

## Association of Basal Metabolic Rate, Body Mass Index and Socio-Economic Factors with Dental Caries Among 3-6 Years Old Children of District Mohali, Punjab

Rohini Dua<sup>1\*</sup> Gulsheen Kaur Kochhar<sup>2</sup> Ripin Garewal<sup>3</sup> Annupriya Khanna<sup>4</sup> Ramandeep Kaur<sup>5</sup>

<sup>1</sup>Professor and Head, Department of Pedodontics, National Dental College and Hospital, Derabassi, Mohali, India.

<sup>2</sup>Reader, Department of Pedodontics, National Dental College and Hospital, Derabassi, Mohali, India.

<sup>3</sup>Reader, Department of Pedodontics, National Dental College and Hospital, Derabassi, Mohali, India.

<sup>4</sup>Senior Lecturer, Department of Pedodontics, National Dental College and Hospital, Derabassi, Mohali, India.

<sup>5</sup>Post Graduate Student, Department of Pedodontics, National Dental College and Hospital, Derabassi, Mohali, India.

### ABSTRACT

**Background:** To determine body mass index (BMI), basal metabolic rate (BMR), socioeconomic status and its relation with the dental caries experience in children aged 3-6 yrs from both public and private schools. The purpose of the study was to determine whether there is an association between Body Mass Index (BMI), BMR, socioeconomic status and dental caries

**Material and Methods:** This cross sectional study comprised of 400 children from both genders aged 3-6yrs in both private and government schools. The survey was carried out in order to assess the relation between socioeconomic status of the families, to assess BMI and BMR of the children and dental caries experience

**Results:** The mean dmft among children with severe, moderate and mild ECC was 7.18, 4 and 2.13 respectively. It was found that with the increase in severity of dmft, BMI decreased and BMR increased. BMI showed statistically significant inverse relation with ECC whereas BMR showed statistically insignificant positive correlation with ECC. It was also found that there was higher caries prevalence among high socioeconomic group.

**Conclusion:** severe ECC can affect the overall growth of the child due to pain in chewing and improper sleep which can be consider an important factor especially in growing years of child. Awareness, education of parents and facilitation of oral health services may help in improving the overall health of the child.

**Keywords:** Early childhood caries, BMI, BMR, dmft, socioeconomic status.

### INTRODUCTION

Childhood and early adolescence are crucial periods in the development of healthy dentition. Early childhood caries (ECC) is very common among children. Early childhood caries is a pathologic expression of multifactorial aetiology with a premature onset, characterised by the presence of many deep dental caries in the primary dentition. It rapidly progress into the pulpal and periodontal

tissues, mostly involving the anterior teeth <sup>1</sup>. The American Academy of Pediatric Dentistry (AAPD) recognizes early childhood caries (ECC; formerly termed “nursing bottle caries”, “baby bottle tooth decay”) as a significant public health problem<sup>2</sup>. It has a major impact of individual’s life; it not only affects the oral health of the child but the overall health is also affected. It results in pain which affect the eating patterns as well as sleep of the child.

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\*Correspondence Dr. Rohini Dua.

Department of Pedodontics, National Dental College and Hospital, Derabassi, Mohali, India.

Email: Not Disclosed

According to AAPD the disease of early childhood caries (ECC) is the presence of 1 or more decayed (non-cavitated or cavitated lesions), missing (due to caries), or filled tooth surfaces in any primary tooth in a child 71 months of age or younger<sup>3</sup>. Dental caries varies with age, sex, socioeconomic conditions, ethnicity, diet, oral hygiene practices, and medical conditions of the patient<sup>4</sup>. Dental problems in early childhood have been shown to be predictive of future dental problems, growth, and development by interfering with comfort, nutrition, concentration, and school participation

The prevalence of dental caries is approximately 60-65% in India<sup>5</sup>. According to the Centres for Disease Control and Prevention (CDC), more than 19 percent of children have untreated cavities and approximately 41 percent of children have decay in their "baby teeth" <sup>6</sup>. Growth is a significant indicator of child health; it is so crucial that the World Health Organization (WHO) recognizes it as the best single measure for delineating the nutritional condition and health of children. It is also conceded as an indicator to identify the quality of life in whole population<sup>7</sup>.

Fisher-Owens et al. describe a multilevel conceptual model to explain influences at the child, family and community level. At the child level, risk factors include: genetic, biological, social and physical environment and health behaviours. At the family level, they include: socioeconomic status, family function and health behaviours, and at the community level: culture, social capital, fluoridation and the health care system<sup>8</sup>. The body mass index determines the health of the child is also related to early childhood caries. Studies have shown invariable results with direct, indirect and no correlation with early childhood caries. BMR is the energy required by the body in 24 hours. It is the daily energy expenditure which is affected by many factors such as age, daily nutrition intake. There are very few studies showing relation between BMR and caries.

The present study aims to determine an association between body mass index (BMI), basal metabolic rate (BMR), socioeconomic status with the dental caries experience in children aged 3-6 years.

## MATERIAL AND METHODS

This cross-sectional survey was conducted in district mohali in Punjab state in India. The survey included 400 children of age 3-6 years from different socioeconomic status. The children were divided into low, medium and high socioeconomic according to modified kuppuswamy criteria<sup>9</sup>. Intraoral examination was carried out and dmft was recorded according to WHO criteria and the height(in meters) and weight(in kilograms) of each child was measured. Demographics, dmft, BMI percentile and BMR was measured during clinical evaluation



Fig 1: Calculating body mass index.

Body mass index of the children was calculated using standard equation<sup>10</sup>

$$\text{BMI} = \text{weight in kilograms} / (\text{height in meters})^2$$

BMR was calculated using Schofield-HW formula<sup>11</sup>

$$\text{For boys, the BMR} = (16.25 \times \text{weight}) + (1.372 \times \text{height}) + 515.5$$

$$\text{For girls, the BMR} = (8.365 \times \text{weight}) + (4.65 \times \text{height}) + 200$$

Children were divided into four subgroups :

1. Mild ECC ( n=100)
2. Moderate ECC (n = 100)
3. Severe ECC (n = 100)
4. Caries Free (n = 100)

Statistical analyses were performed using standard statistical software (SPSS Version 13). Results re expressed as mean  $\pm$  SD and frequencies (percentages), Comparisons of mean values were made using pearson correlation test.

## RESULTS

The mean dmft among high, middle and low socioeconomic status was found to be 1.89+/- 2.07 , 1.74 +/- 0.80 and 0.79 +/- 1.50 which revealed that as the socioeconomic status increases dmft also increases but the results were not statistically significant .

### BMR and dmft

Pearson correlation showed statistically insignificant positive correlation between BMR and dmft (p = 0.249).

Table 1: Showing BMR and dmft.

| BMR<br>(N= 400)                   | Dmft           |
|-----------------------------------|----------------|
| Pearson correlation<br>(p value ) | 0.064<br>0.249 |

### BMI and dmft

In the present study it was found that there is a statistically significant negative correlation between BMI and dmft . as the dmft increased BMI of the child decreased. (p <0.01)

Table 2: Showing BMR and dmft correlation.

| BMI<br>(n=400)      | Dmft   |
|---------------------|--------|
| Pearson correlation | -0.343 |
| P value             | <0.01  |

While comparing the mean scores of BMI , BMR and dmft with severity of Early childhood caries , it was found that BMI decreased with severity of ECC and BMR increased from mild to severe ECC.

Table 3: Socioeconomic and dmft.

|                             | Dmft (mean) | SD   |
|-----------------------------|-------------|------|
| Higher socioeconomic status | 1.89        | 2.07 |
| Middle socioeconomic        | 1.74        | 0.80 |

| status                     |      |      |  |
|----------------------------|------|------|--|
| Lower socioeconomic status | 0.79 | 1.50 |  |

Mean dmft of the revealed that as the socioeconomic status increases dmft also increases. Results showed higher caries prevalence among high socioeconomic class.

Table 4: Comparison Of Mean Scores Of BMI, BMR and dmft.

|                       | Dmft | BMI            | BMR               |
|-----------------------|------|----------------|-------------------|
| Group 1: severe ecc   | 7.18 | 12.04+/- 1.32  | 868.17 +/- 71.04  |
| Group 2: moderate ecc | 4    | 13.76 +/- 0.87 | 864.44 +/- 55.27  |
| Group 3: mild ecc     | 2.13 | 13.91 +/- 0.97 | 855.29 +/- 106.45 |
| Group 4: caries free  | 0    | 14.6 +/- 1.2   | 842.81 +/- 98.75  |

## DISCUSSION

In the present study, a total 400 children of 3-6 years age were screened for deft according to WHO criteria. One objective of the present study was to determine the relationship between the children dental caries status with their socioeconomic status. These results showed a positive relationship between Socioeconomic status and dental caries status. The reason behind this is incorrect diet with more and frequent consumption of snacks and sweets. B.O. Popoola et al<sup>19</sup> 2013 also concluded that caries experience was directly related to socioeconomic status of the parents whereas survey done by N K Elfaki et al<sup>20</sup> , 2015 revealed that the parents with high socioeconomic status scored a significant better oral health status among their children than those who had a low socioeconomic status.

In particular, the involvement of dental and periodontal tissues can have a negative effect on a child's chewing abilities and psychophysical wellness, thus determining a change in what and how he/she eats, and in sleeping habits as well, with

substantial negative consequences on weight and height<sup>1</sup>.

So another objective of our study was to check the relationship of BMI and dmft and it was observed that there is a negative correlation between BMI and dmft. Carina Norberg et al, 2012 showed similar results revealing an inverse relationship between BMI and dmft index and a positive relationship between BMI and being caries free.<sup>21</sup> The variation of Growth Hormone (GH) levels usually occurs in children about 6 years old, which is a time when there is a first growth spurt, and when the phenomenon of adiposity rebound takes place. Among other influencing factors, GH circulating levels are linked to the sleeping pattern<sup>12</sup>, which is impaired in children with ECC, and especially with S-ECC. This is another possibility to explain why dental caries in early childhood become a favouring factor of possible growth impairment, more than a direct aetiological factor<sup>1</sup>.

If we consider the relation between ECC and BMR, the study revealed a positive but statistically insignificant relation. Whereas according to Louie T Austin (1994)<sup>13</sup> the incidence of dental caries appeared to be slightly greater among those whose basal metabolic rates were on the lower side<sup>13</sup>. There is very limited data on relation between BMR and dental caries which needs to be discussed. Hence there is a need of studies relating BMR and caries on a larger sample.

## CONCLUSION

Based on this study's results, it can be concluded that caries were more among higher socioeconomic strata and BMI was lower among children with higher caries incidence which is very likely due to the pain in chewing resulting in diet modification as well the disturbance in sleep. So dental caries can be considered as an important factor which can influence the growth of the child.

## CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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