

# Effect of Perceived Stress, BMI and Emotional Eating on Dental Caries in School-going Children: A Cross-sectional Study

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## ABSTRACT

**Aim:** The following study aims to describe the relationship of dental caries with the body mass index, perceived stress, and emotional eating among 11 to 13-year-old schoolchildren.

**Methodology:** A cross-sectional study on 400 school-going children was conducted in which two questionnaires consisting of Perceived Stress Scale and Emotional Eating were collected from the children. Dental caries was examined using the dft/DMFT Index. The body mass index was calculated using the value obtained from body weight and height (kg/m<sup>2</sup>) of each child.

**Results:** Body mass index score was not found to be significantly different among subjects with and without caries in primary and permanent teeth. It was found that Perceived Stress Scale score was found to be significantly more among subjects without caries in permanent dentition as compared to those who had caries. EES score was found to be significantly high among caries-free subjects as compared to those who were having mean dmft score > 0.

**Conclusion:** Dental caries is independent of the body mass index whereas Perceived Stress Scale and Emotional Eating score was found to be more in children without caries as compared to those whose mean dmft score > 0.

**Clinical significance:** This study was conducted to evaluate if perceived stress, body mass index, and emotional eating have an effect on progression of dental caries. This study helps parents and pedodontists for better knowledge about a child's oral health and overall growth.

**Keywords:** Anxiety, Body Mass Index (BMI), Cross-sectional Study, Eating Behavior, Emotional Eating, Obesity, Perceived Stress, Stress.

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## INTRODUCTION

Most common oral disease in children is dental caries, and over the last 20 years the epidemiological surveys have reported a considerable rise in its level of progress.<sup>1</sup> Given the contributing connection between caries and refined carbohydrates, also connect among dietary ingestion and increase in obese or underweight, it's appropriate to postulate that being overweight or underweight may well be a indicator for cavity in kids and teenagers.<sup>2</sup> Body mass index (BMI) is the most used index for obesity and underweight. High incidence of obesity amongst children is a serious global public health problem. As many as 250 million people, or about 7% of the existing world population are obese. The WHO estimated that obesity in preschool children had a prevalence of around 1% in India and the estimation for obese school-going kids in Asia-Pacific area is roughly 4.1 percent. Thus, caries and overweight are both frequent juvenile diseases which will have an impression on general growth of kids and are a load to health expenditures of a country. General health plans when devised may be simpler and economical. The investigators over the time have apparently attempted to collect information to analyze and account the connection in between these two ailments. It is seen that a few findings registered a positive link on performing a literature search, while according to some research which there has been no association. Intriguingly, a number of findings have reported negative correlation in between caries and obesity amongst schoolchildren.<sup>1</sup> Being overweight in childhood and adolescence has psychological consequences. These children

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are marks of social systematic discrimination, and the psychological stress of communal stigmatization and prejudice can lead to low self-worth, which can hamper intellectual and social functioning that persists into adulthood.<sup>4</sup> Stress is "an inharmonious fit between the person and the environment, one in which the person's resources are taxed or exceeded, forcing the person to struggle, usually in complex ways, to cope." If an occasion is perceived by people as over they might accommodate and surpass the resources accessible to them so at this time that stress is perceived which might lead to disease.<sup>3</sup> Numerous pathologies in the oral cavity are related to stress like periodontitis, ulcerative gingivitis, acute necrotizing gingivitis, caries, upper respiratory infections, and recurrent aphthous ulcerations.<sup>4</sup> Although the bacteria are crucial

for tooth decay, a few host and ecological elements, including psychosocial stress, may increase predisposition.<sup>5</sup>

In the emotive eating field, there is a subsection of information on eating induced by stress. There are two versions of notion existing in this literature “the General Effects and Individual Differences models.” Former is assessed mainly in animals whereas latter has wholly been researched in human beings. As per the “General Effects Model, all organisms will increase intake in response to stress.” “Model of Individual Differences proposes that certain factors of the individual will dictate whether stress leads to eating.” One of the key concepts of Model of Individual Differences has been assessed is that “Obese individuals are likely to engage in stress-induced eating more than normal weight individuals.”<sup>6</sup>

So this study aims to evaluate potential relationship of dental caries in children with BMI, perceived stress and emotional eating.

## MATERIALS AND METHODS

This study consisted of 400 children who were from 11 to 13 years of age were included whereas children with special healthcare needs and those who were not able to comprehend the questionnaire were excluded. A routine preliminary examination of patients was performed. Subjects fulfilling the inclusion criteria were selected for the study.

### Examination of Subjects

The clinical examination of the subjects was carried out by adopting the method of Kerr, Ash, Millard. Teeth were examined for Dental caries using the WHO (2013) mentioned “decayed and filled teeth”/“decayed missing and filled teeth (dft/DMFT)”

### Body Mass Index (BMI) Calculation

Height and weight of each child was recorded for BMI.

Portable glass electronic scale was used for each child’s weight (Fig. 3). Which was measured without shoes to near 0.1 kg. Portable height measuring unit was used to measure the height, nearest 0.5 cm (Fig. 2).

### Perceived Stress Scale (PSS) Assessment

Subjects were administered PSS<sup>7</sup> with questions related to stress, their thoughts, and feelings through the last month in the presence of the investigator (Fig. 1). To remove bias all the questions were taken before 12 noon.

The questionnaire contained demographic details and PSS. “PSS, by Cohen is a 14-item scale designed to measure the degree to which life situations were appraised as stressful by the individual within the last month.” Every item was assessed on a five-point answer scale ranging from “0: never to 4: very often.” The 14 item PSS form due to its significant good evidence of its validity and psychometric properties was used.

### Emotional Eating Scale (EES) Evaluation

Subjects were then administered with EES<sup>8</sup> (Fig. 1). Instructions were given

To remove bias the answers to the scale were taken before 12 noon.

“The EES (Arnou et al., 1995) is a 25-item scale with three factor analytically derived subscales: anger, anxiety, and depression.” Contributors rate the amount to which specific feelings lead to the urge to eat using a Likert scale ranging from “no desire to eat”

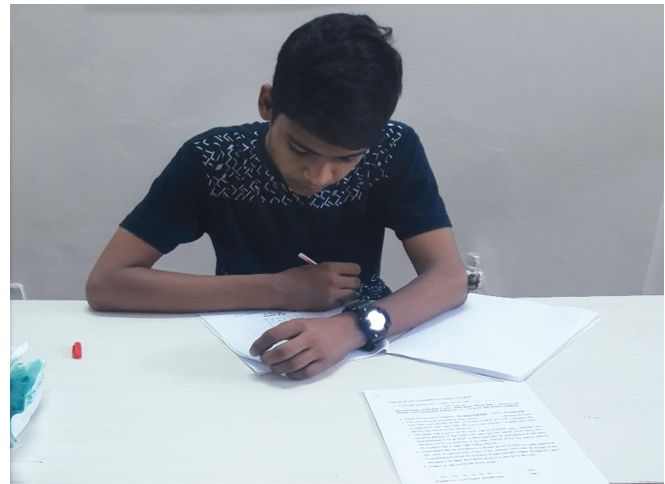


Fig. 1: Recording of PSS and EES scales



Fig. 2: Measurement of height



Fig. 3: Measurement of weight

to “an overwhelming urge to eat.” The EES expresses adequate consistency, validity, and coefficient alphas.

## Statistical Analysis

Data was evaluated using version 21 of Statistical Package for Social Sciences. Categorical variable quantity was reviewed as absolute and relative incidences. Continuous variables were summarized as means and SD. Microsoft Excel was used for graphs. Chi-square test was used for intergroup comparison of categorical variables. Shapiro Wilk test was used to check the continuous variables for normal distribution. If the data satisfies requirement of normality, then the intergroup comparison of continuous variables were done using parametric tests of significance (one-way ANOVA, Independent t test) or else their nonparametric analogues that is, Kruskal Wallis test & Mann Whitney U test was used. 0.05 was set as the level of statistical significance.

## RESULTS

This analysis included 400 school-going children. Statistics are summarized in the Tables and Figures.

## DISCUSSION

Dental caries by virtue of its multifactorial nature and widespread prevalence has been deemed as the most common disease of childhood affecting the general health and well-being of children worldwide.<sup>9</sup>

Daily life modifications and economic development have aided to diminished physical activity and varied eating forms in developing countries.<sup>10</sup>

Children are aims of systematic social discrimination, and therefore the psychological stress of social discrimination and stigmatization might be a reason of low self-confidence, that can deter academic and social functioning that persists through adulthood. There are contradictory statements in literature on the correlation between BMI-for-age and tooth decay among different populations.

According to a study the link between tooth loss and distress using PSS was studied. It was determined that behavior and stress only reasonably diminished social and economic disparity in maintenance of less than 20 teeth, delivering data to support arbitrating role of psychological stress managing.<sup>5</sup>

Quantity of intake in the course of overeating may differ between different groups that is, most individuals with normal weight overeat to a less significant level than those that are overweight. If this emotional eating behavior continues that person during this sample haven't yet become overweight, but, it would still result in overweight.<sup>11</sup>

The current research was done to learn the correlation among dental caries with the BMI, perceived stress, and emotional eating.

As per this study, age group of 11–13 years was chosen as at this age, their nutritive requirements, mindset, preferences, emotions are continuously changing. And the extent of body fat also changes with time representing an active phase in the progress and growth of the kid.

The WHO has projected that occurrence of overweight children for Asia-Pacific region is roughly 4.1%. The danger of overweight and overweight children in US was observed to be 31.0% and 16.0%, respectively.<sup>12</sup>

Wang in 2001 reported the prevalence of overweight to be 14.3% in USA, 10% in Russia, and 3.4% of China.<sup>12</sup> The prevalence of obesity was found to be 7.8% and 14.2% overweight in the studies done on schoolchildren of North India.<sup>14</sup>

According to this study it was found that BMI for age was more significant in males as compared to females.

There are contradictory reports in literature on the relationship between BMI and caries among different populations. Also, there is inadequate data available in India for the same.

According to Chen, in 1998 no significant differences was found in the dft score of kids among distinct groups of BMI.<sup>14</sup>

According to Quadri MF et al., in 2017 there is a deleterious relation between dental caries and BMI.<sup>1</sup>

In 2018, Khadri FA said that Obesity and dmft score were not significantly related. Soft drink consumption was the most vital prognosticator for obesity and tooth decay.

In this study, it was concluded that BMI score was not found to be significantly different (Table 2, Figure 5) among subjects with & without caries in both Deciduous and Permanent teeth.

In 1992 Honkala E conducted a study to evaluate the caries involvement in relation to perceived stress. In this study it was concluded that accretion of various stress markers seemed to be greatly related to higher degree of caries.<sup>15</sup>

According to Jain M in 2014 concluded that in high perceived stress score individuals academic stress affects oral condition, exhibited by greater dental caries experience.<sup>16</sup>

In this study, PSS score was not found to be significantly different among subjects with and without caries in primary teeth (Table 1, Figure 4) whereas it was found that PSS score was found to be significantly more among subjects without caries in permanent dentition as compared to those who had caries (Table 3, Figure 6).

Inconsistencies in findings could also be due to numerous factors like the disparities within the variables monitored for, varieties of stress measurements studied, level of stress, and therefore the understanding of psychometric mechanisms employed. Further considerations are most likely to incorporate changes in testing tactics, design of study, age selection, standards for research entitlement and ranging case-descriptions for decay. Additionally, to those matters just explained, contributors may under-account or over-state their perceived stress for variety of causes.

It was reported by Geliebter A and Aversa A in 2003 that during adverse emotional conditions individuals who were underweight reported a lesser amount of eating than both the overweight and

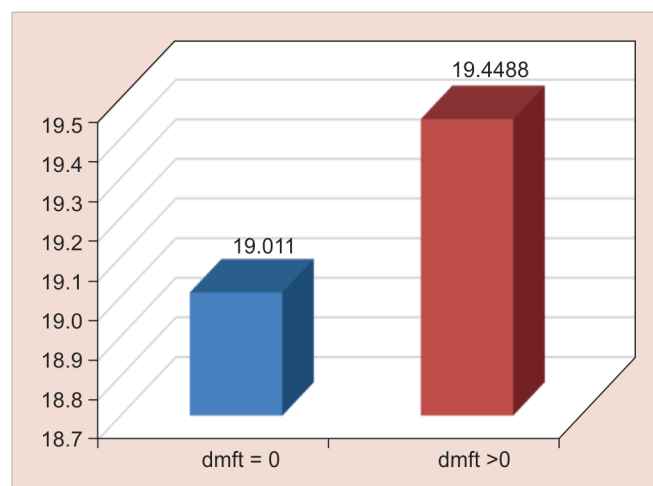


Fig. 4: Comparison of mean PSS scores among caries free and with caries (in deciduous dentition) subjects

**Table 1:** Comparison of mean PSS scores among caries free and with caries (in deciduous dentition) subjects

dmft_	N	Mean	Std. deviation	p value
0	273	19.0110	6.70,956	0.534, NS
>0	127	19.4488	6.19,742	

Mean PSS score was not found to be significantly different among subjects with & without caries in primary dentition.

**Table 2:** Comparison of mean BMI scores among caries free and with caries (in deciduous dentition) subjects

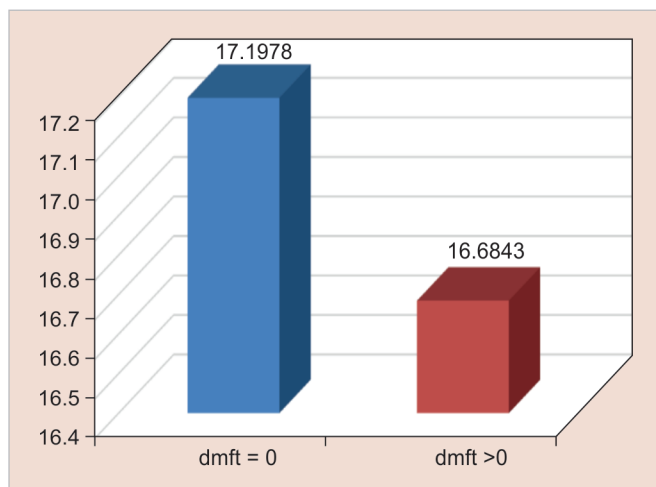
BMI score				
dmft_	N	Mean	Std. deviation	p value
0	273	17.1978	3.05,209	0.099, NS
>0	127	16.6843	2.49,976	

Mean BMI score was not found to be significantly different among subjects with and without caries in primary dentition.

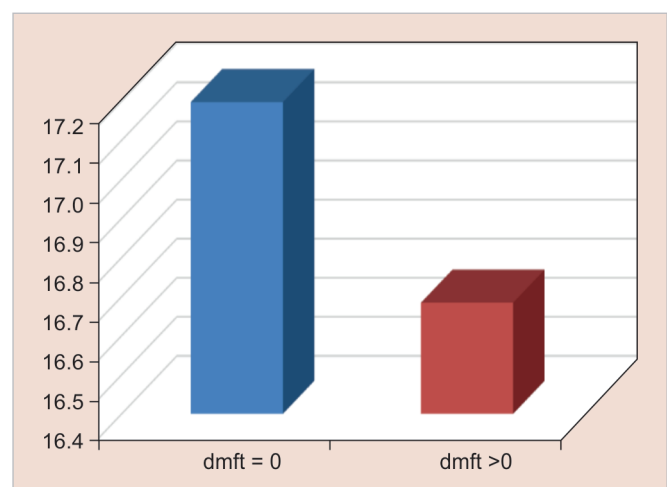
**Table 3:** Comparison of mean PSS scores among caries free and with caries (in permanent dentition) subjects

PSS				
DMFT	N	Mean	Std. deviation	p value
0	308	19.5844	6.67,847	0.015, S
>0	92	17.6957	5.88,860	

Mean PSS score was found to be significantly more among subjects without caries in permanent dentition as compared to those who had caries.



**Fig. 5:** Comparison of mean BMI scores among caries free and with caries (in deciduous dentition) subjects



**Fig. 6:** Comparison of mean PSS scores among caries free and with caries (in permanent dentition) subjects

normal groups. In positive emotional situations more eating was reported in Underweight individuals than the other groups.<sup>17</sup>

Nguyen-Rodriguez ST in 2008 concluded that in between normal weighing and overweighing individuals there is no difference in emotional eating, perceived stress had a substantial relationship with emotional eating, independent of BMI level.<sup>11</sup>

Whereas in this study BMI score showed a very weak negative correlation with PSS score and EES score which was not statistically significant (Table 4).

In 2020, Nembhwani HV stated that along with some food-impending scales (Desire to Drink and Emotional Overeating) there was positive involvement of food evading scales of CEBQ (Satiety Awareness, Slowness in Consuming, Food Inflexibility, and Emotional Undereating) with dental caries status.<sup>17,18</sup>

It was concluded in this study that Mean EES score was found to be significantly high among caries free subjects (Tables 5 and 6) as compared to those who were having mean dmft score > 0 (Figs 7 and 8).

**Table 4:** Correlation of BMI with PSS and EES

Spearman Correlation analysis		
BMI & PSS	Correlation coefficient	-0.016
	p value	0.744, NS
BMI & EES	Correlation coefficient	0.033
	p value	0.512, NS

BMI score showed a very weak negative correlation with PSS score, which was not statistically significant.

BMI score showed a very weak positive correlation with EES score, which was not statistically significant.

## CONCLUSION

From the above study conducted on 400 children aged between 11 and 13 years to assess the relationship of dental caries with the body mass index, Emotional Eating and Perceived Stress it was concluded:



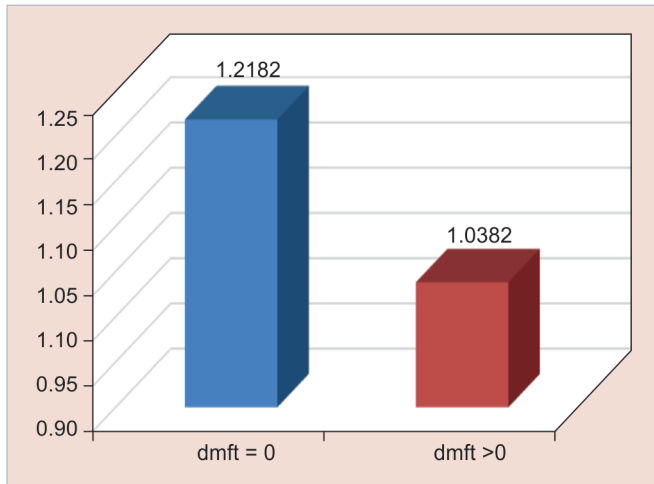


Fig. 7: Comparison of EES with caries in permanent dentition

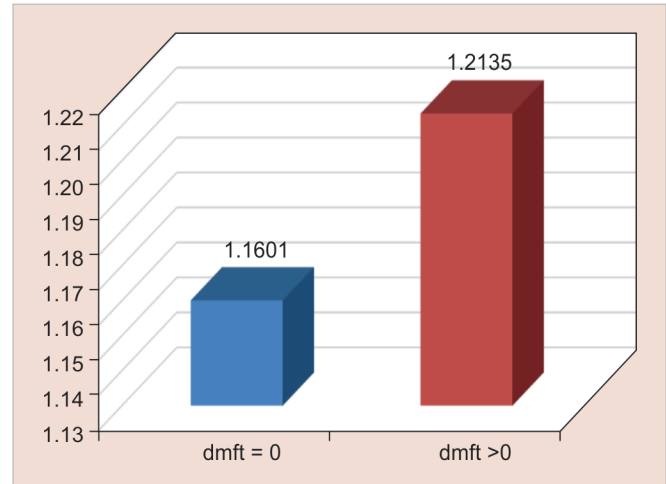


Fig. 8: Comparison of EES with caries in primary dentition

Table 5: Comparison of EES with caries in permanent dentition

DMFT	EES		
	Mean	N	Std. deviation
0	1.2182	308	0.49,728
>0	1.0382	91	0.45,109
Total	1.1771	399	0.49,242
p Value			0.001, S

Mean EES score was found to be significantly high among caries-free subjects as compared to those who were having mean dmft score > 0.

Table 6: Comparison of EES with caries in primary dentition

Dmft	EES		
	Mean	N	Std. deviation
0	1.1601	272	0.52,778
>0	1.2135	127	0.40,603
Total	1.1771	399	0.49,242
p Value			0.076, NS

Mean EES score was not found to be significantly different among subjects with & without caries in primary dentition.

- BMI for age was found more significant in males as compared to females.
  - BMI score was not found to be significantly different among subjects with and without caries in deciduous and permanent teeth.
  - PSS score was not observed to be significantly different among kids with and without caries in deciduous teeth whereas it was found that PSS score was found to be significantly more among subjects without caries in permanent dentition as compared to those who had caries.
  - BMI score showed a very weak negative correlation with PSS score and EES score which was not statistically significant.
  - EES score was found to be significantly high among caries free subjects as compared to those who were having mean dmft score > 0.
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