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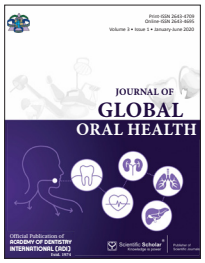

Research Article

Relationship between obesity and dental caries experience in patients attending Tagore Dental College, Chennai, India: A cross-sectional survey

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ABSTRACT

Objectives: This study aims to assess the relationship between body mass index (BMI) and dental caries experience among the patients attending the outpatient department of Tagore Dental College, Chennai, India.

Materials and Methods: A cross-sectional study with a convenient sampling technique was employed in the outpatient department of Tagore Dental College, Chennai, India. Obesity was recorded by measuring the BMI. Dental caries experience was recorded using the World Health Organization's recommended "decayed missing and filled teeth (DMFT)" method. Statistical analysis was performed using the Chi-square test and Student's (unpaired) *t*-test. $P < 0.05$ was considered statistically significant.

Results: Dental caries prevalence was 81.9% with a mean DMFT score of 4.23 ± 3.56. Among the study participants, 69.4% were normal weight, 22.9% were overweight, and 6.8% were underweight. No significant association was found between gender with BMI and caries experience.

Conclusion: The prevalence of dental caries was high among the sampled population but the majority of the sampled population had normal BMI. To address public health concerns connected to dental caries, additional oral health prevention programs and policies should be implemented.

Keywords: Body mass index, Decay missed filled teeth, Dental caries experience, Obesity

INTRODUCTION

Obesity is defined as a condition of abnormal and excessive fat accumulation in adipose tissue to the extent that health may be adversely affected. It is a global epidemic, and the World Health Organization (WHO) estimates that it is the fifth leading cause of mortality worldwide.[1,2] The WHO has also reported that more than 1.9 billion adults aged 18 years and above were overweight, over 600 million adults were obese, and had stated that the prevalence had doubled from the year 1980 to 2014.[3]

Diet plays an important role in the increased prevalence of obesity due to the higher consumption of foods rich in fat and carbohydrates.[4] Apart from that lack of physical activity, increasing sedentary lifestyles and dietary changes are other factors that are strongly associated with the development of obesity.[4] Moreover, individuals who are obese often are exposed to an unhealthy diet that focuses heavily on sugar as well as sweet foods and drinks.

Such a diet pattern promotes both obese conditions and the development of tooth decay.[5]

Thus, obesity can be associated with dental caries, through greater availability of cariogenic factors, modulated by oral hygiene habits. Given the causal relationship between refined carbohydrates and dental caries, it is appropriate to hypothesize that being overweight might also be a marker for dental caries among the population.[6]

Dental caries is a multifactorial, infectious, and transmissible disease, which affects a high percentage of the population in all parts of the world.[7] In recent times, the prevalence of caries has increased in developing nations due to an array of factors, such as intake of sugary foods, low socioeconomic status, exposure to fluorides, ethnicity, age, the limited access to oral health services, and other lifestyle factors.[8] The results of previously conducted studies have shown that change in dietary patterns among the population is contributing to obesity and also acts as a risk factor for the development of dental caries by acting biologically plausible.

Given that dental caries and obesity both measure diet-related health outcomes, an association between these two is not surprising. Many studies conducted around the globe regarding the relationship between caries experience and obesity had revealed conflicting results, with some studies showing a direct relationship[9,10] and others claiming indirect or no relationships.[7,11,12] Interestingly, a systematic review conducted in 2012 has concluded that dental caries are associated with both high and low body mass index (BMI).[13]

Studies reported in the literature, mainly assessed the relationship between obesity and dental caries among schoolchildren, with seemingly scanty information on the general population. Hence, the present cross-sectional study aimed to assess the relationship between BMI and dental caries among the patients attending the outpatient department of Tagore Dental College, Chennai, India.

MATERIALS AND METHODS

The present descriptive cross-sectional study was conducted to assess the relationship between BMI and dental caries among patients visiting the outpatient department of Tagore Dental College and Hospitals, Chennai, India. This study was conducted over a period of 1 month from June 1, 2016, to July 1, 2016, and ethical approval for this study was obtained from the Ethical Committee of the Institutional Review Board (IEC/TDCH/13/2026).

A pilot study was conducted on 30 participants, in which 17% of participants showed a positive caries experience (decayed missing and filled teeth [DMFT] <0). Therefore, the sample size was calculated by keeping an alpha error of 1.96, the power of the study at 80%, and the difference to be detected as 10%. Thus, a sample size of 214 was required to test the hypothesis with a 95% confidence interval to reject the null hypothesis. After meeting the inclusion and exclusion criteria, the final sample arrived was 222 participants.

All patients visiting the dental college over that period with the age of 18–50 years and who were willing to participate in the study were included and those with systemic disease, prolonged illness, nutritional deficiency, and who had undergone orthodontic treatment were excluded from our study. All participants were informed about the study protocol and written informed consent was obtained from each participant before the study.

A pre-structured study pro forma was prepared to collect information regarding demographic data. ADA specified – TYPE III clinical examination was carried out with a plane mouth mirror and explorer to record the dental caries experience. Caps, masks, gloves, and gauze were used in accordance with infection control guidelines.

The dental caries experience (DMFT) was obtained using the WHO standard criteria for dental caries diagnosis, namely, the DMFT index, to determine the total number of teeth or surfaces that are decayed, missing, or filled for each study participant.[14] All examinations were performed by a single examiner who was trained and calibrated for measuring DMFT in the Department of Public Health Dentistry, Tagore Dental College, Chennai and was blinded to BMI measurement. Cohen's kappa coefficient for the assessment of caries experience was 0.91, which indicated a good intraexaminer agreement.

For the purpose of analysis, of caries experience, the participants with DMFT 0 were categorized as having no dental caries while those with DMFT of 1 or more were categorized as having dental caries.[15]

An accepted method to evaluate an individual's body weight relative to population norms was determined by calculating BMI by dividing weight in kilograms divided by the square

Table 1: Demographic characteristics of the participants.

Characteristics	*n* (%)
Age (Mean)	33.27±10.56
Gender	
Male	101 (45.5)
Female	121 (54.5)
Dental caries experience	
DMFT<1	40 (18.1)
DMFT>1	182 (81.9)
Body mass index (BMI)	15 (6.8)
Underweight	154 (69.4)
Normal	51 (22.9)
Overweight Obese	2 (0.9)

DMFT: Decayed missing and filled teeth

Table 2: Association between gender and BMI.

Gender	Underweight, *n* (%)	Normal, *n* (%)	Overweight, *n* (%)	Obese, *n* (%)	Total, *n* (%)	Chi-value	*P*-value
Male	7 (06.9)	64 (63.4)	29 (28.8)	1 (0.9)	101 (100)	6.2796	0.098
Female	8 (6.6)	90 (74.4)	22 (18.2)	1 (0.8)	121 (100)		

BMI: Body mass index

of height in meters.[16,17] Moreover, the WHO had stated BMI provides the most useful population-level measure of overweight and obesity as it is the same for both sexes and all ages of adults;[3] hence, BMI was used to measure obesity in the present study.

The weight and height of the study participants were recorded by a separate investigator who was also blinded with DMFT scores. It was recorded with the help of a weighing machine corrected for zero error and with the least measurement up to 0.5 kg and height recorded with metallic measuring tape fixed to the wall with the least measurement of 1 cm. Measurement of weight and height was taken without shoes. Again, for the purpose of analysis, the study participants were grouped into four strata, according to the criteria given by the WHO as follows: Underweight (BMI <18.5 kg/m^2), normal weight (BMI 18.5–24.9 kg/m^2), overweight (BMI 25–29.9 kg/m^2), and obese (BMI >30 kg/m^2).[18]

Statistical analysis was performed using the Statistical Package for the Social Sciences version 19 (SPSS; Chicago, IL, USA). The obtained data were analyzed using the Chi-square test to examine the association between BMI category with gender and caries experience category, independent sample *t*-test was used to compare mean DMFT scores between genders. The significance of all statistical tests was predetermined at $P \leq 0.05$.

RESULTS

A total of 222 participants were enrolled in the study with a mean age of 33.27 ± 10.44 years, among which 101 (45.5%) were male and 121 (54.5%) were female. Dental caries prevalence was 81.9% with a mean caries experience score of 4.23 ± 3.56. The majority of the participants (69.4%) had normal weight, 22.9% were overweight, 6.8% were underweight, and 0.9% were obese [Table 1].

The majority of the males (63.4%) and females (78.5%) had a normal BMI but no significant difference was found among gender in relation to BMI ($P = 0.0987$) [Table 2]. Even though both males and females had a high caries experience, they did not show any significant difference ($P = 0.920$) with mean DMFT [Table 3]. Dental caries experience was observed in the majority of the participants with normal BMI of 124 (68.1%) and 46 (25.3%) overweight and obese participants had a dental caries experience. There was also no significant association between obesity and dental caries experience ($P = 0.920$) [Table 4].

Table 3: Association between gender and mean DMFT.

Caries index	Gender	Mean (S.D)	*t*-value	*P*-value
DMFT	Male	4.20±3.82	−0.10027	0.920
	Female	4.24±3.34		

DMFT: Decayed missing and filled teeth

DISCUSSION

In the present study, we evaluated the association between obesity and caries experience (DMFT) in a representative sample of patients attending the outpatient department of Tagore Dental College, Chennai, India. The prevalence of dental caries at 81.9% in this study was found to be much higher compared to studies conducted in other parts of the country.[2,19,20] In this study, mean DMFT was observed to be more or less equal among both males and females. A possible reason could be a transition in lifestyle patterns influencing both the genders, leading to changes in dietary patterns.

The results of our study were in accordance with Marshall *et al.*[21] who stated "obesity increases the risk of caries" nor "caries increases risk of obesity," but rather a common risk factor increased the likelihood of both diseases. Wali *et al.*[22] found a positive correlation between dental caries and BMI. A similar finding was also reported by Cantekin *et al.*,[23] Willershausen *et al.*,[24] and Yang *et al.*[25] who was an inverse relationship between body BMI and DMFT/(DMFT + DMFT) index showing that underweight children were more likely found with more severe caries disease, regardless of primary or mixed dentition. Similarly, Markovic *et al.*[26] and Heinrich-Weltzien *et al.*[27] also reported a negative correlation between overweight with the DMFT index among their participants and showed some contradictory results to our findings.

A possible reason for high dental caries experiences among normal and overweight participants in our study might be due to frequent in between meal snacking and increased popularity of "fast food, junk food, frequent consumption of aerated drinks, and carbohydrate-rich foods." Adding to these sedentary lifestyles, lack of sports activities, increased television watching, and prolonged computer usage have all led to a change in lifestyle patterns making these individuals more vulnerable to the development of caries.

One of the main limitations of the study includes the small sample size and data collection being confined to a single

Table 4: Association between caries experience and BMI among the study participants.

Caries experience	BMI						
	Underweight, *n* (%)	Normal, *n* (%)	Overweight, *n* (%)	Obese, *n* (%)	Total, *n* (%)	Chi-value	*P*-valve
DMFT<1	3 (07.5)	30 (75)	06 (15.0)	01 (02.5)	40 (100)	2.997	0.391
DMFT>1	12 (6.6)	124 (68.1)	45 (24.7)	01 (0.6)	182 (100)		

BMI: Body mass index, DMFT: Decayed missing and filled teeth

center, which might affect the generalizability of the study. Hence, studies with a large sample and multicenter approach are needed in the future. Indeed, this study had a cross-sectional design, which limits the ability to identify causality. Therefore, a longitudinal design is needed in the future to explore cause and effect relationships in this regard. Since obesity and dental caries share some common multifactorial etiologies, further studies are needed to explore the possible confounding factors influencing this association.

Necessary steps should be taken by the health professionals, to arrange frequent dental examinations among the vulnerable groups and data should be collected in this regard so that policy-makers can formulate effective preventive strategies to prevent obesity as well as dental caries among the population.

CONCLUSION

The prevalence of dental caries was high among the sampled population but the majority of the sampled population had normal BMI, and moreover, there was no significant association found between BMI and dental caries experience. To address public health concerns connected to dental caries, additional oral health prevention programs and policies should be implemented.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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