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The association between body mass index and dental caries in school children: A cross-sectional study

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Abstract---Background: Association of obesity and dental caries, as they have share same risk factors like consumption of free sugars and deprived socioeconomic status. Individual consuming refined carbohydrates in excess especially in its refined form is associated both with dental caries and overweight & obese. Methodology: The questionnaires were administered to the school children and The examinations of the children were conducted only with the written consent of the children/parents. Results: most of the school children belong to 5-15 yr of age and 71.6% were males. Relationship between BMI & Mean DMFT, infers that if BMI increases from normal, DMFT also increase but overweight and obese category (0.4% and 0.2%) were very less. Mean DMFT also increase significantly if the sugar exposure increases. Conclusion: Positive association between BMI and dental caries was found and it should be guide among health promoters about BMI could be related to dental caries.

Keywords---association, body mass, school children, cross-sectional study.

Introduction

Body mass index (BMI) is physical measure of body fat based on weight relative to the height. Globally an increasing number of overweight children & adults are due to the consumption of fast food and nonalcoholic drinks combined with lack of physical activity. Most prevalent health condition in the world Dental caries [1] and it affects to all age group but 50-60% of children between 5-14 years age group. Dental caries, like most other chronic multifactorial diseases, is influenced by genetic, environmental and behavioural risk factors [2]. In order to prevent dental caries one need to focus on type and kind of diet. The association of obesity with dental caries is not simple and it is governed by many considerable factors [3,4]. Nevertheless, both of these chronic diseases (obesity and dental caries) share common factors, and is mostly influenced by such as diet and lifestyle, and genetic and socio-economic factors [4,5]. Obesity and dental caries are found to share similar complex nature of risk factors therefore know as lifestyle disease[6].

Evidence of the association of nutrition status with dental caries is inconsistent. A recently published systematic review found that approximately half of the studies published between 2004 and 2011 found no association [7] between body mass index (BMI) and dental caries, while one-third of the studies found positive associations and the remaining an inverse relationship [5]. These inconsistencies may be caused by differences in study design, study location [8], methods of assessment of nutritional status and of dental caries, and the age of the participants and their socio-economic background [9]

Objectives

Primary:

- To assess the relationship between dental caries and BMI among school children.
- To assess the relationship between dental caries and sugar exposure among school children.

Secondary:

- To assess BMI among school children.
- To assess Sugar exposure of school children.

Methodology

Present work was conducted in Lucknow to identify association between overweight, Obesity, sugary food & dental caries. The questionnaires were administered to the school children after achieving permission by the school administration. Children's were clarified the purpose of the study and instructions to respond to the questionnaire. Individual confidentiality of school children was ensured and the class teacher was asked to stay away from the class so that the school children were free to fill the accurate information. Students were questioned related to consumption of diet, oral hygiene practice *and*

examination related to BMI and oral checkup. Ethical approval was taken from Research cell, King George's Medical University and a blanket written consent was obtained from all the selected school authorities. The school schedule pertaining to examination and available space for the proposed work in the school premises was attained in advance. A written consent from the participating children and their parents was taken after selection of the pupil. The examinations of the children were conducted only with the written consent of the children/parents.

Inclusion Criteria

3-18 years of age without any systemic disease

Exclusion Criteria

- Age <3 and >18 years
- Condition contraindicated for oral examination

Study Design

Selection of Sample Site & Size

A two-stage, school-based survey was used to produce a representative sample of school students. At the first stage, a list of all Private and Government aided schools having grade pre nursery to 12 standard (age group 3-18 year) was prepared (available from Directorates of Education, UP) and the schools was selected randomly from each area. The schools selection was representative of the type of schools in Lucknow, *viz.*, Private girls only, private boy only, Government girls only, Government boys only, co-educational private and co-educational Government schools. At the second stage, the classes were randomly selected and from each selected class, all students of every alternate section were included. Each selected class was visited twice at an interval of one week and students present during the visits were included in the study.

School Level

The first-stage sampling frame consisted of all schools containing prep to 12 standard.

Class level

The second stage sampling consists of systematic equal probability sampling (with a random start) of classes from each school that participated in the survey. All grades in the selected schools were included in the sampling frame. All students in selected grades were eligible for participation.

Sample size

This cross-sectional survey has been design with cluster random sampling; a total of 1000 pupils aged 3-18 years from schools will be screened.

The Survey

The study was carried out mainly during school time (except examination time) to ensure maximum possible compliance. Personal interviews of students and simultaneous examination of oral cavity by principal investigator. The students identified with obesity and oral problems were advised and offered appropriate treatment and help. Performa directed –bilingual (Hindi as well as English), simple, pre-tested for reliability and validity.

Data Collection

Questionnaire

A diet recording sheet was prepared and children/parents were asked to record the dietary intake for 3 days and Oral hygiene practice during oral examination.

- **BMI:** BMI was used to classify the children's obesity status, according to the Centers for Disease Control 2000 reference charts.
Body weight: was recorded by using digital electronic scale with the subject barefoot and wearing light dresses.
Body height: it was recorded, according to the following protocol: no shoes, heels together and head touching the ruler with line of slight aligned horizontally.
To avoid subjective errors, all the measurements were performed by the single person operator.
- **Oral Examination:** Clinical examination for dental caries was carried out following WHO criteria for primary dentition and permanent dentition. The dental examination was performed by the same operator, will noninvasive (non magnifying mirror, dental probes, cotton roll with day light). No x-rays was used.

Referral

If, on screening the child is found to have obesity and dental caries, he/she would be advice to consult with dietician and dentist respectively.

Statistical Analysis

All data information was entered into a computer with IBM Statistical Package for the Social Sciences (version 21). SPSS (IBM SPSS Statistics for Windows, Version 22.0; IBM Corp., Armonk, NY, USA) was used for statistical analysis. Descriptive data are presented as frequencies and means. Chi-square test was conducted to analyze the relation between BMI and means DMFT.

Results

A total of 1000 (n) school children were approached out of which 960 schoolchildren were part of this study, indicating a response rate of 96%.

Table 1
Correlation between Mean dft/DMFT & BMI Index

BMI Index	Mean dft/DMFT	Chi-Square Vale	df	P- value
Severely Under Weight	1.41	0.776	44	0.001
Under Weight	0.95			
Normal Weight	0.68			
Over Weight	1.00			
Obese	1.50			

According to Table -1 regarding correlation between BMI & Mean DMFT, infers that if BMI increases from normal, DMFT also increase and this relationship statistically significant.

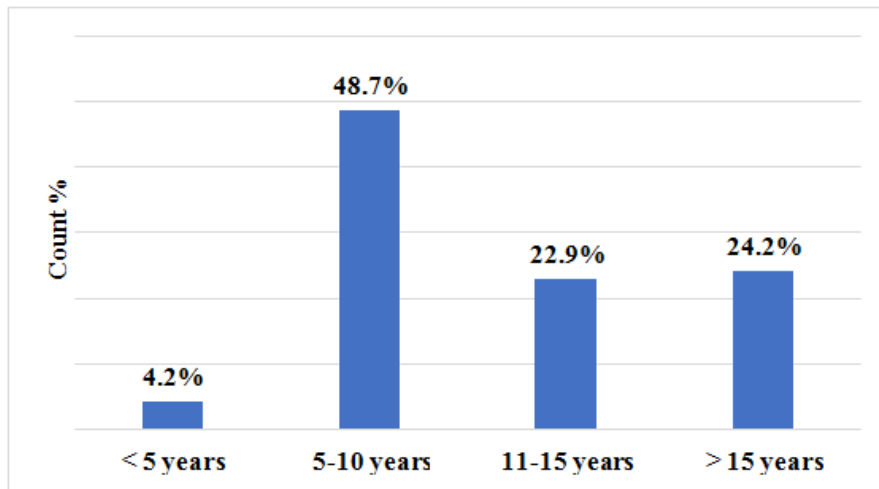


Figure 1. Distribution of subjects by age

Figure 1 describes the distribution of study subjects by age, where majority (48.7%) belong to age group of 5-10 years, followed by 24.2% of age group more than 15 years, 22.9% of age group 11-15 years and only 4.2% of subjects belong to less than 5 years.

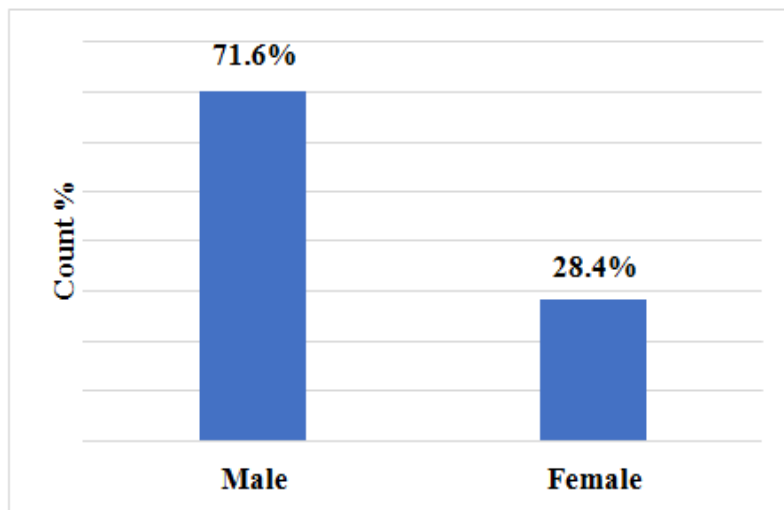


Figure 2. Distribution of subjects by gender

Figure 2 describes the distribution of subjects by gender where 71.6% were males and 28.4% were females.

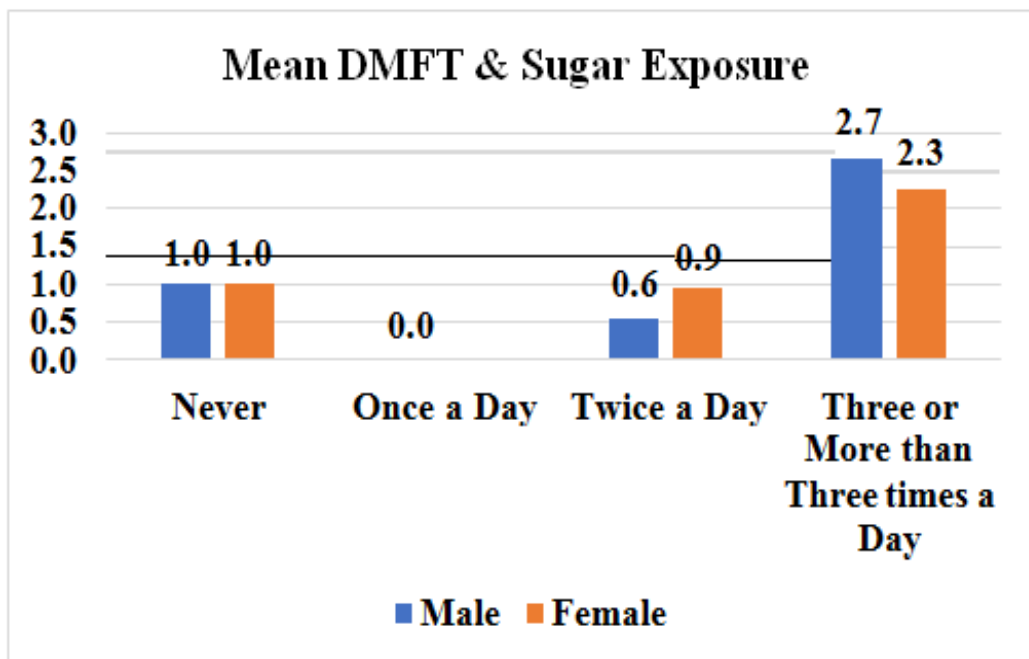


Figure 3. Mean DMFT & Sugar Exposure

Regarding figure 3, Sugar Exposure has a significant role to play in regards to the subject's DMFT level. This infers that the DMFT level will also increase significantly if the sugar exposure increases.

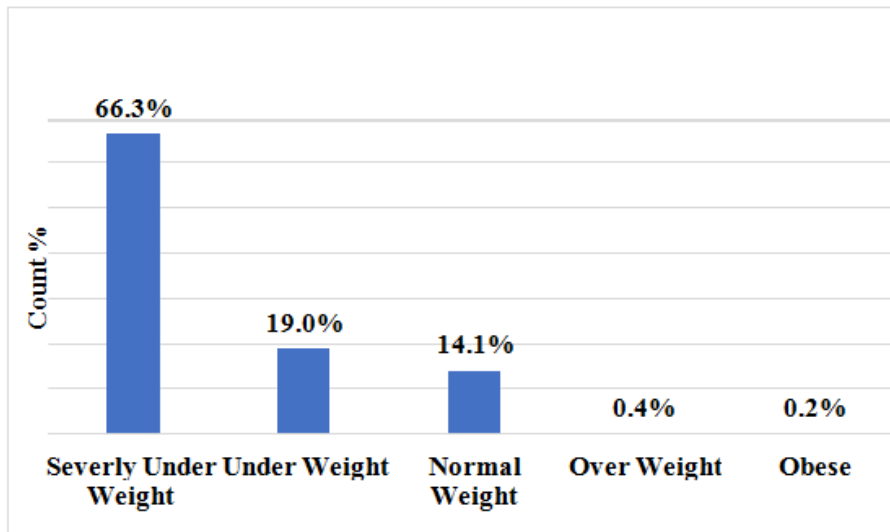


Figure 4. Distribution of subjects by BMI

Figure 4 describes the distribution of subjects by Body Mass Index (BMI), where majority (66.3%) of subjects were severely underweight, followed by 19.0% underweight, 14.1% normal weight, and very few belonged to overweight and obese category (0.4% and 0.2%) respectively.

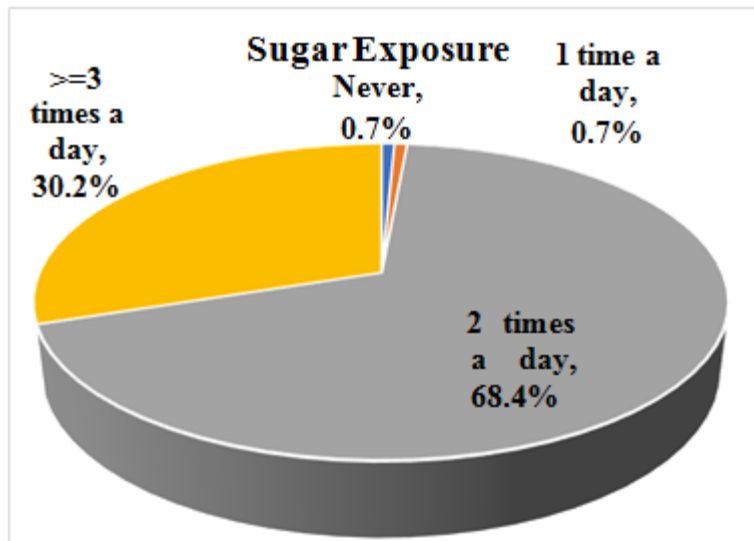


Figure 5. Distribution of subjects by Sugar exposure

Figure 5 describes the distribution of subjects with sugar exposure, 68.4% subjects get exposed twice a day followed by three or more than thrice a day (30.2%). Remaining 1.4% subjects get sugar exposure once a day or never.

Discussion

There is a good amount of literature available demonstrating the relationship between dental caries and BMI among school children. But still we are aware that caries is a multifactorial disease and diet is one of the major factors and BMI is also multifactorial. The vision of this study is to facilitate the health promotion program regarding dental caries among the school-going children.

India is a developing country and Lucknow is a capital city of India's most populous state Uttar Pradesh, where providing proper nutrition to school-going children is a big challenge. Our study also showed similar results according to Figure-4 where maximum school children belonged to the severely underweight (66.3%) and underweight (19%) category and only 14.1% were in the normal weight category. However, less than 1% number of children belonged to the overweight (0.4%) and obese (0.2 %) category. Similar findings can be seen in studies done by Willershausen et al., Elangovan A et al. and Nkambule NR et al (10, 11 & 12) in which least number of subjects were in the obese category.

According to Table 1 regarding correlation between BMI & Mean DMFT, it infers that if BMI increases from normal, DMFT also increases and this relationship is statistically significant. This finding was in accordance to the study done by B. Willershausen et al. (10) where significant association between the caries and the BMI was found and a high BMI was linked to a high number of caries lesions. Obesity appears to be associated with dental caries in the primary dentition of preschool seen in the study done by Vazquez-Nava F et al. [13]. A lower dmfs index was detected in the overweight children, compared with children with a lower BMI seen in the study done by Sanchez-Perez L et al. [14]. Overweight children were found to show statistically significant differences in dmfs values seen in the study done by Trikaliotis A et al. [15]. Finding from systematic review done by Silva et al. shows no relationship [3].

According to Figure 3 regarding mean DMFT & Sugar Exposure, our study concludes that DMFT level will also increase significantly if the sugar exposure increases. Similar results were found by Elangovan A et al (11) and Nkambule NR et al. (12) where statistically significant association was found between dental caries and the number of sweets consumed daily, that stressed the importance of the consumption of refined sugars and its role in the initiation and progression of Dental Caries. Whereas, in contrast to these findings several authors in systematic review done by Hooley M et al. (5) concluded a non-linear association between body mass index and dental caries.

Regarding sugar exposure in our study. This finding can be attributed to frequent snacking of sugary substances leads to risk of dental caries, mothers should be taught regarding risks of dental caries by frequent snacking of sugary substances to their children. All carbohydrates are generally considered cariogenic but primarily sucrose. Other risk factors such as hypo secretion of saliva, poor maintenance of oral hygiene, socioeconomic and cultural background, parenting practices, genetics component, play a major role in the development of oral diseases. Frequent eating of simple form of sugars increases the risk of dental caries in children. We are aware that BMI and dental caries both are public health problems. Public health initiatives should focus both weight loss as well as dental

caries. In addition of that, collaboration with allied health professional could help to optimize and improve the outcomes of these two significant health situations.

Conclusion

In our study positive association between BMI and dental caries was found and it should guide health promoters about BMI could be related to dental caries. BMI and dental caries is a complex association and Confounding factors needs to be specify to give clear picture of this association.

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