants fell within the normal BMI range, as per CDC age- and sex-specific percentiles. A total of 22.1% were classified as underweight, 17.3% as overweight, and 11.7% as obese. This distribution highlights a considerable proportion of children falling outside the normal weight range, indicating the co-existence of both undernutrition and over nutrition within the population.

Prevalence of Dental Caries

The overall prevalence of dental caries in the study population was notably high, with 78.6% of children exhibiting one or more carious lesions. When stratified by BMI category, the highest prevalence was observed among obese children (85%), followed by underweight (80.5%), normal-weight (77.5%), and overweight children (75%). Although there was variation in caries prevalence across BMI categories, statistically significant differences were observed only between specific groups. This suggests that while an association may exist between BMI and caries prevalence, it is not uniformly consistent across all categories.

Dental Caries Experience (DMFT/deft Scores)

Mean dental caries scores, measured using DMFT (Decayed, Missing, and Filled Teeth) for permanent teeth and deft for primary teeth, were found to be highest among children in the obese category. However, when comparing mean values across the BMI groups, the differences were not statistically significant ($p > 0.05$).

This indicates that although a trend toward higher caries experience in obese children was noted, the severity of caries was not significantly different when analyzed between the BMI categories.

Dietary Patterns and Their Association with Caries

An analysis of dietary behavior revealed that the consumption of snack foods, fats, and oils increased progressively with higher BMI levels. Obese children reported the highest intake of snacks, particularly those high in refined sugars and saturated fats. Furthermore, a statistically significant association ($p < 0.05$) was found between the frequency of snack consumption and the incidence of dental caries. This finding emphasizes the influential role of dietary habits—particularly the frequent intake of cariogenic foods—as a critical risk factor for both increased BMI and dental caries.

Discussion

The findings of this study suggest that although no strong or consistent statistical correlation was observed between Body Mass Index (BMI) and dental caries, certain dietary patterns—particularly snack consumption—demonstrated a significant association with caries incidence. This indicates that while BMI alone may not serve as a reliable or direct predictor of dental caries, dietary behaviors closely linked to BMI do play a critical role in influencing oral health outcomes.

Specifically, children categorized as obese exhibited a higher frequency of snack and fatty food consumption compared to their normal-weight and underweight peers. These dietary choices typically included items high in refined sugars, processed carbohydrates, and unhealthy fats—all of which are well-documented contributors to both excess weight gain and the development of dental caries. The increased caries prevalence observed among obese children in this study may thus be indirectly influenced by such dietary habits, rather than by elevated BMI itself. This supports the hypothesis that shared behavioral risk factors, rather than BMI per se, may underlie the co-occurrence of obesity and poor oral health.

In addition, the study found no significant influence of gender on caries experience across different BMI categories. Both male and female participants displayed similar trends in caries prevalence and dietary patterns, suggesting that gender does not play a major role in modifying the relationship between BMI, diet, and dental health in this age group.

These findings align with several previous studies that have emphasized the importance of examining the broader context of lifestyle and dietary habits when assessing risk factors for both systemic and oral health conditions. The results reinforce the need for integrated health interventions that target modifiable behaviors, particularly dietary choices, rather than focusing solely on anthropometric measures such as BMI.

Ultimately, this study underscores the complex interplay between nutrition, body composition, and oral health. While BMI remains an important indicator of overall health status, it should not be viewed in isolation when assessing dental health risks. Comprehensive public health strategies that combine nutritional education, promotion of healthy eating habits, and oral hygiene awareness—particularly among children—are essential to effectively address the dual burden of obesity and dental caries.

Conclusion

The findings of this study highlight a shared dietary foundation—particularly the frequent consumption of snacks and high-fat, high-sugar foods—as a common contributor to both childhood obesity and dental caries. Although a direct and statistically significant correlation between Body Mass Index (BMI) and dental caries was

not established, the data clearly indicate that unhealthy dietary habits play a central role in the development of both conditions.

Children with higher BMI levels were found to consume more snack foods, which are often rich in refined sugars and poor in nutritional value. This increased intake not only contributes to excessive weight gain but also elevates the risk of dental decay due to the cariogenic potential of such foods. These observations underscore the importance of dietary behavior as a more influential factor than BMI itself in determining oral health outcomes.

Given that both obesity and dental caries are multifactorial in origin and share modifiable behavioral risk factors, this study supports the implementation of comprehensive preventive strategies. Health promotion efforts aimed at reducing the intake of sugary snacks and processed foods—while encouraging balanced, nutrient-rich diets—can yield dual benefits: improving both general physical health and oral health status in children.

Furthermore, the absence of gender differences in caries prevalence across BMI categories suggests that dietary and lifestyle interventions should be universally applied, regardless of gender. Schools, parents, and healthcare providers all play a critical role in fostering environments that promote healthy eating habits and proper oral hygiene from an early age.

In conclusion, while BMI alone may not be a definitive predictor of dental caries, its association with poor dietary habits reinforces the need for integrated nutritional and oral health education. Addressing the root causes of both conditions through shared prevention strategies has the potential to significantly enhance the overall well-being of children and reduce the long-term burden of non-communicable diseases.

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