

## Original Article:

# A Study to Explore the Relationship between Dental Caries and Weight of the Slum Living Children in Dhaka

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### Abstract

**Background and Objectives:** Dental caries or decay is the most significant dental disease of childhood in Bangladesh. It is also reported to affect the anthropometric outcomes of children. So the objective was to assess the relationship between dental decay and weight of the children living in various slum areas of Dhaka, Bangladesh.

**Methods:** A cross-sectional study was conducted among the children in a slum area of Mirpur, Dhaka. The children were selected by using simple random sampling technique. A total of 310 children were interviewed and examined on the basis of the questions regarding their age, gender, height, weight, nutrition, socio-economic status and clinical conditions.

**Results:** The study showed an inverse relationship between dental decay and weight among the children. Among 310 children about 40.64% were suffering from dental caries and 95.5% children were underweight. Children with at least one decayed tooth were significantly more likely to be underweight with odds ratios 0.614, 0.763 for the age group of below 6 years and above 12 years.

**Conclusion:** The study depicted an inverse relationship between dental decay and weight among the children of slum dwellers in Dhaka and emphasized on the necessity of implementing proper dental health care policies and programs among those socio-economically deprived people.

**Key words:** Dental caries, Body weight

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### **Introduction:**

There is practically no geographic area in the world whose inhabitants do not exhibit some evidence of dental caries. Dhaka is a highly populated city where dental caries still remains as a smoldering disease that has embedded its root deep into those regions especially where there is lack of resources for dental treatment. According to UN-HABITAT (2006) report, 79% of the urban populations live in slums in Bangladesh.

Being the capital of the country, Dhaka is over populated having a large number of slum dwellers where dental caries has not spared these under privileged people. In most cases dental decay remains untreated here<sup>1, 2</sup> which affects the growth and wellbeing of millions of children<sup>3</sup>. Dental decay become more painful in case of children because they can not verbalize the feeling of pain like adult. The immaturity of children, developing cognition and dependency on adults influence the interpretation of pain. And this creates a problem when the need for treatment is assessed. It does not only cause pain and discomfort, but also in addition, places a financial burden on parents of the affected children.

Socio-economically deprived people do not heed that much attention to the dental problems of their children because they find the dental treatment to be very expensive. A previous study conducted in the slum areas of Tongi, Dhaka reported that, the mean DMFT is higher in both male and female than that of the urban people<sup>4</sup>. Moreover, poor people are mostly not able to provide healthy and nutritious food to their children. Due to their poor socio-economic status and low purchasing power they can not provide their children appropriate food rich in animal protein, vitamins and minerals which are required for their growth. Lack of healthy diet causes severe deficiency of vitamin-D which further increases the risk of demineralization and causes dental caries<sup>5</sup>.

Nutritional deficiencies in the growing child, whether due to deprivation, overindulgence or malabsorption syndromes may have significant impact on neural development and somatic growth<sup>6</sup>. Dental caries is the most prevalent oral disease and it remains the single most common disease of childhood that is not amenable to short-term pharmacological management<sup>7</sup>. Most of the

dental decay remains untreated with significant impacts on general health, quality of life, development and educational performance. So once it is developed it begins to unveil its various symptoms which hamper the normal dietary habit, psychological status, sleeping pattern, social interaction thus ultimately hamper the normal growth of children. Different theories explain the relationship between dental decay and child's growth. Study has shown that untreated dental caries affects the normal eating habit of the children and thus hampers their nutritional intake<sup>8, 9</sup>. Poor nutritional intake can also increase the susceptibility to caries due to altered saliva composition and secretion<sup>10</sup>.

Moreover severe infection makes the children unable to sleep which ultimately affect their normal growth<sup>11</sup>. Infected dental pulp may affect the immune system and erythropoiesis<sup>12-15</sup> of children which in turn may cause anemia<sup>14</sup> and also hamper the bone remodeling<sup>16, 17</sup>. It is also reported that, severe underweight children with dental caries gain weight rapidly and their quality of life were improved after the treatment of dental caries<sup>11</sup>.

Bangladesh is a low income country with a lot of children suffering from malnutrition and poor health, especially among the deprived sectors of the population. Dental caries is a common phenomenon among the children in Bangladesh which is more significant among the socio-economically poor people. The country has very limited facilities for dental treatment and a high population to dental service provider ratio (100,000/2)<sup>18</sup>. But it is alarming that the nutritional and carious status are deteriorating day by day which ultimately may become responsible for the retardation of growth of the children of slum dwellers in Dhaka city. So the objective of our study

was to explore the association of being under-weight and dental caries among the slum living children in Dhaka which will further help us to plan comprehensive dental preventive programs and facilitate those children to have sound oral and dental health.

### **Methods:**

A cross sectional study was conducted among 310 children in a slum area at Pallabi, Mirpur in November, 2015. A simple random sampling technique was used to design the study in case of selecting sampling unit (the children). Data collection included dental clinical examination, anthropometric measurements and a questionnaire comprised of 15 questions related to their age, sex, height, weight. For the socio-economic status the parents of those children were asked some questions regarding their occupation, education, salary, sanitation etc. And to record their nutritional status and dietary habit the children were asked some questions regarding the protein, carbohydrate, vitamins intake.

The children were interviewed by two dentists and the dental clinical examination was performed by another two dentists according to the standard procedures explained by World Health Organization (WHO)<sup>19</sup>. All the anthropometric measurements were done according to the standard guidelines<sup>20</sup>. All the children stood upright without wearing their shoes and the height was measured with a portable stadiometer to the nearest 0.5 cm. The weight was measured with a portable electronic digital scale to the nearest 0.5 kg. Height and weight were assessed by using the z scores of height for age (HAZ), weight for age (WAZ) and BMZ<sup>21</sup>.

The deviation of height, weight and BMI for specific age and gender from the international standard was calculated automatically by using WHO AnthroPlus Software<sup>22</sup>.

Oral examinations were performed by using caries probe, mouth mirror, torch, disposable gloves and masks. Teeth were dried prior to the examination using cotton pellets. Teeth were examined in natural day light and torch was also used for proper visibility. It was not considered to be a dental decay or caries when the ball ended probe did not enter into the cavitations as they were considered as initial stage of cavitations.

### **Statistical Analysis:**

The data were coded and analyzed by SPSS (Statistical Package for Social Sciences) software version 20.0. A level of  $P \leq 0.05$  was considered statistically significant and  $P \leq 0.001$  was taken as highly statistically significant. The children were divided into three age groups (below 6 years, 7-12 years and above 12 years). An analysis was done to assess the relationship between all the variables for children with any decayed teeth and underweight children. For each group we assessed a dichotomous association between being underweight and having at least one decayed tooth.

We constructed a series of linear regression models for each age group to assess the association between each of the two main outcomes (weight for- age Z-score and height-for-age Z-score) and number of untreated caries adjusting for sex.

At last, we assess the relationship between being underweight (weight-for-age Z-scores  $< -2$ ) and having at least one untreated decayed tooth, adjusting for sex by using logistic regression.

**Table No. I: Description of study population:**

| Variables |                | Number<br>(n) | Percentage<br>(%) |
|-----------|----------------|---------------|-------------------|
| Age       | Below 6 years  | 147           | 47.4              |
|           | 7-12 years     | 157           | 50.6              |
|           | Above 12 years | 6             | 1.9               |
| BMI       | Underweight    | 296           | 95.5              |
|           | Normal         | 10            | 3.2               |
|           | Overweight     | 2             | 0.6               |
|           | Obese          | 2             | 0.6               |
| Sex       | Male           | 151           | 48.7              |
|           | Female         | 159           | 51.3              |

**Table No. II: The association between weight-for-age z-score , height-for-age z-score, and number of decayed teeth:**

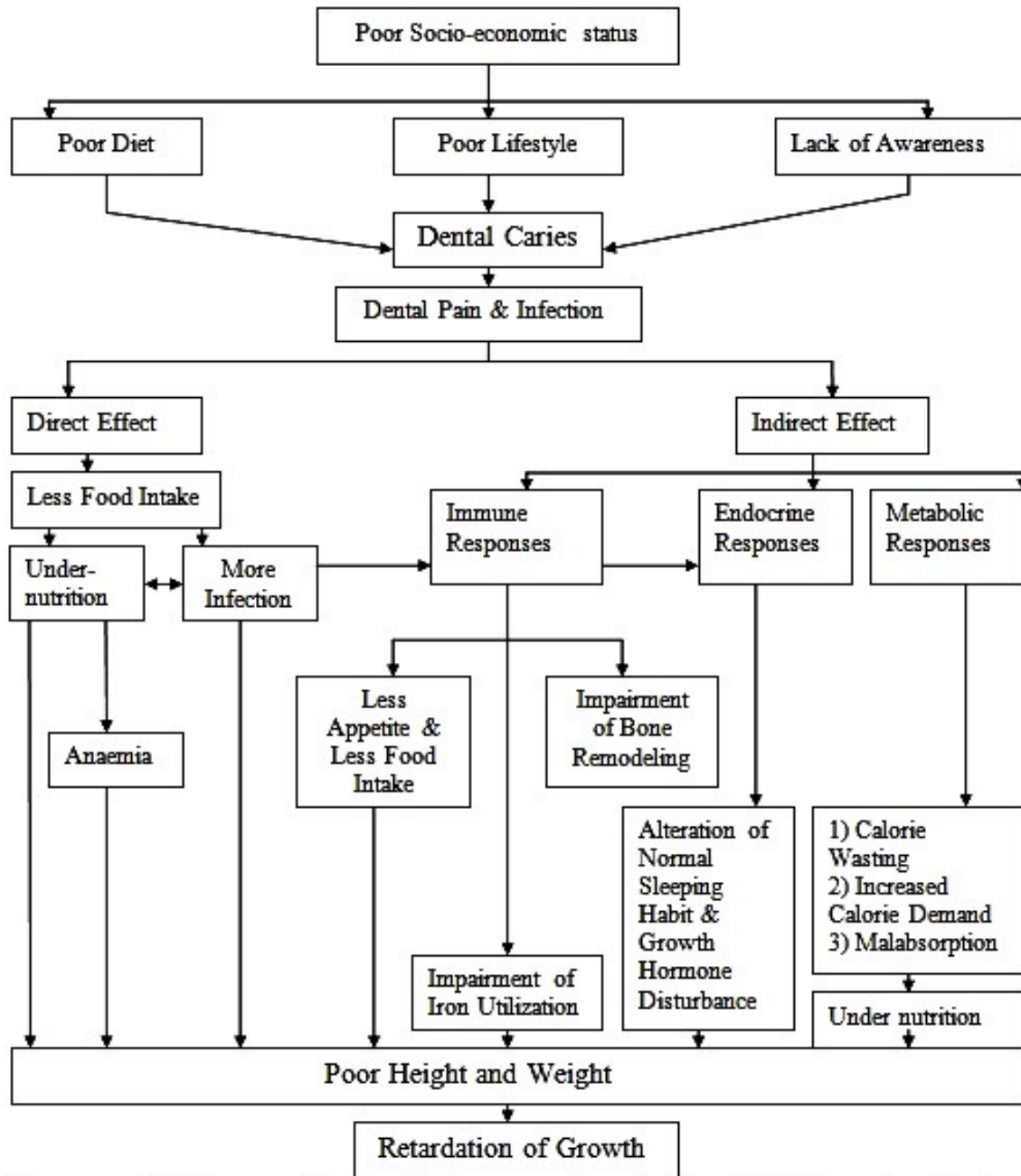
| Age Group                                     |                     | Regression | 95% Confidence Interval | P-value |
|---|---------------------|------------|-------------------------|---------|
| Below 6 years<br>7-12 years<br>Above 12 years | Height-for-age(HAZ) | .035       | -1.163,-.837            | .000    |
|   |                     | -.118      | -1.158,-.842            | .000    |
|   |                     | .611       | -2.049,.0494            | .058    |
| Below 6 years<br>7-12 years<br>Above 12 years | Weight-for-age(WAZ) | .143       | -1.163,-.837            | .000    |
|   |                     | -.037      | -1.158,-.842            | .000    |
|   |                     | -.217      | -2.049,.0494            | .058    |

**Table No. III: Distribution of caries and underweight by age:**

| Age group      | Any decayed teeth(n) | % of underweight children | Significance |
|----------------|----------------------|---------------------------|--------------|
| Below 6 years  | Yes (53)             | 32.1%                     | <.05 (.000)  |
|                | No (94)              | 52.1%                     |              |
| 7-12 years     | Yes(70)              | 61.4%                     | <.05 (.000)  |
|                | No(87)               | 58.6%                     |              |
| Above 12 years | Yes(3)               | 100%                      | > .05 (.391) |
|                | No(3)                | 100%                      |              |

**Table No. IV: Odds ratio of association of underweight (weight-for-age <-2) with untreated caries:**

| Age group      | Odds Ratio | 95% Confidence interval | P-value    |
|----------------|------------|-------------------------|------------|
| Below 6 years  | .614       | .159,.774               | <.05(.028) |
| 7-12 years     | .763       | .620,2.373              | >.05(.677) |
| Above 12 years | 1          | 1,-.01                  | <.05(.016) |



**Figure no. I: Different mechanisms linking severe dental caries with height and weight in young children.**

**Results:**

According to our study, out of 310 children 48.7% were male and 51.3% were female. Among all the participants, about 40.64% children had dental decay. We divided the children into three age groups. Out of total population, we had 47.4 % of children below 6 yrs, 50.6% children were of 7-12 years age group and 1.9% children were above 12 years. About 95.5 % of children were underweight, 3.2% children were of normal weight, 0.7% were overweight and 0.6% were obese (table no. I).

In linear regression model, for decayed tooth, the height-for-age was significantly lower by 0.118 at the age of 7-12 years and also the weight-for-age was significantly lower by 0.037 at the age of 7-12 years (table no. II).

So, the association between dental caries and HAZ, WAZ was highly significant at 7 -12 years with the P value 0.000 (<0.05). Moreover, children who had caries in one or more teeth were significantly more likely to be underweight (weight-for-age) at the age group of below 6 years and 7- 12 years (table no. III).

At last, from the odds ratio, it was showed that children with at least one decayed tooth were significantly more likely to be underweight with odds ratios 0.614, 0.763 for the age group of below 6 yrs and above 12 yrs (table no. IV).

**Discussion:**

This study revealed a robust inverse relationship between dental decay and weight among slum living children of Dhaka. In this study the height for age and weight for age were adversely related to the dental decay. We can also observe the similar pattern of relationship between dental caries and growth in the previous studies conducted in developing countries<sup>23, 24</sup>.

Dental caries affects the growth in different manners. It alters the eating ability, sleeping

quality and thus hampers the daily activities of children which ultimately cause retardation of their growth. Many studies have shown the inverse relationship between caries and growth especially in case of body height and weight.

In our study we have seen that, children who had caries in one or more teeth were significantly more likely to be underweight (weight-for-age) at the age group of below 6 years and 7- 12 years. Other studies have also demonstrated that there is no association between dental caries and obesity. Granville-Garcia et al<sup>25</sup> observed the association between caries in obese and non-obese children in Brazil and found no relationship between obesity and caries while they also assessed a significant relationship between caries and not being obese. But it was difficult to find out whether the non-obese children were normal or under-weight due to their improper categorization. A significant association was also found between dmft and BMI in a Turkish study<sup>26</sup> of similar age group. This linear inverse relationship was found in an Australian longitudinal study<sup>27</sup>. Furthermore, a Swedish study<sup>28</sup> showed the relationship between different categories of BMI and untreated caries. This unavoidable relationship is confounded by a lot of conditions. Different environmental, social and economical conditions affect the oral health that further play an important role in retardation of growth<sup>29</sup>. Poor nutritional status is commonly seen among the people of poor socio-economic status. Poor diet is responsible for various diseases including dental decay or caries. Different studies have shown the relationship between dental caries and socio-economic status. Study has shown that the higher prevalence of dental caries is more likely to be seen in poor socio-economic division<sup>30</sup>. A study<sup>31</sup> conducted among the children of Shimla, India has shown the inverse relationship between caries and growth and again the similar relationship was found in the studies

conducted by Prashant S<sup>32</sup>, Mojard<sup>33</sup>, Sheiham A<sup>34</sup>. There it was reported that the underweight of children was due to poor socioeconomic status and lack of knowledge about general and oral health. In our study a significant association is demonstrated and described of having poor nutritional status, caries and retardation of growth. The relationship between caries, nutrition and growth is directly and indirectly associated with each other which is briefly explained in fig no. 1<sup>35</sup>. Though we were not able to observe the direction of the association for a long period as it was a cross-sectional study. But still our study has highlighted the increasing prevalence of dental caries in slum living children and it is now extensively alarming that dental caries is retarding the normal growth of those children. The poor people of Bangladesh are still not enlightened with proper oral health care facilities as the oral health care policies are pushed to the bottom of the priority list of the country's other health care facilities. And thus dental decay or caries has got the chance to silently embed and spread its root deep into the socio-economically deprived sector of Bangladesh. As we know the slum dwellers are not educationally, economically and socially stable enough to fight this circumstance it is our duty now to help them by providing more voluntary dental health care services and programs which will in turn make them aware of their oral and dental health. Moreover, both government and private organizations should conduct surveys to record the dental health status of children as well as adults and arrange free dental camps on at least monthly basis where these poor people can get necessary dental treatment free or at an affordable cost. In this study, the association between dental caries and growth among the slum living children has focused on the immediate need of implementing proper oral health care policies and facilities among all classes of people.

### Conclusion:

This study depicted an inverse relationship between dental caries and weight among the children of slum dwellers in Dhaka. Children are the future of a country. They should not ever experience the socio-economical deprivation especially in the sphere of health care facilities. So it is now essential to develop and implement necessary oral and dental health care policies and dental health care program in every sector of our country without socio-economical hindrance to build up a better future.

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