Correlation between caries status and Body Mass Index in school children aged 6-10 Years in Greater Noida

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Abstract

Background: Decreased physical activity, sedentary lifestyle, changes in food habits have led to significant rise in the number of obese children. With an increase in number of children preferring fast food products over a balanced diet, the condition has become more prevalent. Food items such as soft drinks, refined breads are generally of low nutritive quality but have high cariogenic potential.

Aim: To determine a correlation between the caries status and Body Mass Index (BMI) in school children aged 6-10 years in Greater Noida, Uttar Pradesh.

Settings and Design: A total of 468 children were examined from 4 primary schools which were selected by simple random sampling method.

Materials & Method: Prior to the dental and medical examination, informed consents were obtained from the parent's/ guardian's of the children. Dental caries was assessed using df-t and DF-T index. The height of the children was measured by a stadiometer and weight was measured by a portable digital weighing machine. BMI was classified according to World Health organization classification.

Statistical Analysis used: Student t-test and Chi-square test were used and all statistical tests were conducted using IBM SPSS software (ver.20.0; IBM, Chicago, IL, USA).

Results: 79.4% children were in normal range, 7.6% in underweight, 10.20% and 2.8% in overweight and obese range respectively. Caries free dentition was found in 52% of underweight children, 47.4% in normal weight children, 41.6% and 38.5% in overweight and obese children respectively. Mean df-t/DF-T score of the study population was 2.32.

Conclusion: The present study showed a significant correlation between caries status and obesity, and it forces the challenge that is forced on preventive public health programs for more focus towards nutrition and physical activity.

Keywords: Correlation, Caries Status, Body Mass Index, School children

Introduction

Over the last 20 years, there is a significant rise in the number of obese children, adolescents and adults in developing countries along with countries with higher economy. Physical inactivity, sedentary life style, the great popularity of video games/ TV as well as changes in food habits have to be regarded as the initial factors for the strong rise in obesity.[1] According to the WHO report (2015), more than 1.9 billion adults (18 years and above) were overweight and more than 600 million were obese. Overall, about 13% of the world's adult population (11% of men and 15% of women) were obese in 2014.[2] An ever increasing working population coupled with paucity of time makes them prefer fast foods rather than a balanced and healthy diet.[3] There are too many reasons for the obesity epidemic. Fast food and refined food contributes to a high-energy consumption, and a stable sedentary lifestyle reduces energy consumption. Indeed, many of the foods, including aerated drinks and refined-grain breads, are low in micronutrients. In a study by Bes-Rastrollo et al., they reported the need for societal changes in diet; however, attention to physical activity is also required.[4] Daily dietary recommendations and guidelines for a healthy diet is freely accessible; however, the junk food that is presently available in fast food chains does not take these recommendations into consideration. In a study conducted by German Society of Child - and Adolescent Psychiatry (DGKJP) carried out among preschool children, living in Aachen, found an impressive increase in the children's weight over the last 30 years.While in 1969 only 10 % of the children were overweight, this figure rose to 33.1 % in the boys and to 27 % in the girls.[5] In 1969, only 3 % of the children were obese when entering school while in 1999 15.7 % of the boys and 11.3 % of the girls were obese. This showed an increase by 350 %. However the study by Flegal et al. that was carried out in the USA and is based on data from the "National Health and

Nutrition Examination Survey (NHANES)" (National Center for Health Statistics, Centers for Disease Control and Prevention) shows a relatively stable percentage in the prevalence of overweight and obesity in a time span between 1960 and 1980.[3] The percentage of obese children (aged: 6-11 years) in the USA with a BMI larger than P95 (95 percentile) has more than doubled (from 6.5 to 15.8 %) over the last 20 years (time span: 1980 to 2002) while that of adolescents has more than tripled (from 5.0 to 16.1%). Obese children, especially girls, are at a very high risk of suffering from severe obesity in adult- hood. The relative risk that a 7-year-old child becomes obese in adulthood is 4 %, while this figure shoots up to 70 % in 10 to 13-year-old children that are already obese.[6] Consequences of obesity like hypertension, diabetes mellitus, impaired lung function or hyperinsulinemia can be a problem during childhood also. According to long-term investigations done by Maffeis et al., obesity in childhood is correlated with an increased mortality rate in adulthood.[7] Young adults suffering from obesity, and especially girls, are often disadvantaged when applying for job and meeting people in social gatherings. So in order to reduce this social unacceptability on the grounds of weight classes need to be studied and worked upon.

The need of the present study is to find a correlation between caries status and body mass index so that care should be taken for special emphasis (if any) on diet & physical activity for school children. The aim of the present study was to determine a correlation between the caries status and Body Mass Index (BMI) in school children aged 6-10 years in Greater Noida, Uttar Pradesh, India.

Settings and Design

A total of 468 children from 4 primary schools of Greater Noida were selected using simple random sampling method in a period of 2 months (July and August 2015).

Material and Methods

The dental examination was non-invasive which included only optimal illumination of the oral cavity for determining the visual caries as no x-rays were used. Ethical clearance was obtained from the Ethical committee. Before commencing the dental examination, the children were instructed to rinse their teeth. The examinations of the children (whether dental or physical) were only conducted after the written consent was obtained from the parents and/or guardian. The number of missing teeth (m/M = missing) were not recorded in the study because the investigated children were gradually receiving their secondary dentition, so no proper statement for the loss of the teeth could be made in this short period of time. The advantage of the df/DF-Tvalues is the determination of the total number of carious lesions independent of the type of the dentition. Physical examination included recording of

height and weight of the children.The height of the children was measured with a portable measuring unit (Detecto PHR Portable Stadiometer). The weight was established with a portable digital scale (Equinox EB-EQ-90 Weighing Scale) and the weight was always rounded to the nearest 100-gram value. For calculation of body mass index, formula BMI = body weight / body height^2 (kg / m^2) was used. The internationally recognized WHO classification of BMI into underweight, normal weight, overweight, and obese was followed (Table/Fig. 1).[8]

Statistical Analysis used

Statistical software was used for data entry (Microsoft Office Excel 2010 for Windows, Microsoft Corporation, Redmond, WA, USA) and all statistical tests were conducted using IBM SPSS software (ver.20.0; IBM, Chicago, IL, USA). Mean DMFT index values were compared between boys and girls using Student's t-test and $p < 0.05$ was considered for statistical significance. Percentages were compared using the Chi square test ($p < 0.05$).

Results

The study population comprised of 468 school children aged from 6 to 10 years from 4 primary schools of Greater Noida. Table/Fig. 2 shows the demographic distribution of study population according to age.

It was found that small percentage of the children were obese (2.8%), underweight (7.6%), overweight (10.2%). The majority of the children (79.4%) had a normal weight (Table/Fig. 3).

It was observed that a fair percentage of the school children (46%), 101 of the 221 girls (45.7%) and 114 of the 247 boys (46.1 %), proved to have caries-free dentitions. Table/Fig. 4 shows the gender-wise distribution of caries free dentition in different age groups. It was also observed that as the age increases the percentage of caries free individuals decreased which may be attributed to decrease in concern regarding oral health.

The mean df-t / DF-T value was 1.4 in 6- year old school children, while it was 2.2 in the 7-year olds which was significant. The mean df-t / DF-T value of 8-year old children was 2.3. The highest mean value of df-t / DF-T (2.6) was found in 9-year olds. In the 10-year old school children, the mean value of df-t / DF-T was 2.4 (Table/Fig. 5).

The evaluation of the percentage of caries-free dentition in weight classes showed the 52% of subjects had healthy dentitions in underweight children. It was also seen that 38.5% of obese children had the lowest percentage of caries-free dentitions. Primary school children with normal weight proved to be caries free in (47.4%) while this applied only to (41.6%) of the overweight children (Table/Fig. 6).

The mean df-t/DF-Tvalues in weight classes increased from the underweight children to those with normal weight or overweight up to those suffering from obesity. Underweight children had a mean df-t/DF-T value of 1.71, those with normal weight had a value of 2.14, overweight children had an average value of 2.62, and obese school children had a mean value of 2.66 (Table/Fig. 7).
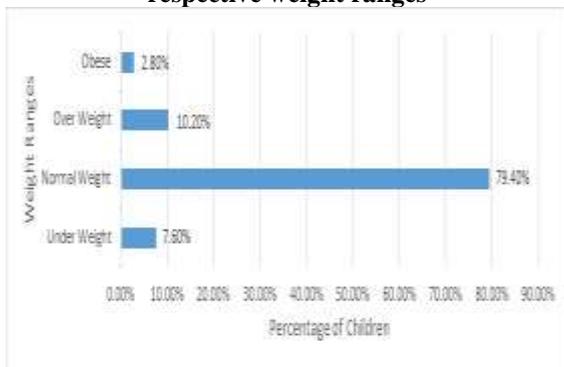
Table/Fig. 1: WHO classification of BMI[8]

Classification	BMI (Kg/m^2)
Underweight	<18.5
Normal	18.5- 24.99
Overweight	25.00-29.99
Obese	>30.00

Table/Fig. 2: Age-wise distribution of study population

| Age	n(%)
6 Years	42(8.9%)
7 Years	123(26.2%)
8 Years	124(26.5%)
9 Years	110(23.6%)
10 Years	69 (14.8%)
Total	468

**Table/Fig. 3: Percentage of children within the respective weight ranges**

Table/Fig. 4: Gender-wise distribution of caries free dentition in different age groups

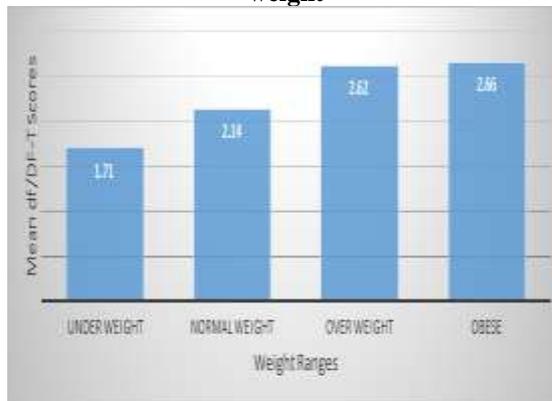| S. No.	Age	Girls (%)	Boys (%)
1.	6 Years	61.2%	59.5%
2.	7 Years	49.1%	45.3%
3.	8 Years	43.7%	48.5%
4.	9 Years	36.7%	44.4%
5.	10 Years	41.1%	34.5%

Table/Fig. 5: Mean df-t/DF-T scores according to Age
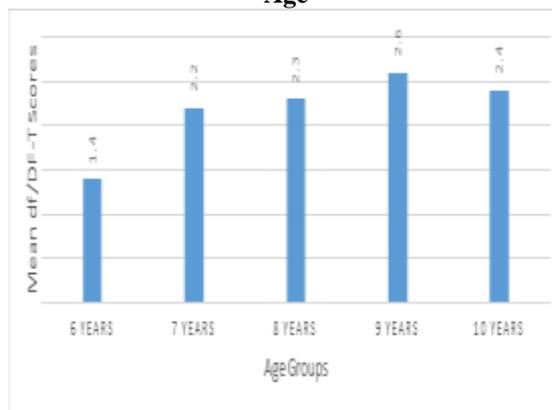
Table/Fig. 6: Percentage of caries free dentitions in 6-10 year old primary school children according to weight ranges
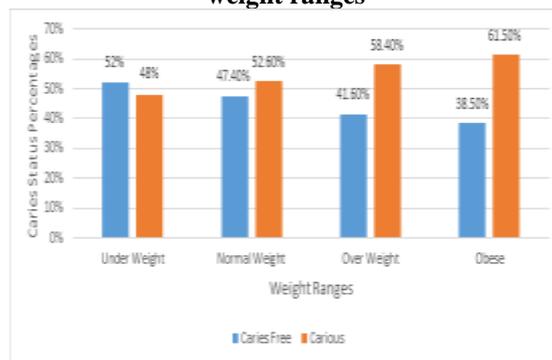
Table/Fig. 7: Mean df-t/DF-T scores according to weight

Discussion

It has been established that the prolonged and excessive consumption of fast food products carries a lot of risk factors for the general health such as obesity, diabetes mellitus or cardiovascular diseases. The frequent consumption of the food high in energy density e.g. fast food, can lead to a significant increase in the daily intake of energy and fat. A low socio-

economic status and income, life style, genetic dispositions are possible risk factors.

Fotedar S et al.[9] found the association between weight and dental caries among 1011 school children 12 and 15 years in Shimla city, Himachal Pradesh, India that 18.3% and 28.9% were in normal weight category in 12 and 15 years of age respectively which is in complete disagreement with the present study, reason for it could be the 3 out of 4 schools were private school in present study.

The present study showed 61.5% of the obese had carious dentition which is in complete disagreement with the study with done by Sharma S et al.[10] among 504 children of 13-17 years which revealed only 20% caries dentition in obese category this could be due to the presence of sticky dietary habit and less oral health concern in present study setting.

A study by Arun et al.[11] revealed the declining patterns of caries free dentition from underweight to obese children which is in complete agreement with the present study.

The limitation of the study is that the sample size taken for the present study is small in number and varying variety of schools (Private, Government-aided and Government) need to be evaluated for the accuracy of the results.

Conclusion

The present study showed a significant correlation between caries status and obesity, which is a challenge to be tackled in preventive public health programs while execution of the same. In future preventive public health programs, the emphasis on nutrition should be given with regard to both general health as well as oral health. Besides nutrition and diet, lack of physical activities seem to be one of the main reasons for the increase in the number of overweight and obese children. Therefore, preventive public health programs especially in schools are very necessary in order to avoid a further rise in obesity.

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