IJFANS INTERNATIONAL JOURNAL OF FOOD AND NUTRITIONAL SCIENCES
ISSN PRINT 2319 1775 Online 2320 7876

Research paper  UGC CARE Listed ( Group -I) Journal Volume 11, Iss 9,Sep 2022

# Relation between Overweight and Dental Caries among 8-13 Year School Children in Ghaziabad District

**Dr. Puneet Kumar[1], Dr. Chandni Batra[2*]**

[1]Professor, Department of Public Health Destistry, Santosh Dental College & Hospital, Santosh Deemed to be University, Ghaziabad.
[2*]Reader, Department of Oral Medicine, Diagnosis & Radiology, Santosh Dental College & Hospital, Santosh Deemed to be University, Ghaziabad.

Corresponding Author: [2]*Dr. Chandni Batra

**Abstract:**

**Introduction:** Overweight is becoming a major public health problem in the modern world. The prevalence of this disorder is steadily growing globally affecting majority of the population, especially children resulting from a paradigm shift in the lifestyle of the modern generation. On the other hand, dental caries is a dental problem worldwide. The magnitude of the disease is increasing in recent years among child population due to modern dietary habits.

**Aim:** This study aims to find an association between overweight and dental caries among 8–13-year-old school children in Ghaziabad, India and to analyze the role of demographic variables on the association.

Materials and Methods: A total of 343 school children aged 8–13 years were recruited from four randomly selected schools located at four different geographic zones of Ghaziabad city. Body mass index for age was recorded for assessing overweight using Centers for Disease Control growth curves. Dental caries was recorded based on the WHO criteria 1997. Data were analyzed. $P < 0.05$ was considered statistically significant.

**Results:** The prevalence of dental caries among school children was 54.6% and overweight was 30.8%. A significant association between dental caries and overweight was observed ($P < 0.05$). Socioeconomic status was found to be the predictor of dental caries among overweight children.

**Conclusion:** There was an association between overweight and dental caries in school children. Overweight and dental caries have common risk determinants and require a comprehensive multidisciplinary approach by health professionals.

## 1. INTRODUCTION

Every human being has the fundamental right to access adequate and healthy nutrition. However, the social inequalities, changes in the lifestyle, especially dietary habits as a result of industrialization, and various other factors are influencing this fundamental right. Currently, globally, there are two problems. One associated with nutritional deficiency and the other one is dietary excess. On the other side, the dental caries in children still continues to be a significant public health problem, especially in developing countries. Dental caries and deviations from normal weight are two conditions which share several predisposing factors such as diet, socioeconomic status (SES), lifestyle, and other factors in common. It is



IJFANS International Journal of Food And Nutritional Sciences
Official Publication of International Association of Food and Nutrition Scientists

Research paper  UGC CARE Listed ( Group -I) Journal Volume 11, Iss 9,Sep 2022

important from public health point of view to understand the relationship between the two for their effective management. Overweight is an excess of body fat related to lean mass, with multifactorial conditions, involving psychological, biochemical, metabolic, anatomic, and social alterations.[1] This is becoming a major public health problem in modern world.[2]

The prevalence of overweight among children has been steadily increasing over past several decades.[3] According to a report of WHO, approximately 4.1% of schoolgoing children in the Asia-Pacific region are overweight.[4] It is predicted that diet plays an important role in this disorder. In developing countries like India, changing lifestyle and economic growth have contributed to decreased physical activity and altered dietary patterns, especially in children living in urban areas.[2] Thus, sedentary lifestyle along with modern dietary patterns is contributing to the epidemic of overweight in children.[5,6] On the other hand, dental caries continues to be a significant public health problem being more common in children. In developing countries like India, the reported prevalence of dental caries in 12-year-old children was 52.5%.

Overweight and dental caries are both diet-based conditions that share a common cause that is ingestion of carbohydrates.[8] The most commonly used tool for measuring overweight in children is body mass index (BMI) for age.[9] The link between dietary carbohydrate intake and overweight and the association between refined carbohydrates and dental caries strongly reveal that being overweight might be a predictor for dental caries in children.[9,10] There are conflicting reports in literature on the association between overweight and dental caries. Thippeswamy et al. reported that dental caries correlates positively with BMI while a systematic review of studies published from 1984 to 2004 showed an inconclusive relationship between overweight and dental caries. [11] A systematic review of the articles published between 2005 and January 2012 by Silva et al. in 2013 did not find sufficient evidence relating the association between obesity and dental caries, and it did not clarify the possible role of diet and other possible effect modifiers on this association.[12] The literature reported from Indian subcontinent on the association is scanty.[13] Hence, the present research was undertaken with an objective to explore the association between overweight and dental caries in 8–13-year-old school children in Ghaziabad, India, and to analyze the role of age, gender, SES, diet, and sugar exposure on the association between overweight and dental caries.

## 2. MATERIALS AND METHODS

The present descriptive, cross-sectional study was carried out among 343 school children of age between 8 and 13 years in Ghaziabad city, Madhya Pradesh, India. The study was approved by the institutional ethical board. The study was carried out for 6 months. A written approval from respective school authorities was obtained and the children were informed about the study before proceeding with the examination.

The information on the total number of schools in the city was obtained from District Educational Department. The pilot survey showed that the prevalence of dental caries was 63.1%.

The final sample size was thus calculated to be at least 345 children, with a confidence level of 95% and a sampling error of 5%. Calibration and training of the single examiner were done in the Department of Public Health Dentistry. Cohen's Kappa coefficient for assessment of dental caries was 0.85, indicating good intra-examiner agreement.

Research paper  UGC CARE Listed ( Group -I) Journal Volume 11, Iss 9,Sep 2022

A three-stage sampling procedure was adopted. During the first stage, all the primary and middle schools accommodating the children between 8 and 13 years in the Bhopal city were listed
out which were 60 in number. In the second stage, four schools were chosen from 60 schools randomly representing four geographic zones of Ghaziabad (1 per zone) by simple random sampling procedure in order to have a uniform representation from different geographic locations of Bhopal city. In the third stage, by applying the cluster sampling procedure, all the randomly selected schools were considered as individual clusters and the children within each cluster were treated as study sample.
All children between 8 and 13 years of age who were present on the day of the study and willing to be examined were included, constituting a total sample of 343. A predesigned pro forma
was used to collect the information about selected variables. The SES was assessed using modified Kuppuswamy's SES scale 2007.[14] The information about the children's SES was obtained from respective class teachers of the selected schools. The recording of the pro forma was followed by the clinical examination of the children by a single trained and calibrated
examiner.
The dental caries was recorded according to WHO dentition status and treatment needs (1997) criteria. [15] The overweight was assessed using BMI for age. BMI was calculated using the
formula weight/height, [2] i.e. weight in kilograms divided by height in meter square.[13]
Data were analyzed using SPSS version 17.0 (SPSS Inc, Chicago, II). Kruskal–Wallis test, Mann–Whitney U-test, and multiple linear regression (stepwise) analysis were used to analyze the data. $P < 0.05$ was considered statistically significant.

## 3. RESULTS

In the present study, a total of 343 children from four randomly selected schools were examined, out of which 206 were males and 127 were females. The males outnumbered the female
participants (58.3% were males and 35.9% were females). Out of the total children, 69 (13.8%) were underweight, 165 (48.1%) were normal weight, and 119 (33.7%) were overweight. The participants falling under the category of "risk of overweight" and "overweight" were clubbed together under "overweight" category [Table 1].

Table 1: Distribution of study participants according to body mass index

| BMI‑for‑age | Males, n (%) | Females, n (%) | Total, n (%) |
|---|---|---|---|
| Underweight | 28 (13.9) | 21 (17.2) | 49 (14.2) |
| Normal weight | 92 (43.4) | 73 (55.2) | 165 (48.1) |
| Overweight | 81 (38.1) | 28 (22.4) | 109 (31.7) |
| Total | 211 (59.6) | 132 (37.4) | 343 (100) |

The prevalence of dental caries was 54.6%, and the prevalence of overweight was 30.8%. The mean caries experience (decayed, missing, and filled teeth [DMFT]) was higher in

Research paper  UGC CARE Listed ( Group -I) Journal Volume 11, Iss 9,Sep 2022

permanent dentition of overweight children (1.17), followed by underweight (0.46) and normal weight (0.28). The mean decayed, extracted, or filled deciduous teeth (deft) was higher in the primary dentition of the underweight children (1.06) followed by the overweight (0.45) and normal weight children (0.57). Kruskal–Wallis analysis revealed significant difference between three groups for DMFT (H = 30.830, P < 0.001) and deft (H = 18.424, P < 0.001). Post hoc analysis using Mann–Whitney U-test has shown that DMFT of overweight children was significantly higher than other two groups, and deft of underweight children was significantly higher than other two groups [Table 2].

Table 2: Mean decayed, missing, and filled teeth and decayed, extracted, or filled deciduous teeth scores of participants according to body mass index

| BMI-for-age | | Mean±SD | |
|---|---|---|---|
| | DMFT* | | deft† |
| Underweight (1) | 0.55±0.95 | | 1.15±1.47 |
| Normal weight (2) | 0.37±0.76 | | 0.56±1.10 |
| Overweight (3) | 1.26±1.46 | | 0.54±1.15 |
| Total | 0.70±1.14 | | 0.65±1.20 |

Mann–Whitney U-test: 3>1=2, 1>2=3. Kruskal–Wallis test: *H=31.830, *P*<0.001, †H=19.474, *P*<0.001. DMFT – Decayed, missing, and filled teeth, deft – Decayed, extracted, or filled deciduous teeth, SD – Standard deviation, BMI – Body mass index

A multiple linear regression analysis (stepwise) with age, gender, SES, diet, and sugar exposure as independent variables and dental caries as dependent variable showed that SES as a single predictor of dental caries among overweight children [Table 3].

Table 3: Multiple linear regression analysis (stepwise) with dental caries as dependent variable and selected independent variable among overweight children

| Model | β coefficient | SE | 95% CI | P |
|---|---|---|---|---|
| Model 1 Constant | 0.341 | 0.377 | 0.014-0.722 | 0.357 |
| SES | 0.430 | 0.196 | 0.50.973 | 0.025 |

Dependent variable: Dental caries. CI – Confidence interval, SE – Standard error, SES – Socioeconomic status

## 4. DISCUSSION

The dental caries and overweight are two such conditions that share a common risk factor, i.e. diet. The rapid economic growth along with nutritional evolution has led to adoption of modern dietary habits in many Asian countries leading to an increase in the prevalence of dental caries and overweight. India is also currently in such a nutritional transition phase. In our study, an attempt was made to explore the association between overweight and dental caries among the school children. There was a preference for inclusion of the children between 8 and 13 years of age as it was an easily available sampling frame for health surveys and it was also established that as individuals grow, their dietary habits will constantly

Research paper  UGC CARE Listed ( Group -I) Journal Volume 11, Iss 9,Sep 2022

change due to peer influence and show an increased tendency toward consumption of refined diet rich in carbohydrate leading to an increased body weight and dental caries.[17] As there was no authenticated data to make the comparison with the same age range group, comparison was made with the 12 years age group of the National Oral Health Survey.

The prevalence of dental caries in children in the current study is 54.6%, which is lower than that reported in National Oral Health Survey, 2002–2003 conducted in India where prevalence in 12-year-old urban children was 76.82%. The decrease in prevalence may be attributed to an increase in the awareness toward dental health, especially in the urban areas and adoption of healthy oral hygiene practices. The prevalence of obesity reported in our study is 30.8%, which is higher than WHO Asia-Pacific region school going children report (4.1%). [5] The prevalence is also higher than that reported by in Udupi district in 2011.[11] However, it is less than a study which reported obesity in 45.5% of Mexican children.[18] These variations may be attributed to differences in the study samples and sampling techniques used and differences in lifestyle and cultural practices between various regions.

In the present study, we observed a significant association between overweight and dental caries which is consistent with the previous studies.[11,19,20] On the contrary, studies on US children have shown that children who were overweight were less likely to have dental caries than normal weight counterparts. [21]

In the present study, the mean DMFT is higher in overweight children. This finding is in agreement with that a study by Larsson et al.[22] Our finding is also in consistency with a study by Marshall et al. that observed children “at risk” of overweight have higher rates of caries experience than their “normal” weight counterparts.[20] The most common reason for a higher DMFT could be that caries-associated dietary habits during infancy are maintained throughout early childhood and may be carried forward to be persistent during childhood. In our study, dental caries was significantly higher in permanent dentition of obese children (51.78%). We found that the dental caries in primary dentition is significantly higher in underweight children (61%) which is in contrary to the study which reported significantly higher dental caries in primary dentition in obese Mexican preschool children.[23] Our study could establish SES as a single predictor associated with dental caries among overweight children. However, our findings are not in agreement with a study which reported that frequency of sweet consumption was associated with dental caries in overweight children.[11] The differences may be attributed to the variations in the study designs and the study variables tested.

The results cannot be generalized to the entire children population as the children who participated in our study were from an urban setting. Further studies with extended longitudinal evaluation and more study variables should be conducted to derive definite conclusions. Overweight and dental caries have common risk determinants and require a comprehensive multidisciplinary approach by health professionals.

## 5. CONCLUSION

There is an association between overweight and dental caries in permanent dentition of school children. Out of selected demographic variables such as age, gender, diet, sugar exposure, and SES, only SES is significantly associated with dental caries among overweight children.

## 6. REFERENCES

 

1. Granville-Garcia AF, de Menezes VA, de Lira PI, Ferreira JM, Leite-Cavalcanti A. Obesity and dental caries among preschool children in Brazil. Rev Salud Publica (Bogota) 2008;10:788-95.
2. Mehta M, Bhasin SK, Agrawal K, Dwivedi S. Obesity amongst affluent adolescent girls. Indian J Pediatr 2007;74:619-22.
3. MacKenzie NR. Childhood obesity: Strategies for prevention. Pediatr Nurs 2000;26:527-30.
4. Vaz M, Yusuf S, Bharathi AV, Kurpad AV, Swaminathan S. The nutrition transition in India. SAJCN 2005;18:198-01.
5. Proctor MH, Moore LL, Gao D, Cupples LA, Bradlee ML, Hood MY, *et al.* Television viewing and change in body fat from preschool to early adolescence: The Framingham Children's Study. Int J Obes Relat Metab Disord 2003;27:827-33.
6. Canning P, Courage ML, Frizzell LM, Seifert T. Obesity in a provincial population of canadian preschool children: Differences between 1984 and 1997 birth cohorts. Int J Pediatr Obes 2007;2:51-7.
7. Bali RK, Mathur VB, Talwar PP, Chanana HB. National Oral Health Survey and Fluoride Mapping 2002-2003India. New Delhi: Dental Council of India in Collaboration with Ministry of Health and Family Welfare, Government of India; 2004
8. Reifsnider E, Mobley C, Beckman Mendez D. Childhood obesity and early childhood caries in a WIC population. J Multicult Nurs Health 2004;10:24-31.
9. Macek MD, Mitola DJ. Exploring the association between overweight and dental caries among US children. Pediatr Dent 2006;28:375-80.
10. Ludwig DS, Peterson KE, Gortmaker SL. Relation between consumption of sugar-sweetened drinks and childhood obesity: A prospective, observational analysis. Lancet 2001;357:505-8.
11. Thippeswamy HM, Kumar N, Acharya S, Pentapati KC. Relationship between body mass index and dental caries among adolescent children in South India. West Indian Med J 2011;60:581-6.
12. Silva AE, Menezes AM, Demarco FF, Vargas-Ferreira F, Peres MA. Obesity and dental caries: Systematic review. Rev Saude Publica 2013;47:799-812.
13. David J, Wang NJ, Astrøm AN, Kuriakose S. Dental caries and associated factors in 12-year-old schoolchildren in Thiruvananthapuram, Kerala, India. Int J Paediatr Dent 2005;15:420-8.
14. Kumar N, Shekhar C, Kumar P, Kundu AS. Kuppuswamy's socioeconomic status scale-updating for 2007. Indian J Pediatr 2007;74:1131-2.
15. World Health Organization. Dentition status and treatment need: Assessment form. In: Oral Health Surveys: Basic Methods. 4th ed. Geneva: World Health Organization; 1997. p. 39-40.
16. Kuczmarski RJ, Ogden CL, Guo SS. 2000 CDC Growth Charts for the United States: Methods and Development. Vol. 11. USA: National Center for Health Statistics; 2002. p. 41-2.
17. Mei Z, Grummer-Strawn LM, Pietrobelli A, Goulding A, Goran MI, Dietz WH, et al. Validity of body mass index compared with other body-composition screening indexes for the assessment of body fatness in children and adolescents. Am J Clin Nutr 2002;75:978-85.

 

18. Sánchez-Pérez L, Irigoyen ME, Zepeda M. Dental caries, tooth eruption timing and obesity: A longitudinal study in a group of Mexican schoolchildren. Acta Odontol Scand 2010;68:57-64.
19. Willerhausen B, Blettner M, Kasaj A, Hohenfellner K. Association between body mass index and dental health in 1,290 children of elementary schools in a German city. Clin Oral Investig 2007;11:195-200.
20. Marshall TA, Eichenberger-Gilmore JM, Broffitt BA, Warren JJ, Levy SM. Dental caries and childhood obesity: Roles of diet and socioeconomic status. Community Dent Oral Epidemiol 2007;35:449-58.
21. Gillcrist JA, Brumley DE, Blackford JU. Community socioeconomic status and children's dental health. J Am Dent Assoc 2001;132:216-22.
22. Larsson B, Johansson I, Hallmans G, Ericson T. Relationship between dental caries and risk factors for atherosclerosis in Swedish adolescents? Community Dent Oral Epidemiol 1995;23:205-10.
23. Vázquez-Nava F, Vázquez-Rodríguez EM, Saldívar-González AH, Lin-Ochoa D, Martinez-Perales GM, Joffre-Velázquez VM, et al. Association between obesity and dental caries in a group of preschool children in Mexico. J Public Health Dent 2010;70:124-30.